ATTITUDES, AWARENESS AND ACTIONS OF THE RESIDENTS OF THE HINKSON CREEK WATERSHED REGARDING WATER QUALITY AND ENVIRONMENTALISM

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by
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Dedicated to my Family

Thank you to Clif, Joshua and Samuel for your understanding and tolerance during the past two years while I have worked so many evenings and weekends. My heart has always been with all three of you. I love you so much.

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Public sentiment is everything.
With public sentiment, nothing can fail;
without it, nothing can succeed

-Abraham Lincoln, 1858-

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ABSTRACT

In Missouri, 70% of the population lives in or around an urban area. Unplanned development increases the stress on already altered ecosystems, while compromising water quality and water resources.

Many researchers are beginning to realize the importance of considering public attitudes when making natural resource plans and policies. This study explored the attitudes and opinions of 4,653 homeowners in the Hinkson Creek watershed regarding water quality and environmentalism in the watershed.

The Hinkson Creek flows north to south through Boone County and the city of Columbia (population 90,000) in central Missouri with a watershed that covers approximately 57,500 acres. The urban portion of Hinkson Creek was placed on the Environmental Protection Agency's list of impaired waters in 1998.

Eight focus groups were conducted with people living in rural, exurban, suburban and urban portions of the watershed. They revealed a high level of concern for the large amount of development occurring in Boone County and how it will affect streams.

A mail survey, designed from the information gained from the focus groups, revealed that respondents know little about water quality in their area; whether Hinkson Creek was polluted, the largest contributors of water pollution to Hinkson Creek and they did not understand the term nonpoint source pollution. The majority of the respondents believed that overdevelopment was the most serious issue in the watershed and that small changes in their daily lives would improve water quality. The information gained in this study will be used to develop educational programs.

Chapter 1

Introduction

Environmental changes associated with urbanization have been significant. The scope of the change is expected to continue through the next several decades. Urban development fragments, isolates, and degrades natural habitats, simplifies and homogenizes species composition, disrupts hydrological systems, and modifies energy flow and nutrient cycling (Alberti and Marzluf 2004).

When studying urbanization and the corresponding environmental changes, urban areas must be viewed not only as an ecological system with plants and animals, but also an area with people. These people have needs and wants which affect systems that biologists are trying to manage. This kind of research needs an integrated management approach, which includes both the biological and social aspects. Traditionally, a biologist's training does not view humans as part of nature, and many natural resource professionals did not enter the field to study humans. When studying an urban or urbanizing ecosystem there is often not a link between humans and the ecological processes.

In Missouri, 70% of the population lives in or around an urban area. Unplanned development increases the stress on already altered ecosystems, decreases the amount of acreage devoted to agriculture and habitat systems and compromises Missouri's water quality and water resources. At the same time, residents of increasingly urbanized landscapes can often be disconnected from the natural world and unaware of what if any impacts they and their activities may have, such as spraying lawn chemicals improperly

or improper disposal of chemicals. Evidence suggests awareness and attitudes regarding issues such as water quality may vary significantly among different groups of people.

The Hinkson Creek watershed is approximately 57,500 acres with a stream that flows north to south through Boone County where 60% of the rain falling on the City of Columbia flows into the creek. Historically Hinkson Creek has had problems, including the damming of the stream in 1892 after a fired destroyed the University of Missouri's Academic Hall. This was to ensure enough water was available in the city for firefighting (Jared Cole, per. comm.). From the 1940's until the mid-seventies coal mining and its runoff took its toll on the fish and aquatic life in the stream. Once mining ceased, the City of Columbia grew without an upgraded septic system.

Hinkson Creek has had dozens of recorded fish kills with causes ranging from acid mine drainage to sewage being released into the stream. The earliest fish kill the Missouri Department of Conservation (MDC) has on record occurred on September 23, 1947 when an acid release from a mine north of Columbia killed several fish. After the coal mines closed, land reclamation efforts began and Hinkson Creek's water quality improved.

Historically the stream was home to the now endangered (and extirpated from the stream) Topeka shiner, the Trout-perch and the Plains minnow. In the surrounding watersheds that flow into the Hinkson the now extirpated Western Silvery minnow was also found (Debby Fantz, pers. comm.).

The urban portion of Hinkson Creek was placed on the Environmental Protection Agency's (EPA) list of impaired waters in 1998. The EPA has given authority to the Missouri Department of Natural Resources (MDNR) to ensure the Clean Water Act is

enforced. Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards and where adequate water pollution controls have not been required. Water quality standards protect beneficial uses of water such as whole body contact (swimming), maintaining healthy fish and aquatic life populations, and provide drinking water for people, livestock and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired or not addressed by stormwater pollution control programs (MDNR 2007). The Missouri Department of Natural Resources, Water Protection Branch, Water Pollution Control Program placed a 14 mile segment of the Hinkson Creek on the 1998 303(d) list for unknown pollutants, bringing Hinkson Creek to the attention of residents, city officials and developers. With the history of fish kills, the urbanization of the stream and the surrounding watershed resulted in the designated beneficial uses becoming impaired. The urbanization concerns included the potential for water quality degradation, increased flow intensity due to stormwater runoff from impervious surfaces and the likely detrimental effects of development on the stream channel and riparian areas A study of the creek by MDNR shows the biological integrity of Hinkson Creek was impaired for approximately 14 miles below the Interstate 70 bridge crossing. MDNR's Environmental Services Program conducted three phases of study in Hinkson Creek which consisted of a combination of biological and chemical monitoring combined with toxicity testing. Samples were collected during base flow and storm events and were analyzed for toxicity, nutrients, metals, organic chemicals, and *E. coli* bacteria. In addition, field measurements of pH, temperature, specific conductivity, dissolved oxygen and discharge were also collected.

Phase I monitoring was conducted from July 2003 to June 2004 from the I-70 Bridge crossing to Broadway. The stream contained pollutants such as E. coli bacteria, fertilizers, salt, petroleum, oils, pharmaceuticals and insecticides mixing in the creek at levels high enough to kill aquatic life (MDNR 2004). Phase II was conducted from July 2004 to June 2005 and was performed in a similar manner. Turbidity levels were highest at the Highway 63 connector and old Highway 63 during base flow, which shows that there was some kind of in-stream activity occurring. Chloride values were high, along with pesticides and pharmaceutical drugs that have the potential to bioaccumulate in aquatic organisms. The final phase, Phase III was completed in June 2006 which focused on the lower portion of the Hinkson Creek, including tributaries entering the lower portion and selected upstream sites sampled during Phases I and II. The results from Phase III did not indicate toxicity or measure organic chemical constituents above the laboratory detection levels which could occur because of a lack of clearly defined stormwater inputs to the main stem of Hinkson Creek, as compared to the phase I and Phase II segments. Dissolved oxygen (DO) fell below the water quality criteria level of 5 mg/l, 10-15% of the time at Highway 63 and during extended dry periods 44-62% of the time at the Broadway stream crossing. Dropping of DO levels below 5mg/l harms sensitive aquatic life in the stream, but oxygen levels improved following rainfall events.

Hydrologic changes have occurred and will continue with the growing amount of impervious surfaces located in the watershed. As the percentage of land covered by impervious surface increases, there is a consistent degradation of water quality. Degradation occurs at relatively low levels of imperviousness (10-20%) and worsens as the paved area increases. The EPA reports that urbanization negatively affects streams

and results in water quality problems such as loss of habitat, increased temperatures, sedimentation and loss of fish populations. Roads, highways, bridges and parking lots are significant contributors of pollutants to streams. Pollutants from cars, roads and highway construction are washed from paved surfaces and roadsides when it rains or snow melts (EPA 2005).

Missouri residents are concerned about water quality. When asked if they personally worried about the pollution of rivers, streams and lakes, approximately 61% of Missouri's rural respondents indicated they worried "a great deal" about water pollution (Rikoon et al. 2004). Slightly more urban respondents (64.8%) gave the same response making it obvious that water pollution is indeed a statewide concern. In another Missouri opinion survey (Weithman 1994) found that respondents supported the protection of water quality above education. Although Missouri residents have indicated concern about water quality in general, little is known about their attitudes, awareness and actions (behaviors) especially in the context of specific watersheds. In Missouri, the MDNR has legal regulatory authority to protect water quality/quantity while the MDC only has an advisory capacity with regulatory powers related to recreational hunting/fishing and fish or wildlife that are killed due to a pollution event. Within this advisory capacity, the MDC could benefit from understanding these attitudes and opinions of Missourians. Recognizing and understanding these attitudes will assist governmental agencies to create decisions that are more representative of all the publics involved. This realization will also help develop communication strategies within the agency and with the public they assist (Dayer et al. 2005).

Purpose of the Study

The purpose of this study is to explore the attitudes and opinions of homeowners living in the Hinkson Creek watershed regarding water quality, pollution in the creek and surrounding watershed, opinions of management objectives and strategies to improve the water quality and to explore where people get their information regarding Hinkson Creek. The study includes the conduct of focus groups and a household survey (Appendix B) of residents in the watershed. Survey questions addressed the following research questions:

Research Questions:

- Do people think Hinkson Creek is polluted? (Question 14, opinion of the level of pollution in Hinkson Creek).
- Why do people think Hinkson Creek is polluted? (Question 18, opinion of how serious are the following potential issues in the Hinkson Creek watershed: overdevelopment, overpopulation, industrial pollution, agricultural pollution, sewage discharge and poor water quality).
- How do people think water quality in Hinkson Creek can be improved? (Question 21, opinion of management strategies for improving water quality: education, media, reduction in lawn chemicals, improving or enforcing laws and offering incentive to buy existing homes).
- How does the New Ecological Paradigm (NEP) in the Hinkson Creek watershed compare with other studies that have utilized the NEP?
- Is there a difference in the above questions depending on where the respondent lives in the watershed (assigned strata; urban, suburban, exurban and rural-numstrat); (self-reported; urban, suburban, small town and rural-question 28); and

where they grew up (self-reported; urban, suburban, small town and rural- question 27)?

Management Objectives

The management objectives of this study would ultimately be to improve water quality in Hinkson Creek and also improve the quality of the surrounding watershed so the creek can be removed from the 303(d) list. Watershed managers need to understand how to:

- Create education programs targeted to homeowners based on knowledge, attitudes and opinions about Hinkson Creek.
- Get media involvement to improve homeowners' knowledge of the watershed.
- Encourage people to reduce lawn chemicals and pesticides.
- Enforce or improve water quality laws in the watershed.

Need for Study

Decades ago people became painfully aware of environmental crises with events such as Love Canal, Three Mile Island and DDT impacting the bald eagle and peregrine falcon (American Values Survey 2006). Unfortunately many of today's crises are more subtle and include complicated issues such as global warming.

According the American Environmental Values Survey (2006), American's support for the environment is declining. While 77% of Americans say that they worry about the environment a great deal or a fair amount, it is neither a personal nor a public policy priority and 83% believe that environmental protection and economic growth can occur at the same time. Palmer (1995) also found the belief that environmental protection and economic growth can occur simultaneously.

Understanding that one message is not going to reach all Americans will help governmental agencies tailor their message to engage specific audiences. For example the American Environmental Values Survey (2006) found that "younger, stimulus seeking Americans are concerned about global warming, but only half of the group state that global warming matters to them personally (19% vs. 39%)". This group feels that global warming is being "over hyped".

Another example from the American Environmental Values Survey (2006) found that conservative, religious Americans are less likely to understand global warming. In addition blue collar; self-sufficient Americans have a strong environmental ethic, but are much less willing to accept a tax increase to stop global warming.

Three-quarters of Americans claim to be concerned or very concerned about the environment yet, when compared to other issues such as the war in Iraq, illegal immigration and taxes, the environment did not rank in their top 20 concerns (American Environmental Values Survey, 2006).

Some of the key findings in the American Environmental Values Survey (2006) include:

1. American's environmental opinions are divergent and polarized (people define the word environment differently, such as hunting habitats, areas for dirt biking or an entire ecosystem but do not have a complete understanding).
2. Issue complexity confuses Americans (this confusion prevents people from doing anything for the environment).
3. Men and women look at the environment differently (women are more sensitive to issues than men).

4. Americans have different and competing priorities (e.g., financial concerns, religious values, personal safety, do not want new taxes, education, political and cynicism towards governmental agencies).
5. Money can change behavior (letting people know how they can save money and help the environment)
6. Environmentalists are looked upon as "eco-freaks" (environmental advocates need to be a part of main-stream America, rather than on the edge).

American Environics (2006) found the following:

1. Americans (especially younger ones) are more supportive of survival values rather than fulfillment values.
2. One-fourth of Americans interested in the environment voted for President Bush in 2004, showing that other values and opinions are more important than the environment.
3. Most environmentally aware people live in the suburban and urban parts of the city; they are generally white, college educated, higher income and over 35.
4. Only 10% of the population considers themselves an environmentalist.

Americans need messages that are tailored to specific segments of the population similar to how marketing ads target specific groups.

The American Values Survey recommends that agencies recognize that people are different; create strategies that give people hope; incorporate young people into strategies who don't consider themselves environmentalists; and create environmental programs to reach out to people without ecological values and are not environmentalists.

According to Decker and Chase (2001) natural resource managers and governmental employees working with stakeholders must understand the "diverse and conflicting" opinions that stakeholders have for the resource. They offer five ways to encourage stakeholder involvement:

1. Expert authority approach- managers and agency people make decisions and take action based on their own knowledge. No stakeholder input is given. The advantage is this only works if there are few stakeholders or the stakeholders have similar opinions. The disadvantage is stakeholders can be alienated.

2. Passive-receptive approach-managers listen to what the stakeholders have to say but are not actively seeking their comments. The advantage is it is easy on the manager. The disadvantage is all stakeholders are not represented

3. Inquisitive approach-managers actively look for the stakeholders to learn about their views and opinions. The advantage is the manager gains a greater understanding of the issue and more social change can occur. The disadvantage is which group of stakeholders has the most important opinion.

4. Transactional approach- the stakeholders meet as a group which is facilitated by the manager, and the stakeholders discuss the issues among themselves. This approach works when looking for an unconventional idea for a problem and the disadvantage includes needing a manager with excellent communication skills.

5. Comanagerial approach-involves agency and stakeholder partnerships. The advantage is it allows decisions to be made at the local level and the disadvantage includes it is a new approach and relatively untested.

Many researchers are beginning to realize the importance of including people into natural resource plans and policies. Land managers must understand the attitudes and awareness of the citizens they serve. Understanding people with different knowledge levels, attitudes, and values will facilitate agreements among these diverse groups (Jacobson and Marynowski, 1997).

Raedeke et al. (2001) found that if landowners are involved in the decision-making process they will be more likely to trust the program the resource manager is offering. When starting a natural resource program they feel that it is helpful to initially find out

what the local people feel to be the more serious environmental problems in the area and address those first if possible. Kellert (1980) found that "people have a limited ecological understanding and that concern for wildlife is largely confined to attractive and emotionally appealing species".

Williams and Stewart (1998) believe when resource managers are designing plans that include people the idea of "sense of place" should be treated as important rather than just some interesting statement. They offer four ways for managers to utilize the idea of sense of place in their day to day management plans:

1. "Know and use the variety of local and place-names
2. Communicate management plans in locally recognized place-specific terms
3. Understand the politics of the places
4. Pay close attention to places that have special but different meanings to different groups". (pages 21-23).

O'Neill (2005) found that people do not know a lot about watersheds and the water cycle, and fewer people think of themselves as living in a watershed. Her idea is to encourage managers to work in smaller watersheds to decrease conflict among the residents living in the area.

Natural resource managers may find an obstacle to stakeholder participation that includes concern that participation in a particular program may lead to future regulations. Raedeke et al. (2001) found that by openly sharing management plans with landowners, following through with commitments made to the stakeholders, incorporating input from the participants, demonstrating the program's moral soundness through the completion of projects, and sharing any program changes with the landowner develops a trusting and more successful partnership.

Increased public awareness and positive public attitudes will be necessary to improve water quality and promote sustainable management of natural resources. Attitudes, awareness and actions of residents in the Hinkson Creek watershed have not been addressed by previous research. Therefore there is no systematic indication of residents' values, perceptions, knowledge and interest level in the creek itself or the watershed. The results from this survey will assist governmental agencies working within the watershed to reach the people with a water quality message directed towards those living in the watershed. Successful resource management will require strong support from different segments of the public and support will be best achieved by understanding the attitudes, awareness and actions of those living in the watershed.

Chapter 2

Literature Review

In Missouri 70% of the population lives in or around an urban area and has also witnessed a move in recent years from living in town to building on large lots in remote areas within commuting distances to urban areas. This human movement threatens to further change already altered ecosystems, decrease agricultural acreage and compromise Missouri's water quality and water resources (The Brookings Institution 2002).

One of the keys to successfully integrating the various facets of urban ecosystems is to understand and quantify the attitude of Missouri's residents' toward the environment. State wildlife agency employee attitudes differ from the public's, and attitudes of agency employees in management positions differ the most from the stakeholders they are attempting to serve (Dayer et al. 2005). Recognizing and understanding stakeholders' attitudes and opinions may help create agency decisions that better represent that of the public. This realization will also help communication strategies within the agency and with the public they assist (Dayer et al. 2005).

Attitudes and behaviors vary among urban, suburban, exurban and rural people. Urban is defined as living in the city; suburban as living in a residential area outside of a city; exurban as living beyond the suburban area and rural is defined as living in the country.

The urban experience with wildlife can be classified as "out of sight out of mind". In other words, unless a wild animal crosses their path while at the park or zoo, wildlife becomes unimportant and distant. It is estimated that 75% of wildlife viewers live in

suburban neighborhoods (Knuth et al. 2001). In comparison, exurban residents place a high value on rural characteristics such as open space, attractive natural environments and privacy (Crump 2003). Rural landowners tend to have close personal ties with farming, forestry and wildlife and are likely to hunt or fish (Conover and Messmer 2001). Rural people view wildlife as a potential nuisance, predator or food; with game animals assigned a utilitarian value as opposed to a symbolic one (Daniels and Brehm 2003).

The literature reviewed in this chapter is divided into five sections: *Demographic and Spatial Dimensions; Human Dimensions of Natural Resource Management; Attitudes, Awareness and Actions and the New Ecological Paradigm.* The overall purpose and focus of this study stated in Chapter 1 is to provide basic models to explore the attitudes and opinions of homeowners living in the Hinkson Creek watershed regarding water quality in Hinkson Creek.

Demographic and Spatial Dimensions

Educational materials are often developed for the "general public" without having a clear idea as to who they are, what they believe and their willingness to improve water quality. Demographic and geographic information can help focus a conservation message.

Research has shown that young people express favorable attitudes toward endangered species and the environment (Kellert, 1980; Van Liere and Dunlap; 1980; Jacobson and Marynowski, 1997). Other studies have shown that young people are more likely to hold environmental beliefs than older respondents such as a concern with the ecological effects of altering the environment (Mohair and Tight, 1987; Arcury and Christianson, 1990; McMillan et al. 1997). Van Liere and Dunlap (1980) attribute this high level of

environmentalism in young people to involvement in social activism. Environmentalism is defined as the activity of protecting the environment from pollution or destruction. The continued exposure to environmental problems through education and the media has caused young people who are environmentally aware to continue as aware adults.

Research has shown that generally women are more likely to have stronger environmental beliefs than men (Arcury et al. 1986; Mohair, 1992; McMillan et al. 1997). According to Schahn and Holzer (1990), women are more environmentally concerned in areas that refer to household behaviors while men know more about environmental problems. They found women had higher values in attitude scales and measures of self-reported behavior, but knew less about environmental problems, while men proved to have higher concrete knowledge about environmental problems. Kellert and Berry (1987) showed that men were more knowledgeable than women about animals, including wildlife management, especially endangered species. Women were more concerned about domestic animals and aesthetically pleasing animals such as lions, tigers and bears.

Education influences the environmental attitudes of individuals would include higher levels of education having a positive effect on environmentalism. Van Liere and Dunlap (1980) believe education is the variable most closely associated with environmentalism.

Income is also positively associated with environmentalism (Arcury et al. 1986; Arcury and Christianson, 1990). Herrera (1992) believes people with high income are accustomed to living in healthy environments and support environmental protection. Jones and Dunlap (1992) believe the effect of income on environmentalism is not straightforward.

Stedman and Heberlein (2001) found that "childhood leisure behaviors provide a strong foundation for adult recreation" and that parental influence on leisure behavior is especially strong in young children. Lowe and Pinhey (1982) found the size of the town where a person was raised was related to environmental concern. Those brought up in urban areas showed more environmental concern than those raised in rural areas, regardless of where they were living at the time of the survey. Witter (1992) found that 4 in 10 Missourians who live in urban areas grew up in a rural area or a small town giving them an interest in nature.

Another variable that influences environmental attitudes is residence in an urban, suburban, exurban or rural area. Several studies have shown that urban areas are generally associated with greater environmentalism because people living in urban areas live in a more polluted environment and are more aware of the problems than people living in rural areas (Van Liere and Dunlap 1980). An alternative explanation poses that rural residents often depend on the land for economic purposes such as agriculture and do not value the land for any aesthetic or intrinsic qualities (Tremblay and Dunlap, 1978).

Tremblay and Dunlap (1978) also found that urban residents were more environmentally concerned than rural residents. This urban-rural difference was stronger when the environmental concern is for pollution problems at the local level. Fortmann and Kusel (1990) found the length of residence did not correlate with environmental attitudes. Reading et al. (1994) found that people new to the area will be more supportive of the environment than long time residents.

Palmer (1995) found about two-thirds of rural residents (68%) and urban residents (66%) thought it possible for environmental protection and economic development to go

hand-in-hand. In the same study Palmer (1995) found 73% of rural residents and 61% of urban residents felt natural resources can be protected and conserved while also using them wisely for public benefits..

Stedman and Heberlein (2001) feel that rural places and urban places may be characterized more by their diversity than by characteristic values, attitudes or behavior patterns. Urban residents often are drawn to rural places where they believe the people are friendlier, the pace is slower and life is safer (Willits and Luloff, 1995). Urban residents are looking for a type of rurality (Mormon, 1987). As people move from urban areas to more rural areas the urban-rural environmental dichotomy may be too simplistic. Dunlap (1987) believes the general "greening" of America has diluted many differences between urban and rural environmental values.

Since World War II, population growth has moved out from the original core areas into the rural countryside with sprawling suburbs and exurbs. But, by 1970, more Americans lived in the suburbs than the cities (Mitchell, 2001). People are now moving from the suburbs to more rural areas to own their own piece of nature on the rural frontier.

The term exurban was originally used in Augusta Spectorsky's 1955 novel *The Exurbanites* to describe residents who commuted to New York City from rural areas beyond the extent of the rail lines (Theobald, 2004). Today there are several definitions to describe exurban including a semi-rural region beyond the suburbs of a city, characterized by low density (~ 5 acres per unit or more), and large lot development (Daniels, 1999).

Exurban development occurs beyond the suburbs and is outside easy commuting range to the central city (Crump, 2003). Odell and Knight (2001) defined exurban development as occurring beyond the incorporated city limits. While Storm (2005) defined exurban development as a non-metropolitan residential development characterized by a human population density and average property size intermediate between suburban and rural areas. In the context of this study, there is a large amount of development occurring in the exurban portion of the Hinkson Creek watershed where people are building large houses on 10 acre tracts that affect the watershed and the stream.

According to Crump (2003) exurbia is neither urban nor rural; it is generally assumed that exurban growth is simply a low-density form of suburbanization. Exurban movers desire the best of both worlds; wanting to live in the country while maintaining access to urban services such as medical care and cultural attractions.

Crump (2003) found the suburbanites were more concerned than exurbanites with the cost of housing, access to highways and the availability of nearby shopping. Exurbanites have a strong desire to live in a rural environment and place high values on environmental things such as open space. Many also move from the city to escape crime, pollution, fast pace of life and impersonality (Graber, 1974; Wulfhorst, 2000).

Widespread population growth began in rural areas in the 1970's, slowed during the 1980's and was strongly revived in the 1990's. Jones et al. (2003) found that upwardly mobile Americans are moving to areas of lower population with clean air and water, scenic beauty and recreation opportunities. Aging "baby boomers" are looking to get

away from urban problems and suburban sprawl in small towns and are moving to communities near public lands that have parks, lakes, mountains or forests.

From an ecological perspective, exurbanization is similar to urbanization. Unplanned changes in the landscape through destruction, degradation and fragmentation of natural habitats have a greater impact on the landscape than suburban or urban growth patterns (Knight, 1999; Storm, 2005).

Willits and Luloff (1995) found that after exurban newcomers settle in their new area they tend to prevent changes that may adversely affect the natural environment which attracted them, by establishing planning and zoning ordinances. Rural residents traditionally do not like government intrusion on their property (Raedeke et al. 2001; Eser and Luloff, 2003).

The exurbanites often have more environmental awareness than rural residents because of their higher level of education and media exposure. They also have more discretionary income to spend on environmental causes and are often independent of the local economy which allows them to oppose polluting industries in their new locality (Eser and Luloff, 2003).

With Hinkson Creek flowing through rural, exurban, suburban and urban areas, this study will contribute to the literature that already exists regarding the demographics and spatial locations of people living in the watershed of a rapidly urbanizing stream.

Human Dimensions of Natural Resource Management

The term "human dimensions" was introduced formally to wildlife professionals 35 years ago by Dr. John Hendee at the North American Wildlife and Natural Resources Conference (Manfredo et al. 1998). According to Manfredo et al. (1998) "human

dimensions" is defined as "the assessment and application of social information in fish and wildlife decision making." It includes a broad array of concepts and techniques used to understand human attitudes and actions. It includes a wide variety of social science disciplines such as anthropology, economics, geography, mass communication, marketing, political science, psychology, recreation, sociology and social psychology (Manfredo et al. 1998). Within governmental agencies these social sciences are used to develop surveys, focus groups, and techniques to involve the public in the decision making process.

Gigliotti (1998) defines human dimensions as a "specialized discipline in fish and wildlife management that blends sociology, psychology, communications, economics, recreation, education, anthropology, statistics and other subjects with biology and ecology to make wise management decisions concerning renewable natural resources; it is an applied science. Human dimensions include people's "beliefs, values, knowledge, customs and laws" (Witter and Jahn, 1998).

Manfredo et al. (1998) listed five reasons why human dimensions are important to fish and wildlife agencies:

First, human dimensions offer tools that allow managers to represent the public in decision making. Traditionally fish and wildlife agencies served hunters and fisherman, while in the 21st Century there are other constituents such as bird watchers, wildlife photographers and people interested in wildflowers and endangered species. Human dimensions can help meet the needs of both the new and traditional constituents in fisheries and wildlife.

The second way that human dimensions tools assist managers is by "maximizing desired consequences and societal benefits." The understanding of public values and fisheries and/or wildlife management consequences can assist in determining the best management option for people and the plant or animal species.

Thirdly, human dimensions can assist by predicting human behavior, such as how people will vote, reaction to regulation, citizen acceptance regarding a particular topic and shifts in public attitudes and values.

The fourth contribution of human dimension information is by "identifying ways to affect human thought and behavior." This knowledge will assist agencies in their ability to educate and persuade.

The last area where human dimensions can assist managers is how they can "improve accountability and cost efficiency in decision making." By understanding what the public wants and needs from an agency, divisive issues can be anticipated and action can be taken to solve the problem.

Decker et al. (1987) identified 10 obstacles to the effective application of human dimension information. They included:

1. "The incorrect assumption by human dimension researchers that agency managers know how to use human dimensions information."
2. "Human dimensions researchers don't understand the social/political decision-making environment of the agency."
3. "Agency managers don't read the human dimensions literature."
4. "University staff and agency staff are motivated by different factors."
5. "Agency managers operate under a number of assumptions about human behavior, some of which are inaccurate or do not fit the entire set of user groups."
6. "Some agency managers have a 'biological' bias."
7. "Some agency managers view human dimensions as a 'magic' public relations weapon."
8. "The increasing popularity of the pseudo-survey (non-scientific survey) both internal and external."

9. "Agencies creating human dimensions positions or using consultants at the technician level rather than the decision-making level."
10. "Lack of standards for what defines a human dimensions professional."

Baker (2006) found other problems with human dimension research can include:

1. Social scientists as well as biological scientists have their own "disciplinary niches" but don't step back and look at the big picture.
2. Both social and biological scientists have their own languages which causes difficulty in communicating with one another.
3. Each discipline has their own culture (research approaches, reward system, how to publish).
4. Different sciences deal with funding sources differently.
5. There are often "walls" between the different scientists causing a difficult working situation.
6. Where the research should be published? In a book or peer reviewed journal?

Witter and Sheriff (1983) also found that resource professionals face the challenge of monitoring wildlife and diverse groups of people interested in specific wildlife species. Often resource professionals find themselves managing for one species of plant or animal and the people interested in that specific flora or fauna, when they need to consider the entire ecosystem and all stakeholders. Some stakeholder groups unassociated with a specific wildlife species are not heard by managers. If habitat conservation is to succeed, all stakeholders need consideration. Because 85% of Missouri is in private ownership, natural resource managers need to involve private landowners if habitat conservation is to succeed.

Decker et al. (1996) felt that a key to success would be that managers would work to "understand, inform, educate, represent and involved diverse publics and facilitate decisions that have a broad stakeholder acceptance." Natural resource decisions should be made using both biological and social science information (Peterson and Manfredo, 1993). According to Manfredo et al. (1998) there are two types of social science that should be used by natural resource managers: the first one deals with "information about

how people regard specific issues and why they feel the way they do" and the second one addresses how people are going to respond to certain "management actions".

Duda et al. (1998) found when fish and wildlife agencies effectively utilize human dimension techniques, successful partnerships can be created with their constituents. The benefits of these collaborations include:

1. increased awareness of the agency
2. increased agency funding due to a better understanding of the agency
3. enhanced customer service
4. strengthened agency relationships

Human dimensions brings an obvious strength to natural resource research which is a body of knowledge including both social structures and human behaviors. Human dimension research has shown that fish and wildlife contribute to people's quality of life, food, shelter; clothing, spiritual meaning, commerce and aesthetic wonder (Witter and Jahn, 1998). It will take a combination of human dimension research and biological research to improve water quality in the future.

Attitudes, Awareness and Actions

There are two theoretical approaches from social psychology used extensively in human dimensions research to aid in understanding values and attitudes and also understanding people's behavior or actions; they are cognitive approaches and motivational approaches. The cognitive approach implies that people's values determine their attitudes and their attitudes affect their behaviors. The relationship between these concepts can be used to predict behavior. A motivational approach attempts to explain why people do what they do and why they behave the way they do (Pierce et al. 2001).

COGNITIVE APPROACH

Values

Rokeach (1973) defines values as a quality of life that an individual or a group holds dear such as freedom or equality. Values are learned early in life and are tied with one's identity; they are extremely resistant to change once established. A value is a general characteristic that a person favors and is likely to promote (Barbour, 1980). Since values cannot be observed directly researchers look for evidence of people's values by using a survey questionnaire that asked people what is considered important. A person's small number of values can direct a large number of attitudes that express those values (Pierce et al. 2001).

Values are hierarchical in nature. Abraham Maslow (1954) developed a value system of human needs, ranging from the most basic to the most satisfying:

1. Survival (physiological needs): food, shelter, clothing, health
2. Security (safety needs): protection from danger and threat
3. Social (belonging needs): friendship, acceptance and love
4. Self-esteem (ego needs): self-respect, recognition, status
5. Self-actualization (fulfillment needs): creativity, realization of individual potential.

According to Maslow (1954), lower level needs such as survival and security must be met before people can give attention to the higher level needs. Starving people are not going to be interested in creativity or status, but may still need love and acceptance.

Value Orientations

Basic beliefs are specific thoughts about an object; it gives meaning to values. Value orientations are the patterns of direction and intensity among basic beliefs (Fulton, et al. 1996). Basic beliefs and value orientations help explain how positions toward specific issues evolve from broad values. Fulton et al. (1996) gave an example of why it is important to define both basic beliefs and value orientations. Two people may both have a strong belief in universalism which implies equality. One person may believe that both people and animals should have the same rights, while the other person may believe that equality would only apply to humans. The basic belief is similar while the value orientation is quite different.

Value orientations directly influence attitudes and behaviors. In the Hinkson Creek watershed most people would agree that clean water is an important value; but residents in the watershed with that basic belief may have very different value orientations. For example, clean water in an urbanizing watershed may result from making more laws, enforcing laws or educating people to understand that everyday actions can improve water quality. The same basic value belief but different expressions of value orientations.

Attitudes

Fishbein and Ajzen (1975) define an attitude as a "person's evaluation, either favorable or unfavorable, of a person, object, concept or action." Attitudes can predict and influence behavior. Values and value orientations are believed to play a major role in shaping attitudes and attitudes are believed to influence behavior.

Attitudes are usually thought of in terms such as, like-dislike, good-bad and positive-negative. Research that looks at opinions, preferences and perceptions is really trying to

understand attitudes (Pierce et al. 2001). General attitudes can predict general behaviors while specific attitudes can predict specific behavior. Millar & Millar (1996) found attitudes that are formed through direct experiences are seen as better predictors of behavior. Attitude intensity or passion is correlated with self-reported environmental behavior and political activism (Steel, 1996).

The cognitive approach looks at how values and attitudes influence behavior. Fulton et al. (1996) developed the cognitive hierarchy which is a predictive model that illustrates the relationship of values and behaviors among concepts. This approach is useful in this study in exploring how values determine attitudes, and how attitudes influence behavior. Hopefully we could then look at each value and predict how it will influence people's actions. This approach can assist agencies managing the watershed to improve water quality in a way that will be supported by the majority of the residents. The cognitive hierarchy can move from urban to suburban to exurban to rural or even from one watershed to another by exploring the different values, value orientations, attitudes, behavioral intentions and behaviors.

MOTIVATIONAL APPROACH

Motivational theory explores why people participate in certain activities like they do. This theory answers questions such as why people go bird watching with friends, why people deer hunt alone or participate in wildlife viewing with family (Pierce et al. 2001).

Motivations

Pierce et al. (2001) defines motivations as forces that drive people to achieve a particular goal. Motivational theory explores two primary reasons for behavior:

1. the expectations that certain behaviors will lead to certain desirable events

2. the likelihood that those events will lead to a valued outcome

Satisfaction

Satisfaction in the motivational theory as explained by Pierce et al. (2001) suggests that we desire a certain outcome, and that outcome is the satisfaction that we hope to achieve. Driver et al. (1991) explores the idea that satisfaction is a product received from a certain experience or a benefit that an individual may experience. Satisfaction can include time with the family, enjoyment of nature or exercise; it can also be a feeling of pleasure or enjoyment from a certain experience. In the Hinkson Creek watershed, people working directly with the creek could feel great satisfaction if the creek is taken off the Environmental Protection Agency's 303d list for impaired waters or for people wanting to make sure that Hinkson Creek would be improved to the quality that it would be fishable and swimable once again.

Hendee (1974) suggested that a person's satisfaction with an activity is complex and depends on various aspects of the experience, including the expectation. He proposed a multiple satisfaction approach, which came from studying hunter satisfaction which was not just a matter of how many animals were killed, but was influenced by several factors and differed from person to person. These factors could include time alone; enjoying the wilderness experience; outdoor skills and/or a searching for a trophy animal.

Motivation theory is concerned with determining the needs and outcomes sought from the behavioral experiences, while satisfaction is a complex product of experiences and expectations. In this research we explore what motivates people to behave in ways to protect water quality. The study does not focus specifically on motivation, but looks at

respondent's opinions about the seriousness and importance of several factors regarding water quality and management strategies to improve water quality.

Stern and Dietz (1994) confirmed empirically that environmentalism is connected to certain basic human values. They believe there are three value bases for environmentalism: egoistic values; altruistic values and biospheric values Egoistic values predispose people to protect different parts of the environment that affect them personally or oppose protection of the environment if the cost is perceived too high. Altruistic values occur when people experience a sense of moral obligation to do what is right for the environment while biospheric values are beliefs held by many environmentalists who incorporate the effects of the world on human beings as well as on non-human species and the biosphere. Their research has linked environmentalism to biospheric-altruistic and inversely related to egoistic value orientations. In this study there are examples of these kinds of people working to improve the water quality in Hinkson Creek.

INCONSISTENCIES BETWEEN ENVIRONMENTAL ATTITUDES AND BEHAVIOR

Diekmann and Preisendorfer (1998) found that environmental attitudes and behaviors may have inconsistencies between, what people say and what they actually do. There are three possible reasons why this occurs:

1. individuals spend time on environmental issues where the behavior is seen in a positive light ("attention-shifting strategy")
2. the environmental behavior saves money ("low-cost strategy")
3. the environmental behavior does not pay off financially ("subjective-rationality strategy")

Pooley and O'Connor (2000) also found discrepancies between ecological awareness and actions. They found that ecologically concerned citizens often do not understand ecology or they believe things that are not true about the environment. In addition these same people are willing to protest environmental problems but lack a firmly held belief that they play a role in environmental problems.

PLACE BASED ATTITUDES

When someone looks into a field what do they see? A developer may see a subdivision or another Wal-Mart, a hunter may see a trophy buck, while a farmer may see a place where he can grow more corn or raise more cows. Landscapes are symbolic environments created by people giving meaning to the environment through values and beliefs (Greider and Garkovich, 1994). Our understanding of nature is a cultural expression used to define who we were, who we are, and who we hope to be at this place and in this space. Landscapes are the reflection of these cultural identities which are about us rather than the natural environment (Greider and Garkovich, 1994).

Space becomes place when people create and attach meaning to it (Williams, 1995). Bell (2004) thinks that nature is something we make as much as it makes us. Knudson et al. (2003) imply that people of any area need to "identify with the landscape and its natural and cultural resources." This identification helps them feel a part of the whole and promotes unity and a sense of belonging.

Sense of place and place attachment are used to characterize an important position of the emotional bond that people have with the environment. Williams and Stewart (1998) define the nature and complexity of the issue as follows:

1. "the emotional bonds that people form with places"

2. "the strongly felt values, meanings and symbols"
3. "the valued qualities of a place"
4. "the set of place meanings that are actively and continuously constructed and reconstructed"
5. "the awareness, historical, and spatial context within the meaning"

There are three components of place: the physical setting, human activities and the human social and psychological processes rooted in the setting. These components form a center of meaning based on human experience, social relationships, emotions and thoughts that are called a "place" (Stedman, 2002).

Eisenhauer et al. (2000) thinks that place attachment is an important tool for natural resource managers because it helps foster public support and may explain public reactions to land management practices. In this study utilizing this tool will assist local agencies to develop educational programs for people in the watershed. The following comments from the survey demonstrate as sense of place:

1. "We are thinking about leaving Columbia because everything that was good and beautiful has been cut down and paved over…"
2. "I am one of a small but dedicated group of people who paddle the Hinkson and are intimately knowledgeable and exposed to the creek. I've been paddling the Hinkson since 1990…"
3. "Stop the sprawl. Leave rural areas rural. We need open space and wildlife…"

The New Ecological Paradigm

Since the 1960's people have become more aware of global environmental problems and the rocky relationship between modern industrialized societies and the environment which people need to survive (Stern et al. 1992). Over the past 15 years there have been suggestions that people are becoming more ecologically aware and may have a sound worldview of what are happening in the environment (Olsen et al. 1992). With this

thought in mind researchers were looking to measure "environmental consciousness". During the environmental turmoil of the 1960's it was not the sociologists that functioned as opinion leaders, the scientists were people such as Rachel Carson, Paul Ehrlich and Garrett Harding (Catton and Dunlap 1978). As there was an increasing concern for the environment, sociologists led numerous studies to explore the public's attitude toward the environment. The first of these include a traditional set of beliefs and values which explored society's antienvironmental view, also known as dominant social paradigm (DSP). DSP views humans as superior to the rest of nature (Dunlap et al. 2000).

Dunlap and Van Liere (1978) felt there had been a shift from a more dominant worldview (man has dominion over the earth) to one that is more ecologically friendly. Sociologists needed to look at nature and humans relationship to it. The 12-item scale they created was called the New Environmental Paradigm (NEP). The NEP focused on the belief that societies can cause environmental problems by disturbing the balance of nature; there are limits to how many people can live on the earth and they challenged humanity's right to rule over nature.

The NEP is commonly used to look at "ecological" worldviews, which can measure environmental concern, reflect a proenvironmental orientation as well as looking at environmental attitudes, beliefs and values (Dunlap et al. 2000). A high score on the NEP Scale shows an ecological worldview that should lead to proenvironmental beliefs and attitudes on a variety of issues (Stern et al. 1995). In this study, the NEP will give researchers a tool to understanding more about the residents living in the watershed (See Appendix B, questions 1-15).

The NEP has been used for twenty years, and is most often used with the general public but has also been used with farmers, special interest groups, and residents of other countries such as Canada, Sweden, the Baltic States, Japan and several Latin American nations and Spain to compare environmental attitudes with those of American students (Dunlap et al. 2000).

Environmental groups score higher on the NEP than the general public or members of nonenvironmental groups. Stern et al. (1995) recognized that even though predicting behaviors from general attitudes and beliefs is difficult, the NEP Scale showed a significant relationship between various types of behavior intentions as well as self-reported and observed behaviors. Dunlap et al. (2000) found most research that utilizes the NEP finds the scale to be negatively related to age and positively related to education and liberalism.

Dunlap et al. (2000) revised Dunlap and Van Liere's original NEP scale by updating the terminology and broadening the scale's content. They wanted to use the term ecological instead of environmental which they felt had broader meaning and was less specific. The new instrument was labeled the New Ecological Paradigm Scale (NEP). This is the scale that is used in the research reported here to help analyze people's attitudes toward the environment.

The new instrument increased the number of questions from 12 to 15 covering five distinct elements of an ecological world view. Questions 1, 6, and 11 evaluate the limits to growth; questions 2, 7, and 12 look at antianthropocentrism; questions 3, 8, and 13 explore the fragility of nature's balance; question 4, 9, and 13 evaluate the rejection of exemptionalism and questions 5, 10, and 15 addresses the possibility of an ecocrisis.

Agreement with items 1, 3, 5, 7, 9, 11, 13 and 15 are worded to agree with a proecological view while disagreement with items 2, 4, 6, 8, 10, 12 and 14 show a proecological view. See Table 2.1.0.

Table 2.1.0

New Ecological Paradigm Scale

Listed below are statements about the relationship between humans and the environment. For each one, please indicate whether you strongly agree, mildly agree are unsure, mildly disagree or strongly disagree.

a. We are approaching the limit of the number of people the earth can support.

b. Humans have the right to modify the natural environment to suit their needs.

c. When humans interfere with nature it often produces disastrous consequences.

d. Human ingenuity will ensure that we do NOT make the earth unlivable.

e. Humans are severely abusing the environment.

f. The earth has plenty of natural resources if we just learn how to develop them.

g. Plants and animals have as much right as humans to exist.

h. The balance of nature is strong enough to cope with impacts of modern industrial nations.

i. Despite our special abilities, humans are still subject to the laws of nature.

j. The so-called "ecological crisis" facing humankind has been greatly exaggerated.

k. The earth is like a spaceship with very limited room and resources.

l. Humans were meant to rule over the rest of nature.

m. The balance of nature is very delicate and easily upset.

n. Humans will eventually learn enough about how nature works to be able to control it.

o. If things continue on their present course, we will soon experience a major ecological catastrophe.

Chapter 3

Methodology

Introduction

This baseline attitude and awareness study explores randomly selected landowners and homeowners in an urbanizing watershed to explore opinions, beliefs and attitudes regarding what has occurred, what is occurring and what can occur in the watershed in the future. Gaining information about the residents' attitudes, awareness and actions will assist governmental agencies in successfully reaching their target audience with a target message.

This study explored the opinions of residents living in the Hinkson Creek watershed in Boone County Missouri regarding water quality and its improvement and has been approved the University of Missouri- Columbia's Institutional Review Board (IRB).

The assessment began by conducting eight focus groups on the University of Missouri-Columbia campus in December 2005. The watershed was stratified into urban, suburban, exurban and rural areas to assess the variation of awareness and attitudes among residents of each area within the watershed (Figure 1), with the information gained from the eight focus groups a 12 page mail survey was designed.

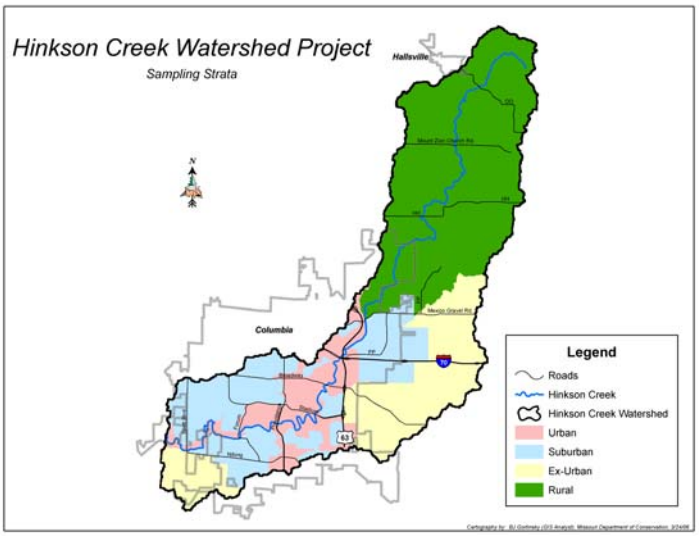


Figure 1.

Sampling Strategy

Hinkson Creek, in the City of Columbia and Boone County Missouri was chosen because the creek is on the 1998 Clean Water Act's 303d list of impaired streams and is similar to many urbanizing streams in the state. The population for the study was 10,000 randomly selected homeowners and landowners living in the Hinson Creek watershed.

The sampling frame was obtained by purchasing a list of homeowners and landowners from the Boone County Assessor's office, which started with 26,586 names. Commercial properties owned by corporations, churches and buildings in public ownership from the Boone County Assessor's office were removed. Duplicates and errors were also removed and the list contained 18,774 names of homeowners and landowners in Boone County.

With the assistance of a Geographical Information Systems (GIS) Analyst from the Missouri Department of Conservation, ArcGIS was used to draw the Hinkson Creek watershed boundary lines in Boone County, which included six sub-watersheds. Using *Environmental Systems Research Institute* (ESRI) blockgroup data from the Missouri

Census Bureau and aerial photographs the watershed was stratified into four regions, urban, suburban, exurban and rural. The regions were defined as urban-belonging to a city; suburban a residential region around a major city; exurban-development that occurs immediately beyond an incorporated city limit and rural-pertaining to the country.

The landowners and homeowners living in the watershed were divided into the four regions and were contacted to participate in one of the eight focus groups, two focus groups per region. Prospective participants were contacted by telephone using a script to invite the landowner(s)/homeowner(s) to participate with eight to eleven other people in a discussion group regarding water quality in Hinkson Creek. The invitation script contained information regarding the focus group discussion content, time, duration, location and compensation (Appendix A).

The focus group contained 10 questions starting with the general and becoming more specific and ending with what participants thought were the most important things discussed (Appendix A). The focus groups were held from 10:00-noon in the morning and 7-9:00 evening of the same day (Table 3.1.0).

Table 3.1.0

Focus Groups

Region	Urban		Suburban		Exurban		Rural	
	AM	PM	AM	PM	AM	PM	AM	PM
# of participants	7	5	9	7	8	6	9	9
Total	12		16		14		18	

A total of 60 residents shared opinions on watersheds, water quality, problems in the watershed and ways to improve water quality in the area. The information gathered in

the focus groups was used to develop a 12 page mail survey that was randomly sent to 10,000 residents during summer 2006, with 4,653 useable surveys returned (Table 3.1.1).

Table 3.1.1

Mailing Dates and Number of Packets Sent Out

Mailing Number	Number Mailed	Mailing Date	Number of Postcards	Mailing Date
1	10,000	7/3/06	10,000	7/17/06
2	7,656	7/31/06	7,656	8/7/06
Total	17,656		17,656	

Mailing procedures were followed as outlined by Dillman (2000). Two mailings were sent out during the mailing period beginning on July 3, 2006 and ending July 31, 2006. Reponses were accepted until September 30, 2006, with a total of 4,653 surveys returned.

Coded surveys were used to determine which respondents had replied and those who had not. Residents who returned their surveys were removed from the mailing list. Each packet included a postage paid return envelope, cover letter explaining the purpose of the study, the survey and a bumper sticker from the Missouri Department of Conservation. If there was no response, then two weeks later a reminder postcard was mailed to the same address. If there was no response after two weeks, a second packet containing another survey and cover letter were sent to the address.

Data Collection

The sample was determined by the number of surveys returned from the 10, 000 that were mailed. The study population was 4,563. The mail survey method was chosen because of advantages such as elimination of interviewer bias, increased confidentiality and less expense than other methods. Response rates of similar studies range from 45% to 90%.

Responses from the survey were entered directly into a Microsoft Access Database which was later exported into the Statistical Package for the Social Sciences 14.0 (SPSS14.0). Coded numbers were used to identify respondents, and remove the names from the second mailing to assure there were no duplicate responses.

Questionnaire

The mail survey was designed using information gathered during the focus groups and pursued information the Missouri Department of Conservation was interested in exploring. Validity was assessed by a panel of experts including the researcher's committee members at the University of Missouri-Columbia, as well as the survey crew and the sociologist from the Missouri Department of Conservation.

The questionnaire was 12 pages long with 37 questions addressing four areas; people and water quality; the New Ecological Paradigm (NEP); the Missouri Department of Conservation and water quality; and the demographics of the respondents.

Section 1, *People and Water Quality*, consisted of 21 questions which explored residents' opinions, on what contributes to water pollution; behaviors that can affect water quality, level of agreement or disagreement regarding water quality, seriousness of different kinds of water pollution, opinions of Hinkson Creek, opinions of the importance of specific management objectives, seriousness of potential issues in the watershed that could affect water quality, where residents get information regarding Hinkson Creek and the importance of specific management strategies to improve water quality in Hinkson Creek.

Section 2, *The New Ecological Paradigm (NEP)*, consisted of 15 questions that are used to measure environmental attitudes, beliefs, values and worldview.

Section 3, *The Missouri Department of Conservation (MDC) and Water Quality* has four questions that explore how familiar people are with MDC.

Section 4, *Tell Us About You,* has 10 questions looking at the demographics of the respondents including where they grew up as a child, where they live now, whether they hunt, fish or receive the *Missouri Conservationist* magazine, their income, marital status, children under 18, gender and age. The last page thanked the respondent for their participation and allowed the rest of the page to be used for comments.

Statistical Analysis

This study used both descriptive and inferential statistics. The descriptive statistics included frequencies, percentages, means and standard deviations. Inferential statistics were used to test the research questions by using linear regression analyses.

Research Questions:

1. Do people think Hinkson Creek is polluted? (Question 14, level of pollution in Hinkson Creek)
2. Why do people think Hinkson Creek is polluted? (Question 18, how serious are the following potential issues in Hinkson Creek: overdevelopment, overpopulation, industrial pollution, agricultural pollution, sewer discharge and poor water quality).
3. How do people think water quality in Hinkson Creek can be improved? (Question 21, management strategies for improving water quality: education, media, reduction in lawn chemicals, improving or enforcing laws and offering incentives to buy existing homes)

4. How does the NEP in the Hinkson Creek watershed compare with other studies that have utilized the NEP?
5. Is there a difference in how urban and rural respondents get information about Hinkson Creek?

Table 3.1.2

Statistical Measures for the Research Questions

Research Question	**Statistical Analyses**
1. Do people think Hinkson Creek is polluted?	Regression Analysis
2. Why do people think Hinkson Creek is polluted?	Regression Analysis
3. How do people think water quality in Hinkson Creek can be improved?	Regression Analysis
4. How does the NEP in the Hinkson Creek watershed compare with other studies that have utilized the NEP?	Regression Analysis
5. Is there a difference in how urban and rural respondents get their information about Hinkson Creek?	Independent T-Test

All data was analyzed using the SPSS14.0. Regression analyses were used to determine if a significant relationship existed between respondents' opinion of the level of pollution in Hinkson Creek, the seriousness of potential issues in the watershed and the level of importance of management strategies to improve water quality in Hinkson Creek. Regression analyses were also used with the NEP scale and the opinions of residents in the Hinkson Creek watershed. Multiple linear regression models were used to explore which independent variables contribute most to the dependent variable.

Questions 18, 21 and the NEP were evaluated to see if the analyses could be explored as a scale. For Question 18, opinions of the seriousness of potential issues in the Hinkson Creek watershed can be explored by lumping together the seriousness of potential issues.

Question 21 explores the opinion of how important or unimportant management strategies are for improving water quality. Like Question 18, the opinions can be put together to be analyzed as a group. Question 22 is evaluated as a scale in the literature.

Questions 18 and 21 did not need reverse scoring because the answers were coded with a low number indicating very serious or very important and the higher number indicating less serious or less important. The NEP was worded so agreement with the alternate numbered statements indicated a proecological view while disagreement with the even numbered statements indicated the proecological view. Because of the different directions of the questions the alternate questions needed to be reversed so the lower numbers strongly agreed and the higher numbers disagreed.

Next the reliability was evaluated to assure the answers were highly correlated to each other. The property of each item was examined by computing its item-scale correlation, using the corrected item scale correlation. This correlation correlates each item with all the other scale items except for itself. A high corrected item-total correlation is more desirable than a low score (Dunlap et al. 2000).

The next number evaluated in the reliability of the scale development was the Chronbach's Alpha. Nunnally (1978) suggests a value of .70 or higher as an accepted number for reliability. Questions 18 and 21's answers did not increase the Chronbach's Alpha if any of the answers were deleted. With Question 22 the Chronbach's Alpha was only .257 without the reverse coding. After the reverse coding it increased to .879.

A factor analysis further explored the data reduction process by finding only one component in Questions 18 and 21 and either one or two components with Question 22. The NEP analyses were run as one component.

The independent t-test was used to locate significant differences between urban and rural residents regarding information sources for Hinkson Creek. The alpha level for all statistical tests was set at 0.05.

CHAPTER 4

Results

This chapter summarizes the data analysis used to answer the research questions presented in Chapter one. The assessment began by conducting eight focus groups on the University of Missouri-Columbia campus in December 2005 where 60 residents of the Hinkson Creek watershed shared their opinions on water quality, watersheds, Hinkson Creek, problems in the creek and the watershed and what role the Missouri Department of Conservation (MDC) should take in water quality.

From the information gathered during the focus groups, a 12 page mail survey was developed and randomly sent to 10,000 residents of the Hinkson Creek watershed during summer 2006 with 4,653 returned completed surveys. A total of 17,656 surveys were mailed and 4,738 surveys returned. Of the returned surveys 85 were unusable; 34 were not filled out correctly, 32 were returned by people not wishing to participate, 6 people felt they did not live in the watershed (when they really did), 5 were deceased, 4 had moved out of the watershed, 4 were returned as undeliverable and duplicates were not entered. In addition to the mailed-in responses, there were also 113 telephone calls: 61 were from people who thought they were not in the watershed or did not know the definition of a watershed; 18 were from people that did not want to participate; 13 needed another survey; 9 had already received a survey; 6 were from the media or governmental agency; 3 had pollution or stormwater problems; 1 from a relative of someone who had deceased; 1 moved from the area and 1 had a watershed question.

Survey responses were coded and entered by computer into a Microsoft Access Database which was later exported into SPSS 14.0. Analyses of the data used SPSS 14.0. Qualitative data from the "comments" section of the survey included 334 comments.

Data Collection

Focus Groups

In December 2005 eight focus groups were conducted on the University of Missouri-Columbia campus where sixty residents of the Hinkson Creek were asked to share their opinions about water quality. The focus group participants were aware of water quality issues in their area, believing overdevelopment to be a large cause of pollution. Their views were strong and polarized regarding laws and most groups understood the term watershed.

The residents were stratified into four groups including: rural, exurban, suburban and urban and two focus groups were conducted in each stratum. The topics discussed included issues related to the watershed; Hinkson Creek; water quality; water quality problems and improvement in Hinkson Creek; laws; Missouri Department of Conservation (MDC) and ending comments. The findings were divided into seven categories.

Watershed

Most groups knew the definition of a watershed, with only one rural and one exurban group not knowing the definition of a watershed. All eight groups agreed that streams can have positive and negative affects on property value with rural areas having concerns that water going into their wells will be polluted and suburban residents were concerned with people drinking alcohol heavily along the stream. People in all groups shared a

concern for the large amount of development occurring in the area and how that development affects streams.

Hinkson Creek

All of the groups except for the suburban group knew and were comfortable with the streams in the area. These groups had been near Hinkson Creek or in Hinkson Creek at some point in their lives and had strong opinions about the Creek. The suburban residents had seen or read about the Creek in the newspaper or on television but did not have direct contact. The urban groups were quite knowledgeable about Hinkson Creek and passionate about how they would or would not use the stream.

Water Quality

When asked what water quality meant to all eight groups they all immediately thought of drinking water, with one of the suburban groups coming up with gradations of water quality such as water you can drink; water you can wade in; and water quality that can be smelled. Rural residents were the only ones that added fishing and swimming to the drinking quality of water.

Water Quality Problems and Improvement in Hinkson Creek

Rural people believe the problems in the creek were attributed to the lack of city sewer lines (these people live outside the city of Columbia), with improvements including best management practices (BMP's) such as buffer strips, grass waterways, terraces and retention ponds to improve the water quality in Hinkson Creek. Exurban people believe that urban education is needed. The exurban people self-reported that they are "agrarian and they understand (water quality issues)." Exurban residents believe that development is the problem and improvements include educating people to recycle;

developing an anti-litter campaign and educating others about water quality. The suburban group believes some of the problems include farming and animal runoff, not just concentrated animal feeding operations (CAFO) but regular farms in Boone County. Improvement will come from enforcing the laws. The urban people had the strongest opinions of water quality in Hinkson Creek, with this group having the most ideas for stream improvement and were the least likely to get into the stream without gloves and shoes.

Laws

Each group living in the watershed discussed water quality improvements and problems in Hinkson Creek and all groups discussed laws and whether they should be used or not. None of the groups reached a consensus.

The rural groups felt that laws are needed to force developers to protect water quality, but too many laws "bind up the process in regulation". They also felt education was better than any laws "on the books" and incentives were also better.

Exurbanites opinions were very diverse with one saying that laws "are written by legislators and legislators tend to be wolverines or weasels"; with another responding by saying "legislators are our only hope".

The people in the suburban group felt that collaborations would be successful. Partnerships, such as Partners in Education, having a "Partners in Conservation", including schools to "adopt a spot along the creek" and having biology clubs work to create good conservation through peer pressure were discussed. Others were interested in electing officials to represent their interests of cleaner streams.

The urban residents were interested in stiff fines for infractions, with the addition of local ordinances and incentives for developers to protect streams and incentives for homeowners to buy existing homes.

Missouri Department of Conservation

The rural group wanted to see MDC develop education, stream monitoring programs and incentives to protect Hinkson Creek, while exurbanites wanted see MDC develop a long range plan in the watershed to be accomplished by partnering with the Missouri Department of Natural Resources (MDNR), city planners, people in the watershed and developers. Suburbanites looked at education being something that could be accomplished like an advertisement, such as a flier in your tax bill, while others felt that water quality is DNR's job and MDC should stay out. The urban people also were interested in education and making sure that MDC's curriculum went along with the public school's MAP tests. Both urban groups felt strongly that MDC needs to be proactive in education not reactive.

Ending Comments

In this section the participants were asked if there were additional topics that should have been covered during the focus group. The rural people felt rain gardens were for city people, but everyday we should think about how we individually impact the environment. Also, they added that urban people use more chemicals on their lawns than farmers use on their crop fields. Exurban folks felt that water quality is everyone's problem, not just the landowner or the developer. One comment was "Columbia is light years ahead of other counties (in Missouri)" and they also felt that people in El Chaparral (a subdivision right outside the city limits) are "indifferent to the issues". The suburban

people felt that water quality is "out of sight out of mind". Drinkable water could be as valuable as gold some day, but we have good water for now. Lastly the urban people also felt that water will be worth more than gold some day, and felt it is very important to have safe water.

Mail Survey

The information gathered from the focus groups was used to develop a mail survey. The following are the results represented in five different sections-four sections found in the survey instrument and an additional section for comments. The survey sections included: Demographics; People and Water Quality; The New Ecological Paradigm (NEP); and the Missouri Department of Conservation (MDC).

The mail survey showed the respondents were supportive of management objectives and strategies to improve water quality in the Hinkson Creek watershed, but did not know about the water quality in the stream, if Hinkson Creek was polluted, what contributed the largest amount of pollution to the stream and they did not know the definition of the term nonpoint source pollution.

Demographics

Over half of the respondents were male (52.6%, 2406) while 47.1% (2154) were female. Seventy percent (3190) of the respondents were married, 9.4% (430) had never been married, 0.6% (25) were separated, 11.9% (541) were divorced and 8.0% (365) were widowed. In 2000 48.5% of the household residents in Boone County were married; 36.2% had never been married; 1.3% were separated; 9.6% were divorced and 4.4% were widowed. These numbers are from all Boone County residents not just

landowners and homeowners. In 2000, 57.5% of Boone County's residents owned their home.

The respondents were well educated with 66.8% (3054) having a college or graduate degree. 8.1% (370) were high school graduates and only 1.0% (47) had some high school. Census data shows that 42% of Boone County's residents are college educated with 24.1% with some college and 84.9% graduating from high school.

The mean age of the respondents was 52.7 years; the median and mode were 52.0. The youngest respondent was 12 and the oldest was 99. Table 4.1.0 shows the age distribution of respondents compared to that of Boone County in the 2000 U.S. Census.

Table 4.1.0

Boone County	Respondents to the Survey
18-24 years old 17.9%	18-24 year olds 1.2%
25-34 years old 15.8%	25-34 year olds 11.0%
35-54 years old 25.9%	35-54 year olds 42.1%
55-64 years old 8.3%	55-64 year olds 18.2%
65-84 years old 7.7%	65-84 years old 18.7%
85 years old and older 1.2%	85 years old and older 1.5%
65 years old and older 8.9%	65 years old and older 20.2%

Table 4.1.1 shows the annual household income before taxes. The majority of respondents (27%) made $100,000 or more; followed by 19% of the respondents making between $55,000-$74,999 with only 2% of the respondents making less than $15,000. According to the 2000 Census the median family income in Boone County is $51,210 before taxes.

Table 4.1.1
Annual household income before taxes

Response	Number of Responses	Percent
Less than $15,000	86	2.1
$15,000-$24,999	217	5.2
$25,000-$34,999	316	7.5
$35,000-$44,999	386	9.2
$45,000-$54,999	509	12.1
$55,000-$74,999	803	19.1
$75,000-$99,999	752	17.9
$100,000 or over	1130	26.9
Total	4199	100.00

The majority of the respondents grew up in rural areas or small towns (64%), with only (35%) of them growing up in a suburban or urban area. See Figure 4.1.2.

Table 4.1.2
Where they grew up as child

Response	Number of Responses	Percent
In a rural area	1388	30.3
Small town	1549	33.8
Suburban area	935	20.4
Urban area	676	14.7
More than one answer marked	41	0.8
Total	4589	100.00

Most respondents grew up in a rural area or small town, but the majority of them currently live in a suburban or urban area (93%) with only 7% currently living in a rural area or small town. See Table 4.1.3.

Table 4.1.3

Where best describes where they live now

Response	Number of Responses	Percent
In a rural area	290	6.3
Small town	32	0.7
Suburban area	2145	46.7
Urban area	2115	46.0
More than one answer marked	13	0.3
Total	4595	100.00

The majority of the respondents did not hunt or fish. Tables 4.1.4 and 4.1.5 show that 82% did not hunt and 70% did not fish.

Table 4.1.4

Do they hunt?

Response	Number of Responses	Percent
Yes	801	17.4
No	3775	82.1
Do not know	21	0.5
More than one answer marked	2	0.0
Total	4599	100.00

Table 4.1.5

Do they fish?

Response	Number of Responses	Percent
Yes	1296	28.2
No	3206	69.8
Do not know	91	2.0
More than one answer marked	2	0.0
Total	4595	100.00

People and Water Quality

This section includes survey questions about water quality, pollution sources, knowledge of Hinkson Creek, management strategies and information sources. Frequencies, percentages and descriptive statistics were used to understand the data.

Water Quality

Numbers and percentages of respondents who were familiar with the term nonpoint source pollution are reported in Table 4.2.0. Eight hundred and seven people (17.8%) had heard of the term nonpoint source pollution and knew what it meant, while seven hundred thirty eight (16.3%) people had heard of the term but were not sure what it meant. Two thousand nine hundred and ninety seven people (65.9%) had not heard of the term. This is important because nonpoint source pollution is the leading cause of degradation in the stream.

Table 4.2.0

Definition of Nonpoint Source Pollution

Response	Number of Responses	Percent
They know what it means	807	17.77
Not sure what it means	738	16.25
Never heard of it	2997	65.98
Total	4542	100.00

Numbers and percentages of respondents who were familiar with the term watershed are reported in Table 4.2.1. Three thousand and sixty two people (66%) had heard the term watershed and said they knew what it meant, while one thousand three hundred and forty eight people (29%) had heard of the term but did not know what it meant. Two hundred twenty eight (5%) had not heard of the term. This is important because if water quality in Hinkson Creek is to improve the management will need to include the

watershed and not just the creek itself. People need to see themselves as being a part of a watershed, just as they see themselves as part of a community.

Table 4.2.1

Definition of Watershed

Response	Number of Responses	Percent
They know what it means	3062	66.02
Not sure what it means	1348	29.06
Never heard of it	228	4.92
Total	4638	100.00

In addition to understanding water quality terms, respondents were asked about the water quality of streams in the area Table 4.2.2. Residents' opinions of water quality in streams in the area were that 2,715 (59%) felt that the water quality was fair or good and 1,214 (26%) did not know. With Hinkson Creek listed on the Environmental Protection Agency's (EPA) 303(d) list for impaired waters this is important because this listing mandates the water quality improve to the level of "whole body contact." With 59% of the respondents perceiving the water quality is fair/good an education program can be developed to teach people about the water quality in their area and what they can do to improve it.

Table 4.2.2

Opinion of water quality in the area

Response	Number of Responses	Percent
Poor	552	12.01
Fair	1605	34.92
Good	1110	24.15
Excellent	102	2.22
Don't know	1214	26.41
More than one answer marked	13	0.28
Total	4596	100.00

Knowledge of Hinkson Creek

Specifically respondents were asked their opinion of the pollution levels of Hinkson Creek. Of the total respondents 2,488 (54%) thought it was somewhat polluted while 1,320 (29%) did not know or were not sure if Hinkson Creek was polluted. Table 4.2.3.

Table 4.2.3

Pollution Level in Hinkson Creek

Response	Number of Responses	Percent
Very Polluted	718	15.48
Somewhat Polluted	2488	53.64
Not at all Polluted	108	2.33
Don't know/Not Sure	1320	28.46
More than one answer marked	4	0.09
Total	4638	100.00

Table 4.2.4 looks at the respondents' opinion regarding whether Hinkson Creek was improving or getting worse over the past ten years. One thousand two hundred and fifty two residents of the watershed (27% of the respondents) felt that the water quality had gotten worse, while one thousand three and eighty six (30%) did not know what was happening with the water quality in Hinkson Creek.

Table 4.2.4

Water Quality in Hinkson Creek in the Past 10 Years

Response	Number of Responses	Percent
Improved	542	11.69
Stayed the Same	688	14.84
Gotten Worse	1252	27.01
Don't know/Not Sure	1386	29.90
Have Not Lived Here Long Enough	754	16.26
More than one answer marked	14	0.30
Total	4636	100.00

Respondents were asked how serious the following issues were in the Hinkson Creek watershed: overdevelopment; overpopulation; industrial pollution; agricultural pollution; sewage discharge and poor water quality. Seriousness was rated on a scale of 1 (very serious) to 3 (not at all serious). Table 4.2.5 show that overdevelopment was rated the most serious potential issue in the Hinkson Creek watershed, ($\bar{x}$ =1.74) while agricultural pollution was rated the least serious potential issue in the watershed, ($\bar{x}$ =2.15). There were a large percentage of people that did not know about the seriousness of these issues.

Poor water quality in Hinkson Creek only rated as somewhat important as a potential issue in the watershed which shows that respondents believe that overpopulation and overdevelopment are more important that poor water quality. An education program could be designed around the potential issues threatening Hinkson Creek's water quality.

Table 4.2.5

Seriousness of Potential Issues in the Hinkson Creek Watershed

Activity	Very Important	Somewhat Important	Not at all Important	Don't Know	More Than One Answer Marked	Mean ($\bar{x}$)	Standard Deviation
Overdevelopment							
	2407	1434	326	436	1	1.74	.952
	52.3%	31.2%	7.1%	9.5%	0.02%		
Overpopulation							
	1749	1797	536	499	1	1.95	.967
	38.2%	39.2%	11.7%	10.9%	0.02%		
Industrial Pollution	1699	1756	464	646	7	2.02	1.026
	37.2%	38.4%	10.2%	14.1%	0.15%		
Agricultural Pollution	1305	1957	613	677	1	2.15	.998
	28.7%	43.0%	13.5%	14.9%	0.0%		
Sewer Discharge	1743	1510	390	934	7	2.12	1.132
	38.0%	32.9%	8.5%	20.4%	0.2%		
Poor Water Quality	1852	1609	368	751	1	2.00	1.069
	40.4%	35.1%	8.0%	16.4%	0.0%		

Pollution Sources

Table 4.3.0 reflects the answers from question number 9, which asked the respondents level of agreement on a scale of 1 to 5 with 1 strongly agree and 5 strongly disagree in regards to the following statements: water pollution comes from everyday activities; small changes in people's daily habits can improve water quality; pet waste is a significant source of pollution; and bird droppings can be a significant source of water pollution.

Residents of the Hinkson Creek watershed (with a mean ($\bar{x}$) of 1.92) have the strongest level of agreement with the statement that "small changes in people's daily habits and activities will have an effect on improving water quality". The next strongest level of agreement (with a mean ($\bar{x}$) of 2.34) was the statement that "most water pollution comes from everyday activities in our homes, workplaces and cars". With a mean ($\bar{x}$) of 2.65, respondents agreed that "droppings from pigeons and other birds such as ducks and geese can be a significant source of water pollution". Lastly with a mean score of 3.68, respondents agreed that "pet waste from household pets is a significant source of water pollution".

By understanding that respondents mildly agree with the statement "small changes in their daily lives can improve water quality" can be a possible education message to be used with residents in the watershed by giving them a list of easy things that can be incorporated into their daily lives. Along with that educational message can be the idea that activities people do everyday cause pollution. Informing residents of what they can do to improve their lives and water quality at the same time.

Table 4.3.0

Level of Agreement with Water Quality Statements

Activity	Strongly Agree (1)	Mildly Agree (2)	Neither Agree Nor Disagree (3)	Mildly Disagree (4)	Strongly Disagree (5)	Don't Know	More Than One Answer Marked	Mean ($\bar{x}$)	Standard Deviation
Everyday activities causes pollution	1452 31.5%	1795 39.0%	446 9.7%	459 10.0%	156 3.4%	297 6.5%	1 0.0%	2.34	1.427
Small changes effect water quality	1888 41.0%	2001 43.5%	312 6.8%	160 3.5%	73 1.6%	164 3.6%	6 0.1%	1 .92	1.165
Pet waste causes water pollution	318 7.0%	931 20.3%	969 21.2%	905 19.8%	597 13.0%	856 18.7%	1 0.0%	3.68	1.558
Bird droppings causes pollution	1203 26.1%	1699 36.8%	551 11.9%	401 8.7%	189 4.1%	571 12.4%	1 0.0%	2.65	1.630

Residents of the Hinkson Creek watershed believe that that runoff of insecticides or pesticides from lawn care (22.9%) contributes most to water pollution (Table 4.3.1). Unfortunately, 23.5% of the people don't know what contributes to pollution of the creek. Seventeen and one half percent of the residents believe agricultural runoff from fertilizers and pesticides ranks next, followed by runoff from construction sites after heavy rains (14.9%) and 10.9% of the respondents believe that runoff of automobile oil and other fluids dripped onto parking lots cause the most water pollution in their area.

Table 4.3.1
Opinion of What Contributes Most to Water Pollution

Response	Number of Responses	Percent
Ag Runoff from Fertilizers	809	17.5
Runoff from Construction Sites	697	14.9
Runoff from Parking Lots	498	10.8
Runoff from Lawn Care	1056	22.9
Animal Droppings	85	1.9
Don't Know	1085	23.5
Other	115	2.5
More than one answer marked	276	6.0
Total	4621	100.00

Management Strategies

Respondents were asked to give their opinions of how important or unimportant six different management objectives were for the Hinkson Creek watershed. Table 4.3.2 shows that respondents felt the most important management objective was to ensure healthy streams ($\bar{x}$ =1.35), followed by ensuring clean water supplies for public use having a mean of $\bar{x}$ =1.41 and ensuring open space for wildlife ($\bar{x}$ =1.45). Nearly all the respondents felt all six management objectives were very or somewhat important. By knowing what respondents feel are important management objectives for the watershed will assist governmental agencies develop strategies good for the stream as well as the residents.

Table 4.3.2

Importance of Management Objectives in the Hinkson Creek Watershed

Activity	Very Important	Somewhat Important	Neither important Nor unimportant	Somewhat unimportant	Very unimportant	Don't Know	More Than One Answer Marked	Mean ($\bar{x}$)	Standard Deviation
Clean water supplies	3568	679	142	88	48	89	1	1.41	.967
	77.3%	14.7%	3.1%	1.9%	1.0%	1.9%	0.02%		
Healthy streams	3458	956	91	47	21	49	1	1.35	.775
	74.8%	20.7%	2.0%	1.0%	0.5%	1.1%	0.02%		
Open space for wildlife	3159	1132	169	70	33	53	1	1.45	.857
	37.2%	38.4%	10.2%	14.1%	0.7%	1.2%	0.02%		
Streamside protection	2845	1153	311	144	81	72	1	1.63	1 .042
	61.8%	25.0%	6.8%	3.1%	1.8%	1.6%	0.02%		
Open space for people	2545	1430	335	161	74	61	3	1.69	1.022
	55.2%	31.0%	7.3%	3.5%	1.6%	1.3%	0.07%		
Protect private property	2577	1384	308	181	70	84	3	1.71	1.069
	55.9%	30.0%	6.7%	3.9%	1.5%	1.8%	0.07%		

Respondents were also asked to rate their opinion of how important or unimportant six management strategies would be to improving water quality in Hinkson Creek and the watershed surrounding the Creek. Table 4.3.3 shows the respondents felt that public or homeowner education (with a mean of $\bar{x}$ =1.5) was the most important strategy to improving water quality in Hinkson Creek. Respondents rated media involvement and encouraging people to reduce lawn chemicals (with a mean $\bar{x}$ =1.81) as the next most important management strategy followed by enforcing laws (with a mean of $\bar{x}$ =1.89). There were two management strategies the respondents felt were not very important: improving laws (with a mean of $\bar{x}$ =2.39) and offering incentives for people to buy an existing home rather than having a new home built (with a mean $\bar{x}$ =2.63).

Respondents felt different management strategies for improving water quality are very or somewhat important. By using the media an education message can be designed to teach residents of the watershed about reducing lawn chemicals; there will be less chemicals going into the Creek along with a better educated group of people living in the watershed.

Table 4.3.3

Importance of Management Strategies to Improve Water Quality in Hinkson Creek and the Surrounding Watershed

Activity	Very Important	Somewhat Important	Neither important Nor unimportant	Somewhat unimportant	Very unimportant	Don't Know	More Than One Answer Marked	Mean ($\bar{x}$)	Standard Deviation
Education	2937	1394	112	27	21	98	0	1.50	.903
	64.0%	30.4%	2.4%	0.6%	0.5%	2.1%	0.0%		
Media	2126	1776	352	100	75	118	1	1.81	1.080
	46.8%	39.0%	7.8%	2.2%	1.7%	2.6%	0.02%		
Reduce lawn chemicals	2235	1675	341	93	51	166	4	1.81	1.146
	49.0%	37.0%	7.5%	2.04%	1.1%	3.6%	0.09%		
Improve laws	1312	1690	733	283	189	292	2	2.39	1 .404
	29.0%	37.2%	17.0%	6.2%	4.1%	6.4%	0.04%		
Enforce laws	2312	1419	377	124	88	223	3	1.89	1.290
	50.9%	31.2%	8.3%	2.7%	1.9%	4.9%	0.07%		
Buy existing homes	1275	1294	980	248	338	413	0	2.63	1.562
	28.0%	28.5%	21.6%	5.5%	7.4%	9.1%	0.0%		

Information Sources

Respondents were asked a yes or no question about where they get their information regarding Hinkson Creek. Respondents get most of their information about Hinkson Creek from the newspaper, followed by television and lastly, word of mouth. Respondents did not get their information regarding Hinkson Creek from the radio, internet, local government and environmental organizations.

Respondents were asked if they get information regarding Hinkson Creek from the television and 62.5% (2717) said yes while 37.5% (1631) said no.

Respondents get the majority of their information regarding Hinkson Creek from the newspaper with 76.5% (3388) saying yes and 23.5% (1043) saying they did not get their information from the newspaper.

Less than half of the respondents got their information regarding Hinkson Creek from the radio (44.7%) and 55.3% (2325) did not.

Respondents felt they got little information regarding Hinkson Creek from the internet with only 13.0% saying they did get information from the internet and 87% (3502) saying they did not. This could be because people do not know where to look on the internet to find information about Hinkson Creek. There is information on the Missouri Department of Natural Resources' (MDNR) website and also Show Me Clean Stream who is spending EPA 319 grant money on Hinkson Creek to improve water quality.

Respondents were almost evenly split regarding whether they get information about Hinkson Creek by word of mouth or not. Of the respondents 51% (2144) said yes and 49% (2044) said they did not get their information from each other.

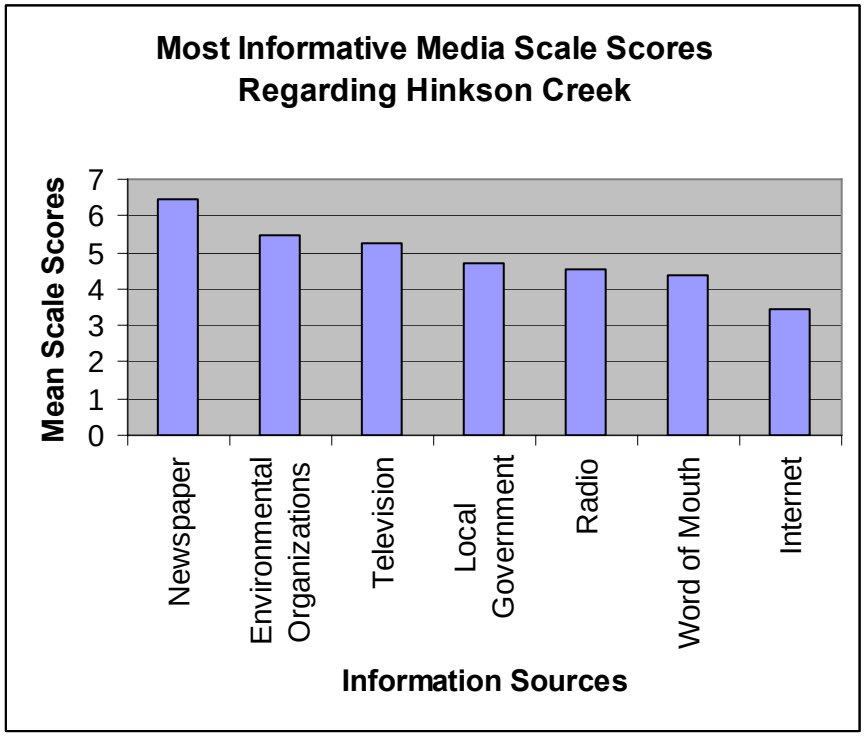
Most people did not get information about Hinkson Creek from local government. Of the respondents 44% (1819) said they did have information from local government while 56% (2320) said they did not. If local governments want to be proactive in improving water quality in Hinkson Creek they need to be getting more information out to the residents of the watershed. They need to let the residents know what the problems are and how they plan to improve water quality.

The last choice the respondents were offered regarding where they got information about Hinkson Creek was from environmental organizations. This option, like word of mouth, is evenly split with 49% (2046) saying they get their information regarding Hinkson Creek from environmental organizations and 51% (2120) saying they did not.

After asking the respondents yes or no questions regarding where they get their information regarding Hinkson Creek, they were asked to rate on a scale of 1-10 how informative the following media sources are with 1 being least informative and 10 being the most informative.

Based on mean scores newspapers were considered the most important source of information regarding Hinkson Creek from the survey respondents with an $\bar{x}$ =6.48; followed by environmental organizations with a mean of $\bar{x}$ =5.48 and television has a mean of $\bar{x}$ =5.25. According to the respondents Figure 4.4.0) the least informative source for information on Hinkson Creek would be the internet with a mean score of $\bar{x}$ =3.42; followed by word of mouth with a mean score of $\bar{x}$ =4.39; followed by radio with a mean score of $\bar{x}$ =4.55 and local governments with a mean score of $\bar{x}$ =4.71.

Figure 2.

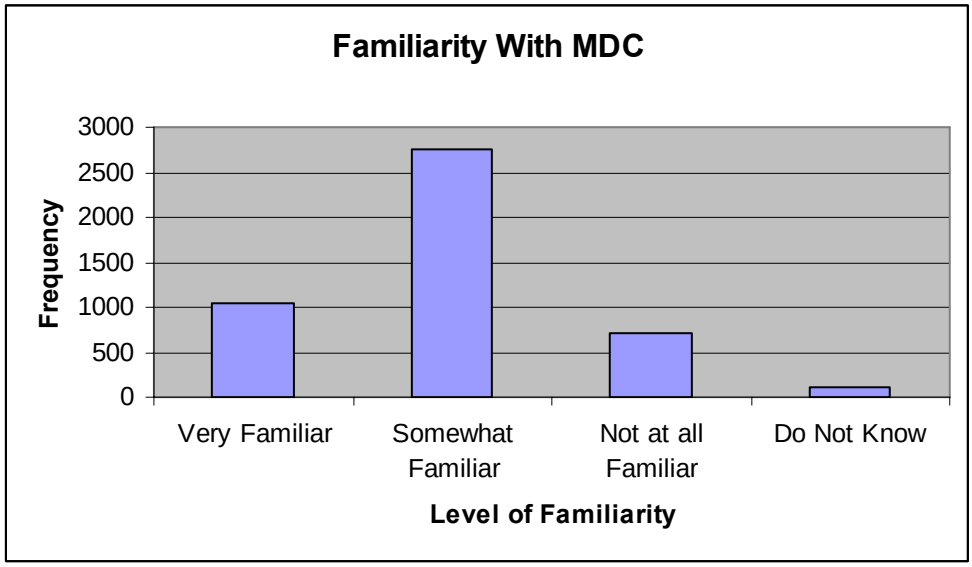


Missouri Department of Conservation (MDC)

This section of the survey looked at the respondents' familiarity with the Missouri Department of Conservation (MDC); the respondents rated how satisfied they were with MDC and if they agree or disagree with a variety of statements regarding what MDC should be doing for the citizens of the state.

Over 82% (1039) of the respondents were either very familiar (22.6%) or somewhat familiar (59.7%) with MDC (Figure 4.5.0). Only 15.6% were not at all familiar with 2.2% were not sure.

Figure 3.



Respondents were asked to rate how MDC was doing for themselves, their family, their community and the state of Missouri. Respondents felt that MDC was doing good or excellent in all categories with the mean values $\bar{x}$ =3.46-3.5. The scores were fairly consistent across categories (Table 4.5.0), but there were a large number of people (between 21.7% and 24.5%) who did not know how MDC was doing in all of the categories.

Table 4.5.0

How Familiar Are You With Missouri Department of Conservation

For Whom	Poor	Fair	Good	Excellent	Don't Know	More Than One Answer Marked	Mean ($\bar{x}$)	Standard Deviation
Respondent	127	655	1818	871	1070	3	3.46	1.086
	2.8%	14.4%	40.0%	19.2%	23.6%	0.07%		
Respondents' family	123	650	1778	831	1100	3	3.48	1.095
	2.7%	14.5%	39.6%	18.5%	24.5%	0.07%		
Community	117	639	1857	895	1015	4	3.46	1.067
	2.6%	14.1%	41.0%	19.8%	22.4%	0.09%		
Missouri	117	585	1750	1098	986	5	3.50	1 .050
	29.0%	37.2%	38.5%	24.2%	21.7%	0.11%		

Respondents were asked if MDC was doing a good job enforcing fish and wildlife laws. Over 57% of the respondents strongly agreed or mildly agreed that MDC was doing a good job, but 36% had "no opinion". (Table 4.5.1.)

Table 4.5.1

MDC is doing a good job enforcing fish and wildlife laws

Response	Number of Responses	Percent	Mean ($\bar{x}$)	Standard Deviation
Strongly agree	1102	24.1%	2.26	.926
Mildly agree	1536	33.6%		
No opinion	1644	36.0%		
Mildly disagree	231	5.1%		
Strongly disagree	57	1.2%		
More than one answer marked	3	0.0%		
Total	4573	100.00		

Respondents were asked their level of agreement with the role MDC should have in the following: water quality education, publicizing Hinkson Creek water quality issues, providing water quality assistance to landowners along the stream (such as help with erosion), making sure that MDC's water quality education program fits in with the local public school science requirements and enforcing state water quality laws.

Table 4.5.2 shows that the respondents strongly or mildly agree with all of the statements with water quality education and providing assistance to landowners ($\bar{x}$ =1.90) having the largest support. Enforcing water quality laws had the strongest disagreement level ($\bar{x}$ =2.19).

The Outreach and Education Division of MDC can develop education programs to reach residents of the watershed while the Private Lands Division can assist landowners along the stream with erosion and other issues they may have.

Table 4.5.2

Level of Agreement with MDC's Role

Activity	Strongly Agree	Mildly Agree	Neither Agree Nor Disagree	Mildly Disagree	Strongly Disagree	Don't Know	More Than One Answer Marked	Mean ($\bar{x}$)	Standard Deviation
Water quality education programs	2200 48.8%	1571 34.9%	310 6.9%	91 2.0%	82 1.8%	249 5.5%	4 0.1%	1.90	1.303
Publicizing issues	2035 45.7%	1498 33.6%	444 9.9%	130 2.9%	109 2.5%	240 5.4%	2 0.0%	1 .99	1.329
Assistance to landowners	2250 49.8%	1515 33.5%	304 6.7%	110 2.5%	83 1.9%	254 5.6%	2 0.0%	1.90	1.315
Assuring programs fit in schools	1887 41.8%	1513 33.5%	577 12.8%	151 3.3%	109 2.4%	278 6.2%	3 0.0%	2.10	1.374
Enforcing water quality laws	2084 46.2%	1160 25.7%	498 11.0%	203 4.5%	230 5.1%	337 7.5%	3 0.0	2.19	1.544

New Ecological Paradigm (NEP)

The NEP is commonly used to look at "ecological" worldviews, which can measure environmental concern, reflect a proenvironmental orientation as well as looking at environmental attitudes, beliefs and values (Dunlap et al. 2000). A high score on the NEP Scale shows an ecological worldview that can lead to proenvironmental beliefs and attitudes on a variety of issues, which will give researchers insight in understanding more about the residents living in the watershed. Dunlap et al. (2000), implies the NEP allows the researcher to "examine the structure and coherence of ecological world views and the relationships between these worldviews and a range of more specific environmental attitudes, beliefs and behaviors."

The respondents of the survey have strong ecological views (Table 4.6.0). They strongly or mildly agreed with the following statements: "humans are severely abusing the environment" with 40.5% of the respondents strongly agreeing and 35.5% mildly agreeing (only 16.4% strongly or mildly disagreed) and "despite our special abilities, humans are still subject to the laws of nature" with 55.5% strongly agreeing and 35.55 mildly agreeing (only2.8% strongly or mildly disagreed).

The statements the respondents most strong disagreed with were "the balance of nature is strong enough to cope with the impacts of modern industrial nations with 30.9% strongly disagreeing and 32.9% mildly disagreeing (only18.7% mildly or strongly agreed). The other statement that respondents strongly disagreed with was "the so-called 'ecological crisis' facing humankind has been greatly exaggerated" with 31.3% strongly disagreeing with that statement and 23.0% mildly disagreeing (20.1% mildly or strongly agreed with that statement).

Responses to statement number four “human ingenuity will insure that we do NOT make the earth unlivable” have an even distribution among the different levels of agreement. Thirty-eight percent of the respondents either strongly or mildly agreed with that statement versus thirty-six percent that either strongly or mildly disagreed and 25.3% were unsure.

The NEP study with the Hinkson Creek watershed found very similar results to what Dunlap et al. 2000 found with their study of students at the University of Washington suggesting that respondents to this survey are environmentally concerned.

Table 4.6.0

Frequency Distribution for the New Ecological Paradigm Scale Items

Do you agree or disagree that:	SA	MA	U	MD	SD	(N)
1. We are approaching the limit of the number of people the earth can support	21.3%	26.1%	22.3%	16.9%	13.4%	4573
2. Humans have the right to modify the natural environment to suit their needs	7.3	33.3	9.1	30.1	18.6	4359
3. When humans interfere with nature it often produces disastrous consequences	36.9	36.2	8.4	13.7	4.8	4563
4. Human ingenuity will insure that we do NOT make the earth unlivable	11.2	27.1	25.3	21.6	14.8	4538
5. Humans are severely abusing the environment	40.5	35.5	7.6	11.0	5.4	4257
6. The earth has plenty of natural resources if we just learn how to develop them	22.5	33.9	15.0	17.8	10.7	4563
7. Plants and animals have as much right as humans to exist	38.4	31.6	7.2	14.3	8.5	4553
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations	3.8	14.9	18.1	32.9	30.9	4553
9. Despite our special abilities humans are still subject to the laws of nature	55.5	35.5	6.4	1.7	1.1	4551
10. The so-called “ecological crisis” facing humankind has been greatly exaggerated	9.2	17.7	18.8	23.0	31.3	4559
11. The earth is like a spaceship with very limited room and resources	22.6	34.4	15.6	19.4	7.9	4532
12. Humans were meant to rule over the rest of nature	14.1	19.6	14.2	23.7	28.3	4502
13. The balance of nature is very delicate and easily upset	30.6	37.8	12.0	16.3	3.3	4547
14. Humans will eventually learn enough about how nature works to be able to control	3.3	16.1	23.3	31.4	25.9	4554
15. If things continue on their present course, we will soon experience a major ecological catastrophe	25.1	28.5	22.9	14.7	8.9	4571

Analysis

When analyzing each of the research questions, I wanted to determine if there are differences among opinions regarding where respondents live now or where they grew up? Using Geographic Information Systems (GIS), a map of the Hinkson Creek watershed was drawn, utilizing population density and an aerial photograph. Lines were drawn onto a map of the watershed to define four assigned strata: rural, exurban, suburban and rural showing where respondents live now. Question number 28 is a self-reported version of "where they live now" and question 27 addresses "where they grew up". These variables were used as the independent variables to test the dependant variable which is the opinion of the level of pollution in Hinkson Creek. The research questions were analyzed using Analysis of Variance (ANOVA) and Regression Analysis using a significance level of α=.05.

Research Question One: *Do people think Hinkson Creek is polluted? Are the answers different by assigned strata of where they live now (numstrat) self-reported where they live now (Q28) and where they grew up (27)? (Question 14, level of pollution in Hinkson Creek).*

In order to test this research question, frequencies and descriptive statistics were also needed to answer the question (Table 4.7.0). It was also explored whether where people live by strata, self-reported or where they grew up had an effect on their opinion of the pollution level of the creek needed to be evaluated. Both the assigned and the self-reported results for where they live now were significant with a .002 when tested against the pollution levels in Hinkson Creek (Tables 4.7.1 and 4.7.2) meaning that people's opinion varies significantly depending on where they live in the watershed. Where they

grew up was not significant which means where they grew up will not significantly affect their opinion regarding the level of pollution in Hinkson Creek (Table 4.7.3).

The first regression model is a global model using variables referenced in the literature (Table 4.7.4) followed by the best fit model (Table 4.7.5). The global model contains independent variables that are used in the literature such as demographics and other variables derived from comments made during the focus groups or how questions were answered on the survey were included in the global model (Tremblay and Dunlap, 1978; Kellert, 1980; Van Liere and Dunlap, 1980; Mohair and Tight, 1987; Arcury and Christianson, 1990; Palmer, 1995; Jacobson and Marynowski, 1997; McMillan et al. 1997 and Stedman and Heberlein 2001

The demographics do not explain any variance in the respondents opinion regarding how polluted is Hinkson Creek. The independent variables that explained the most variance in question number 14 regarding pollution levels in Hinkson Creek were overdevelopment as a potential issue in the watershed, whether or not water quality in Hinkson Creek has improved or not in the past ten years, and whether the respondents got their information from environmental groups. All of these variables were significant, but only explained the 24% of the variance. The variables that fell out included how has the water quality changed in the past ten years in Hinkson Creek, how long they lived in the watershed, where they live now (assigned and self-reported), where they grew up as a child, gender, income and education. For further discussion see Chapter 5.

The second regression model is the best fit model where the data is fitted to the model, by looking for the variables that best explained the variance in the respondents' opinion of the pollution level in Hinkson Creek (Table 4.7.5). The independent variables

that best explain the opinion of pollution levels were the opinion of the overall water quality in the area; how water quality has changed in Hinkson Creek in the last ten years; seriousness of poor water quality; information about Hinkson Creek comes from a newspaper; and water pollution comes from construction sites. All of these variables are significant and explain 41.5% of the variance in the variable. For further discussion see Chapter 5.

The ANOVA analyses shows that where people live now (assigned and self-reported) as significant, but did not show up in the linear regression analyses. This could be because of the large N being an artifact in the ANOVA analyses but not in the linear regression models. It could also be this relationship may not be linear, but quadratic. These spatial variables may need to be explored with other statistical techniques.

Table 4.7.0

Descriptive Values of Dependent Variable: Pollution Level in Hinkson Creek

Response	Number of Responses	Percent	Mean ($\bar{x}$)	Standard Deviation
Very Polluted	718	15.48	2.44	1.063
Somewhat Polluted	2488	53.64		
Not at all Polluted	108	2.33		
Don't know/Not Sure	1320	28.46		
More than one answer marked	4	0.09		
Total	4638	100.00		

Table 4.7.1

ANOVA Pollution Level in Hinkson Creek by assigned strata for where respondents live now

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	230	2.18	.981	4.987	.002*
Suburban	3762	2.45	1.067		
Exurban	381	2.50	1.070		
Rural	265	2.46	1.052		
Total	4638	2.44	1.063	4.987	.002*

* denotes significance at α=.05

Table 4.7.2

ANOVA Pollution Level in Hinkson Creek by self-reported for where respondents live now

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	2107	2.39	1.060	4.291	.002*
Suburban	2139	2.49	1.064		
Small Town	32	2.84	1.081		
Rural	290	2.32	1.028		
Total	4581	2.44	1.061	4.291	.002*

* denotes significance at α=.05

Table 4.7.3

ANOVA Pollution Level in Hinkson Creek by self-reported for where respondents grew up

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	676	2.43	1.081	.522	.719
Suburban	932	2.47	1.058		
Small Town	1543	2.44	1.059		
Rural	1383	2.41	1.055		
Total	4575	2.44	1.061	.522	.719

* denotes significance at α=.05

Table 4.7.4

Linear Regression Global Model of Respondents' Opinion of the Pollution Level in Hinkson Creek

Independent Variables	R	R Square	Adjusted R Square	F Change	Sig F Change
Overdevelopment	.396(a)	.157	.157	680.912	.000*
Water quality in past ten years	.474(b)	.225	.225	320.568	.000*
Information-environmental groups	.492(c)	.242	.241	80.713	.000*

* denotes significance at α=.05

a. Predictors: (Constant), Seriousness of Water Pollution from Overdevelopment

b. Predictors: (Constant), Seriousness of Water Pollution from Overdevelopment, Water quality in the past ten years

c. Predictors: (Constant), Seriousness of Water Pollution from Overdevelopment, Water quality in the past ten years, Information from environmental groups

The variables that dropped out of the model were:
How long have they lived in the watershed
Where they grew up as a child
Where they live now, self-reported and assigned
Income
Education
Gender
Age

Table 4.7.5

Linear Regression Best Fit Model of Respondents' Opinion of the Pollution Level in Hinkson Creek

Independent Variables	R	R Square	Adjusted R Square	F Change	Sig F Change
Overall water quality	.542(a)	.293	.293	1786.361	.000*
Water quality in the last ten years	.597(b)	.357	.356	425.077	.000*
Seriousness of poor water quality	.626(c)	.391	.391	244.380	.000*
Information-Newspaper	.637(d)	.406	.405	103.057	.000*
Water pollution from construction sites	.644(e)	.415	.414	64.453	.000*

* denotes significance at α=.05

a. Predictors: (Constant), Overall water quality
b. Predictors: (Constant), Overall water quality, Water quality in the last ten years
c. Predictors: (Constant), Overall water quality, Water quality in the last ten years, Seriousness of poor water quality
d. Predictors: (Constant), Overall water quality, Water quality in the last ten years, Seriousness of poor water quality, information-newspaper
e. Predictors: (Constant), Overall water quality, Water quality in the last ten years, Seriousness of poor water quality, information-newspaper, water pollution from construction sites

Research Question Two: *Why do people think Hinkson Creek is polluted? Are the answers different by assigned strata of where they live now (numstrat), self-reported where they live now (Q28) and where they grew up (27)? (Question 18 Scale, seriousness of potential issues in Hinkson Cree*k.

In order to test this research question, the frequencies, descriptive statistics, and linear regression models were used. In addition whether people live by strata, self-reported where they live now or where they grew up had an effect on their opinion of the seriousness of the potential issues in Hinkson Creek needed to be evaluated. A scale was made of seriousness of potential issues on a scale of 1 to 3 which included overdevelopment, overpopulation, industrial pollution, agricultural pollution, sewer discharge and poor water quality as discussed in Chapter 3 (Table 4.8.0).

Both the assigned strata (Table 4.8.1) and the self-reported (Table 4.8.2) where they live now were not significant when tested against the seriousness of potential issues in Hinkson Creek. This is important because, as governmental and non-governmental agencies that work in the watershed address the potential issues facing the watershed, there is not a significant difference regarding where they live in the watershed and their opinion as to why Hinkson Creek is polluted. If an agency develops educational materials, they can the same throughout the watershed, the respondents have similar opinions. Where they grew up was significant with a probability of 0.03 (Table 4.8.3). is important because this can be used to design educational programs for children, teaching them about the potential pollution issues in an urbanizing stream at young age.

The first regression model is a global model with variables referenced in the literature (Table 4.8.4) followed by the best fit model (Table 4.8.5). The global model contains

independent variables used in the literature such as demographics and other variables derived from comments made during the focus groups or how questions were answered on the survey should be included in the global model (Tremblay and Dunlap, 1978; Kellert, 1980; Van Liere and Dunlap, 1980; Mohair and Tight, 1987; Arcury and Christianson, 1990; Palmer, 1995; Jacobson and Marynowski, 1997; McMillan et al. 1997 and Stedman and Heberlein, 2001

The independent variables that explained the most variance in respondents' opinions of the seriousness of potential issues in the Hinkson Creek watershed were their opinion of how the water quality in Hinkson Creek has changed in the past ten years and the respondents get their information regarding Hinkson Creek from environmental groups; and where they grew up as a child. All of these variables were significant, but only explained the 6.7% of the variance regarding the respondents' opinion of the seriousness of potential issues in the Hinkson Creek watershed. The variables that fell out included the following: how long they lived in the watershed; where they live now assigned and self-reported; income; education; gender and age. As with the earlier research question the demographic variables do not contribute very much to the variance and are not very important.

The second regression model is the best fit model where the data is fit to the model by looking for variables that best explain the variance (Table 4.8.5). The variables that best explain the most variance in the seriousness of potential issues in the Hinkson Creek watershed were water pollution from construction sites; importance that streamsides are protected; overall water quality; water pollution from lawns; and information about Hinkson Creek comes from environmental groups. All of these variables are significant

and explain 25% of the variance in the variable. What this outcome tells us is that when discussing potential issues in the Hinkson Creek watershed people believe that water pollution is a function of runoff from construction sites and lawn chemicals, they get their information from environmental groups, and they believe it is important that streamsides are protected, and, lastly, their opinion of the water quality in the area is important to their view of the seriousness of the potential issues scale in the Hinkson Creek watershed.

The ANOVA analyses shows that where people live now (assigned and self-reported) was not significant, but the self reported where they grew up was significant This could be because of the large N being an artifact in the ANOVA analyses but not in the linear regression models. It could also be this relationship may not be linear, but quadratic. These spatial variables may need to be explored with other statistical techniques.

Table 4.8.0
Seriousness of Potential Issues Scale

	Very Serious (1)	Somewhat Serious (2)	Not at all Serious (3)	Don't Know (4)
Overdevelopment				
Overpopulation				
Industrial Pollution				
Agricultural Pollution				
Sewer Discharge				
Poor Water Quality				

Table 4.8.1

ANOVA Seriousness of Potential Issues by assigned strata for respondents live now

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	223	11.44	4.938	1.173	.319
Suburban	3626	12.04	4.063		
Small Town	369	11.86	4.609		
Rural	252	12.10	4.937		
Total	4470	12.00	4.932	1.173	.319

* denotes significance at α=.05

Table 4.8.2

ANOVA Seriousness of Potential Issues self-reported by where respondents live now

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	2016	9.06	4.404	1.756	.135
Suburban	2078	9.59	4.689		
Small Town	32	9.06	5.741		
Rural	270	10.25	5.023		
Total	4456	9.39	4.619	1.756	.135

* denotes significance at α=.05

Table 4.8.3

ANOVA Seriousness of Potential Issues self-reported by where they grew up

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	645	11.64	4.849	2.672	.030*
Suburban	904	11.68	4.926		
Small Town	1494	12.11	5.049		
Rural	1334	12.22	4.776		
Total	4413	11.98	4.919	2.672	.030*

* denotes significance at α=.05

Table 4.8.4

Linear Regression Global Model of Respondents' Opinion of the Seriousness of Potential Issues Scale in Hinkson Creek

Independent Variables	R	R Square	Adjusted R Square	F Change	Sig F Change
Water quality in past ten years	.221(a)	.049	.048	183.513	.000*
Information-environmental groups	.245(b)	.060	.059	42.779	.000*

* denotes significance at α=.05

a. Predictors: (Constant), Water quality in the last ten years
b. Predictors: (Constant), Water quality in the last ten years, Information-environmental groups

The variables that dropped out of the model were:
How long have they lived in the watershed
Where they grew up
Where they live now, self-reported and assigned
Income
Education
Gender
Age

Table 4.8.5

Linear Regression Best Fit Model of Respondents' Opinion of the Seriousness of Potential Issues Scale in Hinkson Creek

Independent Variables	R	R Square	Adjusted R Square	F Change	Sig F Change
Water pollution from construction sites	.352(a)	.124	.124	560.521	.000*
Importance that streamsides be protected	.429(b)	.184	.060	289.849	.000*
Overall water quality	.228(c)	.227	.227	222.873	.000*
Water pollution from lawns	.242(d)	.241	.241	72.365	.000*
Information from environmental groups	.500(e)	.250	.249	44.333	.000*

* denotes significance at α=.05

Research Question Three: *How do people think water quality Hinkson Creek can be improved? Are the answers different by assigned strata of where they live now (numstrat) self-reported where they live now (Q28) and where they grew up (27)? (Question 21 Scale, management strategies for improving water quality in Hinkson Cre*ek.)

In order to test this research question, the frequencies and descriptive statistics were also needed to answer the question. In addition it needed to be evaluated if where people live by strata, self-reported or where they grew up affected their opinion of the importance of management strategies to improve water quality in Hinkson Creek. They included a scale made of education, media, reduction in lawn chemicals, improving or enforcing laws and offering incentives to buy existing homes as discussed in Chapter 3 (Table 4.9.0).

Where the respondents live now both assigned (Table 4.9.1) and self-reported (Table 4.9.2) were significant when tested against the seriousness of potential issues in Hinkson Creek. Where they grew up was not significant with a probability of 0.052, not less than α=.05 (Table 4.9.3). This is important because when developing an educational program or media presentation different messages can be designed for where each group of people live; rural, exurban, small town, suburban or urban.

The first regression model is a global model with variables referenced in the literature (Table 4.9.4) followed by the best fit model (Table 4.9.5). The global model contains independent variables that are used in the literature such as demographics and other variables derived from comments made during the focus groups or how questions were answered on the survey that should be included in the global model (Tremblay and

Dunlap, 1978; Kellert, 1980; Van Liere and Dunlap, 1980; Mohair and Tight, 1987; Arcury and Christianson, 1990; Palmer, 1995; Jacobson and Marynowski, 1997; McMillan et al. 1997 and Stedman and Heberlein 2001

Gender was the only demographic variable which contributed to the variance of the respondent's opinion regarding how to improve water quality in Hinkson Creek. Gender contributed 1% of the 18% of the variance. The independent variables that explained the most variance in the variable were the seriousness of overdevelopment; gender and information from environmental groups. All of these variables were significant, and explained 18.2% of the variance. The variables that fell out included the following: how long they lived in the watershed; where they live now (assigned and self-reported); where they grew up as a child; education and age. The demographic variables do not contribute much to the variance and are not important to this research question.

The second regression model is the best fit model where the data is fit to the model by looking for variables that best explained the variance (Table 4.9.5). The variables that best explain the most variance in respondent's opinion of how to improve water quality reduce water pollution from lawn chemicals; overdevelopment is a serious potential issue in the watershed; small changes in everyday life can improve water quality; and water pollution from construction sites is also a serious problem. All of these variables are significant and explain 32.8% of the variance in the variable. The frequencies and descriptive statistics show that people are supportive of all the management strategy options. This could be caused by the lack of understanding of what could improve water quality in the creek, thus they are supportive of all the options rather than select a few.

The ANOVA analyses shows that where people live now assigned with a probability of 0.001 and self-reported with a probability of 0.000 as significant, but did not show up in the linear regression analyses. This could be because of the large N being an artifact in the ANOVA analyses but not in the linear regression models. This could also be due the regression not being linear but possibility quadratic. These spatial variables need to be explored with other statistical techniques.

Table 4.9.0

Importance of Management Strategies for Water Quality Improvement in Hinkson Creek Scale

	Very Important (1)	Somewhat Important (2)	Neither Important Nor Unimportant (3)	Somewhat Unimportant (4)	Not at all Important (5)	Don't Know (6)
Public or homeowner education						
Media involvement						
Encouraging people to reduce lawn chemicals						
Improving laws						
Enforcing laws						
Offering incentives for people to buy existing homes						

Table 4.9.1

ANOVA Water quality improvement by assigned strata for respondents live now

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	217	9.20	4.860	5.653	.001*
Suburban	3621	9.28	4.566		
Small Town	366	10.16	4.964		
Rural	252	10.10	4.816		
Total	4456	9.39	4.636	5.653	.001*

* denotes significance at α=.05

Table 4.9.2

ANOVA Water quality improvement by self-reported by where respondents live now

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	2016	9.06	4.404	7.614	.000*
Suburban	2078	9.59	4.689		
Small Town	32	9.06	5.741		
Rural	270	10.25	5.023		
Total	4456	9.39	4.619	7.614	.000*

* denotes significance at α=.05

Table 4.9.3

ANOVA Water quality improvement by self-reported by where they grew up

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	658	9.03	4.576	2.347	.052
Suburban	903	9.37	4.772		
Small Town	1495	9.33	4.599		
Rural	1309	9.66	4.560		
Total	4402	9.40	4.919	2.347	.052

* denotes significance at α=.05

Table 4.9.4

Linear Regression Global Model of Respondents' Opinion of the Importance of Management Strategies in Hinkson Creek

Independent Variables	R	R Square	Adjusted R Square	F Change	Sig F Change
Seriousness of overdevelopment	.402	.161	.161	690.591	.000*
Information-environmental groups	.415	.172	.172	45.941	.000*
Gender	.426	.182	.181	42.175	.000*

* denotes significance at α=.05

a. Predictors: (Constant), Seriousness of overdevelopment

b. Predictors: (Constant), Seriousness of overdevelopment, , information-environmental groups;

c. Predictors: (Constant), Seriousness of overdevelopment, information-environmental groups; gender

The variables that dropped out of the model were
Water quality in the last ten years
How long have they lived in the watershed
Where they live now, self-reported and assigned
Where they grew up as a child
Education
Age

Table 4.9.5

Linear Regression Best Fit Model of Respondents' Opinion of Importance of Management Strategies in Hinkson Creek

Independent Variables	R	R Square	Adjusted R Square	F Change	Sig F Change
Water pollution from lawns	.426(a)	.181	.181	959.265	.000*
Seriousness of overdevelopment	.514(b)	.264	.264	489.096	.000*
Small changes effect water quality	.556(c)	.309	.308	280.596	.000*
Seriousness of poor water quality	.567(d)	.321	.321	78.464	.000*
Water pollution from construction sites	.573(e)	.328	.328	48.300	.000*

* denotes significance at α=.05

Research Question Number Four: Does the NEP apply to the Hinkson Creek watershed respondents compare to other studies that have utilized the NEP?

The NEP is commonly used to look at ecological worldviews, which can measure environmental concern, reflect a proenvironmental orientation as well as looking at environmental attitudes, beliefs and values (Dunlap et al. 2000).

When testing the reliability of the NEP scale every other question was reverse coded starting with letter a. The eight odd-numbered items were worded so that agreement with the statement indicated a proecological view and the seven even-numbered ones were written so disagreement with the statement indicated a proecological worldview. The reverse coding is a standard technique to decrease the response bias. The Chronbach's Alpha before the reverse coding was .257, but increased to .879 with the reverse coding. A factor analysis was used to evaluate how well the NEP items comprised a univariate scale.

According to Dunlap et al. (2000), there is a question over the dimensionality of the NEP scale. Some researchers such as Roberts and Bacon, (1997) found four dimensions, while Geller and Lasley, 1985 and Noe and Snow, 1990 suggest that the NEP contains three distinct dimensions. In addition Gooch, 1995; Noe and Hammitt, 1992; Scott and Willits, 1994 found only two dimensions. Lastly, other studies found one dimension such as Lefcourt, 1996; Noe and Snow, 1990; and Dunlap et al. 2000.

Using ANOVA it was determined that the NEP mean score is very high for all urban groups, (assigned by strata, self-reported and where they grew up, Tables 4.10.0-4.10.2); high in the self-reported small town group (Table 4.10.2) and low in the assigned exurban group (Table 4.10.0). In the self-reported group the suburban group had a lower score

than the rural group (Table 4.10.1). This result suggests there is high environmental concern among all urban and small town groups (assigned, self-reported and where they grew up); the assigned exurban group had the least amount of environmental concern; followed by the self-reported suburban, then rural groups. In this study the self-reported rural people scored higher (more environmentally concern) than did the self-reported suburban group. This is interesting because the literature refers to people living in urban areas being more environmentally concerned because of living in and among pollution while people living in a rural area have less pollution around them causing them to be less environmentally aware (Tremblay and Dunlap, 1978; Van Liere and Dunlap, 1980; Reading et al. 1994; Palmer, 1995 and Stedman and Heberlein 2001).

Table 4.10.3 has the frequency distribution and corrected item-total correlations for the NEP. The corrected item totals are higher for each of the items that Dunlap et al. (2000) found except for two. Number 9 ("despite our special abilities humans are still subject to the laws of nature") and number 14 ("humans will eventually learn enough about how nature works to be able to control it") both had lower corrected item-total correlations with Dunlap et al. (2000) produced a probability of 0.33, and this study produced a probability of 0.32 and for question 14 Dunlap et al. (2000) found .35 and this study produced .31. Interestingly both of these questions explore the rejection of exemptionalism, which means this study and the study of Dunlap et al. (2000)should exclude the idea of exemptionalism from updated NEP scales. The corrected item-total correlations are so low that they do not fit in the scale.

The first regression model is a global model with variables referenced in the literature followed by the best fit model (Table 4.10.4), followed by the best fit model

(Table 4.10.5). The global model contains independent variables that are used in the literature such as demographics and other variables derived from comments made during the focus groups or how questions were answered on the survey should be included in the global model (Tremblay and Dunlap, 1978; Kellert, 1980; Van Liere and Dunlap, 1980; Mohair and Tight, 1987; Arcury and Christianson, 1990; Palmer, 1995; Jacobson and Marynowski, 1997; McMillan et al. 1997 and Stedman and Heberlein 2001.

Gender was the only demographic variable included in the global model (Table 4.10.4). The independent variables that explained the most variance in the variable were overdevelopment; water quality in the past ten years; gender and information from environmental groups. All of these variables were significant, but only explained 22.6% of the variance. The variables that fell out included the following: how long they lived in the watershed; where they live now assigned and self-reported; where they grew up as a child; and age. The demographic variables do not contribute very much to the variance.

The second regression model is the best fit model where the data is fit to the model by looking for the variables that best explained the variance (Table 4.10.5). The variables that best explain the most variance in the variable were importance that streamsides are protected; importance of property rights; water pollution from lawns; seriousness of overdevelopment; gender; and importance of improving laws. All of these variables are significant and explain 38.1% of the variance in the variable.

When running the NEP in the linear regression models for the previous three questions it dropped out of all the models which means the respondents may have a strong ecological worldview or awareness but that does not predict the specific behaviors in the Hinkson Creek watershed. This could theoretically be due to people's attitudes and

values may be used to predict behavior, but in these models there also people's value orientations regarding Hinkson Creek. These value orientations are the "wild card" when trying to predict behavior because it can change behaviors and attitudes. For example everyone wants clean water and the watershed residents would like to see water quality improve in Hinkson Creek, but how they want that to happen may be different depending on where they live in relation to the stream. Someone that lives on the stream may be willing to pay to have the riparian corridor restored, but others in the watershed located several miles from the stream may not be willing to pay (through taxes) or have interest in restoring the stream corridor, even though both want clean water and water quality improvement in Hinkson Creek.

Another option as to why the NEP is not relevant in this study is the specificity of the study. The NEP is evaluating proenvironmental concern issues such as approaching the limit the earth can support or humans have the right to modify the natural environment to suit their needs. Dunlap et al. (2000) indicates the NEP can be used to "examine the structure and coherence of ecological worldviews and the relationships between these worldviews and a range of more specific environmental attitudes, beliefs and behaviors". In regards to this study there was not a relationship between the NEP and the specific attitudes, beliefs and behaviors of the respondents living in the Hinkson Creek watershed. This could be attributed to the generality of the NEP versus the specific questions in this study and the specific relationship these people have to Hinkson Creek and the watershed itself. The watershed is literally in their backyard making them think more about how and what is going to be happening to the stream, what will it cost them and how their lives will be affected.

Table 4.10.0

ANOVA NEP by assigned strata for respondents live now

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	209	54.39	11.718	4.449	.004*
Suburban	3461	52.99	11.267		
Exurban	360	51.10	10.804		
Rural	246	52.62	10.327		
Total	4276	52.87	11.213	4.449	.004*

* denotes significance at α=.05

Table 4.10.1

ANOVA NEP self-reported by where respondents live now

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	1936	54.045	10.960	11.414	.000*
Suburban	1990	51.741	11.464		
Small Town	30	56.267	9.833		
Rural	270	52.248	10.560		
Total	4236	52.857	11.217		.000*

* denotes significance at α=.05

Table 4.10.2

ANOVA NEP by self-reported by where they grew up

Location	Number	Mean ($\bar{x}$)	Standard Deviation	F	Significance
Urban	625	54.549	10.643	9.302	.000*
Suburban	867	53.100	11.536		
Small Town	1422	53.210	11.162		
Rural	1280	51.423	11.220		
Total	4228	52.841	11.220	9.302	.000*

* denotes significance at α=.05

Table 4.10.3

Frequency Distribution and the Corrected Item-Total Correlations for New Ecological Paradigm Scale Items

Do you agree or disagree that:	SA	MA	U	MD	SD	(N)	r_{i-t}
1. We are approaching the limit of the number of people the earth can support	21.3%	25.6%	22.3%	16.6%	13.2%	4575	.60
2. Humans have the right to modify the natural environment to suit their needs	7.5	32.9	9.6	29.6	18.2	4548	.50
3. When humans interfere with nature it often produces disastrous consequences	36.2	35.5	8.2	13.5	4.7	4569	.54
4. Human ingenuity will insure that we do NOT make the earth unlivable	10.9	26.4	24.7	21.1	14.4	4541	.46
5. Humans are severely abusing the Environment	39.4	34.5	7.4	10.7	5.3	4531	.64
6. The earth has plenty of natural resources if we just learn how to develop them	22.1	33.3	14.7	17.4	10.5	4569	.42
7. Plants and animals have as much right as humans to exist	37.5	30.9	7.1	14.0	8.3	4562	.52
8. The balance of nature is strong enough to cope with the impacts of modern industrial nations	3.7	13.7	18.0	32.2	30.2	4557	.59
9. Despite our special abilities humans are still subject to the laws of nature	54.1	34.7	6.2	1.7	1.1	4553	.32
10. The so-called “ecological crisis” facing humankind has been greatly exaggerated	9.0	17.4	18.4	22.5	30.6	4565	.71
11. The earth is like a spaceship with very limited room and resources	22.1	33.5	15.2	18.9	7.7	4539	.57
12. Humans were meant to rule over the rest of nature	13.7	19.0	13.7	23.0	27.4	4513	.56
13. The balance of nature is very delicate and easily upset	29.9	36.9	11.7	15.9	3.2	4555	.55
14. Humans will eventually learn enough about how nature works to be able to control	3.2	15.7	22.8	30.8	25.4	4557	.31
15. If things continue on their present course, we will soon experience a major ecological catastrophe	24.7	28.0	22.5	14.4	8.7	4575	.72

Table 4.10.4

Linear Regression Global Model of Respondents' Answers to the NEP

Independent Variables	R	R Square	Adjusted R Square	F Change	Sig F Change
Overdevelopment	.399(a)	.159	.159	651.399	.000*
Gender	.448(b)	.201	.200	178.805	.000*
Information-environmental groups	.466(c)	.217	.217	73.166	.000*
Water quality in the last ten years	.475(d)	.226	.225	37.240	.000*

* denotes significance at α=.05

a. Predictors: (Constant), Overdevelopment
b. Predictors: (Constant), Overdevelopment;; gender
c. Predictors: (Constant), Overdevelopment;, gender, information-environmental groups
d. Predictors: (Constant), Overdevelopment, gender, information-environmental group, water quality in the last ten years,

The variables that dropped out of the model were:
Water quality in the last ten years
How long have they lived in the watershed
Where they live now, self-reported and assigned
Where they grew up as a child
Income
Education
Age

Table 4.10.5

Linear Regression Best Fit Model of Respondents' Answers to the NEP

Independent Variables	R	R Square	Adjusted R Square	F Change	Sig F Change
Importance that streamsides be protected	.478(a)	.229	.228	1206.148	.000*
Importance of property rights	.546(b)	.298	.298	405.584	.000*
Water pollution from lawns	.578(c)	.334	.333	215.403	.000*
Seriousness of overdevelopment	.596(d)	.355	.355	136.733	.000*
Gender	.608(e)	.370	.369	94.978	.000*
Importance of improving laws	.617(f)	.381	.380	72.259	.000*

* denotes significance at α=.05

a. Predictors: (Constant), Importance that streamsides be protected
b. Predictors: (Constant), Importance that streamsides be protected, importance of property rights
c. Predictors: (Constant), Importance that streamsides be protected, importance of property rights, water pollution from lawns
d. Predictors: (Constant), Importance that streamsides be protected, importance of property rights, water pollution from lawns, seriousness of overdevelopment
e. Predictors: (Constant), Importance that streamsides be protected, importance of property rights, water pollution from lawns, seriousness of overdevelopment, gender
f. Predictors: (Constant), Importance that streamsides be protected, importance of property rights, water pollution from lawns, seriousness of overdevelopment, gender and importance of improving laws

Table 4.10.6
Summary of Linear Regression Models Regarding Water Quality in the Hinkson Creek Watershed

	Opinion of Water Quality		Seriousness of Potential Issues		Imporance of Mangement Objectives		New Ecological Paradigm	
	Global	Best Fit	Global	Best Fit	Global	Best Fit	Global	Best Fit
Intercept	8.933*	-.043	26.034*	3.958*	27.450*	11.368*	89.138*	130.156*
Overall Water Quality	____	.542*	____	.542*	____	____	____	____
Small Changes Effect Water Quality	____	____	____	____	____	.391*	____	____
Contributes Most to Water Pollution								
Construction Sites	____	.251*	____	.251*	____	.363*	____	____
Lawn Care	____	____	____		____	.426*	____	-.358*
Water Quality in the Last Ten Years	.396*	.395*	.148*	____	.044*	____	.061*	____
How Long They Lived in the Watershed	-.142*	____	-.033	____	-.002	____	.001	____
Importance of Management Objectives								
Streamsides are Protected	____	____	____	.352*	____	____	____	-.478*
Importance of Property Rights	____	____	____	____	____	____	____	.188*
Seriousness of Potential Issues								
Overdevelopment	.299*	____	.763*	____	.402*	.402*	-.399*	-.383*
Poor Water Quality	____	.345*	____	____	_____	.333*	____	____
Importance of Management Strategies								
Imporving Laws	____	____	____	____	____	____	____	-.341*
Where They Live Now								
Assigned	.035	____	.003	____	.034	____	-.023*	____
Self-Reported	-.021	____	-.002	____	-.051*	____	.053*	____
Where They Grew Up	.002	____	-.046*	____	-.037	____	.085*	____
Demographics								
Income	-.019	____	.033	____	.058*	____	-.118*	____
Education	-.046*	____	-.022	____	-.046*	____	.102*	____
Gender	.081*	____	-.015	____	-.117*	____	.222*	.212*
Age	-.081*	____	.018	____	-.014	____	.015	____

*p≤.05

Research Question Number Five: *Is there a difference between how rural and urban respondents get their information regarding Hinkson Creek?*

The independent t-test was used to locate the significant differences between urban and rural residents regarding information sources for Hinkson Creek. The alpha level for all statistical tests was set at 0.05. The independent t-test was used to explore the statistical significance of the different groups.

There were significant differences regarding where respondents got their information about Hinkson Creek. In the assigned strata the urban people were more likely than rural people to get their information from the newspaper, word of mouth and environmental groups, with the newspaper being the most informative for both groups (Table 4.11.0).

The self-reported urban group got more information about Hinkson Creek from the newspaper and radio than rural people. Both self-reported urban and rural people reported the newspaper as being the most important source of information regarding Hinkson Creek followed by environmental groups for both groups (Table 4.11.1).

People that grew up in an urban area were more likely than people who grew up in a rural area to get their information from environmental groups, with environmental groups being the most informative (Table 4.11.2).

This information can be used when an agency or non-governmental organization (NGO) wants to reach the residents of the Hinkson Creek watershed with an educational message or just to inform the residents about the creek. This information will allow agencies working with in the Hinkson Creek watershed to utilize newspapers first to get the information out to the residents followed by environmental groups.

Table 4.11.0

Information sources for urban and rural residents by assigned strata

Information Source	Urban Mean (1=yes and 2=no)	Rural Mean (1=yes and 2=no)	Sig.	Sig (2-tailed)
Newspaper	1.18	1.35	.000**	.000**
Word of Mouth	1.38	1.53	.000**	.000**
Environmental Groups	1.43	1.56	.622	.008**

Most informative sources for urban and rural residents by assigned strata

Most Informative Source	Urban Mean (1 least informative and 10 is most informative)	Rural Mean	Sig	Sig (2-tailed)
Newspaper	6.57	5.84	.216	.006**
Local Governments	5.01	4.07	.215	.000**
Environmental Groups	5.72	4.95	.972	.012*

* <.05

** <.01

Table 4.11.1

Information sources for self reported urban and rural residents

Information Source	Urban Mean (1=yes and 2=no)	Rural Mean (1=yes and 2=no)	Sig.	Sig (2-tailed)
Newspaper	1.20	1.30	.000**	.000**
Radio	1.55	1.62	.000**	.034*

Most informative sources for self reported urban and rural residents

Most Informative Source	Urban Mean (1 least informative and 10 is most informative)	Rural Mean	Sig	Sig (2-tailed)
Newspaper	6.62	6.00	.169	.001**
Local Governments	4.87	4.35	.331	.005*
Environmental Groups	5.71	5.12	.665	.005*

* <.05

** <.01

Table 4.11.2

Information Sources For Where People Grew Up (Urban and Rural)

Information Source	Urban Mean (1=yes and 2=no)	Rural Mean (1=yes and 2=no)	Sig.	Sig (2-tailed)
Environmental Groups	1.48	1.55	.056	.011*

Most Informative Sources Where People Grew Up (Urban and Rural)

Most Informative Source	Urban Mean (1 least informative and 10 is most informative)	Rural Mean	Sig	Sig (2-tailed)
Internet	3.59	3.29	.029*	.040*
Environmental Groups	5.80	5.09	.622	.000**

* <.05

** <.01

Tables 4.12.0 and 4.12.1 compare the demographics of the survey to those in Boone County. The demographics in the Boone County category come from the 2000 Census date. It includes other people besides landowners and homeowners that were surveyed for the study. Some of the things that really stand out are the difference in age between this survey and that of the county. Part of that could be due to homeowners and landowners being older to afford to own their own land or home. Also, college students could be included in the Boone County number.

Also Boone County has more women than men, but the survey consistently had more men than women answering the survey. The income of Boone County residents were almost evenly split between those who made less than $55,000 and those who made more. The survey consistently had more people who made more than $55,000. Boone County had less married people than the survey along with less college educated people than those who answered the survey. The results were similar for the assigned strata as well has the self-reported where they live now

Table 4.12.0
Comparison Between Assigned Strata Respondents and Boone County Residents

	Urban	Suburban	Exurban	Rural	Boone County
Age-Mean in Years	54.9	52.3	55.3	53.5	29.5
Gender-Male/Female	51.8%/47.7%	52.3%/47.3%	55.3%/44.7%	53.5%/46.5%	48.3%/51.7%
Income 0-54,999	45.70%	35.60%	31.90%	41.50%	49.50%
Income 55,000 and over	54.30%	64.40%	68.10%	58.50%	50.50%
Married	61.50%	69.80%	76.40%	71.80%	45.50%
Education/ College Degree	71.00%	78.00%	68.20%	53.50%	46.40%

Table 4.12.1
Comparison Between Self-Reported Respondents and Boone County Residents

	Urban	Suburban	Small Town	Rural	Boone County
Age-Mean in Years	54.8	50.3	47.5	54.3	29.5
Gender-Male/Female	51.4%/48.6%	53.6%/46.4%	65.6%/34.4%	56.8%/43.2%	48.3%/51.7%
Income 0-54,999	39.7%	32.5%	30.9%	35.4%	49.50%
Income 55,000 and over	60.3%	67.5%	69.10%	64.6%	50.50%
Married	67.6%	72.3%	68.8%	72.4%	45.50%
Education/ College Degree	76.9%	77.1%	59.5%	55.9%	46.40%

Tables 4.12.2-Tables 4.12 15 address the large amount of "don't know" response in the survey. One thing which is different between these tables is the age and gender categories. The respondents are much older than the residents of Boone County (52.7 versus 29.5 years old) and more men answered the survey than the percentage of residents in the county (53% versus 48%) . Some other things that were different included income, the respondents had more money than the rest of Boone County, more were married, and respondents were better educated than Boone County. According the literature older and male respondents would know less than others who live in the County (Mohair and Tight 1987; Arcury and Christianson 1990; McMillan et al. 1997).

Table 4.12.2

Not Familiar with Nonpoint Source Pollution-Demographics

	Gender		Income		Marital Status	Education	Length lived
Age	Male	Female	0-$54,499	over $55,000	Married	College Degree	in the watershed
52.4 years	46.0%	53.8%	37.8%	62.2%	68.7%	72.2%	14.3 years

Table 4.12.3

Not Familiar with Nonpoint Source Pollution -Where They Live

Assigned				Self-Reported			
Urban	Suburban	Exurban	Rural	Urban	Suburban	Small Town	Rural
4.8%	81.4%	8.8%	5.0%	44.9%	48.4%	0.7%	5.7%

Table 4.12.4

Familiar with Nonpoint Source Pollution-Demographics

	Gender		Income		Marital Status	Education	Length lived
Age	Male	Female	0-$54,499	over $55,000	Married	College Degree	in the watershed
52.4 years	43.5%	56.5%	41.7%	58.3%	65.7%	71.8%	14.3 years

Table 4.12.5

Familiar with Nonpoint Source Pollution-Where They Live

Assigned				Self-Reported			
Urban	Suburban	Exurban	Rural	Urban	Suburban	Small Town	Rural
5.5%	80.2%	7.4%	6.9%	49.7%	41.3%	0.7%	8.0%

Table 4.12.6

Don't Know What Contributes Most to Water Pollution in Hinkson Creek-Demographics

	Gender		Income		Marital Status	Education	Length lived
Age	Male	Female	0-$54,499	over $55,000	Married	College Degree	in the watershed
52.9 years	43.5%	56.5%	41.7%	58.3%	65.7%	71.8%	14.3 years

Table 4.12.7

Don't Know What Contributes Most to Water Pollution in Hinkson Creek -Where They Live

Assigned				Self-Reported			
Urban	Suburban	Exurban	Rural	Urban	Suburban	Small Town	Rural
4.3%	80.6%	8.8%	6.4%	45.8%	47.2%	0.6%	5.8%

Table 4.12.8

Don't Know Pollution Level in Hinkson Creek-Demographics

	Gender		Income		Marital Status	Education	Length lived
Age	Male	Female	0-$54,499	over $55,000	Married	College Degree	in the watershed
51.2 years	42.9%	56.8%	39.7%	60.3%	65.3%	72.2%	11.8 years

Table 4.12.9

Don't Know Pollution Level in Hinkson Creek -Where They Live

Assigned				Self-Reported			
Urban	Suburban	Exurban	Rural	Urban	Suburban	Small Town	Rural
3.3%	82.3%	8.8%	5.7%	43.8%	49.7%	1.1%	5.3%

Table 4.12.10

Don't Know Level of Pollution in Hinkson Creek in the Past Ten Years-Demographics

	Gender		Income		Marital Status	Education	Length lived
Age	Male	Female	0-$54,499	over $55,000	Married	College Degree	in the watershed
54.3 years	46.2%	53.8%	38.6%	61.4%	66.8%	72.4%	16.1 years

Table 4.12.11

Don't Know Level of Pollution in Hinkson Creek in the Past Ten Years-Where They Live

Assigned				Self-Reported			
Urban	Suburban	Exurban	Rural	Urban	Suburban	Small Town	Rural
4.3%	83.3%	6.7%	5.8%	46.5%	46.4%	0.7%	6.2%

Table 4.12.12

Don't Know Seriousness of Sewage Discharge as a Potential Issue in Hinkson Creek-Demographics

	Gender		Income		Marital Status	Education	Length lived
Age	Male	Female	0-$54,499	over $55,000	Married	College Degree	in the watershed
53.6 years	41.3%	58.4%	40.1%	59.9%	65.8%	75.7%	13.0 years

Table 4.12.13

Don't Know Seriousness of Sewage Discharge as a Potential Issue in Hinkson Creek -Where They Live

Assigned				Self-Reported			
Urban	Suburban	Exurban	Rural	Urban	Suburban	Small Town	Rural
4.7%	83.5%	6.9%	4.9%	46.8%	46.3%	0.5%	4.5%

Table 4.12.14

Don't Know Seriousness of Poor Water Quality as a Potential Issue in Hinkson Creek-Demographics

	Gender		Income		Marital Status	Education	Length lived
Age	Male	Female	0-$54,499	over $55,000	Married	College Degree	in the watershed
54.0 years	41.7%	57.8%	40.0%	60.00%	65.6%	76.2%	13.8 years

Table 4.12.15

Don't Know Seriousness of Poor Water Quality as a Potential Issue in Hinkson Creek -Where They Live

Assigned				Self-Reported			
Urban	Suburban	Exurban	Rural	Urban	Suburban	Small Town	Rural
3.7%	84.6%	7.1%	4.7%	47.4%	48.1%	0.7%	3.4%

Summary

In summary the focus groups and the mail survey found similar results in that residents in the Hinkson Creek watershed are concerned about overdevelopment in the area and how it is going to affect water quality in the watershed itself. Even with demonstrated concern for water quality there was a lack of knowledge of important issues, such as their opinion of the water quality in the streams in the area; whether or not Hinkson Creek is polluted; what is the major cause of pollution in Hinkson Creek; the lack of understanding of key terms such as nonpoint source pollution and watershed. This lack of understanding could be due to the age and gender of the respondents.

This study brought out the majority of the respondents get their information regarding the creek from the newspaper; they believe that small changes in their life can improve water quality, they just need to know what they can do; they felt that reducing lawn chemicals; enforcing laws that were already in place and utilizing the media were all important to improving water quality in Hinkson Creek.

The respondents were also supportive of a variety of management objectives such as ensuring healthy streams that will support fish and other wildlife; ensuring that open spaces and natural areas exist for fish and wildlife habitat; ensure that streamside areas are protected from development; ensure that open spaces and natural areas exist for recreation and ensuring the protection of property rights. Understanding that these objects were rated very important or somewhat important can assist in a dual message, one that protects one or more of these management objectives and the other to improve water quality in Hinkson Creek.

As with the management objectives by understanding the opinions of the respondents they are going to be supportive of the following management strategies for improving water quality in Hinkson Creek and the watershed surrounding the creek: public and homeowner education; reducing lawn chemicals; improving laws and utilizing the media to accomplish these strategies.

The information gained in this study will assist governmental and non-governmental agencies develop strategies that can be used to reach the people and the resource. It will give them tools to make better management decisions for the creek and the people living in the watershed. The following chapter will go into each of these summaries in more depth.

CHAPTER 5

Discussion, Conclusions and Recommendations

This chapter summarizes the results of this study. Conclusions are determined from these results and recommendations are made to aid in the management of the Hinkson Creek watershed and to provide information helpful in developing educational tools for governmental agencies. Besides looking at how this study can assist governmental agencies it will also be used to add to the literature regarding when and if the New Ecological Paradigm can be used in this specific study to evaluate the relationship between the NEP worldviews and the more specific attitudes, beliefs and behaviors explored in this study.

According to the Missouri's Water Quality Standards 10 CSR 20-7.30 (3), Hinkson Creek is affected by the following general state standards:

- Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses (which include livestock and wildlife watering; protection of warm water aquatic life; protection of human health associated with fish consumption and boating and canoeing in the lower section);
- Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses;
- Waters shall be free from substances in sufficient amounts to cause toxicity to human, animal or aquatic life;

- Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community (MDNR 2004).

The impaired portion of Hinkson Creek starts south of Interstate 70 and runs through the city of Columbia to its confluence with Perche Creek. Hinkson Creek, like several other streams, has water quality problems associated with a stream in an urbanizing area such as:

1. Larger and more frequent floods as well as lower base flows due to increased impervious surfaces in the watershed;
2. Increased soil erosion in construction and development areas with deposition of soil in streams;
3. Water contamination from urban storm flows;
4. Degradation of habitat for aquatic organisms due to the concerns listed above;
5. Degradation of aquatic habitat due to the physical alteration of stream channels and adjacent riparian corridors. These include enclosing the stream in a pipe; straightening the stream; paving the stream bottom or banks with concrete or rip rap; and removing trees and other vegetation near the stream (MDNR 2004).

Hinkson Creek's degradation comes from urbanization with the greatest cause of impairment due to nonpoint source pollution. There is a large amount of biological knowledge as to what is wrong with Hinkson Creek; this study has examined the sociological aspects of Hinkson Creek to determine how human perceptions within the

watershed may affect management strategies and objectives for both the stream and the people living in the watershed itself.

It has been a long time since Hinkson Creek was pristine, with changes in the watershed that began with the settlement in the watershed about 1830. The creek was dammed in 1892 at Broadway for fire fighting after Academic Hall burned on the University of Missouri-Columbia campus; Peabody Coal Company mined in the watershed from the 1940's until the mid 1970's causing numerous fish kills; followed by inadequate septic systems and currently urbanization of the watershed. In 1998 Hinkson Creek was listed on the Environmental Protection Agency's 303(d) list of impaired waters, and with the urbanization occurring in the watershed it has been listed that the water quality needs to improve so people can have whole body contact with the water and not get sick.

That is where this study can play an important part, by gaining an understanding of the attitudes of the people living in the watershed, and utilizing this knowledge to improve Hinkson Creek, maybe not to a pristine level, but where it can be removed from EPA's 303(d) list.

Studying the attitudes and perceptions of people can be extremely complicated because theoretically people's attitudes and values can be used to identify or even predict what behaviors might occur which can help when developing management strategies or policies. What makes predicting behaviors more complicated are people's value orientations where people want clean water and they would like to see the water quality in Hinkson Creek improved. For the person living directly on the stream, seeing their yard eroding away because of the increased flow from stormwater events would do

almost anything or pay almost any amount to save their yard. On the other hand the person living in the same watershed but several miles from the stream will not share the same value orientation because they are not losing their yard to the Creek.

This study has found some disconnect between people and the environment. Here area couple of comments from the survey:

1. "If there is/are problem(s) with Hinkson Creek I don't know about them. This survey makes me think its polluted or being disturbed. I'm very unhappy with all the development along Old Highway 63 and Grindstone Parkway"

2. "Silver Lake is a conservation area that essentially baits fowl to come for the hunter's convenience. That cannot be a conservationist position. Bird watchers cannot view during season due to hunting".

3. "I consider overpopulation to be responsible for most, if not all of our major problems. Environmental depletion, air, water, land and animal resources, inability of human beings to be able to live together in peace…"

In this study the New Ecological Paradigm did reveal the respondents in the Hinkson Creek watershed were environmentally concerned, unfortunately in the analyses the NEP was not significant in predicting behaviors, attitudes or beliefs. This could be due to the general nature of the NEP and the specific (in my backyard) nature of this study.

What this study did found was that people are uninformed about water quality in their area, they also do not know if Hinkson Creek is polluted; what the largest contributor of water pollution is to the Creek; or even the definition of the term nonpoint source pollution. Even though the respondents felt they understood the definition of watershed, there are indications this may not be true.

Even though they may not understand or have knowledge of a variety of issues in the watershed they are supportive of management objectives and strategies for the watershed and improving water quality in Hinkson Creek.

If water quality is to improve not only in Hinkson Creek, but also other streams in urbanizing areas, the "people component" as well as the biological need to be addressed together in the same research project.

Discussion

Demographics of Residents

Before discussing the other sections, it is helpful to summarize the demographics of the respondents to the survey. All of the respondents were landowners that lived in Boone County, Missouri in the Hinkson Creek watershed. The majority of the respondents were males 52.5% (n=2406), while 47.1% (n=2154) were female; with 70% (n=3190) of respondents were married; 9.4% (n=430) were never married; 0.6% (n=25) were separated; 11.9% (n=541) were divorce; and 8.0% (n=365) were widowed.

The respondents were well educated with 40.3% (n=1843) having a graduate or professional degree; 26.5% (n=1211) had a college degree; 13.0% (n=596) had some college; 8.6% (n=395) had some graduate school; 2.4% (n=108) graduated from a vocational or technical school; with 8.1% 9 (n=370) were high school graduates and only 1.0% (n=47) had some high school.

The mean age of the respondents was 52.7 years; the median and mode were 52.0. The youngest respondent was 12 and the oldest was 99. The annual household income before taxes of the respondents was $100,000 or more (27%); followed by 19% of the respondents making between $55,000-$74,000 with only 2% of the respondents making less than $15,000.

The majority of the residents grew up in rural areas or small towns (64%) and 35% growing up in a suburban or urban area. While most of the respondents grew up in a

small town or rural area, the majority currently report they live in a suburban or urban area (93%) with 7% living in a rural area or small town. The majority of the respondents did not hunt (82%) or fish (70%).

The higher age and the majority of respondents being men could have contributed to a bias of people who do not know, or may be uninformed regarding the levels of pollution in Hinkson Creek; definition of nonpoint source pollution and the seriousness of potential issues in the watershed.

People and Water Quality

This section explored respondent's opinions of water quality, pollution sources, knowledge of Hinkson Creek, watershed management strategies and information sources. When the respondents were asked if they were familiar with the term "nonpoint source pollution," 17.8% (n=870) people had heard of the term and knew what it meant, while 16.3% had heard the term but did not know what it meant and 65.9% had not heard of the term and did not know what it meant.

Nonpoint source pollution is the largest contributor of pollution entering the stream; and is particularly difficult to manage because it is difficult to find the source of the problem. Nonpoint source pollutants in Hinkson Creek include sedimentation; organic chemicals such as polycyclic aromatic hydrocarbons (PAH's); petroleum compounds; metals (arsenic, chromium, copper, lead, nickel and zinc); *E. coli* bacteria; pesticides; phthalates and pharmaceutical drugs (the last three are known to bioaccumulate in aquatic organisms) (MDNR 2005).

One thing governmental agencies can do to improve Hinkson Creek is to teach residents of the watershed what nonpoint source pollution is and how it impairs Hinkson

Creek specifically. Show the residents this is a creek and its tributaries are literally "in their backyard". Nonpoint source pollution is entering the stream due to increased soil erosion from construction and development in the area and also from an increase in impervious surface area (such as roof tops, paved roads and parking lots).

Once residents of the watershed gain an understanding of what nonpoint source pollution is and how it gets into the stream, educational programs can target residents with messages such as:

- small changes in people's routines such as, properly disposing household chemicals and pesticides;
- decreasing the amount of fertilizers and pesticides sprayed on the lawn;
- having the septic system inspected annually;
- cleaning up after pets
- conserving water are all ways of improving the water quality in Hinkson Creek.

People were not familiar with the term nonpoint source pollution but felt they were very familiar with the term watershed. While 66% (n=3062) of the respondents had heard the term watershed and claimed to know what it meant, 29% (n=1048) had heard the term but were unsure of what it meant On the other hand, of the 113 telephone calls received, 61 were from people who said they did not live in the watershed; also of the returned surveys that were not useable 6 of them were returned saying they did not live in the watershed and maybe someone else could use the survey. After talking with the people who had called and finding out where they lived, they actually were in the watershed. Most of those people thought the stream needed to be on their property or they at least needed to see the stream to be in the watershed. Several people said "I'm

not in the watershed that is on the east side of town", not realizing the Hinkson Creek watershed drains over 60% of the city.

Helping residents of Boone County and specifically the Hinkson Creek watershed understand the definition of a watershed will help them understand the importance of protecting and improving the quality of the watershed. A watershed is similar to a community. A community is a group of people living and working together in an area. A watershed is similar; not just Hinkson Creek, but the small tributaries that run into Hinkson Creek, the parks, shopping centers, wildlife, people and the flora and fauna all make up the watershed. It is not just that dirty creek on the East side of town, but a part of the Columbia community that needs to be protected to improve the quality of the community, similar to how the District's (downtown Columbia) improvements has increased the quality of Columbia.

In addition to understanding water quality terms, this study wanted to explore resident's opinions of the water quality in the area and the pollution level of Hinkson Creek and gained gain an understanding of what landowners know, and where educational efforts can be focused.

When asked what the resident's opinion of the water quality in the area, only 2.2% (n=102) thought the water quality was excellent; 24.2% (n=1110) thought it was good; 35% (n=1605) thought it was fair; 12% (552) thought it was poor and (the most interesting frequency was that) 26.4% (n=1214) did not know about the water quality in the area.

This result could be attributed to the transient nature of Columbia with the three colleges and universities in Columbia and residents do not live here long enough to

understand Hinkson Creek; they don't care about water quality in the area; they are busy raising a family and/or building a career and the problems in Hinkson Creek do not enter their daily lives. Governmental agencies cannot make people care about pollution levels in Hinkson Creek, but they can develop educational programs which talk about Hinkson Creek in ways that provide a relationship, a sense of place; a place where recreational activities such as hiking, biking, canoeing and kayaking occurs; as a place where the resident's quality of life improves because of the improvement of water quality in Hinkson Creek.

Hinkson Creek is on the Environmental Protection Agency's (EPA) 303d list for impaired streams. When the residents were asked their opinion regarding the pollution level in Hinkson Creek, the numbers were similar to the opinions of the water quality in the area. With only 2.3% (n=108) having the opinion that Hinkson Creek was not at all polluted, 53.7% (n=2488) felt it was somewhat polluted, and 15.5% (n=718) felt it was very polluted. Again there was a large number of people admitting they don't know about the pollution levels in Hinkson Creek (28.5% with an n=1320). The mean was $\bar{x} = 2.44$ (on a scale of 1 to 5 for the entire group of respondents, with 1= very polluted).

Since almost 30% of the respondents did not know if Hinkson Creek is polluted it will be a challenge to get residents interested in protecting and improving water quality in their watershed. With over 69% of the respondents believing that Hinkson Creek is somewhat or very polluted, educational messages can be targeted to those specific groups by finding out which groups of people hold specific beliefs.

The study next explored if there were different answers depending on where they live by an assigned spatial location, self-reported location and where they grew up. There is a

significant difference in the urban, suburban, exurban (or small town) and rural groups regarding their opinion of the pollution level in Hinkson Creek with a significance of .002 for both the assigned location and the self-reported location. There is not a significant difference between groups based on where they grew up.

When asked how the water quality in Hinkson Creek had changed in the last ten years, the responses were more evenly distributed among the answers as 11.7% (n=542) of the respondents felt that Hinkson Creek had improved; 14.8% (n=688) felt that it had stayed the same; 27.0% (n=1252) felt it had gotten worse; 16.3% (n=754) felt they had not lived in the watershed long enough, and [1]29.9% (n=1386) did not know or were not sure if the water quality had changed over the past ten years. There were interesting stories about Hinkson Creek in the past. A 92 year old man on the telephone spoke about farming at Fairview Road and Chapel Hill Road in the city of Columbia 60 years ago and the smell would be so bad from the raw sewage dumping into the creek that when the winds were from a certain direction he would have to farm another part of the acreage. Another person, a woman from one of the focus groups talked about when it rained the stream would turn black from the sewage and would be full of trash. The next day they would find fish tangled up in the trash. That occurred 40 years ago. That could suggest that Hinkson Creek may have improved in the past forty years.

Using ANOVA there was a significant difference between people's opinion of pollution levels in Hinkson Creek by where they live now (both assigned and self-reported), but was not significant in the linear regression models. This significance with the ANOVA analyses could be an artifact due to the large number of respondents. The

[1] There were a lot of people in the watershed that were willing to answer a survey about things they felt they did not have knowledge about.

regression analysis is probably a better statistical method for this problem. Future analyses could be accomplished using other statistical methods.

After exploring what people knew about water quality and pollution levels in Hinkson Creek, the study examined the respondents' opinion of the seriousness of different causes of water pollution in Hinkson Creek. The potential causes of water pollution in the watershed included overdevelopment, overpopulation, industrial pollution, agricultural pollution, sewage discharge and poor water quality. Seriousness was rated on a scale of 1 (very serious) to 3 (not at all serious) with overdevelopment ranking number one in potential causes to water pollution with the respondents scoring a mean of $\bar{x}$ =1.74 followed by: overpopulation (with a mean of $\bar{x}$ =1.95); poor water quality (with a mean of $\bar{x}$ =2.00); industrial pollution with a mean of $\bar{x}$ =2.02; followed by sewage discharge (with a mean of $\bar{x}$ =2.12) and, agricultural pollution ranked last in potential causes of water pollution in the watershed (with a mean of $\bar{x}$ =2.15). During the focus groups agricultural pollution ranked as the second potential cause of water pollution in the Hinkson Creek watershed by the urban and suburban groups with overdevelopment ranking first. Several respondents in the watershed were not sure if sewage discharge was a serious potential issue in the stream with 20.4% not knowing (n=934).

The residents were relatively knowledgeable or at least chose the most serious cause of water pollution in the watershed, overdevelopment. Poor water quality ranked as somewhat serious and sewage discharge was between somewhat serious and not at all serious. According to MDNR's biological report, the pollutants found in Hinkson Creek included: sedimentation; organic chemicals such as polycyclic aromatic hydrocarbons (PAH's); petroleum compounds; metals (arsenic, chromium, copper, lead, nickel and

zinc); *E. coli* bacteria; pesticides; phthalates and pharmaceutical drugs. All of the pollutants are common in an urbanizing watershed with increasing amounts of impervious surface (MDNR 2005). Some people are aware of how serious some of the potential issues are in the watershed. An educational program building on what residents already know (overdevelopment, poor water quality and sewer discharge are serious potential issues), and adding key information while informing them about ways they can decrease the amount of pollution entering Hinkson Creek and its tributaries.

The study also wanted to explore the opinions of why people think Hinkson Creek is polluted in regards to where the respondents live, both their assigned and self-reported location along with where they grew up. Using ANOVA there was a significant difference between where people grew up, but not where they live now (assigned or self-reported), but this did not show up in the best fit linear regression models. It did contribute .007 to the variance of the global model. The significance with the ANOVA analyses could be an artifact due to the large number of respondents. The regression analysis is probably a better statistical method for this problem. Future analyses could be accomplished using other statistical methods.

After exploring their opinion of the seriousness of each issue, the study examined respondents opinion of which of the following contributes most to water pollution in their area: runoff of agricultural fertilizers and pesticides; runoff from construction sites after heavy rains; runoff of automobile oil and other fluids dripped onto parking lots; or animal droppings. The respondents' number one choice as to what contributes most to water pollution in their area was "don't know" with 23.5% (n=1085); this was followed by "runoff from lawn care", 22.9% (n=1056); "agricultural runoff", 17.5% (n=809); "runoff

from construction sites", 14.9% (n=697); "runoff from parking lots", 10.8% (n=498) and "animal droppings", with 1.9% (n=85).

An educational program or even a flyer going to each of the homes in the watershed could address this issue. When given several choices of what contributes the most to water pollution in their area the respondents chose "don't know" more than any other answer. There is clearly a disconnect between overdevelopment which ranked number one and the symptoms of overdevelopment such as: runoff from construction sites after heavy rains, runoff from automobile oil and other fluids dripped on parking lots and runoff of insecticides or pesticides from lawn care. What was also interesting is that in the previous question the respondents ranked overdevelopment as the most serious potential issue in the watershed, but they did not know about the seriousness of agricultural pollution, sewage discharge and poor water quality.

On a scale of 1 (strongly agree) to 5 (strongly disagree) the respondents were asked about their level of agreement with the following water quality statements: most water pollution comes from everyday activities in our homes, workplaces and cars; small changes in people's daily habits and activities will have an effect improving water quality; pet waste from household pets is a significant source of water pollution, and droppings from pigeons and other birds such as ducks and geese can be significant source of water pollution. Respondents mildly agreed with the statement that "small changes can improve water quality" (with a mean of $\bar{x}$ =1.92); followed by "everyday activities causes pollution" (with a mean of $\bar{x}$ =2.34). During the focus groups everyone wanted to blame someone else for poor water quality; it was the developer or it was someone that lived in the city or the country, but no one took ownership for contributing to water

pollution themselves. Bird droppings (with a mean of $\bar{x}$ =2.65) and pet waste causes of water pollution (with a mean of $\bar{x}$ =3.68) ranked low.

The survey explored what people knew about different water quality terms, water quality in Hinkson Creek, seriousness of potential issues, and their opinion of what contributes the most to pollution. The study also explored their opinions of the importance or unimportance of different management objectives in the Hinkson Creek watershed. The objectives included: ensuring clean water supplies for the public, ensuring healthy streams that will support fish and other aquatic life; ensuring that open spaces and natural areas exist for fish and wildlife habitat; ensuring that streamside areas are protected from development; ensuring that open spaces and natural area exist for recreation and ensuring the protection of private property rights. The scale was from 1 (very important) to 5 (very unimportant). The respondents' felt all of the management strategies were important with healthy streams ranking number 1 (with a mean of $\bar{x}$ =1.35); followed by clean water supplies (with a mean of $\bar{x}$ =1.41); open space for wildlife (with a mean of $\bar{x}$ =1.45); streamside protection (with a mean of $\bar{x}$ =1.63); open space for people (with a mean of $\bar{x}$ =1.69) and protection of private property (with a mean of $\bar{x}$ =1.71). Very few people answered "did not know", less than 2% for each management option. This is helpful for governmental agencies because the respondents were supportive of all management objectives that were offered. People do want improved water quality in Hinkson Creek and its tributaries and are supportive of efforts aimed at improving the water quality.

The last set of management questions the survey explored were the residents' opinions regarding how important or unimportant were six different management

strategies for improving water quality in Hinkson Creek. These strategies are as follows: public or homeowner education, media involvement, encouraging people to reduce lawn chemicals and pesticides, improving laws, enforcing laws and offering incentives for people to buy existing homes. The answers were on a scale of 1 (very important) to 5 (very unimportant) with four of the six management strategies being either very important or somewhat important. They are as follows: "education" ($\bar{x}$ =1.50); "media involvement" and "reducing lawn chemicals" ($\bar{x}$ =1.81) and "enforcing laws" ($\bar{x}$ =1.89). The last two management strategies were less important; "improving laws" ($\bar{x}$ =2.39) and "offering incentives to buy existing homes" ($\bar{x}$ =2.63). During the focus groups every time the word law came up, there would be a disagreement between those that wanted more laws and those who felt existing laws were not being enforced. The respondents were very supportive of education, utilizing the media, reducing lawn chemicals and enforcing laws that are already in existence to assist in the improvement of Hinkson Creek.

Using ANOVA there was a significant difference between people's opinion of the importance of management strategies to improve water quality in Hinkson Creek by where they live now (both assigned and self-reported), but did not show up in the linear regression models. This significance with the ANOVA analyses could be an artifact due to the large number of respondents. The regression analysis is probably a better statistical method for this problem. Future analyses could be accomplished using other statistical methods.

The respondents to this survey were unsure of the water quality, levels of pollution in the Creek, what contributes most to water pollution in the Creek and were also unsure of

terms such as nonpoint source pollution and the definition of watershed. This lack of knowledge leads them to be very supportive of management strategies and management objectives that could be designed by governmental and non-governmental agencies in the watershed. No one wants to live around pollution; even though they are not knowledgeable about the subject matter, they are supportive of improving the Creek's water quality.

Addressing the spatial issue (where they live now or where they grew up) in regards to people's opinions on a variety of topics is important because if there is a significant difference in their opinions spatially this would allow the researcher to explore their values and attitudes. If an educational program is developed, it may not be a "one size fits all", but may target one group with one message while reaching another group with something completely different.

In summary, the respondents did not know the definition of non-point source pollution, but reported they were familiar with the term watershed. Respondents thought the water quality of the streams in their area was fair, with a large percentage that did not know about the water quality; they also thought Hinkson Creek was somewhat polluted, with a large percentage who did not know if it was polluted or not. The respondents felt that overdevelopment was the most serious potential issue in the watershed, while they did not know what the largest contributor to water pollution was in Hinkson Creek.[2] Respondents believe that small changes can improve water quality, while they felt all the management strategies (clean water supplies, healthy streams, open spaces for wildlife,

[2] The largest contributor of water pollution in Hinkson Creek is nonpoint source pollution which include sedimentation; organic chemicals such as polycyclic aromatic hydrocarbons (PAH's); petroleum compounds; metals (arsenic, chromium, copper, lead, nickel and zinc); *E. coli* bacteria; pesticides; phthalates and pharmaceutical drugs. All of these pollutants are common in an urbanizing watershed with an increasing amount of impervious surface.

streamside protection, open spaces for recreation and private property rights) were important. Education, media use, reduction of lawn chemicals and enforcing laws were all perceived as important methods of improving water quality in the watershed. Lastly the respondents got the majority of their information about Hinkson Creek watershed from the newspaper, environmental groups and television.

When evaluating where people live now in the assigned strata and the self-reported, there were sampling difficulties with a large number people assigned to the suburban group, self-reporting being in the urban group (Table 5.1.0)

Table 5.1.0

Comparison of Urban and Suburban by Assigned Strata and Self-Report

	Assigned strata	**Self-reported strata**
Urban	**231**	**2115**
Suburban	**3774**	**2145**

The large number of "don't know" responses could be following an age bias caused by the sampling process of surveying only landowners and homeowners in the Hinkson Creek watershed.

The large number of "don't know" instead of representing a lack of knowledge could represent an unknown number of people that are uniformed on topics regarding Hinkson Creek and the watershed.

New Ecological Paradigm (NEP)

The NEP is commonly used to look at "ecological" worldviews, which can measure environmental concern, reflect a proenvironmental orientation as well as looking at environmental attitudes, beliefs and values (Dunlap et al. 2000). A high score on the

NEP Scale shows an ecological worldview that should be related to proenvironmental beliefs and attitudes on a variety of issues, which will give researchers a tool to understanding more about the residents living in the watershed. Dunlap et al. (2000), implies that the NEP allows the researcher to "examine the structure and coherence of ecological world views and the relationships between these worldviews and a range of more specific environmental attitudes, beliefs and behaviors".

The respondents of the survey show strong ecological concern. They agree with the statements that "humans are severely abusing the environment" (90%) with only 16.4% disagreeing and "despite our special abilities, humans are still subject to the laws of nature" with 91% agreeing and only 2.8% disagreeing.

The statements the respondents most strongly disagreed with were "the balance of nature is strong enough to cope with the impacts of modern industrial nations with 63.8% disagreeing with only18.7% agreeing. The other statement that respondents strongly disagreed with was "the so-called 'ecological crisis' facing humankind has been greatly exaggerated" with 53.3% disagreeing and 20.1% agreeing with that statement.

The NEP study with the Hinkson Creek watershed found very similar results to what Dunlap et al. 2000 found with their study of students at the University of Washington suggesting that respondents to the survey are environmentally concerned.

The frequency distribution and corrected item-total correlations for the NEP were higher in the category of the corrected item totals than Dunlap et al. (2000) found in their study of the NEP except for numbers 9 and 14. Number 9 (despite our special abilities humans are still subject to the laws of nature) which Dunlap et al. (2000) study scored a .33 and this study scored .32 and number 14 (humans will eventually learn enough about

how nature works to be able to control it) with the former study scoring .35 and this study a .31. Both questions explore the rejection of exemptionalism, meaning that people cannot control their surroundings.

This study also wanted to explore respondent's scores for where they live now (assigned and self-reported) and where they grew up to see if there were any significant differences among the groups for their NEP scores. There were significant differences among all the groups. The assigned location for where they live now was significant (.004) and for the self-reported (.000) and where they grew up was also significant (.000).

The linear regression model also showed that women scored higher on the NEP than men suggesting they would be a better target for education. For this study, the only example where the NEP crossed the boundary between the general and the specific.

In summary, according to the NEP the respondents of this survey scored well environmentally, which would support the statements made during the focus groups that Boone County residents are "green" and support conservation. As with the previous questions, they may not know the answers to specific questions but the respondents are supportive of objectives and strategies that would improve water quality in their area. In comparison with the NEP, when asked their opinion of general things they have opinions; when asked to address specific issues they are not quite as knowledgeable, and women were more ecologically aware than men. Environmental groups and government agencies should be able to build on this general support for ecological health in devising management regimes for the watershed.

Missouri Department of Conservation (MDC)

This section addressed the respondents' familiarity with the Missouri Department of Conservation (MDC); the respondents rated how satisfied they were with MDC and if they agree or disagree with a variety of statements regarding of what MDC should be doing for the citizens of the state.

Over 82% were familiar with the MDC with only 15.6% not at all familiar. Most people reported that MDC is doing a good job for themselves, their family, their community and the state of Missouri, except that between 22%-25% of the respondents did not know what kind of job MDC was doing. Thirty-six percent of the respondents had no opinion about whether MDC was doing a good job enforcing laws. When asked what role MDC should have in the following activities (water quality education programs, publicizing Hinkson Creek water quality issues, providing water quality assistance to landowners along the stream, making sure that MDC's water quality education program fits in with local public school requirements or enforcing state water quality laws) the respondents felt that education and assistance to landowners comes first (with a mean $\bar{x}$ =1.90) followed by publicizing issues (with a mean $\bar{x}$ =1.99). The highest scoring issues were assuring that programs fit in school ($\bar{x}$ =2.10) and enforcing state water quality laws ($\bar{x}$ =2.19).

In summary, respondents were familiar with MDC. Although they were not sure if they did a good job or not, they feel MDC should be involved be involved with water quality education programs, providing water quality assistance to landowners along the stream and publicizing water quality issues in the Hinkson Creek watershed.

Conclusions

In conclusion, the results of this study have provided valuable information for the Hinkson Creek watershed in regards to whether or not the residents know if the creek is polluted, how serious the respondents feel are potential pollution issues to the watershed and how residents feel about ways to improve the water quality in Hinkson Creek. Opinions regarding the NEP and MDC were also explored.

People were not sure of specific issues in the watershed itself such as what was their opinion of the water quality in the area; whether or not Hinkson Creek is polluted; what is the largest contributor of water pollution in the stream; what the terms nonpoint source pollution and watershed meant. It may just be too complicated of an issue for them to take the time to understand all the aspects involved. The respondents get the majority of their Hinkson Creek information from the newspaper. If an education program is designed this would be a good way to reach the residents of the watershed.

With that being stated, respondents were supportive of education, media involvement, improving and enforcing existing laws; and, they believe that small changes in their life can improve water quality (if they knew what that involved). They also thought management objectives such as: ensuring healthy streams for fish and other aquatic life; ensuring that open spaces for wildlife exists; ensuring that streamsides are protected, open spaces for recreation exists and ensuring the protection of property rights were all important. The respondents may not know the biological aspects of Hinkson Creek, but are supportive of strategies and objectives for improvement.

Management Recommendations for the Hinkson Creek Watershed

- Educate residents through the newspaper, environmental groups or television about the definition of nonpoint source pollution

- Use a message that small changes in their lives can decrease nonpoint source pollution.

- Small changes that decrease pollution can include properly disposing of household chemicals and pesticides by taking them to the hazardous waste collection site in Columbia; decrease the amount of fertilizers and pesticides sprayed on the lawn; have the septic system inspected annually; clean up after pets and conserve water.

- While educating about nonpoint source pollution, also educate about watersheds, making sure that residents do really understand the term and how they are a part of the ecosystem.

- Educate people as to what are the large contributors of pollution to Hinkson Creek.

- Ensure people understand what the most serious potential issues to the watershed are and what they can do to help the watershed.

- Inform the residents of the best ways to improve Hinkson Creek, and what they can do.

- Assure/educate residents that big businesses, the dump and other places that empty water (point sources) into Hinkson Creek are monitored; no raw sewage should be entering the creek.

- Encourage recreational activities along the creek such as hiking, biking, rock climbing/rappelling and kayaking.

- Partner federal, state, county and city agencies to work together with the residents to improve the water quality in Hinkson Creek

- Use marketing techniques to reach certain demographics in the watershed

- Develop educational color brochures that can be available at different public areas in the watershed.

- MDC could create water quality programs that can educate and assist landowners in the watershed and increase awareness of the watershed by publicizing the issues.

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Appendix A

Focus Group Invitation Script, Protocol and Questions

Focus Group Invitation Script

"Hello, my name is Michele Baumer and I'm calling from the University of Missouri. I am calling to invite _____ to attend a focus group discussion with other landowners to talk about water quality and conservation. May I please speak with him/her? Thank you."

If the person is not available, ask when would be the best time to call back.

[Hello, etc. if the person comes to the phone, reintroduce yourself and explain that I am calling about a focus group regarding water quality and conservation.] "I am a graduate student in Rural Sociology at the University of Missouri and we are doing a study to learn how people feel about water quality and conservation in Missouri. As part of that study, we are conducting several focus group discussions with landowners like you. The focus groups should last approximately 2 hours and each one will probably have between 6 and 10 people attending. Participants will receive $40 to thank them for taking the time to meet with us. Would you be interested in attending a discussion like this?"

If yes, continue.

If no, thank and terminate.

The discussion will be held at the _____on _____. It will last approximately 2 hours, beginning at 7 p.m. and ending at 9 p.m. As I mentioned, you will receive $40 to thank you for participating. Because only a limited number of people can be invited to participate, it is very important that if you agree to come we are able to count on you to attend. Will you be available on _____at 7 p.m?

If yes, continue.

If no, thank and terminate.

In a week or so I will mail you a letter confirming this conversation and including the date and time of the discussion and directions to the focus group site. Also, in order to write a check for you, we will need to get your social security number the night of the focus group.

Do you have any questions?

Thank you very much for agreeing to participate in the discussion. We'll look forward to speaking with you on _____.

Focus Group Protocol

WELCOME

Thank you for coming here this evening. My name is Michele Baumer and I am a graduate student in Rural Sociology at the University of Missouri-Columbia. With me this evening is Heather Scroggins, a Resource Scientist with the Department of Conservation.

We have invited you here tonight to explore with you your opinions and ideas about conservation and water quality. This is one of several groups we are meeting with in Columbia in the next few weeks. The discussion that we have here tonight will help us design a survey that will be sent out to landowners in the Hinkson Creek watershed later this year.

I don't believe we will be discussing any sensitive topics, but I want to assure you that everything you say here tonight is confidential. We will only use first names in our discussion, and your names will not be included in the report of this study.

We would like to tape our discussion tonight. This is only so we have a good record of what is said and I can concentrate on facilitating the discussion rather than taking detailed notes. Once we have made notes the regulations require that all research materials including tapes will be kept securely for a period of 3 years following the completion of the study.

You should have an informed consent form on the table in front of you. Please take a few minutes to read this over, and if you agree, sign the form so that you can participate in tonight's focus group discussion. Of course, you may refuse to sign this form and leave

the focus group discussion now or at any time if you have any hesitations or concerns about participating.

GUIDELINES

Before we begin, I would like to go over a few guidelines for tonight's discussion. To get the most out of our time tonight, there are a few simple ground rules for us to follow. It's important that you share what is on your mind regarding the topics we discuss. Comments from each participant are very important. I expect and hope that there will be differences of opinion in the group tonight and it is just as important to me to know when you disagree with something as it is to know when you all agree. Please don't be swayed by other opinions if you have a different point of view. We are not here to persuade each other, but rather to share our opinions.

Also, I am not looking for any particular responses to the questions I have for you. There are no right or wrong answers. I would like you to share your views and respect the views of others although you may disagree.

Sometimes we use "probing questions". These aren't challenging you to defend your point of view; they are just efforts to be sure we completely understand your perspectives.

Any time that a question is unclear, please ask me to explain further.

Please try to speak one at a time and loud enough so that everyone here can hear your comments.

This is a large group for a focus group, so we will have to be very conscious of time. It is our goal to take up no more of your time than is necessary and adjourn in the two hours we told you we would.

As the facilitator, I need to be very focused on keeping us on track and conserving time. From time to time, I may ask you to be brief or I may need to interrupt you or redirect the conversation. Please understand that I do not mean to be rude or discourteous, but we have several things to talk about in our two hours tonight. My task tonight is to keep everyone on the topic and your task is to provide your experience and input.

Does anyone have any questions on the ground rules?

Focus Group Questions

Purpose Statement

What do people know about water quality in Hinkson Creek, and do they care? What do they see as the role of MDC, a non-regulatory agency?

1. **Opening**

   Tell me your name (first names only, please) and your favorite hobby.

2. **Introduction**

   What is a watershed?

   (Follow up) Do you know which watershed you live in?

   (Follow up) Do you think that streams have any effects on your property or nearby property? (property values, aesthetically)

3. **Transition**

   Tell me what you know about Hinkson Creek. If you had access to Hinkson Creek for recreation purposes (swimming, fishing, hiking, wading and picnicking) would you use the stream?

4. **Transition**

   What does water quality mean to you?

   What kinds of things can make water quality better? (Write these on a flip chart)

   What kinds of things can make water quality worse?

5. **Key**

   What do you think about the water quality in Hinkson Creek?

   (Follow up) Would you swim in the water?

   (Follow up) Would you drink the water?

   (Follow up) What do you see as a source of problems in Hinkson Creek?

   We just talked about things that can affect water quality. Now that we are talking about Hinkson Creek, are there any more effects we should add to our list?

6. **Key**

   What would be some ways to improve water quality in Hinkson Creek?

   Probe: Can you think of anything that happens in your or other people's property that affects the creek?

   (Follow up) How do you feel about laws regulating water quality?

7. **Key**

   What do you see as the role of the Missouri Department of Conservation regarding water quality in Hinkson Creek?

8. **Ending (all things considered)**

   Of all the things we've discussed this evening which one is the most important to you?

9. **Ending (summary)**

   After a summarization of the evening I will ask if that was an adequate summary.

10. **Ending (final question)**

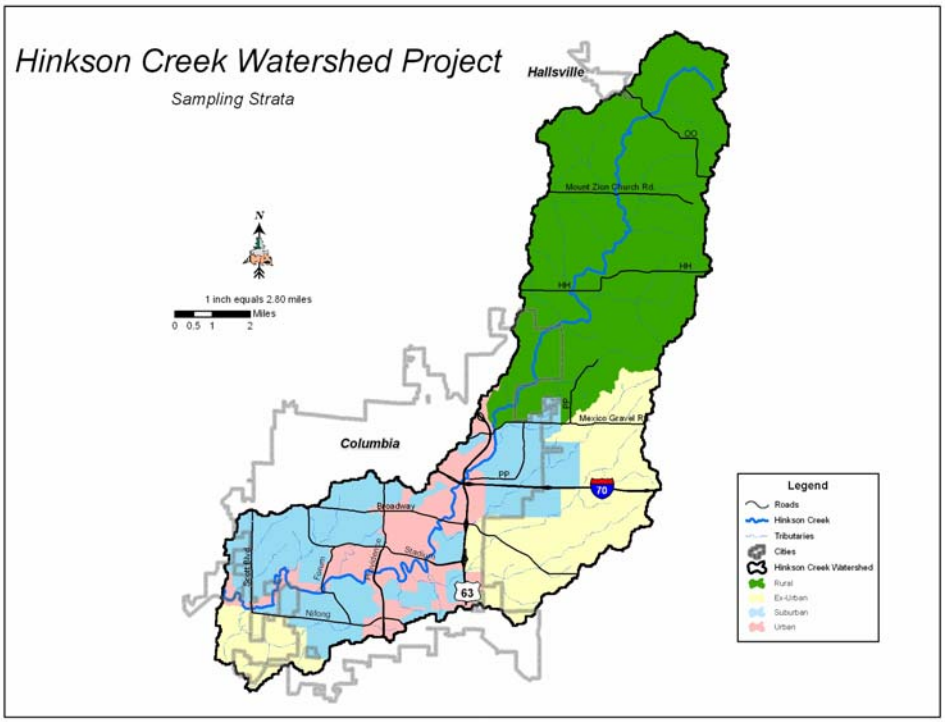
Appendix B

Questionnaire

Water Quality and You

A Survey of Hinkson Creek Watershed Residents

A Survey By: University of Missouri


Hinkson Creek Watershed Project
Sampling Strata
Hallsville
Columbia
Mount Zion Church Rd.
Mexico Gravel Rd
Broadway
Stadium
Rollins
Nifong
Providence
63
70
N
1 inch equals 2.80 miles
Miles
0 0.5 1 2
Legend
Roads
Hinkson Creek
Tributaries
Cities
Hinkson Creek Watershed
Rural
Ex-Urban
Suburban
Urban

When answering this survey, please consider only your property located in the Hinkson Creek watershed.

People and Water Quality

1 In your opinion, how would you rate the overall water quality of the streams in your area? *(Check one)*

- Poor
- Fair
- Good
- Excellent
- Don't know

2 In your opinion, how would you rate the overall quality of the tap water in your home? *(Check one)*

- Poor
- Fair
- Good
- Excellent
- Don't know

3 Do you filter or treat your tap water? *(Check one)*

- Yes
- No
- Don't know

4 Where do you change the oil for your car or other vehicles? *(Check one)*

- At home or another residence
- At a service center or a garage
- Don't know
- I don't have a car

5 If you answered "at home or another residence," how do you dispose of used automobile oil? *(Check one)*

- Throw it in the yard or on the driveway
- Take it somewhere to have it disposed of/recycled
- Burn it
- Other

6 Is your home: *(Check one response for each)*

	Yes	No	Don't know
On a public sewer system			
Equipped with a septic tank			
Equipped with a lagoon			

7 If you said yes to "septic tank" in question 6, how often do you have your septic tank pumped? *(Check one)*

More than once per year

Once a year

Less than once per year

Don't know/Not sure

8 Do you pay a utility company or water supply district for your water, or does your water come from a well? *(Check one)*

Utility company/Water supply district

Well

Don't know/Not sure

9 Please indicate your level of agreement or disagreement with the following statements. *(Check one response for each)*

	Strongly Agree	Mildly Agree	Neither Agree Nor Disagree	Mildly Disagree	Strongly Disagree	Don't Know
a. Most water pollution comes from everyday activities in our homes, workplaces and cars.						
b. Small changes in people's daily habits and activities will have an effect on improving water quality.						
c. Pet waste from household pets is a significant source of water pollution.						
d. Droppings from pigeons and other birds such as ducks and geese can be a significant source of water pollution.						

10 Are you familiar with the term "Nonpoint Source Pollution"? *(Check one)*

Yes, I have heard of it and know what it means

Yes, I have heard of it but I'm not really sure what it means

I have never heard of it

11 In your opinion, how serious are each of the following possible causes of water pollution? *(Check one for each statement)*

	Very Serious	Somewhat Serious	Not at all Serious	Don't Know
Runoff of agricultural fertilizers and pesticides				
Runoff from construction sites after heavy rains				
Runoff of automobile oil and other fluids dripped onto parking lots				
Runoff of insecticides or pesticides from lawn care				
Animal droppings				

12 In your opinion, which one of the following contributes most to water pollution in your area? *(Check one)*

Runoff of agricultural fertilizers and pesticides
Runoff from construction sites after heavy rains
Runoff of automobile oil and other fluids dripped onto parking lots
Runoff of insecticides or pesticides from lawn care
Animal droppings
Don't know
Other

---

13 Are you familiar with the term "watershed"? *(Check one)*

Yes, I have heard of it and know what it means
Yes, I have heard of it but I'm not really sure what it means
I have never heard of it

14 In your opinion, Hinkson Creek is: *(Check one)*

Very polluted
Somewhat polluted
Not at all polluted
Don't know/Not sure

15 In the past 10 years, would you say the water quality in Hinkson Creek: *(Check one)*

Has improved
Has stayed the same
Has gotten worse
Don't know/Not sure
I have not lived here long enough to know

16 How long have you lived or owned land in the Hinkson Creek watershed? _____ years *(Fill in the blank)*

17 In your opinion, how important or unimportant are each of the following management objectives for the Hinkson Creek watershed?
(Check one response for each)

	Very Important	Somewhat Important	Neither Important Nor Unimportant	Somewhat Unimportant	Very Unimportant	Don't Know
a. Ensure clean water supplies for public use						
b. Ensure healthy streams that will support fish and other aquatic life						
c. Ensure that open spaces and natural areas exist for fish and wildlife habitat						
d. Ensure that streamside areas are protected from development						
e. Ensure that open spaces and natural areas exist for recreation						
f. Ensure the protection of private property rights						

18 In your opinion, how serious are each of the following potential issues in the Hinkson Creek watershed? *(Check one response for each)*

	Very Serious	Somewhat Serious	Not at all Serious	Don't Know
a. Overdevelopment				
b. Overpopulation				
c. Industrial pollution				
d. Agricultural pollution				
e. Sewer discharge				
f. Poor water quality				

19 Do you get information about Hinkson Creek from each of the following sources? *(Check one response for each)*

	Yes	No
Television		
Newspaper		
Radio		
Internet		
Word of mouth		
Local government		
Environmental organizations		
Other_____		

20 On a scale of 1 to 10, how informative do you find each of the following to be with regard to Hinkson Creek (1 being the least informative and 10 being the most informative)? *(Check one response for each)*

	Least Informative									Most Informative
	1	2	3	4	5	6	7	8	9	10
Television										
Newspaper										
Radio										
Internet										
Word of mouth										
Local government										
Environmental organizations										
Other										

21 In your opinion, how important or unimportant are the following management strategies to improving water quality in Hinkson Creek and the watershed surrounding the creek? *(Check one response for each)*

	Very Important	Somewhat Important	Neither Important Nor Unimportant	Somewhat Unimportant	Very Unimportant	Don't Know
Public or homeowner education						
Media involvement						
Encouraging people to reduce lawn chemicals and pesticides						
Improving laws						
Enforcing laws						
Offering incentives for people to buy existing homes						

22 Listed below are statements about the relationship between humans and the environment. For each one, please indicate whether you strongly agree, mildly agree, are unsure, mildly disagree or strongly disagree with it.

	Strongly Agree	**Mildly Agree**	**Unsure**	**Mildly Disagree**	**Strongly Disagree**
a. We are approaching the limit of the number of people the earth can support.					
b. Humans have the right to modify the natural environment to suit their needs.					
c. When humans interfere with nature it often produces disastrous consequences.					
d. Human ingenuity will ensure that we do NOT make the earth unlivable.					
e. Humans are severely abusing the environment.					
f. The earth has plenty of natural resources if we just learn how to develop them.					
g. Plants and animals have as much right as humans to exist.					
h. The balance of nature is strong enough to cope with impacts of modern industrial nations.					
i. Despite our special abilities, humans are still subject to the laws of nature.					
j. The so-called "ecological crisis" facing humankind has been greatly exaggerated.					
k. The earth is like a spaceship with very limited room and resources.					
l. Humans were meant to rule over the rest of nature.					
m. The balance of nature is very delicate and easily upset.					
n. Humans will eventually learn enough about how nature works to be able to control it.					
o. If things continue on their present course, we will soon experience a major ecological catastrophe.					

23 How familiar are you with the Missouri Department of Conservation (MDC)? *(Check one)*

Very familiar

Somewhat familiar

Not at all familiar

Don't know

24 Please rate the job the Missouri Department of Conservation is doing providing services for you, your family, your community and the State of Missouri. *(Check one response for each)*

	Poor	Fair	Good	Excellent	Don't Know
a. You					
b. Your family					
c. Your community					
d. The state of Missouri					

Please indicate your level of agreement or disagreement with the following statements:

25 The Missouri Department of Conservation is doing a good job of enforcing fish and wildlife laws. *(Check one)*

Strongly agree

Mildly agree

No opinion

Mildly disagree

Strongly disagree

26 The Missouri Department of Conservation is responsible for protecting the fish, forests and wildlife of the state, but does not enforce state water quality laws. To what extent do you agree or disagree that the Missouri Department of Conservation should play a role in each of the following? *(Check one response for each)*

	Strongly Agree	Mildly Agree	Neither Agree Nor Disagree	Mildly Disagree	Strongly Disagree	Don't Know
Water quality education programs						
Publicizing Hinkson Creek water quality issues						
Providing water quality assistance to landowners along the stream (such as help with erosion)						
Making sure that MDC's water quality education program fits in with the local public school science requirements						
Enforcing state water quality laws						

Tell Us About You

27 Which best describes where you grew up as a child? *(Check one)*

- In the country or a rural area
- Small town
- A suburban area close to a large city
- An urban area in the city

28 Which best describes where you live now? *(Check one)*

- In the country or a rural area
- Small town (i.e. Hallsville)
- A suburban area in or near Columbia
- An urban area in the city of Columbia

29 Do you consider yourself a hunter? *(Check one)*

- Yes
- No
- Don't know

30 Do you consider yourself an angler? *(Check one)*

- Yes
- No
- Don't know

31 Does your household currently receive the *Missouri Conservationist* magazine? *(Check one)*

Yes

No

Don't know

32 Which category best describes your annual household income before taxes? *(Check one)*

Less than $15,000

$15,000–$24,999

$25,000–$34,999

$35,000–$44,999

$45,000–$54,999

$55,000–$74,999

$75,000–$99,999

$100,000 or over

33 What is the highest level of education you have completed? *(Check one)*

Some high school

High school graduate

Vocational or technical school

Some college

College degree

Some graduate school

Graduate or professional degree

34 Your current marital status: *(Check one)*

Married

Never married

Separated

Divorced

Widowed

35 How many children do you have under the age of 18? _____ children *(Fill in the blank)*

36 You are: *(Check one)*

Female

Male

37 Your age? _____ years old (Fill in the blank)

Thank you for your participation!

If you have any other comments you would like to share with us, please use the space below (add additional sheets if necessary).