IDENTIFYING BENEFICIAL ATTRIBUTES

OF WATER MANAGEMENT ORGANIZATIONS

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ABSTRACT

Kritsky, Craig Charles; M.S.; Department of Agribusiness and Applied Economics; College of Agriculture, Food Systems, and Natural Resources; North Dakota University; August 2007. Identifying Beneficial Attributes of Water Management Organizations. Major Professor: Dr. Robert R. Hearne.

Water Management Organizations (WMOs) have evolved from their inception in the early 1900s and continue to evolve today. Recently, WMOs have increased their awareness of water-quality and environmental issues. WMOs evolve at different rates due to local social, economic, and political norms. The Red River creates the border for Minnesota and North Dakota. This makes the Red River Basin ideal for WMO and institutional research.

The objective of this research is to identify the characteristics of WMOs that are more successful at adopting activities considered positive to local water management as well as basin management. These activities include collaboration and water-quality improvement efforts.

Results demonstrate that board member experience positively impacts several traditional WMO activities, including water movement projects, stream flow clearing efforts, wetland restoration, and tree sales. Board member experience negatively impacts collaboration, conservation contracts, water retention projects, and education and outreach. Board member attendance at annual water conferences has a positive correlation with total grant funding and conservation contracts. Cooperative extension training for board members positively correlates with conservation contracts and joint-powers agreements.

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CHAPTER 1. INTRODUCTION

This chapter is divided into three sections. Section one describes the Problem of water management in the Red River of the North Basin. Section two explains the Objectives of this study. Section three states the Hypotheses.

Problem

There is a diverse population of water management organizations (WMOs) in the Red River of the North (Red River) Basin. Along with federal and state agencies responsible for water and natural resources management, there are a variety of local WMOs responsible to local constituencies. Local WMOs include conservation districts (CDs) in North Dakota and Minnesota, water resource districts (WRDs) in North Dakota, watershed districts (WDs) in Minnesota, tribal departments of natural resources, township and municipal water supply, and nongovernmental interest groups. Generally, the goal of WMOs is to manage water-resources to maximize quality of life pertaining to water-resources for residents of their district without excessively infringing on current and future water needs. This goal could be accomplished by preventing economic damage from major floods, increasing potable water supply, decreasing potable water demand, or increasing water-quality.

Water management organizations need to evolve to improve water-quality due to increased governmental regulations, economic activity, and an increase in the general population's water-quality standards (Saleth and Dinar, 2004). However, there is concern that some WMOs formed to address needs in the 1930s have not evolved to meet the current water management needs (Hearne, 2004).

Increased household incomes increased demand for water and water-quality. Rupasingha et al. (2004) and Jia et al. (2006) show that the United States follows an Environmental Kuznets Curve (EKC) for water use and toxic pollutants. The EKC illustrates an inverted "U" shaped relationship between environmental degradation and per-capita income (Appendix C: Figure 1. Environmental Kuznets Curve). Initially, environmental quality decreases as income rises. After a threshold, environmental quality increases as income rises. The United States is on the downward slope of the EKC because with increased income, the citizenry desire greater environmental quality. The EKC implies that WMOs and other natural resource management organizations that were once dedicated toward resource exploitation may, with greater income levels, need to refocus toward environmental conservation.

Economic activity is not possible without raw material and energy inputs from the environment. Raw minerals, water, air, and an energy source are needed to produce goods for consumption. Waste from production and consumption eventually finds its way back into the natural environment as a useful part of the biological cycle or as pollution. Waste increases with expanded economic activity. Therefore, new water management measures need to be exercised as the United States and world economies grow (Field, 1994).

The first public policy targeted toward the conservation of water-resources was the 1899 *Refuse Act*. The *Act* did little to increase water-quality; the primary objective of the *Act* was to ensure navigation, not control water pollution. There were no major changes to United States (U.S.) water policy until after World War II, with the most influential changes taking place during the 1970s and 1980s. The 1948 *Water Pollution Control Act* (WPCA) gave the federal government authority to conduct research, investigations, and

surveys of water-quality and pollution. However, the federal government did not receive any regulatory authority over water-resources. The 1956 WPCA Amendments, 1965 *Water Quality Act*, and the 1972 WPCA Amendments set a path to the *Clean Water Act* of 1977 (*Clean Water Act*). The *Clean Water Act* established procedures for regulation of pollution discharges into U.S. waters and authorized the creation of water-quality standards (Field 1994).

Water-resource concerns of the people in the Red River Basin are water-quality and quantity. Drought and flooding are primary causes of water damage in the Red River Basin. The area is flat, so when flooding occurs it causes damage over a large area. It also is nearly impractical to store surface water due to the region's flat topography. The Red River Basin is approximately 60 miles wide. The flat slope would cause any storage reservoir to be impractically large and shallow. The Red River Valley's rapid projected population growth also poses future potable water concerns for residents (Red River Basin Commission, 2007)

Water quantity has been recognized as a problem for a long time. The United States Congress enacted the *Flood Control Act* of 1944, which provided the opportunity for the creation of the Garrison Conservancy Unit in 1965. The initial stages of the Garrison Diversion was to provide municipal and industrial water, fish and wildlife development, recreation and flood control along with irrigation of 250,000 acres. The Garrison Diversion never was completed. However, there is still serious discussion about finishing the project (Garrison Diversion Conservancy District, 2004).

High levels of sediment and bacteria, low levels of oxygen, and habitat alteration are primary impairments of streams in the basin. Non-point pollution runoff from

agricultural fields and urbanization are primary causes of stream impairment (Minnesota Pollution Control Agency, 1997). In 1996, the Minnesota Pollution Control Agency (MPCA) assessed the water-quality of the Red River Basin in Minnesota. The MPCA assessed a total of 2,474 miles of the Red River and its tributaries and investigated 8 causes of impairment. Bacteria, turbidity, habitat alteration, and oxygen depletion were the four main causes of impairment. There were 900 miles of river segments impaired from bacteria and turbidity, 600 miles of river segments impaired from habitat alterations, and 425 miles impared from oxygen depletion. Heavy metals and un-ionized ammonia contributed to a small amount of impaired waters, with chloride causing no impaired waters (Stoner et al. 1998).

Existing North Dakota WRDs can be traced back to county drain boards created in 1895. In 1935, the North Dakota Legislature created water conservation and flood control districts. In 1973, these districts were renamed water management districts. In 1981, the North Dakota Legislature abolished county drain boards, which were renamed water management districts and provided for the establishment of WRDs with expanded powers, including the power of county drain boards (Krenz and Leitch, 1993).

The North Dakota Legislator has empowered WRDs with a wide range of authorities. One of the most important powers WRDs have is the right to exercise eminent domain. Without eminent domain, a WRD would find it difficult to manage water-resources, construct water retention reservoirs, control water levels in lakes and rivers for conservation and flood control purposes, and develop water supply systems. Water resource districts also have the power to make rules and regulations pertaining to conservation and prevention of pollution of North Dakota's water-resources. They have the

power to do almost anything necessary to protect water-resources in North Dakota (North Dakota Century Code (N.D.C.C.) §16-16.1-09).

Water resource districts are financed by a tax levy and special assessments allocated by county commissions. The water resource board must estimate expenses for the coming year and prepare a budget. Costs of right of ways, easements, or other interests in property deemed necessary for the construction, operation, and maintenance of any project may be included. The district also may include expenses for future projects if they are part of a master plan. This budget is sent to the county auditor and voted on by the county commissioners, who can approve, disapprove, or amend and approve the budget. Once the budget is approved, the county auditor levies a tax no greater than four mills on the taxable valuation in the district. At the board's discretion, special assessments also may be assessed in whole or in part for the construction, operation, or maintenance of a project (N.D.C.C. §61-16.1-06).

In Minnesota, chapter 103D of Minnesota Statutes authorizes the formation of WDs. Watershed districts follow natural hydrological boundaries and are formed to address local water-resource problems. The purpose of WDs is to conserve the state's natural resources by using scientific principles in planning, flood control, and other conservation undertakings. To form a WD, the Board of Water and Soil Resources (BWSR) must be petitioned by local stakeholders. Currently, the entire Minnesota portion of the Red River Basin is covered by WDs. Watershed districts are partners with many other local and state entities in the planning and management of water needs (Minnesota Association of Watershed Districts, 2006). Watershed districts may impose an ad valorem tax levy of up to 1 mill to fund organizational expenses, for construction or implementation

projects, or for survey and data acquisition projects. (Minnesota State Statutes, 2007 and Krenz and Leitch, 1993).

Two other types of WMOs also exist in the Red River Basin. Soil conservation districts (CDs) in North Dakota and soil and water conservation districts (CDs) in Minnesota, are fundamentally the same. Districts are organized by county with few exceptions. Conservation districts were designed to promote soil and water conservation at the local level by working with landowners. One way CDs achieve this is to funnel state and federal funds to landowners for the voluntary commitment to conservation practices. Most, if not all CDs, in the Red River Basin are housed in the local United States Department of Agriculture (USDA) building along with the National Resource Conservation Service (NRCS) and the Farm Service Agency (FSA). North Dakota and Minnesota CDs have the power to set a mill levy for the annual operation of the district. However, North Dakota CDs are limited to a levy of one mill unless authorized by referendum (N.D.C.C §4-22-06; Minnesota Statutes §103C.325). Conservation districts also receive substantial amounts of state and federal aid including money for conservation programs and technical support from the NRCS and FSA (personal communication, February through December 2006).

The North Dakota Legislature observed that the most efficient and economical method of water-resource management would emphasis hydrologic boundaries (N.D.C.C. §61-16.1-01). The North Dakota Legislature is consistent with Blomquist (2005), who asserts that water management should be organized by watersheds. However, many WMOs are not organized by hydrologic boundaries, due to institutional framework following political boundaries already being in place. For example, all but four North Dakota WRDs

are based on political boundaries in the Red River Basin (Appendix C: Figure 2. Map of North Dakota Water Resource Districts). The four WRDs organized by hydrologic boundaries include the Maple River, Rush River, Southeast Cass, and North Cass WRDs. All four WRDs are in Cass County. Although these WRDs are not 100% watershed based, it does show signs of institutional evolution.

In the absence of a governmental unit that dictates basin-wide management, increased collaboration is needed among local WMOs to achieve basin-wide goals. Although goals of WMOs are similar, responsibilities and activities of a district can negatively impact other districts. Local experts suggest increased collaboration among local WMOs is needed to meet goals of the Red River Basin (personal communication, February through December, 2006).

There are two organizations in the Red River Basin dedicated to basin-wide concerns:

i) Red River Basin Commission (RRBC); and

ii) International Joint Commission's International Red River Board (IRRB).

Both commissions promote increased collaboration. The RRBC promotes local collaboration, whereas the IRRB promotes international collaboration between the United States and Canada. (Red River Basin Commission, n.d.; Hearne, 2007).

According to the RRBC, one basin-wide goal is to reduce nitrogen and phosphorus concentrations flowing into Canada by 10% (Hearne, 2007). This particular basin-wide goal supports downstream water-quality and would be difficult to accomplish without cooperation from upstream WMOs. Formal collaboration between upstream and

downstream WMOs would facilitate the cooperation by reducing the transactions costs between the WMOs.

A number of institutional arrangements allow for collaboration and the sharing of resources. Joint-powers agreements, such as the Red River Watershed Management Board (RRWMB) in Minnesota and the Red River Joint Water Resource Board (RRJWRB) in North Dakota, are examples of institutional evolution that allows cost sharing, use of special services, and economies of scale. The RRJWRB consists of 13 of 25 WRDs from the North Dakota side of the Red River Basin. These 13 WRDs are the districts nearest to the Red River. All but one of Minnesota's WDs in the Red River Basin belongs to the RRWMB. According to interviews, this one WD is thought to be financially independent due to high agricultural land value and a large urban area in its district. The RRJWRD and the RRWMB have the power to enter into contracts, compacts, and other agreements necessary to accomplish their basin-wide goals (Krenz and Leitch, 1993 and (N.D.C.C.) §16-16.1-09). Hearne (2007) points out that in Minnesota, joint-powers agreements among SWCDs have been used to employ specialized engineers and technicians.

Although WMOs were generally established through legislative initiative, there are cases of local leadership establishing WMOs. For example, the Pelican River chain of lakes spans a number of townships and counties and has been highly regarded for its clear waters and fine sandy beaches. However in the early 1960s, community leaders collaborated to restore the clear waters that were deteriorating. In 1966, the Pelican River Watershed of Becker and Otter Tail counties was formed by local stakeholders with a specific objective: "To protect and enhance the quality of water in the lakes within its jurisdiction and to ensure that wise decisions are made concerning the management of

streams, wetlands, lakes, groundwater, and related land resources which impact these lakes" (Pelican River Watershed District, 2007).

Some WMOs perform water management practices better than others. According to Saleth and Dinar (2005), it is an increasing practice for WMOs to learn water management practices from each other. As the characteristics of successful WMOs are understood by federal, state, and local agencies, they can increase support to successful WMOs and increase their responsibilities. The less successful WMOs can be targeted for training and learn from more successful WMOs.

Objectives

The primary objective of this study is to improve the understanding of water management organizations by identifying characteristics of WMOs that are effective at particular tasks.

Specific objectives include

i) identifying characteristics of WMOs that are most likely to take on collaborative basin-wide initiatives;

ii) identifying characteristics of WMOs that are most likely to effectively carry out water-quality responsibilities; and

iii) identifying characteristics of WMOs that are successful at securing grant funding.

Hypotheses

A number of hypotheses are examined. These are

i) Water management organizations are likely to collaborate with water-quality initiatives when their board members attend water management conferences;

ii) Water management organizations are likely to collaborate with basin-wide water quality initiatives when there is a developed education/outreach staff;

iii) Water management organizations with more experienced board members are likely to collaborate with basin-wide water-quality initiatives;

iv) Water management organizations are likely to carry out water-quality responsibilities when they are in Minnesota;

v) Water management organizations are likely to carry out water-quality responsibilities when they participate in more joint-powers agreements; and

vi) Water management organizations are likely to carry out water-quality responsibilities when a larger percentage of board members have had cooperative extension training.

CHAPTER 2. LITERATURE REVIEW

This Literature Review consists of four sections. Section one reviews Institutional Evolution and Evaluation. Section two highlights the Characteristics of Effective/Successful Water Institutions. Section three presents Adoption Studies, and section four reviews literature that deals with Governance in the Red River Basin.

Institutional Evolution and Evaluation

Institutions, whether formal or informal, establish the rules and norms that guide societal behavior. By establishing a stable structure for human interaction, humans create institutions to place constraints on their own behavior and reduce uncertainty. Changes in relative prices or preferences cause people to change the current institutional structure to a more efficient structure by either altering the current institutions or creating new institutions. These changes are typically marginal adjustments to the current institutional framework, but changes are restrained by the organizational-institutional relationship that causes path dependency (the influence of the past on the future) and the feedback process where humans need time to react to changes (North 1990).

Water institutions can be evaluated from an economic perspective with cost-benefit analysis. The benefits and cost to individual stakeholders, including transaction costs of potential organizing parties, influence whether individuals with similar interests will organize. If the benefits after a change outweigh the cost to change, institutional change should occur. The primary force behind most institutional change is direct economic gain for stakeholders. Individual human values and interests are primary causes for institutional

change at the micro level. The political economy must also be understood to evaluate institutional change at the micro level.

The meso level may pose obstacles to institutional change, such as the structure and dynamics of the actual process to change the institution (Livingston, 2005). Gordon (1980) states that an institution will continue to promote the status quo until outside pressure, such as technology or interest group pressure, forces change.

Furthermore, interest group politics play an important role in institutional change. Individual stakeholders will organize together to accomplish similar goals. In order for this to happen, some sort of democratic government is needed (Livingston, 2005). For example, Hearne (2004) notes that Mexico's water sector demonstrated institutional change due to a changing political, social, and economic atmosphere after the year 2000.

Characteristics of Effective/Successful Water Institutions

Water management organizations first began appearing in the United States in the early 1900s. However, it was not until the late 1980s and early 1990s that WMOs were established in large numbers. In the Red River Basin, most WMOs were organized in the 1930s through the 1970s. Due to the recent increase in WMOs, research is limited (Clark, 2005; Draeger 2001). However, there are studies examining the characteristics of effective/successful water institutions. Most of the studies use subjective analysis, which can be problematic since value judgments can influence results (Draeger 2001).

Leach and Pelky (2001) performed a review of empirical literature that looks at conflict resolution in watershed partnerships. A watershed partnership was defined as a formal or informal organization where stakeholders come together to discuss management

of water-resources. Most studies reviewed informal organizations without by-laws, minutes, or officers.

According to Leach and Pelky (2001), funding is the most identified factor of success among WMOs. Leach and Pelkey (2001) assert that having a large and diverse membership causes problems because there is too much disagreement that slows progress. Creative and committed individuals are needed for successful WMOs, and they must have high levels of trust for each other. Technically skilled staff from state or local agencies is essential in running a successful WMO. Consensus-based decision making also seems to be a factor leading to success. On the contrary, some studies have cautioned that consensus based decision making can impede the accomplishment of goals (Leach and Pelkey, 2001).

Michaels (2001) performed a non-statistical study on three watershed initiatives created by environmental, business, and local, state, and federal government interests. Michaels agrees with Leach and Pelkey (2001) that funding is an important factor in the success of WMOs. However, Michaels goes on to state that WMOs need to have an important ongoing issue that plays a role in initially generating funding.

In 2001, a study was completed on the effectiveness of watershed organizations in Minnesota (Draeger, 2001). Four different types of organizations were surveyed: 42 WDs, 25 watershed management organizations, 9 joint-powers boards, and 3 nonprofit organizations. The study was funded by the Minnesota State Legislature in order to improve and/or protect water-resources by identifying characteristics of effective watershed organizations. This information could be used to influence policy direction and funding decisions.

Draeger's study used a high performing systems model to judge at five levels ranging from highly effective to ineffective. The model is output based and used the following six categories of output:

i) Installation of best management practices;

ii) Construction of capital improvement projects;

iii) Riparian, wetland, and/or shoreline restoration;

iv) Education and outreach;

v) Regulation and enforcement of water-quality protection measures; and

vi) Monitoring where used to design implementation programs or as a regulatory tool.

There was no weight given to any particular practice. Weight was given to the implementation of more than one practice. Chi square analysis was used on yes/no questions to find the characteristics of watershed organizations that were classified as effective. If this was found to be significant, Student-Newman-Keuls Analysis of Variance (ANOVA) was used on responses with a range of values. From the 79 organizations previously mentioned, 572 watershed board members and staff were surveyed (Draeger, 2001).

Staffing was found to be significantly ($P < 0.05$) related to effectiveness at all levels of effectiveness. Watershed planning was not found to be significant for the top four levels of effectiveness, but was significantly different ($P < 0.05$) from the ineffective level. Ineffective organizations alone reported significantly lower ($P < 0.005$) interest in increasing citizen participation. Collaboration with eleven state agencies was found to be significantly lower ($P < 0.05$) for the two lowest levels of effectiveness. Highly effective

organizations alone received significantly higher ($P < 0.05$) technical assistance and financial support from the MPCAA. Concern for water-quality amid respondents was highest among the top three levels of effectiveness and significantly differed ($P < 0.05$) from the other two. Education level did not differ significantly among different levels of effectiveness (Draeger, 2001).

Adoption Studies

This research focuses on the adoption of activities by WMOs. Water management organizations are local units of government. While the following adoption studies deal with farmer's adoption of activities, there are three key similarities that link WMOs and farming practices:

i) this study and the reviewed studies investigate the adoption of natural resource management practices;

ii) this study and the reviewed studies are in a rural setting; and

iii) many board members of analyzed WMOs are farmers.

Furthermore, the following adoption studies form the basis for statistical analysis used in this study.

Willingness to adopt or adoption level studies of natural resource management technologies by agriculture operations are often performed. These adoption studies show a farmer's willingness to adopt a new technology based on variables, such as the farmer's age, education level, farm size, and the level of off-farm income. A number of these types of studies use probit or logit models and assume a discrete adoption level of zero or 100-percent (Chebil et al., 2007; Gedikoglu and McCann, 2007). However, Ramirez and Shultz

(2000) used a poisson count model to account for different levels of adoption. Farmers do not always completely adopt a new technology. Sometimes they will choose partial adoption. The poisson count model is a good choice for analyzing partial adoption (Ramirez and Shultz, 2000). Kim et al. (2005) points out that if the dependent variable is zero inflated, causing over dispersion, a negative binomial model is a good choice. Chebil et al. (2007) used a tobit model to capture the level of adoption with a continuous dependent variable.

Gedikoglu and McCann (2007) studied the impact of off-farm income, off-farm work, age, and education on adoption of conservation practices. Following Greene (2003), a multivariate probit model is used as an extension of the bivariate model. Four technologies were examined using the following econometric models:

i) $Y_1 = X_1\beta_1 + \varepsilon_1$, where $y_1 = 1$ if injecting manure is adopted and 0 otherwise and X_1, is a vector of potential explanatory variables;

ii) $Y_2 = X_2\beta_2 + \varepsilon_2$, where $y_2 = 1$ if grass filter is adopted and 0 otherwise and X_2, is a vector of potential explanatory variables;

iii) $Y_3 = X_3\beta_3 + \varepsilon_3$, where $y_3 = 1$ if soil test is adopted and 0 otherwise and X_3, is a vector of potential explanatory variables.

iv) $Y_4 = X_4\beta_4 + \varepsilon_4$, where $y_4 = 1$ if record keeping is adopted and 0 otherwise and X_4, is a vector of potential explanatory variables.

In spring of 2006, a mail survey was used to collect data from 3,014 farmers in Iowa and Missouri. To eliminate most retired and lifestyle farmers, those with farm sales less than $10,000 were not sampled (Gedikoglu and McCann, 2007). Dillman methodology was followed to learn whether farmers have adopted the chosen conservation

practices and how the farmer and farm characteristics impacted the adoption decision. It was hypothesized that off-farm income would positively influence the adoption of capital intensive practices and negatively influence the adoption of labor intensive practices. These predictions were supported by the multivariate probit regression of injecting manure, grass filters, soil testing and record keeping.

Chebil et al. (2007) studied the farmer's willingness to adopt salt-tolerant forage in the southeastern part of Tunisia. In-person farm visits were used to survey 97 farmers, with the average farm size being 56.84 acres. Both qualitative and quantitative information about the farming system, socio economic indicators, practice and perception about the use of saline water for irrigation, and feeding patterns of livestock were collected in 2005. A tobit model was used to capture the different levels of adoption in acres. The dependent variable, measured in acres of salt-tolerant forage, had an average willingness to adopt 3.21 acres and varied between 0 and 29.65 acres. The farmer's age, salinity level of water, and activity were hypothesized to have a negative relationship with the adoption of salt-tolerant forage. The farmer's education level, farm size, standard livestock units, and membership of farmers association were hypothesized to have a positive relationship with the adoption of salt-tolerant forage.

Five of seven variables were found to have the hypothesized signs (Chebil et al., 2007). The signs of age and education level of farmers were opposite of hypothesized. Standard livestock units and activity were the two variables where a significant relationship was found. Standard livestock units were defined as 1 cattle = 5 sheep = 6 goats = 1 camel. Activity was defined as one if the farmer only had farm income and zero if the farmer had off-farm income. The activity variable, having a negative sign and statistically significant

at the five-percent level, suggested that farmers with off-farm income have a greater willingness to adopt salt-tolerant forage. The livestock size was positive and statistically significant at the one-percent confidence level. This showed that farmers with greater need for livestock forage are more willing to adopt salt-tolerant forage to meet their livestock's nutrient demand.

Kim et al. (2005) studied the adoption of best management practices (BMPs) in beef cattle production. Seventeen hundred beef cattle producers were surveyed in Louisiana, collecting information on production characteristics, current adoption of BMPs, and producer characteristics. NRCS contact and cattle income ratio was positively related to the adoption of BMPs and significant ($P < 0.01$), household income was positively related and significant ($P < 0.05$), and diversification, hilly land, and college education was positive and significant ($P < .10$).

Governance

Numerous local and state governmental units deal with environmental and water-quality issues. This section highlights the important government organizations related to water-resources management in the Red River Basin.

Townships, municipalities, counties, and special districts are four major types of local government in North Dakota. Townships, municipalities, and counties are general purpose units of government; the units' roles related to the water-resources are described in the following paragraphs.

Townships decide where to locate roads and when to perform ditch maintenance. Municipalities are responsible for supplying clean water to the city and collaborating with

county, state, and federal government on water supply projects. For example, collaboration in larger cities is important because larger cities have the potential to greatly influence the water-quality of a stream through their sewage disposal systems. Locally, counties maintain a vital role in the Red River Basin's water management. Each county has five county commissioners who are responsible for making policies and regulations for special districts. Special districts are usually single purpose institutions, such as WRDs and other governmental departments. County commissioners also hold a vital role by levying taxes and making appropriations. County highway engineers also have responsibility for considerable impacts to water-quality, such as the construction of roads can highly influence water-quality (Leitch et al., 1977).

North Dakota has two major water management organizations at the state level. The primary state agency is the North Dakota State Water Commission (NDSWC). The NDSWC allocates water rights, collects and maintains atmospheric and hydrological data, develops and implements the state water plan, regulates the development of infrastructure projects, monitors dam and dike safety, and provides technical support to local water managers. The North Dakota Department of Health monitors water-quality, administers programs to identify impaired waters, establishes total maximum daily loads (TMDLs), preserves surface and groundwater-quality, regulates point source discharges of wastewater, promotes voluntary incentive based programs to reduce nonpoint source pollution, grants permits for storm water discharge projects, works on solid waste management, and regulates drinking water (Hearne, 2005).

Minnesota has five major WMOs at the state level. The primary state agency is the Minnesota Department of Natural Resources (MDNR). The MDNR maintains data, grants

public use and construction permits, maintains fishing and recreational sites, and works on floodplain and shoreline management. The Minnesota Pollution Control Agency is an autonomous agency that helps protect environmental quality and has a water-quality division. The Minnesota Board of Water and Soil Resources support local water management efforts and is the state's administrative agency for CDs, WDs, county WMOs, and metropolitan WMOs. Potable water-quality is regulated by the Minnesota Department of Health and agricultural operations are regulated by the Minnesota Department of Agriculture (Hearne 2005).

Leitch et al. (1977) surveyed the decision makers within the governmental units. The survey instrument was designed to discover the attitudes of environmental decision makers, determine what influences governmental decision makers, find out about the informal institutional structure, and identify characteristics of environmental decision makers. Questionnaires were sent to 9 state and federal agencies, 17 county agencies, and 7 municipalities (Leitch et al. 1977). In summary, Leitch et al. (Page ii) stated

> The majority of public officials who responded to a mail questionnaire were moderately conservative in political ideology, belonged to three or more voluntary associations, felt their primary clientele was the general public, most respected the opinions of farmers, and least respected the opinions of politicians. A greater percentage of state and federal officials felt there were serious environmental problems in the Lower Sheyenne River Basin than did local officials as did a higher percentage of appointed officials than elected officials.

Respondents identified water-quality and soil erosion as the most serious problems. Long range environmental planning was favored as the means to solve environmental problems. In a separate survey of 33 government agencies and units, less than one-third of respondents indicated existing water-quality activities and programs were being used in the Sheyenne River Basin (Leitch et al. 1977).

Summary

Limited empirical research on institutional evolution pertinent to water management has been conducted. However, Saleth and Dinar (2004) performed research on the institutional evolution of water management in different countries. Also, few empirical studies which focus on local WMOs exist. Draeger (2001) performed research assessing the effectiveness of Minnesota WMOs related to water-quality. There are a number of adoption studies related to water management. These adoption studies focus on a single dependant variable. The adoption studies reviewed form the basis for statistical analysis used in this study.

Numerous local and state governmental units deal with environmental and water-quality issues. Townships, municipalities, counties, and special districts are local units of government, and affect water-quality in different ways. Special districts are the subjects of this study. Water-quality also is influenced by state government. North Dakota has two major water management organizations at the state level, while Minnesota has five major water management organizations at the state level.

CHAPTER 3. METHODS AND PROCEDURES

Chapter 3 presents the methods and procedures followed for this study and consists of three sections. Section one gives details on geography and demographics of the study area. Section two describes survey construction and implementation, and section three explains the procedure followed for data analysis.

Study Area

The Red River flows north along the border of North Dakota and Minnesota, through Manitoba, and is part of the Hudson Bay drainage system (Krenz and Leitch, 1993). The Red River Basin is about 45,000 square miles and drains into Lake Winnipeg (Fritz, 2003). The drainage area encompasses 19 counties in North Dakota, 16 counties in Minnesota, and 8 divisions in Manitoba (Appendix C: Figure 3. Map of the Red River Basin). Divisions in Canada are generally provincially legislated areas, such as counties or a group of municipalities. However, some divisions are only used for the utilization of census data (Statistics Canada, 2008). Wahpeton/Breckinridge, Fargo/Moorhead, and Grand Forks/East Grand Forks are the major cities in the U.S. on the Red River, while Winnipeg is the largest city in Manitoba. These communities contain the majority of basin residents. The Red River tributaries and sub basins include Wild Rice, Sheyenne, Turtle, Park, Pembina, Roseau, Aux Marais, Plum, Morris, Tamarac, Red Lake, Buffalo, and Otter Tail (Krenz and Leitch, 1993).

Minnesota, which borders the east side of the Red River, follows the riparian rights water law. Riparian rights give the right to use the adjacent water to the entity that owns shore land (Minnesota DNR, 2004). Minnesota also manages its water based on

watersheds, as opposed to political boundaries like counties. A watershed is an area that drains to a river, river system, or other body of water (Pickett, 2006).

North Dakota borders the west side of the Red River and follows prior appropriation. Prior appropriation is the predominant set of water law in the arid western United States. Based upon first come first serve, water is treated more like real property and it does not matter who owns the shoreline (Castle, 1999). North Dakota follows political boundaries to perform its water management as opposed to watersheds.

The slope of the river is relatively mild. At Wahpeton, ND, the elevation is 943 feet above sea level. At Lake Winnipeg, the elevation is 714 feet above sea level. Over a distance of roughly 545 miles, this is only a half-foot drop in elevation per mile. The width of the Red River Basin has the same elevation characteristics, but not quite as drastic. Due to small changes in altitude, the Red River expands to large extents during flood stage. During the flood of 1997, portions of the Red River reached a width of 25 miles in Manitoba (Fritz, 2003).

Flooding and drought are the primary water problems in the Red River Basin. If there is not flooding in the Basin, there is probably drought. Major flooding occurred in the Basin in 1882, 1883, 1893, 1897, 1916, 1943, 1947, 1948, 1950, 1952, 1965, 1966, 1969, 1975, 1978, 1979, 1989, 1993, and 1997 (Krenz and Leitch, 1993). There was also a flood in 1826 that is believed to be the largest flood in 200 years (Red River Basin Decision Information Network, 2005).

The 1997 flood was the largest and most damaging flood in recent history. The area along the main stem Red River and its tributaries was in a state of emergency. All major cities on the Red River saw noteworthy negative impacts from the 1997 flood.

Grand Forks and East Grand Forks experienced extensive damage with parts of downtown being submerged by floodwaters.

Major cities on the Red River have adopted three primary flood control mechanisms to help prevent future flood damage. The mechanisms are

i) permanent flood control structures, such as dikes;

ii) infrastructure improvement to the storm sewer system and backup electrical generators for pumps; and

iii) property acquisition efforts for high-risk areas along the river (FEMA, 2007). In the spring of 2006, these improvements were put to a test. The fourth largest flood in recent history occurred in the Red River Basin with minimal damage to major cities on the Red River. Many people went about their daily lives without even realizing the Red River was in flood stage (Wilkens, et al. 2007).

The Red River Basin, once part of the large glacial lake Agassiz, was formed by a glacier (Minnesota Pollution Control Agency, 2006; Krenz and Leitch, 2003). Due to the Red River's topography, the valley is home to some of the richest, most fertile, and flattest farmland in the United States. The main crops in the basin are wheat, sugar beets, barley, sunflowers, hay, corn, and soybeans (Minnesota Pollution Control Agency, 2006). As of 1997, there were 52,817 farms in the Red River Basin, with an estimated market value of land and buildings of $470,589 per farm, and an estimated market value of agriculture products sold of $6.13 billion (Fritz, 2003; Krenz and Leitch, 1993).

Farming has changed the prairie of the Red River Basin from grassland to cultivated fields. Large commercial farms with profitable crops have a strong incentive to increase production, consequently increasing nonpoint source pollution. There are 42

rivers or streams in the Red River Basin that exceed TMDL according to the Minnesota Pollution Control Agency (Fritz, 2003).

Survey Construction

Local WMOs directed by a board of non-professional supervisors were selected for the analysis. This left 78 WMOs in the survey: 12 Watershed Districts, 20 Soil and Water Conservation Districts, 24 Water Resource Districts, 20 Soil Conservation Districts, and two Tribal Nations' Department of Natural Resources. Two survey instruments were created for each WMO, one for the administrative staff and one for board members. The total number of WMOs in the study was reduced from 78 to 77 after a survey instrument was received from the recently merged East and West Grand Forks CD.

The literature provided a vague idea of pertinent survey questions. Questions had to be designed that would capture the activities and composition of WMOs in the study area. To assist in developing the survey instrument, over thirty interviews were conducted. Interviews consisted of discussion with a wide variety of local water management professionals and experts who helped create a majority of the survey questions. Subsequently, the large list of survey questions created from the literature review and interviews were reduced so the administrators of WMOs could complete the survey instrument in less than 1 hour, and board members in 15 minutes. To ensure the questions were not confusing to WMO administrators, two trial surveys were conducted.

The surveys followed the North Dakota State University Institutional Review Board protocols for human subject research and were accompanied with a letter of informed consent (Appendix A).

The administration of the survey instruments closely followed the Dillman Total Design Method (Dillman, 1978). In late November of 2006, a postcard was mailed to all 77 organizations letting them know they would receive a questionnaire in the mail. The organization's survey instrument was sent out in early December 2006 and two weeks later a reminder and thank you post card was sent. In January of 2007, e-mails and phone calls were made to organizations that had not responded. Thirty-seven of 76 organizations responded to the survey questionnaire. The board member's survey followed the same procedure as the organization's survey, except e-mails and phone calls were not made because response rates (181 of 350) were judged adequate to build the database.

Data Analysis

A set of 22 dependent variables, representing activities, activity levels, or strategies, were chosen for analysis. These variables are

i) the value of education projects;

ii) value of wetland restoration projects;

iii) value of recreation projects;

iv) value of wildlife habitat projects;

v) value of aquatic habitat projects;

vi) value of potable water supply projects;

vii) value of water-quality projects;

viii) value of water movement projects;

ix) value of water retention projects;

x) number of snagging and clearing efforts;

xi) miles of new or improved drainage ditch;

xii) level of ditch maintenance per year;

xiii) number of organizations collaborated with on budgeted projects;

xiv) number of joint-powers agreements;

xv) total number of studies;

xvi) number of conservation contracts signed;

xvii) acres of windbreak/shelterbelt installed;

xviii) number of trees sold;

xix) total revenue for CDs;

xx) total grant funding;

xxi) dollars spent on contracting; and

xxii) miles of stream bank stabilization.

Twenty-one of the twenty-two dependent variables demonstrate a number of positive activities including revenue generation, drainage, conservation, water-quality, collaboration, recreation, and research and development. One dependent variable, snagging and clearing, is generally considered an environmentally unfriendly activity, due to increased water flows that degrade riparian shoreline and reduce chemical buffering. Another set of 17 characteristics of WMOs and WMOs' boards were chosen as potential explanatory variables. The variable and the variables correlations are presented in Table 1. Some variables, such as the number of joint-powers agreements that a WMO was involved with were considered to be both dependent and explanatory variables.

Table 1. Correlation Coefficients

	CD	In MN	Land Area	Population	Downstream	% of Board Farmers	# of Meetings Per Year	Board Member Experience	# of Joint-Powers Agreements	Technical Staff Hours Per Week	Administrative Staff Hours Per Week	Education/Outreach Staff Hours Per Week	# of Board Members that Attend Water Conferences	Presence of State or Federal Agency Employee on Board	# of Organizations Collaborated with on Budgeted Projects	% of Board Members that have had Cooperative Extension Training	# of other Organizations Board Members are a Part of the Decision Making Body
CD	1.0	.19	-.18	.00	.10	.02	-.49	.05	.01	.31	.21	.30	-.49	.02	-.07	-.04	-.10
In MN		1.0	.03	.08	.24	-.19	.07	.09	.27	.35	.61	.00	.03	.05	.67	-.09	-.30
Land Area			1.0	.49	.02	-.04	.26	-.11	.05	.28	.41	-.08	.07	-.14	.26	-.03	-.19
Population				1.0	.36	-.22	.21	.05	-.07	.40	.27	.37	.12	.23	.34	-.03	-.21
Downstream					1.0	-.31	.23	-.06	-.17	.21	.15	.22	-.24	.11	.22	-.30	-.39
% of Board Farmers						1.0	-.15	.37	.20	-.15	.04	.11	-.05	-.20	-.33	-.07	.10
# of Meetings Per Year							1.0	.10	.11	-.14	.02	-.17	.34	-.04	.28	-.13	.03
Board Member Experience								1.0	.06	.02	.12	.02	.16	-.02	-.06	-.05	.27
# of Joint-Powers Agreements									1.0	-.10	.14	.22	.11	-.08	.15	.07	.31
Technical Staff Hours Per week										1.0	.25	.35	-.19	.04	.32	.12	-.37
Administrative Staff Hours Per Week											1.0	.02	-.17	-.11	.48	-.26	-.29
Education/Outreach Staff Hours Per Week												1.0	-.30	.21	-.13	-.14	-.14
# of Board Members that Attend Water Conferences													1.0	-.01	.26	.13	.23
Presence of State or Federal Agency Employee on Board														1.0	.06	.00	.01
# of Organizations Collaborated with on Budgeted Projects															1.0	.03	-.19
# of Board Members that have had Cooperative Extension Training																1.0	.00
# of other Organizations Board Members are a Part of the Decision Making Body																	1.0

A suggested statistical test to find characteristics of active WMOs is Multivariate Analysis of Variance (MANOVA) (Maxwell, 2001). North Dakota State University's (NDSU) Statistical Consulting Services was utilized to run the MANOVA. A number of variations of MANOVA were attempted to complete the analysis. However, there were not enough observations and/or non-zero values to complete the MANOVA analysis.

As an alternative to MANOVA, separate regressions were run on each of the 22 dependent variables using the 17 characteristics of WMOs as independent variables. All possible models of the 17 independent variables were run using ordinary least squares (OLS), poisson, negative binomial, and Gamma regressions. Akaike Information Criterion C (AICC) was used to select the best model. AICC is a measure of goodness of fit with a correction for small sample size. The model with the lowest AICC measure was selected. The more standard AIC measure is the foundation for AICC. The equations for AIC and AICC are as follows:

i) $AIC = -2 \ln(L) + 2k$

ii) $AICC = AIC + (2k(k+1))/(n-k-1)$,

where L is the likelihood function and k is the number of free parameters (Hurvich, 1998; SAS Institute Inc., 2006)

Six of the 22 regressions did not yield significant explanatory variables and results are not presented. The six dependent variables are:

i) value of wetland restoration projects;

ii) value of recreation projects;

iii) value of wildlife habitat projects;

iv) value of aquatic habitat projects;

v) value of potable water supply projects; and

vi) level of ditch maintenance per year.

For these six dependant variables, binary logit models were run. Two of the binary logit models yielded significant explanatory variables. The two models are:

i) wetland restoration projects; and

ii) recreation projects.

These models are presented in results and discussion.

The binary logit models began with all seventeen independent variables as regressors. One independent variable at a time was removed, the variable with the highest P value. The independent variable with the highest P valued continued to be removed until the remaining independent variables had P values less than 0.20.

CHAPTER 4. RESULTS AND DISCUSSION

This chapter is organized into three sections. Section one presents descriptive statistics of the survey data. Section two presents regression results. Section three discusses pertinent independent variables.

Descriptive Statistics

Seventy-eight survey instruments were sent directly to the organizations' administrators: 11 to WDs, 41 to CDs, 23 to WRDs, and 2 to tribal nations. Five responded from WDs, 23 from CDs, 8 from WRDs, and 1 from tribal nations, totaling 37. The response rate was 48.1% (after accounting for the merger between the East Grand Forks and West Grand Forks CDs).

Of 350 board members for the 78 districts surveyed, 68 were members of WD boards, 199 were members of CD boards, and 83 were members of WRD boards. Board member surveys were omitted from the tribal nations because they did not have a decision making body for the natural resources department. Twenty-seven WD board members responded, 111 from CDs, and 43 from WRDs. The response rate for board members was 51.7 percent.

Data are divided into three categories: WDs, WRDs, and CDs. Watershed districts average land area is 1,950.4 square miles, WRDs average land area is 1,111 square miles, and CDs average land area is 1,083.8 square miles.

The staff was most commonly technical, administrative, and secretarial. Watershed districts had an average of 38.2 technical staff hours per week, 42 administration hours per week, and 22.8 secretarial hours per week. Water resource districts had considerably less staff hours than WDs. Conservation districts had an average of 36.3 technical hours per

week, 28.7 administrative hours per week, and 21.1 secretarial hours per week. Watershed districts and WRDs had 0 hours per week of education/public outreach, while CDs had an average of 8 hours per week and a maximum of 40 hours per week. Districts education/public outreach staffing confirms CDs continue to follow their legislative mandate.

Watershed districts had the most dollars spent on contracted construction, with an average of $1,525,106, a minimum of $0, and a maximum of $4,660,406. Water resource districts spent an average of $98,278 on contracted construction, with a maximum of $620,000 spent. Conservation districts reported a minimal amount spent on construction contracts. Watershed districts and WRDs contracted construction is primarily due to water movement projects.

Water resource districts and CDs had an average of 1.7 joint-powers agreements, with WDs having an average of 1.2. Watershed districts, WRDs, and CDs had a maximum of 4, 5, and 11 joint-powers agreements, respectively. The RRWMB forms a joint-powers agreement for most of the red river basin in Minnesota (Red River Watershed Management Board). Therefore, the 1.2 average indicates that WDs do not take part in many joint-powers agreements other than the RRWMB. Watershed districts lower number of joint-powers agreements reflects their organization by watersheds. Water resource districts participate in numerous joint-powers agreements in order to work in multiple watersheds within their district (State Water Commission, 2008).

Watershed districts had an average of 131 miles of drainage ditch easement and 103 miles of drainage ditch owned. Water resource districts had an average of 107 miles of ditch easement and 105 miles of drainage ditch owned. Watershed districts permitted an

average of 10.25 miles of drainage ditch and had a maximum of 40 miles permitted. Water resource districts had an average of 7 miles of drainage ditch permitted with a maximum of 20 miles. Only one district denied permits for drainage ditches, and that district denied five miles of proposed ditch. The district that approved the most miles of drainage ditch also was the district that denied permits for drainage ditches.

Watershed districts organized an average of 5.2 snagging and clearing efforts, with a minimum of 0 and a maximum of 15. Water resource districts organized an average of 1.2 snagging and clearing efforts, with a minimum of 0 and a maximum of 3. Conservation districts did not organize any snagging and clearing efforts.

Conservation districts planted an average of 77,188 trees, with a maximum of 278,000 planted. Watershed districts and WRDs did not plant any trees. Conservation districts signed an average of 27.5 conservation contracts with landowners, with a maximum of 94 signed conservation contracts. One WD signed four conservation contracts with landowners, and one WRD signed a conservation contract with a landowner. Conservation districts developed an average of 16.4 acres of buffer/filter strips along natural riparian wetlands with a maximum of 300 acres and an average of 1.1 acres along drainage ditches with a maximum of 10 acres. Watershed districts developed an average of 1.8 acres of buffer/filter strips along natural riparian wetlands with a maximum of 9 acres and an average of 4.4 acres along drainage ditches with a maximum of 22 acres. Water resource districts implemented an average of 2.7 acres of buffer/filter strips along natural riparian wetlands with a maximum of 20 acres and an average of 0 acres along drainage ditches with a maximum of 0 acres. This shows that WDs and WRDs have begun to increase their water-quality concerns.

Conservation districts signed an average of 208.4 acres of minimum-tillage contracts with a maximum of 3,000 acres, and an average of 91 acres of no-tillage contracts with a maximum of 1000 acres. All minimum and no-tillage contracts were signed by three CDs. The CD with the greatest number of minimum and no-tillage contracts did so with a low interest loan program to purchase equipment. All Watershed districts and WRDs did not sign any minimum-tillage or no-tillage contracts with farmers.

Water resource districts currently maintain an average of 0.3 recreational sites with a maximum of 2 recreational sites. Conservation districts currently maintain an average of .2 recreational sites with a maximum of 1 recreational site. The maintenance of recreational sights shows signs of evolution.

The average total revenue for all districts was $1,458,008. Watershed districts, WRDs, and CDs had average total revenue of $5,921,570, $565,689, and $553,818 respectively, with maximum revenue of $11,534,653 for WDs, $3,400,000 for WRDs, and $1,414,000 for CDs. Watershed districts received the largest share of their revenues from organizational taxes at 31% of total revenue, with revenue from state agencies close behind at 24.8%. One WD received 99.8% of its total revenue from state agencies. Water resource districts received a majority (73.9%) of its revenue from county taxes. The WRD with the most revenue received 98% of its revenue from special assessments. This is due to the large number of water movement projects in the district. Conservation districts received the largest share of their revenue from county taxes at 26.3%, with tree planting a close second at 24.5% of revenue received.

Watershed districts largest expenditure was for water retention projects, at 42.8% of expenditures. Water resource districts largest expenditure was for water movement

projects, at 50.2%. Conservation districts largest expenditure was for in house staff, at 44.9%.

Watershed districts made an average of 12.6 requests to obtain outside funding. Water resource districts made an average of 3.1 requests to obtain outside funding; and CDs made an average of 5.7 requests to obtain outside funding. Watershed districts' larger number of funding requests is partially explained by differences in land area. However, WDs make 400% more requests for outside funding than WRDs and are only 176% larger.

In addition to organizations surveys, board member questionnaires were sent to all board members of WDs, WRDs, and CDs in the Red River Basin; 350 questionnaires were sent and 182 returned.

Seventy-five of the responding board members were elected, and 106 appointed. Many board members have considerable experience. Fifty-three board members have 1 to 5 years of experience, 60 have 6 to10 years of experience, 46 have 11 to 20 years of experience, and 23 have over 20 years of experience. A majority (129 of 182) of board members are farmers. All board members have a high school education; 101 have education past high school. Fifteen board members are employed by a state or federal agency.

Eighty-nine board members have a state water management handbook, and 59 have some other management handbook. Eighty-two board members would like to see a mandatory water management training course for new board members. Fifty-one board members would like to attend water management conferences. Twenty-nine board members have received cooperative extension training. Thirteen board members would like to attend university courses on water management, while 37 board members would like

to receive cooperative extension training. It appears board members are not open to training. However, water management conferences are the preferred method of training current board member.

Ninety-one board members feel their constituents believe there is a water-quality or upcoming water-quality problem in the Red River Basin. One-hundred-sixteen (116) board members feel their constituents would like to see more resources allocated to protect them from periodic flood events. One-hundred-five (105) board members feel their constituents would like to see their district organized by watershed, while 71 believe they should be organized by political boundary. One-hundred-thirteen (113) board members feel lack of funding is an obstacle to accomplishing their responsibilities, while 27 board members feel there are no significant obstacles to meeting their responsibilities. One-hundred-sixty-five (165) board members say that their board tries to receive input from people who do not attend board meetings (see appendix B for complete descriptive statistics).

Regression Results

Each best fit model, with the lowest AICC score, conformed to the prior judgment as to which distribution would present the best model for each dependent variable, based upon the distribution of the dependent variable. Four dependent variables did not yield usable regressions:

i) the value of wildlife habitat projects;

ii) the value of aquatic habitat projects;

iii) the value of potable water supply projects; and

iv) the level of ditch maintenance.

The absence of usable regressions for the first three dependent variables was due to the WMOs' inactivity in these areas. There was not enough explanatory power in the independent variables to create a useful regression for the level of ditch maintenance. Dependent variables that yielded significant results are presented in the chapter's tables present on the following pages. The numbers of observations in these regressions vary. Some regressions used only data from CDs or WDs and WRDs because of the nature of the activities. Also, there were intermittent missing data in some observations.

Conservation districts were the focus of the first analysis of data derived from specific activities. Conservation districts' original mission was to promote soil conservation. Their traditional soil conservation mechanism was selling/planting trees for the implementation of shelterbelts. They also encourage farmers to adopt no-tillage/minimum-tillage agriculture practices and to participate in government programs to reduce erosion. Since their inception, CDs have evolved to concern themselves with surface water-quality issues, and have developed traditional shelterbelt contracts into a variety of water-quality conservation contracts. Regressions for activities specific to CDs were run using only observations from CDs. Results are presented in Tables 2, 3, and 4. Due to heterogeneity of institutional types, initial efforts to regress total revenue across all observations did not produce informative results. Therefore, results reported in Table 5 for the dependent variable total revenue are just for CDs.

Tree selling was generally similar in Minnesota and North Dakota and all districts participated in tree selling. Therefore, the regression for the number of trees sold by CDs (Table 2) used a normal distribution. Table 2 shows that CDs' tree selling (CDs' most traditional activity) decreases as board member cooperative extension training increases.

Table 2. Dependent Variable: Number of Trees Sold for Conservation Districts

Dependent Variable: Number of Trees Sold for Conservation Districts		
Distribution = Normal	Link Function = Identity	
N = 19		
Log Likelihood = -225.28	Scaled Deviance/DF = 1.58	
Independent Variable	Parameter Estimate	Pr > t
Intercept	-203238.00	0.0292
Board Member Meetings	18643.29	0.0049
Organizations Collaboration with Budgeted Projects	11707.34	0.0050
Board Member Experience	5641.81	<0.0001
Board Member Cooperative Extension Training	-228381.00	<0.0001
Weeding	6997.87	0.4842
Tiller	-121300.00	<0.0001
Scale	34131.95	NA

Table 3. Dependent Variable: Acres of Windbreaks/Shelterbelts for Conservation Districts

Dependent Variable: Acres of windbreaks/shelterbelts for Conservation Districts		
Distribution = Gamma	Link Function = Log	
N = 18		
Log Likelihood = -85.34	Scaled Deviance/DF = 1.43	
Independent Variable	Parameter Estimate	Pr > t
Intercept	-0.01	0.9944
Population	<0.01	<0.0001
Board Member Meetings	0.26	0.0029
Education/Outreach Staff	0.03	0.0007
Weeding	0.14	0.2855
Scale	4.74	NA

Table 4. Dependent Variable: Number of Conservation Contracts Signed for Conservation Districts

Dependent Variable: Number of Conservation Contracts Signed for Conservation Districts		
Distribution = Poisson	Link Function = Log	
N = 21		
Log Likelihood = 1583.39	Scaled Deviance/DF = 0.8850	
Independent Variable	Parameter Estimate	Pr > t
Intercept	4.63	<0.0001
Population	<0.00	<0.0001
Downstream	-0.83	<0.0001
In Minnesota	1.49	<0.0001
Board Member Experience	-0.35	<0.0001
Presence of State or Federal Agency Employee on the Board	1.60	<0.0001
Board Member Decision Making Activity in other Organizations	-4.30	<0.0001
Board Members Attendance at water management conferences	2.56	0.0004
Board Member Cooperative Extension Training	8.93	<0.0001
Administrative Staff	0.23	<0.0001
Technical Staff	-0.02	<0.0001
Organizations Collaboration with Budgeted Projects	-0.16	0.0292
No-Till Demonstration Site	-1.16	<0.0001
Scale	1.00	NA

Table 5. Dependent Variable: Total Revenue for Conservation Districts

Dependent Variable: Total Revenue for Conservation Districts		
Distribution = Normal	Link Function = Identity	
N = 16		
Log Likelihood = -214.79	Scaled Deviance/DF = 1.45	
Independent Variable	Parameter Estimate	Pr > t
Intercept	613593.3	0.0006
In Minnesota	190021.7	0.0244
Board Members Attendance at water management conferences	168439.8	0.2441
Board Member Decision Making Activity in other Organizations	-225223.0	0.0034
Number of Trees Sold	2.5053.0	0.0018
Scale	163951.7	NA

There also is a positive correlation between the number of trees sold and board member experience. It is possible that experienced board members continue to promote tree sales, while inexperienced board member and those with extension training focus their concerns on other areas.

The regression for acres of shelterbelts installed by CDs (Table 3) used a gamma distribution. Shelterbelts installed by CDs are uniform across North Dakota and Minnesota, with 19 of 21 districts installing shelterbelts. Table 3 illustrates a positive correlation between education/outreach staff and acres of windbreaks/shelterbelts installed by CDs. Education/outreach staff promotes soil conservation; this could explain the positive correlation between education staff and shelterbelts.

North Dakota and Minnesota CDs signed conservation contracts with landowners, but several North Dakota CDs did not sign any conservation contracts. Therefore, the regression for the number of conservation contracts signed by CDs (Table 4) used a Poisson distribution. Table 4 illustrates a negative correlation between conservation contracts signed and downstream districts. That is, upstream districts sign more conservation contracts with landowners than downstream districts. This suggests that downstream districts with higher valued land have a more difficult time signing conservation contracts. Downstream districts land values vary greatly from one end to the other, with the highest valued land nearest the mainstream Red River. Conservation contracts are adjusted for land values on a county basis. Thus conservation programs might under compensate landowners nearest the mainstream Red River, and reduce the number of contracts signed in these districts. Table 4 suggests that the number of conservation contracts signed increases if the district is in Minnesota. Furthermore,

Table 4 illustrates a positive relationship between contracts signed and cooperative extension training.

All CDs have revenue (Table 5) which is distributed normally across CDs. Therefore, OLS regression is appropriate for this analysis. Table 5 shows that Minnesota CDs receive more revenue than CDs in North Dakota and that tree sales significantly influences CDs revenue.

Similar to CDs, WDs and WRDs have traditional activities they perform. These activities relate to water movement and water storage, principally drainage. Watershed Districts and WRDs are responsible for drainage ditch permitting, and have played a role in water retention. Snagging and clearing also is an activity specific to WDs and WRDs. Regressions were run using only WDs and WRDs. Results for these activities are presented in Tables 6, 7, and 8.

Two districts in both North Dakota and Minnesota did not approve any drainage ditch permits. Most districts approved less than 5 miles of drainage ditch, 3 districts approved between 5 and 20 miles of drainage ditch, and one district approved over 20 miles of drainage ditch. Therefore, the regression for miles of approved drainage ditch permit (Table 6) by WDs and WRDs used a poisson distribution. Table 6 demonstrates a negative correlation between the number of joint-powers agreements a district participates in and the miles of new or improved drainage ditch permitted by the district. Joint-powers agreements show a concern for basin-wide goals, while drainage ditch passes the problem to downstream districts. This could explain the relationship between drainage ditch permitted and joint-powers agreements.

Table 6. Dependent Variable: Miles of New or Improved Drainage Ditch Permitted for Watershed Districts and Water Resource Districts

Dependent Variable: Miles of New or Improved Drainage Ditch Permitted for Watershed Districts and Water Resource Districts		
Distribution = Poisson	Link Function = Log	
N = 11		
Log Likelihood = 188.07	Scaled Deviance/DF = 1.80	
Independent Variable	Parameter Estimate	Pr > t
Intercept	-0.07	0.8996
Population	<0.01	<0.0001
Presence of State or Federal Agency Employee on the Board	-3.83	<0.0001
Number of joint-powers agreements	-2.00	<0.0001
Board Member Decision Making Activity in other Organizations	1.81	<0.0001
Scale	1.00	NA

Table 7. Dependent Variable: Water Retention Value for Watershed Districts and Water Resource Districts

Dependent Variable: Water Retention Value for Watershed Districts and Water Resource Districts		
Distribution = Gamma	Link Function = Log	
N = 5		
Log Likelihood = -53.43	Scaled Deviance/DF = 5.00	
Independent Variable	Parameter Estimate	Pr > t
Intercept	10.67	<0.0001
Presence of Farmers on the Board	-3.27	<0.0001
In Minnesota	8.26	<0.0001
Board Member Experience	-0.20	<0.0001
Scale	1080.32	NA

Table 8. Dependent Variable: Number of Snagging and Clearing Efforts for Watershed Districts and Water Resource Districts

Dependent Variable: Number of Snagging and Clearing Efforts for Watershed Districts and Water Resource Districts		
Distribution = Poisson	Link Function = Log	
N = 13		
Log Likelihood = 23.56	Scaled Deviance/DF = 0.90	
Independent Variable	Parameter Estimate	Pr > t
Intercept	3.01	0.0001
Board Member Experience	0.15	<.0001
Board Members Attendance at water management conferences	-2.49	0.0181
Board Member Decision Making Activity in other Organizations	-0.91	<.0001
Scale	1.00	NA

The regression for the value of water retention projects by WDs and WRDs (Table 7) used a gamma distribution. All Minnesota districts spent over $100,000 on water retention, while only one district in North Dakota spent money on water retention. Table 7 illustrates a negative correlation between water retention and farmers, and a negative correlation between water retention and board member experience. Table 7 also illustrates a positive relationship between water retention and districts in Minnesota.

Five districts did not perform any snagging and clearing, eight districts performed one to three snagging and clearing efforts, and two districts performed more than three snagging and clearing efforts. Therefore, the regression for the number of snagging and clearing efforts by WDs and WRDs (Table 8) used a poisson distribution. Table 8 demonstrates that board member experience increases the level of an environmentally unfriendly activity, snagging and clearing. Furthermore, Table 8 shows snagging and clearing decreasing as more board members attend water management conferences. Water management conferences focus on basin-wide goals. Board member might become educated about snagging and clearings effect on flows and the degradation of shoreline at water management conferences.

Data relating to activities relevant to all three types of organizations also were analyzed. Because CDs, WDs, and WRDs have evolved to be fairly homogeneous in their water-quality practices, a number of water-quality dependent variables were assessed. Regressions for water-quality practices were run using all observations and results are presented in Tables 9, 10, and 11. The regression for the miles of stream bank stabilization implemented (Table 9) used a gamma distribution. Stream bank stabilization is similar

Table 9. Dependent Variable: Miles of Stream Bank Stabilization Implemented

Dependent Variable: Miles of Stream Bank Stabilization Implemented		
Distribution = Gamma	Link Function = Log	
N = 9		
Log Likelihood = -6.44	Scaled Deviance/DF = 1.54	
Independent Variable	Parameter Estimate	Pr > t
Intercept	-1.29	<0.0001
Downstream	1.88	<0.0001
# of Joint-Powers Agreements	0.26	0.0051

Table 10. Dependent Variable: Value of Water-Quality Projects

Dependent Variable: Value of Water-Quality Projects		
Distribution = Gamma	Link Function = Log	
N = 13		
Log Likelihood = -153.61	Scaled Deviance/DF = 1.57	
Independent Variable	Parameter Estimate	Pr > t
Intercept	10.29	<0.0001
Technical Staff	0.06	0.0007
Board Members Attendance at water management conferences	-1.70	0.2247
Scale	0.69	NA

Table 11. Dependent Variable: Wetland Restoration Projects

Dependent Variable: Wetland Restoration Projects		
Distribution = Logit		
N = 35		
Log Likelihood = -17.51	Scaled Deviance/DF = NA	
Independent Variable	Parameter Estimate	Pr > t
Intercept	5.28	0.0237
Presence of Farmers on the Board	-3.76	0.1303
Board Member Meetings	-0.15	0.0114
Board Member Experience	0.18	0.0853

across all districts, but most districts did not perform any stream bank stabilization. Table 9 shows a positive correlation between the number of joint-powers agreements a district participates in and the miles of stream bank stabilization. Joint-powers agreements show a concern for basin-wide goals, while stream bank stabilization decreases water flows and chemical concentrations.

The regression for the value of water-quality projects (Table 10) used a gamma distribution. Watershed districts spent more on water-quality projects than other WMOs. About half of SWCDs and CDs did not perform any water-quality projects, and only one WRD spent money on water-quality projects. Table 10 reveals a positive correlation between water-quality projects and technical staff. This correlation could be explained by the need for technical staff to carry out water-quality projects.

The regression for wetland restoration projects (Table 11) used a logit distribution, implying a discrete yes/no adoption. Seven organizations performed wetland restoration. Table 11 demonstrates a positive relationship between wetland restoration and board member experience, and a negative relationship between wetland restoration and the frequency of board member meetings.

Four other activities common to CDs, WDs, and WRDs are

i) total number of studies;

ii) value of water movement projects;

iii) value of education/outreach projects; and

iv) recreational sites.

These regressions were run using all observations. Results are presented in Tables 12, 13, 14, and 15.

Table 12. Dependent Variable: Total Number of Studies

Dependent Variable: Total Number of Studies		
Distribution = Poisson	Link Function = Log	
N = 33		
Log Likelihood = 53.06	Scaled Deviance/DF = 2.35	
Independent Variable	Parameter Estimate	Pr > t
Intercept	-3.62	<0.0001
Presence of Farmers on the Board	3.48	<0.0001
Presence of State or Federal Agency Employee on Board	-1.89	0.0019
Number of Joint-Powers Agreements	-0.18	0.0288
In Minnesota	2.21	<0.0001
Board Member Experience	-0.14	<0.0001
Board Member Decision Making Activity in other Organizations	1.13	<0.0001
Organizations Contribution to Environmental Groups	0.78	<0.0001
Scale	1.00	NA

Table 13. Dependent Variable: Value of Water Movement Projects

Dependent Variable: Value of water movement projects		
Distribution = Gamma	Link Function = Log	
N = 14		
Log Likelihood = -170.96	Scaled Deviance/DF = 1.61	
Independent Variable	Parameter Estimate	Pr > t
Intercept	8.48	<0.0001
Board Meetings	8.48	<.0001
Board Member Experience	0.07	0.0039
Technical Staff	0.03	0.1819
Scale	1.03	NA

Table 14. Dependent Variable: Value of Education/Outreach Projects

Dependent Variable: Value of Education/Outreach Projects		
Distribution = Gamma	Link Function = Log	
N = 12		
Log Likelihood = -109.34	Scaled Deviance/DF = 1.62	
Independent Variable	Parameter Estimate	Pr > t
Intercept	6.88	<0.0001
Population	<0.01	<0.0001
Conservation District	1.80	<0.0001
Board Member Experience	-0.09	0.0348
Scale	2.10	NA

Table 15. Dependent Variable: Recreation Projects

Dependent Variable: Value of Recreation Projects		
Distribution = Logit		
N = 36		
Log Likelihood = -12.56	Scaled Deviance/DF = NA	
Independent Variable	Parameter Estimate	Pr > t
Intercept	3.69	0.0122
Conservation District	2.40	0.1539
Number of Joint-Powers Agreements	-0.34	0.1974
Organizations Collaboration with Budgeted Projects	-0.50	0.0539

All WDs performed studies, but a number of SWCDs, SCDs, and WRDs did not perform any studies. Therefore, the regression for the total number of studies (Table 12) used a poisson distribution. Table 12 shows more studies are performed by districts in Minnesota; this demonstrates that Minnesota is more pro-active than North Dakota. All WDs implemented water movement projects, all but one WRDs implemented water movement projects, and most CDs did not implement any water movement projects. A gamma distribution was used for the value of water movement projects (Table 13). Table 13 shows that board member experience and the number of board meetings is positively correlated with the value of water movement projects by a district.

The regression for the value of education/outreach projects (Table 14) used a gamma distribution. Most districts did not spend any money on education/outreach projects. Table 14 illustrates a positive relationship between the dollar value of education/outreach and CDs. This shows that conservation districts continue to perform their legislative mandate.

The regression for recreation projects (Table 15) used a logit distribution, implying a discrete yes/no adoption. Four districts spent money on recreation projects. Table 15 illustrates a positive relationship between recreation projects and conservation districts. This shows that CDs have somewhat evolved.

There are a number of institutional ways to work beyond traditional methods. For example, organizations can work together through collaborated projects to meet identical goals. Joint-powers agreements also are used to come to an agreement on regional issues by a number of organizations and to agree upon methods used to complement each organization's effort in response to regional issues. Contracting and securing grant funding

are two other ways to work beyond traditional methods. These ways to work were regressed using all observations and are presented in Tables 16, 17, 18, and 19.

The regression for dollars spent on contracting (Table 16) used a gamma distribution. All WDs contracted out work, while all but one WRD contracted out work. Most conservation districts did not contract out any work. Table 16 illustrates a negative relationship between CDs and dollars spent on contracting. The fact that CDs receive assistance from NRCS and FSA could explain this negative relationship.

A number of organizations in North Dakota and Minnesota did not collaborate with budgeted projects or did not enter into any joint-powers agreements. Therefore, the regressions for district collaboration on budgeted projects (Table 17) and the number of joint-powers agreements entered into by a district (Table 18) used poisson distributions. Furthermore, districts in Minnesota collaborated with budgeted projects and entered into joint-powers agreements more than North Dakota Districts. Tables 17 and 18 illustrate that Minnesota districts collaborate more than North Dakota districts; the structure of state government could explain this result. Table 17 also suggests that experienced board member do not collaborate as much as inexperienced board members. Furthermore, Table 18 shows that technical staff reduces collaboration, while board member cooperative extension training increases collaboration.

The regression for district grant funding (Table 19) used a gamma distribution. A few districts in Minnesota did not receive any grant funding, while a majority of districts in North Dakota did not receive any grant funding. Table 19 illustrates a positive correlation between grant funding and districts in Minnesota. Interviews with local water experts indicate that Minnesota has a more pro-active state government compared to North Dakota

Table 16. Dependent Variable: Dollars Spent on Contracting

Dependent Variable: Dollars Spent on Contracting		
Distribution = Gamma	Link Function = Log	
N = 16		
Log Likelihood = -200.26	Scaled Deviance/DF = 1.69	
Independent Variable	Parameter Estimate	Pr > t
Intercept	16.42	<0.0001
Conservation District	-3.08	0.0018
Presence of Farmers on the Board	-6.41	<0.0001
Presence of State or Federal Agency Employee on Board	-3.98	0.0001
Administrative Staff	0.06	<0.0001
Scale	0.97	NA

Table 17. Dependent Variable: Number of Organizations Collaborated with on Budgeted Projects

Dependent Variable: Number of Organizations Collaborated with on Budgeted Projects		
Distribution = Poisson	Link Function = Log	
N = 34		
Log Likelihood = 22.63	Scaled Deviance/DF = 1.12	
Independent Variable	Parameter Estimate	Pr > t
Intercept	-0.73	0.0630
Population of District	<0.01	0.0031
In Minnesota	1.68	<0.0001
Board Member Experience	-0.04	0.0296
Board Members Attendance at water management conferences	0.90	0.432
Scale	1.00	NA

Table 18. Dependent Variable: Number of Joint-Powers Agreements

Dependent Variable: Number of Joint-Powers Agreements		
Distribution = Poisson	Link Function = Log	
N = 34		
Log Likelihood = -5.10	Scaled Deviance/DF = 1.11	
Independent Variable	Parameter Estimate	Pr > t
Intercept	-2.87	<0.0001
Land Area	<0.01	0.0021
In Minnesota	2.04	<0.0001
Technical Staff	-0.03	0.0016
Education/Outreach Staff	0.05	<.0001
Board Member Cooperative Extension Training	1.98	0.0024
Board Member Decision Making Activity in other Organizations	0.66	<0.0001
Scale	1.00	NA

Table 19. Dependent Variable: Total Grant Funding

Dependent Variable: Total Grant Funding		
Distribution = Gamma	Link Function = Log	
N = 15		
Log Likelihood = -183.98	Scaled Deviance/DF = 1.55	
Independent Variable	Parameter Estimate	Pr > t
Intercept	10.40	<0.0001
Land Area	<0.01	<0.0001
In Minnesota	3.17	<0.0001
Administration Staff	-0.08	<0.0001
Board Members Attendance at water management conferences	1.14	0.0045
Scale	4.71	NA

(personal communication, February through December, 2006). The positive correlation between grant funding and districts in Minnesota suggests greater water-resource spending by state government in Minnesota compared to North Dakota. Furthermore, Table 19 shows a positive correlation between grant funding and board members attendance at water management conferences.

Overall, the regressions were robust. Most P-values were less than 0.01 and 69 out of 77 dependent variables were significant at the 85% confidence level. Seventeen of the eight-teen models showed low evidence of overdispersion or underdispersion. Overdispersion is when the sample's variance is higher than the theoretical models while underdispersion is when the sample's variance is lower than the theoretical models.

Discussion of Pertinent Characteristics

Conservation districts, WRDs, and WDs have different specializations but share a common interest in a number of activities. Conservation districts are housed in USDA buildings, along with NRCS and FSA. Conservation districts receive NRCS and FSA support. This gives CDs a comparative advantage in the production of education/outreach and conservation contacts. For activities common to all WMOs, this specialization was controlled for with the use of a dummy variable to identify CDs. It was hypothesized that CDs would have a positive relationship with the dollar value of education/outreach projects and recreation projects, and a negative relationship with dollars spent on contacting. These hypothesized relationships are seen in the regression results (Tables 14, 15, and 16). These results verify that CDs continue to follow their legislative mandate.

During the survey instrument development process, numerous experts stressed the importance of board members in the success of a WMO. A number of board member attributes were discussed:

i) frequency of meetings;

ii) board member experience;

iii) board members having an active role in other forms of government;

iv) board member attendance at the annual Red River Basin water management conference;

v) board members who are farmers; and

vi) board member education and training.

The survey results confirm certain apriori expectations and reject others.

The number of board member meetings per year is perceived two ways. Some individuals feel that frequent meetings demonstrate a pro-active board that wants to accomplish a large number of goals. Others suggest that frequent board meetings reveal board member's interest in receiving per diem payments. The number of board meetings per year has a positive correlation with the dollar value of water movement projects (Table 13), the number of trees sold by conservation districts (Table 2), and the number of acres of shelterbelts installed by conservation districts (Table 3). The number of board member meetings per year was negatively correlated with wetland restoration projects (Table 11).

Board member experience is correlated to a relatively large number of activities. Board experience has a positive relationship with a number of activities that may be considered to be traditional duties of drainage districts, including the dollar value of water movement projects (Table 13), the number of snagging and clearing efforts (Table 8),

wetland restoration projects (Table 11), and the number of trees sold by conservation districts (Table 2). Board experience has a negative relationship with some other activities, some traditional and some non-traditional, including the dollar value of water retention projects (Table 7), the number of conservation contracts signed by conservation districts (Table 4), the number of budgeted projects districts have collaborated on (Table 17), the dollar value of education/outreach projects (Table14), and the total number of studies performed by a district (Table 12).

Board members taking an active role in organizations outside their WMOs are perceived to increase collaboration due to networking. Board members being part of a decision making body for other organizations have a positive relationship with the number of joint-powers agreements entered into by an organization (Table 18). A positive relationship also exists among board members being part of a decision making body for other organizations and the miles of new or improved permitted drainage ditch (Table 6), and between board members being part of a decision making body for other organizations and the total number of studies performed (Table 12). A negative relationship exists between board members being part of a decision making body for other organizations and the number of snagging and clearing efforts by WRDs and WDs (Table 8), the number of contracts signed by CDs (Table 4), and the total revenue of CDs (Table 5).

The percentage of board members that attend water management conferences was expected to be an important determinate of collaboration and efforts to improve basin-wide water management. There is a positive correlation between conference attendance and total grant funding (Table 19), and a negative correlation between conference attendance and snagging and clearing efforts (Table 8). There also is a positive correlation between

conference attendance and the number of conservation contracts signed by conservation districts (Table 4).

Having a state or federal agency employee on a district's board was thought to increase the availability of resources to the district. Resources are needed to entice landowners to give up potential profits by signing a conservation contract. This notion is supported by the positive correlation between the presence of a state or federal agency employee and the number of contracts signed by conservation districts (Table 4). There are negative correlations between the presence of a state or federal agency employee and the miles of new or improved drainage ditch by WRDs and WDs (Table 6), dollars spent on contracting (Table 16), and the total number of studies (Table 12).

District boards having a larger percentage of farmers were thought to be more concerned about drainage than water-quality or wetland restoration. There was no correlation between the number of farmers on a board and the amount of new or improved drainage ditches. However, there is a negative correlation between the number of farmers and the dollar value of water retention projects by WRDs and WDs (Table 7), and wetland restoration projects (Table 11). There also was a positive relationship between the number of farmers and the number of studies conducted (Table 12) and a negative relationship between the number of farmers and the amount of dollars spent on contracting (Table 16).

Previous to the study, board member training was thought to be an important characteristic of active WMOs. In fact, board members' cooperative extension training has a positive relationship with the number of conservation contracts signed (Table 4), and the number of joint-powers agreements entered into by districts (Table 18). Surprisingly, cooperative extension training has a negative relationship with the number of trees sold by

conservation districts (Table 2). This result is not clearly understood; however, it could be that greater extension training promotes diversified CD activity. In other words, the traditional selling of trees diminishes with increased activities promoted by the cooperative extension services.

Previously published literature and interviews with local water experts suggest that well-staffed WMOs are more active than WMOs with less staff ((Draeger, 2001; personal communication, February through December 2006). The number of technical staff hours per week is positively correlated with the value of water-quality projects (Table 10). The number of technical staff hours per week is negatively correlated with the number of conservation contracts signed by conservation districts (Table 4), and the number of joint-powers agreements entered into by a district (Table 18). This shows that technical staff can increase the activity of WMOs on certain technical activities, such as water-quality projects. However, too much emphasis on technical staffing might reduce a WMOs' interaction with stakeholders. A WMO with its own staff technicians might have less incentive to participate in joint-powers agreements.

Administrative staff hours are positively correlated with the number of conservation contracts signed by CDs (Table 4), and dollars spent on contracting (Table 16). The results unexpectedly identified a negative correlation between administrative staff hours and total grant funding (Table 19). However, this could be explained by Minnesota's practice of funneling money where the state government feels the money is helpful. Districts that have a well-funded administrative department probably have more local funding and less need for state support to alleviate water-quality problems.

Water management organizations that take part in a larger number of joint-powers agreements were thought to be more concerned about basin-wide problems. This presumption was supported by the positive relationship between the number of joint-powers agreements a district takes part in and the miles of stream bank stabilization implemented (Table 9). Stream bank stabilization reduces water flows and alleviates flooding downstream and nonpoint pollution. The number of joint-powers agreements has a negative relationship with the miles of new or improved drainage ditch permitted, which increases water flows and increases downstream flooding by WRDs and WDs (Table 6). This suggests that board members, who enter into more joint-powers agreements, are concerned with basin-wide water-quality goals. There also was a negative relationship between the number of joint-powers agreements and the total number of studies performed by a WMO (Table 12). One particular basin-wide goal is increased water-quality. There is a positive correlation between technical staff and the value of water-quality projects (Table 10).

Interviews revealed a consensus among water experts that districts in Minnesota are more active than those in North Dakota. This was supported by a number of results. Districts in Minnesota did not have a negative correlation with any activity. Furthermore, WDs in Minnesota had higher dollar values for water retention projects than WRDs in North Dakota (Table 7). The number of conservation contracts signed by CDs (Table 4), total revenue for CDs (Table 5), total grant funding (Table 19), number of joint-powers agreements (Table 18), the number of collaborative budgeted projects (Table 17), and the total number of studies were higher in Minnesota than in North Dakota (Table 12).

Many experts suggested that CDs in counties with high land values had greater difficulty signing landowners to conservation contracts. Counties nearest the mainstream Red River tend to have higher land values than districts further away from the mainstream Red River. Districts adjacent to the mainstream Red River had fewer signed conservation contracts than upstream districts (Table 4). Districts adjacent to the mainstream Red River also had a positive relationship with the miles of stream bank stabilization implemented (Table 9).

The population of a district is not negatively correlated with any activities, but is positively correlated with the miles of new or improved drainage ditch by WRDs and WDs (Table 6), the number of contracts signed by conservation districts (Table 4), the number of budgeted projects districts have collaborated with (Table 17), and the value of education/outreach projects (Table 14).

A number of interviewees suggested that providing no-till demonstration sites would help conservation districts sign no-till contracts with landowners. Other respondents felt that all farmers are familiar with no-till. Regression results show that providing access to a no-till demonstration site does not increase the number of contracts signed by CDs. In fact, conservation districts providing access to a no-till demonstration site had a negative correlation with the number of contracts signed for conservation districts (Table 4).

Conservation districts owning a tiller was used as a dummy control variable for the number of trees sold by CDs. It was not perceived that CDs owning a tiller would have a negative correlation with the number of trees sold by CDs, and cannot be explained (Table 2).

A few interviewees suggested that some conservation districts have to sell trees to survive financially. As expected, the number of trees sold by CDs has a positive relationship with the total revenue of conservation districts (Table 5).

Land area of WMOs was perceived to be correlated with a number of activities. However, this was not illustrated by the regression results. The land area of districts has a positive relationship with total grant funding (Table 19), and the number of joint-powers agreements entered into by a district (Table 18).

CHAPTER 5. CONCLUSIONS AND OBSERVATIONS

Conservation districts, watershed districts, and water resource districts were the subjects of this study. Conservation districts in North Dakota and Minnesota maintain essentially the same institutional framework. Water resource districts are in North Dakota, while WDs are in Minnesota. Water resource districts and WDs are comparable to each other, but differences exist in the institutional framework. Minnesota's WMOs are well-funded compared to North Dakota's WMOs. However, this does not necessarily mean Minnesota's WMOs are more successful. North Dakota accomplishes its water management goals with limited resources.

Conservation districts were created to promote soil conservation. Through the years, CDs have evolved to conserve and improve surface water-quality. However, CDs continue to follow their original mission of soil conservation.

North Dakota's WRDs originated from county drain boards and follow county boundaries. Over the years, WRDs received greater authority and thus increased their involvement with the protection of surface water-quality, while remaining committed to their water drainage activities. The Cass County WRD demonstrated institutional evolution of WRDs. The Cass Country WRD divided into four smaller districts conforming to watershed boundaries. Local stakeholders created WDs to address local problems. Since WDs were created years after WRDs, they do not have as much vested interest in drainage.

A number of hypotheses were stated in chapter one concerning water-quality initiatives. The first hypothesis stated "Water management organizations are likely to collaborate with water-quality initiatives when their board members attend water

management conferences." This research shows that water management conference attendance does not significantly influence WMOs' level of collaboration or the number of water-quality initiatives. However, water management conference attendance is negatively correlated with snagging and clearing. The decrease in snagging and clearing could be due to water management conferences emphasis of reducing water flows to increase chemical buffering.

The second hypothesis stated "Water management organizations are likely to collaborate with basin-wide water-quality initiatives when they employ education/outreach staff." This research found that education/outreach staff is correlated with WMO collaboration, but does not significantly affect water-quality initiatives.

The third hypothesis stated "Water management organizations with more experienced board members are likely to collaborate with basin-wide water-quality initiatives." This research found that board member experience decreases collaboration and does not affect the dollar value of water-quality initiatives or stream bank implementation. However, board member experience is positively correlated with wetland restoration. Furthermore, board member experience increases snagging and clearing efforts. Watershed districts and WRDs' traditional interest in drainage could explain the positive relationship between board members' experience and snagging and clearing efforts.

The fourth hypothesis stated "Water management organizations are likely to carry out water-quality activities when they are in Minnesota." This research found that WMOs in Minnesota are not more likely to carry out water-quality activities than North Dakota WMOs.

The fifth hypothesis stated "Water management organizations are likely to carry out water-quality activities when they participate in more joint-powers agreements." This research found that joint-powers agreements are positively correlated with WMOs' level of water-quality activities.

The sixth hypothesis stated "Water management organizations are likely to carry out water-quality activities when a larger percentage of board members have had cooperative extension training." This research found that cooperative extension training has a positive relationship with water-quality activities.

Minnesota and North Dakota have comparable CDs. However, Minnesota's CDs had more funding and signed more conservation contracts than North Dakota's CDs. This could be due to a number of factors, including Minnesota's more active state programs for environmental and water management. Downstream CDs work with landowners who farm relatively high valued land. Conservation payments are adjusted by land value according to county. It appears that further adjustments may be needed, since downstream districts have less success encouraging landowners to sign conservation contracts. Improvements could be made by adjusting conservation payments by township rather than by counties. Conservation districts have a comparative advantage in the production of education/outreach projects and conservation contracts. Conservation districts are housed in the USDA building, along with NRCS and FSA, facilitating outside agency support to CDs.

Larger districts receive more grant funding than smaller districts, and Minnesota districts receive more grant funding than North Dakota districts, possibly due to Minnesota's greater state spending in water-quality and soil conservation programs. Board

members hear about funding opportunities at water management conferences, which could partially explain the positive relationship between board members' attendance at water management conferences and grant funding.

There was consensus among experts interviewed that an increase in collaboration between WMOs in the Red River Basin is needed to accomplish basin-wide goals. This study shows WMOs with larger education/outreach staffs collaborate more. Furthermore, this study found that WMOs with experienced board members carry out less project collaboration.

Furthermore, this research shows that the education level of board members was not a significant factor in any activity. However, cooperative extension training for board members did have a positive correlation with the number of conservation contracts and a negative correlation with the quantity of trees sold by CDs. This research also found that organizations allocate more resources to water-quality projects when they have technical staff to perform some of the needed tasks to make water-quality projects successful.

Survey results demonstrate that few WMOs carry out

i) wildlife habitat projects;

ii) aquatic habitat projects; or

iii) potable water supply projects.

Because of the low number of non-zero values, statistical analysis did not produce significant results. Additional organizational evolution may be required before these activities become common among current WMOs.

Limitations of Study

The major limitation of this research is lack of observations. The response rate was relatively high at 48.1%. This provided 37 observations for statistical analysis; 60 observations were anticipated. A recommended form of analysis, MANOVA, uses a degree of freedom for every dependant and independent variable. This characteristic of MANOVA did not allow MANOVA analysis on intended variables.

Conservation districts, WDs, and WRDs are similar in a number of ways. However, their specializations differentiate the districts. This differentiation caused a large number of organizations to have no action in a number of analyzed activities. Dependant variables are difficult to predict when a large number of zero values for the dependant variables are present. Consequently, the large number of zero values for dependent variables complicated the statistical analysis.

Need for Further Research

This research focused on the adoption of water management activities. Further research on water management should expand beyond the confined focus of adoption studies. For example, cost-benefit analysis could be performed on these water management activities. The cost-benefit analysis should include the environmental effectiveness of activities, and all costs, such as: education/outreach, administrative burden, and implementation. This would identify water management activities that are environmentally and cost effective to implement.

Another suggestion for further research includes a detailed analysis of the institutional framework of local WMOs. The analysis should focus on the interactions of separate water management institutions and on their interactions with each other. This

could be expanded to describe an institutional framework that allows WMOs to work with each other to meet common basin-wide goals.

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APPENDIX A

Survey of Water Management Organizations in the Red River Basin

I would like to express my deepest gratitude for your time to complete this survey. Please answer each question completely, to the best of your knowledge, and follow directions for each question. In numerous questions it's stated to give an answer for the last three years. Please use the last three full fiscal years you have on record. Please feel free to comment in the margins if there is anything you think we should know about a question.

The following questions pertain to your organization's structure.

1. Does your organization hold regularly scheduled meetings? (Circle one)

A. No
B. Yes → If yes, approximately how many regularly scheduled meetings does your organization hold a year? _____

2. Does your organization hold special meetings? (Circle one)

A. No
B. Yes → If yes, approximately how many special meetings does your organization hold a year? _____

3. Does your organization employ staff? (Circle one)

A. No
B. Yes → If yes, Please indicate the approximate number of workers and the approximate number of hours per week for each kind.

	Workers	Total Hours/week
1. Administrative	_____	_____
2. Engineering/construction	_____	_____
3. Education/Outreach	_____	_____
4. Technical	_____	_____
6. Legal	_____	_____
7. Secretarial	_____	_____
8. Other_____	_____	_____

ID Number

4. Approximately what percentage of Staff workload is used on the following? (Fill in a percentage for each)

	Percentage
A. Education/public outreach	_____ %
B. Water-Quality Monitoring	_____ %
C. Test Plots	_____ %
D. Budgeted Projects	_____ %
E. Maintenance	_____ %
F. Tree planting	_____ %
G. Other services	_____ %
H. Project planning	_____ %
I. Working with contractors	_____ %
J. Meetings/Meeting Preparation	_____ %
K. Other	_____ %

5. Does your organization contract out work with private firms? (Circle one)

A. No
B. Yes → If yes, Please indicate the approximate dollar amount contracted for each work type.

	Dollars/year	
1. Administrative	_____	Dollars
2. Engineering	_____	Dollars
3. Education/Outreach	_____	Dollars
4. GIS	_____	Dollars
5. Limnologist	_____	Dollars
6. Legal	_____	Dollars
7. Secretarial	_____	Dollars
8. Technical: water quality	_____	Dollars
9. Technical: Range/Plants	_____	Dollars
10. Construction	_____	Dollars

6. Does your organization have a short-range water management plan (1-5 years)?

A. No
B. Yes → If yes, how often is it updated? (Circle one)

1. More than twice a year
2. Twice a year
3. Yearly
4. Less often than once a year

7. Does your organization have a long-range water management plan (6-25 years)?

A. No
B. Yes →

If yes, how often is it updated? (Circle one)

1. More than twice a year
2. Twice a year
3. Yearly
4. Less often than once a year

8. Does your organization take part in any joint-powers agreements? (Circle one)

A. No
B. Yes →

If yes, please list the joint-powers agreements that your organization is a part of

9. Please estimate expenditures your organization has made in budgeted projects over the last three years in the following categories. (If a project covers more than one category, please break up the project into the relevant categories.)

	# of Projects	$ Value
A. Water retention	_____	_____
B. Water movement (Ditches, culverts, and storm sewers)	_____	_____
C. Water-quality	_____	_____
D. Potable water supply	_____	_____
E. Aquatic habitat	_____	_____
F. Wildlife habitat	_____	_____
G. Recreation	_____	_____
H. Wetland restoration	_____	_____
I. Education/Outreach	_____	_____

10. Are there any ongoing studies being conducted by your organization? (Circle one)

A. No
B. Yes → If yes, please indicate the approximate number of each kind of study.

A. Water quality monitoring _____
B. Data collection other than water quality monitoring _____
C. Public opinion _____
D. Engineering _____

11. Does your organization own and maintain equipment? (Circle one)

A. No
B. Yes → If yes, please circle the equipment your organization maintains. (Circle all that apply)

1. Water monitoring equipment
2. Computers with GIS software
3. Tiller
4. Tractor
5. Mower
6. Tree planter
7. Grass drill
8. No till grain drill
9. ATV
10. Survey equipment

12. Does your organization provide rental equipment? (Circle one)

A. No
B. Yes →

If yes, please circle the equipment your organization rents out. (Circle all that apply)

1. Water monitoring equipment
2. Computers with GIS software
3. Tiller
4. Tractor
5. Mower
6. Tree planter
7. Grass drill
8. No till grain drill
9. ATV

The following questions pertain to your organizations activities.

13. Does your organization have easements to drainage ditches? (Circle one)

A. No
B. Yes →

If yes, approximately how many miles of drainage ditch easement are in your organizations district? _____

14. Does your organization own drainage ditches? (Circle one)

A. No
B. Yes →

If yes, approximately how many miles of drainage ditch does your organization own? _____

15. Does your organization perform regularly scheduled maintenance on all drainage ditches? (Circle one)

A. No
B. Yes →

If yes, how often does your organization perform regularly scheduled ditch maintenance? (Circle one)

A. More than once a year
B. Once a year
C. Less than once a year

16. Approximately how many miles of new or improved drainage ditch have been permitted by your organization in the last three years? _____

17. Approximately how many miles of proposed new or improved drainage ditch have been denied a permit by your organization in the last three years? _____

18. Does your organization perform/organize snagging and clearing efforts? (Circle one)

A. No
B. Yes → If yes, approximately how many snagging and clearing efforts were performed/organized by your organization in the last three years? _____

19. Has your organization considered stream bank stabilization/restoration? (Circle one)

A. No
B. Yes → If yes, approximately how many miles of stream bank has your organization used this practice on in the last three years? (Please fill in a number for each kind)

a. Tree Plantings _____
b. Rip Rap _____
c. Bio engineering _____
d. None

20. Does your organization sell trees? (Circle one)

A. No
B. Yes → If yes, approximately how many trees were sold in the last three years? _____

21. Does your organization offer tree-planting services? (Circle one)

A. No
B. Yes → If yes, approximately how many trees were planted in the last three years? _____

22. What maintenance does your organization perform on tree plantings? (Circle all that apply)

A. Weeding (Manual)
B. Tilling
C. Chemical application for weed control
D. None

23. Does your organization help fund landowners to participate in conservation practices? (Circle one)

A. No
B. Yes → If yes, approximately how many conservation contracts were signed with landowners and your organization in the last three years? _____

24. Does your organization help fund the installation of vegetative buffer/filter strips along natural riparian wetlands? (Circle one)

A. No
B. Yes → If yes, approximately how many acres of buffer/filter strips were funded by your organization in the last three years?
_____

25. Does your organization help fund the installation of non-obligative vegetative buffer/filter strips along drainage ditches? (Circle one)

A. No
B. Yes → If yes, approximately how many acres of buffer/filter strips were funded by your organizations in the last three years?
_____

26. Is your organization involved in the implementation of windbreak/shelterbelts? (Circle one)

A. No
B. Yes → If yes, approximately how many acres of windbreaks/shelterbelts have been installed primarily due to your organization in the last three years? _____

27. Does your organization help fund the installation of runoff holding ponds in feedlot operations? (Circle one)

A. No
B. Yes → If yes, approximately how many runoff holding ponds were funded by your organization in the last three years?

_____

28. Does your organization conduct educational workshops? (Circle one)

A. No
B. Yes → If yes, approximately how many educational workshops did your organization conduct in the last three years? _____

29. Does your organization conduct tours? (Circle one)

A. No
B. Yes → If yes, approximately how many tours were conducted by your organization in the last three years? _____

30. Does your organization sponsor visits to any conservation tillage demonstration sites? (Circle one)

A. No
B. Yes

31. Does your organization conduct board member tours? (Circle one)

A. No
B. Yes → If yes, approximately how tours and how many board members participated in tours conducted by your organization in the last three years?

a. Number of tours _____
b. Average number of board members per tour _____

32. Does your organization create/maintain recreational sites for the public? (Circle one)1

A. No

B. Yes → If yes, approximately how many recreational sites has your organization created in the last three years? _____

If yes, approximately how many recreational sites does your organization currently maintain? _____

33. Has your organization conducted activities to directly improve fish habitat? (Circle one)

A. No

B. Yes → If yes, approximately how many projects have been started by your organization to directly improve fish habitat in the last three years? _____

34. Does your organization help fund landowners/farmers to follow prescribed grazing practices? (Circle one)

A. No

B. Yes → If yes, approximately how many farmers have signed contracts with your organization to follow prescribed grazing practices in the last three years? _____

35. Is your organization directly or indirectly involved in research to asses the effectiveness of conservation tillage? (Circle one)

A. Yes

B. No

36. Does your organization help fund landowners to follow conservation tillage farming practices?

A. No

B. Yes → If yes, approximately how many acres of minimal-till contracts have been completed by your organization in the last 3 years?

_____

If yes, approximately how many acres of no-till contracts have been completed by your organization in the last 3 years?

_____

37. Does your organization collaborate with other water management organizations with budgeted projects? (Circle one)

A. No
B. Yes → If yes, approximately how many organizations did your organization collaborate with budgeted projects in the last three years? _____

38. Does your organization provide educational information? (Circle one

A. No
B. Yes → If yes, please circle all forms your organization uses to relay educational information. (Circle all that apply)

1. Newspaper advertisements
2. Newsletters
3. Personal contact
4. County fair booths/Farm shows
5. Meetings
6. Radio Advertisements
7. Regular newspaper column
8. Class room visits

39. Is educational information customized for each individual landowner? (Circle one)

A. No
B. Yes
C. Sometimes

40. Does your organization invite state, federal, or other local agents to meetings to discuss important matters? (Circle one)

A. No
B. Yes

41. Please circle the collaborating committees/organizations listed below that your organization directly contributes to. e.g. Staff time, funding, or data. (Circle all that apply)

A. International Red River Board (IRRB)
B. Aquatic Ecosystem Health (Committee of the IRRB)
C. Red River Basin Water-Quality Team
D. Red River Water Management Board
E. Red River Basin monitoring advisory committee
F. North Dakota Joint Water Resource Board
G. Flood Damage Reduction Technical Scientific Advisory Committee
H. County/Local Watershed Plans
I. Audubon Society
J. South Valley Initiative
K. Pembina River Basin Advisory Board
L. Annual Red River Basin Land and Water International Summit Conferences
M. Water-Quality Conference hosted by the RRBC
N. Mike 11 Main stem Modeling
O. RRBC Board Tours
P. Plan Implementation Committee
Q. Flood Damage Reduction Workgroup
R. Greenway on the Red
S. River Keepers
T. Roseau River International Watershed Taskforce
U. Roseau River Watershed Steering Committee
V. Public comment sessions for federal and state agencies
W. The Nature Conservancy
X. Clean Water Alliance

The following questions pertain to your organizations finances.

42. What were your organizations combined total revenues for the last three years?
$_____

43. Approximately what percentage of total revenues did your organization receive for each of the following in the last three years? (Fill in a percentage for each)

A. Organizations taxes	_____	%
B. County taxes	_____	%
C. Special assessments	_____	%
D. Loan	_____	%
E. Project funding grants	_____	%
F. Matching funds grants	_____	%
G. Operating funds grants	_____	%
H. State agencies	_____	%
I. Federal agencies	_____	%
J. Revenues from operations (other than tree planting)	_____	%
K. Tree planting (Site prep, tree planting, and matting)	_____	%
L. 319 funding	_____	%
M. Other	_____	%

44. What were your organizations combined total expenditures in the last three years?
$_____

45. Approximately what percentage of total expenditures did your organization spend in the last three years on the following? (Fill in a percentage for each)

A. Capital outlay	_____%
B. Water retention projects	_____%
C. Water movement projects (Ditches, culverts, and storm sewers)	_____%
D. Interest and Service charges	_____%
E. Recreational sites	_____%
F. Cost share funding to other organizations	_____%
G. In-house Staff	_____%
H. Outside contracts	_____%
I. Legal	_____%
J. Meetings	_____%
K. Other	_____%

46. What is the approximate dollar value of your organizations capital assets? (Fill in a dollar value for each)

A. Land	_____	Dollars
B. Facilities	_____	Dollars
C. Equipment	_____	Dollars

47. In the last three years, approximately how many requests did your organization make to outside sources to receive matching funds? _____

48. In the last three years, approximately how many requests did your organization make to outside sources to receive direct funding? (Matching funds requests do not count here) _____

49. In the last three years, approximately how many requests did your organization make to outside sources to receive 319 funding? _____

Survey of Water Management Organization Board Members in the Red River Basin

I would like to express my deepest gratitude for your time to complete this survey. Please answer each question completely, to the best of your knowledge, and follow directions for each question.

1. How did you become a board member? (Circle one)

A. Elected
B. Appointed
C. Other, please explain_____

2. How long have you served as a board member? _____

3. What is your primary occupation? (Circle one)

A. Private sector employee
B. Public sector employee
C. Farmer
D. Business Owner
E. Retired

4. What is your education level? (Circle one)

A. Some high school
B. High school or GED
C. Associates degree
D. Bachelors degree
E. Post graduate degree

5. Are you employed by a state agency? (Circle one)

A. No
B. Yes

6. Are you employed by a federal agency? (Circle one)

A. No
B. Yes

7. How many local, state, and federal government organizations do you belong to where you are a member of the decision making body? (Including the organization your filling this survey out for) _____

ID Number

8. Do you personally currently have any conservation contracts with a state or federal agency? (Circle one).

A. No
B. Yes →

If yes, please circle each type of conservation practice you currently have in a contract. (Circle all that apply.

1. Riparian buffer/filter strips
2. Prescribed grazing practices
3. Wetland restoration
4. Environmentally friendly feedlots
5. No/minimal tillage

9. What water management training have you had? (Circle all that apply)

A. State water management handbook
B. Other water management guide
C. Attended water management conferences
D. Cooperative extension training
E. University courses

10. What water management training would you like to have? (Circle all that apply)

A. State water management handbook
B. Other water management guide
C. Attended water management conferences
D. Cooperative extension training
E. University courses

11. Do new board members have a mandatory water management training course to attend? (Circle one)

1. No
2. Yes →

If no, would you like to see a mandatory water management training course for all new board members? (Circle one)

1. No
2. Yes

12. Who are your constituents? (Circle one)

A. Residents of your organizations jurisdiction
B. All landowners of your organizations jurisdiction
C. Farmers of your organizations jurisdiction
D. All water users of your organizations jurisdiction

13. What are the primary water resource concerns of your constituents? (Please number the top three with number one being the most important.)

A. Surface water-quality _____
B. Ground water-quality _____
C. Potable water supply _____
D. Water drainage _____
E. Recreation _____
F. Soil erosion _____
G. Flood mitigation _____
H. Droughts _____

14. Do your constituents feel there is a water-quality or upcoming water-quality problem in the Red River Basin? (Circle one)

A. No
B. Yes

15. Do your constituents feel there are excessive chemicals being transported into the Red River? (Circle One)

A. No
B. Yes → If yes, do your constituents feel it is their responsibility to help control the chemicals being transported into the Red River? (Circle one)

1. No
2. Yes

16. Do your constituents feel that more resources should be allocated to protect water-quality and fish habitat?

A. No
B. Yes

17. Do your constituents feel that more resources should be allocated to protect their property from periodic flood events? (Circle one)

A. No
B. Yes

18. Do your constituents feel that more resources should be allocated to protect communities from water shortages due to periodic drought? (Circle one)

A. No
B. Yes

19. Do your constituents feel that more resources should be allocated to construct/maintain recreational sites by your organization? (Circle one)

A. No
B. Yes

20. What do your constituents feel are the best tools to manage floodwaters? (Please number the top three with number one being the most important.)

Water retention reservoirs _____
Waffle Project _____
Diversions _____
Drain water as fast as possible _____
Restoration of Wetlands _____
Culvert sizing _____
Diking _____

21. Do your constituents feel your organization should be organized by watershed or political boundaries? (Circle one)

A. Watershed
B. Political boundaries

22. What do your constituents feel the most effective conservation practice is that pertains to water-quality? (Circle one)

A. Buffer strips
B. No till/minimal till
C. Prescribed grazing practices
D. Environmentally friendly feedlots

23. Do your constituents feel that additional funding is needed to increase financial compensation for conservation practices? (Circle one)

A. No
B. Yes

24. How often does the board you serve on meet? (Circle one)

A. Weekly
B. Twice a month
C. Monthly
D. Other

25. Who regularly attends board meetings? (Circle all that apply)

A. Urban residents
B. Farmers
C. Rural landowners
D. State personnel
E. Federal personnel
F. Watershed coordinator
G. District conservationist
H. Engineer
I. Legal
J. County extension agents
K. Mayors
L. County commissioners
M. Press
N. Members of local resource conservation groups
O. Employees of organization

26. Does the board you serve on feel there is enough collaboration between local water management organizations? (Circle one)

A. No
B. Yes

27. How involved is the board you serve on when it comes to working with other organizations to solve basin-wide problems? (Circle one)

A. Very involved
B. Involved
C. Neutral
D. Uninvolved
E. Very uninvolved
F. I don't know

28. Does the board you serve on think the media adequately cover the results of your board meetings?

A. No
B. Yes

29. What are the obstacles your district/organization faces in meeting its responsibilities? (Circle all that apply)

A. Insufficient funding
B. Insufficient staffing
C. Insufficient information
D. Insufficient regulatory authority
E. Lack of a central water management organization for the entire Red River Basin
F. Insufficient public concern about water management
G. No significant obstacles
E. Slow moving state and federal bureaucracy

30. Does the board you serve on take into account downstream affects when making decisions? (Circle one)

A. No
B. Yes

31. What state/federal organizations assist your water management organization? (Circle all that apply)

A. Board of water and soil resources
B. Minnesota pollution control agency
C. Department of natural resources
D. Environmental protection agency
E. Game and fish department
F. North Dakota Department of health
G. State water commission
H. NRCS
I. U.S. Fish and Wildlife Service
J. U.S. Forest Service

32. Does your organization try to receive input from people who do not attend meetings? (Circle one)

A. Yes
B. No

Letter to Individual Participants

NDSU NORTH DAKOTA STATE UNIVERSITY
Department of Agribusiness and Applied Economics
P.O. Box 5636
Fargo, ND 58105-5636

701.231.7441
Fax 701.231.7400
coa-econ@ndsuext.nodak.edu

Dear ***Organization Title, Participants Title, ***

I'm Craig Kritsky, a Masters degree Student in Agribusiness and Applied Economics at North Dakota State University. My thesis research is an analysis of the characteristics of local Water Management Organizations in the Red River Basin. I am conducting a survey in order to learn about the structure, activities, and finances of local watershed districts, conservation districts, water districts and tribal resource councils. The purpose of this research is to support efforts to improve water management. I greatly appreciate your cooperation in completing the enclosed questionnaire and returning it in the provided return envelope.

The enclosed questionnaire has seen a variety of changes from local water management staff like you. You might still run into some troubles while filling out the questionnaire, due to interpretation. If you have any questions while filling out the questionnaire, please call or e-mail me. My telephone number and e-mail address is 701-799-2929/c.kritsky@ndsu.edu

Keep in mind that the questionnaire is designed for four different types of water management organizations encompassing two states. There are a number of questions that might seem as if they are not directed towards your organization. Please answer these questions completely, to the best of your ability, and do not leave them blank.

As a token of appreciation I would like to offer you the enclosed NDSU pen to fill the questionnaire out with.

Thank you for your assistance.

Sincerely,

Craig C. Kritsky

Craig C. Kritsky

Institutional Review Board Letter

North Dakota State University
Fargo, North Dakota 58102
Department of Agribusiness and Applied Economics
Room 201D, Morrill Hall

November 28th, 2006

Dear Water Management Organization ***Participants Title***,

You are invited to participate in a research study of the analysis of local water management organizations in the Red River Basin being conducted by Craig Kritsky, Graduate Research Assistant (NDSU) and Dr. Robert Hearne, Professor (NDSU.)

The purpose of this research is to identify key characteristics of successful local water management organizations in the Red River Basin. This research may also support efforts to improve water management.

You will only be asked to fill out the enclosed survey and mail it back with the provided self addressed envelope. If some of your provided information is unclear, you may be contacted to clarify your responses.

The results from your enclosed questionnaire will be compiled together with the results of all other completed questionnaires. The dataset created from everyone's questionnaires will be used to perform statistical analysis to support formulated hypothesis.

If you choose to fill out the enclosed questionnaire, there are no perceived risks or discomforts to you.

By filling out the questionnaire, you are given the option to receive summarized results of this study. If you would like a summary of results sent to you, write "copy of results requested" along with your name and address on the back of the return envelope. Please do not write this information on the questionnaire itself.

You may be assured of complete confidentiality. The questionnaire has an identification number so that the research team can mark off who has completed the survey. Your name will never be placed on the questionnaire or used in any research paper. Your name and identification number will be stored separately from the dataset of responses. The dataset, which will contain information about your organization and responses that you have provided, will only be made available to Craig Kritsky, Dr. Robert Hearne, and future researchers supervised by Dr. Robert Hearne.

Data and records created by this project are owned by NDSU and the investigator. You may view information collected from you by making a written request to Dr Robert

Hearne. You may view only information collected from you, and not information collected about others participating in the project. Collected data will be kept by Dr Hearne for at least five years.

Your participation is voluntary and you may quit at anytime. Your decision weather or not to participate will not affect your present or future relationship with NDSU or any other benefits to which you are otherwise entitled. If you decide to participate, you are free to withdraw your consent and to discontinue at anytime.

You should feel free to ask questions now or at anytime during the study. If you have any questions about this study, you can contact Craig Kritsky, 701-799-2929, c.kritsky@ndsu.edu and/or Robert Hearne, 701-231-6494, robert.hearne@ndsu.edu. If you have any questions about the rights of human research participants, or wish to report a research related problem or injury, contact the NDSU IRB office at 701-231-8908 or ndsu.irb@ndsu.edu.

Sincerely,

Craig C. Kritsky

APPENDIX B

Survey Data's Descriptive Statistics

Table 20. Watershed Districts

Activity	Mean	Standard Deviation	Minimum	Maximum
# of Regularly Scheduled Meetings /Year	17.8	5.8	12	24
# of special Meetings /Year	9.6	9.4	3	25
# of Administration Employees	1.0	0.7	0	2
Staff Administration Hours /Week	42.0	28.4	0	80
# of Engineering/Construction Workers	0.6	0.9	0	2
Staff Engineering/Construction Hours /Week	24.4	36	0	80
# of Education/Outreach Workers	0.0	0.0	0	0
Staff Education/Outreach Hours /Week	0.0	0.0	0	0
# of Technical Workers	1.5	1.1	0	3
Staff Technical Hours /Week	38.2	28.7	0	80
# of Legal Workers	0.2	0.4	0	1
Staff Legal Hours /Week	0.9	2.0	0	5
# of Secretarial Workers	0.6	0.5	0	1
Staff Secretarial Hours /Week	22.8	21.1	0	42
# of Other Workers	0.6	0.9	0	2
Staff Other Hours /Week	12.0	17.9	0	40
% of Staff Workload on Education/Public Outreach	4.9	5.6	0	14
% of Staff Workload on Water-Quality Monitoring	9.8	11.4	0	28
% of Staff Workload on Test Plots	0.1	0.2	0	1
% of Staff Workload on Budgeted Projects	18.6	19.5	0	50
% of Staff Workload on Maintenance	4.1	6.4	0	15
% of Staff Workload on Tree Planting	0.0	0.0	0	0
% of Staff Workload on Other Services	5.2	11.6	0	26
% of Staff Workload on Project Planning	10.6	9.6	0	25
% of Staff Workload Working with Contractors	13.6	15.3	0	40
% of Staff Workload Meetings/Meeting Preparation	7.2	7.7	0	20
% of Staff Workload Other	6.0	10.7	0	25
Contracted Work for Administrative Purposes	21826.0	41361.0	0	95000
Contracted Work for Engineering Purposes	240360.0	349741.0	9881	856610
Contracted Work for Education/Outreach Purposes	5490.8	7912.4	0	17354
Contracted Work for GIS Purposes	4000	8944.3	0	20000
Contracted Work for Limnologist purposes	0.0	0.0	0	0
Contracted Work for Legal Purposes	52812.0	40325.0	2000	106374
Contracted Work for Secretarial Purposes	23098.0	32098.0	0	65488
Contracted Work for Technical Water-Quality Purposes	20000.0	44721.0	0	100000
Contracted Work for Technical Range/Plants Purposes	0	0	0	0

Table 20. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
Contracted Work for Construction Purposes	6399734.0	11729984.0	0	27081266
# of Jointed Powers Agreements	1.2	1.6	0	4
# of Water Retention Projects *	5.1	4.8	1	12
Dollar Value of Water Retention Projects *	3321956.0	4106847.0	128000	9714072
# of Water Movement Projects *	4.4	5.3	0	12
Dollar Value of Water Movement Projects *	312488.0	285568.0	13811	631164
# of Water-Quality Projects *	2.8	4.8	0	10
Dollar Value of Water-Quality Projects *	108252.0	134304.0	0	314754
# of Potable Water Supply Projects *	0.0	0.0	0	0
Dollar Value of Potable Water Supply Projects *	0.0	0.0	0	0
# of Aquatic Habitat Projects *	0.6	1.0	0	2
Dollar Value of Aquatic Habitat Projects *	109000.0	141872.0	0	330158
# of Wildlife Habitat Projects *	0.2	0.4	0	1
Dollar Value of Wildlife Habitat Projects *	400.0	894.4	0	2000
# of Recreation Projects *	0.2	0.4	0	1
Dollar Value of Recreation Projects *	651.2	1456.13	0	3256
# of Wetland Restoration Projects *	1.2	1.8	0	4
Dollar value of Wetland Restoration Projects *	52134.2	72310.4	0	170000
# of Education/Outreach Projects *	1.8	1.7	0	4
Dollar Value of Education/Outreach Projects *	10797.0	19074.0	0	44674
# of Ongoing Water Quality Monitoring Studies	2.4	3.4	0	8
# of Data Collection other than Water Quality Monitoring Studies	2.2	0.8	1	3
# of Public Opinion Studies	0.0	0.0	0	0
# of Engineering Studies	1.2	2.2	0	5
Miles of Drainage Ditch Easements in District	130.9	139.4	0	300
Miles of Drainage Ditch Owned by District	103.3	179.0	0	310
# of Miles of New or Improved Drainage Ditch Permitted *	10.3	19.8	0	40
# of Miles of New or Improved Drainage Ditch Denied A Permit *	1.3	2.5	0	5
# of Snagging and Clearing Efforts Performed *	5.2	5.8	0	15
Miles of Tree Plantings for Stream Bank Stabilization/Restoration *	0.2	0.4	0	1
Miles of Rip Rap Laid for Stream Bank Stabilization/Restoration *	0.2	0.3	0	1
Miles of Biological Engineering for Stream Bank Stabilization/Restoration *	0.0	0.0	0	0
# of Trees Sold *	0.0	0.0	0	0
# of Trees Planted *	0.0	0.0	0	0
# of Conservation Contracts Signed with Landowners *	0.8	1.8	0	4
Acres of Buffer/Filter Strips Along Natural Riparian Wetlands Funded *	1.8	4.0	0	1
Acres of Buffer/Filter Strips Along Drainage Ditches Funding *	4.4	9.8	0	22

Table 20. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
Acres of Windbreaks/Shelterbelts Installed Due to Districts Effort *	0.0	0.0	0	0
# of Runoff Holding Ponds Funded By Districts *	0.0	0.0	0	0
# of Educational Workshops Conducted by Districts *	1.0	1.4	0	3
# of Tours Conducted by Districts *	2.7	2.5	0	5
# of Board Member Tours Conducted by Districts *	5.0	3.2	2	9
Average Number of Board Member Attendants per Tour	5.4	1.5	3	7
# of Recreational Sites Created *	0.0	0.0	0	0
# of Recreational Sites Currently Maintained by Districts	0.0	0.0	0	0
# of Projects to Directly Improve Fish Habitat *	1.2	1.3	0	3
Acres of Minimal Till Contracts Completed *	0.0	0.0	0	0
Acres of No Till Contracts Completed *	0.0	0.0	0	0
# of Organizations Districts Collaborated with *	5.6	2.3	3	8
Districts Total Revenues	5921569.0	5028381.0	982442	11534653
% of Revenues Received from Organizations Taxes	31.0	29.0	0	62
% of Revenues Received from County Taxes	1.6	3.5	0	8
% of Revenues Received from Special Assessments	13.0	15.3	0	39
% of Revenues Received from Loans	0.4	0.9	0	2
% of Revenues Received from Project Funding Grants	0.4	0.5	0	1
% of Revenues Received from Matching Funds Grants	13.4	15.3	0	33
% of Revenues Received from Operating Funds Grants	0.0	0.0	0	0
% of Revenues Received from State Agencies	24.8	42.5	0	99
% of Revenues Received from Federal Agencies	1.6	2.0	0	5
% of Revenues Received from Operations Other	0.0	0.0	0	0
% of Revenues Received from Tree Planting	0.0	0.0	0	0
% of Revenues Received from 319 Funding	0.2	0.4	0	1
% of Revenues Received from Other Sources	13.6	18.0	0	40
Districts Total Expenditures	6657953.4	5283260.0	1145877	12354046.8
% of Expenditures from Capital Outlays	6.0	8.8	0	19
% of Expenditures from Water Retention Projects	42.8	23.6	19	73
% of Expenditures from Water Movement Projects	14.2	16.9	1	43
% of Expenditures from Interest and Service Charges	0.0	0.0	0	0
% of Expenditures from Recreational Sites	0.0	0.0	0	0
% of Expenditures from Cost Share Funding to Other Organizations	5.8	12.4	0	28
% of Expenditures from In House Staff	13.2	12.8	0	33

Table 20. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
% of Expenditures from Outside Contracts	4.0	6.2	0	15
% of Expenditures from Legal Activities	2.1	1.4	1	4
% of Expenditures from Meetings	0.8	0.8	0	2
% of Expenditures from Other Activities	9.3	17.0	0	39.5
Districts Land Value in Dollars	1092611.0	1061128.0	0	2346600
Districts Facilities Value in Dollars	68010.0	104461.0	0	236950
Districts Equipments Value in Dollars	171721.2	165813.8	25000	365256
# of Requests to Outside Sources to Receive Matching Funds *	7.6	6	0	15
# of Requests to Outside Sources to Receive Direct Funding *	3.8	4.55	0	11
# of Requests to Outside Sources to Receive 319 Funding *	1.2	1.3	0	3
* In the last three years				

Table 21. Water Resource Districts

Activity	Mean	Standard Deviation	Minimum	Maximum
# of Regularly Scheduled Meetings /Year	17.8	13.2	6	50
# of special Meetings /Year	4.7	4.3	1	12
# of Administration Employees	0.1	0.3	0	1
Staff Administration Hours /Week	1.6	5.0	0	15
# of Engineering/Construction Workers	0.1	0.4	0	1
Staff Engineering/Construction Hours /Week	0.6	1.8	0	5
# of Education/Outreach Workers	0.0	0.0	0	0
Staff Education/Outreach Hours /Week	0.0	0.0	0	0
# of Technical Workers	0.0	0.0	0	0
Staff Technical Hours /Week	0.0	0.0	0	0
# of Legal Workers	0.1	0.4	0	1
Staff Legal Hours /Week	0.8	1.8	0	5
# of Secretarial Workers	0.8	0.7	0	2
Staff Secretarial Hours /Week	11.1	16.3	0	44
# of Other Workers	0.8	1.8	0	5
Staff Other Hours /Week	5.3	13.3	0	40
% of Staff Workload on Education/Public Outreach	2.8	3.6	0	10
% of Staff Workload on Water Quality Monitoring	2.6	4.3	0	10
% of Staff Workload on Test Plots	0.0	0.0	0	0

Table 21. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
% of Staff Workload on Budgeted Projects	11.7	18	0	50
% of Staff Workload on Maintenance	8.9	17	0	50
% of Staff Workload on Tree Planting	0.1	0.2	0	.5
% of Staff Workload on Other Services	0.6	1.7	0	5
% of Staff Workload on Project Planning	7.2	10	0	25
% of Staff Workload Working with Contractors	8.3	9	0	25
% of Staff Workload Meetings/Meeting Preparation	36.7	28.7	0	90
% of Staff Workload Other	6.3	16.5	0	50
Contracted Work for Administrative Purposes	0.0	0.0	0	0
Contracted Work for Engineering Purposes	29944.0	57091.0	0	175000
Contracted Work for Education/Outreach Purposes	25.0	75.0	0	225
Contracted Work for GIS Purposes	0.0	0.0	0	0
Contracted Work for Limnologist purposes	0.0	0.0	0	0
Contracted Work for Legal Purposes	4111.1	6570.7	0	20000
Contracted Work for Secretarial Purposes	0.0	0.0	0	0
Contracted Work for Technical Water Quality Purposes	555.6	1666.7	0	5000
Contracted Work for Technical Range/Plants Purposes	0.0	0.0	0	0
Contracted Work for Construction Purposes	98277.8	205830.2	0	625000
# of Jointed Powers Agreements	1.7	1.5	0	5
# of Water Retention Projects *	0.2	0.7	0	2
Dollar Value of Water Retention Projects *	33.3	100.0	0	300
# of Water Movement Projects *	6.3	5.0	0	13
Dollar Value of Water Movement Projects *	71815.6	106085.0	0	335000
# of Water Quality Projects *	0.3	0.7	0	2
Dollar Value of Water Quality Projects *	6.3	17.7	0	50
# of Potable Water Supply Projects *	0.2	0.7	0	2
Dollar Value of Potable Water Supply Projects *	5.6	16.7	0	50
# of Aquatic Habitat Projects *	0.0	0.0	0	0
Dollar Value of Aquatic Habitat Projects *	1.1	3.3	0	10
# of Wildlife Habitat Projects in the Last Three	0.2	0.7	0	2
Dollar Value of Wildlife Habitat Projects *	16.6	50.0	0	150
# of Recreation Projects *	0.7	1.7	0	5
Dollar Value of Recreation Projects *	3377.8	9984.2	0	30000
# of Wetland Restoration Projects *	0.7	1.7	0	5
Dollar value of Wetland Restoration Projects *	1166.7	3316.6	0	10000
# of Education/Outreach Projects *	0.4	0.7	0	2
Dollar Value of Education/Outreach Projects in the Last	1147.2	3320.7	0	10000
# of Ongoing Water Quality Monitoring Studies	0.4	0.7	0	2

Table 21. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
# of Data Collection other than Water Quality Monitoring Studies	0.3	0.7	0	2
# of Public Opinion Studies	0.25	0.7	0	2
# of Engineering Studies	1.3	1.8	0	4
Miles of Drainage Ditch Easements in District	107.0	244.5	0	750
Miles of Drainage Ditch Owned by District	105.0	247.5	0	750
# of Miles of New or Improved Drainage Ditch Permitted *	7.0	8.0	0	20
# of Miles of New or Improved Drainage Ditch Denied A Permit *	0.0	0.0	0	0
# of Snagging and Clearing Efforts Performed *	1.2	1.3	0	3
Miles of Tree Plantings for Stream Bank Stabilization/Restoration *	0.0	0.1	0	0
Miles of Rip Rap Laid for Stream Bank Stabilization/Restoration *	0.0	0.1	0	0
Miles of Biological Engineering for Stream Bank Stabilization/Restoration *	0.1	0.3	0	1
# of Trees Sold *	0.0	0.0	0	0
# of Trees Planted *	0.0	0.0	0	0
# of Conservation Contracts Signed with Landowners *	0.1	0.3	0	1
Acres of Buffer/Filter Strips Along Natural Riparian Wetlands Funded *	2.7	6.7	0	20
Acres of Buffer/Filter Strips Along Drainage Ditches Funding *	0.0	0.0	0	0
Acres of Windbreaks/Shelterbelts Installed Due to Districts Effort *	0.0	0.0	0	0
# of Runoff Holding Ponds Funded By Districts *	0.0	0.0	0	0
# of Educational Workshops Conducted by Districts *	0.0	0.0	0	0
# of Tours Conducted by Districts *	0.2	0.7	0	2
# of Board Member Tours Conducted by Districts *	0.3	0.5	0	1
Average Number of Board Member Attendants per Tour	0.8	1.2	0	3
# of Recreational Sites Created *	0.0	0.0	0	0
# of Recreational Sites Currently Maintained by Districts	0.3	0.7	0	2
# of Projects to Directly Improve Fish Habitat *	0.1	0.3	0	1
Acres of Minimal Till Contracts Completed in the Last	0.0	0.0	0	0
Acres of No Till Contracts Completed *	0.0	0.0	0	0
# of Organizations Districts Collaborated with *	1.0	1.3	0	4
Districts Total Revenues	565689.2	1159212.9	5000	3400000

Table 21. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
% of Revenues Received from Organizations Taxes	0.0	0.0	0	0
% of Revenues Received from County Taxes	73.9	36.9	0	100
% of Revenues Received from Special Assessments	13.3	32.4	0	98
% of Revenues Received from Loans	1.2	3.7	0	11
% of Revenues Received from Project Funding Grants	0.0	0.0	0	0
% of Revenues Received from Matching Funds Grants	0.0	0.0	0	0
% of Revenues Received from Operating Funds Grants	0.0	0.0	0	0
% of Revenues Received from State Agencies	6.1	17.6	0	53
% of Revenues Received from Federal Agencies	0.1	0.3	0	1
% of Revenues Received from Operations Other	2.2	6.7	0	20
% of Revenues Received from Tree Planting	0.0	0.0	0	0
% of Revenues Received from 319 Funding	0.0	0.0	0	0
% of Revenues Received from Other Sources	3.1	4.7	0	10
Districts Total Expenditures	494161.6	833203.8	60000	2500000
% of Expenditures from Capital Outlays	0.0	0.0	0	0
% of Expenditures from Water Retention Projects	0.0	0.0	0	0
% of Expenditures from Water Movement Projects	50.2	24.8	30	98.5
% of Expenditures from Interest and Service Charges	1.1	3.3	0	10
% of Expenditures from Recreational Sites	7.8	17.1	0	50
% of Expenditures from Cost Share Funding to Other Organizations	10.1	15.4	0	36
% of Expenditures from In House Staff	3.7	5.9	0	15
% of Expenditures from Outside Contracts	6.7	14.1	0	40
% of Expenditures from Legal Activities	5.2	5.4	0	15
% of Expenditures from Meetings	11.7	11.5	0	30
% of Expenditures from Other Activities	4.6	11.3	0	34
Districts Land Value in Dollars	84375.0	234634.0	0	665000
Districts Facilities Value in Dollars	0	0	0	0
Districts Equipments Value in Dollars	3250.0	6984.7	0	20000
# of Requests to Outside Sources to Receive Matching Funds *	1.6	2.0	0	5
# of Requests to Outside Sources to Receive Direct Funding *	1.3	3.3	0	10
# of Requests to Outside Sources to Receive 319 Funding *	0.2	0.4	0	1
* In the last three years				

Table 22. Conservation Districts

Activity	Mean	Standard Deviation	Minimum	Maximum
# of Regularly Scheduled Meetings /Year	12.5	1.8	12	20
# of special Meetings /Year	1.6	1.4	0	6
# of Administration Employees	0.7	0.4	0	1
Staff Administration Hours /Week	28.7	16.7	0	40
# of Engineering/Construction Workers	0.1	0.3	0	1
Staff Engineering/Construction Hours /Week	3.5	11.5	0	40
# of Education/Outreach Workers	0.2	0.4	0	1
Staff Education/Outreach Hours /Week	8	15.5	0	40
# of Technical Workers	1.1	0.9	0	3
Staff Technical Hours /Week	36.3	29	0	110
# of Legal Workers	0.0	0.0	0	0
Staff Legal Hours /Week	0.0	0.0	0	0
# of Secretarial Workers	0.6	0.5	0	2
Staff Secretarial Hours /Week	21.1	20.7	0	64
# of Other Workers	0.2	0.5	0	2
Staff Other Hours /Week	6.6	14.8	0	40
% of Staff Workload on Education/Public Outreach	11.5	8.8	0	30
% of Staff Workload on Water Quality Monitoring	7.9	11.2	0	40
% of Staff Workload on Test Plots	0.1	0.3	0	1
% of Staff Workload on Budgeted Projects	13.7	22.8	0	100
% of Staff Workload on Maintenance	2.7	3.9	0	10
% of Staff Workload on Tree Planting	20.9	17.1	0	75
% of Staff Workload on Other Services	7.4	12	0	40
% of Staff Workload on Project Planning	15.6	9.6	0	30
% of Staff Workload Working with Contractors	2.5	3.8	0	10
% of Staff Workload Meetings/Meeting Preparation	9.5	5.4	0	20
% of Staff Workload Other	6.8	7.6	0	25
Contracted Work for Administrative Purposes	0.0	0.0	0	0
Contracted Work for Engineering Purposes	869.6	4170.3	0	20000
Contracted Work for Education/Outreach Purposes	0.0	0.0	0	0
Contracted Work for GIS Purposes	0.0	0.0	0	0
Contracted Work for Limnologist purposes	0.0	0.0	0	0
Contracted Work for Legal Purposes	0.0	0.0	0	0
Contracted Work for Secretarial Purposes	113.0	520.8	0	2500
Contracted Work for Technical Water Quality Purposes	0.0	0.0	0	0
Contracted Work for Technical Range/Plants Purposes	0.0	0.0	0	0
Contracted Work for Construction Purposes	1087.0	5212.9	0	25000
# of Jointed Powers Agreements	1.7	2.7	0	11

Table 22. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
# of Water Retention Projects *	1.0	4.1	0	20
Dollar Value of Water Retention Projects *	575095.7	2708852.2	0	13000000
# of Water Movement Projects *	1.8	7.7	0	37
Dollar Value of Water Movement Projects *	2079.35	8535.4	0	40625
# of Water Quality Projects *	4.0	8.0	0	30
Dollar Value of Water Quality Projects *	35967.0	73417.2	0	250000
# of Potable Water Supply Projects *	0.7	3.5	0	17
Dollar Value of Potable Water Supply Projects *	199.3	956.0	0	4585
# of Aquatic Habitat Projects *	0.1	0.6	0	3
Dollar Value of Aquatic Habitat Projects *	3182.6	15263.2	0	73200
# of Wildlife Habitat Projects in the Last Three	1.4	3.9	0	15
Dollar Value of Wildlife Habitat Projects *	7272.7	22505.4	0	100000
# of Recreation Projects *	0.0	0.2	0	1
Dollar Value of Recreation Projects *	14347.8	68809.7	0	330000
# of Wetland Restoration Projects *	0.5	1.8	0	8
Dollar value of Wetland Restoration Projects *	5227.3	21407.5	0	100000
# of Education/Outreach Projects *	1.2	2.5	0	10
Dollar Value of Education/Outreach Projects in the Last	1883.1	3535.8	0	10000
# of Ongoing Water Quality Monitoring Studies	0.7	1.3	0	6
# of Data Collection other than Water Quality Monitoring Studies	1	3.5	0	17
# of Public Opinion Studies	0.0	0.0	0	0
# of Engineering Studies	0.0	0.2	0	1
Miles of Drainage Ditch Easements in District	0.0	0.0	0	0
Miles of Drainage Ditch Owned by District	0.0	0.0	0	0
# of Miles of New or Improved Drainage Ditch Permitted *	0.0	0.0	0	0
# of Miles of New or Improved Drainage Ditch Denied A Permit *	0.0	0.0	0	0
# of Snagging and Clearing Efforts Performed *	0.0	0.0	0	0
Miles of Tree Plantings for Stream Bank Stabilization/Restoration *	0.7	2.0	0	9
Miles of Rip Rap Laid for Stream Bank Stabilization/Restoration *	0.0	0.1	0	1
Miles of Biological Engineering for Stream Bank Stabilization/Restoration *	0.0	0.1	0	1
# of Trees Sold *	66827.8	58144.0	0	250000
# of Trees Planted *	77188.3	76247.1	7500	278000
# of Conservation Contracts Signed with Landowners *	27.5	26.5	0	94
Acres of Buffer/Filter Strips Along Natural Riparian Wetlands Funded *	16.4	63.9	0	300

Table 22. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
Acres of Buffer/Filter Strips Along Drainage Ditches Funding *	1.1	3.1	0	10
Acres of Windbreaks/Shelterbelts Installed Due to Districts Effort *	107.0	254.0	60	1200
# of Runoff Holding Ponds Funded By Districts *	0.5	1.2	0	4
# of Educational Workshops Conducted by Districts *	5.4	3.8	0	12
# of Tours Conducted by Districts *	1.4	1.6	0	6
# of Board Member Tours Conducted by Districts *	0.8	1.1	0	3
Average Number of Board Member Attendants per Tour	1.3	1.9	0	5
# of Recreational Sites Created *	0.1	0.4	0	2
# of Recreational Sites Currently Maintained by Districts	0.2	0.4	0	1
# of Projects to Directly Improve Fish Habitat *	0.5	1.1	0	5
Acres of Minimal Till Contracts Completed in the Last	208.4	708.5	0	3000
Acres of No Till Contracts Completed *	91.0	294.2	0	1000
# of Organizations Districts Collaborated with *	2.4	2.6	0	9
Districts Total Revenues	553817.6	378107.3	46000	1414000
% of Revenues Received from Organizations Taxes	0.0	0.0	0	0
% of Revenues Received from County Taxes	26.3	18.8	0	57
% of Revenues Received from Special Assessments	0.3	1.2	0	5
% of Revenues Received from Loans	0.9	3.75	0	15
% of Revenues Received from Project Funding Grants	4.9	8.6	0	15
% of Revenues Received from Matching Funds Grants	1.9	4.2	0	15
% of Revenues Received from Operating Funds Grants	5.9	11.8	0	35
% of Revenues Received from State Agencies	11.3	13.7	0	45
% of Revenues Received from Federal Agencies	2.3	3.9	0	10
% of Revenues Received from Operations Other	13.0	15.5	0	50
% of Revenues Received from Tree Planting	24.5	13.7	0	50
% of Revenues Received from 319 Funding	5.9	16.4	0	60
% of Revenues Received from Other Sources	2.4	3.4	0	10
Districts Total Expenditures	497072.7	336945.3	50000	1267500
% of Expenditures from Capital Outlays	13.0	23.1	0	91
% of Expenditures from Water Retention Projects	0.8	2.5	0	10

Table 22. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
% of Expenditures from Water Movement Projects	0.7	2.3	0	9
% of Expenditures from Interest and Service Charges	1.6	4.0	0	14
% of Expenditures from Recreational Sites	0.3	0.8	0	3
% of Expenditures from Cost Share Funding to Other Organizations	3.7	9.3	0	35
% of Expenditures from In House Staff	44.9	20.7	2	80
% of Expenditures from Outside Contracts	0.1	0.3	0	1
% of Expenditures from Legal Activities	0.5	0.7	0	2
% of Expenditures from Meetings	5.2	5.1	0	20
% of Expenditures from Other Activities	28.8	24.6	0	65
Districts Land Value in Dollars	6920.0	16591.3	0	65000
Districts Facilities Value in Dollars	17881.3	34318.2	0	135000
Districts Equipments Value in Dollars	42017.0	41052.5	4000	145247
# of Requests to Outside Sources to Receive Matching Funds *	2.1	2.9	0	8
# of Requests to Outside Sources to Receive Direct Funding *	2.5	2.3	0	6
# of Requests to Outside Sources to Receive 319 Funding *	1.1	1.8	0	7
* In the last three years				

Table 23. All Organizations

Activity	Mean	Standard Deviation	Minimum	Maximum
# of Regularly Scheduled Meetings /Year	14.4	7.0	6	50
# of special Meetings /Year	3.5	4.8	0	25
# of Administration Employees	0.6	0.5	0	2
Staff Administration Hours /Week	23.8	20.9	0	80
# of Engineering/Construction Workers	0.19	0.5	0	2
Staff Engineering/Construction Hours /Week	5.6	16.9	0	80
# of Education/Outreach Workers	0.15	0.4	0	1
Staff Education/Outreach Hours /Week	5.0	12.8	0	40
# of Technical Workers	0.9	1.0	0	3
Staff Technical Hours /Week	28.0	29.0	0	110
# of Legal Workers	0.1	0.2	0	1
Staff Legal Hours /Week	0.3	1.1	0	5
# of Secretarial Workers	0.6	0.6	0	2

Table 23. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
Staff Secretarial Hours /Week	18.4	19.7	0	64
# of Other Workers	0.42	1.0	0	5
Staff Other Hours /Week	7.9	15.3	0	40
% of Staff Workload on Education/Public Outreach	8.5	8.3	0	30
% of Staff Workload on Water Quality Monitoring	8.0	12.1	0	50
% of Staff Workload on Test Plots	0.1	0.3	0	1
% of Staff Workload on Budgeted Projects	13.7	20.6	0	100
% of Staff Workload on Maintenance	4.5	9.2	0	50
% of Staff Workload on Tree Planting	12.7	16.80	0	75
% of Staff Workload on Other Services	5.3	10.5	0	40
% of Staff Workload on Project Planning	12.8	10.0	0	30
% of Staff Workload Working with Contractors	5.3	8.3	0	40
% of Staff Workload Meetings/Meeting Preparation	15.6	18.5	0	90
% of Staff Workload Other	6.5	10.3	0	50
Contracted Work for Administrative Purposes	2924.4	15513.0	0	95000
Contracted Work for Engineering Purposes	39376.0	142733.0	0	856610
Contracted Work for Education/Outreach Purposes	860.0	3280.2	0	17354
Contracted Work for GIS Purposes	526.3	3244.4	0	20000
Contracted Work for Limnologist purposes	0.0	0.0	0	0
Contracted Work for Legal Purposes	7923.9	22401.0	0	106374
Contracted Work for Secretarial Purposes	3107.6	13181.0	0	65488
Contracted Work for Technical Water Quality Purposes	3421.1	16608.0	0	100000
Contracted Work for Technical Range/Plants Purposes	0.0	0.0	0	0
Contracted Work for Construction Purposes	866004.5	4432926.0	0	4660406
# of Jointed Powers Agreements	1.6	2.2	0	11
# of Water Retention Projects *	1.2	3.8	0	20
Dollar Value of Water Retention Projects *	785191.5	2692603.0	0	13000000
# of Water Movement Projects *	2.8	7.0	0	37
Dollar Value of Water Movement Projects *	59384.3	148741.0	0	631164
# of Water Quality Projects *	3.0	6.6	0	30
Dollar Value of Water Quality Projects *	66182.9	186487.0	0	1050000
# of Potable Water Supply Projects *	0.5	2.8	0	17
Dollar Value of Potable Water Supply Projects *	122.0	743.6	0	4585
# of Aquatic Habitat Projects *	0.2	0.7	0	3
Dollar Value of Aquatic Habitat Projects *	17929.2	60897.5	0	330158
# of Wildlife Habitat Projects in the Last Three	1.0	3.2	0	15
Dollar Value of Wildlife Habitat Projects *	24652.7	123807.0	0	750000
# of Recreation Projects *	0.2	0.8	0	5

Table 23. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
Dollar Value of Recreation Projects *	9569.9	53607.8	0	330000
# of Wetland Restoration Projects *	0.6	1.7	0	8
Dollar value of Wetland Restoration Projects *	10437.1	33664.9	0	170000
# of Education/Outreach Projects *	1.1	2.1	0	10
Dollar Value of Education/Outreach Projects in the Last	3301.5	8098.1	0	44674
# of Ongoing Water Quality Monitoring Studies	0.9	1.7	0	8
# of Data Collection other than Water Quality Monitoring Studies	1	2.9	0	17
# of Public Opinion Studies	0.1	0.3	0	2
# of Engineering Studies	0.5	1.2	0	5
Miles of Drainage Ditch Easements in District	42.7	136.3	0	750
Miles of Drainage Ditch Owned by District	34.9	135.4	0	750
# of Miles of New or Improved Drainage Ditch Permitted *	2.7	7.9	0	40
# of Miles of New or Improved Drainage Ditch Denied A Permit *	0.2	0.9	0	5
# of Snagging and Clearing Efforts Performed *	1.6	4.4	0	23
Miles of Tree Plantings for Stream Bank Stabilization/Restoration *	0.4	1.6	0	9
Miles of Rip Rap Laid for Stream Bank Stabilization/Restoration *	0.0	0.1	0	1
Miles of Biological Engineering for Stream Bank Stabilization/Restoration *	0.0	0.2	0	1
# of Trees Sold *	66760.7	169111.0	0	1000000
# of Trees Planted *	72679.0	175293.0	0	1000000
# of Conservation Contracts Signed with Landowners *	19.0	27.0	0	94
Acres of Buffer/Filter Strips Along Natural Riparian Wetlands Funded *	10.6	49.4	0	300
Acres of Buffer/Filter Strips Along Drainage Ditches Funding *	1.3	4.2	0	22
Acres of Windbreaks/Shelterbelts Installed Due to Districts Effort *	64.0	199.1	0	1200
# of Runoff Holding Ponds Funded By Districts *	0.3	1.0	0	4
# of Educational Workshops Conducted by Districts *	3.5	3.9	0	12
# of Tours Conducted by Districts *	1.3	1.7	0	6
# of Board Member Tours Conducted by Districts *	1.4	2.1	0	9
Average Number of Board Member Attendants per Tour	2.1	2.5	0	8
# of Recreational Sites Created *	0.1	0.3	0	2

Table 23. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
# of Recreational Sites Currently Maintained by Districts	0.2	0.5	0	2
# of Projects to Directly Improve Fish Habitat *	0.5	1.0	0	5
Acres of Minimal Till Contracts Completed in the Last	123.9	551.0	0	3000
Acres of No Till Contracts Completed *	54.0	229.0	0	1000
# of Organizations Districts Collaborated with *	2.6	2.6	0	9
Districts Total Revenues	1458008.4	2785405.3	5000	11534653
% of Revenues Received from Organizations Taxes	5.0	15.7	0	62
% of Revenues Received from County Taxes	35.3	35.5	0	100
% of Revenues Received from Special Assessments	6.1	18.8	0	98
% of Revenues Received from Loans	0.9	3.3	0	15
% of Revenues Received from Project Funding Grants	2.6	6.6	0	32
% of Revenues Received from Matching Funds Grants	3.1	7.8	0	33
% of Revenues Received from Operating Funds Grants	3.0	8.9	0	35
% of Revenues Received from State Agencies	11.6	21.4	0	99
% of Revenues Received from Federal Agencies	4.7	18.0	0	100
% of Revenues Received from Operations Other	7.4	13.0	0	50
% of Revenues Received from Tree Planting	12.6	15.8	0	50
% of Revenues Received from 319 Funding	3.1	11.6	0	60
% of Revenues Received from Other Sources	4.3	8.5	0	40
Districts Total Expenditures	1598246.6	3128481.1	50000	12354046
% of Expenditures from Capital Outlays	7.5	17.7	0	91
% of Expenditures from Water Retention Projects	7.5	18.4	0	73
% of Expenditures from Water Movement Projects	17.8	26.5	0	98.5
% of Expenditures from Interest and Service Charges	1.1	3.4	0	14
% of Expenditures from Recreational Sites	2.5	9.9	0	50
% of Expenditures from Cost Share Funding to Other Organizations	5.8	11.7	0	36
% of Expenditures from In House Staff	27.4	25.0	0	80
% of Expenditures from Outside Contracts	3.0	8.4	0	40
% of Expenditures from Legal Activities	2.1	3.6	0	15
% of Expenditures from Meetings	6.5	8.0	0	30
% of Expenditures from Other Activities	18.3	22.4	0	65
Districts Land Value in Dollars	215236.0	584820.0	0	2346600
Districts Facilities Value in Dollars	20975.0	51859.0	0	236950

Table 23. (Continued)

Activity	Mean	Standard Deviation	Minimum	Maximum
Districts Equipments Value in Dollars	60857.3	96919.5	0	365256
# of Requests to Outside Sources to Receive Matching Funds *	2.8	3.9	0	15
# of Requests to Outside Sources to Receive Direct Funding *	2.9	4.0	0	17
# of Requests to Outside Sources to Receive 319 Funding *	0.8	1.5	0	7
* In the last three years				

Table 24. Board Members from All Organizations

Attribute	Frequency
# Of Elected Board Members	75
# Of Appointed Board Members	106
Experience Of Board Members From 1-5 Years	53
Experience Of Board Members From 6-10 Years	60
Experience Of Board Members From 11-20 Years	46
Experience Of Board Members Greater Than 20 Years	23
# Of Private Sector Employee Board Members	5
# Of Public Sector Employee Board Members	8
# Of Board Members Who Are Farmers	129
# Of Board Members Who Are Business Owners	10
# Of Board Members Who Are Retired	30
# Of Board Members With Some High School	5
# Of Board Members With High School Degree Or GED	76
# Of Board Members With Associates Degree	35
# Of Board Members With Bachelors Degree	53
# Of Board Members With Post Graduate Degree	13
# Of Board Members Employed By A State Agency	11
# Of Board Members Employed By A Federal Agency	4
# Of Other Governmental Organizations Board Members Belong To	105
# Of Board Members That Have Riparian Buffer/Filter Strip Contracts	38
# Of Board Members That Have Prescribed Grazing Practices Contracts	17
# Of Board Members That Have Wetland Restoration Contracts	15
# Of Board Members That Have Environmentally Friendly Feedlot Contracts	7
# Of Board Members That Have No/Minimal Till Contracts	32
# Of Board Members That Have A State Water Management Handbook	89
# Of Board Members That Have Some Other Water Management Handbook	58
# Of Board Members That Attend Water Management Conferences	109

Table 24. (Continued)

Attribute	Frequency
# Of Board Members That Have Taken Cooperative Extension Training Pertaining To Water Management	29
# Of Board Members That Have Taken University Courses Pertaining To Water Management	23
# Of Board Members That Would Like To Have A State Water Management Hand Book	36
# Of Board Members That Would Like To Have Some Other Water Management Handbook	33
# Of Board Members That Would Like To Attend Water Management Conferences	51
# Of Board Members That Would Like To Participate In Cooperative Extension Training Pertaining To Water Management	37
# Of Board Members That Would Like To Take University Courses Pertaining To Water Management	13
# Of New Board Members That Had A Water Management Training Courses To Attend	3
# Of Board Members That Would Like To See A Mandatory Water Management Training Course	82
# Of Board Members Who Feel Residents Of Their District Are Their Constituents	69
# Of Board Members Who Feel All Landowners Of Their District Are Their Constituents	67
# Of Board Members Who Feel Farmers Of Their District Are Their Constituents	18
# Of Board Members Who Feel All Water Users Of Their District Are Their Constituents	24
# Of Board Members Who Feel Their Constituents' Primary Water Resource Concern Is Surface Water Quality	16
# Of Board Members Who Feel That Their Constituents Feel More Resources Should Be Allocated To Protect Their Property From Periodic Flood Events	80
# Of Board Members Who Feel That Their Constituents Feel More Resources Should Be Allocated To Protect Communities From Water Shortages Due To Period Drought	43
# Of Board Members Who Feel That Their Constituents Feel More Resources Should Be Allocated To Construct/Maintain Recreational Sites	74
# Of Board Members Who Feel Their Constituents Feel That Water Retention Reservoirs Are The Best Tool To Manage Flood Waters	4
# Of Board Members Who Feel Their Constituents Feel That The Waffle Project Is The Best Tool To Manage Flood Waters	15
# Of Board Members Who Feel Their Constituents Feel That Diversions Are The Best Tool To Manage Flood Waters	24
# Of Board Members Who Feel Their Constituents Feel That Draining Water As Fast As Possible Is The Best Tool To Manage Flood Waters	16
# Of Board Members Who Feel Their Constituents Feel That Restoration Of Wetlands Is The Best Tool To Manage Flood Waters	36
# Of Board Members Who Feel Their Constituents Feel That Culvert Sizing Is The Best Tool To Manage Flood Waters	8
# Of Board Members Who Feel Their Constituents Feel That Diking Is The Best Tool To Manage Flood Waters	105
# Of Board Members Who Feel Their Constituents Would Like Their Organization Organized By Watershed	71
# Of Board Members Who Feel That Their Constituents Feel That Buffer Strips Are The Most Effective Conservation Practice For Water Quality	72

Table 24. (Continued)

Attribute	Frequency
# Of Board Members Who Feel That Their Constituents Feel That No Till/Minimal Till Are The Most Effective Conservation Practice For Water Quality	8
# Of Board Members Who Feel That Their Constituents Feel That Prescribed Grazing Practices Are The Most Effective Conservation Practice For Water Quality	16
# Of Board Members Who Feel That Their Constituents Feel That Environmentally Friendly Feedlots Are The Most Effective Conservation Practice For Water Quality	148
# Of Board Members Who Feel Their Constituents Feel That Additional Funding Is Needed To Increase Financial Compensation For Conservation Practices	10
# Of Board Members Whose Board Meets Weekly	16
# Of Board Members Whose Board Meets Twice A Month	151
# Of Board Members Whose Board Meets Monthly	25
# Of Board Members That See Urban Residents Regularly Attend Meetings	84
# Of Board Members That See Farmers Regularly Attend Meetings	60
# Of Board Members That See Rural Landowners Regularly Attend Meetings	60
# Of Board Members That See State Personnel Regularly Attend Meetings	59
# Of Board Members That See Federal Personnel Regularly Attend Meetings	45
# Of Board Members That See Watershed Coordinators Regularly Attend Meetings	104
# Of Board Members That See District Conservationists Regularly Attend Meetings	53
# Of Board Members That See Engineers Regularly Attend Meetings	45
# Of Board Members That See Legal Council Regularly Attend Meetings	39
# Of Board Members That See County Extension Agents Regularly Attend Meetings	8
# Of Board Members That See Mayors Regularly Attend Meetings	63
# Of Board Members That See County Commissioners Regularly Attend Meetings	10
# Of Board Members That See The Press Regularly Attend Meetings	37
# Of Board Members That See Members Of Local Resource Conservation Groups Regularly Attend Meetings	105
# Of Board Members That See Employees Of The Organization Regularly Attend Meetings	128
# Of Board Members Who Feel The Board They Serve On Feels There Is Enough Collaboration Between Local Water Management Organizations	48
# Of Board Members That Feel The Board They Serve On Is Very Involved With Other Organizations To Solve Basin-wide Problems	114
# Of Board Members That Feel The Board They Serve On Is Involved With Other Organizations To Solve Basin-wide Problems	12
# Of Board Members That Feel The Board They Serve On Is Neutral With Other Organizations To Solve Basin-wide Problems	3
# Of Board Members That Feel The Board They Serve On Is Uninvolved With Other Organizations To Solve Basin-wide Problems	3
# Of Board Members That Feel The Board They Serve On Is Very Uninvolved With Other Organizations To Solve Basin-wide Problems	108
# Of Board Members Who Feel The Board They Serve On Feels That The Media Adequately Covers Their Board Meetings	113
# Of Board Members Who Feel Insufficient Funding Is An Obstacle In Meeting Their Responsibilities	

Table 24. (Continued)

Attribute	Frequency
# Of Board Members Who Feel Insufficient Staffing Is An Obstacle In Meeting Their Responsibilities	24
# Of Board Members Who Feel Insufficient Information Is An Obstacle In Meeting Their Responsibilities	12
# Of Board Members Who Feel Insufficient Regulatory Authority Is An Obstacle In Meeting Their Responsibilities	16
# Of Board Members Who Feel The Lack Of A Central Water Management Organization For The Red River Basin Is An Obstacle In Meeting Their Responsibilities	23
# Of Board Members Who Feel Insufficient Public Concern About Water Management Is An Obstacle In Meeting Their Responsibilities	51
# Of Board Members Who Feel Slow Moving State And Federal Bureaucracy Is An Obstacle In Meeting Their Responsibilities	101
# Of Board Members Who Feel There Are No Significant Obstacles To Meeting Their Responsibilities	27
# Of Board Members That Feel The Board They Serve On Takes Into Account Downstream Effects When Making Decisions	175
# Of Board Members Whose Organization Receives Assistance From The Board Of Water And Soil Resources	98
# Of Board Members Whose Organization Receives Assistance From The Minnesota Pollution Control Agency	57
# Of Board Members Whose Organization Receives Assistance From The Department Of Natural Resources	84
# Of Board Members Whose Organization Receives Assistance From The Environmental Protection Agency	47
# Of Board Members Whose Organization Receives Assistance From The Game And Fish Department	77
# Of Board Members Whose Organization Receives Assistance From The North Dakota Department Of Health	48
# Of Board Members Whose Organization Receives Assistance From The State Water Commission	67
# Of Board Members Whose Organization Receives Assistance From The Natural Resource Conservation Service	154
# Of Board Members Whose Organization Receives Assistance From The U.S. Fish And Wildlife Service	78
# Of Board Members Whose Organization Receives Assistance From The U.S. Forest Service	38
# Of Board Members Whose Organization Tries To Receive Input From People Who Do Not Attend Board Meetings.	165

APPENDIX C

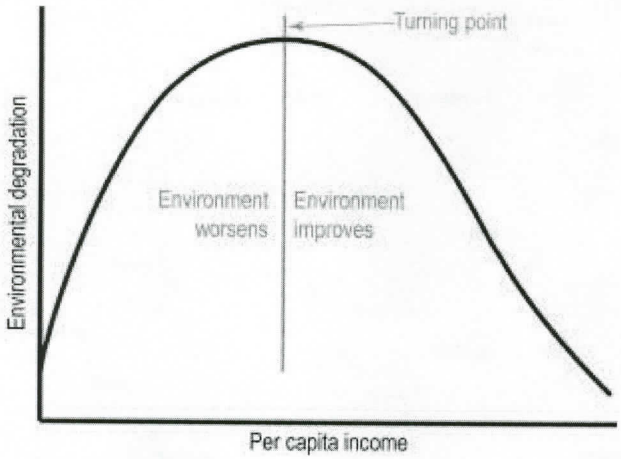

Figure 1. Environmental Kuznets Curve.

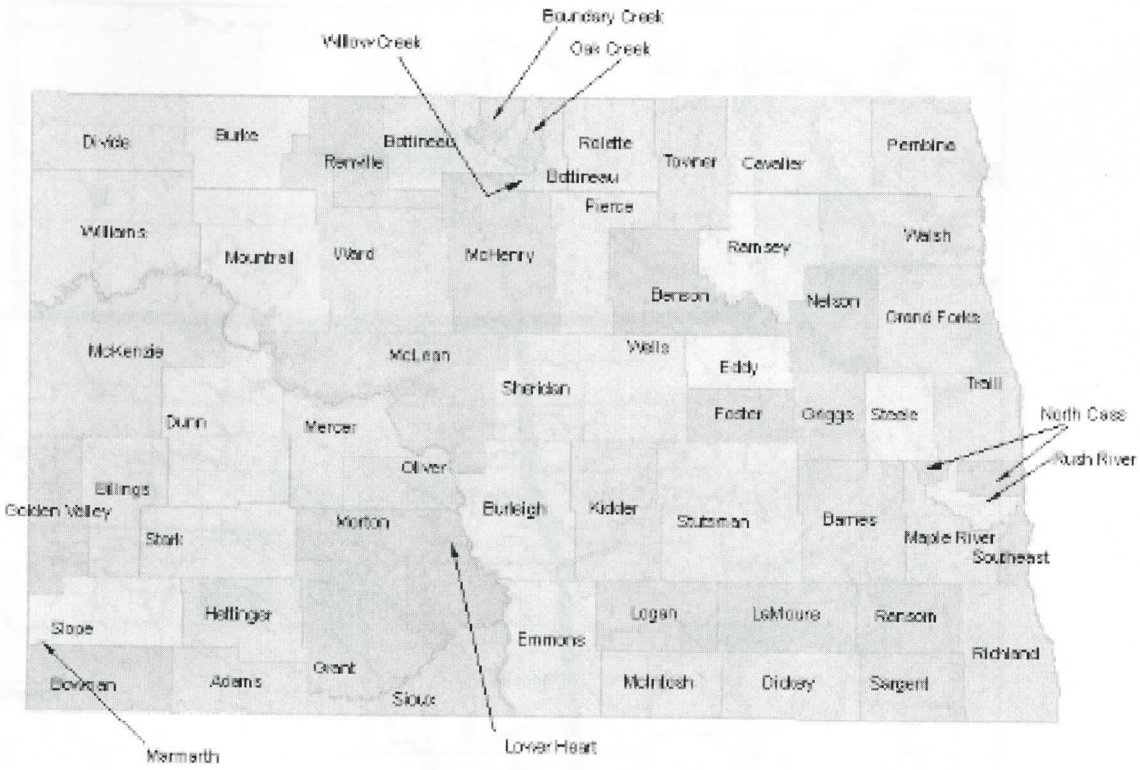

Figure 2. Map of North Dakota Water Resource Districts.

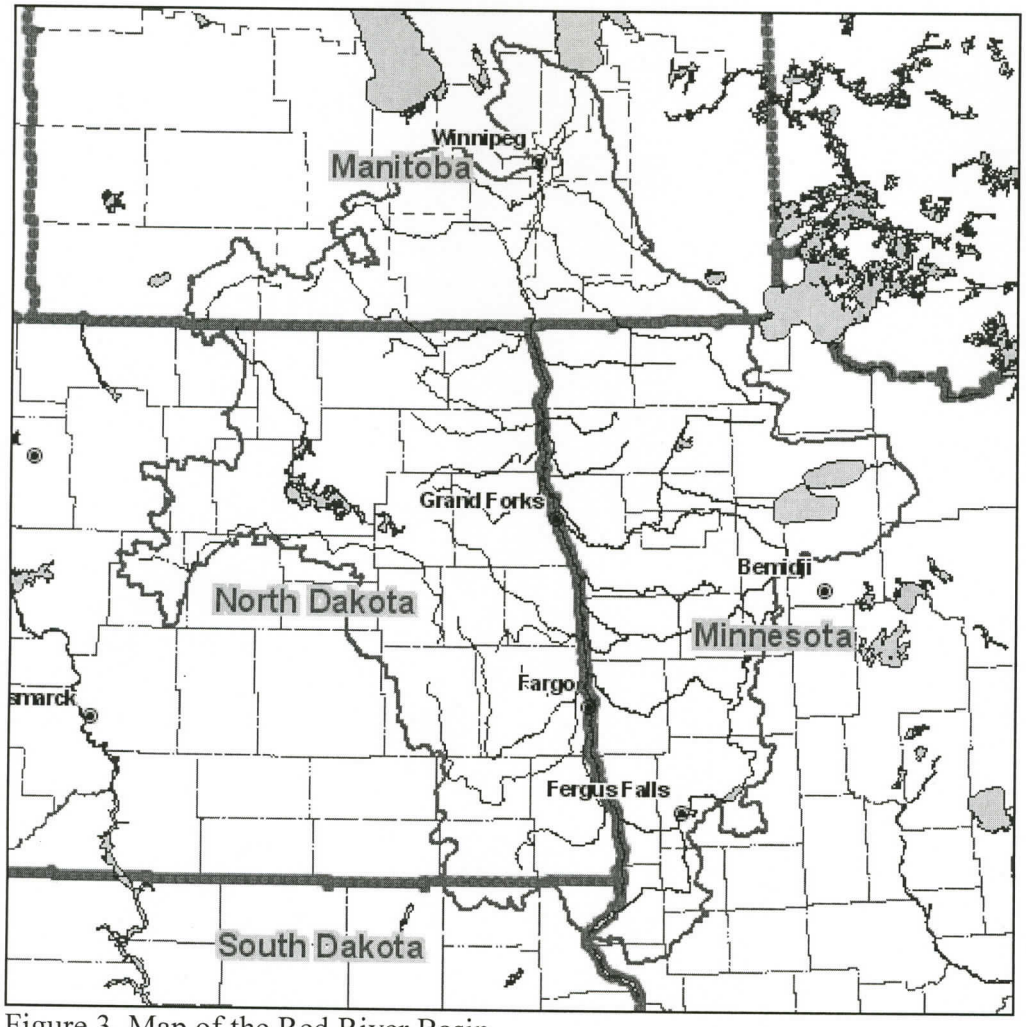

Figure 3. Map of the Red River Basin.