Upper Elkhorn Natural Resources District

Groundwater Management Plan

Prepared by the Upper Elkhorn NRD
Staff & Board of Directors

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES
-continued-

Figure *Page*

LIST OF TABLES

INTRODUCTION

Background

Nebraska is blessed with an abundance of high quality groundwater. In fact, it is estimated that nearly 2 billion acre-feet of usable groundwater underlies nearly the entire state (UNL Conservation & Survey Division, 1986). The importance of this resource for Nebraska is reflected in the fact that approximately 84% of public water supplies come from groundwater (Exner and Spalding, 1990). In addition, groundwater is also used for many other purposes including irrigation, industrial purposes, wildlife habitat, and recreation.

Degradation of this precious resource has been a growing problem for the past several decades. Continued widespread use of pesticides and fertilizers coupled with poor management practices has resulted in the contamination of groundwater supplies. There is a growing public concern since many of these agrichemicals and fertilizers are known carcinogens or can have serious non-cancerous effects on the human body. Contamination of our groundwater also reduces the reservoir of usable groundwater, creating more intensive competition and possible conflict over this resource. Clean-up of contaminated groundwater or drilling new wells costs time, money, and a considerable amount of effort.

Environmental concerns are not the only considerations. Economic issues are also important. The detection of these agrichemicals and fertilizers in groundwater supplies suggests a lack of efficient management practices in place to prevent loss. As a result,

much time, money, and effort can be wasted. Again, clean-up costs can be very high, especially for smaller communities and rural households which often have limited budgets. Detection of agrichemicals and fertilizers in the groundwater indicates a need for management practices to address both environmental and economic issues and insure future sustainability of groundwater resources.

With the passage of the Groundwater Management Act in 1975, the State of Nebraska took a step towards addressing groundwater issues. This legislation provided for examination of groundwater problems, primarily quantity, and delegated authority to the local governmental level through the Natural Resources Districts (NRDs). In 1984, LB 1106, the Groundwater Management and Protection Act (GWMPA), was passed by the Nebraska Legislature which required NRDs to develop and submit district-specific groundwater management plans to the Nebraska Department of Water Resources (NDWR) for approval. The focus of this act was also directed towards groundwater quantity. The portion of this act pertaining to NRDs is listed in Appendix A.

Over the past several years, the primary issue concerning groundwater has shifted from quantity to quality. To address the ever-increasing problem of groundwater quality degradation, LB 51 was enacted in 1991. This piece of legislation required NRDs to specifically address groundwater quality issues in their management plans and submit revised plans to NDWR for approval by July 1, 1993. This approval date was extended to January 1, 1996 via the passage of LB 480. Specific areas which must be addressed as directed by LB 51 include: levels and sources of groundwater contamination; groundwater goals; long-term solutions to prevent levels of contamination from

becoming too high and reduce high levels sufficiently to eliminate health hazards; and practices recommended to stabilize, reduce, and prevent the occurrence, increase, or spread of groundwater contamination.

The Upper Elkhorn Natural Resources District (UENRD) has developed this Groundwater Management Plan (GWMP) to comply with the requirements of LB 1106 (the GWMPA) and LB 51. This plan is a dynamic, evolving document which will be amended or enhanced as circumstances dictate. Water resource management has and will continue to be an integral part of the UENRD's commitment to protecting, enhancing, and utilizing the natural resources of the District.

General Document Format

The format of the UENRD's Groundwater Management Plan follows the framework suggested by the UNL Conservation and Survey Division (1984) in their publication, *Handbook for the Preparation of Groundwater Management Plans*. The GWMP is divided into eight sections as well as appendices and references. The sections are: Physiography & Hydrogeologic Characterization; Groundwater Monitoring & Inventory; Land Use & Contamination Source Inventory; Groundwater Use & Demand; Identification of Critical Areas for Protection; Groundwater Goals & Objectives; Groundwater Programs & Practices; and Plan Evaluation & Assessment.

Many sources have contributed to the data and technical information presented in this plan including, but not limited to, state and federal agencies, private consultants, local producers, and the District's on-going monitoring programs. Some areas of the

District have limited information available at this time. However, as monitoring programs evolve and expand, new data and technical information will be incorporated into the District's GWMP. Sample collection and analysis is performed by qualified individuals and laboratories. Information presented is deemed reliable.

PHYSIOGRAPHY & HYDROGEOLOGIC CHARACTERIZATION

General Area Description

The UENRD encompasses approximately 3,000 square miles (1,920,000 acres) of the Elkhorn River Basin within four counties: all of Antelope County except the town of Tilden, 60 percent of Holt County from the Elkhorn River south, 60 percent of Rock County, and the northern 25 percent of Wheeler County. The delineation of the District is illustrated in Figure 1.

The majority of the UENRD can be characterized as agricultural, with few incorporated communities. According to 1990 census figures, the District has a population of approximately 23,000 persons, with the largest community, O'Neill, having a population of 3,852 persons (U.S. Census Bureau, 1990). All population centers within the District having a population of 1,000 persons or greater are located adjacent to or within several miles of the Elkhorn River.

The Elkhorn River Basin

The Elkhorn River, a tributary of the Platte River, rises in Rock County and flows generally east-southeast to Cuming County where it veers to a generally south-southeast direction which it follows to its confluence with the Platte River in northern Sarpy County. The river has a total valley length of approximately 335 miles, and a basin area of 7,000 square miles (4,480,000 acres). The Elkhorn River has an inherent tendency to meander since there are few natural deterrents to migration. This tendency accounts for

the fact that the river is approximately 35 % longer than its valley. Several oxbow lakes are visible throughout the Elkhorn River Valley, indicating former channels that the river has now abandoned (Bentall et. al., 1971).

Surface elevations in the Elkhorn River Basin range from 2,700 to 1,100 feet above Mean Sea Level (Figure 2). Elevations generally decrease moving southeast through the basin. In the portion of the Elkhorn River Basin found within the UENRD, elevations range from 2,700 feet above Mean Sea Level in western Rock County to 1,600 feet above Mean Sea Level in northern and central Antelope County.

Principal tributaries in the UENRD include the South Fork (333 square miles), and the North Fork (861 square miles). Several secondary tributaries also feed the Elkhorn River including Holt Creek, Dry Creek, Cache Creek, Clearwater Creek, and Cedar Creek. The Elkhorn River is fed from overland runoff and groundwater seepage its entire length.

Historically, several stream gauging stations have been established at various locations along the Elkhorn River and tributaries to measure water discharge. However, not all data is currently available, so only published records are presented in this GWMP. At the Ewing gauging station located near the juncture of the Elkhorn River and the South Fork, annual mean discharge for the water year 1994 (October 1993-September 1994) was 244 cubic feet per second (cfs). The highest daily mean flow was 1300 cfs during the month of March and the lowest daily mean was 80 cfs during August. The highest flows typically occur during the Spring months when precipitation and runoff (including snowmelt runoff) are greatest, whereas lowest flows generally occur during the

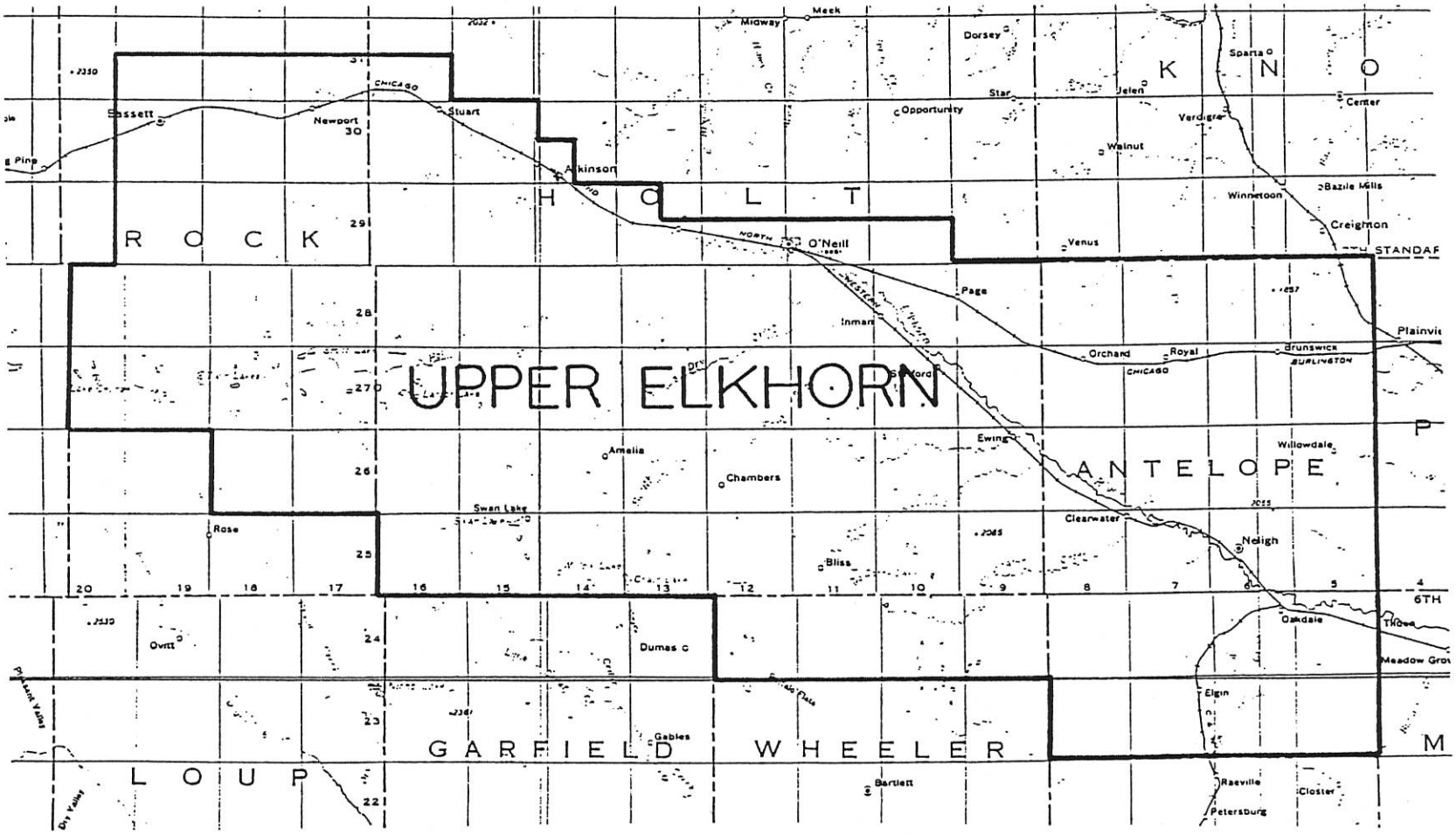


Figure 1. The Upper Elkhorn Natural Resources District.

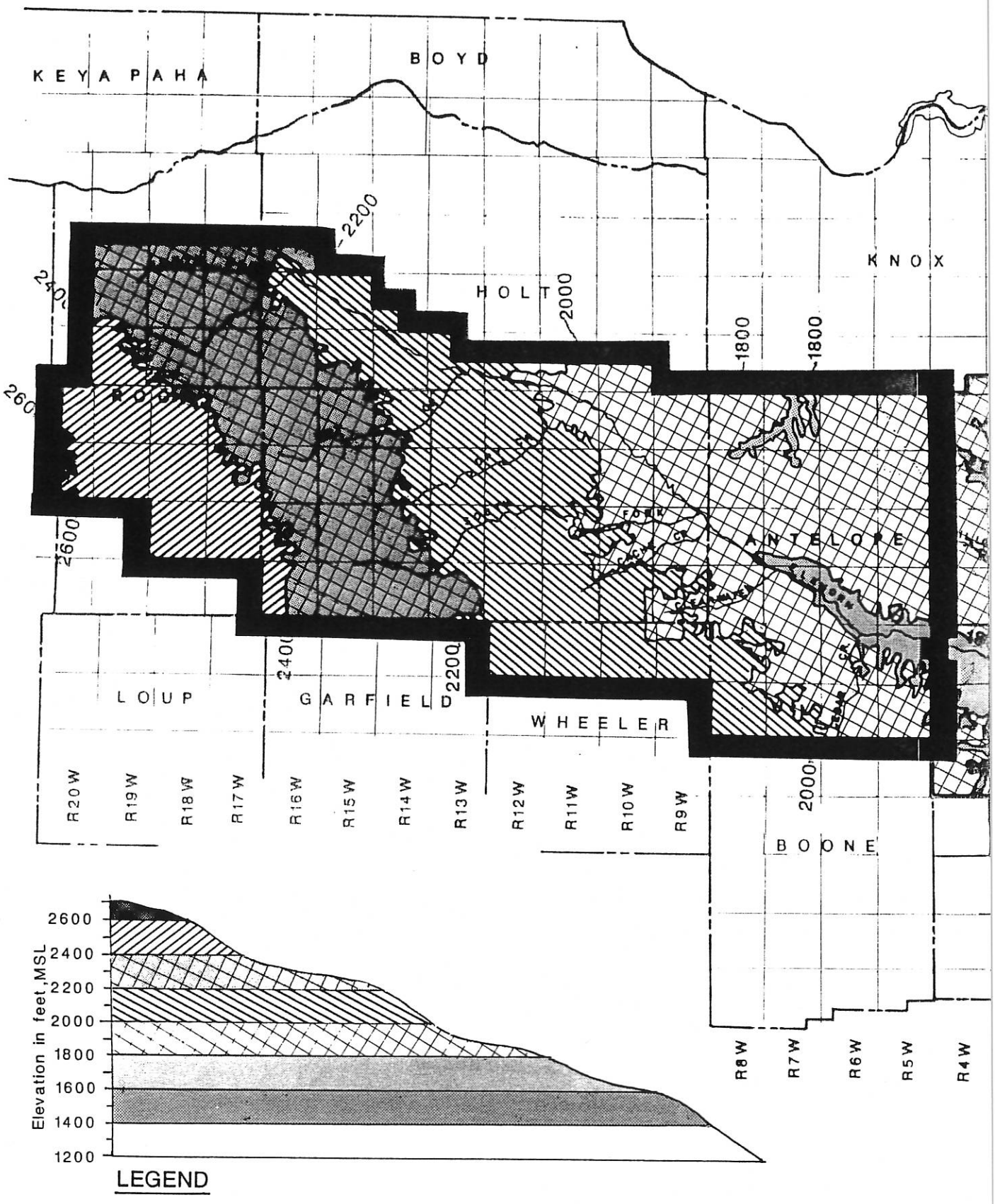


Figure 2. Topographic Relief Map.

drier months when irrigation pumping and crop water use is highest. Annual mean discharge for the water years 1947-1994 was 187 cfs, while daily mean flow ranged from 5.2 to 6700 cfs (U.S. Geological Survey, 1994). Currently, the Ewing gauging station is the only operational gauging station with data available. Further downstream at the Neligh gauging station, the mean annual discharge for the water years 1931-1993 was 313 cfs, while the daily mean flow ranged from 12 to 12,600 cfs (U.S. Geological Survey, 1993). Upstream from the Ewing gauging station near Atkinson, the mean annual for the water years 1982-1991 was 95.4 cfs with the mean daily discharge ranging from 1.1 to 2,500 cfs (U.S. Geological Survey, 1991). Flow at each gauging station is quite variable from year to year and season to season. As the data show, the Elkhorn River has the potential for high discharge rates. Along with the natural meandering tendency of the river, high flows can potentially cause severe erosion and flooding problems.

Climate

The climate of the Elkhorn River Basin is transitional between the humid east and the semi-arid western plains. The UENRD lies within a belt of dry, subhumid conditions. Conditions are favorable for the raising of livestock and the growing of both feed and grain crops. Generally, the spring months are cool with considerable precipitation, while the summers are hot and relatively dry. Autumn is generally pleasant with occasional rains, and winters are cold with significant snowfall.

Average annual precipitation ranges from approximately 21 inches/year in the northwestern corner of Rock County to 25 inches/year in the southeastern corner of

Antelope County (Figure 3). Normally, 65 to 67 percent of annual precipitation occurs during the growing season between May and September. The average number of frost-free days is approximately 160 with an average annual temperature of 50° F (Bentall et. al, 1971). July is generally the warmest month in the UENRD with an average mean temperatures in the mid to upper 70's (° F), while January is generally the coldest averaging in the upper teens to low 20's (° F). Soil temperature lags behind air temperature by approximately a month with the highest temperatures occurring in late July or August and the lowest in February (Bentall et. al., 1971).

Soils

The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), has published soil surveys for all counties making up the UENRD. These soil surveys give a detailed description of soil types and characteristics. A brief description of general soil types and characteristics is presented in this GWMP. For a more detailed description and maps, refer to the NRCS (SCS) soil surveys.

The majority of soils in Rock County within the UENRD are found in the Valentine-Elsmore-Tryon and Els-Valentine-Loup associations (Figure 4). Slopes are nearly level to very steep, and can be either poorly or excessively-drained. These soils are sandy soils that have formed on bottomlands, sand ridges, and in sandhill valleys. Holt County soils are mainly the Els-Valentine-Loup association, but the southwestern corner of the county has soils in the Valentine-Elsmore-Tryon association. Again, these soils are sandy soils. The portion of Wheeler County within the UENRD has Els-Valentine-Loup

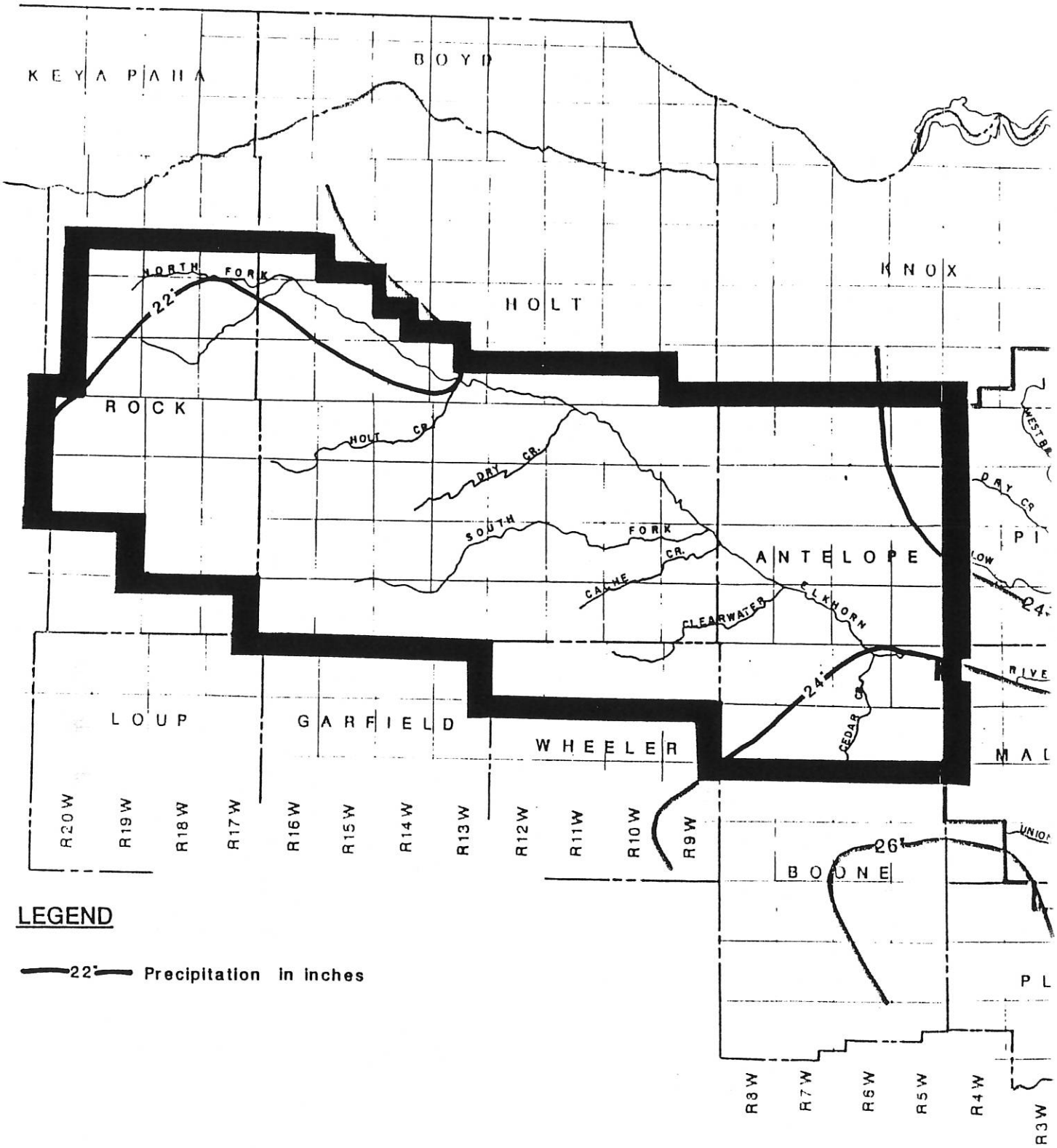
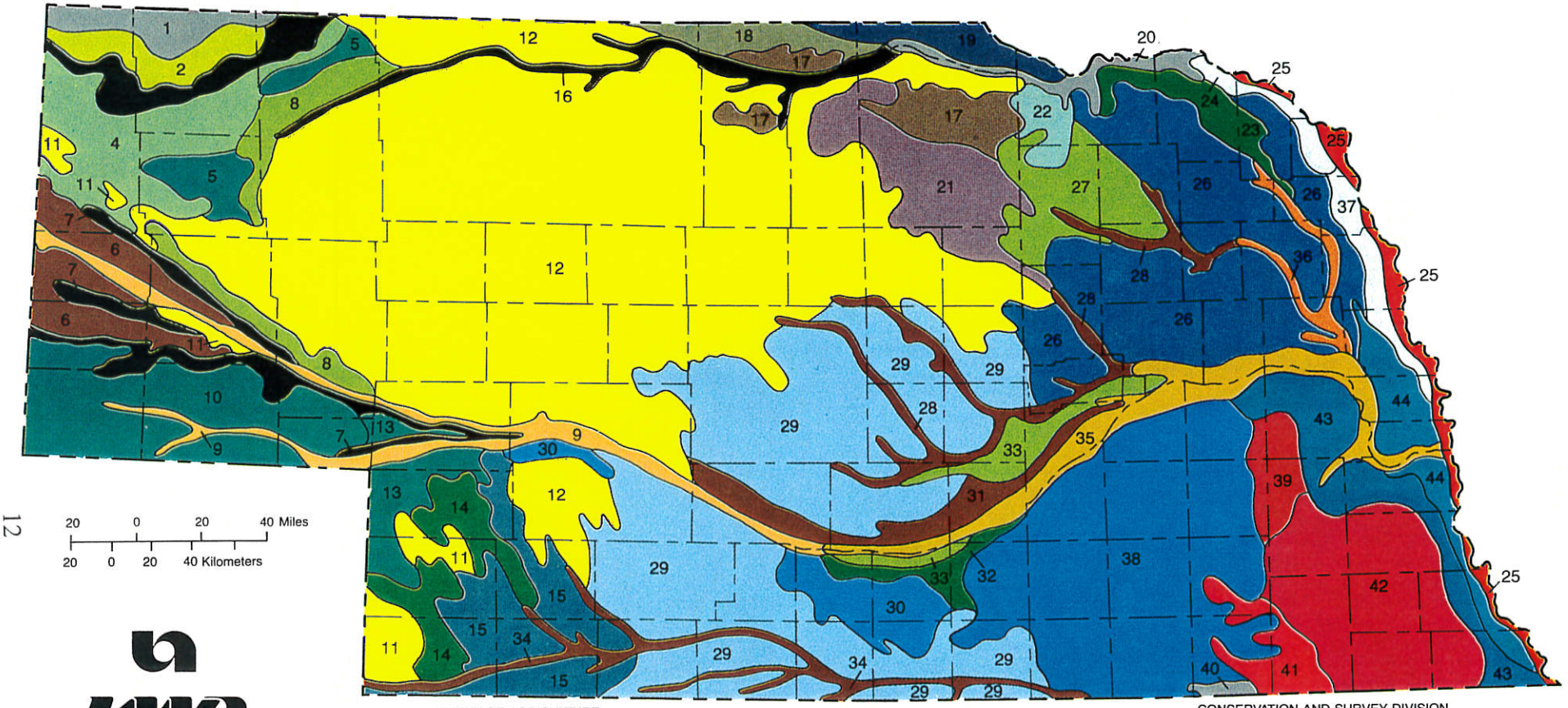


Figure 3. Average Annual Precipation.

Figure 4. GENERAL SOIL MAP OF NEBRASKA



U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
JAMES R. CULVER - STATE SOIL SCIENTIST
STEVEN J. SCHAEFER - CARTOGRAPHER
JANUARY 1988

CONSERVATION AND SURVEY DIVISION
INSTITUTE OF AGRICULTURE AND NATURAL RESOURCES
UNIVERSITY OF NEBRASKA–LINCOLN
MARK S. KUZILA - RESEARCH SOIL SCIENTIST
ANN M. MACK - CARTOGRAPHER

1 - Pierre-Samsil-Kyle
2 - Kadoka-Mitchell-Bufton
3 - Canyon-Bridget-Rock outcrop
4 - Busher-Jayem-Tassel
5 - Keith-Alliance-Rosebud
6 - Tripp-Mitchell-Alice
7 - Tassel-Busher-Rock outcrop
8 - Jayem-Sarben-Valent
9 - Las-Gothenburg-Platte
10 - Rosebud-Alliance-Canyon
11 - Valent
12 - Valentine-Elsmere-Tryon
13 - Kuma-Rosebud-Satanta
14 - Satanta-Keith
15 - Kuma-Keith-Colby
16 - Tassel-McKelvie-Rock outcrop
17 - Jansen-O'Neill-Meadin
18 - Valentine-Duda-Tassel
19 - Onita-Reliance-Labu
20 - Labu-Bristow-Redstoe
21 - Els-Valentine-Loup
22 - Brunswick-Paka-Simeon
23 - Moody-Thurman
24 - Crofton-Alcester-Nora
25 - Albaton-Haynie-Sarpy
26 - Nora-Moody-Crofton
27 - Thurman-Boelus-Nora
28 - Hord-Boel-Inavale
29 - Coly-Uly-Holdrege
30 - Holdrege
31 - Cozad-Hord
32 - Kenesaw-Hersh
33 - Hersh-Valentine
34 - Hord-McCook-Hobbs
35 - Gibbon-Gothenburg-Platte
36 - Shell-Muir-Colo
37 - Ida-Monona
38 - Hastings-Crete-Fillmore
39 - Sharpsburg-Pawnee-Steinauer
40 - Kipson-Benfield-Crete
41 - Crete-Mayberry
42 - Wymore-Pawnee
43 - Sharpsburg
44 - Marshall-Ponca

soil associations. The majority of Antelope County has soils in the Thurman-Boelus-Nora association. These are deep sandy and silty soils formed on uplands with nearly level to steep slopes. The southeastern corner of the county has soils in the Nora-Moody-Crofton soil association. These are deep silty soils on loess (wind-deposited) uplands, which can have gentle to steep slopes. Surrounding the Elkhorn River Valley in Antelope County, soils in the Cozad-Hord association can be found. These soils are silty soils found on foot slopes and stream terraces.

Topographic Regions

Topographic Regions are areas of similar physical features and reflect both surface and subsurface geology (UNL Conservation and Survey Division, 1986). Several topographic regions have been identified in the UENRD (Figure 5). The western third of the District is primarily sand hills, with a small region of plains in the northern reaches. The sand hills are regions of sand dunes stabilized by vegetation and underlain by sandstone, stream-deposited silt, sand, and gravel. These permeable soils allow for rapid infiltration of precipitation and very low runoff. The Plains Region is composed of relatively flat uplands underlain by sandstones, alluvial sands (stream-deposited), and gravely-sands. Infiltration in wind-deposited silts (loess) is moderate and runoff is low (UNL Conservation and Survey Division, 1986).

The center third of the district, located primarily in Holt County, is a mixture of sand hills and plains (Figure 5). The Sand Hills Region encompasses the central and southwestern portions of Holt County, while the plains occupy the southeastern and

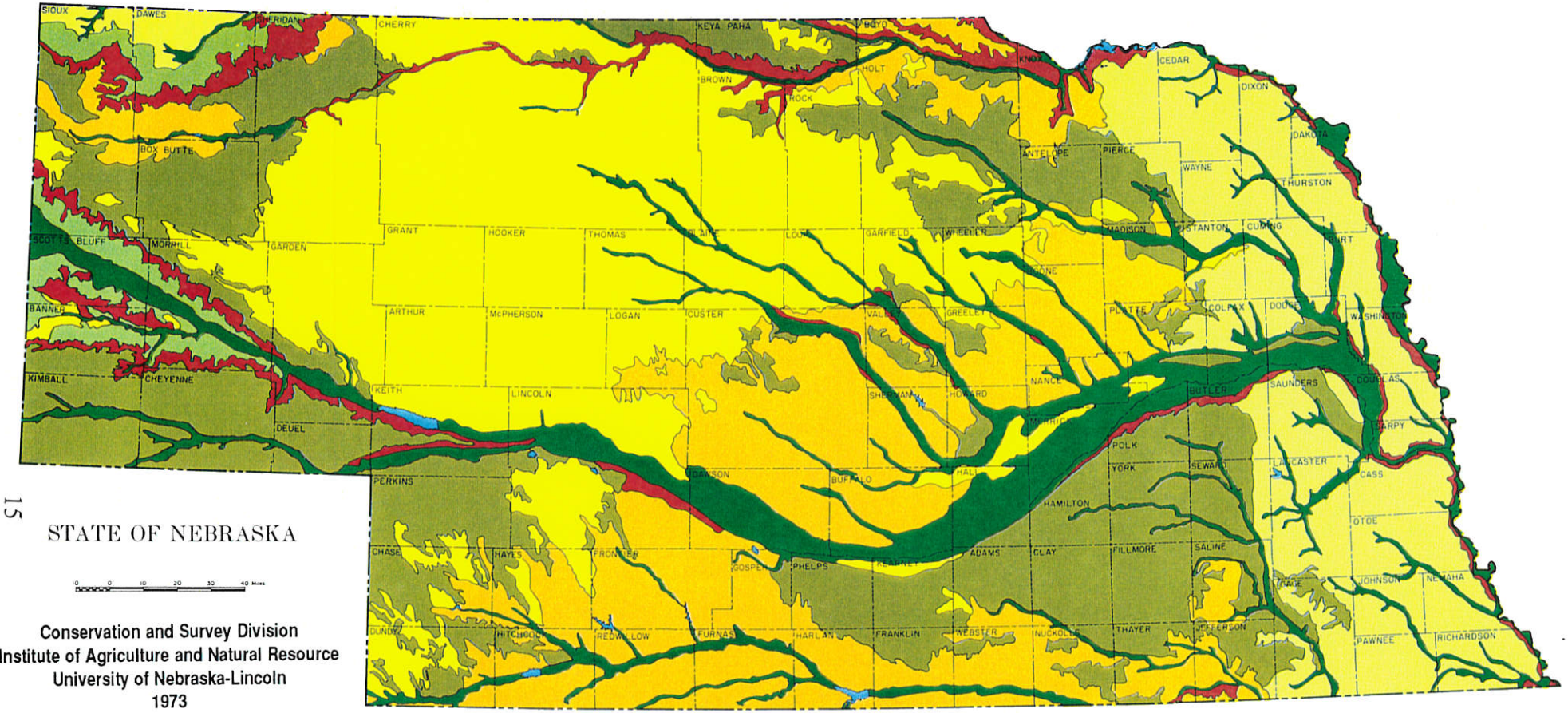
northern reaches. A Valley Region is located where the Elkhorn River runs through Holt County. Valley Regions are areas of low relief found along major streams which are underlain by alluvial deposits of clay, silt, sand, and gravel. Plant growth and groundwater recharge are favorable in these regions. However, there is the potential for elevated salt concentrations in soil and groundwater as a result of high evapotranspiration rates (UNL Conservation and Survey Division, 1986).

The eastern third of the District, encompassing the extreme eastern part of Holt County and all of Antelope County, is relatively variable with several identifiable regions (Figure 5). The northern part of this area is primarily plains with a small patch of dissected plains in northwestern Antelope County. Dissected plains are areas where wind and water have eroded hilly lands leaving landforms with sharp crest ridges and moderate to steep slopes. The southern half of this area is mainly dissected plains with some spotty areas of sand hills to the West. Again, where the Elkhorn River runs through Antelope County, there is a band of Valley Region (UNL Conservation and Survey Division, 1986).

Groundwater Regions

The UENRD can be characterized by two distinct Groundwater Regions: (1) the *Sand Hills Region*, and (2) the *East Central Dissected Plains Region* (Figure 6). Groundwater Regions identify areas where groundwater occurs under similar conditions and designation is partially based on the Topographic Regions discussed in the previous section. The majority of the District lies within the *Sand Hills Region.* The surface

Figure 5. TOPOGRAPHIC REGIONS MAP



STATE OF NEBRASKA

10 0 10 20 30 40 Miles

Conservation and Survey Division
Institute of Agriculture and Natural Resource
University of Nebraska-Lincoln
1973

EXPLANATION

Valleys—flat-lying land along the major streams. The materials of the valleys are stream-deposited silt, clay, sand, and gravel.

Large Reservoirs—constructed for purposes such as water storage for irrigation, generation of electricity, flood control, or recreation.

Dissected Plains—hilly land with moderate to steep slopes, sharp ridge crests, and remnants of the old, nearly level plain. The Dissected Plains are old plains eroded by water and wind.

Rolling Hills—hilly land with moderate to steep slopes and rounded ridge crests. In eastern Nebraska, the Rolling Hills are mostly glacial till that has been eroded and mantled by loess, while in northwestern Nebraska the hills were produced by the erosion of clay and clay-shale beds.

Valley-Side Slopes—moderately sloping land which occurs between the escarpments and the major stream valleys in western Nebraska. These areas are mostly siltstone bedrock covered by a few feet to a few tens of feet of sand, gravel, or silt.

Plains—flat-lying land which lies above the valley. The materials of the plains are sandstone or stream-deposited silt, clay, sand, and gravel overlain by wind-deposited silt (loess).

Sand Hills—hilly land composed of low to high dunes of sand stabilized by a grass cover. The sand dunes mantle stream-deposited silt, sand and gravel, and sandstone.

Bluffs and Escarpments—rugged land with very steep and irregular slopes. Bedrock materials, such as sandstone, shale, and limestone, are often exposed in these areas.

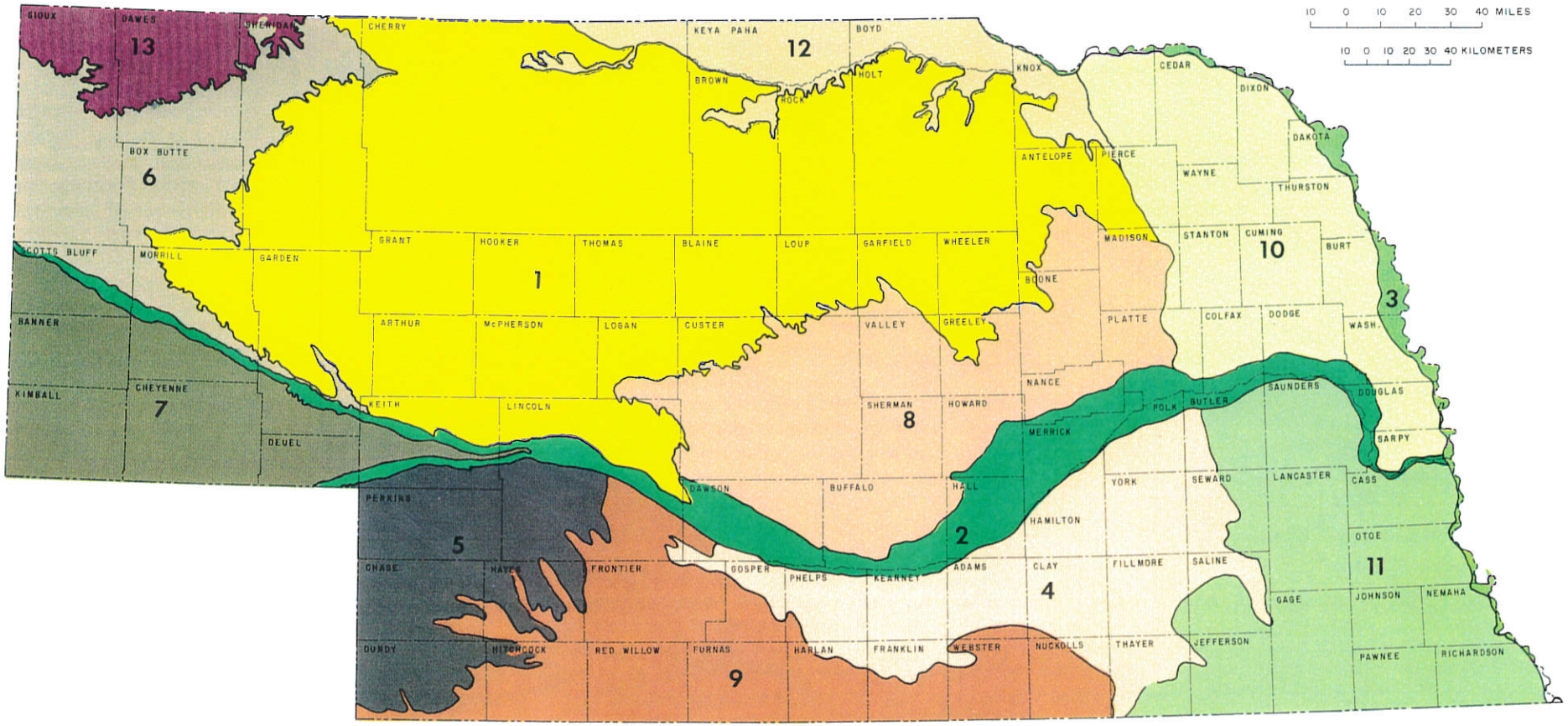


Figure 6. Groundwater Regions

(Source: The Groundwater Atlas of Nebraska, UNL Conservation & Survey Division, 1986)

mantle of this region consists primarily of sandy, highly permeable soils which contribute to a high infiltration rate and low runoff. Large yields of high-quality groundwater can be obtained from this region which is comprised of Tertiary and Quaternary age aquifers. Groundwater loss in this region is due to evapotranspiration and seepage into streams (UNL Conservation and Survey Division, 1986). A small area of the *East Central Dissected Plains Region* occupies the southeastern corner of Antelope County. This region consists of loessial soils of moderately low permeability which overlie Pleistocene age silt, sand, and gravel. Groundwater in this region is generally of good quality (UNL Conservation and Survey Division, 1986).

Geology and Aquifer Description

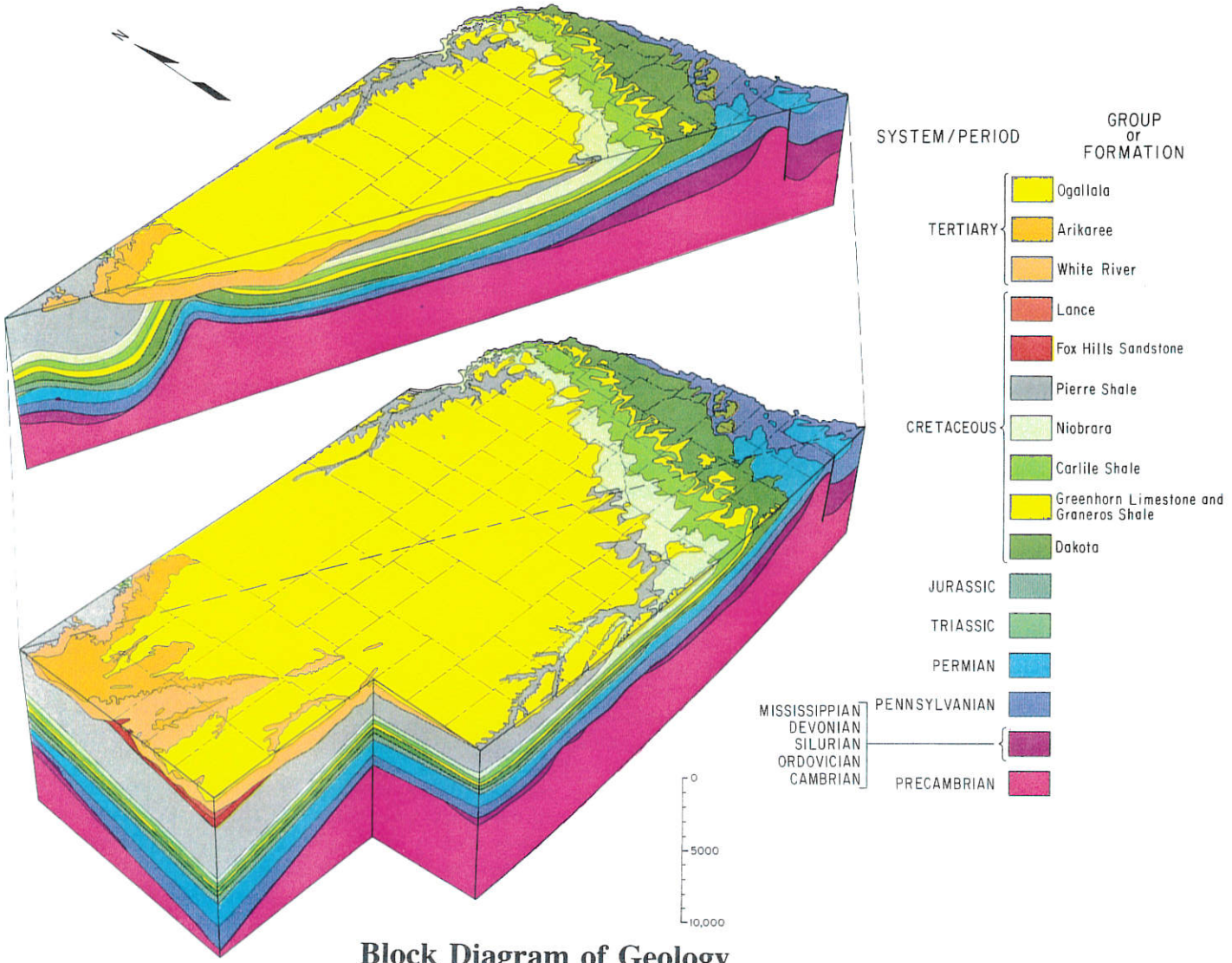
In order to better understand the principals governing groundwater location and distribution, several terms must first be defined. Groundwater can be found in many types of geologic formations, the most prevalent and important being an *aquifer*. An *aquifer* is a water-bearing layer of rock or sediment capable of yielding significant supplies of water (UNL Conservation and Survey Division, 1986). Aquifers can be comprised of consolidated (bedrock) or unconsolidated (glacial till and alluvium) materials. A *principal aquifer* is an aquifer or system of aquifers in a particular area which constitute the primary source of groundwater for wells. A *secondary aquifer* is an aquifer that is not the primary source of groundwater for wells in a given area. The *groundwater reservoir* is the subsurface storage between the water table and the base of the principal aquifer and can include one or more aquifers. This term is not synonymous

with *principal aquifer*. The *water table* is the boundary at which pore spaces below are generally saturated. At this boundary, the pore pressure equals atmospheric pressure (UNL Conservation and Survey Division, 1986).

Different geologic formations or rock units have different water-bearing properties. An understanding of the District's geology will also indicate the location and distribution of groundwater. The geologic make-up of the District is illustrated in Figure 7. The principal aquifer of the UENRD includes the Ogallala Formation of the Tertiary Period and the overlying sand and gravel deposits of the Quaternary Period (Figure 8). The Quaternary deposits vary in thickness from 100 to 150 feet. In general, the full depth of the Quaternary deposits is not saturated except in wetland areas and stream beds. The Ogallala Formation consists of saturated sand and sandstone intermixed with layers of clay, silt, and siltstone. It varies from 200 to 400 feet in thickness (Figure 7). The saturated thickness of the principal groundwater aquifer is illustrated in (Figure 9). The greatest saturated thickness in the UENRD is found in the southern portions of Holt and Rock Counties and in the northern portion of Wheeler County (Olsson Associates, 1985).

In some areas, Arikaree and White River Tertiary deposits occur between the Ogallala Formation and the underlying Cretaceous bedrock formations (Figure 8). Comprised of sandstone, siltstone, and clay, the White River Group is capable of yielding significant quantities of groundwater. However, water quality can be poor due to mineralization. The Arikaree Group is primarily sandstone and siltstone deposits which yield considerable quantities of high quality groundwater. The Cretaceous Formations, primarily Pierre Shale, are relatively impervious and considered to be the base of the

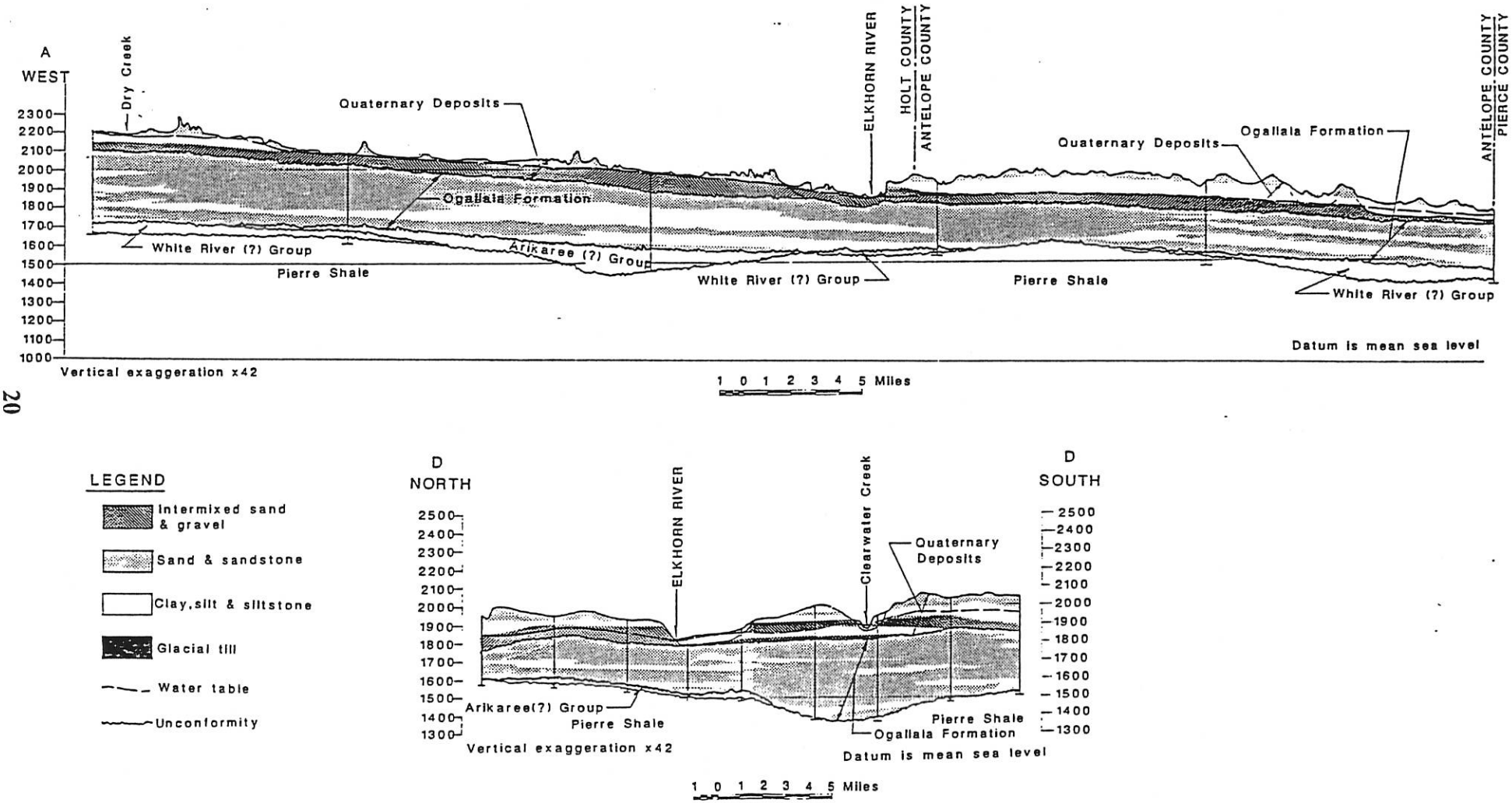
Figure 7.



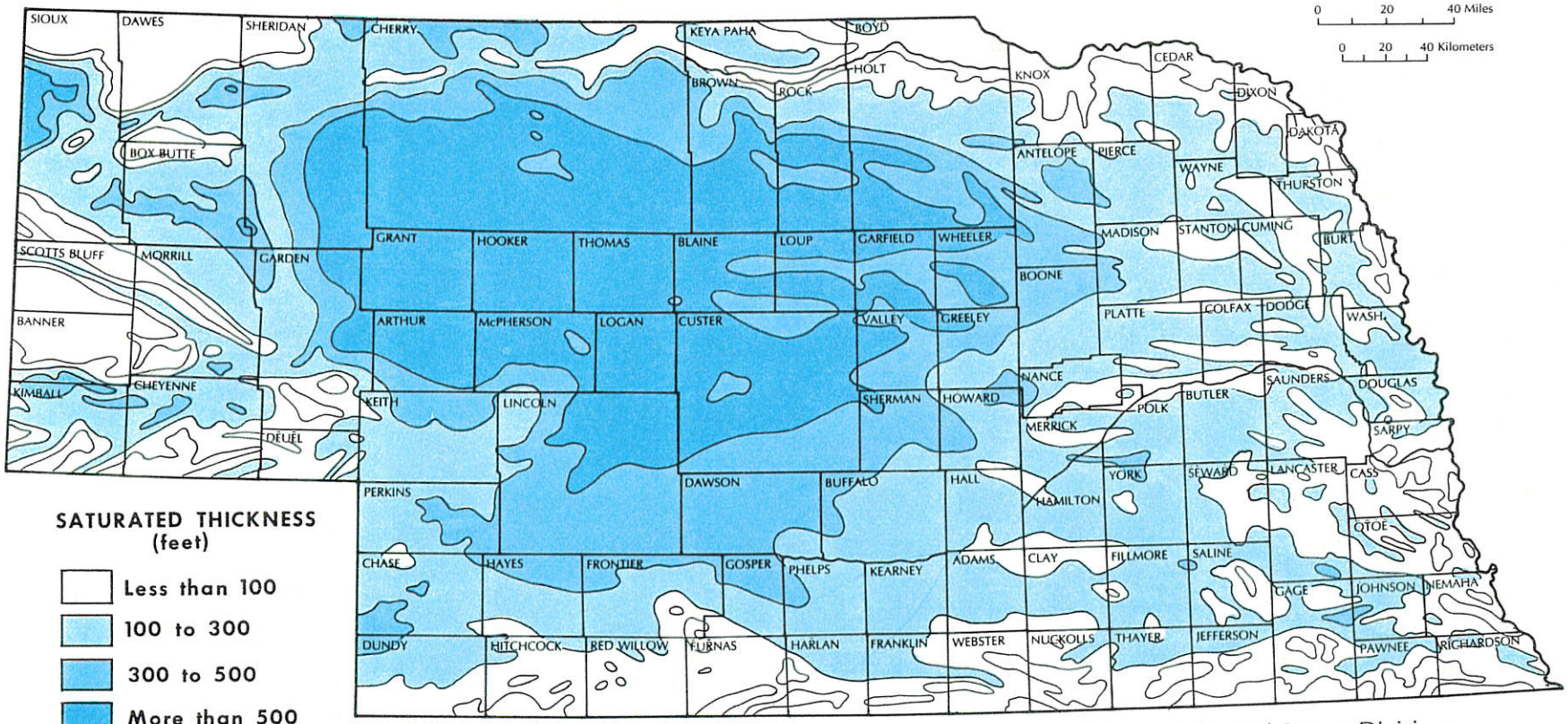
Block Diagram of Geology

(Source: The Groundwater Atlas of Nebraska, UNL Conservation & Survey Division, 1986)

Figure 8. Geologic Cross-Section of the Upper Elkhorn NRD.



Saturated Thickness of the Principal Groundwater Reservoir in Nebraska



Conservation and Survey Division
Institute of Agriculture and Natural Resources
The University of Nebraska–Lincoln
1988

Figure 9.

groundwater reservoir in the Sand Hills Region (UNL Conservation and Survey Division, 1986).

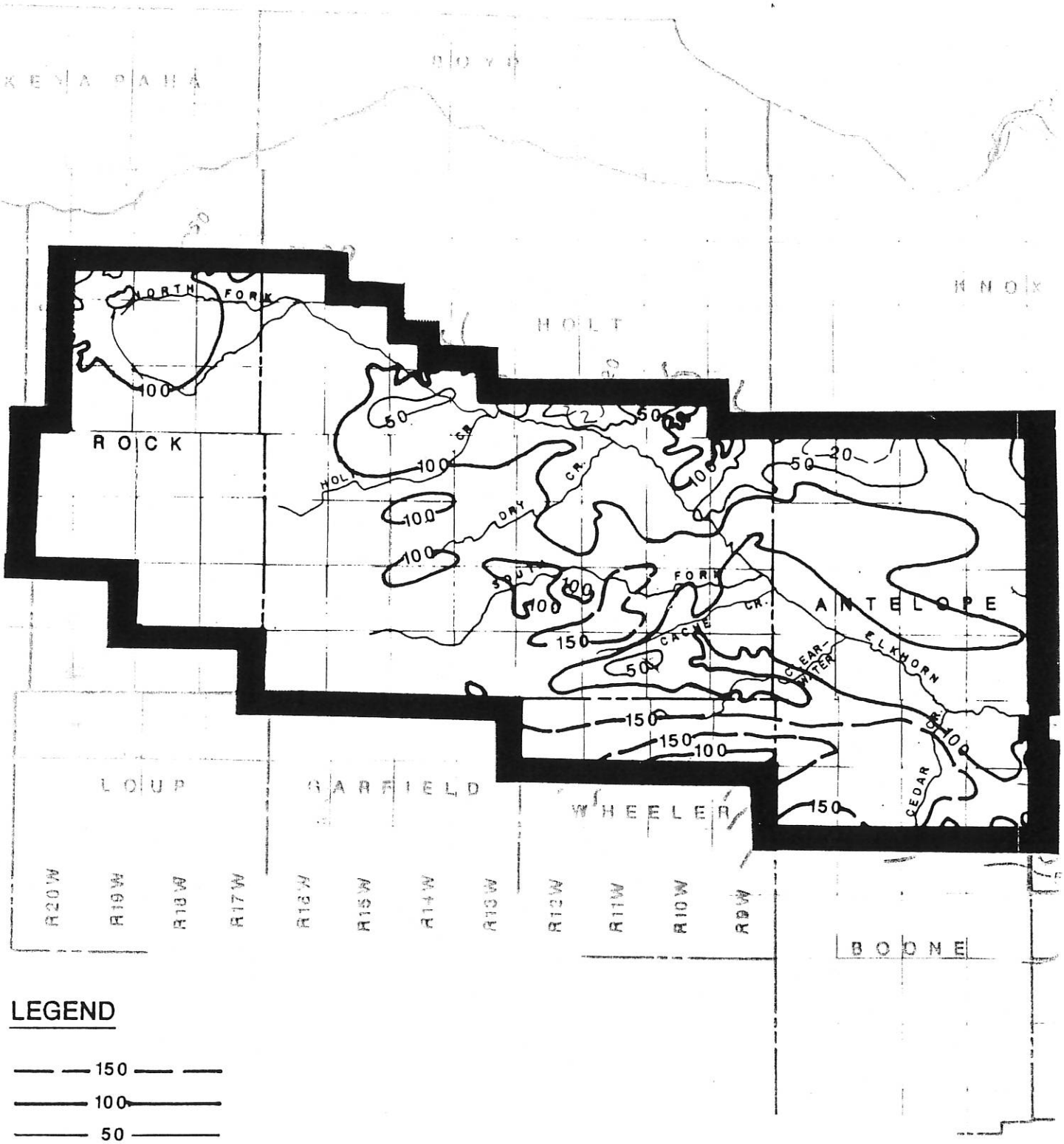
Transmissivity

The ability of an aquifer to transmit or supply groundwater to wells is known as the transmissivity. This aquifer characteristic is a function of both the saturated thickness and permeability of an aquifer (UNL Conservation and Survey Division, 1986). When determining potential locations for well sites and estimating well yield, the transmissivity is very important. Transmissivity values of 20,000 gallons per day per foot (gpd/ft) are adequate for the development of certain types of irrigation wells, while values exceeding 100,000 (gpd/ft) are generally sufficient to supply high-capacity wells. Figure 10 shows the transmissivity of the principal groundwater reservoir in Nebraska. In the UENRD, the southern portions of Rock and Holt Counties, the northern portion of Wheeler County, and the southern and central portions of Antelope County have high transmissivities of approximately 100,000 to 150,000 gpm/ft. Generally, these areas of high transmissivities correspond to the Sand Hills Topographic and Groundwater Regions. The northern part of the District in Rock and Holt Counties have lower transmissivities falling within the range of 20,000 to 100,000 gpm/ft. Portions of Antelope County also fall within this range of transmissivity values (UNL Conservation and Survey Division, 1986).

Vulnerability Description

There are many factors to consider when determining the vulnerability of groundwater to contamination. Overlying soil type, aquifer type, and recharge are just a few of the considerations. A methodology tool known as DRASTIC was developed by the U.S. Environmental Protection Agency (U.S. EPA) and the National Water Well Association (NWWA) to provide for systematic evaluation of groundwater pollution potential (Arnoff et. al., 1991). This tool takes into account seven mappable hydrogeologic variables including: (1) Depth to Water, (2) Recharge (net), (3) Aquifer Media, (4) Soil Media, (5) Topography, (6) Impact of the Vadose Zone (unsaturated zone below root zone) Media, and (7) Conductivity (hydraulic) of the Aquifer. The first letter from each variable name was used to form the acronym DRASTIC. Results of the DRASTIC analysis are shown in Figure 11. The areas of highest vulnerability are indicated by hot colors such as red and orange, while the areas of lowest vulnerability are indicated by cool colors such as gray and blue.

There are several areas of high vulnerability potential in the UENRD, with the majority of these areas lying adjacent to the Elkhorn River (Figure 11). The bed of the Elkhorn River Basin is primarily composed of sand and allows for rapid infiltration of water and any contaminant constituents. Virtually, the entire river valley in Holt County was found to have a high potential for groundwater contamination. In this area, the soils are very sandy and the depth to groundwater is shallow. There is also extensive irrigation and agrichemical use in this area which increases the potential for groundwater contamination. In fact, this area has already been targeted as a problem area with levels



LEGEND

150

100

50

20

Lines of equal transmissivity in thousands of gallons per day per foot.

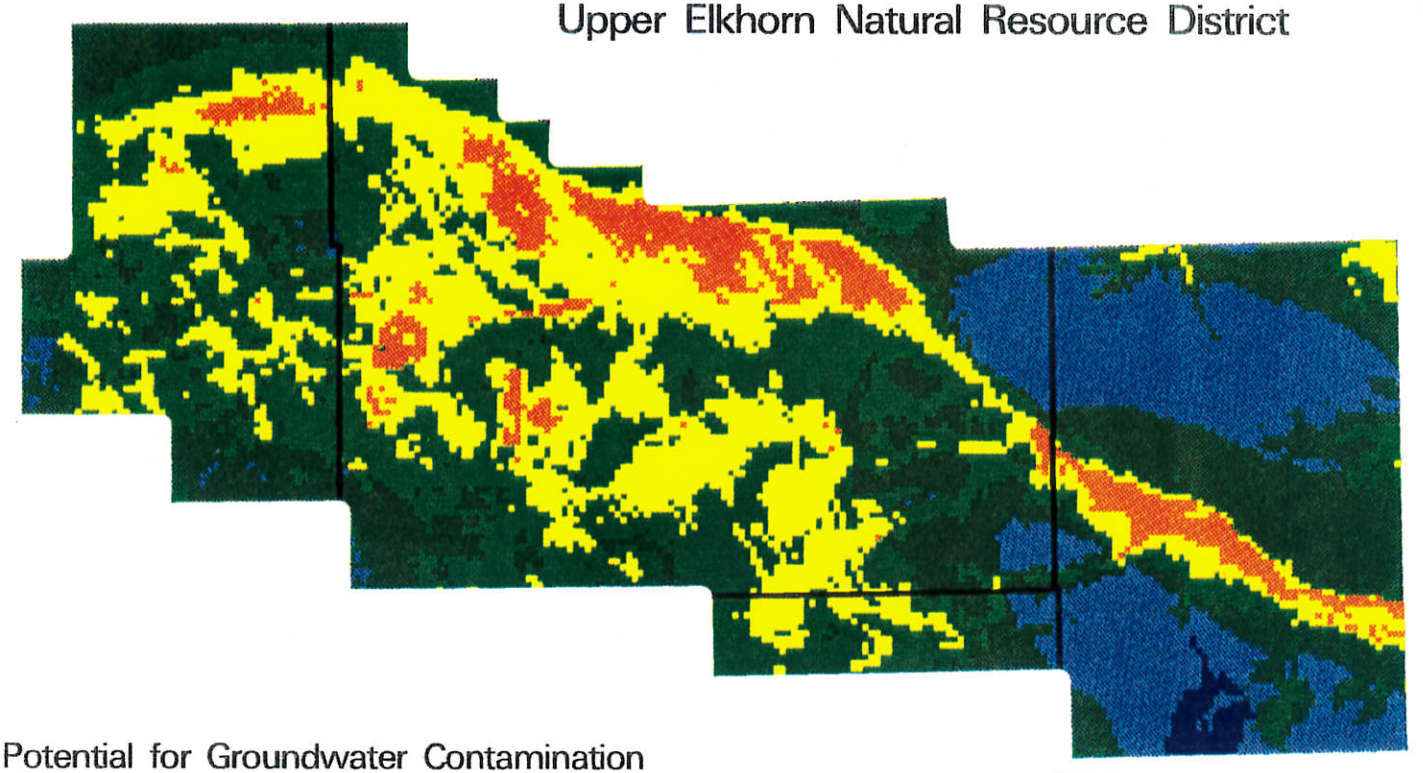
Transmissivity is a rate which quantifies the ability of an aquifer to transmit water.

Figure 10. Transmissivity of the Principal Aquifer.

Figure 11.

Groundwater Vulnerability to Contamination Using the DRASTIC Model

Upper Elkhorn Natural Resource District



Potential for Groundwater Contamination

low — high

Scale

10 0 10 Miles

Source: CALMIT, Conservation and Survey Division

of nitrates far exceeding the EPA's Maximum Contaminant Level (MCL) of 10 mg L^{-1} (ppm). Much of Holt and Rock Counties are spotted with pockets of moderate to high vulnerability areas. These areas roughly correspond to the Sand Hills Topographic Region which is characterized by sandy soils (UNL Conservation and Survey Division, 1986). In addition, the depth to groundwater is very shallow as evidenced by the many wet meadows and wetlands found in these areas. The majority of Antelope County is in the low to moderate vulnerability category with the exception of the areas adjacent to the Elkhorn River which are highly vulnerable. Soils in this county are relatively higher in silt content, thus reducing infiltration and the potential for groundwater contamination (USDA-SCS, 1978). Some parts of southern Antelope County are known to have a restrictive clay layer which further reduces the potential for groundwater contamination. Table 1 shows the area (in acres) of the UENRD found within each vulnerability class. High class numbers represent high vulnerability areas while low class numbers represent low vulnerability areas. In general, the majority of the District lies within the moderate vulnerability range. However, the UENRD does have a disproportional large amount of high vulnerability areas compared to other NRDs.

Table 1. Groundwater Vulnerability to Contamination Within the Upper Elkhorn Natural Resources District Using the DRASTIC Model.

Class Number	Vulnerability	Area (acres)	% of Total Area
1	Low	0	0.00
2	.	19,200	1.00
3	.	376,896	13.63
4	.	473,088	24.64
5	.	633,216	32.98
6	.	424,704	22.12
7	.	108096	5.63
8	High	0	0.00

Depth to Groundwater

The depth to the regional water table or groundwater in the majority of the District ranges from 0 to 50 feet (Figure 12). Most of Antelope County has groundwater depths ranging from 50 to 100 feet. However, there are some areas in the southern and eastern portions of the county where this distance ranges from 100 to 200 feet. These depth ranges are very general and should not be considered site or time-specific since the depth to groundwater can be quite variable with location and time.

The UENRD established a water level monitoring program in 1975. Since this time, Static Water Levels (SWL) have been measured in 92 irrigation wells within the District (Appendix B). Measurements are taken in the spring prior to the irrigation season and in the fall following the irrigation season. These values are listed in Appendix C. This information is kept on file in the UENRD office, with the UNL Conservation and Survey Division, and with the U.S. Geological Survey.

Recharge Characteristics and Rates

Precipitation is the primary source of natural recharge for the principal groundwater reservoir in the UENRD. As discussed earlier, precipitation ranges from 21 inches/year in the northwestern corner of Rock County to 25 inches/year in the southeastern corner of Antelope County (Figure 3). However, there are several factors which determine the extent of recharge from precipitation including the amount, timing, frequency, and distribution of the precipitation event. In addition, physical features such as soil properties, topography, and perched aquifers can also affect recharge. The soils in the

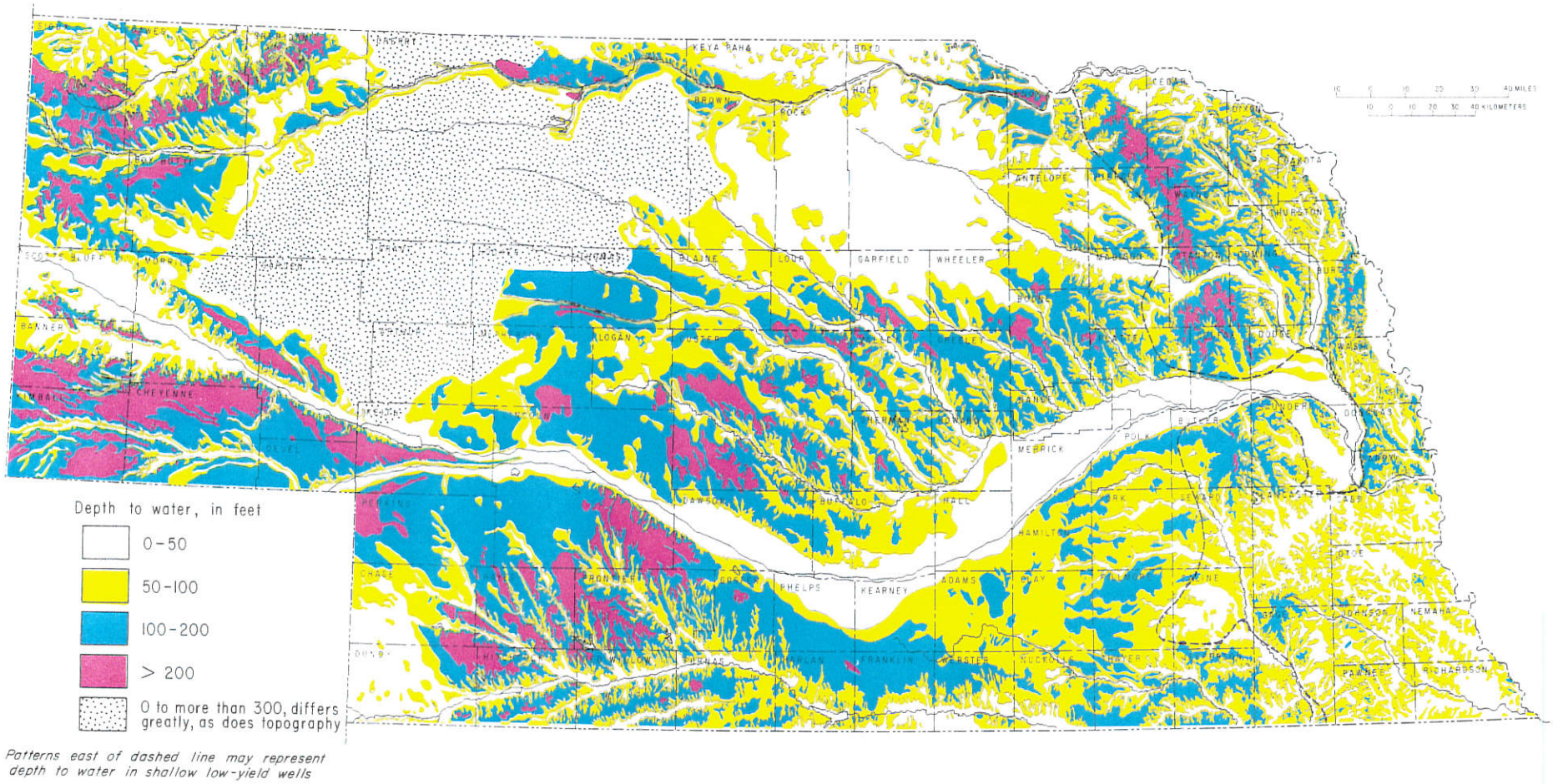


Figure 12. Depth to the Regional Water Table

(Source: The Groundwater Atlas of Nebraska, UNL Conservation & Survey Division, 1986)

majority of the District are sandy loams to fine sands, with some areas of gravels (Figure 13). Permeability in these soils ranges from 5.0 to 10.0 inches/hour, which is relatively high. A large portion of northern Antelope County has soils of loams to sands and gravels with permeabilities of greater than 10.0 inches/hour (Olsson Associates, 1985). With such high permeabilities for the entire District, evaporation is relatively low, with the exception of wetlands and surface water.

Other sources of recharge, although not as significant as precipitation, can contribute to the recharge of the principal reservoir in the UENRD. One source is from surface water seepage into the groundwater. However, this source is very minimal and the reverse is more likely where groundwater feeds surface water (Olsson Associates, 1985). Another source is through artificial recharge. Artificial recharge is the addition of water to the groundwater reservoir as a result of human activity. Infiltration of irrigation water to groundwater and the use of leaky pipes or canals are examples of such activities. It is difficult to get an accurate determination of this recharge source, but it is estimated to be minimal.

Overall, natural recharge from precipitation appears to be adequate enough to maintain consistent groundwater levels. Figure 14 shows significant rises and declines in groundwater levels comparing 1988 levels to pre-development levels. Generally, in the UENRD there are no significant areas of decline or rise in groundwater levels. Data from the District's SWL monitoring program show seasonal fluctuations, but overall there does not appear to be any significant declines (Appendix C).

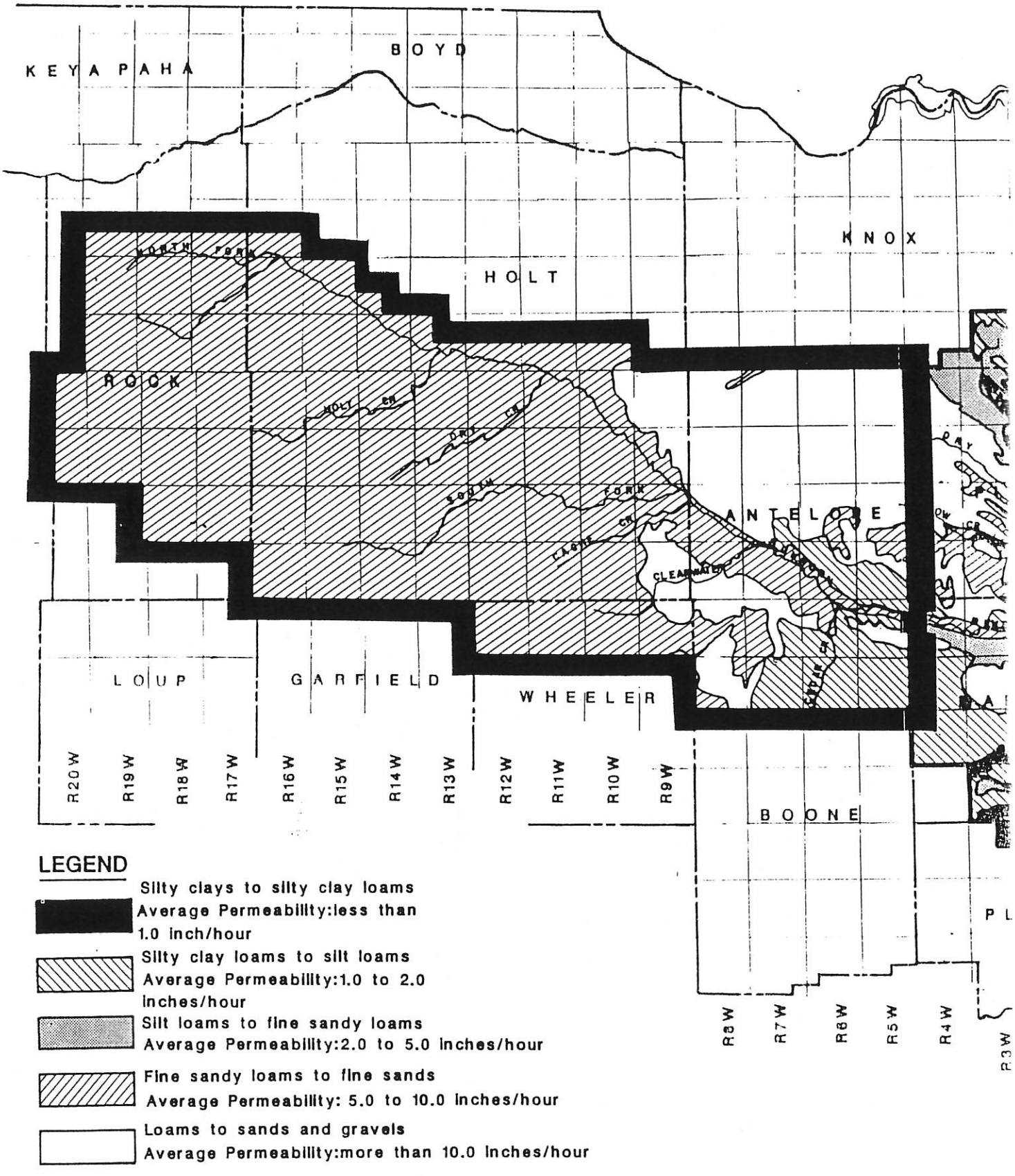
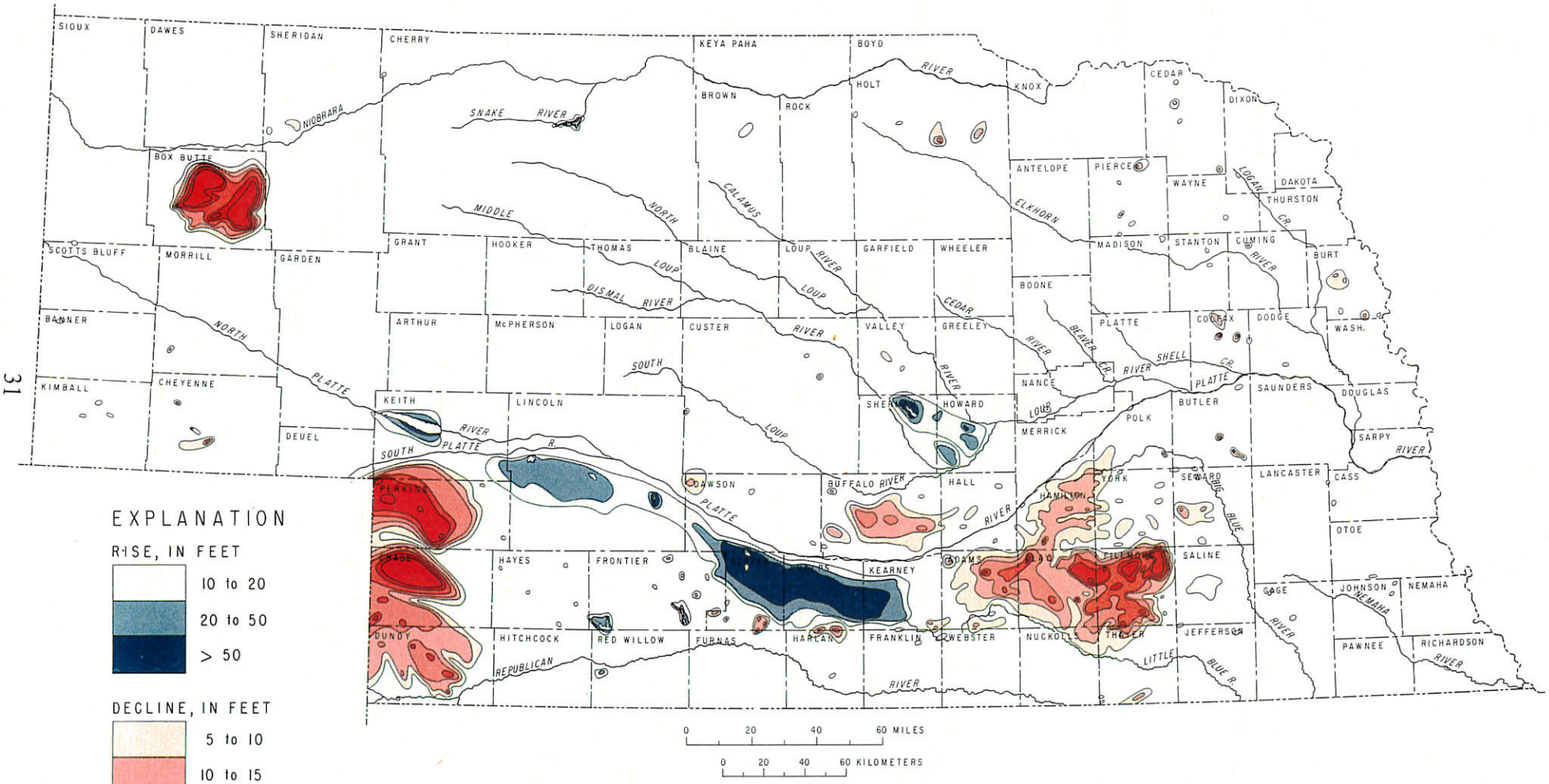


Figure 13. Soils Permeability.

Significant Rises and Declines in Nebraska Groundwater Levels

(from predevelopment as of fall 1988)



(Preliminary)

Prepared cooperatively by
U.S. Geological Survey and
Conservation and Survey Div., IANR,
The University of Nebraska–Lincoln

Figure 14.

GROUNDWATER INVENTORY & MONITORING

Philosophy

The sustainability of groundwater resources has always been an integral component of the UENRD's philosophy. Currently, focus has shifted from groundwater quantity to groundwater quality. This shift does not imply a disregard for quantity aspects, but rather that groundwater levels are not presently a concern. This fact may be due, in part, to on-going monitoring programs and the implementation of Best Management Practices (BMPs). If groundwater levels become a concern in the future, proper measures will be taken to address the problem. Specific triggers are discussed in future sections.

Advancements in technology and increased public awareness have pushed groundwater quality to the forefront. Although good quality groundwater may be plentiful now, there is no assurance that future generations will have an abundant supply of this precious resource. Not only does the District have a responsibility to employ corrective practices, but also to encourage and implement preventive practices.

The District must have cooperation from other agencies and the public to sustain the viability of groundwater resources. In light of this need, the UENRD has enlisted the help of private and governmental entities as well as the general public to determine the status of groundwater quantity and quality in the District. Annual sampling programs along with special areal studies are just some of the tools used for this purpose. The continuation and enhancement of these programs and studies is essential to the success of

this plan. Since quality is currently the primary groundwater resource concern, this plan will focus on groundwater quality.

Groundwater Quality Monitoring

Groundwater samples are collected from 474 registered irrigation wells throughout the District and tested for nitrates. These samples are taken on a three-year staggered basis, so approximately 150 samples are taken each year. Appendix D shows all of the current nitrate sampling locations in the District. Expectations are to increase this number to 200 samples per year for a total of approximately 600 irrigation wells sampled. In addition, approximately 95 registered irrigation wells throughout the District are sampled for pesticides on a five-year staggered basis (Appendix E). High analysis costs preclude the District from increasing the number sampled for pesticides. All groundwater samples are sent to certified analytical labs for analysis. Nitrate and pesticide sample results are tabulated in Appendices F and G, respectively.

Selection criteria for wells is based on several factors including completeness of well registrations, water-bearing units, and the areal distribution within the District. Irrigation wells are sampled due to the general lack of domestic well information such as depth to water, screened interval, material screened, and increased chance of point source contamination. This information is vital for determination of the water-bearing unit and assurance of consistent sampling protocol. The District's on-going sampling program is the primary source of up-to-date groundwater quality information.

In general, groundwater quality is relatively good in the majority of the District. However, certain areas north of the Elkhorn River in Holt County have levels of nitrates greater than the MCL of 10 mg L^{-1}. In addition, the northern half of Antelope County has some areas with moderate (> 7.5 mg L^{-1}) to high (> 10 mg L^{-1}) nitrate levels. These are areas of high soil permeabilities, intensive irrigated agriculture, and shallow water tables. Looking at the data with time, the trend appears to be one of increasing nitrate levels throughout the District, although some areas have leveled off and even decreased. Several wells in the O'Neill and Atkinson areas have tested positive for atrazine, although most have been well below the MCL of 3.0 ug L^{-1} (ppb). Around the town of Royal in north central Antelope County, several wells have tested positive for pesticides. In addition, southern Antelope County is dotted with several more wells of detectable pesticide concentrations, albeit these concentrations are below the MCLs.

Several other programs and studies have also been used to monitor groundwater quality in the District. The 1976 Baseline Survey of the Groundwater Chemistry in Holt County, Nebraska by Exner and Spalding was one of the first efforts by the District to determine the status of groundwater quality in the UENRD. This study was a result of a cooperative agreement between the UENRD, the Lower Niobrara Natural Resources District (LNNRD), and the University of Nebraska-Lincoln Conservation and Survey Division. During the summer of 1976, 308 irrigation wells in Holt County (125 in the UENRD) were sampled and analyzed for chemical constituents. Approximately 20% of these wells were found to have nitrate levels above the MCL (Exner and Spalding, 1976). The majority of wells with elevated nitrate readings were concentrated around the

Atkinson and O'Neill areas, north of the Elkhorn River. The average nitrate concentration in this identified area was greater than 11 mg L^{-1} (Exner and Spalding, 1976). This study was instrumental in determining problem areas in the UENRD and provided baseline values for future comparisons.

Olsson Associates was contracted to develop a Groundwater Management Plan for the District in 1985. Data from various sources was incorporated into this plan, resulting in a detailed document specific to the District. Included in the plan was background information, physical characteristics, groundwater parameters, and District goals. All of this information was used to make informed decisions concerning the groundwater resources of the District. Portions of the original GWMP have been incorporated into this current plan.

Concern over elevated nitrate levels in the municipal wells of several communities in northeastern Nebraska spawned a study in 1990 known as the Bazile Triangle Groundwater Quality Study. Past groundwater sampling in the communities of Osmond, Creighton, Royal, and Orchard revealed nitrate levels exceeding the MCL of 10 mg L^{-1}. As a result, a study area was determined which included these communities (UNL Conservation and Survey Division, 1990). This region centered around the Bazile Creek drainage area and included portions of the UENRD, the LNNRD, the Lewis and Clark Natural Resources District, and the Lower Elkhorn Natural Resources District (Figure 15). One hundred twenty-five wells were sampled in the study area and analyzed for nitrates. Only 25% of the sampled wells had nitrate levels greater than the MCL. In the UENRD portion of the study area, the northeastern corner of Antelope had several

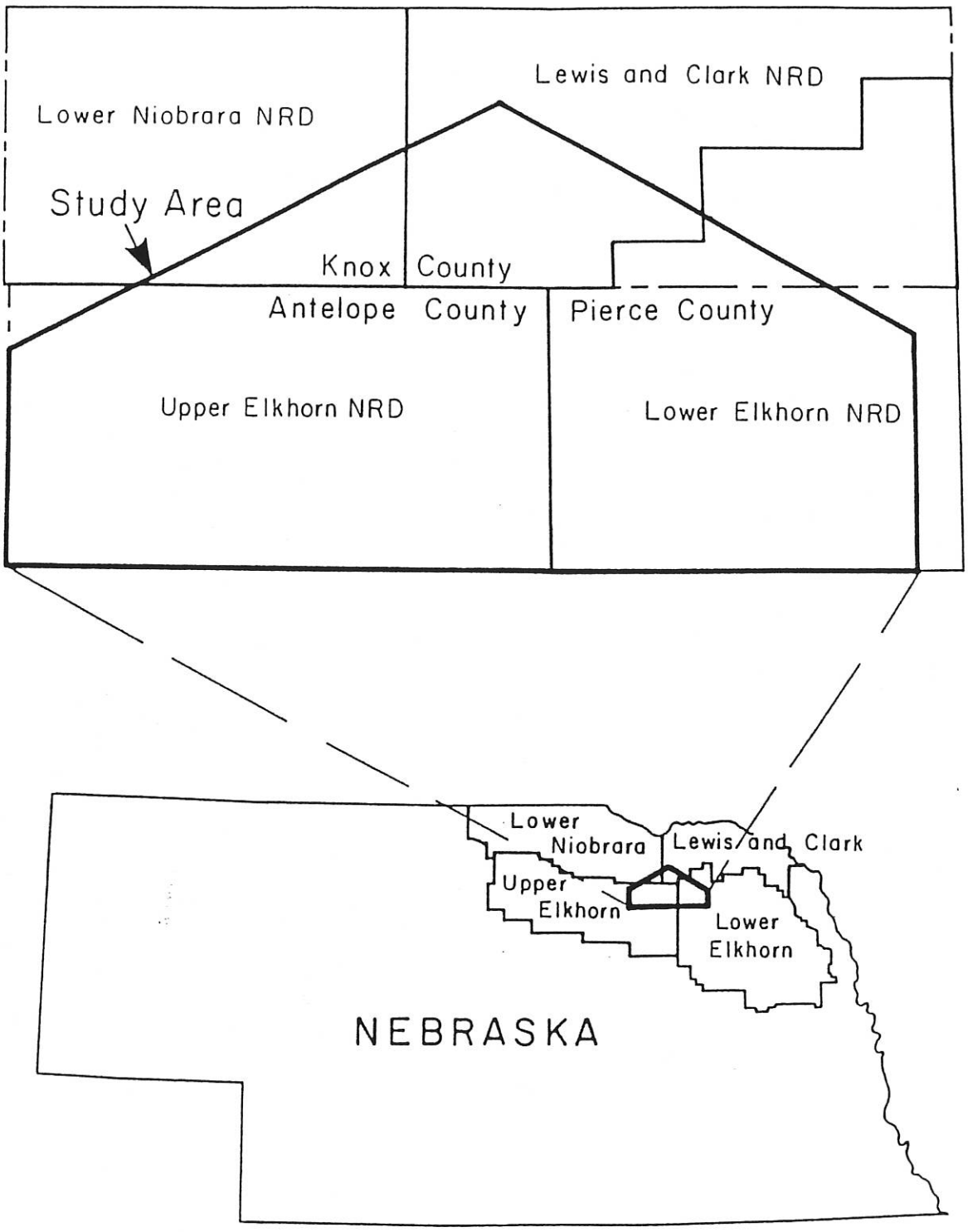


Figure 15. Location of Bazile Triangle Groundwater Quality Study area.

pockets of elevated nitrate levels (Figure 16). These findings collaborate with results from the District's own sampling program.

In 1990, Exner and Spalding published Occurrence of Pesticides and Nitrate in Nebraska's Ground Water which assessed the status of Nebraska's groundwater quality. Data for this assessment was provided by various state, federal, and local governmental agencies and educational institutions. Again, the area north of the Elkhorn River in Holt County was targeted as a problem area, often having nitrate concentrations greater than the MCL of 10 mg L^{-1}. In fact, there are numerous wells in the Atkinson and O'Neill areas with nitrate levels greater than 20 mg L^{-1} (Exner and Spalding, 1990). These high nitrate areas correspond with high water tables and extensive irrigated agriculture. There were also several wells in northern Antelope County with elevated nitrate levels above the MCL (Exner and Spalding, 1990). As with the problem areas in Holt County, these areas correspond to regions of high water tables and irrigated agriculture. Exner and Spalding also assessed data for the detection of pesticides in groundwater. Findings revealed atrazine was the only pesticide detected in the UENRD. Detectable concentrations were primarily found in the same areas as high nitrate levels around Atkinson and O'Neill. However, the majority of atrazine concentrations were well below the MCL of 3.0 ug L^{-1}, and only one well had a concentration greater than this value (Exner and Spalding, 1990). Overall, the results from this study targeted the same areas around Atkinson and O'Neill as did results from the District's sampling program.

Another important study was the Trend Analysis of Ground-Water Quality in Holt County within the Upper Elkhorn Natural Resources District conducted by Exner and

Spalding in 1991. For this study, wells sampled in 1976 for the 1976 Baseline Survey of the Groundwater Chemistry in Holt County, Nebraska were resampled in 1990 to determine rate of change in concentrations and delineate the areal extent of nitrate contamination in Holt County. The primary focus in this study was the targeted problem areas by Atkinson and O'Neill. The trend analysis showed that these areas had a net increase of more than 0.3 mg L^{-1} of nitrate per year (Figure 17). However, the majority of these areas are located within the Lower Niobrara NRD. The average increase of nitrate-nitrogen concentrations in Holt County within the UENRD was only 0.07 mg L^{-1}.

Eleven irrigation wells were also tested for atrazine. Nine of the eleven had detectable levels of atrazine. However, these levels were well below the MCL ranging from 0.05 to 0.81 ug L^{-1} (Figure 18). Again, these detectable atrazine levels were concentrated around the Atkinson and O'Neill areas (Exner and Spalding, 1991a).

In December 1991, Exner and Spalding published another study entitled, Ground-Water Monitoring for Agrichemicals within the Upper Elkhorn Natural Resources District. This study evaluated the areal distribution of several chemical constituents in groundwater including nitrates and atrazine. Of the 128 wells sampled in Antelope County for nitrates, 19 exceeded 10 mg L^{-1} (Figure 19). The majority of these were concentrated around the town of Royal and in the northeastern corner of the county. In Holt County, 18 of the 31 sampled wells exceeded the nitrate MCL with the majority located north and west of O'Neill. Only a few samples were taken in Rock and Wheeler Counties, but all were below 2 mg L^{-1}. Atrazine was detected in 16 of 18 sampled wells in Antelope County and in all three samples taken from Holt County. However, values

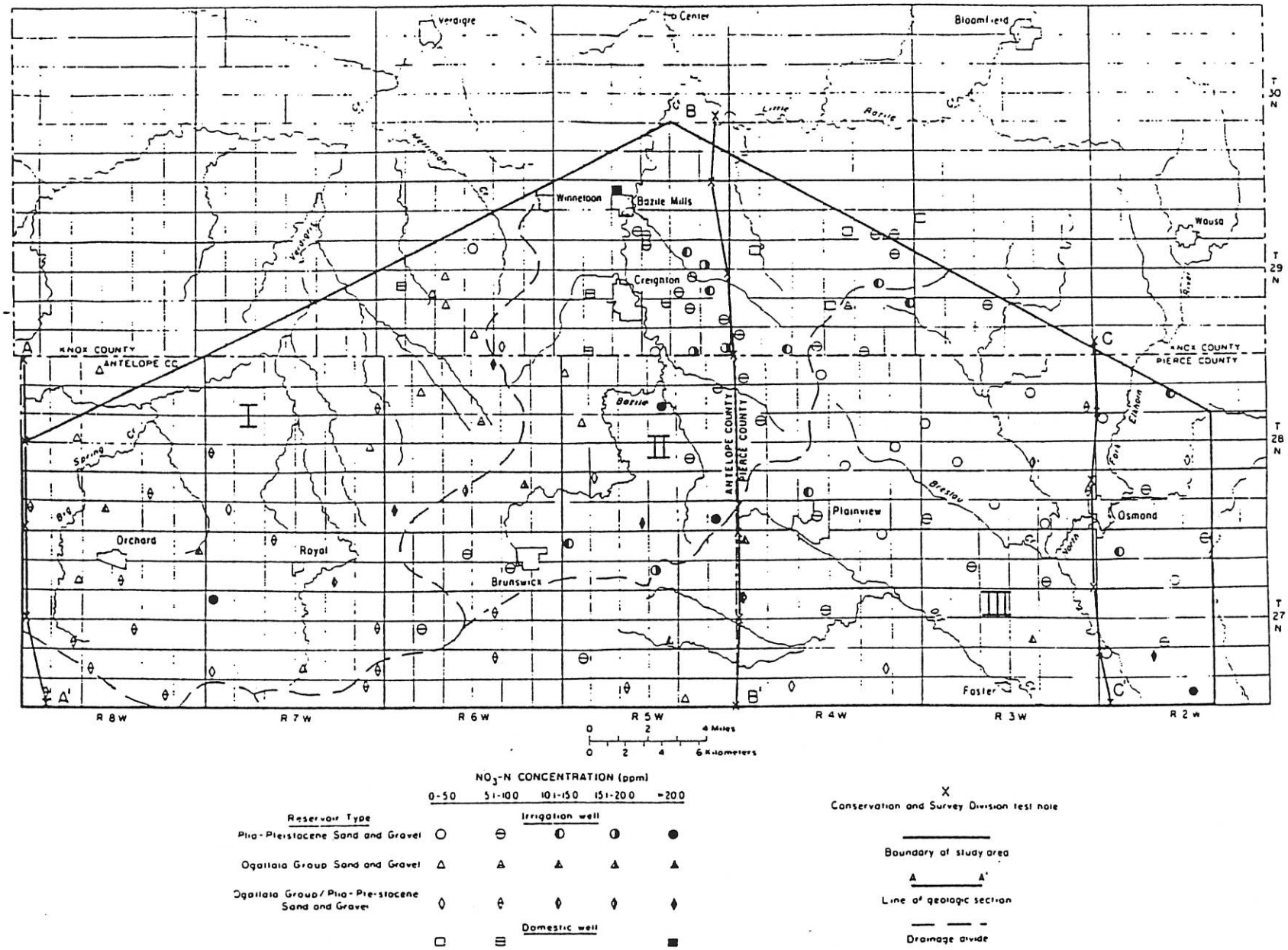


Figure 16. Sample locations for the Bazile Triangle Study.

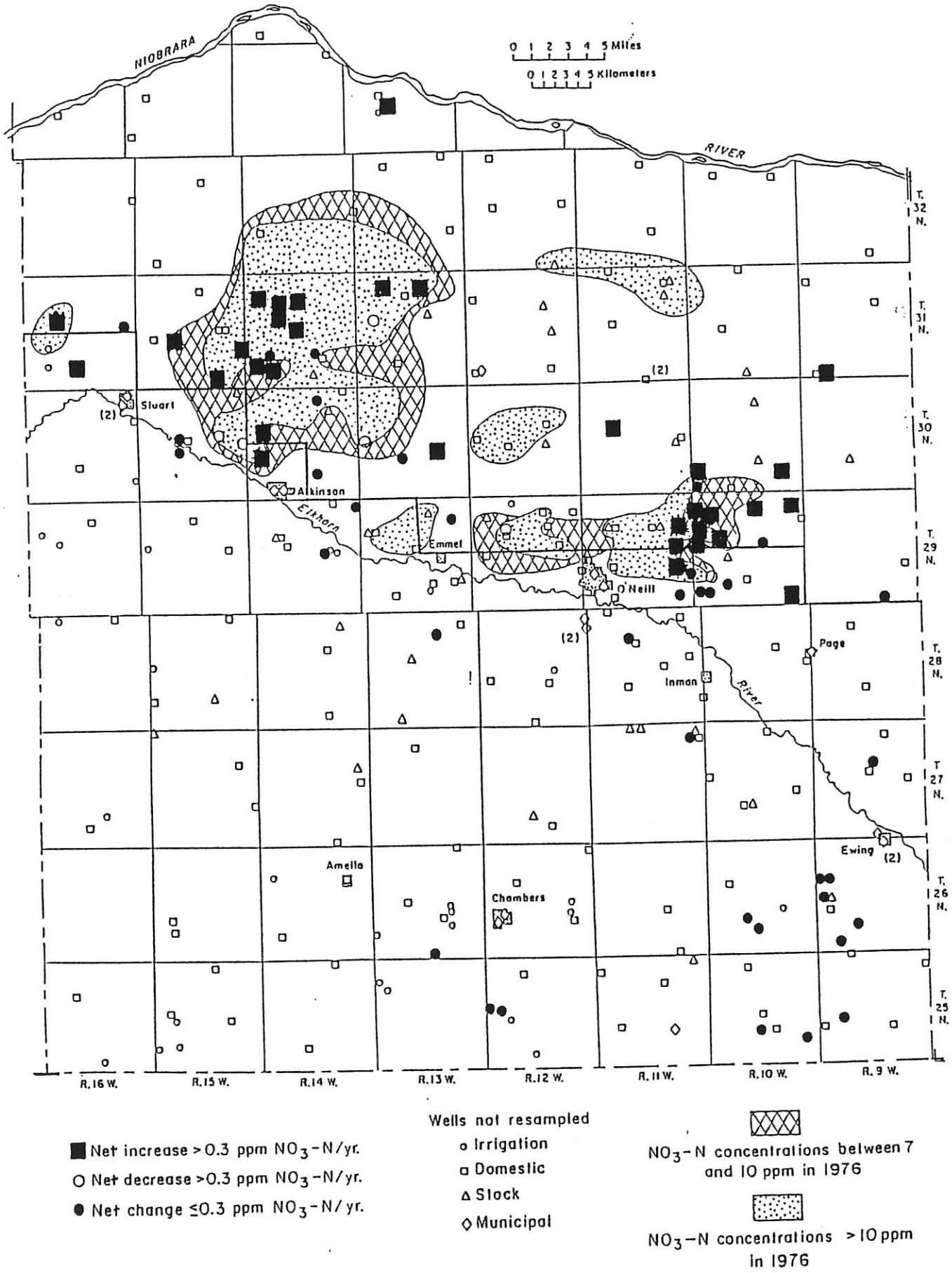


Figure 17. Net changes in nitrate-nitrogen concentrations in irrigation wells between 1976 and 1990.

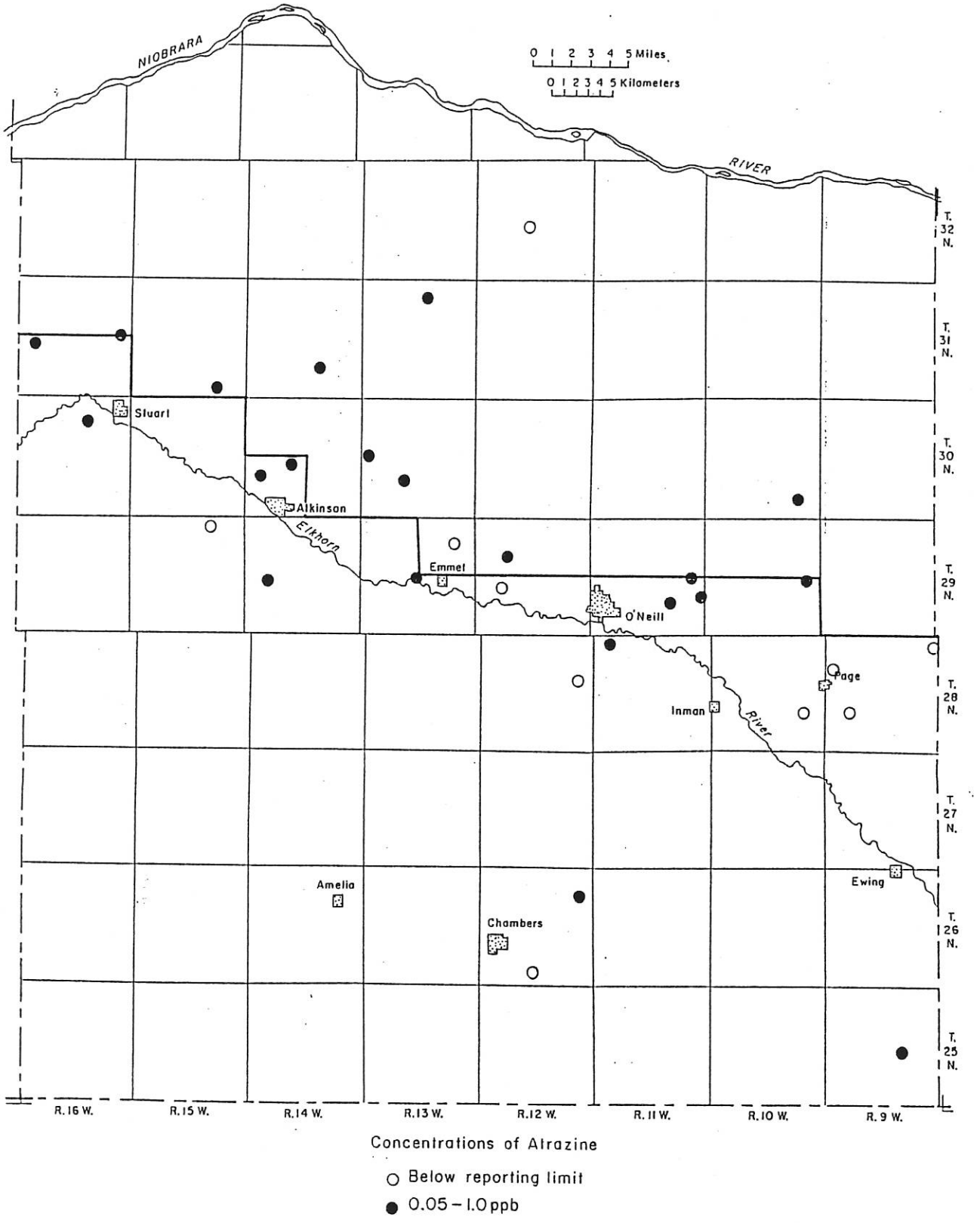


Figure 18. Relative concentrations of atrazine in irrigation wells in Holt County.

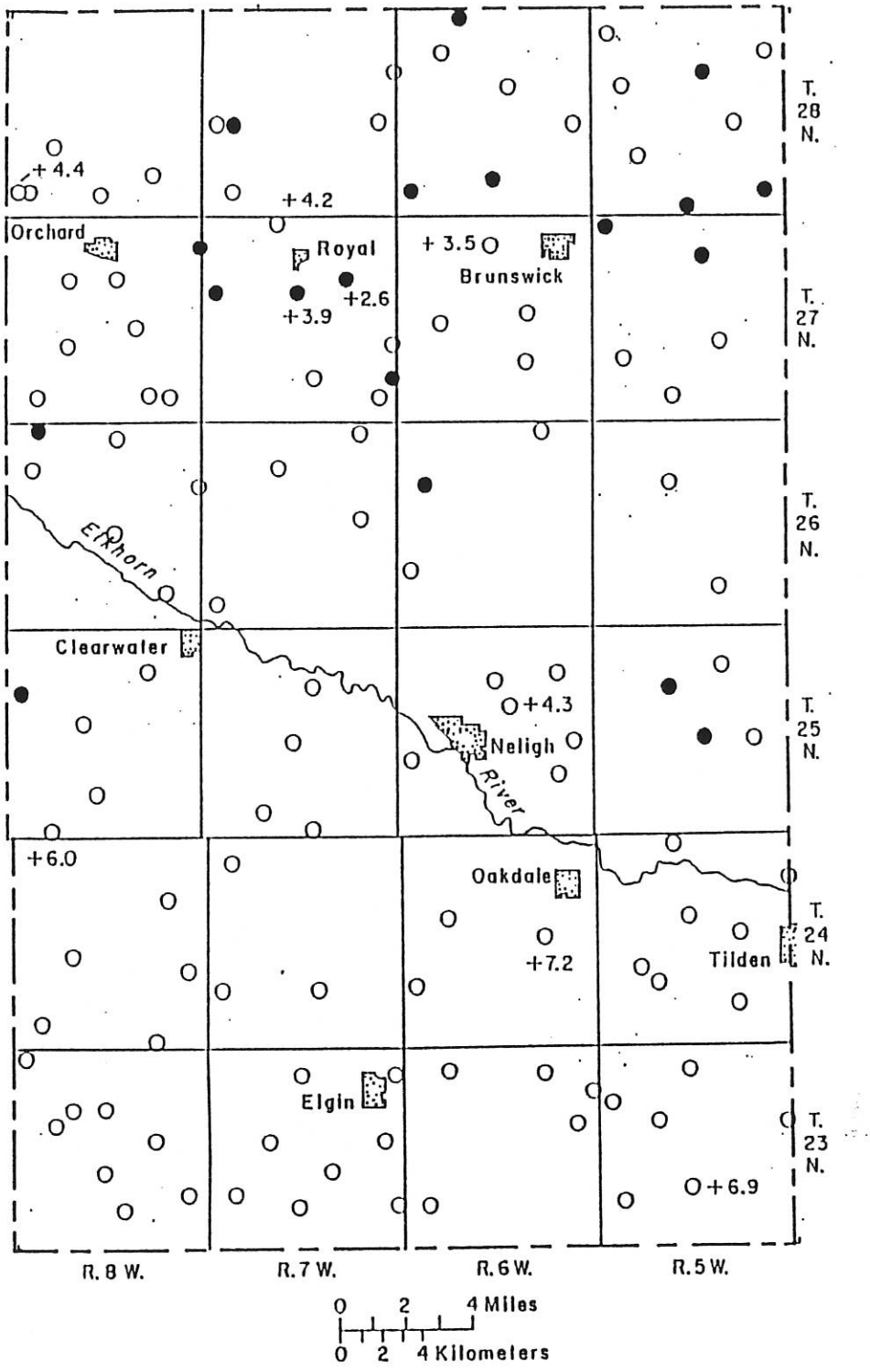


Figure 19. Relative Concentrations of Nitrate-Nitrogen in Irrigation Wells in Antelope County

only ranged from 0.01 to 0.03 ug L^{-1} (Exner and Spalding, 1991b). The wide areal distribution and low concentrations of atrazine indicate nonpoint source pollution.

In 1992, the UENRD began a Vadose Zone Soil Sampling Program. The purpose of this program is to assess the amount of nitrogen (nitrate) found in the vadose zone. The vadose zone is the unsaturated portion of the soil profile found between the root zone and the water table. Nitrogen in the vadose zone is a potential source of groundwater contamination since it is not utilized by crops and can move through the soil profile to the groundwater. Results have shown that various parameters can affect the movement of nitrogen to the groundwater including type of crop, soil topography and texture, irrigation, precipitation, and nitrogen management. The District produces a summary document of results for this program each year it is conducted. As this program continues to evolve and expand, even more useful information will become available, which can be incorporated into the District's GWMP.

The UENRD purchased a HACH Kit in 1975 which allows rapid testing of water samples for various contaminants including nitrates. As a service, the District tests water samples brought in to the office by District constituents. Records showing results of the tests have been retained on file in the office since the onset of this program. Most samples tested are domestic wells, however, irrigation and livestock wells are also tested. Since the District currently has no domestic well sampling program, these results provide some information on the quality of rural domestic water supplies.

LAND USE & CONTAMINATION SOURCE INVENTORY

When determining potential sources of groundwater contamination, an important idea to understand is the relationship between land use and contamination sources. Certain anthropologic (human) activities are more conducive to increased contamination potential. A sound management plan for agricultural and urban activities can mean the difference between sustainability and degradation of groundwater resources.

Land Use

Encompassing nearly 1.9 million acres, the UENRD is primarily an agricultural area with 66% of the area in range and pasture land and 29% in cropland. Urban and built-up land (roads, railroads, earthen structures, etc.) accounts for only 12,700 acres or less than 1% of the District's area ((USDA-NRI, 1982). Irrigated cropland accounts for 351,100 acres or nearly 65% of total cropland, with approximately 97% of this irrigated cropland utilizing center pivot irrigation (USDA-NRI, 1982).

Land Capability Classification

The Natural Resources Conservation Service (NRCS) classifies all soils into eight classes (I - VIII) based on their ability to produce crops without eroding. Class I land is the best land with no restrictions, while Class VIII land has the most restrictions for use (SCS, 1992). A description of each land capability class is given below along with the percentage of District land within each class. Table 2 shows the distribution of District land found within each capability class.

Class I. This is very good, nearly level land that has no erosion hazards and will support continuous row crops. Class I land accounts for approximately 2 % of the District. There are no restrictions on this land.

Class II. This is also very good land, but with gentle slopes. These slopes may present slight vulnerability to water erosion, while the presence of sandy loam surface soils may constitute vulnerability to wind erosion. Minor erosion control practices will stabilize these soils. Class II land makes up approximately 5% of the District. This land can generally be protected with best management practices (BMPs).

Class III. This is moderately rolling land subject to water erosion or a moderately sandy soil that is subject to wind erosion. Moderately intensive conservation practices are needed to control erosion. Class III makes up approximately 14% of the District. Over 50% of this land is cropland. Soils subject to wind erosion can generally be protected with management practices such as cropping sequences and conservation tillage. Soils subject to water erosion may need structural practices such as terraces and waterways, or other management practices.

Class IV. This is marginal land with severe limitations due to water and wind erosion. Very intensive conservation practices are needed to stabilize for row crop production. Class IV land accounts for approximately 27% of the District. Nearly 40% of this land is cropland. Conservation tillage is the primary practice used for controlling erosion.

Class V. This land is too wet for cropland due to poor surface and subsurface drainage, and is only capable of supporting permanent vegetation. Class V land makes up approximately 8% of the District land. In general, this land does not have significant erosion problems.

Class VI. This is very steep or sandy land with severe erosion, and should be maintained as permanent vegetation for hayland or grazing. Class VI land accounts for approximately 41% of District land. Nearly 90% of this land is in permanent vegetation.

Class VII. This is extremely steep or sandy land that should always be permanent native vegetation. Class VII land makes up approximately 2% of the District land. Good management of permanent native vegetation is necessary to protect this land from erosion.

Class VIII. This land is comprised of stream banks, river banks, and river wash land capable only of producing wildlife habitat. Class VIII land makes up less than 1% of the District land. Permanent vegetation is used to protect this land.

MISC. This includes urban and built-up land, rural transportation land, and water areas. Miscellaneous land makes up approximately 5% of District land.

Table 2. Land Use Distribution Within NRCS Capability Classes in the UENRD.

Class	Cropland Non-irr. (acres)	Cropland Irr. (acres)	Pasture Land (acres)	Range Land (acres)	Forest Land (acres)	Other Land (acres)	Total (acres)
I	9,900	27,500				8,500	45,900
II	41,600	33,500	6,400	4,600		6,700	92,800
III	60,600	78,500	21,700	96,600		2,400	259,800
IV	63,200	129,700	18,600	262,800		11,000	485,000
V	5,000	5,100	2,300	125,600	6,200	2,400	146,600
VI	12,700	76,800	9,900	642,700		2,800	744,900
VII				43,000			43,000
VIII				6,200			6,200
Misc.						61,300	61,300
TOTAL	**193,000**	**351,100**	**58,900**	**1,181,500**	**6,200**	**95,100**	**1,885,800**

(Source: USDA-SCS Multi-Year Plan for the UENRD, 1992).

Many of these land capability classes have restrictions for use. The UENRD does have a considerable amount of land in restricted classes and much of it is still in need of conservation practices. Table 3 shows the amount of District land that is adequately and inadequately protected from erosion for each type of land use. Nearly half of the irrigated cropland and 44% of the non-irrigated cropland is inadequately protected. In addition, a third of the pasture land and over a quarter of the range land is in need of conservation practices. As a whole, approximately 31% of the District is in need of conservation treatment practices to protect it from erosion and degradation.

Table 3. Conservation Treatment Needs in the UENRD.

Land Use*	Total Acres	Adequately Protected		Treatment Unfeasible		Treatment Needed	
		Acres	%	Acres	%	Acres	%
Cropland(NI)	193,000	107,500	56			85,500	44
Cropland (I)	351,100	183,500	52			167,600	48
Pasture Land	58,900	39,000	66			19,900	34
Range Land	1,181,500	868,500	74			313,000	26
Forest Land	6,200			6,200	100		
Other Land	33,800	33,800	100				
Misc.	61,300	61,300	100				
TOTAL	**1,885,800**	**1,293,600**	**69**	**6,200**	**0**	**586,000**	**31**

(Source: USDA-SCS Multi-Year Plan for the UENRD, 1992).

* **NI** represents Non-Irrigated cropland. **I** represents Irrigated cropland

Contamination Source Inventory

A. *Nonpoint Source Inventory*

Nonpoint sources are diffuse, indiscernible, often indistinct conveyances from which contaminants can be discharged. It is very difficult to pinpoint the origin of pollutants with nonpoint source pollution since the discharge may occur over large areas. Urban storm runoff, over-irrigation, agrichemicals, feedlots, and erosion can all contribute to this problem. The majority of work conducted in the District has been slated for nonpoint source pollution. This pollution source has significantly impacted groundwater quality in the UENRD and has the potential to do even greater damage. Nonpoint source pollution is characteristic of moderate contamination levels over a broad area. However, contamination can reach greater levels if

uninhibited. Implementation of proper management plans for both agricultural and urban activities is essential to combat this problem.

B. *Point Source Inventory*

Point source pollution can be identified as discharging from a known point of conveyance. The Nebraska Department of Environmental Quality (NDEQ) and the Nebraska Department of Health (NDOH) are the primary agencies responsible for point source pollution. Natural Resource Districts assist these agencies when possible and may even keep records on file. The Nebraska Environmental Protection Act established in 1971, mandated NDEQ with the responsibility of protecting and enhancing environmental quality of land, water, and air in Nebraska. NDEQ issues permits, conducts monitoring programs, and develops long-range strategies, primarily focusing on point source pollution. The NDOH becomes involved when public water supplies are contaminated by point source pollutants. Neither agency systematically samples or monitors groundwater for agrichemical contamination. Although the UENRD is not the leading agency with this type of pollution, information is provided to emphasize that point source pollution can also result in groundwater contamination.

Solid Waste

The NDEQ issues licenses to landfill facilities. Currently, there are no operating landfills located in the UENRD. However, the city of O'Neill has a recycling plant

which collects area waste and recycles up to 90% of this waste. Other communities must collect and ship solid waste refuse outside the District for proper disposal in a licensed, approved landfill.

Underground Storage Tank (USTs)

NDEQ issues permits and monitors activities concerning USTs. The majority of USTs are used to store gasoline and diesel fuel although some are used for storage of other compounds. Any leak associated with a UST must be reported to NDEQ and the Nebraska State Fire Marshall. There are 30 reported UST spill sites in the UENRD.

Agricultural Facilities

Agricultural facilities such as feedlots must be registered with NDEQ. Currently, there are 39 such facilities in the UENRD and all but 8 require controls.

Hazardous Waste Inventory

There are a reported 10 hazardous waste facilities in the District according to the Environmental Protection Agency's report for Hazardous Waste Administrative Inventory.

Waste Water Treatment Facilities

The National Pollutant Discharge Elimination System (NPDES) requires all discharges of point source pollutants into any waters of the state to obtain a permit from NDEQ. There are 21 permits in the District, the majority of which are for waste water treatment facilities.

Chemigation

The application of agrichemicals through center pivot irrigation systems, or chemigation, is widely used in the UENRD. This practice is very useful for distributing agrichemicals over a wide area, but can become a potential point source of groundwater contamination. Regulation authority of chemigation systems was dictated to the Natural Resources Districts via the passage of the Nebraska Chemigation Act in 1986. Since this time, the District has issued over 9,000 permits (Table 4). The policy of the UENRD is to inspect all new systems and 50% of renewal permits each year.

Acts, Regulations, and Programs

The Resource Conservation and Recovery Act or RCRA is a federal statute requiring any business that generates, stores, or transports hazardous wastes to register their activities with the EPA. RCRIS is a list of businesses that have complied with this act. Currently, there are 36 RCRA registrations in the UENRD.

Table 4. Chemigation Permit Summary in the UENRD

CHEMIGATION PERMIT SUMMARY									
						Permits per County			
Year	Renewals	New	Emerg.	Total Apps.	Apps Den.	Holt Co.	Rock Co.	Antelope Co.	Wheeler Co.
1987		824		824	59	272	66	445	41
1988	714	202	0	916	0	325	69	465	57
1989	808	158	0	966	1	354	66	482	64
1990	817	216	1	1034	7	357	71	539	67
1991	916	262	6	1184	6	365	90	664	65
1992	1113	241	0	1354	4	429	113	747	65
1993	1192	161	0	1353	6	413	107	770	63
1994	1267	121	1	1388	5	431	114	782	61

The Emergency Planning and Community Right-to-Know Act or Title III lists businesses that use, store, or release hazardous materials as part of normal business operation. It was established to provide necessary information to emergency response teams when preparing for incidents involving hazardous substances. It was also enacted to inform the public of any hazardous materials being used in the community. The UENRD has 78 sites registered under Title III, any of which are potential point sources for groundwater contamination.

Other Sources

This list is not an exhaustive list and there are many more potential sources for point source pollution. Presently, there are no statistics available identifying the number of septic systems or properly abandoned wells in the UENRD. The UENRD will work with the NDEQ and NDOH to address situations as they require.

Groundwater contamination, whether from point or nonpoint sources, is a concern of the District. Table 5 is a summary of potential and existing point source pollution.

Table 5. Potential and Existing Point Source Pollution Summary.

County	Community	RCRIS[1]	UST[2]	NPDES[3]	Haz Waste[4]	Title III[5]
Antelope	Atkinson	5	2	1	2	9
Rock	Basset	2	3	1	1	7
Antelope	Brunswick	3	-	1	-	4
Holt	Chambers	-	2	1	-	4
Antelope	Clearwater	-	1	2	-	2
Antelope	Elgin	3	-	1	1	9
Holt	Emmet	1	-	1	-	2
Holt	Ewing	2	-	2	-	5
Antelope	Neligh	7	8	1	2	8
Rock	Newport	-	-	1	-	1
Antelope	Oakdale	2	-	1	-	1
Holt	O'Neill	8	7	2	4	13
Antelope	Orchard	3	2	1	-	5
Antelope	Page	-	1	1	-	3
Antelope	Royal	-	1	3	-	1
Holt	Stuart	-	3	1	-	4
TOTALS		**36**	**30**	**21**	**10**	**78**

1. **Resources Conservation and Recovery Act (RCRA), NDEQ, March 15, 1993.**
2. **Underground Storage Tanks, December, 1992.**
3. **National Pollutant Discharge Elimination System, March 11, 1992.**
4. **Hazardous Waste Administrative Inventory, May 28, 1991.**
5. **Community Right-To-Know, 1993.**

GROUNDWATER USE & DEMAND

Groundwater Use

Groundwater is a very important resource in the state of Nebraska. In fact, during 1990, over 4.4×10^3 million gallons of groundwater were used for irrigation every day. Additionally, groundwater accounted for 75% of public water supplies or 2.4×10^3 million gallons per day (mg d^{-1}) during this same year (NNRC, 1994). Not only is groundwater an important resource for irrigation and public drinking supplies, but also for a variety of other purposes including wildlife habitat and industrial uses.

When referring to groundwater use, the topic of surface water use must also be considered since the two are often connected. Many times groundwater feeds streams and rivers. A large drawdown of groundwater may greatly affect stream flow and cause conflicts with surface water users or degrade wildlife habitat. On the flip side, leaking irrigation canals can recharge the underlying groundwater aquifer, resulting in higher groundwater levels. This concept of "interconnectedness" between groundwater and surface water use is termed *conjunctive use*. Conjunctive use is an important issue today and will continue to be as groundwater and surface water users compete for Nebraska's water resources.

Groundwater resources are used for a variety of purposes in the UENRD. Among these are demands for irrigation, livestock, rural domestic uses, municipal uses, industrial uses, wildlife habitat, and others. The U.S. Geological Survey (USGS) and the NNRC have collected water data in Nebraska from 1990 in an effort to estimate categorical water usage. These results are specific to counties and not to NRDs. However, they do

provide good indications of groundwater usage in a particular region. Table 6 shows groundwater use for various purposes by county.

Table 6. Groundwater Usage in Antelope, Holt, Rock, and Wheeler Counties in the UENRD.

	Ave. Annual Groundwater Use per County (ac-ft /yr)			
Groundwater Use	**Antelope**	**Holt**	**Rock**	**Wheeler**
Irrigation	105,300	100,200	23,400	25,700
Livestock	2,100	4,640	1,150	2,200
Municipal	630	740	210	20
Rural Domestic (self-supplied)	610	890	100	130
Commercial	240	400	60	10
Industrial	150	30	0	0
TOTAL**	109,030	106,900	24,920	28,060

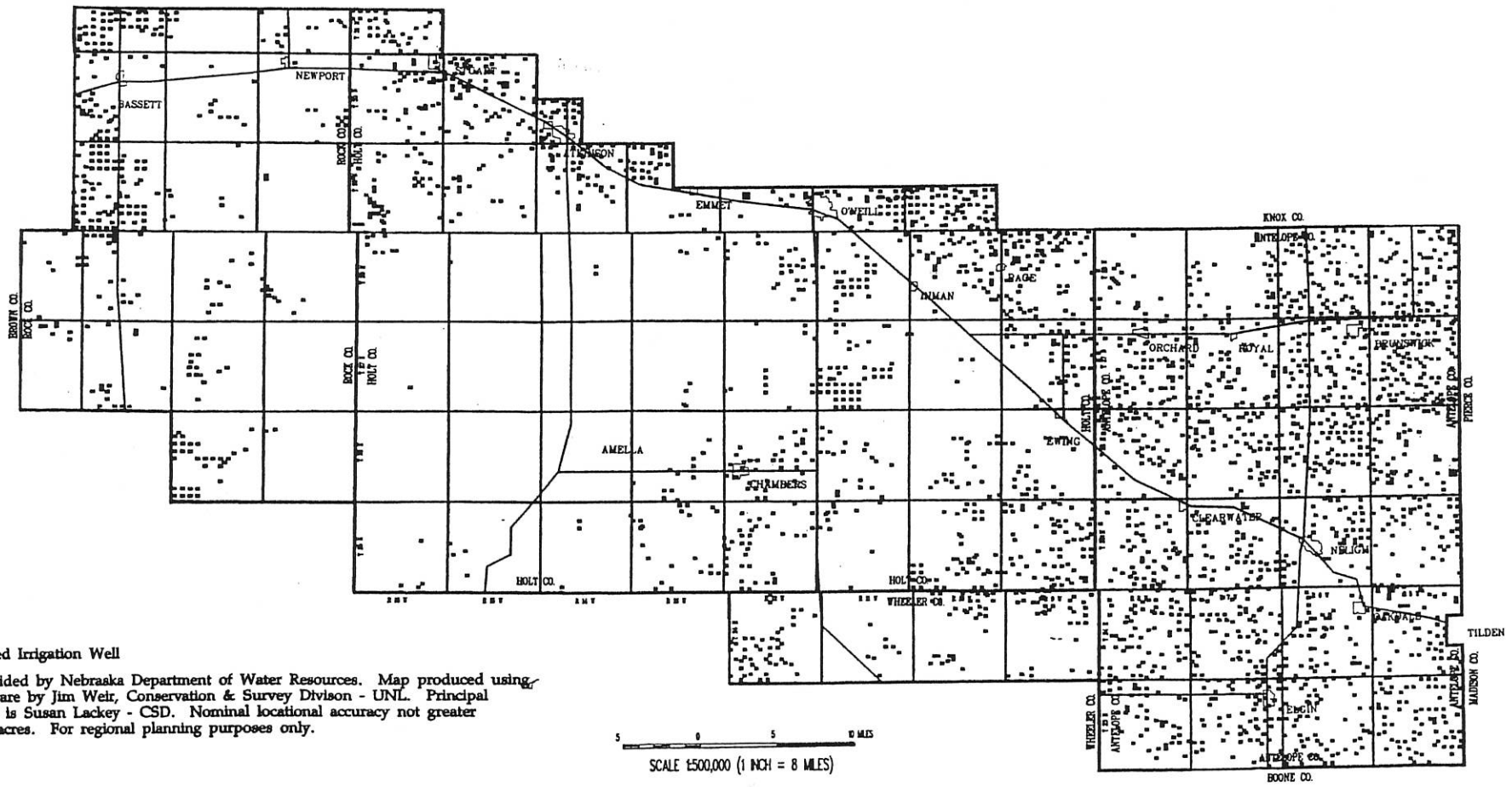
(Source: NNRC, *Estimated Water Use in Nebraska 1990*)

** Totals are for entire counties. The UENRD occupies 99% of Antelope, 60% of Holt, 60% of Rock, and 25% of Wheeler County.

Agriculture

The agricultural sector, including irrigation and livestock uses, is by far the greatest user of groundwater in the UENRD (Table 6). There are nearly 3000 registered irrigation wells in the District (Figure 20). Based on these numbers, crop requirements, acres planted, and crop type, current annual groundwater irrigation requirements in the UENRD are estimated to be approximately 2.35×10^5 acre-feet per year assuming normal precipitation conditions. This estimate can vary from year to year depending upon many factors including temperature, precipitation, evapotranspiration, wind, and several others. Geographically, precipitation generally decreases from west to east in the UENRD,

Figure 20. Registered Irrigation Wells - Summer 1994



⊠ Registered Irrigation Well

Data provided by Nebraska Department of Water Resources. Map produced using GIS software by Jim Weir, Conservation & Survey Divison - UNL. Principal researcher is Susan Lackey - CSD. Nominal locational accuracy not greater than 160 acres. For regional planning purposes only.

Conservation and Survey Division
Institute of Agriculture and Natural Resources
University of Nebraska - Lincoln
Lincoln, Nebraska 68588 - 0517

potentially requiring a larger input of water through irrigation. However, precipitation is not the only thing to consider since many soils in the District are very sandy and have low water-holding capacities.

Groundwater is also utilized in farming operations for the production of livestock, but this value is difficult to quantify. According to the *1994-95 Agricultural Statistics* handbook, there was an inventory of 492,000 head of cattle and 341,700 hogs in counties making up the UENRD in 1990, accounting for over 10,000 acre-feet of groundwater used in 1990 (Table 6). Statistics for 1995 show even larger inventories. With such large numbers, it is important to quantify groundwater use for these operations.

Another important agricultural groundwater user is subirrigation. Subirrigation is the withdrawal of groundwater directly from the watertable or the capillary fringe by vegetation. Subirrigation can produce lush native grasses for haying as well as supporting trees and other vegetation. For the UENRD, subirrigation is an important consideration since there is a significant amount of wetland areas in the District. This use of groundwater is not listed in Table 6, but estimates for the District based on wetland inventories and plant water requirements are approximately 300,000 acre-feet per year. This is a large volume of groundwater withdrawn each year and needs to be considered when developing a groundwater budget.

Rural Domestic

Rural domestic groundwater use refers to groundwater withdrawn for human consumption, recreation, and landscaping uses. For purposes of this plan, rural domestic

does not include groundwater supplied through municipalities or rural water districts, but rather self-supplied groundwater (domestic wells). Table 6 shows that over 1.7×10^3 acre-feet of groundwater is used for rural domestic purposes each year in counties making up the District. Since there are few large incorporated communities in the District and a large rural population, rural domestic use is relatively high. Estimates specific to the UENRD are difficult to determine.

Municipal

Municipal groundwater uses include domestic use supplied through municipalities, sanitation uses, fire protection, and other uses supplied through municipalities such as landscaping and recreation. According to Table 6, nearly 2.5×10^3 acre-feet of groundwater was used in 1990 for municipal purposes in counties making up the District. Currently, the UENRD has fifteen municipal systems operating.

Commercial and Industrial

Commercial groundwater use includes water withdrawn for facilities such as restaurants, governmental facilities, wholesale and retail businesses, and office buildings. According to Agricultural Statistics, this sector accounted for 7.1×10^2 acre-feet of groundwater used during 1990 in counties making up the UENRD (Table 6). Compared to other uses in the District, commercial use is relatively small.

Industrial use includes groundwater use by industrial facilities used in manufacturing processes. Table 6 shows that 1.8×10^2 acre-feet of groundwater was used for these

purposes. Again, this amount is relatively small compared to other uses such as agricultural.

Other Plant and Animal Species

Surface water is the predominant water source used by fish and wildlife. However, because surface and groundwater are often connected, the concept of *conjunctive use* must be considered. In areas with high water tables such as wetlands, wildlife habitat can be greatly affected by reductions in groundwater levels. In addition, many streams and rivers are fed by groundwater, and a significant drawdown can threaten fish habitat and drinking water supplies for wildlife. Currently, declining groundwater and surface water levels are not a problem in the District as a whole. However, if problems do arise or are anticipated to arise, the District will takes steps to address the situation, possibly including the practice of allocating water resources in an equitable manner.

The quality of groundwater can also affect fish and wildlife habitat. Groundwater quality has always been a major focus of District programs. Successful implementation of Groundwater Quality Management Areas (GWQMA) will address quality issues in problem areas and help maintain the ecological diversity found within the UENRD. Additional practices and controls required to sustain fish or wildlife species will be coordinated with other governmental and private entities.

Certain plant species can also be negatively affected by declining quality and quantity groundwater levels. In particular, the Nebraska Game and Parks Commission (NG&PC) has determined that the habitat of the Western Prarie Fringed Orchid may

occur in the UENRD. The habitat of this threatened plant is normally wet areas of native, tall grass prairies. The District has not conducted a comprehensive study to identify habitat suitable for this species, or an inventory of orchid populations since there has not been a documented sighting of the Western Prarie Fringed Orchid in the UENRD. However, with the authority delegated to the District under the Nebraska Groundwater Management and Protection Act and other pertinent legislation, the UENRD will coordinate an effort with other agencies, including the NG&PC, to maintain suitable habitat and the viability of threatened and endangered species.

The District has already taken steps to maintain the integrity of natural wetland habitat by entering into a Conservation/Preservation Easement with the Foxley Cattle Company. The easement applies to a 500 acre area in Wheeler County covered with wetlands, lakes, ponds, marshes, and a 150 foot buffer zone surrounding each wetland area. The purpose of this easement is to ensure that wetland areas remain as such perpetually through natural causes. The District recognizes the natural and ecological character of the region as shown by the establishment of control areas and easements. This is only a beginning and the UENRD will continue with efforts to protect and enhance natural habitat. There may be other groundwater uses not specifically pointed out in this discussion of groundwater usage in the UENRD. However, these uses would constitute a very insignificant amount and do not warrant a separate discussion.

IDENTIFICATION OF CRITICAL AREAS FOR PROTECTION

An assessment of water quality data, study results, and other information reveals there are several areas of concern within the UENRD. The DRASTIC vulnerability assessment (discussed in Section II) targeted areas adjacent to the Elkhorn River as being highly susceptible to groundwater contamination (Figure 11). In addition, Rock, Holt, and Wheeler Counties are dotted with areas of high contamination vulnerability. In Antelope County, the Elkhorn River Valley is the primary area of concern for groundwater contamination.

The DRASTIC assessment only indicates vulnerability potential and not measured results. However, all of the studies discussed in Section V indicate that many of these same areas are experiencing contamination problems, particularly in the Atkinson and O'Neill areas. This finding was true for all of the studies discussed including the District's own groundwater quality sampling program. Two other areas were identified by study results as having elevated nitrate levels. The first was the northeastern corner of Antelope County. Several studies found this area to have a nitrate contamination problem. The second is the area surrounding the community of Royal in north central Antelope County. Again, the consensus was one of elevated nitrate levels in this area.

Results have identified three primary areas of concern: (1) the stretch of Holt County immediately north of the Elkhorn River from Atkinson to Inman, (2) the northeastern corner of Antelope County, and (3) the immediate area surrounding the community of Royal in north central Antelope County. These areas will be the focus of remediation

and intensive monitoring for the UENRD. However, the entire District will continue to be monitored for groundwater quality.

The DRASTIC methodology has identified several areas of high groundwater contamination vulnerability. Although not all of these areas are currently experiencing contamination problems, the potential still remains for future problems. Special attention will be paid to high vulnerability areas in addition to the three primary targeted areas. The UENRD will continue to encourage the implementation of management plans and best management practices throughout the District.

GROUNDWATER RESERVOIR LIFE GOAL & OBJECTIVES

Groundwater Reservoir Life Goal

The Groundwater Reservoir Life Goal for the Upper Elkhorn Natural Resources District is to protect the quality and quantity of groundwater, and to support reasonable and beneficial uses of the District's groundwater for an infinite period of time.

Objectives

The UENRD has developed specific objectives to achieve this goal. A periodic evaluation will be made to determine if these objectives are effectively helping the District to reach it's goal. Future revisions and additions may be required. The objectives are outlined below:

Objective I. ***Citizen Advisory Committee***

The Upper Elkhorn NRD has established a Citizen Advisory Committee to work with the District and provide public input concerning the District's programs. This 18 member committee is made up of producers, agri-business people, and urban people to provide a good representation of all constituents in the District.

Objective II. ***Groundwater Quality and Quantity Monitoring Programs***

Continue with the District's baseline groundwater quality and quantity

monitoring programs and continue to monitor trends in groundwater quality and quantity levels.

Objective III. ***Groundwater Conservation***

Groundwater quantity is not now, nor is it anticipated to be a major concern of the District in the foreseeable future. However, if a significant rise or decline in groundwater levels occurs or a trend is observed, the District will develop a control or management area based on specified triggering mechanisms.

Triggering mechanisms are set to take action when an unacceptable rise or decline occurs in the District's monitoring wells over a five year period. This can be based on actual footage (i.e. 10 feet) or a percentage (i.e. 15%) of the aquifer depth. For example, if a fifteen percent decline is established as the triggering threshold in an area with an aquifer of 100 feet in depth, the establishment of a groundwater management or control area would occur when groundwater levels drop an average of 15 feet over a five year time period.

To reduce the possibility of significant groundwater level changes, the District has and will continue to improve conservation management of municipal, industrial, and irrigation systems; promote Best

Management Practices (BMPs) in utilizing soil and groundwater resources through District programs; and develop a drought management education program.

Objective IV. ***Maintain and Improve Groundwater Quality***

Continue to work with District constituents to develop and implement fertility, pest, and irrigation management plans. Encourage the incorporation of BMPs into management plans to reduce groundwater quality degradation. These programs will continue to include the rural (agricultural) and urban sectors. Expand and update information available and information dissemination.

BMP's recommended for implementation include, but are not limited to, the following:

1. Deep Soil Testing (2 or 3 foot level, if applicable)
2. Use of Crop Consultant
3. Expanded Educational Programs
4. Demonstration Site Evaluations
5. Alternative Cropping Practices
6. Chemigation
7. Animal Waste Accountability

Objective V. ***Administration of Nebraska Chemigation Act.***

This UENRD chemigation program was established in 1986. Irrigators who apply fertilizers or pesticides through center pivot irrigation systems must be certified every four years and have proper equipment in place to prevent chemicals from contaminating the groundwater supply. District staff will continue to inspect these systems, issue permits to certify District cooperators, and maintain proper records of such activities.

Objective VI. ***Administer and Expand Information and Education Programs to Encourage the Proper Management of Groundwater Resources.***

Existing information and education programs will continue to be updated, expanded, and administered to most effectively distribute information regarding District programs. This includes, but is not limited to brochures, newsletters, youth-oriented groundwater awareness programs, monitoring results, demonstrations, presentations, and Public Service Announcements.

Objective VII. ***Establish Groundwater Quality Management Areas to Address Specific Groundwater Quality Problems***

The UENRD has determined that successful implementation of this groundwater management plan will require the establishment of Groundwater Quality Management Areas (GWQMA). Establishment

of these areas and requirements of each will depend on contamination levels. Appendix H outlines the format, rules, and regulations of GWQMAs.

Objective VIII. ***Cooperate with Adjacent NRD's in the Management of Groundwater Quality and Quantity.***

Since geographic and geologic boundaries do not always correspond with political boundaries, the UENRD will cooperate with adjacent NRDs to effectively and consistently manage water resources. Adjacent NRDs include the Lower Niobrara, the Lewis and Clark, the Lower Elkhorn, the Lower Loup, the Middle Niobrara, the Lower Platte North , and the Upper Loup NRDs. Cooperation and information exchange will be encouraged with all NRDs in Nebraska.

Objective IX. ***Vadose Zone Sampling Program***

The District will continue to administer and expand their Vadose Zone sampling program which began in 1992. The information received will help develop a broad data base and target areas in need of management programs.

Objective X. ***Well Abandonment Cost-Share Program***

Wells which are not properly abandoned, provide for a direct access of contaminants to enter the groundwater. The District will

continue to administer a well abandonment program which encourages landowners to take the proper steps and precautions to abandon wells.

Objective XI. ***Deep Soil Sampling Cost-Share Program***

The UENRD will continue to provide cost share funds for cooperators who conduct a deep soil sampling analysis to determine residual soil nutrients. The District will encourage producers to take residual soil nutrients into account when formulating their management plans.

Objective XII. ***Nitrogen Demonstration Plots***

The UENRD has cooperated with the UNL Northeast Research and Extension Center in developing nitrogen demonstration plots in the District. In addition, the District has helped sponsor a 319 Project to demonstrate BMPs to cooperators. The participation in current demonstration programs and the development of new programs will continue to be a focus of the District.

Objective XIII. ***Work With and Cooperate with State and Federal Agencies in Management of Groundwater Quality and Quantity.***

Continue to work with the Natural Resources Conservation Service on Water Quality Incentive Projects (WQIP) in the District. Currently, there are two WQIP project areas established in the District (Antelope

and Holt Counties) to educate producers on the value of Integrated Crop Management Programs.

Continue to work with other state and federal agencies to monitor the groundwater quality and quantity of the District. Programs, projects, control areas, and management areas will be developed and administered in coordination with these other agencies.

Maintain and improve open information channels and good working relationships with these agencies to manage the District's water resources.

GROUNDWATER PROGRAMS & PRACTICES

The UENRD administers many programs and practices focusing on the management of groundwater resources. Several of these have previously been discussed, but this section provides a brief summary of all water quality and quantity programs. These current programs and practices may be modified, expanded, or even eliminated and new practices may be added in the future. As this is a dynamic, evolving document, necessary changes will be made to achieve the District's *Reservoir Life Goal.*

District Monitoring Programs

Currently, the UENRD monitors approximately 474 registered irrigation wells for nitrate-nitrogen on a three-year rotational basis. Using this sampling scheme, there is a uniform distribution of information available each year to evaluate groundwater quality. Future plans are to expand to 600 wells sampled, which would provide for 200 sample results each year. The implementation of this groundwater management plan may also dictate expansion of this program. Approximately 20% of these wells (95 wells) are also sampled for pesticides, but on a five-year rotational basis. Prohibitive costs prevent the District from expanding this percentage.

Groundwater quantity is also monitored using measurements from 92 registered irrigation wells. Each Spring and Fall, static water levels (SWL) are measured and compared with measurements from previous years. This program has been in place since 1975, so the determination of trends is possible.

Although this plan focuses on groundwater parameters, surface water must also be considered since the two are often connected. In 1992, a surface water quality project was administered. Surface water samples were taken and analyzed for nitrates and a variety of pesticides. No significant levels of contaminants were found in the samples. The District will continue to monitor surface water quality, investigate complaints of surface water contamination, and take the necessary steps to remediate problems encountered.

HACH Kit

District constituents can bring water samples into the NRD for a nitrate-nitrogen analysis using the District's own HACH kit. This service provides an opportunity for rural domestic water users to evaluate the quality of their groundwater. The District has not intensively tested rural domestic well samples because many do not have detailed geologic information available. The District may work with rural domestic groundwater users to establish a monitoring program.

Nitrogen Demonstration Programs

Currently, the District supports and participates in a 319 Project jointly administered by the Lower Niobrara NRD, UNL Northeast Research and Extension Center, Holt County Extension Service, UNL Conservation and Survey Division, and the USDA Natural Resources Conservation Service. The original project was slated for two years, but an extension of three additional years has been approved. The project focuses on the

problem of non-point source pollution and uses demonstrations to illustrate practices and research results. The specific objectives are as follows:

- Increase by 20%, cropland acres where nitrogen management BMPs are utilized.
- Increase by 20%, cropland acres where irrigation management BMPs are utilized.
- Inform and educate city residents, farmers, other rural residents, and school children about water quality and nonpoint source pollution issues.
- Improve communications between agriculture, city residents, and government on water quality and nonpoint source issues.

Chemigation Permit and Inspection Program

The UENRD administers a chemigation permit and inspection program in cooperation with the Nebraska Department of Environmental Quality (NDEQ). A permit must be obtained each year chemigation is used. Approximately 1360 chemigation permits are issued each year in the District. All new chemigation sites and approximately 50% of renewals are inspected each year to assure that required equipment is installed and functioning properly to prevent backflow of agrichemicals into the groundwater.

Cost-Sharing and Administration of Cost-Share Funds for Conservation Practices

The District cost-shares and distributes both state and federal cost-share funds for the implementation of conservation practices including tree-planting, cross-fencing, construction of water control structures, and many others. By providing financial assistance, the District hopes to promote interest in conservation practices. The UENRD

generally sells approximately 150,000 trees and plants roughly half of these using the District's own tree planters. In addition, the District has available conservation mulch to prevent weeds from choking out newly planted trees. Past projects have also included the construction of dams and other water control structures such as Cache Creek Structures. All of these projects were established using the District, state, and federal cost-share funds.

Deep Soil Sampling Analyses

The UENRD will cost-share on 50% of the actual cost of deep soil sampling for nitrogen content. Results from this analysis can be used by the cooperator to develop a fertility management plan. Residual nitrogen in the soil profile may be available for crop uptake possibly reducing future nitrogen input and reducing the possibility of excess nitrogen degradates reaching the groundwater.

Abandoned Well Closure Program

The District cost-shares on the proper abandonment of wells. Cooperators contract licensed well drillers to properly abandon wells in accordance with state and federal regulations. The cooperator pays 25% of the actual cost of abandoning the well subject to size restrictions as established by the District. Qualifications and restrictions regarding the District's well abandonment program are outlined in a pamphlet available in several locations.

Water Quality Incentive Projects

The purpose of Water Quality Incentive Projects (WQIP) is to promote irrigation management, crop nutrient management, pest management, and waste management systems in areas with established groundwater quality problems. Cost-share funding is provided to participating cooperators through the Farm Services Agency (FSA), while technical assistance is provided through NRDs and the NRCS.

Information and Education

A variety of on-going information and education programs are currently in place to collect, organize, and distribute information regarding the District's water resources. Demonstrations, pamphlets, newsletters, newspaper articles, and public meetings are just a few of the forums used to disseminate this information. In addition, District staff coordinate and participate in educational programs for both children and adults. The District will continue to administer and expand current programs as well as add new programs and projects.

PLAN EVALUATION & ASSESSMENT

The UENRD's original 1985 Groundwater Management Plan focused primarily on groundwater quantity. Groundwater monitoring programs since this time have revealed a growing quality problem. Groundwater quantity levels have stabilized or steadily increased over the past several years due to high precipitation amounts. As a result, the District has shifted it's focus from groundwater quantity to groundwater quality.

In accordance with the new focus of the District, this version of the plan incorporates changes to specifically address groundwater quality.

As time passes, new challenges may be encountered by the District, requiring a re-evaluation of District goals and possible a revision of this document. This is an evolving document which will reflect the direction and focus of the District. Programs which have been successful will continue to be instituted. However, as new ideas and technologies develop, the District will continue to expand and improve. Hopes are not to move towards regulatory programs, but instead to utilize voluntary, educational programs. In order for the UENRD to achieve its goals, the help of other organizations, and even more importantly, the public must be enlisted. The UENRD has always focused on helping its constituents to protect, enhance, and best utilize the natural resources of the District. This philosophy will continue to be an integral part of the District's mission.

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APPENDIX A

Portions of the Nebraska Groundwater Management and Protection Act

46-656. Declaration of intent and purpose. The Legislature finds that groundwater is one of the most valuable natural resources in the state and that an adequate supply of groundwater is essential to the general welfare of the citizens of this state and to the present and future development of agriculture in the state. The Legislature recognizes its duty to define broad policy goals concerning the utilization and management of groundwater and to ensure local implementation of those goals. Every landowner shall be entitled to a reasonable and beneficial use of the groundwater underlying his or her land, subject to the provisions of Chapter 46, article 6, and the correlative rights of other landowner when the groundwater supply is insufficient for all users. The Legislature determines that the goal shall be to extend groundwater reservoir life to the greatest extent practicable, consistent with beneficial use of groundwater and best management practices.

The Legislature further recognizes and declares that the management, protections, and conservation of groundwater and the beneficial use thereof are essential to the economic prosperity and future well being of the state, and that the public interest demands procedures for the implementation of management practices to conserve and protect groundwater supplies and to prevent the pollution or inefficient or improper use thereof. The Legislature recognizes the need to provide for orderly management systems in areas where management of groundwater is necessary to achieve locally determined groundwater reservoir life goals and where available data, evidence, or other information indicated that present or potential groundwater conditions, including subirrigation conditions, require the designation of areas with special regulation of development and use.

Nothing in this act relating to the pollution of groundwater is intended to limit the powers of the Department of Environmental Control provided in Chapter 81, article 15. 46-673. 01. Management area designation; groundwater management plan; prepared; when; contents. Prior to January 1, 1986, each district shall prepare a groundwater management plan based upon the best available information and submit such plan to the director for review and approval. If on the operative date of this act a control or management area has been designated in a district, the district shall not be required to prepare a plan for the geographical area encompassed by such control or management area.

The plan shall include, but not be limited to, the identification to the extent possible of:

(1) Proposed geographic and stratigraphic boundaries of the management area;

(2) Groundwater supplies within the area including transmissivity, saturated thickness maps, and other groundwater reservoir information, if available;

(3) Local recharge characteristics and rates from any sources, if available;

(4) Average annual precipitation and the variations within the area;

(5) Crop water needs within the area;

(6) Current groundwater data collection programs;

(7) Past, present, and potential groundwater use within the area;

(8) Groundwater quality concerns within the area;

(9) Proposed water conservation and supply augmentation programs for the area;

(10) The availability of supplemental water supplies, including the opportunity for groundwater recharge;

(11) The opportunity to integrate and coordinate the use of water from different sources of supply;

(12) Groundwater management objectives, including a proposed groundwater reservoir life goal for the area;

(13) The controls enumerated in sections 46-673.08 to 46-673.12 proposed to achieve the groundwater reservoir life goal, and the impact of such controls on the goal;

(14) Existing subirrigation uses within the area; and

(15) The relative economic value of different uses of groundwater proposed or existing within the area.

If the expenses incurred by a district preparing a groundwater management plan exceed twenty-five percent of the district's current budget, the district may make application to the Nebraska Resources Development Fund for assistance.

46-673.02. Groundwater management plan preparation; district; solicit and utilize information. During preparation of a groundwater management plan, the district shall actively solicit public comments and opinions, and shall utilize and draw upon existing research, data, studies, or any other information which has been compiled by, or is in the possession of, state or Federal agencies, natural resources districts, or any other subdivision of the state. State agencies, districts, and other subdivisions shall furnish information or data upon the request of any district preparing such a plan. A district shall not be required to initiate new studies or data collection efforts, or to develop computer models, in order to prepare a plan.

46-673.03. Groundwater management plan; director; review; duties. The director shall review any groundwater management plan submitted by a district to ensure that the best available studies, data, and information were utilized and considered and that such plan

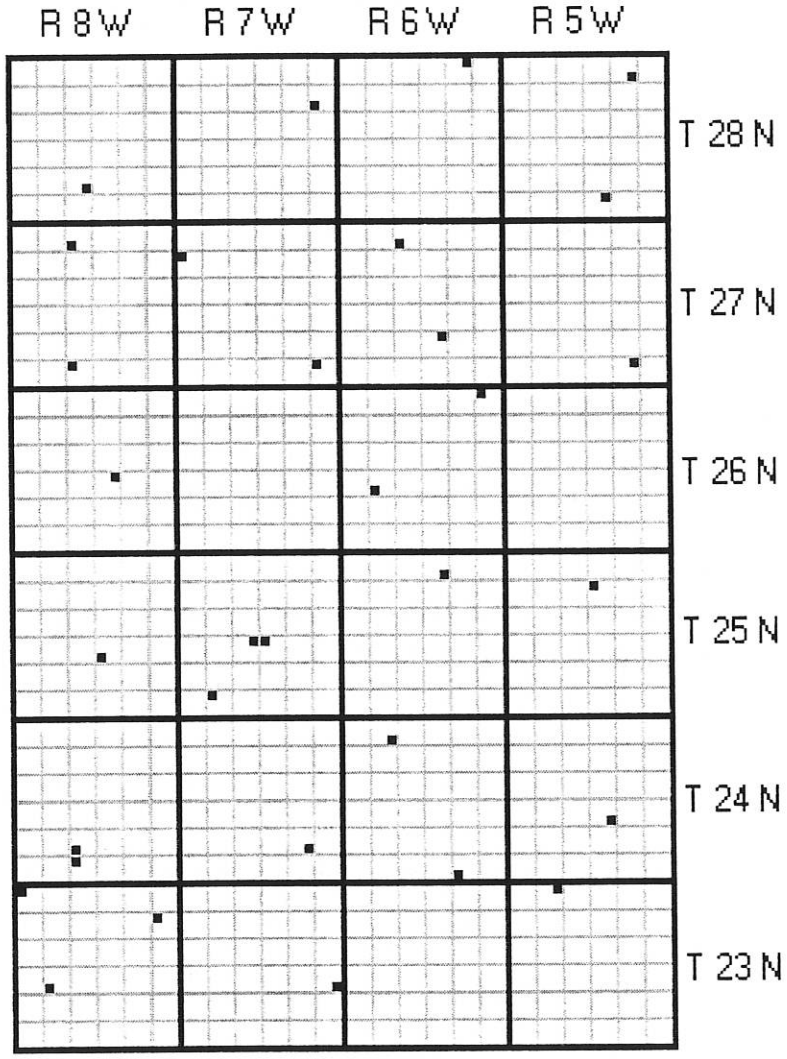
is supported by and is a reasonable application of such information. The director shall consult with the Conservation and Survey Division of the University of Nebraska, the Natural Resources Commission, and such other state or Federal agencies the director shall deem necessary when reviewing plans. Within ninety days after receipt of a plan, the director shall transmit his or her finding, conclusions, and reasons for approval or disapproval to the district submitting the plan.

APPENDIX B

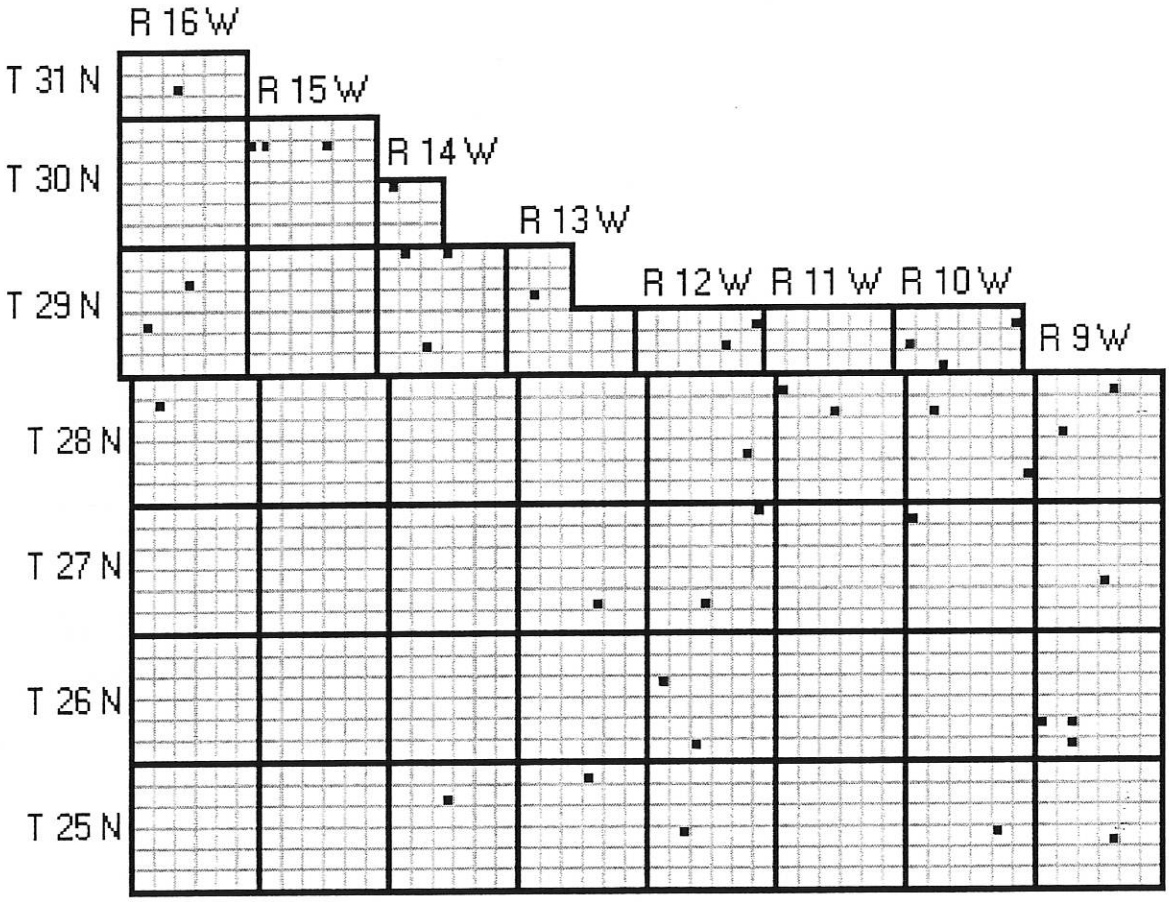
Locations of Static Water Level Monitoring Sites Within the UENRD.

Appendix B shows the locations of the UENRD's static water level (SWL) monitoring sites. Four figures are presented on the following pages, one for each county in the District. This program was established in 1975 and SWL readings have been taken every spring and fall for these registered irrigation wells, if possible.

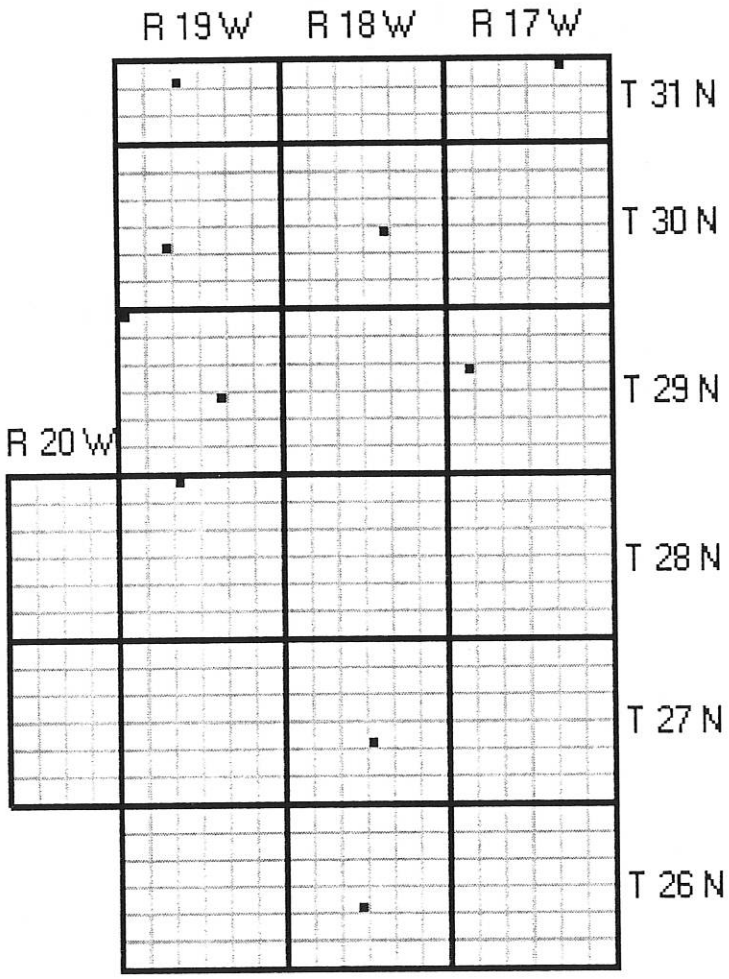
Antelope County
Static Water Level Monitoring Sites



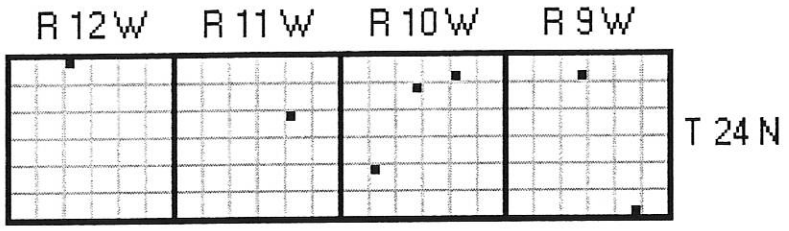
Holt County
Static Water Level
Monitoring Sites



Rock County
Static Water Level
Monitoring Sites



Wheeler County
Static Water Level
Monitoring Sites



Antelope County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					Drilled	1975	1976		1977		1978		1979	
Tn	*R*	*Sec*	*Sub*			*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
23	5	5	BA	Richard Penne	92.00	84.73	84.59	86.17	85.74	86.37	85.74	86.95	86.26	86.50
23	5	24	C	A.D. Warneke	55.00	52.90	52.01	54.45	53.56	53.83	51.99	54.94	53.54	54.63
23	7	24	BD	Leonard Hoefer	137.00	140.00	140.00	141.29	141.50	140.80	144.08	141.10	140.57	140.76
23	8	6	B	Roger Currie				127.43	125.25	126.36	124.98	127.16	124.97	126.32
23	8	12	A	Don Selting										
24	8	20	BC	Wayne Elliott	150.00	158.30	163.30	162.00	158.65	159.18	158.60	160.10	158.66	159.34
24	5	22	AD	Glen Larson	41.00	46.83	46.09	46.84	44.98	45.45	43.78	46.57	44.03	43.26
24	6	5	D	Tim Brennan										
24	6	35	AC	Sam Simmons	90.00	84.49	84.39	85.33	84.98	85.38	85.47	86.00	85.08	
24	7	26	D	Charles Meiss										
24	8	28	DC	Rueben Bergman	92.00	100.00	96.45	100.58	94.00	99.28	98.18	100.74	98.49	99.44
24	8	33	AB	Rueben Bergman	128.00	153.07	163.92	174.40	158.50	145.00	141.40	143.81	141.57	144.21
25	5	10	DB	V. Furstenau		196.10	197.30	198.85	198.48	200.12	198.69	200.26	199.10	200.20
25	6	3	DD	Charles Raymond										
25	7	21	AA	Marvin Koinzan					17.08	16.75	13.32	16.62	13.27	16.43
25	7	22	DB	Marvin Koinzan										
25	7	32	BB	Jerry McKillip		47.57	43.15	47.70	45.46	46.85	45.15	48.13	45.30	48.00
25	8	16	C	Jack Jones, Jr.										
26	6	1	AB	David Snodgrass	77.00	85.20	86.44	84.90	86.02	83.63	82.33	83.50	82.53	82.65
26	6	20	AC	Dale F. Reinke	66.00	67.05	66.80	68.24	68.02	69.58	68.10	71.00	69.51	70.30
26	8	22	BA	Art Ahlers	20.00	21.45	18.46	20.80	19.57	19.69	18.14	20.79	18.60	20.50
27	5	35	CA	Vernard Young		63.10	64.00	64.62	63.74	65.38	63.16	65.16	62.72	63.80
27	6	4	AC	Ken Hoffman	19.00	19.84	20.40	21.78	22.14	22.75	22.47	23.36	23.20	22.87
27	6	27	A	Doug Hall										
27	7	7	DB	Sam Schwager	72.00	78.65	79.60	76.54	79.68	80.38	80.43	81.85	81.33	81.80
27	7	36	BC	Board of Education										
27	8	4	AC	Rich Stellings	99.00	107.63	109.00	107.78	107.54	107.50	108.80	108.66	108.33	108.48
27	8	33	DB	Ralph Schrader	97.00	98.55	97.62	100.09	98.80	100.70	99.35	101.40	99.90	100.70
28	5	2	AD	Leonard Wortman	22.00	25.73	22.75	28.10	25.64	29.00	25.10	29.80	25.34	25.56
28	5	34	DD	Gerald Frahm	38.00	39.96	40.58	41.65	41.40	42.10	41.35	41.71	40.95	40.75
28	6	2	BA	Julieus Wagner	58.00		64.54	60.10	60.03	61.20	60.73	61.49	60.53	61.55
28	7	12	DC	Claus "Bud" Knuth	28.00		27.45	30.20	29.07	29.48	28.57	30.16	29.03	29.60
28	8	28	D	E. Gudenschwager						47.35	47.25	47.45	47.82	47.60
				Seasonal Average	**72.68**	**83.56**	**80.40**	**83.91**	**79.58**	**78.56**	**77.49**	**79.15**	**77.63**	**78.14**
				Yearly Average	**N/A**		**82.19**		**79.06**		**78.32**		**77.88**	

Antelope County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1980		1981		1982		1983		1984	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
23	5	5	BA	Richard Penne	86.14	87.44	87.02	87.75	86.95	87.83	85.69	85.89	83.87	84.11
23	5	24	C	A.D. Warneke	53.59	56.00	54.96	56.17	54.90	55.95	53.48	55.40	50.12	
23	7	24	BD	Leonard Hoefer	141.05	142.39	142.10	142.85	142.33	141.30	141.00	141.70	139.73	140.81
23	8	6	B	Roger Currie	125.77	130.93	127.09	128.34	126.57	128.29	124.19	124.83	120.79	121.02
23	8	12	A	Don Selting										
24	8	20	BC	Wayne Elliott	158.94	160.40	160.35	159.98	161.44	160.80	156.92	158.29	154.89	155.52
24	5	22	AD	Glen Larson	44.28	44.56	44.77	44.62	44.62	44.59	36.61	36.15	33.46	33.74
24	6	5	D	Tim Brennan										
24	6	35	AC	Sam Simmons							85.55	85.62	83.98	
24	7	26	D	Charles Meiss										
24	8	28	DC	Rueben Bergman	99.48	101.39	101.52	101.77	98.60	101.47	103.97	98.66	94.76	94.25
24	8	33	AB	Rueben Bergman	142.70	146.12	144.28	144.57	142.80	144.11	140.28	141.65	138.00	137.90
25	5	10	DB	V. Furstenau	200.18	200.60	199.34	201.42	199.04	200.85	195.23	200.20	196.53	198.39
25	6	3	DD	Charles Raymond										
25	7	21	AA	Marvin Koinzan	13.90	20.28	15.10	17.62	13.97	17.50				
25	7	22	DB	Marvin Koinzan							10.18	14.61	9.17	11.93
25	7	32	BB	Jerry McKillip	45.33	50.33	47.07	49.44	47.41	49.51	42.79	42.40	38.08	35.68
25	8	16	C	Jack Jones, Jr.										
26	6	1	AB	David Snodgrass	82.53	84.74	84.76	84.95	84.68	84.78	81.16	81.86	78.65	78.85
26	6	20	AC	Dale F. Reinke	69.80	72.19	71.23	72.25	71.49	72.53	70.34	71.17	68.69	69.66
26	8	22	BA	Art Ahlers	18.90	22.97	22.82	21.19	21.28	20.80	15.51	17.68	12.83	16.16
27	5	35	CA	Vernard Young	60.95	64.49	63.30	64.66	62.96	64.75	57.77	59.29	54.53	57.23
27	6	4	AC	Ken Hoffman	22.42	25.16	24.42	25.68	25.26	25.08	20.73	21.10	20.43	19.57
27	6	27	A	Doug Hall										
27	7	7	DB	Sam Schwager	81.41	82.97	83.61	83.45	84.88	83.98	82.60	81.69	80.74	79.86
27	7	36	BC	Board of Education										
27	8	4	AC	Rich Stellings	108.64	109.10	110.02	110.10	110.53	110.53	110.94	111.69	110.40	110.33
27	8	33	DB	Ralph Schrader	99.27	103.10	100.71	102.70	100.35	101.53	102.24	101.48	99.84	101.02
28	5	2	AD	Leonard Wortman	26.00	26.49	27.50	30.50	27.30	28.52	20.64		17.72	23.60
28	5	34	DD	Gerald Frahm	41.25	46.10	42.67	45.85	42.54	43.15	40.00	42.03	37.86	38.98
28	6	2	BA	Julieus Wagner	63.50	62.29	61.88	63.40	63.17	63.17	59.96	57.98	56.44	55.30
28	7	12	DC	Claus "Bud" Knuth	28.77	31.36	30.96	32.41	31.16	31.60	25.38	27.59	22.89	26.23
28	8	28	D	E. Gudenschwager	48.03	48.78	49.06	49.21	49.00	49.36	48.48	48.29	47.58	48.88
				Seasonal Average	**77.62**	**80.01**	**79.02**	**80.04**	**78.88**	**79.67**	**76.47**	**79.47**	**74.08**	**75.61**
				Yearly Average	78.81		79.53		79.28		77.94		74.81	

Antelope County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1985		1986		1987		1988		1989	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
23	5	5	BA	Richard Penne	82.57	83.30	83.23	81.17	80.53	81.79	80.77	82.76	81.20	84.32
23	5	24	C	A.D. Warneke	48.31	48.67	48.45	46.30	46.05	47.58	45.53	48.39	46.28	50.78
23	7	24	BD	Leonard Hoefer	138.27	138.10	137.93	136.42	135.30	136.20	135.22	137.20	135.46	139.42
23	8	6	B	Roger Currie	116.98	116.88	115.70	115.12	114.05	115.42	112.85	117.89	114.70	119.60
23	8	12	A	Don Selting										48.00
24	8	20	BC	Wayne Elliott	153.39	152.80	152.56	151.10	150.65	151.42	149.75	152.88	150.00	155.62
24	5	22	AD	Glen Larson	37.53	33.96	32.51	36.36	36.80	38.22	38.90	41.01	38.61	42.14
24	6	5	D	Tim Brennan										78.01
24	6	35	AC	Sam Simmons	82.34	83.73	83.52	82.79	80.54	83.34	81.80		81.79	84.15
24	7	26	D	Charles Meiss										78.01
24	8	28	DC	Rueben Bergman	92.05	91.89	91.68	91.64	86.70	88.42	81.90	91.20	87.35	93.67
24	8	33	AB	Rueben Bergman	134.39	133.25	132.90	130.90	130.10	131.60	128.42	134.25	130.20	137.10
25	5	10	DB	V. Furstenau	197.08	193.55	192.00	191.60	191.86	191.98	191.16	193.92	192.33	195.68
25	6	3	DD	Charles Raymond										97.70
25	7	21	AA	Marvin Koinzan			12.51	17.00	16.20	18.52	18.61	17.36	21.63	20.66
25	7	22	DB	Marvin Koinzan	9.65			11.25	10.39	13.56	12.79	20.75	15.63	20.90
25	7	32	BB	Jerry McKillip	33.19	34.18	34.01	31.27	31.20	32.13	42.56	44.44	43.32	47.32
25	8	16	C	Jack Jones, Jr.										66.35
26	6	1	AB	David Snodgrass	78.38	79.73	79.33	78.12	76.10	77.66	76.10	79.78	79.46	83.60
26	6	20	AC	Dale F. Reinke	66.49	67.65	67.46	67.08	65.70	66.66	65.14	67.61	66.15	69.32
26	8	22	BA	Art Ahlers	15.68	16.47	16.16	15.08	13.86	17.42	16.46	20.15	18.97	21.62
27	5	35	CA	Vernard Young	56.72	59.23	58.98	58.00	55.87	58.60	57.30	61.08	60.44	66.57
27	6	4	AC	Ken Hoffman	19.60	19.65	19.21	19.61	17.86	20.05	19.01	21.05	21.66	23.92
27	6	27	A	Doug Hall										112.00
27	7	7	DB	Sam Schwager	80.78	79.39	79.16	78.13	77.26	77.60	76.60	77.52	77.17	79.15
27	7	36	BC	Board of Education										93.32
27	8	4	AC	Rich Stellings	110.29	109.30	109.10	107.16	106.33	107.30	106.40	107.22	105.25	106.31
27	8	33	DB	Ralph Schrader	97.58	101.75	101.69	99.25	99.83	97.51	100.85	97.77	101.67	99.78
28	5	2	AD	Leonard Wortman	20.77	22.86	22.81	21.46	17.20	23.90	20.37	26.63	22.70	29.97
28	5	34	DD	Gerald Frahm	38.28	39.19	38.92	39.10	37.30	39.54	38.75	40.77	40.12	43.09
28	6	2	BA	Julieus Wagner	55.05	55.37	55.11	53.80	53.50	55.16	54.77	56.53	56.86	58.94
28	7	12	DC	Claus "Bud" Knuth	25.68	26.04	25.85	25.98	23.74	26.62	25.91	28.72	26.94	31.76
28	8	28	D	E. Gudenschwager	48.07	46.47	47.30	46.70	45.20	46.60	45.50	45.82	45.37	48.66
				Seasonal Average	**73.56**	**76.39**	**73.52**	**70.48**	**69.24**	**70.95**	**70.13**	**72.51**	**71.59**	**76.59**
				Yearly Average	**74.95**		**71.97**		**70.09**		**71.30**		**74.38**	

Antelope County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1990		1991		1992		1993		1994	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
23	5	5	BA	Richard Penne	81.30	85.00	84.28	87.33	86.04	85.70	84.66	83.16	81.84	82.42
23	5	24	C	A.D. Warneke	46.38	51.67	49.64	54.89	52.16	51.53	49.87	48.39	46.62	47.00
23	7	24	BD	Leonard Hoefer	135.74	140.46	138.40	142.57	140.65	140.42	139.40	138.24	137.00	137.74
23	8	6	B	Roger Currie	116.02	123.68	120.36	127.12	124.00	124.20	122.20	122.79	120.24	122.10
23	8	12	A	Don Selting	54.00	49.38	47.45	53.42	49.47	51.25	49.94	49.82	47.63	48.80
24	8	20	BC	Wayne Elliott	151.00	156.60	15.33	159.66	158.32	158.43	157.40	157.81	156.40	157.42
24	5	22	AD	Glen Larson	37.83	43.73	40.10	44.01	41.13	41.45	38.52	36.11	34.05	35.88
24	6	5	D	Tim Brennan	78.30	82.21	80.09	80.43	78.27	78.30	76.42	74.00	73.82	74.35
24	6	35	AC	Sam Simmons	82.35	86.00	85.24	87.33	86.39	86.18	85.62	84.56	83.71	84.44
24	7	26	D	Charles Meiss	78.30	82.21	36.60	41.15	39.00	37.60	35.83	34.13	32.63	33.83
24	8	28	DC	Rueben Bergman	98.80	97.33	93.45	101.50	97.74	99.24	95.99	97.74	93.37	96.42
24	8	33	AB	Rueben Bergman	131.60	140.03	136.40	144.50	140.74	141.18	139.09	139.94	136.50	139.44
25	5	10	DB	V. Furstenau	193.22	198.70	197.94	201.66	199.76	199.52	197.00	194.93	192.45	194.50
25	6	3	DD	Charles Raymond	96.22	100.20	98.62	101.36	99.74	100.09	97.60	98.56	96.78	98.80
25	7	21	AA	Marvin Koinzan	22.74	19.63	25.76	28.66	23.71	21.00	18.44	17.28	17.40	19.81
25	7	22	DB	Marvin Koinzan	15.35	21.07	17.60	20.69	14.70	12.70	10.52	10.29	10.72	13.32
25	7	32	BB	Jerry McKillip	44.20	50.34	47.68	53.31	49.38	48.66	46.28	45.19	43.47	46.72
25	8	16	C	Jack Jones, Jr.	65.53	67.82	66.24	69.50	67.00	65.40	63.52	61.36	59.80	61.15
26	6	1	AB	David Snodgrass	82.90	85.34	84.20	89.98	87.46	88.22	81.30	80.06	77.48	79.75
26	6	20	AC	Dale F. Reinke	68.26	71.01	70.24	72.08	73.13	71.83	69.74	69.52	66.77	68.80
26	8	22	BA	Art Ahlers	19.43	21.76	19.83	23.50	20.22	18.45	17.54	16.49	16.16	18.03
27	5	35	CA	Vernard Young	64.50	68.86	66.31	69.06	64.20	61.87	57.60	54.12	54.22	57.87
27	6	4	AC	Ken Hoffman	22.02	25.89	25.58	27.62	26.32	25.35	23.41	20.96	20.01	20.50
27	6	27	A	Doug Hall	112.32	115.38	115.56	117.71	117.74	118.10	117.45	117.28	115.69	115.12
27	7	7	DB	Sam Schwager	76.70	80.67	80.47	81.85	81.27	81.75	80.47	80.10	78.02	78.88
27	7	36	BC	Board of Education	91.36	87.87	89.33	90.00	87.23	88.70	90.86	87.60	85.75	87.24
27	8	4	AC	Rich Stellings	104.38	108.25	107.70	109.15	108.69	109.11	108.36	108.76	107.90	108.37
27	8	33	DB	Ralph Schrader	102.20	100.27	98.25	102.86	100.79	101.05	99.40	99.04	96.83	98.12
28	5	2	AD	Leonard Wortman	25.60	30.26	26.87	31.93	27.16	24.35	21.10	19.00	17.94	18.22
28	5	34	DD	Gerald Frahm	42.67	44.70	44.15	45.73	44.52	43.69	41.59	41.96	38.15	38.19
28	6	2	BA	Julieus Wagner	58.67	61.82	61.68	63.60	62.30	62.42	60.90	58.36	56.64	55.19
28	7	12	DC	Claus "Bud" Knuth	28.60	33.64	31.86	35.04	32.38	31.50	29.72	27.49	27.16	26.29
28	8	28	D	E. Gudenschwager	46.35	47.75	48.23	49.29	48.79	48.65	48.05	47.04	46.97	47.00
				Seasonal Average	**75.00**	**78.17**	**71.26**	**79.05**	**76.68**	**76.30**	**74.42**	**73.40**	**71.82**	**73.08**
				Yearly Average	**76.58**		**75.15**		**76.49**		**73.91**		**72.45**	

Antelope County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)								
					1995		Seasonal Average		Overall Average				
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*					
23	5	5	BA	Richard Penne	80.79	81.63	**83.96**	**84.87**	**84.43**				
23	5	24	C	A.D. Warneke	45.95	46.52	**50.17**	**51.80**	**50.98**				
23	7	24	BD	Leonard Hoefer	135.77	137.48	**139.08**	**139.87**	**139.48**				
23	8	6	B	Roger Currie	118.60	123.00	**120.81**	**123.42**	**122.15**				
23	8	12	A	Don Selting	45.77	49.10	**49.04**	**49.97**	**49.54**				
24	8	20	BC	Wayne Elliott	156.12	157.57	**149.13**	**157.39**	**153.36**				
24	5	22	AD	Glen Larson	35.17	34.32	**39.69**	**40.94**	**40.33**				
24	6	5	D	Tim Brennan	72.33	72.25	**76.54**	**77.08**	**76.83**				
24	6	35	AC	Sam Simmons	83.00	83.66	**83.87**	**84.87**	**84.34**				
24	7	26	D	Charles Meiss	32.20	32.63	**42.43**	**48.51**	**45.70**				
24	8	28	DC	Rueben Bergman	91.44	97.49	**94.80**	**97.34**	**96.10**				
24	8	33	AB	Rueben Bergman	134.50	140.40	**139.41**	**142.26**	**140.87**				
25	5	10	DB	V. Furstenau	193.15	192.65	**196.09**	**197.41**	**196.77**				
25	6	3	DD	Charles Raymond	96.48	97.11	**97.57**	**99.12**	**98.40**				
25	7	21	AA	Marvin Koinzan	17.02	15.44	**17.54**	**18.79**	**18.16**				
25	7	22	DB	Marvin Koinzan	9.88	10.54	**12.22**	**15.13**	**13.67**				
25	7	32	BB	Jerry McKillip	43.35	44.18	**42.92**	**44.92**	**43.94**				
25	8	16	C	Jack Jones, Jr.	59.45	59.00	**63.59**	**64.37**	**64.01**				
26	6	1	AB	David Snodgrass	78.14	76.60	**81.50**	**82.57**	**82.05**				
26	6	20	AC	Dale F. Reinke	67.04	67.42	**68.51**	**69.66**	**69.10**				
26	8	22	BA	Art Ahlers	15.82	15.54	**17.81**	**19.36**	**18.60**				
27	5	35	CA	Vernard Young	55.98	56.17	**60.26**	**62.09**	**61.20**				
27	6	4	AC	Ken Hoffman	19.46	17.03	**21.78**	**22.32**	**22.06**				
27	6	27	A	Doug Hall	113.36	114.57	**115.35**	**115.74**	**115.56**				
27	7	7	DB	Sam Schwager	77.33	45.39	**79.98**	**78.65**	**79.30**				
27	7	36	BC	Board of Education	84.15	85.64	**88.11**	**88.62**	**88.39**				
27	8	4	AC	Rich Stellings	106.09	107.47	**108.23**	**108.58**	**108.41**				
27	8	33	DB	Ralph Schrader	95.87	98.54	**99.65**	**100.34**	**100.01**				
28	5	2	AD	Leonard Wortman	14.75	16.04	**22.76**	**25.60**	**24.18**				
28	5	34	DD	Gerald Frahm	38.62	37.68	**40.58**	**41.71**	**41.16**				
28	6	2	BA	Julieus Wagner	53.65	51.10	**59.00**	**58.94**	**58.97**				
28	7	12	DC	Claus "Bud" Knuth	25.07	23.58	**27.81**	**29.26**	**28.54**				
28	8	28	D	E. Gudenschwager	46.55	45.65	**47.42**	**47.71**	**47.57**				
				Seasonal Average	**71.00**	**70.71**							
				Yearly Average	**70.85**								

Holt County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater) **bold, italicized values = 1974 values									
					Drilled	1975	1976		1977		1978		1979	
Tn	R	Sec	Sub			Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
25	9	22	D	Joe Funk	36.00	27.44	25.38	27.43	25.20	25.80	25.35	25.66	25.98	27.00
25	10	23	CB	Jake Schindler		11.13	5.26	8.68	5.00	6.78	4.98	8.74	5.61	8.52
25	12	20	AA	Vernon Harley										
25	13	3	C	Clair Coulthard										
25	14	9	D	Hugh Carr										
26	9	29	BA	Dick Kalloff	3.00	12.59	4.22	6.67		5.20	5.43	6.44	2.13	4.90
26	9	30	DB	R.D. Kalloff										
26	9	32	CA	Lewis Vandersnick	58.00	72.65	67.80	70.32	67.50	68.60	67.18	69.98	68.04	69.07
26	12	18	DA	Dennis Werner	14.00	22.22	12.72	15.65	12.50	13.31	11.60	15.25	11.77	14.21
26	12	33	B	Neal Garwood										
27	9	22	DC	Duke Hobbs	62.00	60.90	58.20	54.10	58.00	55.60	54.90	53.42	52.76	53.28
27	10	6	CC	Rich Sobotka										
27	12	1	B	Wayne Herley										
27	12	28	D	Stanley Klabenes										
27	13	27	D	Ray Klabenes										
28	9	3	DD	Russ Hilger										
28	9	17	C	Robert Wood, Sr.	19.00	48.98	47.90	92.00	91.60			88.02		88.09
28	10	8	CC	Rich Chohon		***19.83***	19.00	22.74	23.00	22.88	22.80	23.68	23.30	23.61
28	10	25	AD	Ervin Mosel	54.00	64.44	53.10	56.82	53.00	55.53	55.43	57.54	56.96	57.50
28	11	6	AC	Russ Holz										
28	11	9	D	Ted Kalloff	7.00	12.39	12.39	7.69	9.50	5.20	3.67	6.50	7.15	7.00
28	12	23	D	Merle Pease	6.00	22.54	9.50	14.22	9.20	10.05	6.92	12.40	7.51	10.66
28	16	8	B	Carol Olson										
29	10	24	CD	Keith Kennedy	18.00	***30.31***	30.40	30.88	30.60	30.95	30.20	32.07	30.60	32.38
29	10	30	AD	Duke Hobbs										
29	10	33	DC	Emmett Thompson	48.00	43.00	41.30	45.70	46.68	46.15	46.29	47.25	46.95	47.21
29	12	24	DB	Bob Kracl										
29	12	26	BC	Wayne Fox	18.00	***21.17***	19.79	22.40	19.60	19.80	18.94	21.98	18.90	21.30
29	13	14	CC	Chas Peterson		***48.44***	48.20	45.96	48.00	44.20	43.23	44.40	43.60	43.88
29	13	17	DB	Ken Huston	24.00	23.10	22.45	23.83	22.40	23.00	21.80	23.39	22.60	23.36
29	14	3	DB	Paul Segar	29.00	***33.78***	34.00	34.60	34.00	34.20	33.80	35.00	33.60	
29	14	5	DB	Terry Frisch		11.95	9.09	11.58	9.00	10.00	7.49	10.30	8.09	10.17
29	14	28	AC	Eugene Hamik	4.00	4.30	3.55	5.40	3.50	4.94	3.54	4.82	3.85	4.60
29	16	11	DC	Lawrence Skrdla	14.00	15.00	12.08	14.65	12.00	13.22	11.23	13.10	11.48	13.20
29	16	20	DC	Neal Hamilton	4.00	2.10	1.00	2.30	1.00	1.40	0.90	1.90	1.00	2.10
30	14	19	A	National Farms										
30	15	7	BA	Wilford Kaup	24.00	***22.51***	22.65	23.40	22.50	22.60	22.20	22.70	21.53	22.73
30	15	7	DB	George Kohle	4.00		5.90	7.06	5.50	5.25	5.00	5.40	5.96	5.50
30	15	10	A	P.G. Reality										
31	16	28	CD	Quinton Ramold		21.73	20.00	22.36	19.80	20.75	17.74	19.30	17.27	19.30
				Seasonal Average	**23.47**	**28.37**	**24.41**	**27.77**	**27.35**	**23.71**	**22.64**	**27.05**	**22.90**	**26.50**
				Yearly Average	**N/A**		**26.09**		**25.53**		**24.89**		**24.70**	

Holt County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1980		1981		1982		1983		1984	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
25	9	22	D	Joe Funk	26.30	29.68	28.71	29.20	27.23	29.52	24.39	27.80	23.22	20.85
25	10	23	CB	Jake Schindler	5.58	10.32	9.82	8.28	6.33	7.10	1.80	5.92	1.01	2.82
25	12	20	AA	Vernon Harley										
25	13	3	C	Clair Coulthard										
25	14	9	D	Hugh Carr										
26	9	29	BA	Dick Kalloff	2.18	7.60	4.08	6.55	4.10	5.50	2.10	4.80	0.88	1.94
26	9	30	DB	R.D. Kalloff										
26	9	32	CA	Lewis Vandersnick	67.86	70.34	69.48	70.90	69.12	70.84	61.60	68.00		60.54
26	12	18	DA	Dennis Werner	11.70	16.13	12.91	16.12	13.16	15.27	10.57	14.10	9.40	12.91
26	12	33	B	Neal Garwood										
27	9	22	DC	Duke Hobbs	53.00	55.30	53.67	55.09	53.59	54.96	51.05	52.38	49.51	49.45
27	10	6	CC	Rich Sobotka										
27	12	1	B	Wayne Herley										
27	12	28	D	Stanley Klabenes										
27	13	27	D	Ray Klabenes										
28	9	3	DD	Russ Hilger										
28	9	17	C	Robert Wood, Sr.			88.94	87.84	88.83	88.14	87.40	88.30	87.84	87.75
28	10	8	CC	Rich Chohon	23.29	25.68	25.40	26.33	26.03	26.48	22.10	24.80	19.97	21.81
28	10	25	AD	Ervin Mosel	56.80	59.83	58.94	61.19	59.60	61.59	57.60	59.94	56.49	58.21
28	11	6	AC	Russ Holz				8.97	7.83	8.34	6.20	7.98	4.70	5.90
28	11	9	D	Ted Kalloff	7.31	9.30	7.68	7.30	7.03	6.87	5.47	6.30	4.35	5.54
28	12	23	D	Merle Pease	7.69	16.76	11.66	13.69	9.30	12.75	8.86	11.33	7.53	9.21
28	16	8	B	Carol Olson										
29	10	24	CD	Keith Kennedy	31.03	34.31	34.20	35.31	34.75	35.79	33.00	35.68	25.95	28.58
29	10	30	AD	Duke Hobbs										
29	10	33	DC	Emmett Thompson	47.12	48.42	48.67	50.36	49.82	51.02	48.00	50.11	38.65	47.48
29	12	24	DB	Bob Kracl										
29	12	26	BC	Wayne Fox	18.70	23.00	22.67	23.22	20.70	23.21	18.46	22.10	15.74	20.32
29	13	14	CC	Chas Peterson	43.43	45.78	44.65	49.62	44.88	49.51	42.11	47.40	39.98	41.44
29	13	17	DB	Ken Huston	22.79	24.22	23.85	24.71	23.57	24.74	21.58	24.42	19.28	20.86
29	14	3	DB	Paul Segar		35.20	34.71	35.41	34.97	35.30	33.37	35.40	31.97	32.45
29	14	5	DB	Terry Frisch	9.10	11.48	10.69	11.65	8.97	11.48	7.44	10.23	6.39	9.01
29	14	28	AC	Eugene Hamik	3.73	6.58	4.90	5.97	3.80	5.75	1.70	4.90	0.90	4.58
29	16	11	DC	Lawrence Skrdla	11.37	14.17	13.42	13.86	12.91	13.66	11.00	13.81	10.30	11.78
29	16	20	DC	Neal Hamilton	1.70	3.88	0.70	1.25	0.00	0.50	0.00	0.30	0.00	0.00
30	14	19	A	National Farms										
30	15	7	BA	Wilford Kaup	21.47	24.52	22.63	23.32	22.60	22.99	20.45	23.10	19.32	21.52
30	15	7	DB	George Kohle	5.73	6.89	6.64	7.17	5.40	7.05	2.90	5.95	1.80	2.71
30	15	10	A	P.G. Reality										
31	16	28	CD	Quinton Ramold	17.10	20.54	19.67	20.11	19.87	20.01	16.80	20.61	13.80	15.91
				Seasonal Average	**22.50**	**26.08**	**27.45**	**27.74**	**26.18**	**27.53**	**23.84**	**26.63**	**20.37**	**23.74**
				Yearly Average	**24.33**		**27.59**		**26.86**		**25.23**		**22.09**	

Holt County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1985		1986		1987		1988		1989	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
25	9	22	D	Joe Funk	18.43	20.89	20.81	18.05	14.95	17.78	19.77	22.07	21.60	26.15
25	10	23	CB	Jake Schindler	2.55	2.80	1.90	1.16	1.95	4.10	3.23	6.35	6.29	9.25
25	12	20	AA	Vernon Harley										2.70
25	13	3	C	Clair Coulthard										
25	14	9	D	Hugh Carr										
26	9	29	BA	Dick Kalloff	0.89	2.02	1.09	0.80	0.00	3.16	2.10	5.16	6.73	7.64
26	9	30	DB	R.D. Kalloff				27.65	25.71	29.75	30.18	30.58	35.84	34.55
26	9	32	CA	Lewis Vandersnick		61.09	60.93	60.46	55.26	61.00	61.33	66.43	66.36	70.56
26	12	18	DA	Dennis Werner	9.57	13.00	12.53	9.54	9.57	13.87	11.22	14.71	14.55	17.58
26	12	33	B	Neal Garwood										12.40
27	9	22	DC	Duke Hobbs	49.93	49.30	48.60	49.40	48.11	51.80	48.55	51.12	50.10	52.82
27	10	6	CC	Rich Sobotka										6.85
27	12	1	B	Wayne Herley										
27	12	28	D	Stanley Klabenes										
27	13	27	D	Ray Klabenes										
28	9	3	DD	Russ Hilger										51.80
28	9	17	C	Robert Wood, Sr.	0.00	88.27			88.21	88.65	87.01	89.43	87.62	92.10
28	10	8	CC	Rich Chohon	21.82	22.28	21.99	21.65	19.53	21.35	20.99	21.83	21.92	23.82
28	10	25	AD	Ervin Mosel	55.43	56.54	56.36	43.15	56.45	56.65	55.79	58.23	57.05	61.57
28	11	6	AC	Russ Holz		6.20	5.79	4.50	4.66	8.23	5.99	7.11	7.43	9.15
28	11	9	D	Ted Kalloff	4.42	5.61	4.89	2.46	2.83	6.00	4.26	5.14	5.11	7.56
28	12	23	D	Merle Pease	7.64	9.85	9.52	6.05	6.52	11.22	11.12	9.92	10.47	12.57
28	16	8	B	Carol Olson										
29	10	24	CD	Keith Kennedy	27.87	31.54	31.39	30.08	26.20	28.85	29.10	31.16	30.10	33.90
29	10	30	AD	Duke Hobbs				23.77	25.83	24.16	33.80	25.76	26.26	28.94
29	10	33	DC	Emmett Thompson	46.97	47.83	47.67	46.55	45.23	45.28	44.89	45.63	44.86	47.71
29	12	24	DB	Bob Kracl										29.37
29	12	26	BC	Wayne Fox	18.40	20.75	20.26	18.32	15.10	19.15	17.15	19.87	22.20	22.10
29	13	14	CC	Chas Peterson	40.43	43.06	42.90	42.27	38.78	41.37	40.45	42.29	41.66	44.30
29	13	17	DB	Ken Huston	20.45	22.27	22.00	22.10	19.04	21.27	20.36	21.91	21.64	23.40
29	14	3	DB	Paul Segar	32.18	33.67	33.15	32.50	29.90	31.98	32.26	32.86	33.23	33.86
29	14	5	DB	Terry Frisch	7.97	10.33	10.15	6.40	6.10	10.25	7.76	10.43	9.52	11.18
29	14	28	AC	Eugene Hamik	1.13	6.68	5.59	2.43	2.15	5.35	4.10	5.18	5.03	6.25
29	16	11	DC	Lawrence Skrdla	11.00	13.21	13.02	9.95	9.85	13.13	10.63	13.14	12.42	14.10
29	16	20	DC	Neal Hamilton	0.00	0.60	0.00	flow	flow	0.00	0.00	0.00	0.00	1.18
30	14	19	A	National Farms										40.70
30	15	7	BA	Wilford Kaup	20.62	23.07	22.33	21.55	18.05	20.54	20.12	21.94	21.55	22.65
30	15	7	DB	George Kohle	2.01	3.10	3.11	4.28	4.90	4.12	4.06	5.50	5.94	5.22
30	15	10	A	P.G. Reality										57.18
31	16	28	CD	Quinton Ramold	16.33	19.44	19.00	15.54	14.40	17.60	15.74	17.62	16.86	20.24
				Seasonal Average	**18.09**	**24.54**	**21.46**	**20.82**	**22.66**	**24.32**	**23.78**	**25.24**	**25.27**	**27.69**
				Yearly Average	**21.45**		**21.13**		**23.51**		**24.51**		**26.62**	

Holt County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1990		1991		1992		1993		1994	
Tn	R	Sec	Sub		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
25	9	22	D	Joe Funk	24.33	25.80	24.37	29.63	26.22	24.94	23.87	21.30	19.94	20.70
25	10	23	CB	Jake Schindler	6.84	9.93	8.11	11.56	5.87	4.75	2.12	3.29	3.20	4.15
25	12	20	AA	Vernon Harley	1.46	5.80	2.82	6.79	1.22	0.67	flow	0.60	0.00	3.15
25	13	3	C	Clair Coulthard					10.77	10.24	8.95	9.93	9.48	12.64
25	14	9	D	Hugh Carr					30.80	31.22	30.63	30.16	29.79	31.73
26	9	29	BA	Dick Kalloff	3.68	7.74	5.50	9.69	4.90	4.16	1.63	1.84	0.64	2.79
26	9	30	DB	R.D. Kalloff	32.80	37.95	32.40	37.25	32.00	30.72	28.98	29.00	27.82	29.36
26	9	32	CA	Lewis Vandersnick	66.55	72.35	70.10	75.74	69.69	67.30	64.54	62.63	61.20	63.29
26	12	18	DA	Dennis Werner	15.00	17.00	14.28	17.13	12.66	12.39	10.37	12.15	11.07	14.03
26	12	33	B	Neal Garwood	11.30	12.95	10.06	12.74	11.42	7.50	6.28	7.45	6.81	9.10
27	9	22	DC	Duke Hobbs	50.36	54.25	53.37	57.35	54.44	52.78	51.89	51.07	50.72	50.37
27	10	6	CC	Rich Sobotka	6.10	8.60	6.90	9.35	5.33	7.45	3.78	6.18	4.90	7.34
27	12	1	B	Wayne Herley					3.35	4.22	2.09	4.50	2.45	4.27
27	12	28	D	Stanley Klabenes					4.45	5.25	3.25	4.25	1.59	6.06
27	13	27	D	Ray Klabenes						12.78	11.17	12.16	11.48	13.90
28	9	3	DD	Russ Hilger	48.25	60.00	54.59	61.04	56.57	58.06	54.88	57.50	49.42	51.90
28	9	17	C	Robert Wood, Sr.	87.30	92.00	90.80	95.20	92.75	93.88	91.90	90.80	88.77	91.05
28	10	8	CC	Rich Chohon	21.83	24.76	25.07	26.36	25.54	25.64	24.76	22.09	22.94	20.44
28	10	25	AD	Ervin Mosel	58.10	63.07	61.40	63.95	62.40	63.02	60.85	58.07	56.47	57.40
28	11	6	AC	Russ Holz	5.57	8.52	7.47	10.42	6.46	5.81	4.09	6.13	4.50	7.14
28	11	9	D	Ted Kalloff	4.20	5.73	3.72	8.65	4.43	5.68	2.20	4.70	2.62	4.64
28	12	23	D	Merle Pease	8.40	10.38	9.70	12.71	10.30	8.75	6.75	8.28	6.93	9.64
28	16	8	B	Carol Olson					12.43	12.16	11.16	11.06	10.83	11.96
29	10	24	CD	Keith Kennedy	31.37	35.12	34.60	38.14	36.68	37.12	35.08	29.47	30.05	28.41
29	10	30	AD	Duke Hobbs	27.42	31.71	30.80	35.72	33.34	34.02	31.33	26.49	26.32	26.57
29	10	33	DC	Emmett Thompson	45.18	49.75	48.58	51.67	50.52	52.02	50.25	48.54	46.83	47.33
29	12	24	DB	Bob Kracl	28.79	33.44	32.27	35.83	34.03	35.00	33.15	31.13	28.53	29.78
29	12	26	BC	Wayne Fox	21.10	22.54	21.63	23.97	22.80	22.37	21.39	19.56	19.80	19.53
29	13	14	CC	Chas Peterson	41.52	45.79	43.64	46.57	43.86	45.70	43.55	41.57	40.20	42.45
29	13	17	DB	Ken Huston	20.85	25.43	22.64	24.80	23.20	23.97	22.50	21.16	20.52	21.59
29	14	3	DB	Paul Segar	31.63	34.98	34.09	35.44	34.53	34.10	33.52	31.68	31.62	31.78
29	14	5	DB	Terry Frisch	8.12	11.28	9.76	11.85	9.00	9.00	7.80	7.13	7.76	8.62
29	14	28	AC	Eugene Hamik	4.54	6.34	4.16	7.55	3.53	3.95	2.00	2.94	2.40	4.88
29	16	11	DC	Lawrence Skrdla	10.95	13.00	11.34	13.96	11.20	11.46	9.89	10.11	10.45	12.16
29	16	20	DC	Neal Hamilton	0.12	0.53	0.00	1.65	0.00	0.00	flow	flow	flow	0.00
30	14	19	A	National Farms	39.57	41.99	42.93	43.38	40.28	40.67	38.73	36.44	35.10	36.26
30	15	7	BA	Wilford Kaup	22.10	23.00	22.25	23.63	22.27	21.92	20.67	19.62	19.72	20.27
30	15	7	DB	George Kohle	5.34	7.20	6.22	7.53	6.30	6.18	4.67	4.73	5.00	5.50
30	15	10	A	P.G. Reality	55.58	61.33	58.17	61.82	58.15	58.93	56.31	53.29	51.90	53.28
31	16	28	CD	Quinton Ramold	17.31	22.02	19.53	21.69	18.75	17.13	15.75	14.75	14.79	15.40
				Seasonal Average	**25.40**	**28.89**	**27.16**	**30.32**	**25.45**	**25.07**	**24.55**	**23.43**	**22.42**	**23.27**
				Yearly Average	**27.14**		**28.74**		**25.26**		**23.98**		**22.85**	

Holt County

Upper Elkhorn NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)					
					1995		Seasonal Average		Overall Average	
Tn	R	Sec	Sub		Spring	Fall	Spring	Fall		
25	9	22	D	Joe Funk	17.81	21.25	23.19	24.71	23.97	
25	10	23	CB	Jake Schindler	1.60	3.54	4.45	6.63	5.57	
25	12	20	AA	Vernon Harley	flow	2.02	1.38	3.10	2.48	
25	13	3	C	Clair Coulthard	8.97	11.09	9.54	10.98	10.26	
25	14	9	D	Hugh Carr	29.45	26.13	30.17	29.81	29.99	
26	9	29	BA	Dick Kalloff	flow	0.86	2.90	5.15	4.11	
26	9	30	DB	R.D. Kalloff	26.73	34.08	30.27	32.09	31.23	
26	9	32	CA	Lewis Vandersnick	59.06	57.69	65.20	67.13	66.24	
26	12	18	DA	Dennis Werner	10.28	12.80	11.87	14.73	13.34	
26	12	33	B	Neal Garwood	6.13	7.85	8.67	10.00	9.38	
27	9	22	DC	Duke Hobbs	49.73	49.49	52.02	53.06	52.55	
27	10	6	CC	Rich Sobotka	4.15	5.78	5.19	7.36	6.36	
27	12	1	B	Wayne Herley	2.11	3.30	2.50	4.07	3.29	
27	12	28	D	Stanley Klabenes	3.01	6.20	3.08	5.44	4.26	
27	13	27	D	Ray Klabenes	10.45	25.69	11.03	16.13	13.95	
28	9	3	DD	Russ Hilger	47.95	48.68	51.94	55.57	53.90	
28	9	17	C	Robert Wood, Sr.	87.72	89.11	80.91	87.76	84.54	
28	10	8	CC	Rich Chohon	20.38	18.28	22.58	23.16	22.88	
28	10	25	AD	Ervin Mosel	55.10	54.03	57.17	58.49	57.84	
28	11	6	AC	Russ Holz	3.53	5.77	5.71	7.34	6.59	
28	11	9	D	Ted Kalloff	1.84	3.32	5.25	6.36	5.82	
28	12	23	D	Merle Pease	6.40	7.81	8.60	11.47	10.07	
28	16	8	B	Carol Olson	10.30	10.83	11.18	11.50	11.34	
29	10	24	CD	Keith Kennedy	27.69	21.90	31.04	32.00	31.53	
29	10	30	AD	Duke Hobbs	25.65	23.69	28.97	28.08	28.50	
29	10	33	DC	Emmett Thompson	45.28	44.24	46.49	47.77	47.15	
29	12	24	DB	Bob Kracl	27.40	27.65	30.70	31.74	31.26	
29	12	26	BC	Wayne Fox	16.53	18.39	19.49	21.19	20.36	
29	13	14	CC	Chas Peterson	40.19	40.70	42.76	44.60	43.71	
29	13	17	DB	Ken Huston	19.93	21.01	21.67	23.07	22.39	
29	14	3	DB	Paul Segar	31.18	30.90	33.04	33.75	33.41	
29	14	5	DB	Terry Frisch	5.82	8.09	8.30	10.11	9.23	
29	14	28	AC	Eugene Hamik	2.25	4.22	3.32	5.12	4.24	
29	16	11	DC	Lawrence Skrdla	9.52	11.42	11.30	12.96	12.15	
29	16	20	DC	Neal Hamilton	flow	flow	0.40	1.09	0.77	
30	14	19	A	National Farms	35.25	35.26	38.64	39.24	38.97	
30	15	7	BA	Wilford Kaup	18.32	19.89	21.17	22.26	21.73	
30	15	7	DB	George Kohle	2.92	5.40	4.77	5.59	5.18	
30	15	10	A	P.G. Reality	52.47	52.68	55.43	56.93	56.24	
31	16	28	CD	Quinton Ramold	13.74	15.44	17.21	18.93	18.09	
				Seasonal Average	**22.62**	**22.73**				
				Yearly Average	**22.68**					

Rock County

UPPER ELKHORN NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					Drilled	1975	1976		1977		1978		1979	
Tn	*R*	*Sec*	*Sub*			*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
26	18	21	AD	Joe Andrews		46.66	44.18	45.44	45.25	45.92	44.23	45.66	44.36	45.32
27	18	22	BC	Everett Stoutt	13.00	12.80	11.70	12.00	11.47	11.00	10.50	12.29	9.98	10.54
28	19	4	BB	John Kietzman	18.00	31.40	31.00	33.20	31.00	32.30	30.30	29.95	29.20	
29	17	18	A	Rex Arrowsmith										
29	19	6	CB	Fred Hepler	35.00	40.42	42.50	43.02	42.50	42.40	42.00	41.44	41.84	41.05
29	19	22	BA	F.H.A.	7.00	22.69	18.10	20.12	17.22	16.77	16.21	15.85	13.16	14.60
29	20	25	CD	Dale Ellwanger		61.30	64.50	63.50	62.67	63.50	62.40	60.86	60.80	60.80
30	18	22	BA	Delane May	4.00	6.60	5.00	5.86	4.70	3.76	4.20	0.96	3.70	2.79
30	19	20	BD	William Sieker	12.00	21.70	14.90	15.86	14.89	14.46	13.90	13.20	12.33	13.10
30	20	12	DD	Tom Frank		21.74	22.48	23.30	22.47	22.74	22.00	21.56	20.15	21.06
31	17	23	DB	F & K Svoboda	21.00	22.06	22.60	23.23	22.70	22.10	21.80	21.60	21.00	20.98
31	19	21	DC	P.G. Realty	18.00	13.70	14.38	15.70	14.39	13.94	13.61	10.85	10.73	11.50
				Seasonal Average	**16.00**	**27.37**	**26.49**	**27.38**	**26.30**	**26.26**	**25.56**	**24.93**	**24.30**	**24.17**
				Yearly Average	**N/A**		**26.94**		**26.28**		**25.24**		**24.24**	

Rock County

UPPER ELKHORN NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1980		1981		1982		1983		1984	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
26	18	21	AD	Joe Andrews	42.63	46.31	45.92	46.40	45.10	45.29	42.40	43.55	43.74	36.68
27	18	22	BC	Everett Stoutt	9.18	10.83	12.20	11.04	11.27	9.61	7.74	7.31	5.56	6.02
28	19	4	BB	John Kietzman	27.10	31.32				24.75	20.97	23.80	18.97	21.98
29	17	18	A	Rex Arrowsmith										
29	19	6	CB	Fred Hepler	37.04	41.77	38.01	41.38	43.30	43.00	41.11	39.80	37.15	36.26
29	19	22	BA	F.H.A.	11.90	15.28	18.00	19.00	16.49	17.55	12.30	13.29	10.43	13.31
29	20	25	CD	Dale Ellwanger	58.90	61.70	60.70	63.05	60.45	61.27	60.10	60.80	57.99	55.36
30	18	22	BA	Delane May	1.83	3.41	3.48	3.50	3.12	3.30	1.90	2.00	0.77	0.52
30	19	20	BD	William Sieker	11.38	12.45	13.20	14.73	13.89	14.41	11.28	10.28	8.72	9.80
30	20	12	DD	Tom Frank	18.95	21.43	25.84	23.53	22.40	23.79	21.68	21.90	19.67	18.84
31	17	23	DB	F & K Svoboda	16.98	22.10	18.40	22.79	18.21	22.77	15.70	21.52	14.97	20.18
31	19	21	DC	P.G. Realty	9.57	12.74	12.15	14.75	13.65	16.08	11.04	11.68	7.60	9.16
				Seasonal Average	**22.31**	**25.39**	**24.79**	**26.02**	**24.79**	**25.62**	**22.38**	**23.27**	**20.51**	**20.74**
				Yearly Average	**23.85**		**25.40**		**25.22**		**22.83**		**20.62**	

Rock County

UPPER ELKHORN NRD

Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1985		1986		1987		1988		1989	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
26	18	21	AD	Joe Andrews	34.22	36.94	36.71	35.71	34.59	34.02	33.12	32.89	33.56	34.30
27	18	22	BC	Everett Stoutt	5.97	6.75	6.39	4.77	3.56	5.62	4.86	5.28	6.24	7.00
28	19	4	BB	John Kietzman	19.18	21.70	21.59	16.49	18.06	15.40	16.20	15.11	16.52	19.20
29	17	18	A	Rex Arrowsmith										
29	19	6	CB	Fred Hepler	35.19	37.35	37.03	35.40	33.76	33.83	32.12	32.30	30.92	34.95
29	19	22	BA	F.H.A.	12.65	14.42	14.28	10.68	8.30	11.00	9.17	10.93	11.09	13.77
29	20	25	CD	Dale Ellwanger	55.52	55.75	54.99	52.88	51.80	50.46	48.30	49.10	47.04	49.83
30	18	22	BA	Delane May	0.73	0.70	0.30	4.77	2.30	4.80	3.22	3.72	3.62	5.44
30	19	20	BD	William Sieker	9.57	11.27	10.92	10.37	7.49	9.60	7.69	8.90	8.47	11.68
30	20	12	DD	Tom Frank	19.00	20.51	20.34	20.20	17.97	20.85	17.86	18.01	19.99	20.12
31	17	23	DB	F & K Svoboda	15.23	20.19	19.90	20.24	15.10	19.40	17.56	16.28	19.52	20.47
31	19	21	DC	P.G. Realty	8.66	12.70	12.29	11.12	7.85	11.04	7.56	9.06	9.00	13.52
				Seasonal Average	**19.63**	**21.66**	**21.34**	**20.24**	**18.25**	**19.64**	**17.97**	**18.33**	**18.72**	**20.93**
				Yearly Average	**20.65**		**20.79**		**18.95**		**18.15**		**19.83**	

Rock County

UPPER ELKHORN NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1990		1991		1992		1993		1994	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
26	18	21	AD	Joe Andrews	36.05	36.30	36.46	36.94	37.91	38.23	36.20	35.85	34.67	35.25
27	18	22	BC	Everett Stoutt	7.64	7.72	7.78	7.06	7.46	7.16	6.67	5.58	5.63	6.42
28	19	4	BB	John Kietzman	19.82	20.48	19.03	21.05	20.12	18.50	18.50	15.57	15.77	16.86
29	17	18	A	Rex Arrowsmith					5.75	6.00	4.80	4.88	4.77	5.94
29	19	6	CB	Fred Hepler	35.08	37.20	36.22	38.69	37.27	36.94	35.02	32.63	30.34	31.39
29	19	22	BA	F.H.A.	13.09	14.83	12.70	17.54	12.80	12.85	11.79	10.00	10.53	11.80
29	20	25	CD	Dale Ellwanger	53.25	51.88	51.44	53.19	52.04	52.14	50.90	49.21	47.38	48.69
30	18	22	BA	Delane May	2.42	5.78	3.38	6.00	3.50	3.41	3.82	3.10	2.75	3.85
30	19	20	BD	William Sieker	9.42	12.44	11.72	12.94	11.50	10.02	9.55	6.93	6.35	6.22
30	20	12	DD	Tom Frank	20.03	21.30	21.29	22.87	20.95	20.87	19.19	18.20	16.02	16.14
31	17	23	DB	F & K Svoboda	19.15	23.62	23.85	21.69	20.89	17.32	17.62	14.40	15.57	14.83
31	19	21	DC	P.G. Realty	10.80	14.73	13.56	15.59	13.90	10.84	10.14	7.73	7.32	7.10
				Seasonal Average	**20.61**	**22.39**	**21.58**	**23.05**	**20.34**	**19.52**	**18.68**	**17.01**	**16.43**	**17.04**
				Yearly Average	**21.50**		**22.32**		**19.93**		**17.85**		**16.73**	

Rock County

UPPER ELKHORN NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)								
					1995		Seasonal Average		Overall Average				
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*					
26	18	21	AD	Joe Andrews	34.86	32.90	**39.31**	**39.84**	**39.58**				
27	18	22	BC	Everett Stoutt	5.55	5.14	**7.87**	**8.19**	**8.03**				
28	19	4	BB	John Kietzman	15.11	16.00	**21.58**	**22.37**	**21.99**				
29	17	18	A	Rex Arrowsmith	4.33	5.12	**4.91**	**5.49**	**5.20**				
29	19	6	CB	Fred Hepler	30.34	30.08	**36.94**	**37.68**	**37.32**				
29	19	22	BA	F.H.A.	10.08	8.01	**13.01**	**14.49**	**13.77**				
29	20	25	CD	Dale Ellwanger	47.57	44.80	**55.44**	**55.72**	**55.58**				
30	18	22	BA	Delane May	1.85	5.72	**2.83**	**3.81**	**3.33**				
30	19	20	BD	William Sieker	4.32	3.75	**10.57**	**11.62**	**11.11**				
30	20	12	DD	Tom Frank	15.32	13.49	**20.18**	**20.59**	**20.39**				
31	17	23	DB	F & K Svoboda	14.65	15.13	**18.57**	**20.14**	**19.37**				
31	19	21	DC	P.G. Realty	5.14	4.92	**10.67**	**11.83**	**11.26**				
				Seasonal Average	**15.76**	**15.42**							
				Yearly Average	**15.59**								

Wheeler County

UPPER ELKHORN NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					Drilled	1975	1976		1977		1978		1979	
Tn	*R*	*Sec*	*Sub*			*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
24	9	4	CD	Keith Bartak										
24	9	9	C	Kryger Ranch	26.00	12.42		13.00		12.71				
24	9	35	BD	Walt Kozoil	50.00	65.55	61.57	63.40	60.05	62.33	61.00	61.70	60.93	61.41
24	10	2	AC	Dale Hixson										
24	10	9	CA	Don Mannelein	7.00	3.73		3.73		1.55		1.10	0.78	2.77
24	10	29	AB	Don Oesligle										
24	11	14	DB	Rich Burtwistle										
24	12	4	AB	Duane Grossnicklaus	10.00	14.23	7.58	9.07		9.31	8.98	9.20	8.50	9.29
				Seasonal Average	**23.25**	**23.98**	**34.58**	**22.30**	**60.05**	**21.48**	**34.99**	**24.00**	**23.40**	**24.49**
				Yearly Average	**N/A**		**26.39**		**29.19**		**28.40**		**23.95**	

Wheeler County

UPPER ELKHORN NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1980		1981		1982		1983		1984	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
24	9	4	CD	Keith Bartak		39.20	38.70	38.68	38.11	38.35	32.86	38.57	32.86	35.91
24	9	9	C	Kryger Ranch										
24	9	35	BD	Walt Kozoil	61.09	63.21	64.08	62.93	64.10	62.87	68.50	65.00	68.50	55.09
24	10	2	AC	Dale Hixson		7.33	6.97	5.25	6.52	4.97	1.33	6.81	0.00	5.11
24	10	9	CA	Don Mannelein	1.50	4.09	3.21	2.69	0.00	2.61	0.00	1.30	0.00	0.00
24	10	29	AB	Don Oesligle		9.37	9.02	7.95	8.78	7.85	5.34	9.20	0.00	6.90
24	11	14	DB	Rich Burtwistle				5.93	4.70	5.63	2.37	5.30	0.00	3.71
24	12	4	AB	Duane Grossnicklaus	9.20		10.80	9.40	10.52	9.13	4.51	11.44	4.51	8.08
				Seasonal Average	**23.93**	**24.64**	**22.13**	**18.98**	**18.96**	**18.77**	**16.42**	**19.66**	**15.12**	**16.40**
				Yearly Average	**24.37**		**20.43**		**18.87**		**18.04**		**15.76**	

Wheeler County

UPPER ELKHORN NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1985		1986		1987		1988		1989	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
24	9	4	CD	Keith Bartak	31.91	36.10	35.61	32.18	30.65	34.14	33.66	37.38	36.02	38.24
24	9	9	C	Kryger Ranch										
24	9	35	BD	Walt Kozoil	53.27	55.74	55.31	51.79	50.70	52.37	50.30	54.84	53.38	56.75
24	10	2	AC	Dale Hixson	5.33	5.13	4.58	1.17	1.62	4.86	4.19	6.42	5.70	7.75
24	10	9	CA	Don Mannelein	0.00	0.00	0.00	0.64	0.30	2.68	2.00	3.46	2.57	3.60
24	10	29	AB	Don Oesligle	6.92	7.02	6.88	6.64	4.42	7.00				
24	11	14	DB	Rich Burtwistle	3.92	3.69	3.06	2.36	2.05	6.05	3.89	5.79	5.45	7.30
24	12	4	AB	Duane Grossnicklaus	3.68	8.01	7.83	4.25	4.97	7.24	6.06	8.20	7.40	10.40
				Seasonal Average	**15.00**	**16.53**	**16.18**	**14.15**	**13.53**	**16.33**	**16.68**	**19.35**	**18.42**	**20.67**
				Yearly Average	**15.77**		**15.16**		**14.93**		**18.02**		**19.55**	

Wheeler County

UPPER ELKHORN NRD
Static Water Levels

Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)									
					1990		1991		1992		1993		1994	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*	*Spring*	*Fall*
24	9	4	CD	Keith Bartak	34.72	37.67	35.56	40.24	36.86	35.70	34.25	33.68	33.72	34.82
24	9	9	C	Kryger Ranch										
24	9	35	BD	Walt Kozoil	53.43	59.23	57.72	63.05	60.46	60.45	58.18	58.50	56.03	57.16
24	10	2	AC	Dale Hixson	6.01	6.58	4.96	8.63	4.05	3.09	1.20	2.60	2.72	4.10
24	10	9	CA	Don Mannelein	2.26	3.83	1.28	4.36	1.35	1.56	Flow	1.08	1.09	2.76
24	10	29	AB	Don Oesligle										
24	11	14	DB	Rich Burtwistle	5.36	7.70	5.42	7.67	4.05	4.27	3.11	4.20	3.86	5.32
24	12	4	AB	Duane Grossnicklaus	6.42	11.02	8.47	11.35	6.87	6.32	5.56	6.10	6.02	8.56
				Seasonal Average	**18.03**	**21.01**	**18.90**	**22.55**	**18.94**	**18.57**	**20.46**	**17.69**	**17.24**	**18.79**
				Yearly Average	**19.52**		**20.73**		**18.75**		**18.95**		**18.01**	

Wheeler County

UPPER ELKHORN NRD
Static Water Levels

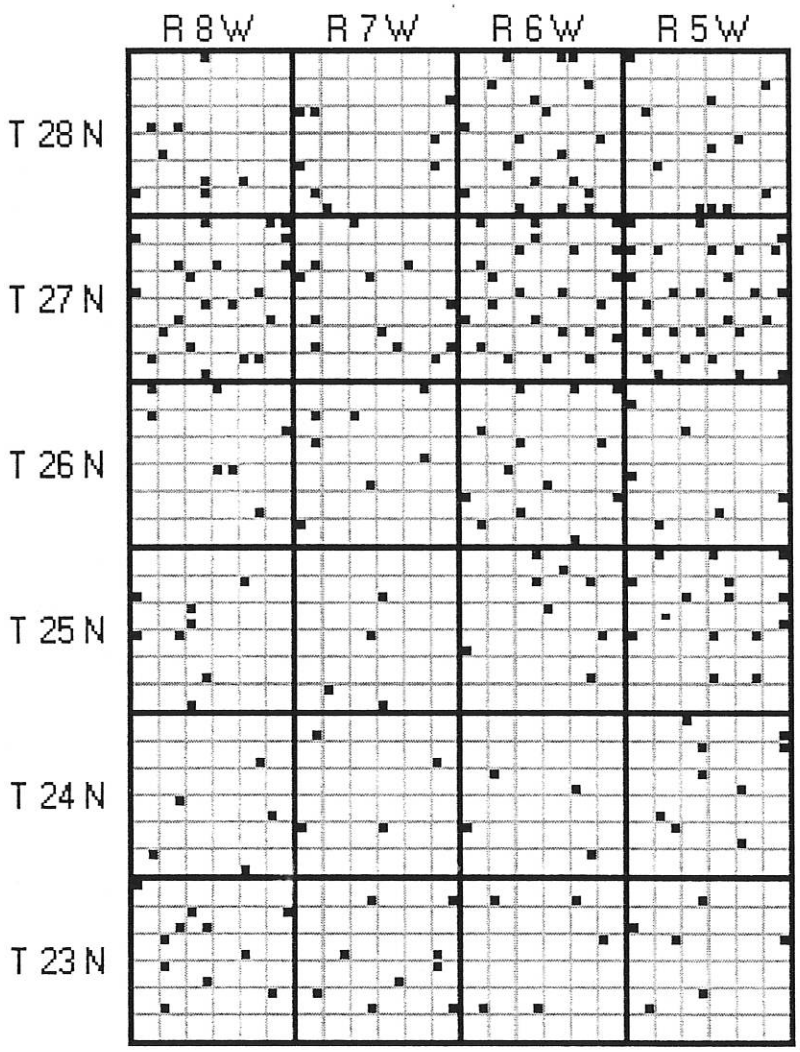
Legal Description				Owner/Operator	Static Water Level per Year (feet to groundwater)					
					1995		Seasonal Average		Overall Average	
Tn	*R*	*Sec*	*Sub*		*Spring*	*Fall*	*Spring*	*Fall*		
24	9	4	CD	Keith Bartak	32.44	34.98	**34.53**	**36.62**	**35.61**	
24	9	9	C	Kryger Ranch			**N/A**	**12.71**	**12.86**	
24	9	35	BD	Walt Kozoil	54.52	57.23	**58.66**	**59.55**	**58.95**	
24	10	2	AC	Dale Hixson	1.28	3.70	**3.76**	**5.22**	**4.51**	
24	10	9	CA	Don Mannelein	Flow	2.44	**1.09**	**2.38**	**1.79**	
24	10	29	AB	Don Oesligle			**5.91**	**7.74**	**6.89**	
24	11	14	DB	Rich Burtwistle	3.00	4.89	**3.59**	**5.32**	**4.48**	
24	12	4	AB	Duane Grossnicklaus	5.41	7.46	**7.02**	**8.90**	**7.82**	
				Seasonal Average	**19.33**	**18.45**				
				Yearly Average	**18.85**					

APPENDIX D

Locations of Nitrate-Nitrogen Sampling Sites Within the UENRD.

Appendix D shows the locations of registered irrigation wells sampled for nitrate-nitrogen in the UENRD. Four figures are presented on the following pages, one for each county in the District.

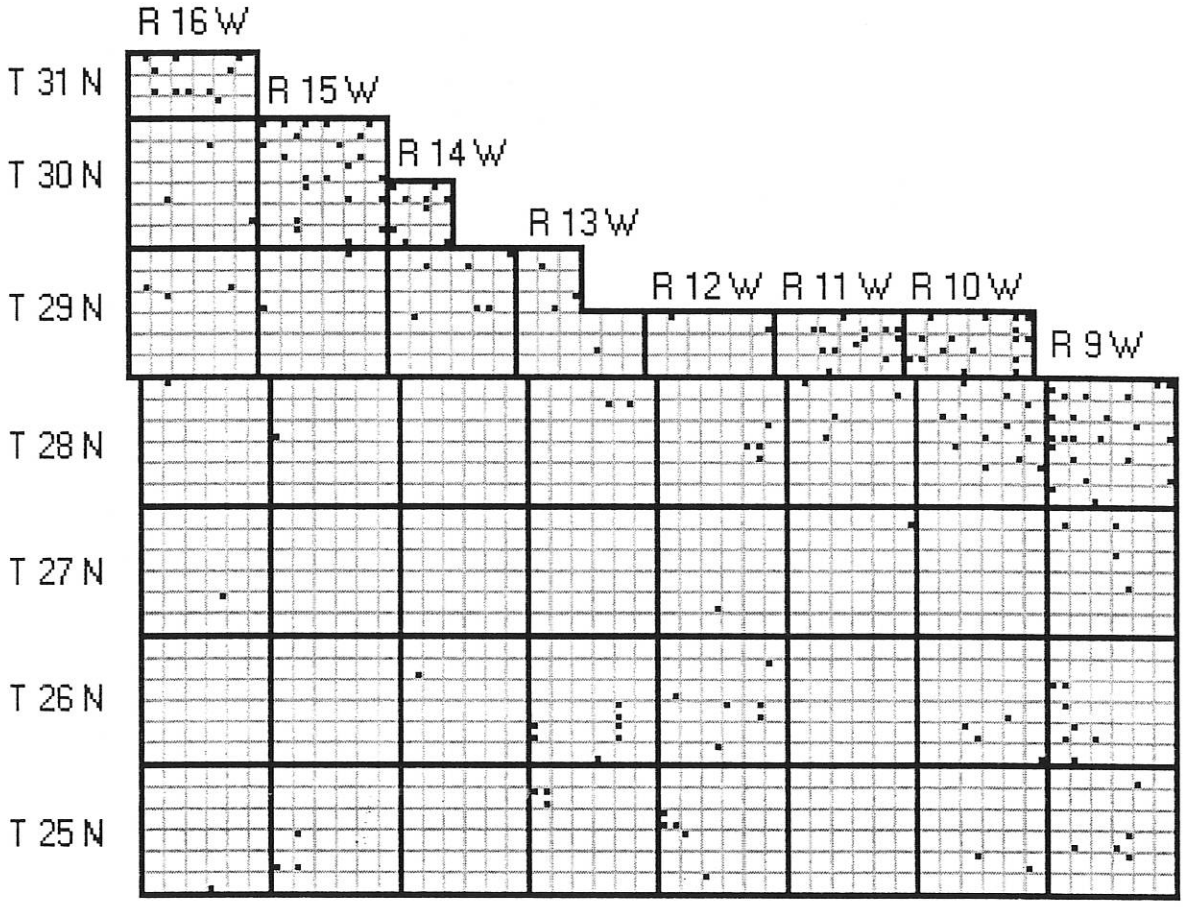
Antelope County
Groundwater Quality Sampling Sites
Nitrate-Nitrogen



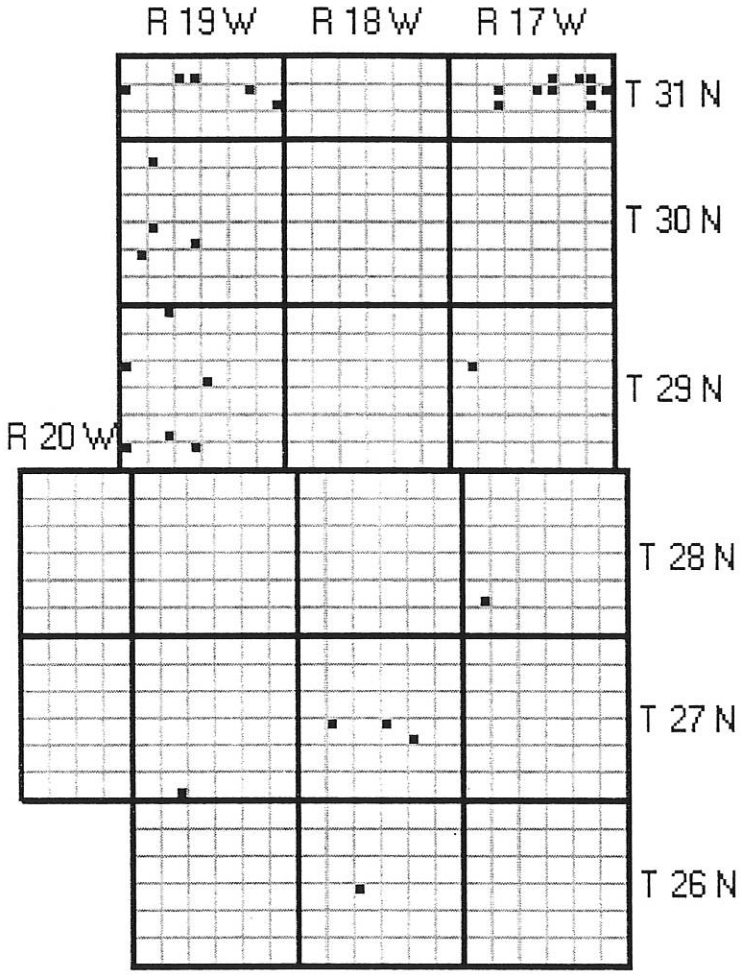
Holt County

Groundwater Quality Sampling Sites

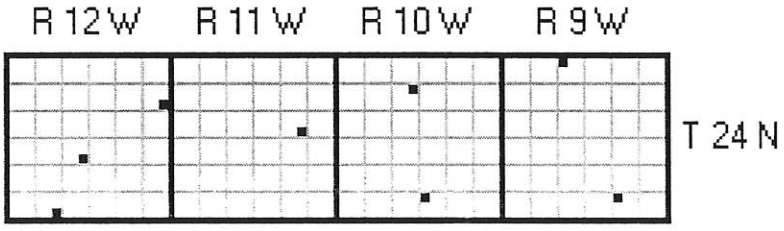
Nitrate- Nitrogen



Rock County
Groundwater Quality Sampling Sites
Nitrate-Nitrogen



Wheeler County
Groundwater Quality Sampling Sites
Nitrate-Nitrogen



APPENDIX E

Nitrate-Nitrogen Results for Sampled Sites within the UENRD

Upper Elkhorn Natural Resources District
Antelope County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
23-5	GRANT															
	SE 04-23-5	83.00	3.00	3.30								3.00	3.30			
	SW 07-23-5		1.10	1.10									1.10			
	NE 13-23-5	74.00	1.80	2.00								1.80	2.00			
	NE 17-23-5	130.00	2.30	2.30									2.30			
	NE 28-23-5	80.00	2.30	3.80								2.30	3.80			
	SE 30-23-5	140.00	1.00	1.00									1.00			
23-6	CEDAR															
	SW 02-23-6		1.60	1.60									1.60			
	SW 05-23-6	100.00	1.20	1.20									1.20			
	NW 13-23-6		1.10	1.10									1.10			
	SE 28-23-6	60.00	2.80	2.80								2.80				
	SE 30-23-6		1.20	1.30								1.20	1.30			
23-7	LOGAN															
	SE 01-23-7		1.10	1.10									1.10			
	SE 04-23-7	108.00	1.90	1.90									1.90			
	SW 13-23-7	95.00	2.10	2.10									2.10			
	SE 17-23-7	165.00	1.90	1.90									1.90			
	SE 22-23-7	110.00	1.10	1.20								1.10	1.20			
	NW 24-23-7		2.20	2.20												2.20
	SE 25-23-7	100.00	0.70	0.70									0.70			
	SE 28-23-7		3.20	3.20									3.20			
	NE 30-23-7	126.00	0.60	0.60					0.60			0.80	0.60			
23-8	LINCOLN															
	NW 06-23-8	116.00	1.50	4.50		1.50	1.80	2.20				4.10	4.50			
	SE 08-23-8	130.00	3.00	2.90								3.00	2.90			
	SE 09-23-8	100.00	1.70	1.60								1.70	1.60			
	NW 09-23-8		1.60	1.60												1.60
	NE 12-23-8	100.00	0.40	0.60								0.40				0.60
	SW 14-23-8	93.00	0.80	0.80									0.80			
	NW 17-23-8		2.00	2.00									2.00			
	NW 20-23-8		2.10	2.10												2.10
	SE 21-23-8	95.00	1.80	1.80								1.80	1.80			
	NW 25-23-8	189.00	1.00	1.00									1.00			
	SW 27-23-8	95.00	1.40	7.50								1.40	1.40			7.50
24-5	BURNETT															
	SE 01-24-5	12.00														
	NW 04-24-5	50.00	1.00	1.00									1.00			
	NE 09-24-5		1.80	1.80								1.80				
	NOC-NE 12-24-5		2.80	2.80									2.80			
	SW 14-24-5	20.00	1.10	1.10									1.10			
	NE 16-24-5	18.00	0.70	0.40								0.70	0.40			
	SW 20-24-5	95.00	1.50	1.60								1.50	1.60			
	SW 26-24-5	50.00	1.80	1.80									1.80			
	NE 29-24-5	40.00	1.60	1.30					1.60				1.70		1.30	
24-6	OAKDALE															

Upper Elkhorn Natural Resources District

Antelope County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
	SW 14-24-6	125.00	6.10	6.10									6.10			
	NW 17-24-6	89.00	0.30	0.10		0.30	0.15	0.65				0.10	0.10			
	NW 30-24-6	65.00	0.10	0.10									0.10			
	NE 35-24-6		3.00	3.00												3.00
24-7	ELGIN															
	SE 06-24-7	59.00	1.20	1.20									1.20			
	SW 12-24-7	90.00	0.10	0.10						0.10						
	NW 27-24-7		1.30	1.30									1.30			
	NW 30-24-7		0.10	0.10									0.10			
24-8	STANTON															
	SE 11-24-8	103.00	0.70	0.80								0.70	0.80			
	NE 20-24-8	54.00	2.70	2.70									2.70			
	SW 24-24-8	25.00	1.10	2.30						1.10		0.90	1.10		2.30	
	NE 31-24-8	110.00	2.50	2.60								2.50	2.60			
	SW 35-24-8	57.00	1.30	1.30								1.30	1.30			
25-5	ELM															
	NE 01-25-5		11.80	11.80												11.80
	NW 03-25-5		21.50	21.50												21.50
	NW 05-25-5		6.60	6.60												6.60
	NW 07-25-5		5.30	5.30												5.30
	SW 09-25-5	68.00	6.20	11.80		6.20	6.00	8.80					11.80			
	SE 10-25-5		2.70	2.70												2.70
	NE 10-25-5	99.00	5.20	8.00		5.20	5.25					11.10	8.00			
	SE 12-25-5		0.40	0.40												0.40
	SE 13-25-5		25.40	25.40												25.40
	CN 17-25-5		16.10	16.10												16.10
	NW 19-25-5		2.30	2.30												2.30
	NW 22-25-5	82.00	11.70	11.70									11.70			
	NE 23-25-5	68.00	1.70	2.80						1.70			1.80		3.30	2.80
	SE 26-25-5		2.10	2.10												2.10
	SW 27-25-5	165.00														
25-6	NELIGH															
	SE 03-25-6		5.60	5.60												5.60
	NE 04-25-6	105.00	3.50	4.00		3.50	2.80	3.48				4.00				
	NE 09-25-6	86.00	4.00	5.40		4.00	3.60	3.87				4.40	5.40			
	NE 11-25-6	105.00	1.40	1.50								1.40	1.40			
	NW 15-25-6	90.00	3.00	3.20								3.00	3.20			
	SW 19-25-6	14.00	0.20	0.20									0.20			
	NW 24-25-6	10.00	1.80	1.80									1.30			
	SE 26-25-6	148.00	1.80	1.80									1.80			
25-7	ORD															
	SW 10-25-7	6.00	1.20	1.20									1.20			
	NE 21-25-7	20.00	1.00	1.50									1.00			1.50
	NW 32-25-7	75.00	0.10	0.50									0.10			0.50
	SW 34-25-7	34.00	0.40	0.40									0.40			

Upper Elkhorn Natural Resources District
Antelope County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
25-8	CLEARWATER															
	SW 07-25-8	70.00	22.80	22.80									22.80			
	NW 11-25-8	11.00	0.77	0.30						0.77			0.30			
	SW 16-25-8	62.00	5.50	5.20						5.50			5.20			
	NW 16-25-8		5.10	5.10											5.10	
	NW 19-25-5		2.30	2.30												2.30
	NE 20-25-8	32.00	2.20	2.20								2.20				
	SE 28-25-8	34.00	1.30	6.50		1.30	0.30			7.90			6.50			
	SW 32-25-8		3.60	3.60									3.60			
26-5	WILLOW															
	SW 06-26-5		7.10	7.10												7.10
	SW 09-26-5	19.00	4.40	5.80						4.40		4.60	4.70			5.80
	S/NW-N/SW 19-26-5		7.60	7.60								7.60				
	NE 25-26-5		14.30	14.30												14.30
	E/SW-W/SE 27-26-5	9.00	2.40	6.20		2.40	1.60					1.60	6.20			
	NW 32-26-5		8.80	8.80												8.80
26-6	CUSTER															
	NE 01-26-6		22.00	22.00												22.00
	NW-02-26-6	43.00	5.20	8.80		5.20	6.50	7.25				9.30	8.80			
	NW 04-26-6		10.70	10.70												10.70
	SE 07-26-6	81.00	10.80	10.80									10.80			
	NW 13-26-6		17.90	17.90												17.90
	NW 16-26-6		8.60	8.60												8.60
	NE 20-26-6		11.90	11.90												11.90
	SW 22-26-6	90.00	2.00	1.25		2.00	1.25									
	NE 25-26-6	86.00	10.70	10.70												10.70
	SW 28-26-6	40.00	4.50	4.50					4.50							
	NW 30-26-6		2.40	2.40									2.40			
	NE 31-26-6		3.20	3.20												3.20
	SW 35-26-6		4.40	4.40												4.40
26-7	BLAINE															
	NE 02-26-7	110.00	8.10	8.10									8.10			
	NE 07-26-7	153.00														
	NW 09-26-7		7.50	9.00		7.50	6.40	7.20					9.00			
	SE 14-26-7	64.00	2.20	2.20									2.20			
	NE 18-26-7		2.30	2.30					2.30							
	SE 21-26-7	108.00	2.30	1.60		2.30	1.60									
	NW 31-26-7	13.00	0.80	0.80									0.80			
26-8	FRENCHTOWN															
	NW 03-26-8	75.00	4.80	5.80		4.80	2.75						5.80			
	NE 06-26-8	65.00	13.30	13.60					13.30				13.60			
	NE 07-26-8		2.60	2.60									2.60			
	SE 12-26-8	127.00	0.10	0.10									0.10			
	NE 22-26-8	45.00	1.60	4.20		1.60	1.25	1.87								
	NW 22-26-8		4.20	5.40									4.20			5.40
	SE 26-26-8	12.00	0.10	0.10									0.10			

Upper Elkhorn Natural Resources District
Antelope County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
27-5	CRAWFORD															
	SE 01-27-5		13.00	13.00												13.00
	NE 04-27-5		21.70	21.70												21.70
	NW 06-27-5	93.00	13.64	18.50							13.64		12.20			18.50
	NW 07-27-5		8.00	8.00												8.00
	NW 08-27-5	48.00	6.40	7.80		6.40	5.50									7.80
	NW 10-27-5	50.00	15.01	13.50							15.10	13.00	13.50			
	NW 11-27-5		13.20	13.20												13.20
	CN1\2 12-27-5		11.00	11.00												11.00
	SE 13-27-5		3.90	3.90												3.90
	SE 14-27-5		12.30	12.30												12.30
	NE 15-27-5		13.20	13.20												13.20
	SE 16-27-5		18.20	18.20												18.20
	SE 17-27-5		4.70	4.70												4.70
	NW 18-27-5	70.00	7.90	8.70					7.90							8.70
	NE 19-27-5		6.90	6.90												6.90
	SE 22-27-5	20.00	10.60	9.00							10.60		9.00			
	SW 24-27-5		10.70	10.70												10.70
	NW 26-27-5		5.20	5.20												5.20
	NNE 28-27-5		12.00	12.00												12.00
	NE 29-27-5		10.50	10.50												10.50
	NE 30-27-5	131.00	8.94	8.60							8.94		8.60			
	NE 31-27-5		6.40	6.40												6.40
	SW 32-27-5	15.00	4.75	6.29				4.75						6.29		
	NW 33-27-5	94.00	8.91	9.30							8.91		9.30			
	NW 34-27-5	35.00	7.50	2.90		7.50	2.90									
	SW 35-27-5	60.00	9.11	9.11							9.11					
	SE 36-27-5		3.50	3.50												3.50
27-6	ELLSWORTH															
	NE 01-27-6		23.10	23.10												23.10
	NE 04-27-6		9.60	9.60												9.60
	SE 04-27-6	26.00	9.08	9.10							9.82		9.10			
	NE 06-27-6		18.20	18.20												18.20
	SE 07-27-6		13.40	13.40												13.40
	NW 09-27-6		6.20	13.40		6.20	6.40									13.40
	NW 11-27-6	88.00	8.00	8.40							8.00					8.40
	NE 12-27-6		6.90	6.90												6.90
	NE 13-27-6		9.20	9.20												9.20
	SE 15-27-6	97.00	8.90	9.50							8.90	8.50	9.50			
	SW 16-27-6		9.40	9.40												9.40
	NW 17-27-6		9.20	9.20												9.20
	SW 19-27-6		6.70	6.70												6.70
	NW 20-27-6	95.00	8.85	8.70							8.85		8.70			
	SE 21-27-6		12.20	12.20												12.20
	NW 24-27-6		12.30	12.30												12.30
	SNE-NSE 25-27-6		12.50	12.50												12.50
	NNE 26-27-6		6.50	6.50												6.50
	NE 27-27-6	110.00	5.23	7.10							5.23		5.60			7.10
	SE 30-27-6		6.70	6.70												6.70
	NE 32-27-6	118.00	4.90	12.30		4.90	5.60	6.35								12.30
	NW 34-27-6		12.50	12.50												12.50
	NE 35-27-6		12.80	12.80												12.80

Upper Elkhorn Natural Resources District
Antelope County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
27-7	ROYAL															
	NW 04-27-7	62.00	8.60	7.40							8.60		7.40			
	SE 07-27-7		15.40	15.40												15.40
	SW 11-27-7	50.00	8.16	12.00							8.16		12.00			
	NE 16-27-7		10.10	10.10									10.10			
	NW 18-27-7	52.00	21.90	19.20					21.90		21.25	19.40	19.20			
	SE 19-27-7		3.50	3.50		3.50	3.50									
	NE 24-27-7	85.00	8.16	6.60							8.16		6.60			
	SE 25-27-7	125.00	8.20	10.40						8.20	9.46		10.40			
	NW 27-27-7	110.00	7.90	7.00		7.90	4.40	7.00					1.50			
	SW 27-27-7		2.83	1.50							2.83					
	SW 30-27-7	130.00	4.09	4.09							4.09					
	NW 36-27-7	86.00	8.40	9.80							8.40		8.80			9.80
27-8	GARFIELD															
	NW 01-27-8		6.50	6.50												6.50
	NE 01-27-8		9.40	9.40												9.40
	SE 01-27-8	95.00	13.64	10.60							13.64		10.60			
	NE 04-27-8		3.30	3.30												3.30
	SW 06-27-8		6.00	4.00												4.00
	SE 08-27-8	47.00	3.50	3.30						3.50	3.31		3.30			
	SW 10-27-8	110.00	8.44	8.40							8.44	7.20	8.40			
	SE 12-27-8		13.40	13.40												13.40
	SE 14-27-8		7.10	7.10												7.10
	NW 16-27-8	110.00	6.70	6.10		6.70	5.70	6.10								
	SW 18-27-8		36.20	36.20												36.20
	SE 20-27-8	90.00	9.19	9.10							9.19		9.10			
	NE 21-27-8		5.90	5.90												5.90
	NE 22-27-8	118.00	8.73	9.90							8.73		9.90			
	SW 24-27-8	103.00	3.70	6.60		3.70	6.60									
	SW 28-27-8	110.00	8.47	13.20							8.47					13.20
	NW 29-27-8		23.20	23.20												23.20
	NE 31-27-8	89.00	8.36	9.60							8.36		9.60			
	SE 33-27-8		17.00	17.00												17.00
	NE 35-27-8	140.00	4.00	4.70					4.00		5.75		6.10			4.70
	NW 35-27-8		5.40	5.40									5.40			
28-5	BAZILE															
	NW 06-28-5	17.00	2.81	2.50							2.81		2.50			
	SW 10-28-5	8.00	22.17	22.70							22.17	20.50	22.70			
	NW 12-28-5	5.00	5.60	5.80					5.60		5.78		5.80			
	NE 18-28-5	42.00	1.57	1.40							1.57		1.40			
	NW1\2 22-28-5		3.20	2.70		3.20	2.70									
	NW 23-28-5	27.00	6.70	6.00							6.70		6.00			
	NW 29-28-5	72.00	4.02	3.00							4.02		3.00			
	SE 33-28-5	38.00	24.68	22.80							24.68		22.80			
	SE 34-28-5		24.20	24.20												24.20
	SW 34-28-5	10.00	7.50	15.00		7.50	9.75	15.00								
	NW 36-28-5		21.65	24.90							21.65		24.90			
28-6	EDEN															
	NW 02-28-6		10.70	10.70												10.70

Upper Elkhorn Natural Resources District
Antelope County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
27-7	ROYAL															
	NW 04-27-7	62.00	8.60	7.40							8.60		7.40			
	SE 07-27-7		15.40	15.40												15.40
	SW 11-27-7	50.00	8.16	12.00							8.16		12.00			
	NE 16-27-7		10.10	10.10									10.10			
	NW 18-27-7	52.00	21.90	19.20					21.90		21.25	19.40	19.20			
	SE 19-27-7		3.50	3.50		3.50	3.50									
	NE 24-27-7	85.00	8.16	6.60							8.16		6.60			
	SE 25-27-7	125.00	8.20	10.40						8.20	9.46		10.40			
	NW 27-27-7	110.00	7.90	7.00		7.90	4.40	7.00					1.50			
	SW 27-27-7		2.83	1.50							2.83					
	SW 30-27-7	130.00	4.09	4.09							4.09					
	NW 36-27-7	86.00	8.40	9.80							8.40		8.80			9.80
27-8	GARFIELD															
	NW 01-27-8		6.50	6.50												6.50
	NE 01-27-8		9.40	9.40												9.40
	SE 01-27-8	95.00	13.64	10.60							13.64		10.60			
	NE 04-27-8		3.30	3.30												3.30
	SW 06-27-8		6.00	4.00												4.00
	SE 08-27-8	47.00	3.50	3.30						3.50	3.31		3.30			
	SW 10-27-8	110.00	8.44	8.40							8.44	7.20	8.40			
	SE 12-27-8		13.40	13.40												13.40
	SE 14-27-8		7.10	7.10												7.10
	NW 16-27-8	110.00	6.70	6.10		6.70	5.70	6.10								
	SW 18-27-8		36.20	36.20												36.20
	SE 20-27-8	90.00	9.19	9.10							9.19		9.10			
	NE 21-27-8		5.90	5.90												5.90
	NE 22-27-8	118.00	8.73	9.90							8.73		9.90			
	SW 24-27-8	103.00	3.70	6.60		3.70	6.60									
	SW 28-27-8	110.00	8.47	13.20							8.47					13.20
	NW 29-27-8		23.20	23.20												23.20
	NE 31-27-8	89.00	8.36	9.60							8.36		9.60			
	SE 33-27-8		17.00	17.00												17.00
	NE 35-27-8	140.00	4.00	4.70					4.00		5.75		6.10			4.70
	NW 35-27-8		5.40	5.40									5.40			
28-5	BAZILE															
	NW 06-28-5	17.00	2.81	2.50							2.81		2.50			
	SW 10-28-5	8.00	22.17	22.70							22.17	20.50	22.70			
	NW 12-28-5	5.00	5.60	5.80					5.60		5.78		5.80			
	NE 18-28-5	42.00	1.57	1.40							1.57		1.40			
	MW1\2 22-28-5		3.20	2.70		3.20	2.70									
	NW 23-28-5	27.00	6.70	6.00							6.70		6.00			
	NW 29-28-5	72.00	4.02	3.00							4.02		3.00			
	SE 33-28-5	38.00	24.68	22.80							24.68		22.80			
	SE 34-28-5		24.20	24.20												24.20
	SW 34-28-5	10.00	7.50	15.00		7.50	9.75	15.00								
	NW 36-28-5		21.65	24.90							21.65		24.90			

Upper Elkhorn Natural Resources District
Holt County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
25-9																
	SW 02-25-9															
	SW 20-25-9	65.00	0.50	1.20	0.50	1.10	0.75		1.95			1.20				
	NE 22-25-9	70.00	6.40	5.90					6.40			5.90				
	SE 22-25-9	36.00	0.35	0.20		0.35	0.60								0.30	0.20
	NE 27-25-9	23.00	0.70	0.70								0.70				
25-10																
	SW 25-25-10	34.00	0.40	0.30	0.40	1.20						0.30				
	NE 28-25-10	12.00	0.09	0.10	0.09							0.10				
25-12																
	NW 18-25-12	20.00	0.09	0.09	0.09											
	SW 18-25-12	20.00	0.09	0.20	0.09							0.20				
	SE 18-25-12	18.00	0.50	0.50	0.50											
	NW 20-25-12	13.00	2.02	1.00	2.02							0.60			1.00	
	NW 33-25-12	8.00	0.50	0.50	0.50	STOP										
25-13																
	NE 07-25-13	12.00	0.40	0.40						0.40		0.40				
	NW 07-25-13	12.00	0.40	0.40	0.40											
	SE 07-25-13	14.00	0.79	0.79	0.79	STOP										
25-15																
	NW 20-25-15	42.00	0.40	0.10	0.40	1.80			0.10							
	SW 29-25-15	22.00	0.29	0.29	0.29	CRP										
	SW 30-25-15		0.40	0.40	0.40	CRP										
25-16																
	SW 34-25-16	57.00	0.40	0.40	0.40	CRP										
26-9																
	NE 18-26-9	17.00	1.50	2.70	1.50	3.70	2.10					2.30			2.70	
	NW 18-26-9	20.00	3.22	5.30	3.22							3.60			5.30	
	NE 19-26-9		0.09	0.10	0.09							0.10				
	SW 28-26-9	20.00	1.00	9.20	1.00							3.20			9.20	
	NW 29-26-9		0.10	0.10												0.10
	SE 30-26-9		0.70	0.70												0.70
	SW 32-26-9	58.00	0.70	2.30	0.70	1.10	2.00			1.30		1.50				2.30
26-10																
	SW 23-26-10	12.00	0.70	0.70	0.70											
	NW 28-26-10	30.00	0.40	1.20	0.40							1.20				
	SE 28-26-10	30.00	2.52	2.60	2.52	0.40	0.60					2.60				
	SE 36-26-10	11.00	0.10	0.10						0.10		0.10				
26-12																
	NW 12-26-12	40.00	1.30	1.30								1.30				
	SE 18-26-12	14.00	0.50	0.50								0.50				
	NW 22-26-12	28.00	1.10	0.80						1.10		0.80				
	NE 23-26-12	5.00	0.40	2.15	0.40	2.15	CRP									
	SE 23-26-12	7.00	0.50	0.50	0.50	CRP										
	NE 33-26-12		1.00	1.00								1.00				
26-13																
	NW 23-26-13	14.00	0.40	0.40	0.40											

Upper Elkhorn Natural Resources District
Holt County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
	SW 23-26-13	5.00	0.61	0.65	0.61	1.10				0.65						
	NW 26-26-13	10.00	15.00	15.00	15.00											
	SW 26-26-13	10.00	1.00	1.00		1.00										
	NW 30-26-13		1.25	1.25		1.25										
	SW 30-26-13	2.00	0.40	0.40	0.40											
	SW 34-26-13	18.00	0.50	0.60	0.50							0.60				
26-14																
	SE 07-26-14		0.40	0.40	0.40											
27-9																
	SW 03-27-9	89.00	9.30	9.90					9.30			6.00			9.20	9.90
	NE-SE 6-27-9		18.80	18.80									18.80			
	NW 15-27-9	60.00	3.81	10.40	3.81	5.20	8.50					7.50				10.40
	SE 22-27-9		11.30	11.30												11.30
27-11																
	SE 01-27-11	5.00	3.00	1.00	3.00							1.00				
27-12																
	SE 28-27-12	8.00	0.60	0.60								0.60				
27-16																
	NE 27-27-16	8.00	0.50	0.50	0.50	NF										
28-9																
	NW 01-28-9		5.10	5.10												5.10
	NE 01-28-9	55.00	1.50	1.60								1.50				1.60
	SE 03-28-9		1.40	2.30									1.40			2.30
	SE 05-28-9		13.50	13.50									13.50			
	N/SW-S/NW 06-28-9	100.00	0.90	5.70			0.90									5.70
	NE-SE 06-28-9		4.60	4.60												4.60
	SW 07-28-9	10.00	10.10	10.10								10.10				
	SW 08-28-9		11.40	11.40									11.40			
	SE 09-28-9	49.00	1.80	1.80								1.80				
	SE 13-28-9		4.20	4.20												4.20
	NE 14-28-9		1.80	1.80									1.80			
	ESW-WSE 16-28-9		6.60	6.60												6.60
	SW 17-28-9		4.70	18.40									4.70			18.40
	SW 18-28-9		0.70	5.50	0.70	4.10	5.50									
	SE 18-28-9		19.70	26.80									19.70			26.80
	SOC-NW 19-28-9		9.20	9.20									9.20			
	SW 20-28-9	38.00	3.00	5.30								3.00				5.30
	SE 22-28-9		5.80	5.80									5.80			
	SE 25-28-9		7.30	7.30												7.30
	SW 29-28-9		4.70	4.70									4.70			
	SE-NW 31-28-9		3.20	3.20									3.20			
	SW 33-28-9		11.60	18.20									11.60			18.20
28-10																
	SW 02-28-10		8.90	8.90									8.90			
	NW 04-28-10		3.00	3.00									3.00			
	SW 08-28-10		34.00	34.00												34.00
	SW 09-28-10		31.01	33.60						31.01		16.40				33.60
	NW 12-28-10		8.00	8.00									8.00			
	SW 13-28-10		15.20	15.20									15.20			

Upper Elkhorn Natural Resources District
Holt County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
	NW 14-28-10		14.20	14.20									14.20			
	SW 15-28-10		11.40	11.40									11.40			
	NW-NE 20-28-10		1.10	1.10									1.10			
	SE 23-28-10	32.00	7.10	7.10								7.10				
	NE 25-28-10		7.50	9.00									7.50			9.00
	NW 27-28-10		16.90	16.90									16.90			
28-11																
	SW 01-28-11	7.00	3.40	1.20						3.40		1.20				
	NE 06-28-11		1.80	1.80								1.80				
	SW 09-28-11		0.60	2.80	0.60							2.80				
	SE 17-28-11	10.00	4.00	8.40					4.00			8.40				
28-12																
	NW 13-28-12	7.00	2.00	2.00								2.00				
	NW 23-28-12		0.40	0.40	0.40	CRP										
	NE 23-28-12		6.00	10.70								6.00				10.70
	SE 23-28-12		3.90	3.90												3.90
28-13																
	NE 10-28-13		0.09	0.40	0.09							0.40				
	NE 11-28-13		0.50	0.40	0.50							0.40				
28-15																
	SW 18-28-15		0.80	0.80	0.80											
28-16																
	NW 05-28-16	4.00	0.50	0.50	0.50	STOP										
29-10																
	NW 20-29-10		15.80	15.80												15.80
	NE 22-29-10		23.00	23.00												23.00
	NE 24-29-10		31.40	31.40												31.40
	NW 24-29-10	19.00	30.00	20.40						30.00		13.00	23.00		20.40	
	SW 24-29-10		29.90	33.60									29.90			33.60
	NW 25-29-10		25.00	25.00											25.00	
	NE 25-29-10		19.20	23.20											19.20	23.20
	SW 27-29-10		5.70	5.70									5.70			
	NW 28-29-10	45.00	21.60	24.90						21.60		11.90	10.20		24.90	
	SE 29-29-10	40.00	0.61	16.50	0.61							2.20			5.90	16.50
	NE 30-29-10	29.00	10.00	3.60	10.00							2.10				3.60
	NE 31-29-10	37.00	0.70	3.70	0.70	1.55	2.25	9.90				3.70				
	NW 31-29-10	34.00	0.61	18.10	0.61							3.70				18.10
	SE 33-29-10		18.30	18.30												18.30
	NW 36-29-10	74.00	5.75	12.10	5.75	10.00	9.75	18.90				12.10				
	SW 36-29-10		6.00	6.00	6.00	NF										
29-11																
	SE 20-29-11		1.20	1.20												1.20
	SW 21-29-11	37.00	8.40	19.10							8.40	4.70			7.30	19.10
	NW 22-29-11		2.30	2.30												2.30
	SW 23-29-11	46.00	22.30	34.20					22.30			11.90	13.70		23.40	34.20
	SW 24-29-11	30.00	13.18	33.40	13.18							18.20			33.40	
	SE 24-29-11	30.00	23.00	50.40								23.00			50.40	
	NE 25-29-11	18.00	12.04	48.60	12.04							12.00			48.60	
	NW 26-29-11	20.00	6.60	9.70								6.60			9.70	

Upper Elkhorn Natural Resources District
Holt County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
	SE 11-30-15		12.70	12.70												12.70
	SE 13-30-15	39.00	14.09	11.60	14.09							7.60				11.60
	NW 14-30-15	31.00	22.10	20.20	22.10	33.60	27.00			22.20		14.50				20.20
	SW 15-30-15		8.00	8.00												8.00
	SW 16-30-15		0.70	2.60	0.70							1.40			2.60	
	NW 21-30-15	6.00	0.79	1.50	0.79	5.30						1.40			1.50	
	SW 23-30-15		6.50	6.50												6.50
	SE 24-30-15		10.50	10.50												10.50
	SE 29-30-15	4.00	1.00	1.30					1.00			1.10				1.30
	NE 32-30-15		0.60	0.60												
	SW 35-30-15		0.80	0.80												0.80
	NE 36-30-15		8.30	8.30												8.30
30-16																
	NE 10-30-16	7.00	3.00	3.00								3.00				
	SE 20-30-16	3.00	0.90	0.80						0.90		0.80				
	SE 25-30-16	6.00	0.61	0.68	0.61	1.17				0.68						
31-16																
	NE 19-31-16	24.00	17.50	27.60					17.50			14.60				27.60
	SW 20-31-16	37.00	14.09	24.80	14.09											24.80
	NW 21-31-16		33.60	33.60												33.60
	SE 23-31-16		5.50	5.50												5.50
	NW 24-31-16		3.40	3.40												3.40
	SE 27-31-16		29.20	29.20												29.20
	SE 28-31-16	22.00	9.57	23.80	9.57	20.80						23.80				
	SW 28-31-16		16.30	16.30												16.30
	SW 29-31-16	25.00	6.25	6.40	6.25	NF										6.40
	NW 35-31-16		4.90	4.90												4.90

Upper Elkhorn Natural Resources District
Rock County (Nitrate-Nitrogen PPM) Data
September, 1994

TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
26-18																
	NW 21-26-18	57.00	0.60	0.60		0.60										
27-18																
	NW 20-27-18	23.00	0.98	0.80		0.98	0.80									
	NW 22-27-18		0.70	0.70					0.70							
	SW 23-27-18		0.50	0.80		0.50	0.80									
27-19																
	SE 32-27-19		1.00	1.45		1.00	1.45									
28-17																
	SE 30-28-17	3.00	0.40	0.40					0.40							
29-17																
	NE 18-29-17		0.60	0.70						0.60				0.70		
29-19																
	NE 05-29-19	16.00	6.00	6.00						6.00						
	SW 15-29-19	15.00	2.70	3.60		2.70	2.60								3.60	
	NW 18-29-19	34.00	1.40	2.05		1.40	1.40			2.05						
	SE 29-29-19	66.00	1.80	2.00		1.80	2.00									
	NW 31-29-19	29.00	0.90	0.90						0.90						
	NE 33-29-19		0.80	0.80											0.80	
30-19																
	SW 05-30-19		1.20	1.20									1.20			
	NW 20-30-19	10.00	1.90	1.25		1.90	1.25									
	SE 21-30-19		1.20	1.20									1.20			
	NE 30-30-19	16.00	1.60	1.60					1.60							
31-17																
	SE 22-31-17		4.50	5.25		4.50	5.25									
	SE 23-31-17		16.40	16.40												16.40
	SW 24-31-17	18.00	13.60	17.30						13.60						17.30
	NE 25-31-17		9.40	9.40												9.40
	SW 25-31-17		4.70	4.70												4.70
	NW 25-31-17		5.10	5.10												5.10
	NW 27-31-17		6.30	6.30												6.30
	NE 27-31-17	24.00	9.00	7.30						9.00				6.35		7.30
	SE 29-31-17	35.00	2.10	9.70			2.10									9.70
	NE 29-31-17		8.00	8.00												8.00
31-19																
	SW 21-31-19	17.00	3.70	5.80						3.70						5.80
	SE 21-31-19	18.00	2.90	2.30		2.90	2.75			2.90					2.30	
	SE 25-31-19	5.00	1.70	1.70		1.70										
	NE 26-31-19	8.00	1.10	2.00						1.10						2.00
	NW 30-31-19		3.40	3.40									3.40			

Upper Elkhorn Natural Resources District
Wheeler County (Nitrate-Nitrogen PPM) Data
September, 1994

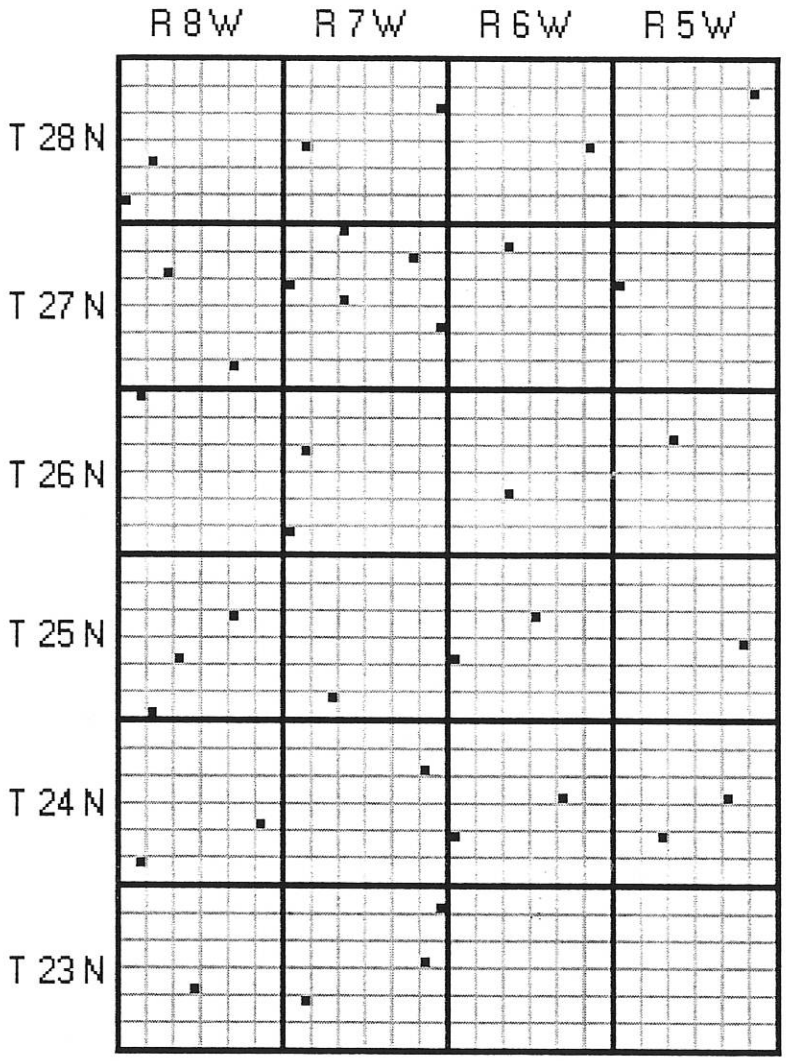
TWNSP RANGE	Legal	Static Water	First Reading	Last Reading	1976	1980	1982	1984	1987	1988	1989	1990	1991	1992	1993	1994
24-9																
	NW 04-24-9		0.50	0.50									0.50			
	NW 35-24-9	50.00	3.90	3.90						3.90						
24-10																
	NE 09-24-10	7.00	0.30	0.30					0.30							
	NW 34-24-10	15.00	1.40	1.40						1.40						
24-11																
	SE 14-24-11		0.80	0.80					0.80							
24-12																
	SE 12-24-12		1.50	1.50									1.50			
	SE 21-24-12	10.00	1.90	1.90					1.90							
	SE 32-24-12	29.00	1.70	1.70					1.70							

APPENDIX H

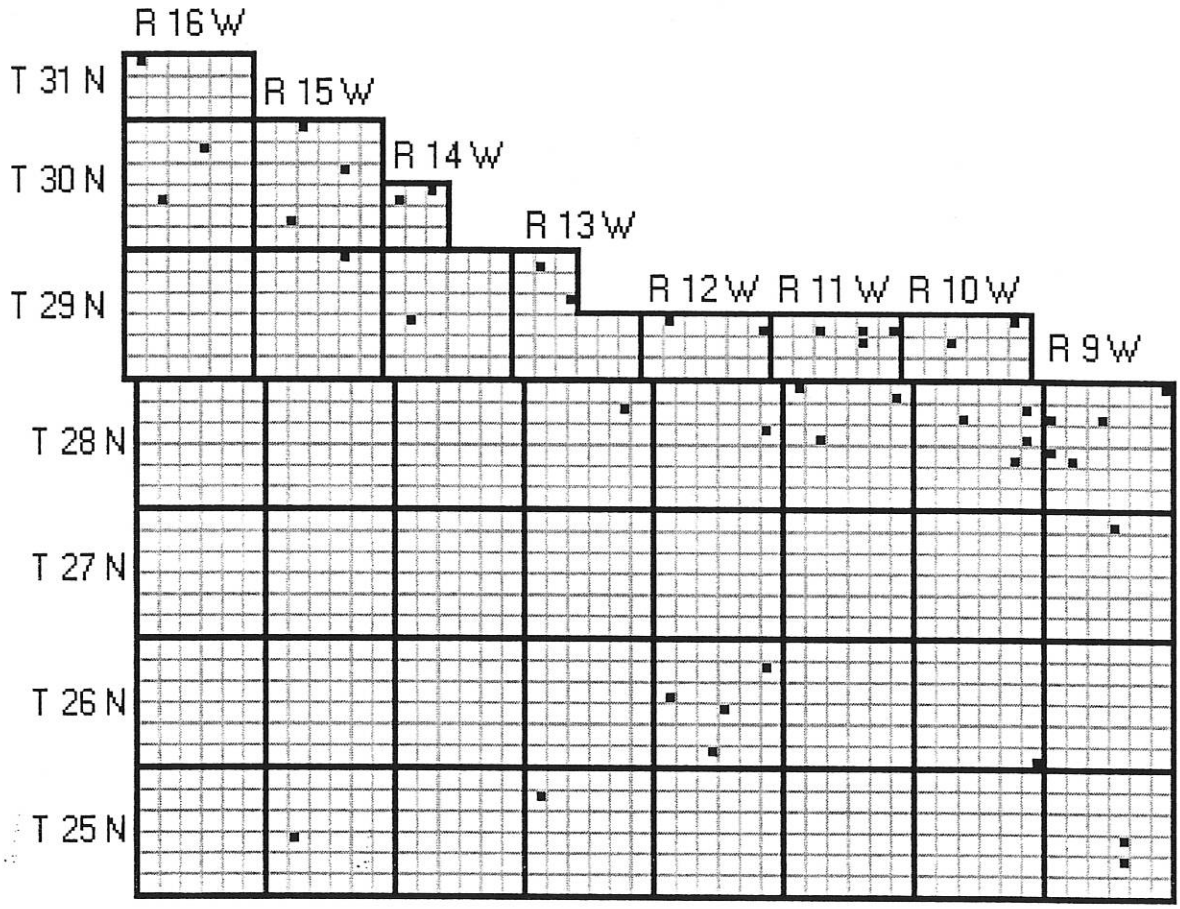
Locations of Pesticide Sampling Sites within the UENRD

Appendix H shows the locations of registered irrigation wells sampled for pesticides. Four figures are presented on the following pages, one for each county in the District.

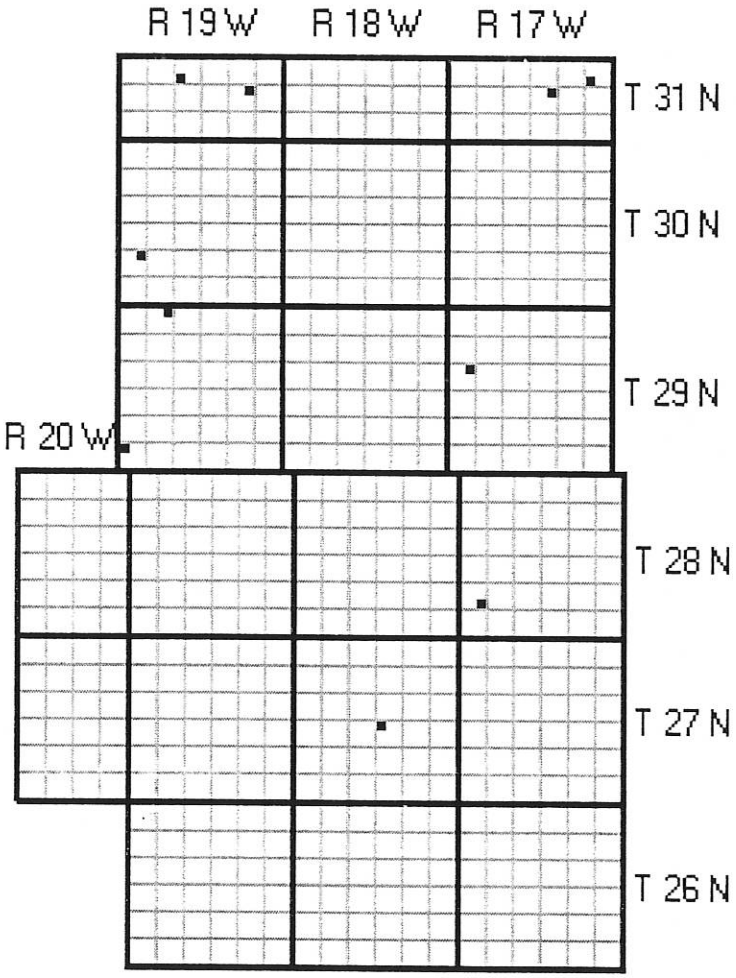
Antelope County
Pesticide Sampling Sites



Holt County
Pesticide Sampling Sites

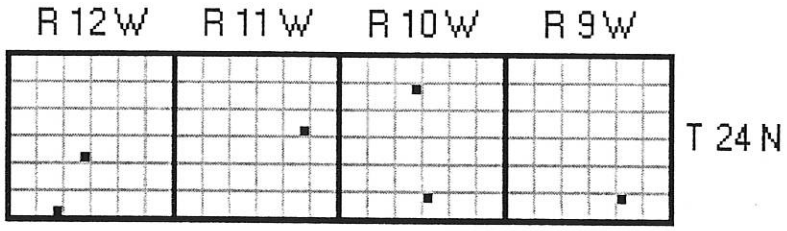


Rock County
Pesticide Sampling Sites



Wheeler County

Pesticide Sampling Sites



Antelope County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
23-5	Grant	SE	4	23	5																
		NW	5	23	5																
		SW	7	23	5																
		NE	13	23	5																
		NE	18	23	5																
		SW	24	23	5																
		NE	23	23	5																
		NE	17	23	5																
		NE	28	23	5																
		SE	30	23	5																
23-6	Cedar	SW	2	23	6																
		SW	5	23	6																
		NW	13	23	6																
		SE	28	23	6																
		SE	30	23	6																
23-7	Logan	SE	1	23	7							0.01	Atrazine								
		SE	4	23	7																
		SW	13	23	7							0.01	Atrazine								
		SE	17	23	7																
		SE	22	23	7																
		NW	24	23	7																
		SE	25	23	7																
		SE	28	23	7																
		NE	30	23	7	BDL															
23-8	Lincoln	NW	6	23	8																
		SE	8	23	8																
		SE	9	23	8																
		NW	9	23	8																
		NE	12	23	8																

Antelope County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits													
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		SW	14	23	8																
		NW	17	23	8																
		NW	20	23	8																
		SE	21	23	8							0.01	Atrazine								
		SE	24	23	8																
		NW	25	23	8																
		SW	27	23	8																
24-5	Burnett	SE	1	24	5																
		NW	4	24	5																
		NE	9	24	5																
		NC-NE	12	24	5																
		SW	14	24	5							0.01	Atrazine								
		NE	16	24	5																
		SW	20	24	5																
		NE	22	24	5																
		SW	26	24	5																
		NE	29	24	5	BDL										BDL					
24-6	Oakdale	SW	14	24	6							0.01	Atrazine								
		NW	17	24	6																
		NW	30	24	6							0.01	Atrazine								
		NE	35	24	6																
24-7	Elgin	SE	6	24	7																
		SW	12	24	7	BDL															
		SE	26	24	7																
		NW	27	24	7																
		NW	30	24	7																
24-8	Stanton	SE	11	24	8																
		NE	20	24	8																

Antelope County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits													
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		SW	25	24	8																
		SW	24	24	8	BDL										0.06	Atrazine				
		NE	33	24	8																
		NE	31	24	8							0.01	Atrazine								
		SW	35	24	8																
25-5	Elm	NE	1	25	5																
		NW	3	25	5																
		NW	5	25	5																
		NW	7	25	5																
		SW	9	25	5																
		SE	10	25	5																
		NE	10	25	5																
		SE	12	25	5																
		SE	13	25	5																
		CN	17	25	5																
		NW	19	25	5																
		NW	22	25	5																
		NE	23	25	5	BDL										BDL					
		SE	26	25	5																
		SW	27	25	5																
25-6	Neligh	SE	3	25	6																
		NE	4	25	6																
		NE	9	25	6																
		NE	11	25	6																
		NW	15	25	6							BDL									
		SW	19	25	6							0.01	Atrazine								
		NW	24	25	6																
		SE	26	25	6																
25-7	Ord	SW	10	25	7																

Antelope County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		NE	21	25	7																
		SE	22	25	7																
		NE	32	25	7							0.01	Atrazine								
		NW	32	25	7																
		SW	34	25	7																
25-8	Clearwater	SW	7	25	8																
		NW	11	25	8							0.01	Atrazine								
		SW	16	25	8	BDL										BDL					
		NW	16	25	8																
		NW	19	25	5																
		NE	20	25	8																
		SE	28	25	8																
		SW	32	25	8							0.01	Atrazine								
26-5	Willow	SW	6	26	5																
		SW	9	26	5	BDL															
		S/NW-N/SW	19	26	5																
		NE	25	26	5																
		E/SW-W/SE	27	26	5																
		NW	32	26	5																
		C/W 1/2	19	26	5																
26-6	Custer	NE	1	26	6																
		NW	2	26	6																
		NW	4	26	6																
		SE	7	26	6																
		NW	13	26	6																
		NW	16	26	6																
		NE	20	26	6																
		SW	22	26	6																
		NE	25	26	6																

Antelope County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits													
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		SW	28	26	6	BDL															
		NW	30	26	6																
		NE	31	26	6																
		SW	35	26	6																
26-7	Blaine	NE	2	26	7																
		NE	7	26	7																
		NW	9	26	7																
		SE	14	26	7																
		NE	18	26	7	BDL															
		SE	21	26	7																
		NW	31	26	7							0.01	Atrazine								
26-8	Frenchtown	NW	3	26	8																
		NE	6	26	8	BDL															
		NE	7	26	8																
		SE	12	26	8																
		NE	22	26	8																
		NW	22	26	8																
		SE	26	26	8																
27-5	Crawford	SE	1	27	5																
		NE	4	27	5																
		NW	6	27	5																
		NW	7	27	5																
		NW	8	27	5																
		NW	10	27	5																
		NW	11	27	5																
		C/N 1/2	12	27	5																
		SE	13	27	5																
		SE	14	27	5																
		NE	15	27	5																

Antelope County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		SE	16	27	5																
		SE	17	27	5																
		NW	18	27	5	BDL															
		NE	19	27	5																
		SE	22	27	5																
		SW	24	27	5																
		NW	26	27	5																
		NNE	28	27	5																
		NE	29	27	5																
		NE	30	27	5																
		NE	31	27	5																
		SW	32	27	5																
		NW	33	27	5																
		NW	34	27	5																
		SW	35	27	5																
		SE	36	27	5																
27-6	Ellsworth	NE	1	27	6																
		NE	4	27	6																
		SE	4	27	6							0.01	Atrazine								
		NE	6	27	6																
		SE	7	27	6																
		NW	9	27	6																
		NW	11	27	6																
		NE	12	27	6																
		NE	13	27	6																
		SE	15	27	6																
		SW	16	27	6																
		NW	17	27	6																
		SW	19	27	6																
		NW	20	27	6																
		SE	21	27	6																

Antelope County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits													
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		NW	24	27	6																
		SNE-NSE	25	27	6																
		NNE	26	27	6																
		NE	27	27	6																
		SE	30	27	6																
		NE	32	27	6																
		NW	34	27	6																
		NE	35	27	6																
27-7	Royal	NW	4	27	7							0.01	Atrazine								
		SE	7	27	7																
		SW	11	27	7							0.02	Atrazine								
		NE	16	27	7							0.02	Atrazine								
		NW	18	27	7	BDL														0.03	Deethyatrazine
																				0.06	Atrazine
		SE	19	27	7																
		NE	24	27	7																
		SE	25	27	7	BDL															
		NW	27	27	7																
		SW	27	27	7																
		SW	30	27	7																
		NW	36	27	7																
27-8	Garfield	NW	1	27	8																
		NE	1	27	8																
		SE	1	27	8																
		NE	4	27	8																
		SW	6	27	8																
		SE	8	27	8	BDL														BDL	
		SW	10	27	8																
		SE	12	27	8																
		SE	14	27	8																

Antelope County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		NW	16	27	8																
		SW	18	27	8																
		SE	20	27	8																
		NE	21	27	8																
		NE	22	27	8																
		SW	24	27	8																
		SW	28	27	8																
		NW	29	27	8																
		NE	31	27	8																
		SE	33	27	8																
		NE	35	27	8																
		NW	35	27	8	BDL														BDL	
28-5	Bazile	NW	6	28	5																
		SW	10	28	5																
		NW	12	28	5	BDL														BDL	
		NE	18	28	5																
		MW1/2	22	28	5																
		NW	23	28	5																
		NW	29	28	5																
		SE	33	28	5																
		SE	34	28	5																
		SW	34	28	5																
		NW	36	28	5																
28-6	Eden	NW	2	28	6																
		NE	3	28	6																
		NE	5	28	6																
		NW	8	28	6																
		SE	9	28	6																
		NE	11	28	6																
		NW	15	28	6																

Antelope County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		SW	18	28	6																
		NW	21	28	6																
		SE	22	28	6																
		NW	24	28	6	BDL														BDL	
		SW	26	28	6																
		SE	28	28	6																
		NE	29	28	6																
		NW	31	28	6																
		SW	33	28	6																
		SE	34	28	6																
		NE	35	28	6																
		SE	35	28	6																
28-7	Verdigris	SE	12	28	7	BDL														BDL	
		NE	19	28	7	BDL														BDL	
		NW	19	28	7																
		NW	24	28	7																
		NW	25	28	7																
		NW	30	28	7																
		NE	31	28	7																
		SW	32	28	7																
28-8	Sherman	NE	4	28	8																
		SE	17	28	8																
		SE	18	28	8																
		SW	20	28	8	BDL															
		SW	26	28	8																
		SE	28	28	8																
		NW	31	28	8							0.01	Atrazine								
		NE	33	28	8																

Holt County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township	Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits													
	Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
					ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
25-9	SW	2	25	9																
	SW	20	25	9																
	NE	22	25	9	BDL															
	SE	22	25	9																
	NE	27	25	9					0.06	Atrazine										
25-10	SW	25	25	10																
	NE	28	25	10																
25-12	NW	18	25	12																
	SW	18	25	12																
	SE	18	25	12																
	NW	20	25	12																
	NW	33	25	12																
25-13	NE	7	25	13	BDL															
	NW	7	25	13																
	SE	7	25	13																
25-15	NW	20	25	15	BDL															
	SW	29	25	15																
	SW	30	25	15																
25-16	SW	34	25	16																
26-9	NE	18	26	9																
	NW	18	26	9																
	NE	19	26	9																
	SW	28	26	9																
	NW	29	26	9																
	SE	30	26	9																
	SW	32	26	9																

Holt County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township	Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits													
	Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
					ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
26-10	SW	23	26	10																
	NW	28	26	10																
	SE	28	26	10																
	SE	36	26	10	BDL															
26-12	NW	12	26	12					0.05	Atrazine										
	SE	18	26	12																
	NW	22	26	12	BDL															
	NE	23	26	12																
	SE	23	26	12																
	NE	33	26	12					BDL										0.10	Atrazine
26-13	NW	23	26	13																
	SW	23	26	13																
	NW	26	26	13																
	SW	26	26	13																
	NW	30	26	13																
	SW	30	26	13																
	SW	34	26	13																
26-14	SE	7	26	14																
27-9	SW	3	27	9	BDL										0.70	Atrazine				
	NE-SE	6	27	9																
	NW	15	27	9																
	SE	22	27	9																
27-11	SE	1	27	11																
27-12	SE	28	27	12																

Holt County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township	Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
	Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
					ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
27-16	NE	27	27	16																
28-9	NW	1	28	9																
	NE	1	28	9					BDL											
	SE	3	28	9																
	SE	5	28	9																
	N/SW-S/NW	6	28	9																
	NE-SE	6	28	9																
	SW	7	28	9					BDL											
	SW	8	28	9																
	SE	9	28	9	BDL														BDL	
	SE	13	28	9																
	NE	14	28	9																
	ESW-WSE	16	28	9																
	SW	17	28	9																
	SW	18	28	9																
	SE	18	28	9																
	SOC-NW	19	28	9							0.01	Atrazine								
	SW	20	28	9					BDL										bdl	
	SE	22	28	9																
	SE	25	28	9																
	SW	29	28	9																
	SE-NW	31	28	9																
	SW	33	28	9																
28-10	SW	2	28	10																
	NW	4	28	10																
	SW	8	28	10																
	SW	9	28	10	BDL														0.85	Deethylatrazine
																			0.28	Atrazine
																			0.10	Alachlor
	NW	12	28	10							0.01	Atrazine								

Holt County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township	Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
	Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
					ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
	SW	13	28	10							0.03	Atrazine								
	NW	14	28	10																
	SW	15	28	10																
	NW-NE	20	28	10																
	SE	23	28	10					BDL										0.09	Deethylatrazine
	NE	25	28	10																
	NW	27	28	10																
28-11	SW	1	28	11	BDL															
	NE	6	28	11					0.13	Atrazine										
	SW	9	28	11																
	SE	17	28	11	BDL															
28-12	NW	13	28	12					BDL											
	NW	23	28	12																
	NE	23	28	12																
	SE	23	28	12																
28-13	NE	10	28	13																
	NE	11	28	13	BDL															
28-15	SW	18	28	15																
28-16	NW	5	28	16																
29-10	NW	20	29	10																
	NE	22	29	10																
	NE	24	29	10																
	NW	24	29	10	BDL				0.06	Atrazine					BDL					
	SW	24	29	10																
	NW	25	29	10																
	NE	25	29	10																

Holt County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
		Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
						ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		SW	27	29	10																
		NW	28	29	10	BDL										BDL					
		SE	29	29	10																
		NE	30	29	10																
		NE	31	29	10																
		NW	31	29	10																
		SE	33	29	10																
		NE	36	29	10																
		NW	36	29	10																
		SW	36	29	10																
29-11		SE	20	29	11																
		SW	21	29	11	BDL										BDL					
		NW	22	29	11																
		SW	23	29	11	BDL														0.38	Deethylatrazine
																				0.15	Atrazine
		SW	24	29	11																
		SE	24	29	11					0.09	Atrazine					0.14	Atrazine				
		NE	25	29	11					0.05	Atrazine										
		NW	26	29	11																
		NSE-SNE	27	29	11															BDL	
		SW	28	29	11																
		SE	28	29	11																
		SW	33	29	11																
		NW	36	29	11																
29-12		NW	20	29	12					BDL										BDL	
		SE	24	29	12	BDL										BDL					
29-13		SW	5	29	13	BDL														BDL	
		SW	14	29	13																
		NE	16	29	13					0.05	Atrazine									0.25	Deethylatrazine

Holt County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
		Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
						ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		SE	17	29	13																
		SE	27	29	13																
29-14		NE	1	29	14																
		SE	3	29	14																
		SE	5	29	14																
		SW	14	29	14																
		SE	14	29	14																
		NW	20	29	14					0.05	Atrazine									BDL	
29-15		NW	2	29	15					BDL											
		SW	18	29	15																
29-16		SE	7	29	16																
		SE	11	29	16																
		NE	17	29	16																
30-14		NW	19	30	14																
		SE	19	30	14	0.08	Atrazine			0.16	Atrazine									0.99	Deethylatrazine
																				0.23	Atrazine
																				0.05	Alachlor
		SE	20	30	14					0.08	Atrazine										
		NW	21	30	14											0.07	Atrazine				
		SE	21	30	14	0.21	Atrazine														
		NE	29	30	14																
		NW	31	30	14																
		SE	31	30	14																
		SE	33	30	14																
30-15		NW	1	30	15																
		SE	2	30	15																
		NW	3	30	15																

Holt County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
						1988		1989		1990		1991		1992		1993		1994		1995	
		Sub	Sec	Tn	R	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		NW	4	30	15	BDL										BDL					
		SE	5	30	15																
		NW	5	30	15																
		NW	6	30	15																
		NW	7	30	15																
		SW	8	30	15																
		NE	10	30	15																
		SE	11	30	15																
		SE	13	30	15																
		NW	14	30	15	BDL														0.90	Deethylatrazine
																				0.22	Atrazine
																				0.06	Metolachlor
		SW	15	30	15																
		SW	16	30	15																
		NW	21	30	15																
		SW	23	30	15																
		SE	24	30	15																
		SE	29	30	15	BDL														BDL	
		NE	32	30	15																
		SW	35	30	15																
		NE	36	30	15																
30-16		NE	10	30	16					0.07	Atrazine									0.15	Deethylatrazine
																				0.08	Atrazine
																				0.11	Metolachlor
		SE	20	30	16	BDL															
		SE	25	30	16																
31-16		NE	19	31	16	0.25	Atrazine			0.38	Atrazine										
		SW	20	31	16																
		NW	21	31	16																
		SE	23	31	16																

Holt County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits													
		Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
						ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
		NW	24	31	16																
		SE	27	31	16																
		SE	28	31	16																
		SW	28	31	16																
		SW	29	31	16																
		NW	35	31	16																

Rock County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township	Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
	Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
					ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
26-18	NW	21	26	18																
27-18	NW	20	27	18																
	NW	22	27	18	BDL															
	SW	23	27	18																
27-19	SE	32	27	19																
28-17	SE	30	28	17	BDL															
	SW	13	28	17																
29-17	NE	18	29	17	0.20	Atrazine			BDL											
29-19	NE	5	29	19	BDL														0.32	Deethylatrazine
	NW	16	29	19																
	SW	15	29	19																
	NW	18	29	19																
	SE	29	29	19																
	NW	31	29	19	BDL															
	NE	33	29	19																
29-20	SE	25	29	20																
30-19	SW	5	30	19																
	NW	20	30	19																
	SE	21	30	19																
	NE	30	30	19	BDL														BDL	
30-20	SE	12	30	20																
31-17	SE	22	31	17																
	SE	23	31	17																

Rock County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township	Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits													
	Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
					ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
	SW	24	31	17	BDL														0.81	Deethylatrazine
																			0.10	Atrazine
																			0.06	Alachlor
																			0.08	Metolachlor
	NE	25	31	17																
	SW	25	31	17																
	NW	25	31	17																
	NW	27	31	17																
	NE	27	31	17	BDL														0.68	Deethylatrazine
																			0.15	Atrazine
																			0.09	Alachlor
	SE	29	31	17																
	NE	29	31	17																
31-19	SW	21	31	19	BDL															
	SE	21	31	19																
	SE	25	31	19																
	NE	26	31	19	BDL															
	NW	30	31	19																

Wheeler County

Upper Elkhorn NRD

Water Quality Sampling Results - *Pesticides*

Township		Legal Description				Pesticide Results and Type per Year (in parts per billion, ppb) **BDL = Below Detection Limits															
		Sub	Sec	Tn	R	1988		1989		1990		1991		1992		1993		1994		1995	
						ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type	ppb	type
24-9		NW	4	24	9																
		NW	35	24	9	2.33	cyanazine			BDL											
24-10		NE	9	24	10	BDL															
		NW	34	24	10	BDL															
24-11		SE	14	24	11	BDL															
24-12		SE	12	24	12																
		SE	21	24	12	BDL															
		SE	32	24	12	BDL															

APPENDIX H

Rules and Regulations for Establishment of a Groundwater Quality Management Area

With the acceptance of the Districts Groundwater Management Plan, the entire Upper Elkhorn Natural Resources District (UENRD) will be designated as a ***Groundwater Quality Management Area (GWQMA)*** following a public hearing. The reason for this action is to keep with the District's Groundwater Reservoir Life Goal(refer to Section VII). The GWQMA will consist of three levels or *phases* (Phase I, Phase II, and Phase III), each corresponding to a particular range of nitrate-nitrogen concentrations in the groundwater. The designation of phase areas will be based primarily on the District's on-going water quality sampling program along with areal studies conducted within the UENRD. The District will try to implement the Groundwater Management Plan on **January 1, 1997**, with the entire District starting in a Phase I GWQMA. Phase I of the program will primarily emphasize mandatory educational programs, while Phases II and III will emphasize and/or require the implementation of Best Management Practices (BMPs). Phase II Areas will be designated, if needed, by **January 1, 2004** and Phase III Areas will be designated, if needed, by **January 1, 2013**. Phase II and III Areas will be designated by townships within the UENRD unless data collected from the District's monitoring program shows a definite boundary where by only a portion of a township should be designated. The UENRD reserves the right to designate a Phase II or Phase III Area at any time deemed necessary. This designation will be done by the UENRD staff and Board of Directors.

Designation of Phase II & Phase III Areas

Phase II Areas

As data indicates, Phase II Areas of the UENRD will be designated no later than **January 1, 2004**. Before a Phase II Area can be designated, 60% of the registered irrigation wells monitored by the District must have nitrate-nitrogen levels greater than 75% of the maximum contaminant level (MCL). The MCL is a level of contamination established by the U.S. Environmental Protection Agency beyond which there is a high probability of health risks. Currently, the MCL for nitrate-nitrogen is 10 parts per million (ppm) which is equivalent to 10 mg/L. If the percentage of monitored irrigation wells is below 25% or the number is less than ten registered irrigation wells, the UENRD will increase the current monitoring program the following year in that area to at least 25% or not less than 10 registered irrigation wells.

A Phase II Area will be designated after two monitoring periods have passed (where a monitoring period is three years), and nitrate-nitrogen concentrations in 60% of these wells exceeds 75% of the MCL. However, the District reserves the right to designate a Phase II Area at any time deemed necessary. In areas with less than ten registered irrigation wells and nitrate-nitrogen concentrations exceeding 75% of the MCL, the District will work with the individual cooperators to implement Best Management Practices (BMPs). However, if the area is adjacent to a predesignated Phase II or Phase III area, the cooperator(s) will be required to abide by the rules and regulations of that predesignated phase area. Applicability of this requirement is at the UENRD Board of Director's discretion.

After initial designation, it will be determined to redesignate an area as a Phase I Area if data from monitored irrigation wells shows a decreasing trend in nitrate-nitrogen concentrations and 60% of these concentrations are below 75% of the MCL. Areas will remain as Phase II Areas if 60% of the nitrate-nitrogen concentrations from monitored irrigation wells exceed 75% of the MCL, but are equivalent to or less than 95% of the MCL.

Phase III Areas

As data indicates, Phase III Areas of the UENRD will be designated no later than **January 1, 2013**. Before a Phase III Area can be designated, the area must have been designated a Phase II Area for a minimum of three years, and nitrate-nitrogen levels in 60% of the monitored irrigation wells exceed 95% of the MCL. However, the District reserves the right to designate a Phase III Area at anytime that 70% of the monitored wells have nitrate-nitrogen concentrations exceeding 95% of the MCL.

In areas with less than 10 registered irrigation wells and nitrate-nitrogen levels exceeding 95% of the MCL, the District will work with individual cooperators to implement Best Management Practices (BMPs). However, if the area is adjacent to a designated Phase III Area, the cooperator(s) will be required to abide by the rules and regulations of that designated Phase III Area. Applicability of this requirement is at the UENRD Board of Director's discretion.

After initial designation, it will be determined to redesignate an area as a Phase I Area if data from monitored irrigation wells shows a decreasing trend in nitrate-nitrogen concentrations and 60% of these concentrations are below 75% of the MCL. Areas will be redesignated Phase II Areas if 60% of the nitrate-nitrogen concentrations from monitored irrigation wells exceed 75% of the MCL, but are equivalent to or less than 95% of the MCL. If the nitrate-nitrogen concentrations in 60% of the monitored irrigation wells exceed 95% of the MCL, the area will remain a Phase III Area.

Phase I Areas
0 to 7.5 ppm nitrate-nitrogen

1). The person or persons responsible for making decisions on any type of applications of nitrogen fertilizer on an area larger than **one acre** and applying more than **50 pounds per acre per year** on any agricultural land within the UENRD, either commercially or privately, must be certified by the District once every four (4) years. The person or persons will be considered the *certified operator(s)*. The certification requirement will include attending educational classes established by the District with assistance from the County Extension, University of Nebraska Research and Extension personnel, and others. Nitrogen certification from bordering NRDs will be accepted as fulfillment of the UENRD nitrogen certification requirement pending UENRD Board approval.

2). Certified operators are encouraged to set a realistic yield goal for crops where more than **50 pounds per acre per year** of actual nitrogen fertilizer is to be applied. A realistic goal is based on the last five years actual yield averaged plus five percent.

3). Certified operators will be strongly encouraged to fill out and return an annual *Best Management Practices Survey*. The District will mail out the survey each year by **December 1** with **December 20** as the return date.

4). Residents residing in communities within the UENRD who apply nitrogen fertilizer will be encouraged to attend *Nitrogen Awareness Programs* established by the District with assistance from the County Extension, University of Nebraska Research and Extension personnel, and others.

5). Fall (*September 23 to December 20*) and Winter (*December 21 to March 1*) applications of commercial nitrogen fertilizer will be discouraged on all soils. Spring (*March 2 to June 20*) applications of commercial nitrogen fertilizer greater than **100 pounds per acre per year** will be discouraged unless applied through split applications (i.e. preplant, planting, weed and feed, post emergence side-dressing, and, if applicable, through an irrigation distribution system).

6). A groundwater analysis for nitrate-nitrogen content in all wells used for irrigation of crops must be accomplished by the certified operator once every four (4) years prior to recertification. The results of this analysis must be submitted to the UENRD by the following **February 1** report deadline. The sample must be collected and analyzed using UENRD approved methods. A methodology for sample collection and proper analysis procedures will be included as part of the District's educational program. Information from this analysis will give the certified operator knowledge of usable nitrate-nitrogen already present in the groundwater. This information will not be used in determining a phase area.

7). The District encourages voluntary testing of all domestic and stock wells for nitrate-nitrogen content.

8). The District encourages a deep soil sampling analysis (two or three foot sample, if applicable) for nitrate-nitrogen content on each field larger than **40 acres** with more than **50 pounds per acre per year** of actual nitrogen fertilizer applied. Approved sampling and analysis techniques will be included as part of the educational program. This analysis will give the certified operator knowledge of usable and inaccessible nitrogen in the soil profile.

9). The District encourages the use of calibration monitors on all applications of fertilizers and pesticides. Proper maintenance of all fertilizer and pesticide equipment is also encouraged.

10). The District encourages producers to use alternative irrigation and fertility management technology as it becomes available.

11). All wells (new or replacement) constructed in a management or control area within the UENRD must be in accordance with **section 46-659** of the **Groundwater Management and Protection Act.**

Phase II Areas
>7.5 to 9.5 ppm nitrate-nitrogen

1). A continuation of Phases I activities will remain in effect unless modified or negated by Phase II requirements.

2). The District will require the certified operator to accomplish a deep soil sampling analysis (mandatory two foot sample, three foot sample encouraged, if applicable) for nitrate-nitrogen content on each field larger than **40 acres** with more than **50 pounds per acre per year** of actual nitrogen fertilizer applied. The sample must be collected and analyzed using UENRD approved methods. Approved sampling and analysis techniques will be included as part of the District's educational program. This analysis will give the certified operator knowledge of usable and inaccessible nitrogen in the soil profile.

3). Certified operators must submit a report to the Upper Elkhorn NRD by **February 1** following each crop year on forms provided by the District for areas larger than **40 acres** where more than **50 pounds per acre** of actual nitrogen fertilizer is applied. The report may consist of, but is not limited to, the following sections:

Section I. Nutrient Management
Section II. Pest Management
Section III. Irrigation Management

An informational packet will be provided to each of the certified operators containing any necessary information and a list of possible information sources. Similar reports are used by the Natural Resources Conservation Service (formerly SCS). This continuity allows for greater information exchange and dissemination. Many different sources of information will be available to certified operators should questions arise. The District reserves the right to request additional information needed to assist in the successful implementation of this Groundwater Management Plan.

4). The District will encourage certified operators to incorporate credits from application of animal waste (solid or affluent) and municipality waste into the total nitrogen requirement for the specific crop where this application of waste is made. An analysis of waste slurry will be encouraged to determine nitrogen content. Operators are encouraged to apply animal and municipality waste evenly over as many acres as possible. The following rules and regulations apply to the application of animal and municipal waste, accordingly:

a) All required livestock waste facilities must be properly permitted by the State of Nebraska.
b) Nitrogen application including livestock waste (solid or affluent) should not exceed crop need.
c) Waste will not be spread on land subject to frequent flooding (subject to flooding more than once in a ten year period) or in areas during peak flood periods.
d) Waste will not be spread within 200 feet of, and draining into, adjacent water bodies.

e) Spreading of animal and municipality waste on frozen or snow covered ground will be discouraged. Animal and municipality waste can be applied to land where slopes are four percent (4%) or less or have adequate erosion control practices.

f) A nitrogen analysis of animal waste slurry will be encouraged during the growing season if the slurry is applied through an irrigation distribution system.

5). Fall (*September 23 to December 20*) and Winter (*December 21 to March 1*) application of all commercial nitrogen fertilizer will not be allowed before **November 1** and will be discouraged until after **March 1** on all soils. Exceptions will be allowed for Spring and Fall seeded crops and meadows if the actual nitrogen fertilizer application rate is less than **20 pounds per acre.**

6). The use of monitoring equipment (i.e., flow meters, rain gauges, hour meters, etc.) and distribution equipment (i.e. pressure regulators, low pressure nozzles, etc.) for efficient fertilizer and water distribution will be encouraged by the District.

Phase III Areas
>9.5 ppm nitrate-nitrogen

1). All rules and regulations established for Phases I & II will remain in effect unless modified or negated by Phase III requirements.

2). If a town, village or city lies within a Phase III Area, then residents who apply any amount of commercial nitrogen fertilizer must become certified through the District's nitrogen certification class. Nitrogen certification from bordering NRDs will also be accepted as fulfillment of the UENRD nitrogen certification requirement pending approval by the UENRD Board of Directors.

3). If the groundwater analysis from Phase I, #6 and reported in Phase II, #3 shows nitrate-nitrogen levels **greater than 75% of the MCL**, then the groundwater analysis for nitrate-nitrogen in Phase I, #6 must be made annually and results submitted in the report discussed in Phase II, #3.

4). The District may require the use of monitoring equipment (i.e., flow meters, rain gauges, hour meters, etc.) and distribution equipment (i.e. pressure regulators, low pressure nozzles, etc.) for efficient fertilizer and water distribution. A flow test through the irrigation distribution system will be required once every eight (8) years. The first flow test must be completed within the first two (2) years following initial designation of a Phase III Area. The Upper Elkhorn NRD may decide to develop a cost-share program to assist operators in the purchase, installation, and testing of such equipment.

5). The UENRD may choose to allocate groundwater if the UENRD Board of Directors deems it necessary.

6). Certified operators are required to submit an annual ***Integrated Crop Management Plan (ICMP)*** to the UENRD by **April 1** (or prior to planting of crops) on forms provided by the District for areas larger than **25 acres** where more than **50 pounds per acre per year** of actual nitrogen fertilizer is applied. This ICMP will emphasize future planning and the establishment of fertility, pest, and irrigation management plans. The required reports from Phase II will be incorporated into the ICMP to help evaluate past practices and identify areas for improvement. The ICMP will consist of three sections including, but not limited to, the following:

Section I. Fertility Management Plan

a) Fertility Management Report - from the *previous* year (from Phase II).
b) Evaluation of the Fertility Management Plan - from the *previous* year.
c) Planned fertility management actions for the *upcoming* year.

Section II. Pest Management Plan

a) Pest Management Report - from the *previous* year (from Phase II).
b) Evaluation of Pest Management Plan - from the *previous* year.
c) Planned pest management actions for the *upcoming* year.

Section III. Irrigation Management Plan

a) Irrigation Management Report - from the *previous* year (from Phase II).
b) Evaluation of Irrigation Management Plan - from the *previous* year
c) Planned irrigation management activities - for the *upcoming* year.

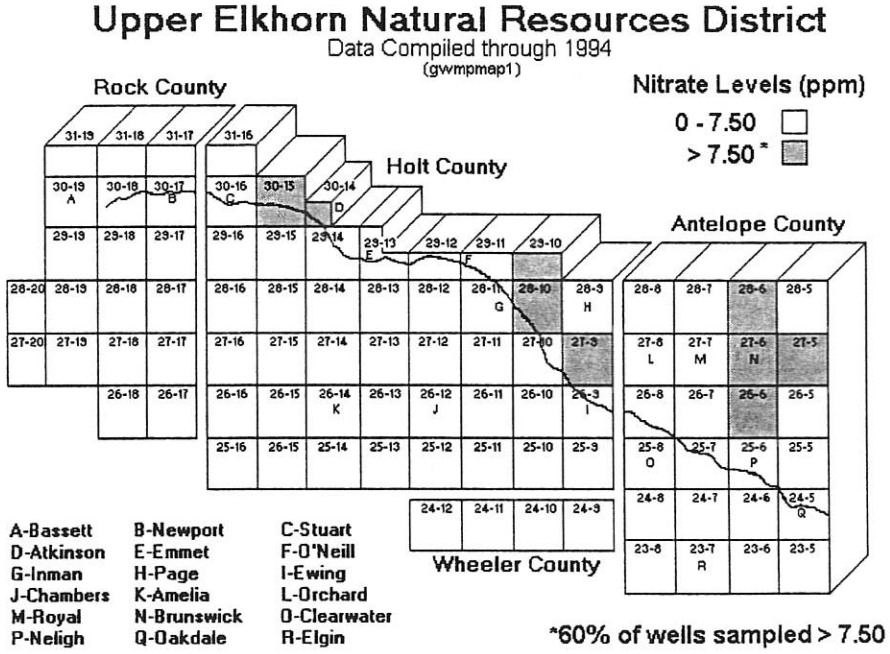
Each section of the ICMP consists of three subsections. The first subsection is the Management Report (Fertility, Pest, and Irrigation) already required in Phase II. This subsection is a summary of activities and results from the *previous* year.

The second subsection is an evaluation of the Management Plan (Fertility, Pest, and Irrigation) from the *previous* year. It compares the activities planned prior to planting with activities and results reported following harvest. For the first ICMP, no evaluation will be required since there will not be any documented planned management activities (Phase III, Section III, c) from the *previous* year. The District will provide guidelines and recommendations during this first year. For following years, the certified operator will need to refer back to the ICMP from the *previous* year for documentation of planned activities.

The third and final subsection details planned management activities (fertility, pest, and irrigation) for the upcoming year. Planned activities should be based on the evaluation in *subsection c* and can change from year-to-year depending on the ability of activities and practices to produce desired results.

7. The application of commercial nitrogen fertilizer is prohibited on all soils until after **March 1**. Spring (*March 1 to June 20*) application of commercial nitrogen over **100 pounds per acre per year** of actual nitrogen fertilizer will require split applications (i.e. pre-plant, post emergence side dress, weed and feed, planting time, and through the center pivot, if applicable).

Figure H-1 shows a map of the UENRD and the townships which have average nitrate-nitrogen concentrations less than and greater than 7.5 ppm. Those areas exceeding 7.5 ppm (75% of the MCL for nitrate-nitrogen), could potentially be designated Phase II or Phase III Areas once the District's GWMP goes into effect. Monitoring and educational efforts will continue to be focused on these areas in particular. The delineation of these areas is based on results from the District's monitoring program.



Testing for Other Contaminants within the Upper Elkhorn Natural Resources District

The UENRD will incorporate recommendations from the State of Nebraska FIFRA Program when it becomes established. Until this time, the District will implement its own monitoring program for contaminants other than nitrate-nitrogen based on established MCLs. This program consists of monitoring no less than fifteen percent (15%) of the irrigation wells monitored for nitrate-nitrogen in addition to the following:

- **At *50% of the MCL***
  Recommend increased monitoring and further review of the problem.

- **At *75% of the MCL***
  In conjunction with the U.S. EPA, U.S. Department of Agriculture (USDA), and other agencies, amend the District's nitrate-nitrogen certification class to include information, standards, and regulations regarding the contaminant of concern. Work in cooperation with EPA, USDA, and other agencies to develop and implement an approved State Pesticide Management Plan and UENRD Pesticide Management Plan.