# Nebraska Statewide Groundwater-Level Monitoring Report

# 2009

**Jesse T. Korus and Mark E. Burbach**
Conservation and Survey Division
School of Natural Resources

**Nebraska Water Survey Paper Number 76**

Institute of Agriculture and Natural Resources
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# University of Nebraska-Lincoln



The Conservation and Survey Division of the University of Nebraska-Lincoln is the agency designated by statute to investigate and interpret the geologically related natural resources of the state, to make available to the public the results of these investigations, and to assist in the development and conservation of these resources. It consists of program areas in geology, water, soils, and remote sensing-geographic information systems.

The division is authorized to enter into agreements with federal and state agencies to engage in cooperative surveys and investigations of the state. Publications of the division and the cooperating agencies are available through the Conservation and Survey Division, 101 Hardin Hall, University of Nebraska-Lincoln, Lincoln, NE 68583-0961. Contact the address above, phone : (402) 472-3471, or e-mail snrsales@unl.edu. The Conservation and Survey Division web site is: http://snr.unl.edu/csd/.



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Thanks to Dee Ebbeka and Les Howard for their assistance with graphics and maps.

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## FORWARD

Nebraskans are proud keepers of their natural resources. This is especially true of groundwater: it is inextricably linked to our rich heritage, maintains our agricultural economy, and provides steady flows to some of the nation's most admired natural streams. The groundwater resources that lie beneath the State are vast yet vulnerable: even small changes in groundwater levels can have profound impacts.

We are proud to present this report, which is a continuation of the series of water resources reports and maps published by the Conservation and Survey Division of the School of Natural Resources. This information can be used to inform, educate, and guide the citizens of Nebraska as we enter new and challenging times regarding water resources.

## INTRODUCTION

*Groundwater-level information is valuable to citizens and stakeholders for understanding water resource availability and making informed management decisions.*

This report is a statewide synthesis of groundwater-level monitoring programs in Nebraska. It is a continuation of the series of annual reports and maps produced by the Conservation and Survey Division (CSD) of the University of Nebraska in cooperation with the U.S. Geological Survey (USGS) since the 1950's. This information is valuable to citizens and stakeholders for understanding water resource availability and making informed management decisions.

Groundwater-level monitoring began in Nebraska in 1930 in an effort to survey the State's groundwater resources and observe changes in its availability on a continuing basis. The CSD and USGS cooperatively developed, maintained, and operated an observation well network throughout the state. For many years, these two agencies were primarily responsible for collecting, storing, and making this information available to the citizens.

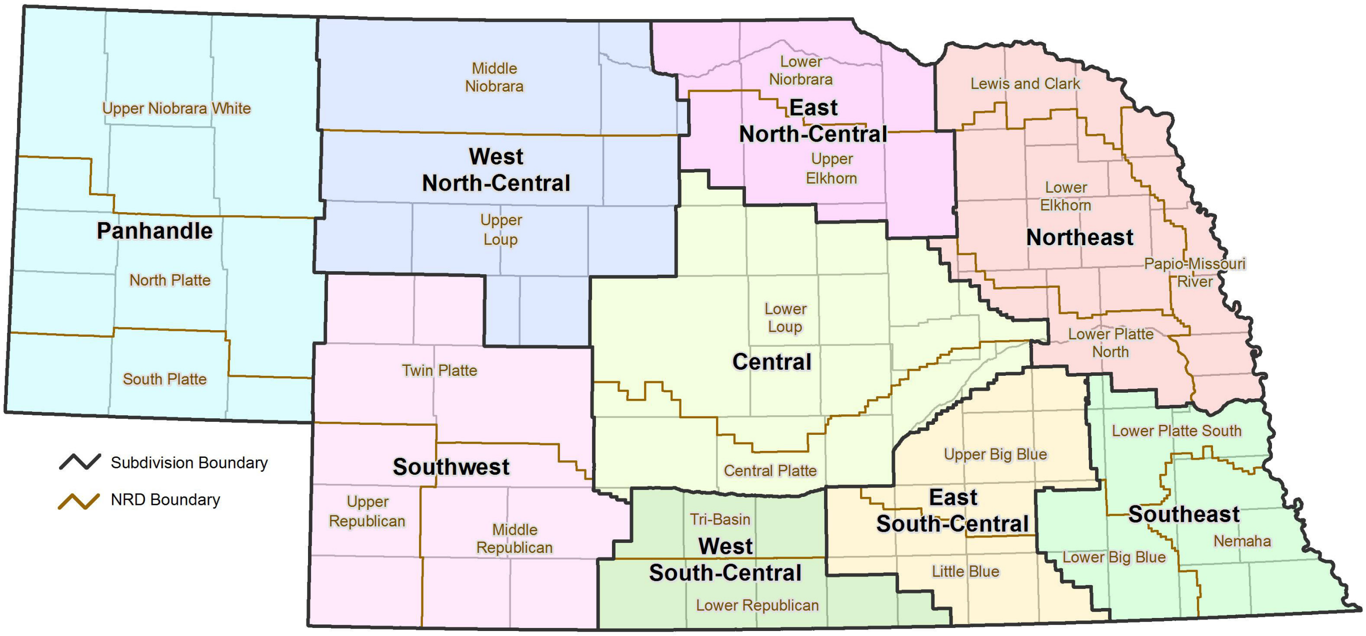
Over the years, other agencies began to assume the responsibilities of building and maintaining observation networks and measuring water levels. The CSD and USGS continue to operate some of the original observation wells, but today the majority of measurements are made by agencies such as the U.S. Bureau of Reclamation, the U.S. Fish and Wildlife Service, Public Power and Irrigation Districts, County Extension offices, municipalities, and particularly, Natural Resources Districts. Since these agencies are located throughout the state, they are able to implement groundwater-level monitoring programs using local field staff, landowner contacts, taxing and regulatory authority, and first-hand knowledge of their particular conditions. Collectively, these agencies have developed an extensive network of observation wells throughout the state.

The CSD plays a vital role in providing technical expertise to these agencies as they develop and implement groundwater-level monitoring plans. The CSD evaluates the adequacy and accuracy of the water-level data and provides the state-wide assessment of groundwater-level changes across all geographic regions and aquifers. Traditionally, CSD has provided technical services to stakeholders by integrating groundwater-level change data with multiple data sets to:

1) Determine the amount of groundwater in storage and its availability for use.
2) Assess the water-supply outlook by determining changes in the volume of groundwater in storage.
3) Identify areas in which changes in groundwater levels may have an economic impact.
4) Assist state and local agencies in the formulation and administration of resource-management programs.
5) Determine or estimate the rate and direction of groundwater movement, specific yield of aquifers, base flow of streams, sources and amounts of groundwater recharge, and locations and amounts of groundwater discharge.
6) Assess the validity of hydrogeologic interpretations and the assumptions used in developing models of a groundwater system.

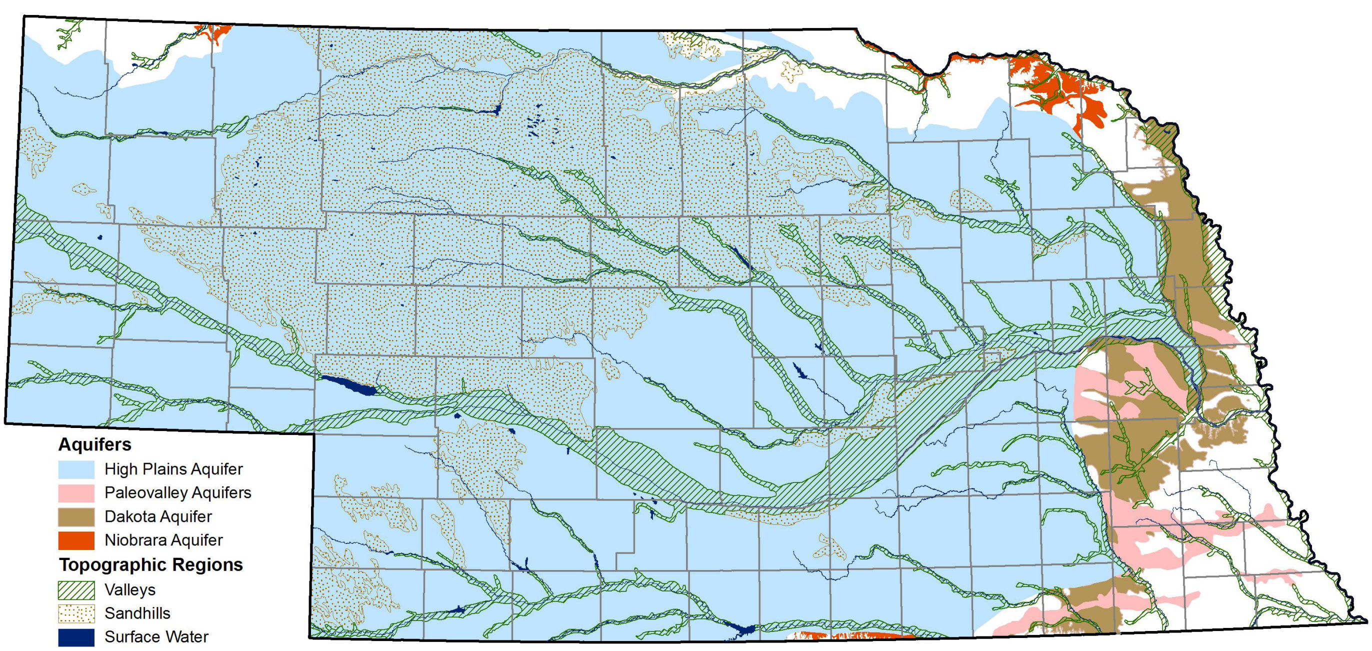
The need for this information has increased tremendously, yet the resources available for fulfilling this need have decreased. CSD strives to meet this challenge by focusing on fundamental data, building collaborative relationships with the agencies that depend on the information, and providing scientifically accurate information in a timely manner.

## Statewide Subdivisions used to Describe Regional Trends




*Divisions are based on Natural Resources District boundaries and are consistent with divisions used in previous reports to categorize and describe regional trends.*

## Important Aquifers and Topographic Regions of Nebraska




*Note: In some areas, the aquifer units shown here may contain little or no saturated thickness.*

### *Purpose and Methods*

This report summarizes annual and long-term changes in Nebraska's groundwater levels. These changes are depicted in maps, tables, and graphs. The maps delineate regional trends on a statewide basis. Although localized conditions may vary considerably, the maps presented in this report provide an overview of the general locations, magnitudes, and extents of rises and declines. The tables summarize statewide statistics regarding observation networks and water-level changes. The water-level hydrographs depict changes at a single observation point. Since there are thousands of observation wells in the state, only a few can be shown in this report. The hydrographs were selected based on the length, accuracy, and completeness of their records and whether or not they are generally representative of a particular area and aquifer.

The annual groundwater-level change map in this report was prepared by comparing groundwater levels measured in spring 2009 to levels collected in the same well in the previous year. Data were used from thousands of sites throughout the state. Contours were computer-generated, then manually edited on maps at a scale of 1:500,000 to conform to hydrogeologic boundaries.

For the drought-period map, water levels were compared in wells for which both Spring 2000 and Spring 2009 levels were measured. In order to be consistent with previous versions of this map, contours were drawn manually with the aid of the previous year's map and with knowledge of major hydrogeologic boundaries.

For the predevelopment to spring 2009 map, comparisons were made between spring 2009 water levels and estimated predevelopment water levels. An estimated predevelopment water level is the approximate average water level at a well site prior to any development that significantly affects water levels. Predevelopment water levels for most of the state are the estimated water levels that generally occurred before the 1930s, 1940s, or early-to-mid-1950s. These dates, which vary throughout Nebraska, generally are dependent on the beginning dates of intensive use of groundwater for irrigation. Typically all available water-level data collected prior to or during the early stages of groundwater development are used to estimate predevelopment water levels. Contours were drawn manually with the aid of the previous year's map and with knowledge of major hydrogeologic boundaries.

### *Factors Causing Groundwater-Level Changes*

Groundwater-level changes are a reflection of the changing balance between recharge to, discharge from, and storage in an aquifer. If recharge and discharge are in balance, groundwater levels generally remain unchanged because storage neither increases nor decreases. If, however, the rate of recharge exceeds the rate of discharge, the amount of water stored in the aquifer increases and groundwater levels rise. Conversely, if the rate of discharge exceeds the rate of recharge, the amount of water in storage is depleted and groundwater levels decline. The physical properties of an aquifer affect this balance and control the magnitude by which groundwater levels change and the rate at which these changes are transmitted through an aquifer.

Groundwater levels respond to a variety of natural and man-made factors affecting recharge and discharge. Recharge occurs from precipitation, but also from irrigation return flow and seepage from canals, reservoirs, and streams. Discharge occurs as baseflow to streams and lakes, but also as a result of groundwater pumping and evapotranspiration.

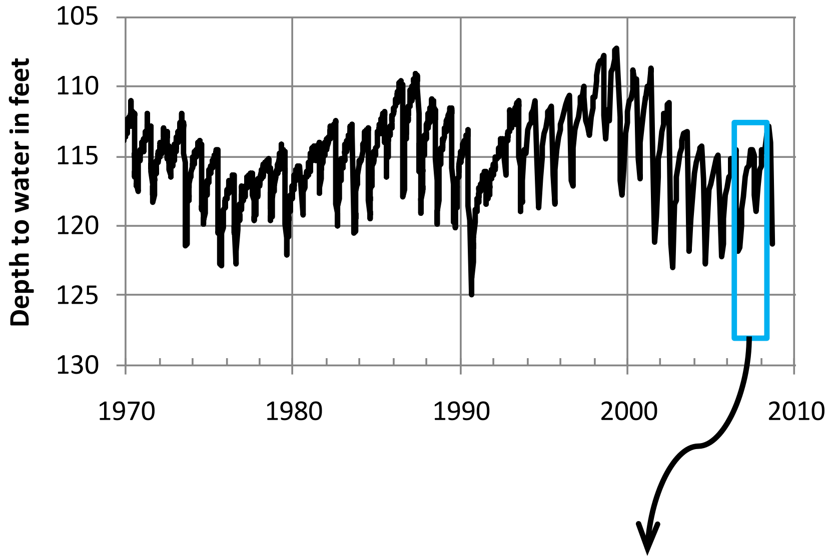
Groundwater-level changes can be observed at many different temporal scales. Changes may occur over several minutes or hours in response to pumping, floods, or earthquakes. Long-term changes may occur due to the cumulative effects of pumping over many irrigation seasons, prolonged droughts or wet periods, or continual seepage from man-made water bodies.

Groundwater levels can be observed at multiple spatial scales. For example, groundwater levels decline around the immediate vicinity of an individual well during pumping, but also from the cumulative effects of many irrigation wells pumped over many irrigation seasons at the scale of an entire regional aquifer. Similarly, groundwater levels rise along the banks of a stream during a flood, but may also rise significantly over an entire drainage basin during a prolonged wet period.

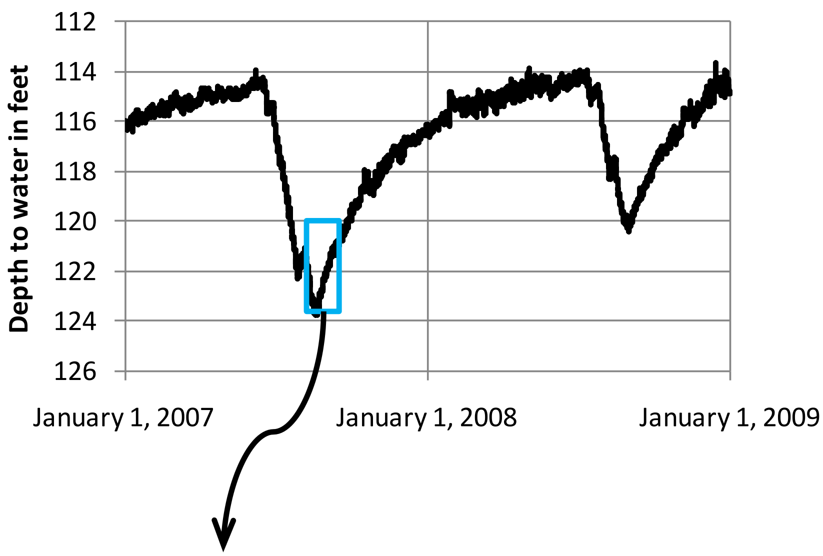
The maps presented in this report were generally mapped at a scale of 1:500,000. They are intended to identify regional trends at medium and long-term time scales throughout the entire state of Nebraska. As such, these changes chiefly reflect the interplay between precipitation, groundwater pumping, and artificial recharge from reservoirs and canals.

## Example of Groundwater-Level Changes at Different Temporal Scales

### Long-term groundwater-level changes




### Seasonal groundwater-level changes




### Daily groundwater-level changes


*Based on data from Plymouth Recorder well, Jefferson County*

## STATUS OF GROUNDWATER-LEVEL MONITORING PROGRAM, 2009

*Nebraska has developed a massive network of long-term groundwater-level monitoring sites, but our ability to observe short-term fluctuations has decreased sharply because fewer continuous recorder wells are being measured.*

The distribution of observation wells in the state is non-uniform in several ways. First of all, the geographic distribution of wells varies tremendously. The number of observation wells per county ranges from 0 in some counties to more than 250 in others, with the greatest density in areas where substantial changes in water levels have occurred. For this reason, water-level changes in some areas may not be detected or delineated because of insufficient data.

Second, the hydrogeologic distribution of wells varies. Wells are completed to different depths and in different geologic materials depending on the type of well, its purpose, and the availability of aquifers at different depths. Hydrogeology is complex, so hydrogeologists must simplify water-level information collected over large regions in order to analyze results. The water-level change maps in this report show changes over a wide range of aquifer materials and hydrogeologic conditions. Significant hydrogeologic boundaries were adhered to where possible, but only a limited amount of information can be obtained regarding interactions between aquifers.

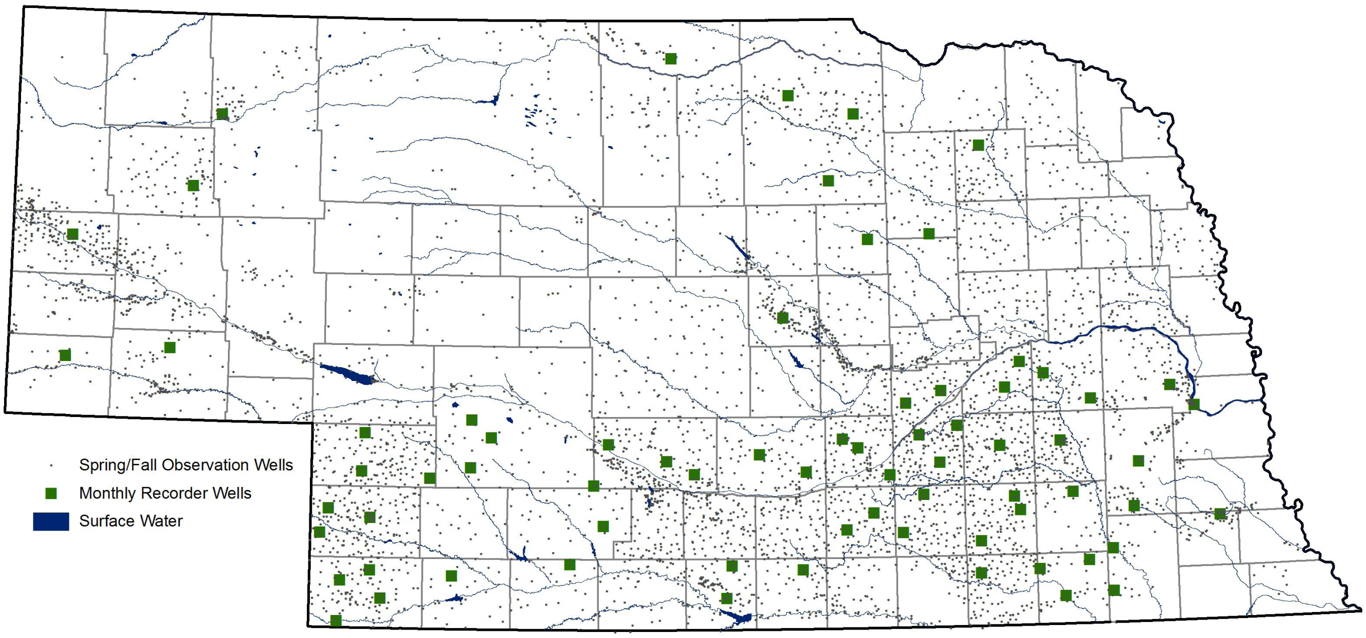
In 2009, approximately 7,482 water-level measurements, measured in nearly 6,019 observation wells, were reported to CSD. Many, but not all, of these measurements were also reported to the USGS. The reason for this discrepancy is that some observation wells maintained by the various agencies have not been added to the USGS database, a process that requires providing basic information about the well and its construction on a standardized well schedule form. The CSD maintains a database that stores all records from all wells reported from cooperating agencies. Currently there are an additional 13,062 records from 2,096 wells in the CSD database that are not part of the USGS database. Since the local agencies making water-level measurements have the best information regarding their observation well sites, resolving this issue will require cooperation between all entities involved in making water-level measurements in Nebraska.

To compile information regarding the status of water-level monitoring in Nebraska in this report, data from the USGS system were combined with data from the CSD database. Every attempt was made to avoid duplication of records, however, some wells and/or measurements might exist in duplicate due to the large number of records involved, limited information regarding changes at monitoring sites, and other factors unknown to the compiler at the time of the report. For example, a large, but unknown number of fall measurements are not yet recorded in any centralized database.

The number of wells used to measure groundwater levels has increased dramatically since 1930. Significant increases came in the late 1940's, late 1970's, and from 2000 to 2003. Additionally, the number of wells with long term historical records has increased. The increase in the number of wells with at least 10, 20, or 30 years of previous measurements has increased in a manner similar to the total increase. These trends indicate that many of the same observation wells used in the past are being used today. These wells will provide valuable information regarding long-term historical trends at thousands of individual sites.

In contrast to the increasing number of wells being monitored, the frequency of measurements has decreased markedly over the years. Most observation wells in Nebraska are measured in the spring and late fall. Spring measurements are useful in determining amounts of groundwater in storage prior to the irrigation season under static conditions, whereas fall measurements are useful in evaluating the effects of pumping and canal seepage after the irrigation season. Some wells, however, are measured more frequently, providing a detailed record of seasonal changes. The groundwater-level hydrographs shown later in this report illustrate the utility of long-term, continuous recorder wells. These wells are particularly useful for examining seasonal extremes. The decreasing number of wells being measured in this manner is concerning because key information can be obtained from seasonal fluctuations, including the timing and duration of pumping or recharge events, the degree of confinement of an aquifer, and the adequacy of the well used for monitoring (for example, see the Kimball Recorder Well hydrograph on page 30). Such detailed information can be particularly useful for developing and calibrating groundwater models. It is likely that many wells are actually equipped with automatic water-level sensors, but currently the locations and quantity of such wells or whereabouts of this information are unknown to the authors.

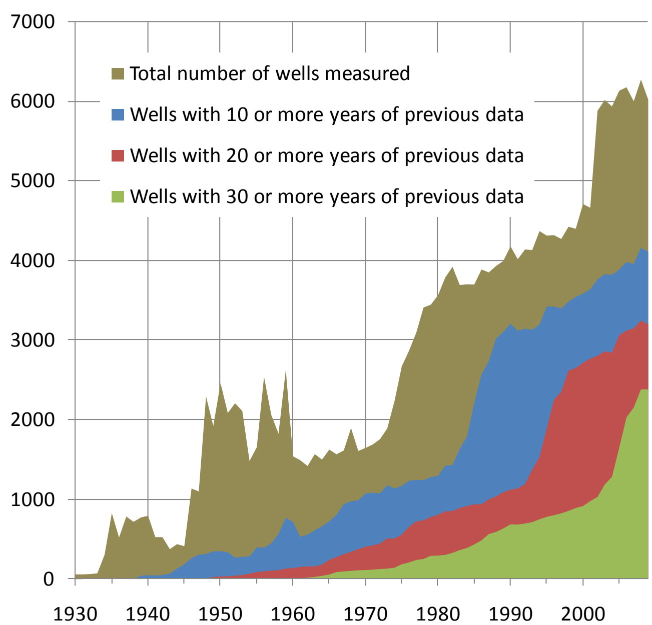
## Locations of Spring/Fall and Monthly Observation Wells



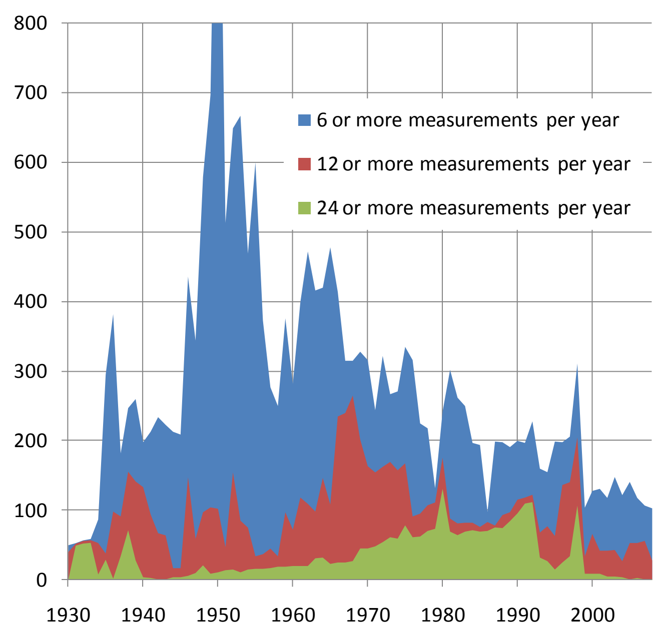

*Sources: U.S. Geological Survey, Nebraska Water Science Center; Nebraska Natural Resources Districts.*

## Graphs showing Numbers of Groundwater-Level Monitoring Wells Statewide since 1930

**A. Number of wells measured each year since 1930**




**B. Number of recorder wells measured each year since 1930**




*Although the number of observation wells and wells with long-term records have increased (A), the number of wells being measured more than twice per year has decreased (B).*

## CHANGES IN GROUNDWATER LEVELS, SPRING 2008 TO SPRING 2009

*Groundwater levels rose throughout much of Nebraska due to above-average precipitation in 2008.*

Groundwater levels rose throughout much of central and east-central Nebraska from 2008 to 2009. Areas of greater than one foot rise occurred mainly in a broad area extending from the north-central and northeast toward the south-central and southeast. Rises of greater than five feet occurred in large portions of Clay, Fillmore, and York Counties in south-central Nebraska, Gage County in the southeast, Buffalo County in the central, and Platte County in the northeast. Several smaller areas with greater than five foot rises were scattered throughout this region.

Groundwater levels rose in small, widely scattered areas of western Nebraska. The largest of these areas were in Red Willow, Frontier, Chase, and Perkins Counties in the southwest, and Scottsbluff, Morrill, and Sheridan Counties in the panhandle.

Most of the groundwater level rises can be attributed to above-average precipitation for 2008 across much of the State. Much of central Nebraska experienced greater than 130% of the 30-year average precipitation. The abundant moisture likely resulted in reduced pumping for irrigation and, in areas of shallow water table and permeable soils, increased recharge to the aquifer.

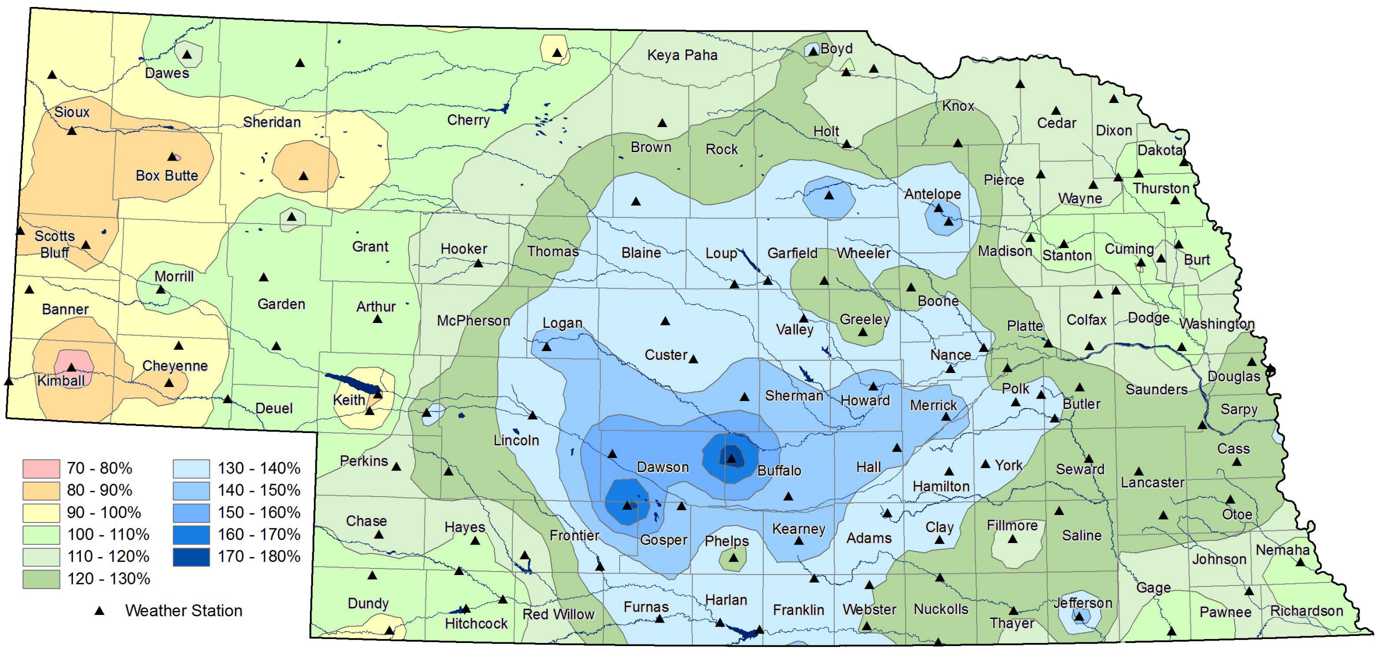
Groundwater-level declines occurred in several, widely scattered areas of the State. The two largest areas were in southwestern Nebraska in portions of Keith, Perkins, Dundy, and Chase Counties, where declines ranged from one to more than eight feet.

Declines in the panhandle occurred in Box Butte, Sheridan, and Cheyenne Counties. These declines were generally between one and five feet. Other significant areas experiencing declines were in Custer and Dawson Counties in the central, and Gosper and Phelps Counties in the south-central. Elsewhere in the State, declines occurred in Holt, Colfax, Dixon, Dakota, Thurston, Burt, and Washington Counties in the north-central and northeast.

Below-average precipitation was mostly limited to the panhandle of Nebraska in 2008. Both rises and declines in groundwater levels were observed in this area, although declines appear to have been more widespread than rises. Other areas experiencing groundwater-level declines, such as the southwest and northeast, received near or slightly above-average precipitation for 2008. Areas of south central Nebraska experiencing groundwater-level declines, such as Custer and Dawson Counties, received abundant precipitation in 2008.

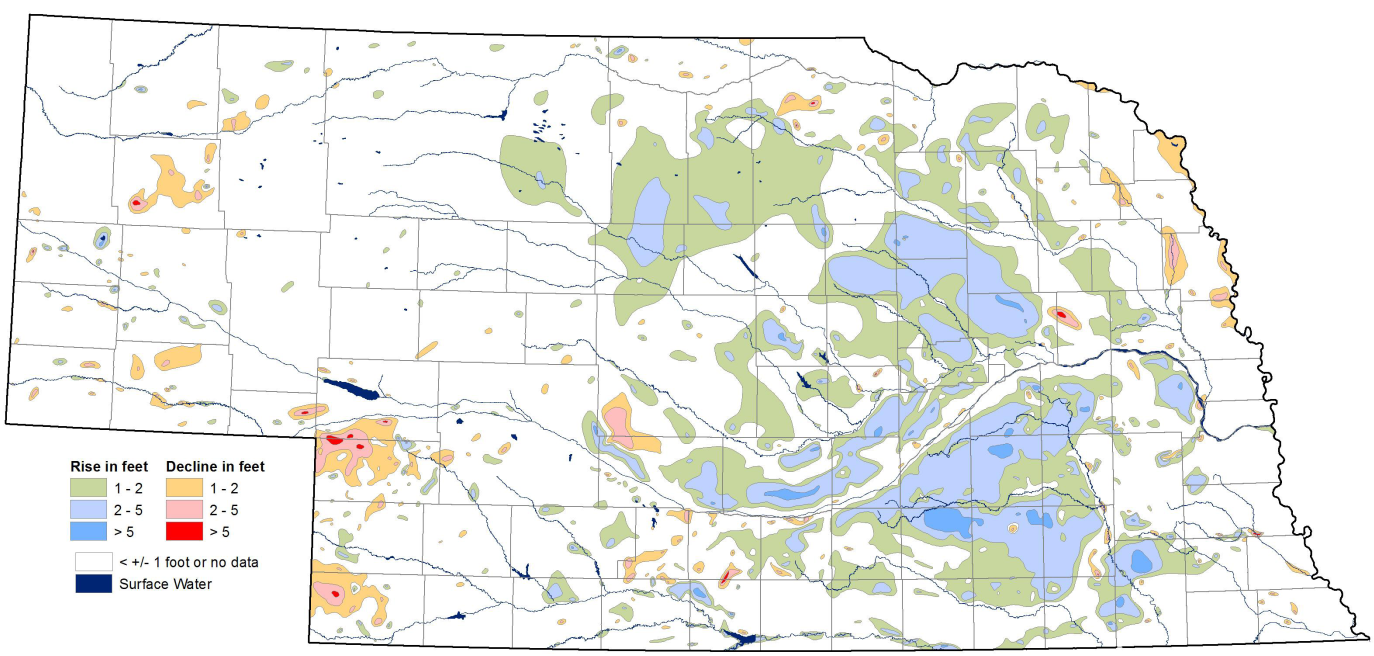
Large areas of little to no change were in the western sandhills and portions of the southwest. These areas received near normal precipitation, and are also areas of relatively low irrigation well density. Areas along major river valleys also were generally unchanged because groundwater-level declines were supplemented by river seepage and rises were limited to the elevation of the discharge points along river beds.

## Percent of Normal Precipitation - January 2008 to January 2009




*Sources: National Climate Data Center, Asheville, North Carolina;*
*High Plains Regional Climate Center, University of Nebraska–Lincoln.*

## Groundwater-level Changes in Nebraska - Spring 2008 to Spring 2009




*Sources: U.S. Geological Survey, Nebraska Water Science Center; U.S. Bureau of Reclamation, Kansas-Nebraska Area Office; Nebraska Natural Resources Districts; Central Nebraska Public Power and Irrigation District.*

## CHANGES IN GROUNDWATER LEVELS, SPRING 2000 TO SPRING 2009

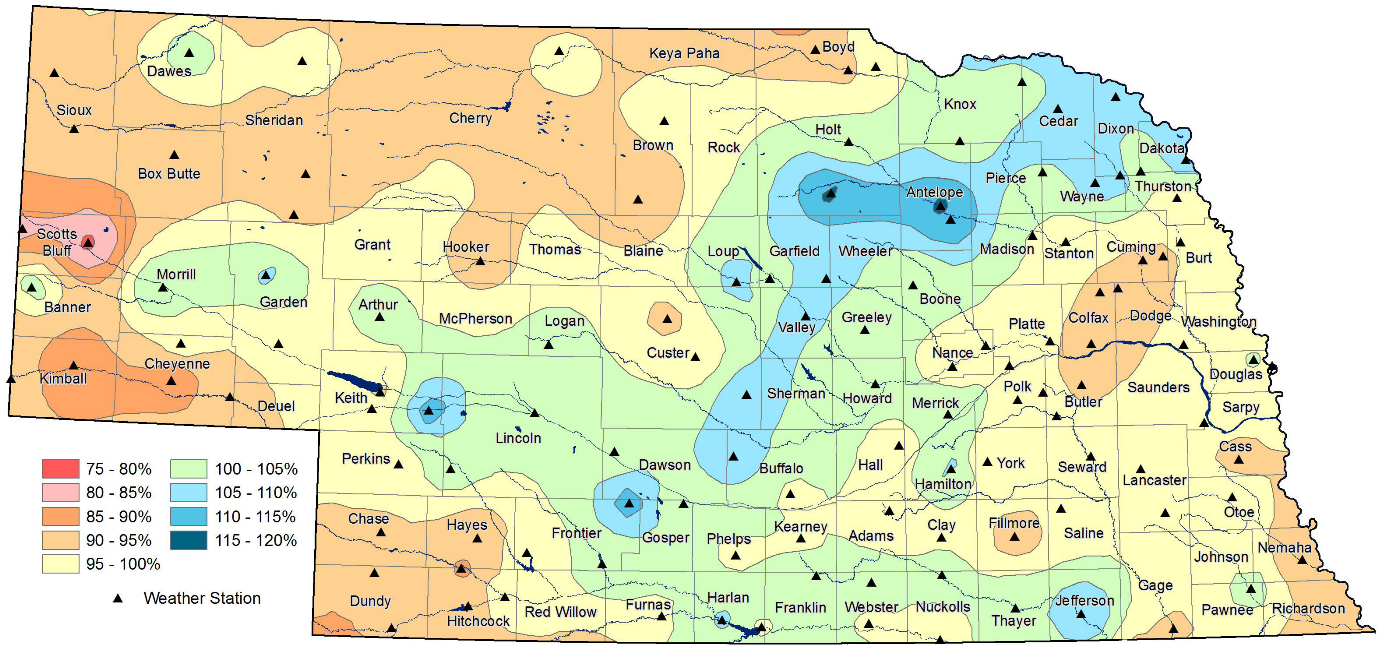
*Groundwater levels remain below pre-drought levels throughout most of the state, but some groundwater-level rises are occurring in the central and northeast.*

Nebraska experienced a widespread multi-year drought during the first part of this decade. By 2006-2007, groundwater levels had declined by at least one foot over almost the entire State, and at least 5 feet to more than 25 feet in areas of major irrigation development (Burbach, 2006; 2007). Although the drought had ended by the beginning of 2007 in the eastern part of the State, and by the beginning of 2009 in the west, groundwater levels remained below pre-drought levels throughout most of the State. As of Spring 2009, widespread areas of 5 or more feet of decline still existed in the southwest, south-central, the panhandle, and the north-central. These areas generally received below-average precipitation from 2000-2009.

Declines in the southwest were most severe in Chase, Dundy, Lincoln, and Perkins Counties. Declines of more than 25 feet occurred in the vicinity of Lake McConaughy in Keith County. Declines in the panhandle were most severe in Cheyenne County near Sidney, in Box Butte County, and in Sheridan County near Gordon. The largest declines in the east north-central were northwest of O'Niell in Holt County. Declines of up to 15 feet occurred in central Colfax County in the northeast. The east south-central was mostly below pre-drought levels in 2009, with the largest declines occurring in Hamilton, Polk, northern Clay, and northern York Counties. Southern Gage County experienced the largest declines in the southeast, and declines in the central were greatest in Buffalo County and small portions of Custer, Dawson, and Hall Counties.

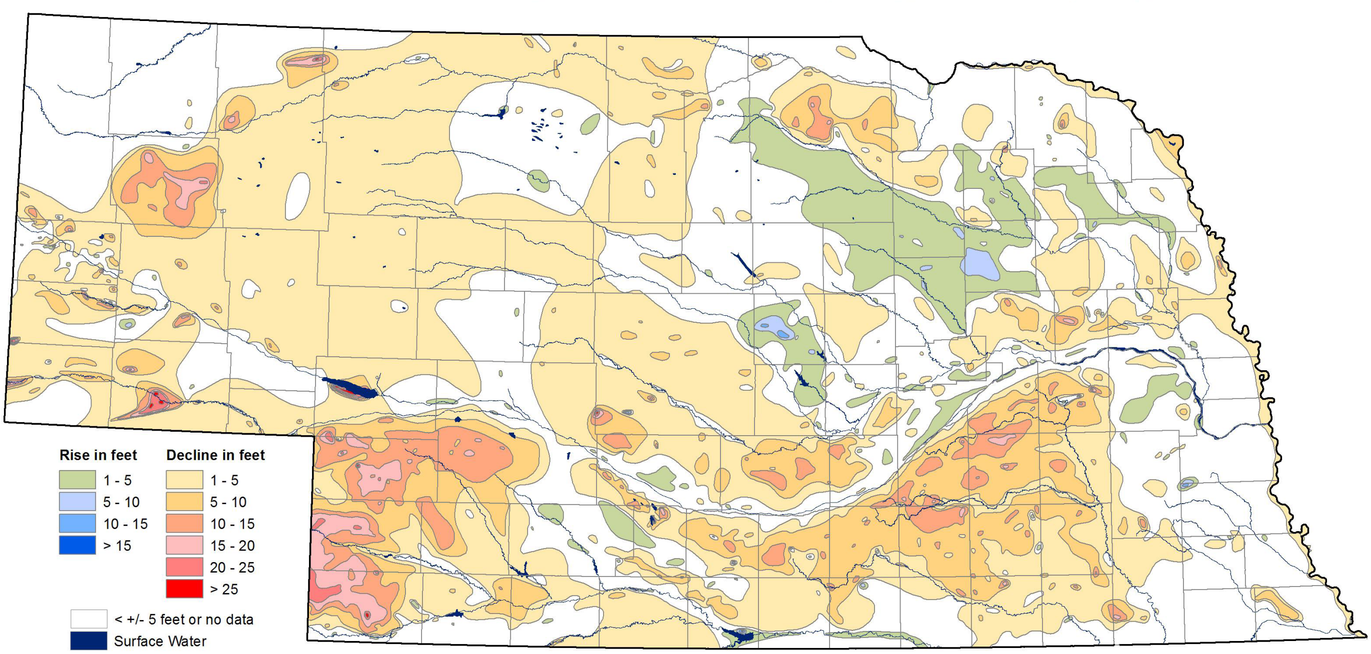
Spring 2009 groundwater levels rose above Spring 2000 levels in some areas. Areas of Holt, Wheeler, Antelope, Boone, Madison, Pierce, and Wayne Counties in the northeast, and Valley and Sherman Counties in the central had experienced rises of between 1 and 5 feet, with a few areas of greater than 5 feet rise, such as Madison and Valley Counties. These areas received mostly below-average precipitation during the drought (Burbach, 2007), but by 2009 had received enough rainfall that the 9-year period was above the 30-year average.

## Percent of Normal Precipitation - January 2000 to January 2009




*Sources: National Climate Data Center, Asheville, North Carolina;*
*High Plains Regional Climate Center, University of Nebraska–Lincoln.*

## Groundwater-level Changes in Nebraska - Spring 2000 to Spring 2009




*Sources: U.S. Geological Survey, Nebraska Water Science Center; U.S. Bureau of Reclamation, Kansas-Nebraska Area Office; Nebraska Natural Ressources Districts; Central Nebraska Public Power and Irrigation District.*

## CHANGES IN GROUNDWATER LEVELS, PREDEVELOPMENT TO SPRING 2009

*Long-term groundwater-level changes in Nebraska primarily reflect aquifer depletion in areas of dense irrigation development and increases in storage due to seepage from canals and reservoirs.*

Spring 2009 groundwater levels continue to indicate long-term declines and rises in certain areas of Nebraska. The largest groundwater-level declines from predevelopment to spring 2009 occurred in the southwest and in the panhandle. The largest rises occurred in the central and west south-central.

The predevelopment groundwater levels used in the southwest are representative of the approximate average water levels prior to 1953. Available data indicate that, as a result of intensive use of groundwater for irrigation, a general trend of declining water levels began in about 1966 in Chase, Dundy, and Perkins counties. The area of decline extends into portions of Keith, Lincoln, and Hayes Counties. Declines of as much as 70 feet occurred in Chase County since predevelopment.

Predevelopment water levels used to develop the groundwater-level change map in Box Butte County are the approximate average water levels prior to 1946. Intensive groundwater development for irrigation since 1950 has caused water-levels to decline 5 to more than 70 feet from predevelopment levels.

A large portion of east south-central Nebraska has experienced long-term groundwater-level declines since predevelopment. Predevelopment water levels in this area are generally representative of the approximate average water levels prior to 1950. Groundwater levels in large parts of Webster, Adams, Clay, Fillmore, Nuckolls, and Thayer Counties have declined more than 10 feet, and in some areas nearly 30 feet, from predevelopment. Areas of Hamilton, York, Seward, Polk, and Butler have declined at least 5 feet from predevelopment. The areal extent and magnitude of the groundwater-level declines have improved somewhat due to recent above-average precipitation. The most notable improvement was in northeastern Clay County where much of the area that was previously 5 to 10 feet below predevelopment is now less than 5 feet below. The declines in Hamilton, York, Seward, Polk, and Butler are much less severe than in recent years.

Parts of other counties that experienced relatively large areas of decline include Buffalo, Custer, and Dawson in the central; Harlan and Franklin in the south-central; Hitchcock, Frontier, and Red Willow in the southwest; Banner, Kimball, Morrill, Cheyenne, and Sheridan in the panhandle; and Holt in the north central. A newly developing area of decline is located in central Colfax County in the northeastern part of the State. Many of these areas occur in areas of intense groundwater irrigation, but in other areas, wells are not particularly dense. Other factors such as aquifer characteristics, rates of recharge, and irrigation scheduling could be contributing to the declines.

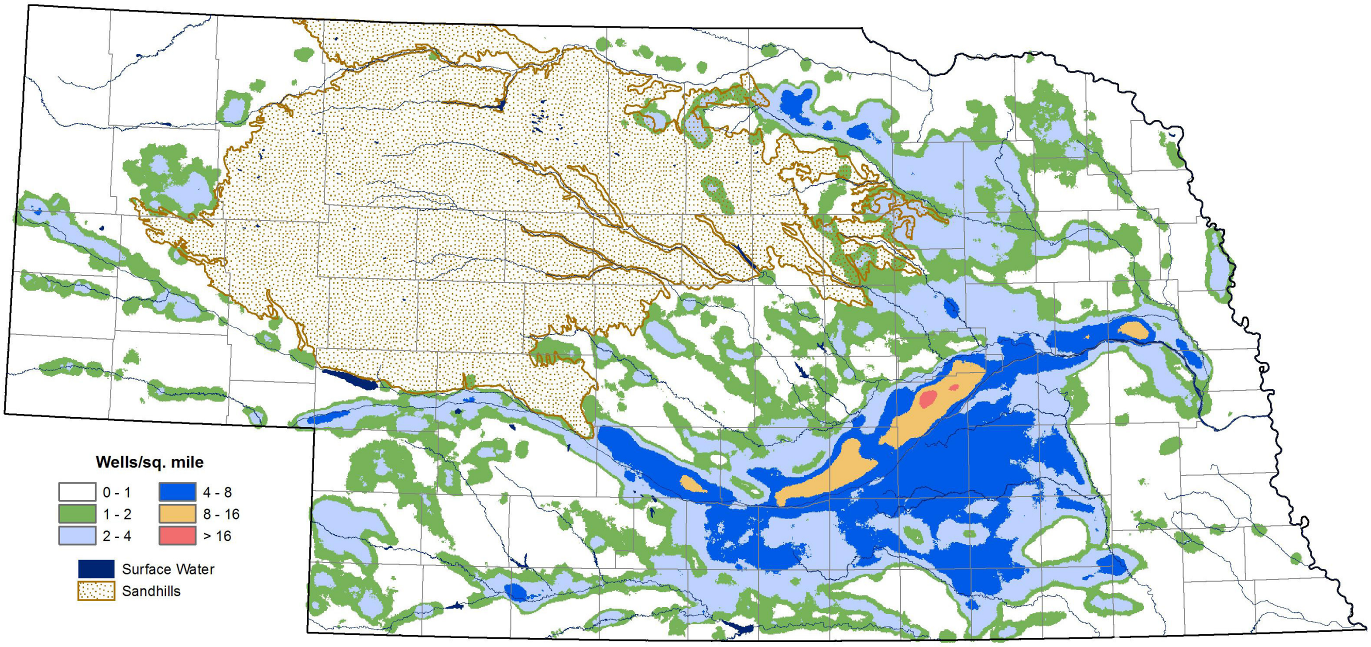
Groundwater-level rises from predevelopment generally occurred in areas of surface irrigation systems. Storage of water in Lake McConaughy began in 1941, and seepage losses caused water-level rises of as much as 60 feet in nearby observation wells (Ellis and Dreeszen, 1989). Water levels generally stabilized by about 1950 and since then have fluctuated in response to changes in reservoir levels and precipitation (Johnson and Pederson, 1984).

Water released from storage in Lake McConaughy and subsequently diverted from the Platte River near North Platte has been used for irrigation, primarily in Gosper, Keamey, and Phelps counties, since 1941. Deep percolation of water from these irrigation-distribution systems and from excess water applied to crops has raised water levels 10 to 50 feet or greater from predevelopment levels in an area extending from southeastern Keith County in the west to central Kearney County in the east. Rises in Gosper, Phelps, and Kearney Counties exceed 50 feet, and in some areas are as much as 136 feet.

Water-level rises of 5 to 30 feet have occurred south of the South Platte and Platte rivers in Keith, Lincoln, and Dawson counties. Seepage from Sutherland Reservoir, Lake Maloney, and their associated canals caused water levels to start rising south and west of North Platte in about 1935. East of North Platte, water levels began rising in about 1940 as a result of seepage from the Tri-County Supply Canal and Jeffrey Reservoir.

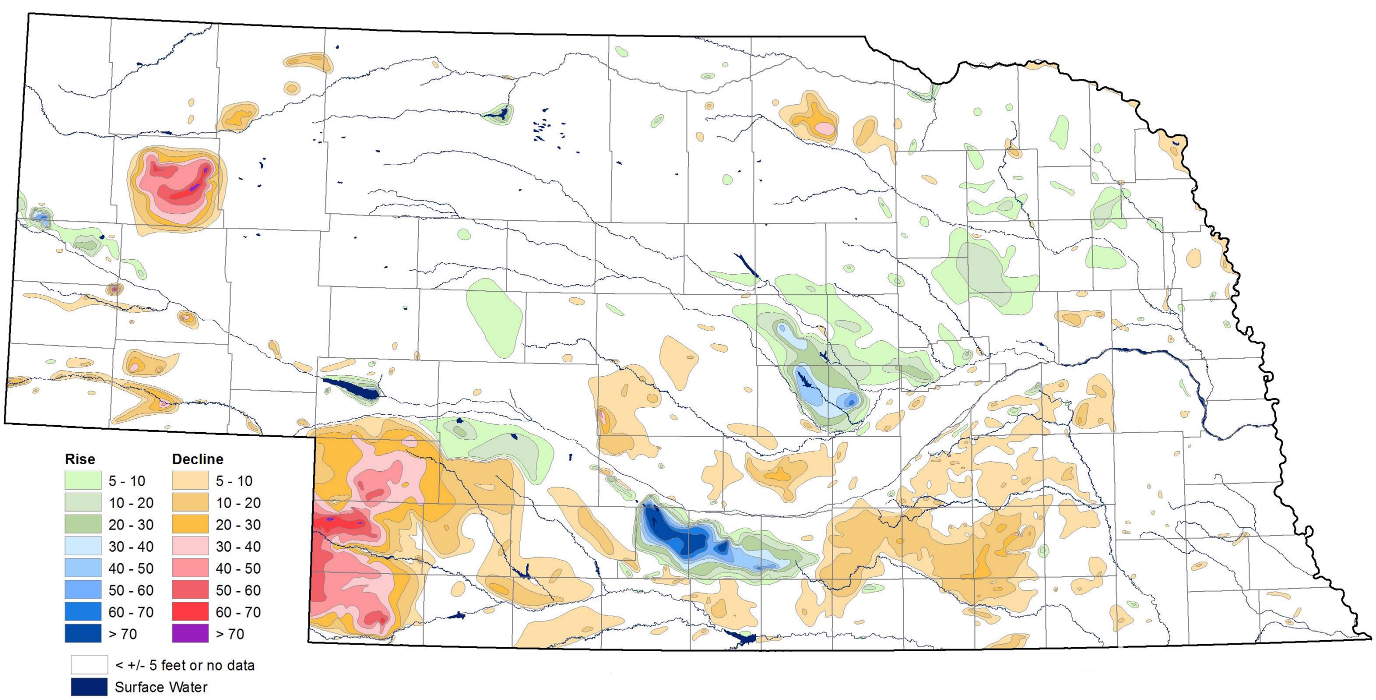
Rises of 10 to more than 60 feet occurred in portions of Howard, Sherman, Valley, and Greeley Counties in the central. The water-level rises in this area are the result of seepage from irrigation canals, seepage from Sherman Reservoir, and deep percolation of irrigation water applied to crops.

## Density of Active Registered Irrigation Wells - January 2009




*Source: Nebraska Department of Natural Resources.*

## Groundwater-level Changes in Nebraska - Predevelopment to Spring 2009




*Sources: U.S. Geological Survey, Nebraska Water Science Center; U.S. Bureau of Reclamation, Kansas-Nebraska Area Office; Nebraska Natural Ressources Districts; Central Nebraska Public Power and Irrigation District.*

## AVERAGE DAILY STREAMFLOWS, 2008

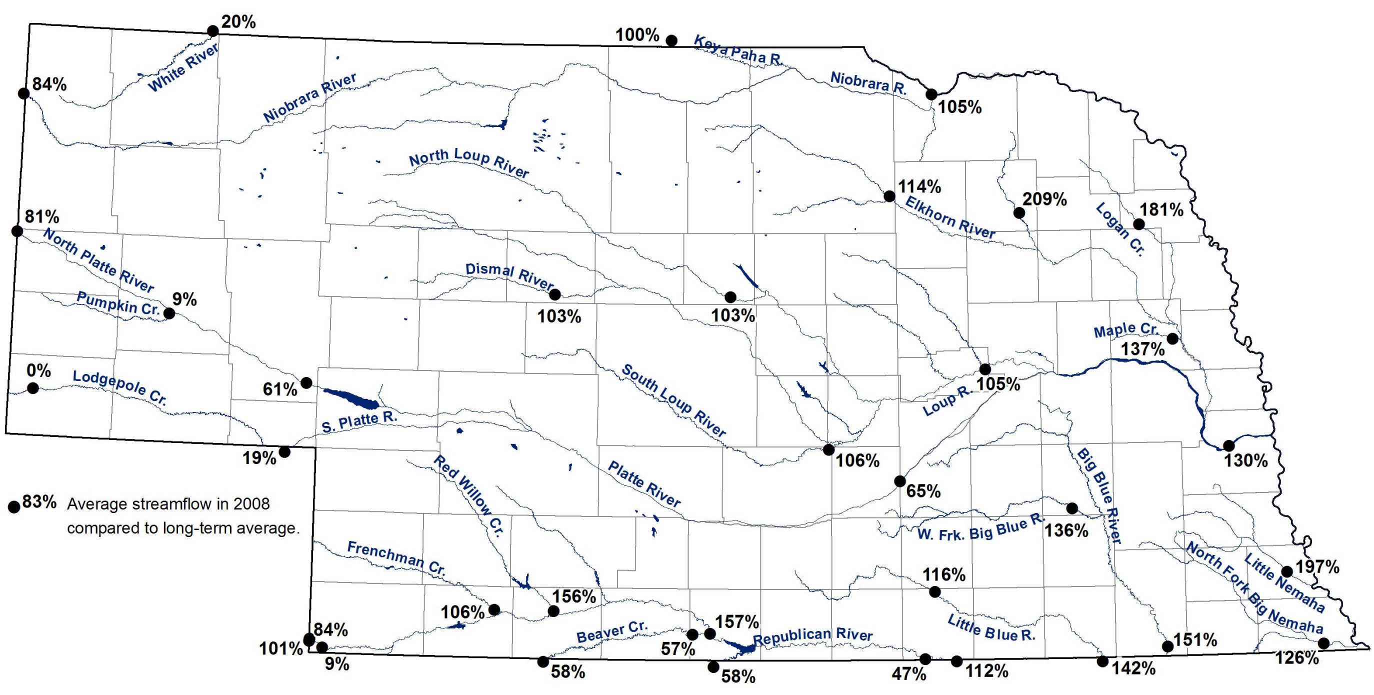
*Streamflows in 2008 varied from 0% to more than 200% of the long-term average, reflecting regional trends in precipitation and long-term effects on baseflow.*

The flows in Nebraska streams have several different sources. Snowmelt in the Rocky Mountains west of Nebraska provides springtime flows for the Platte River as it enters Nebraska. Variations in the amount of winter snowpack have a profound impact on discharges, but so also can the timing and amount of releases from dams in Nebraska, Wyoming, and Colorado. Runoff from precipitation is the source of many of the peak flows in Nebraska streams. Runoff is greatest on soils with low infiltration rates and/or high slopes. As such, many streams in eastern Nebraska have 'flashy' discharges characterized by high flows immediately following large precipitation events. Streams with headwaters in the sandhills are characterized by steady flows year-round because high infiltration rates in the sandy soils limit runoff and provide constant groundwater discharge to streams.

Average daily streamflow values varied tremendously across the state in 2008. Flows were well above the long-term average over much of the state due to above-average precipitation. In parts of western Nebraska, where precipitation was near or below average, flows were below the long-term average. The reduced baseflow to these streams is part of a regional trend in the High Plains Aquifer of reduced baseflows due to lowering of the regional water table (Sophocleous, 1998).

The factors affecting streamflows are numerous and complex. Nonetheless, it is commonly known that in areas where streams are well-connected to aquifers, groundwater-level changes can have an effect on baseflows. Continued monitoring of groundwater-level changes throughout Nebraska is necessary in order to evaluate and manage these interconnected resources.

### Average Streamflow in 2008, as a Percentage of the Long-term Average




*Sources: U.S. Geological Survey, Nebraska Water Science Center; Nebraska Department of Natural Resources.*

## Average Long-term and 2008 Streamflows at Selected Gaging Stations

| Stream | long-term average (acre-feet) | 2008 (acre-feet) | 2008 (% of long-term average) |
|---|---|---|---|
| Sappa Creek nr Stamford | 9,720 | 5,510 | 57 |
| Red Willow Creek nr Red Willow | 7,640 | 11,900 | 156 |
| Republican River nr Orleans | 109,000 | 171,000 | 157 |
| Frenchman River at Culbertson | 32,000 | 33,800 | 106 |
| Republican River nr Hardy | 185,000 | 207,000 | 112 |
| Courtland Canal at Kan-Neb line | 54,800 | 25,900 | 47 |
| Prairie Dog Creek nr Woodruff, KS | 5,610 | 3,270 | 58 |
| Beaver Creek at Cedar Bluffs, KS | 2,060 | 1,200 | 58 |
| Haigler (Pioneer) Ditch at Colo-Neb line | 5,340 | 5,410 | 101 |
| Arikaree River at Haigler (minus spillback) | 2,640 | 240 | 9 |
| Republican River at Colo-Neb line | 25,080 | 21,070 | 84 |
| South Platte River at Julesburg, CO | 491,000 | 93,900 | 19 |
| Lodgepole Creek at Bushnell | 2,700 | 0 | 0 |
| North Platte River at Wyo-Neb line | 1,060,000 | 859,000 | 81 |
| Pumpkin Creek near Bridgeport | 7,890 | 730 | 9 |
| Platte River at Louisville | 5,890,000 | 7,640,000 | 130 |
| Platte River nr Grand Island | 1,310,000 | 850,000 | 65 |
| North Platte River at Lewellen | 929,000 | 571,000 | 61 |
| (Combo) Loup River & Canal nr Genoa | 1,900,000 | 2,000,000 | 105 |
| South Loup River at St. Michael | 160,000 | 170,000 | 106 |
| Dismal River nr Thedford | 154,000 | 158,000 | 103 |
| North Loup River at Taylor | 382,000 | 392,000 | 103 |
| Niobrara River at Wyo-Neb line | 2,190 | 1,840 | 84 |
| Niobrara River nr Verdel | 1,390,000 | 1,460,000 | 105 |
| Keya Paha River at Wewela, SD | 68,000 | 67,900 | 100 |
| White River nr SD-Neb line | 27,700 | 5,480 | 20 |
| Little Blue River nr Deweese | 100,000 | 116,000 | 116 |
| W. Fk. Big Blue River nr Dorchester | 137,000 | 186,000 | 136 |
| Little Blue River at Hollenberg, KS | 369,000 | 523,000 | 142 |
| Big Blue River at Barneston | 701,000 | 1,060,000 | 151 |
| Elkhorn River at Ewing | 162,000 | 185,000 | 114 |
| Logan Creek at Pender | 159,000 | 288,000 | 181 |
| Maple Creek nr Nickerson | 71,100 | 97,300 | 137 |
| No. Fk. Elkhorn River nr Pierce | 90,000 | 188,000 | 209 |
| Big Nemaha River at Falls City | 455,000 | 575,000 | 126 |
| Little Nemaha River at Auburn | 250,000 | 493,000 | 197 |

# GROUNDWATER-LEVEL CHANGE STATISTICS

*Groundwater-level change statistics can be used to make generalized comparisons between time periods and counties*

The following table summarizes groundwater-level changes by county for Spring 2008 to Spring 2009, Spring 2000 to Spring 2009, and predevelopment to Spring 2009. Since counties are political boundaries, water-level change statistics shown here may reflect conditions averaged over more than one hydrogeologic unit. Counties are readily recognizable boundaries, however, and can be used to generalize changes on a local level for comparison purposes. Ideally, groundwater-level change statistics should be summarized by individual aquifers throughout the state. Such an assessment requires detailed knowledge of the screened interval of the well and the local geology. This information is not always available, and would require analysis of thousands of additional wells. This process is on-going.

In the table below, 'Count' is the number of observation wells used to compute the statistics, 'Min' is the minimum water-level change during that time period in an individual well, 'Max' is the maximum water-level change during that time period in an individual well, and 'Average' is the average water-level change during that time period computed from all wells in the county.

## Groundwater-Level Change Statistics by County

| | Spring 2008 to Spring 2009 | | | | Spring 2000 to Spring 2009 | | | | Predevelopment to Spring 2009 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| County | Count | Min | Max | Average | Count | Min | Max | Average | Count | Min | Max | Average |
| Adams | 82 | -2.2 | 3.6 | 1.1 | 58 | -10.2 | 3.2 | -6.2 | 59 | -27.8 | 0.5 | -10.5 |
| Antelope | 68 | -2.4 | 6.9 | 1.7 | 36 | -8.6 | 9.0 | 1.0 | 34 | -5.3 | 9.7 | 2.2 |
| Arthur | 19 | -1.1 | 0.9 | 0.0 | 19 | -3.8 | -0.3 | -1.5 | 13 | -11.7 | 5.3 | -2.2 |
| Banner | 93 | -2.8 | 5.7 | -0.4 | 64 | -30.1 | 3.9 | -8.0 | 5 | -80.8 | -8.6 | -24.6 |
| Blaine | 12 | -0.7 | 2.9 | 1.4 | 12 | -2.9 | 1.0 | -0.5 | 12 | -2.2 | 4.0 | 1.5 |
| Boone | 29 | -0.6 | 4.4 | 2.3 | 24 | -3.4 | 10.1 | 2.2 | 22 | -2.8 | 15.1 | 5.3 |
| Box Butte | 74 | -6.1 | 16.6 | -0.4 | 43 | -21.8 | 2.9 | -10.3 | 50 | -88.4 | -1.0 | -35.5 |
| Boyd | 8 | -5.1 | 1.0 | -0.4 | 8 | -7.9 | 0.4 | -2.8 | 7 | -3.5 | 0.1 | -1.6 |
| Brown | 40 | -4.3 | 2.7 | 0.7 | 34 | -7.0 | 1.5 | -2.3 | 20 | -3.6 | 17.2 | 3.4 |
| Buffalo | 82 | -2.2 | 7.0 | 1.7 | 68 | -14.2 | 1.4 | -5.4 | 75 | -26.9 | 4.1 | -6.3 |
| Burt | 31 | -4.7 | 0.7 | -1.5 | 31 | -12.6 | 3.0 | -2.5 | 30 | -19.3 | 10.3 | -2.1 |
| Butler | 70 | -2.4 | 7.0 | 1.7 | 50 | -26.1 | 2.5 | -6.6 | 48 | -22.1 | 5.8 | -4.9 |
| Cass | 26 | -3.9 | 3.3 | 1.4 | 6 | -2.4 | 8.8 | 0.7 | 6 | -6.0 | -0.6 | -3.0 |
| Cedar | 29 | -1.4 | 3.0 | 0.7 | 25 | -21.0 | 2.7 | -1.7 | 28 | -9.5 | 8.8 | 0.9 |
| Chase | 160 | -3.1 | 2.9 | 0.0 | 160 | -21.9 | 0.2 | -11.5 | 122 | -73.9 | -0.2 | -37.0 |
| Cherry | 75 | -10.0 | 3.3 | 0.5 | 56 | -13.1 | 2.3 | -2.2 | 56 | -15.1 | 30.1 | 0.2 |
| Cheyenne | 84 | -5.0 | 2.5 | -0.8 | 52 | -28.9 | 2.8 | -13.8 | 48 | -42.6 | 6.4 | -18.2 |
| Clay | 87 | -0.8 | 16.7 | 2.7 | 73 | -17.4 | -1.0 | -7.9 | 69 | -20.7 | 4.2 | -9.5 |
| Colfax | 32 | -7.2 | 1.7 | -0.1 | 29 | -15.4 | 1.6 | -3.6 | 30 | -15.7 | 3.3 | -2.8 |
| Cuming | 26 | -28.7 | 1.9 | -1.0 | 21 | -57.4 | 6.6 | -3.1 | 26 | -25.3 | 50.2 | 2.2 |
| Custer | 91 | -4.9 | 3.2 | 0.6 | 84 | -36.0 | 15.0 | -3.1 | 85 | -44.1 | 8.9 | -4.4 |
| Dakota | 2 | -1.4 | -0.1 | -0.7 | 2 | -6.3 | -3.2 | -4.7 | 2 | -12.5 | -3.2 | -7.9 |
| Dawes | 9 | -1.9 | 9.2 | 0.9 | 6 | -4.3 | -0.3 | -2.0 | 6 | -7.0 | 0.1 | -3.4 |
| Dawson | 170 | -10.2 | 5.3 | 0.8 | 160 | -16.1 | 3.7 | -3.3 | 135 | -22.1 | 33.5 | -0.7 |
| Deuel | 23 | -5.8 | 3.4 | -0.1 | 17 | -10.6 | 3.1 | -3.5 | 13 | -19.0 | 0.2 | -5.8 |
| Dixon | 11 | -1.9 | 4.0 | 0.2 | 11 | -2.4 | 1.6 | -0.4 | 11 | -6.2 | 8.8 | 0.4 |
| Dodge | 52 | -3.4 | 7.2 | 0.7 | 52 | -7.3 | 4.3 | -1.7 | 52 | -10.2 | 10.0 | -1.5 |
| Douglas | 0 | na | na | na | 0 | na | na | na | 0 | na | na | na |
| Dundy | 104 | -7.2 | 2.8 | -0.7 | 101 | -27.8 | 3.0 | -11.4 | 83 | -63.0 | 0.4 | -34.8 |
| Fillmore | 102 | -3.4 | 11.1 | 2.6 | 96 | -14.3 | 13.8 | -5.0 | 89 | -37.9 | 18.5 | -12.2 |
| Franklin | 51 | -0.5 | 2.9 | 0.5 | 21 | -6.2 | 0.8 | -3.0 | 37 | -12.6 | 0.5 | -4.3 |
| Frontier | 36 | -8.6 | 5.4 | 0.6 | 35 | -8.2 | 3.6 | -0.1 | 28 | -18.8 | 2.7 | -5.4 |
| Furnas | 48 | -3.3 | 6.2 | 0.6 | 14 | -7.5 | 7.2 | -2.8 | 23 | -18.3 | 5.6 | -2.7 |
| Gage | 27 | -4.3 | 9.5 | 2.7 | 22 | -18.7 | -0.1 | -4.5 | 25 | -12.0 | 15.6 | -1.3 |
| Garden | 99 | -2.6 | 1.4 | 0.1 | 66 | -11.6 | 1.6 | -2.1 | 30 | -14.7 | 1.9 | -3.0 |
| Garfield | 29 | -0.7 | 6.5 | 0.6 | 13 | -5.9 | 3.0 | -0.7 | 12 | 0.3 | 11.4 | 4.9 |
| Gosper | 129 | -7.0 | 4.1 | -0.2 | 102 | -65.2 | 38.7 | -5.8 | 37 | -17.4 | 136.7 | 36.2 |

| County | Spring 2008 to Spring 2009 Count | Min | Max | Average | Spring 2000 to Spring 2009 Count | Min | Max | Average | Predevelopment to Spring 2009 Count | Min | Max | Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grant | 4 | -0.3 | 1.4 | 0.8 | 2 | -1.9 | -0.6 | -1.2 | 4 | -2.4 | 0.9 | -0.8 |
| Greeley | 56 | -1.3 | 2.9 | 0.6 | 18 | -4.7 | 1.5 | -1.4 | 19 | -1.9 | 15.3 | 5.6 |
| Hall | 97 | -1.5 | 5.6 | 1.5 | 79 | -13.9 | 10.6 | -3.7 | 79 | -10.8 | 15.5 | -1.7 |
| Hamilton | 125 | -0.3 | 6.9 | 2.3 | 124 | -18.8 | 0.1 | -8.1 | 121 | -14.6 | 8.0 | -5.5 |
| Harlan | 95 | -8.4 | 12.0 | 1.3 | 68 | -10.9 | 18.7 | -3.5 | 68 | -18.0 | 9.0 | -6.7 |
| Hayes | 21 | -1.8 | 1.4 | 0.0 | 21 | -14.5 | 0.0 | -5.9 | 20 | -21.1 | -1.6 | -9.8 |
| Hitchcock | 24 | -1.7 | 1.1 | -0.1 | 25 | -10.4 | 1.0 | -1.8 | 12 | -23.5 | 1.6 | -7.0 |
| Holt | 138 | -14.5 | 5.6 | 0.4 | 78 | -17.2 | 4.3 | -3.3 | 85 | -32.3 | 10.1 | -4.8 |
| Hooker | 7 | -0.4 | 1.2 | 0.4 | 7 | -2.7 | -0.1 | -2.1 | 7 | 1.3 | 7.5 | 3.7 |
| Howard | 109 | -5.4 | 15.6 | 1.0 | 34 | -9.1 | 3.0 | -1.7 | 35 | -8.5 | 63.9 | 5.3 |
| Jefferson | 41 | -2.6 | 6.7 | 1.7 | 28 | -13.0 | 1.6 | -4.3 | 28 | -14.0 | 1.1 | -3.3 |
| Johnson | 41 | -19.2 | 3.3 | 0.2 | 13 | -7.3 | 3.7 | -1.2 | 20 | -10.2 | 0.9 | -2.9 |
| Kearney | 83 | -3.7 | 4.7 | 0.2 | 59 | -13.9 | 1.9 | -5.4 | 52 | -14.9 | 58.5 | 5.9 |
| Keith | 86 | -8.9 | 5.9 | -0.4 | 89 | -46.5 | 1.8 | -6.4 | 42 | -32.2 | 80.7 | 4.1 |
| Keya Paha | 30 | -4.0 | 6.3 | 0.3 | 15 | -9.3 | -0.4 | -3.5 | 21 | -1.0 | 12.2 | 3.1 |
| Kimball | 29 | -4.1 | 12.8 | 0.1 | 20 | -25.4 | 5.2 | -6.0 | 20 | -32.4 | 9.8 | -9.3 |
| Knox | 25 | -3.1 | 2.6 | 0.9 | 21 | -11.8 | 3.3 | -2.1 | 23 | -12.2 | 11.4 | 2.4 |
| Lancaster | 80 | -7.4 | 25.3 | 1.5 | 35 | -24.8 | 3.6 | -2.0 | 32 | -10.4 | 20.4 | -1.4 |
| Lincoln | 86 | -3.0 | 6.4 | 0.4 | 85 | -16.9 | 7.1 | -4.0 | 59 | -19.2 | 27.9 | 0.2 |
| Logan | 7 | -1.9 | 1.6 | 0.4 | 6 | -5.6 | -0.1 | -3.4 | 7 | -7.9 | 3.5 | -0.6 |
| Loup | 36 | -0.6 | 2.6 | 0.3 | 10 | -4.9 | 3.5 | -1.3 | 10 | -3.3 | 9.7 | 1.5 |
| Madison | 35 | -0.9 | 3.8 | 1.5 | 35 | -2.3 | 8.0 | 2.7 | 35 | -6.1 | 19.4 | 6.8 |
| McPherson | 16 | -1.6 | 2.7 | 0.5 | 13 | -4.8 | 2.2 | -1.8 | 13 | -0.8 | 5.9 | 2.0 |
| Merrick | 67 | -2.3 | 5.5 | 0.9 | 61 | -5.2 | 2.6 | 0.3 | 61 | -16.1 | 2.4 | -1.2 |
| Morrill | 257 | -3.2 | 4.1 | 0.0 | 109 | -16.3 | 7.1 | -3.4 | 25 | -42.3 | 17.5 | -3.5 |
| Nance | 53 | -3.0 | 4.7 | 0.7 | 30 | -6.3 | 1.9 | -0.6 | 33 | -8.9 | 26.6 | 4.4 |
| Nemaha | 7 | -2.0 | 1.2 | -0.9 | 1 | 3.2 | 3.2 | 3.2 | 1 | -0.7 | -0.7 | -0.7 |
| Nuckolls | 46 | -0.6 | 5.1 | 1.4 | 27 | -12.7 | 3.2 | -4.6 | 36 | -19.4 | 2.7 | -8.6 |
| Otoe | 27 | -21.0 | 3.9 | -0.2 | 4 | -4.4 | 35.6 | 11.3 | 3 | -12.2 | -4.5 | -8.7 |
| Pawnee | 0 | na | na | na | 0 | na | na | na | 0 | na | na | na |
| Perkins | 146 | -9.3 | 4.8 | -0.7 | 146 | -28.1 | 1.6 | -11.7 | 91 | -53.6 | -2.8 | -32.2 |
| Phelps | 109 | -5.3 | 2.2 | 0.0 | 85 | -13.4 | 5.8 | -4.1 | 70 | -34.3 | 93.7 | 25.2 |
| Pierce | 61 | -1.5 | 3.8 | 1.0 | 58 | -5.8 | 6.0 | 0.2 | 61 | -14.8 | 12.2 | 3.8 |
| Platte | 67 | -1.4 | 6.4 | 1.9 | 38 | -13.5 | 2.6 | -2.8 | 40 | -4.3 | 19.1 | 2.5 |
| Polk | 56 | -4.0 | 11.4 | 2.0 | 56 | -13.1 | 1.7 | -6.3 | 56 | -11.4 | 22.9 | -2.4 |
| Red Willow | 24 | -4.1 | 4.4 | 0.4 | 24 | -9.3 | 2.3 | -2.3 | 21 | -15.2 | -1.6 | -7.0 |
| Richardson | 7 | -12.9 | 0.0 | -3.8 | 5 | -7.6 | -0.5 | -5.6 | 4 | -14.8 | 0.0 | -8.3 |
| Rock | 36 | -9.5 | 3.8 | 1.2 | 13 | -15.8 | 2.5 | -1.6 | 18 | -13.8 | 5.4 | -0.8 |
| Saline | 35 | -8.5 | 8.3 | 1.4 | 32 | -16.0 | 0.3 | -5.6 | 28 | -14.5 | -0.7 | -4.8 |
| Sarpy | 18 | -2.9 | 1.6 | -0.8 | 15 | -1.0 | 17.1 | 7.3 | 1 | -2.2 | -2.2 | -2.2 |
| Saunders | 102 | -4.8 | 5.8 | 1.2 | 73 | -7.4 | 4.6 | -0.4 | 56 | -9.6 | 5.3 | -0.4 |
| Scotts Bluff | 225 | -9.8 | 6.9 | 0.1 | 204 | -15.5 | 10.3 | -2.1 | 67 | -9.4 | 44.4 | 4.8 |
| Seward | 82 | -7.3 | 5.0 | 1.8 | 74 | -11.1 | 6.4 | -6.2 | 73 | -10.6 | 4.4 | -5.1 |
| Sheridan | 65 | -2.5 | 2.5 | -0.5 | 33 | -27.5 | 0.4 | -8.8 | 34 | -26.4 | 2.1 | -14.1 |
| Sherman | 18 | -0.9 | 5.0 | 1.0 | 18 | -7.3 | 5.0 | -0.2 | 17 | -14.5 | 46.8 | 15.2 |
| Sioux | 82 | -2.4 | 0.7 | -0.4 | 49 | -13.8 | 1.6 | -6.7 | 31 | -5.1 | 61.7 | 17.5 |
| Stanton | 21 | -2.3 | 2.3 | 0.5 | 20 | -5.5 | 4.8 | -1.1 | 21 | -6.7 | 6.7 | -0.1 |
| Thayer | 97 | -0.8 | 4.2 | 1.3 | 68 | -17.2 | 0.8 | -3.4 | 83 | -26.3 | -0.2 | -7.8 |
| Thomas | 9 | -1.2 | 1.7 | 0.1 | 9 | -4.3 | -1.8 | -3.3 | 9 | -0.7 | 3.0 | 1.8 |
| Thurston | 9 | -9.0 | 0.6 | -1.9 | 8 | -4.5 | 2.9 | -0.2 | 9 | -8.4 | 6.8 | -0.8 |
| Valley | 103 | -9.4 | 12.9 | 1.0 | 22 | -3.3 | 10.6 | 2.6 | 17 | -5.5 | 41.2 | 12.4 |
| Washington | 7 | -4.5 | 0.3 | -1.3 | 7 | -2.2 | 3.2 | -0.5 | 4 | -3.2 | 13.0 | 1.4 |
| Wayne | 21 | -2.5 | 3.7 | 0.3 | 19 | -4.1 | 3.2 | 0.8 | 21 | -4.5 | 10.8 | 3.2 |
| Webster | 53 | -0.8 | 4.1 | 1.1 | 17 | -15.7 | 8.4 | -2.5 | 26 | -16.5 | 13.2 | -2.5 |
| Wheeler | 22 | -0.2 | 4.2 | 1.7 | 15 | -3.6 | 4.5 | 0.7 | 15 | -2.6 | 10.9 | 3.4 |
| York | 124 | -0.7 | 7.8 | 2.4 | 120 | -19.4 | -0.5 | -8.8 | 118 | -20.0 | 1.6 | -6.0 |

# GROUNDWATER-LEVEL HYDROGRAPHS

*Groundwater-level hydrographs provide detailed information about seasonal and long-term stresses on aquifers.*

Hydrographs are used to illustrate seasonal and long-term water-level fluctuations in wells that represent hydrologic conditions at various locations throughout the State. The observation wells selected include those with long-term records and continuous or semi-continuous measurements. Throughout much of the history of these wells, a float system was used to detect depths to water and record these depths graphically on a chart or digitally on punched tape. Since only a limited amount of data can be stored, only the lowest daily value for about every fifth day was recorded in the archives. More recently, however, submersible pressure transducers have replaced the old float systems for taking automatic measurements. Pressure transducers work by sensing the hydrostatic pressure on the device and automatically calculating the amount of water above the sensor. The depth to water is obtained by subtracting the height of the water column above the sensor from the depth of the sensor. This data can be collected at user-defined intervals and downloaded directly to a computer.

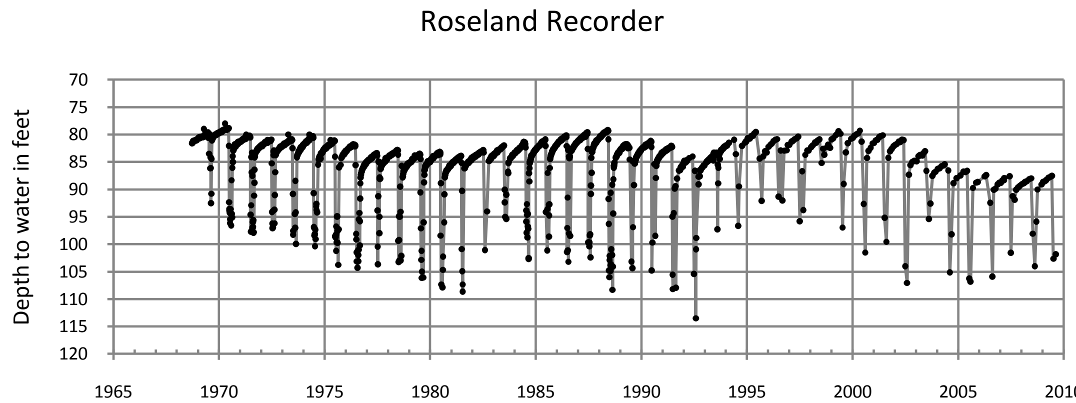
Hydrographs provide a detailed record of water-level changes in observation wells. It is not practical to record continuous measurements in all observation wells in the state. By selecting a few key wells in certain locations as "index" wells, important short-term changes can be identified. Hydrographs of wells measured only in the spring and fall may not show extremes in water-level fluctuations, but they provide important information on long-term water-level trends.

The time periods shown in the hydrographs in this report vary from well-to-well. So too do the ranges in fluctuations. The top and bottom of the hydrographs usually do not correspond to the top or bottom of the aquifer. Rather, they represent general maximum and minimum water levels measured in each individual well. Water-level changes may appear to fluctuate within similar ranges in all wells, but upon closer examination, it becomes apparent that the water-level range represented in each hydrograph is different.

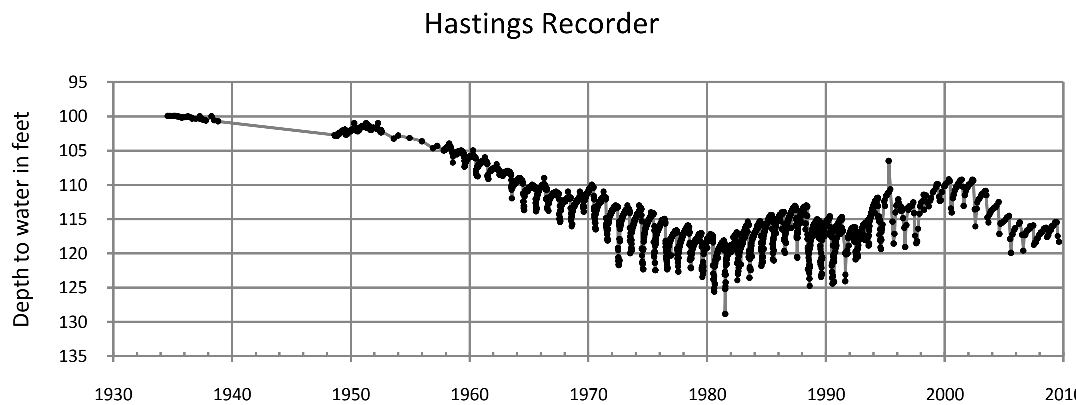
In the following hydrographs, elevation is in feet above sea level (ft. a.s.l.) and predevelopment water levels are in feet below ground surface (ft. b.g.s.).

# Adams County

Roseland Recorder
ID#: 402910098352101
Legal: 6-11W-17 CB
Elevation: 1980 ft. a.s.l.
Estimated predevelopment water level: 77 ft. b.g.s.

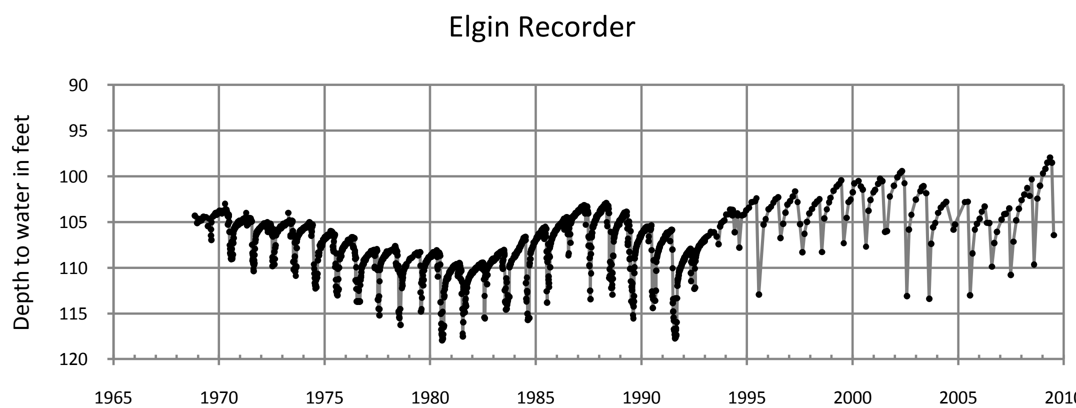



Hastings Recorder
ID#: 403403098244001
Legal: 7-10W-23 AB
Elevation: 1927 ft. a.s.l.
Estimated predevelopment water level: 99.96 ft. b.g.s.



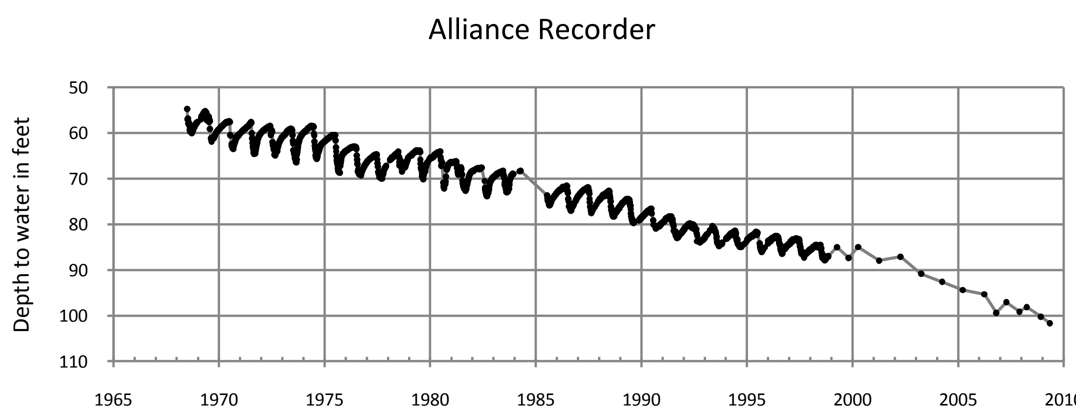

# Antelope County

Elgin Recorder
ID#: 415559098005201
Legal: 23-6W-28 DC
Elevation: 1922 ft. a.s.l.
Estimated predevelopment water level: 101 ft. b.g.s.



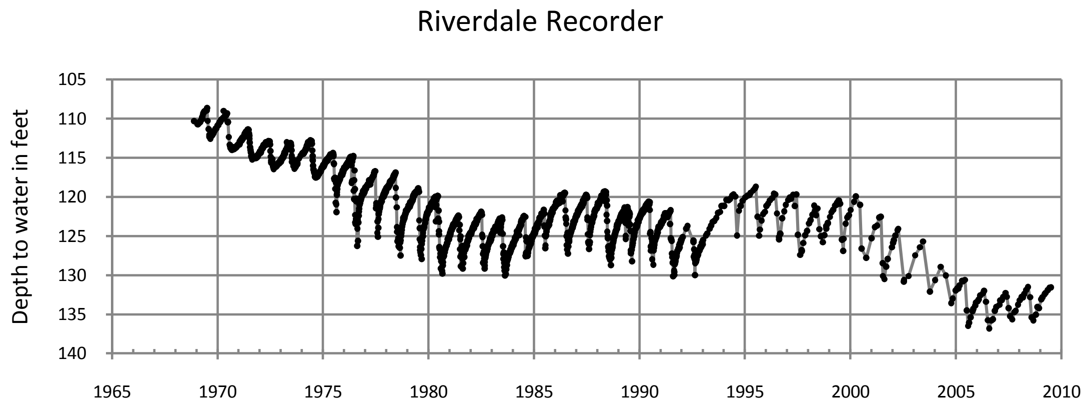

# Box Butte County

Alliance Recorder
ID#: 420904102525201
Legal: 25-48W-12 CCA
Elevation: 3950 ft. a.s.l.
Estimated predevelopment water level: 52 ft. b.g.s.

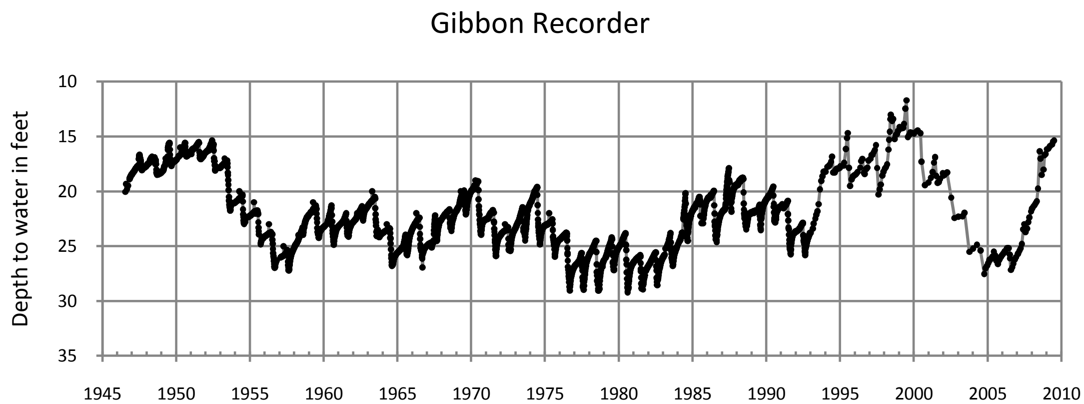


## Buffalo County

Riverdale Recorder
ID#: 405137099085201
Legal: 10-16W-5 DC
Elevation: 2262 ft. a.s.l.
Estimated predevelopment
water level: 106 ft. b.g.s.

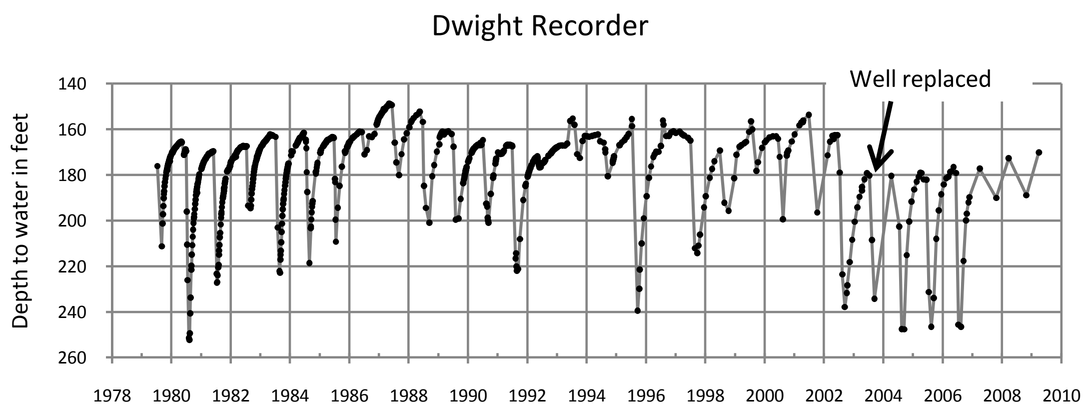



Gibbon Recorder
ID#: 404618098504401
Legal: 9-14W-1 DC
Elevation: 2060 ft. a.s.l.
Estimated predevelopment
water level: 17 ft. b.g.s.

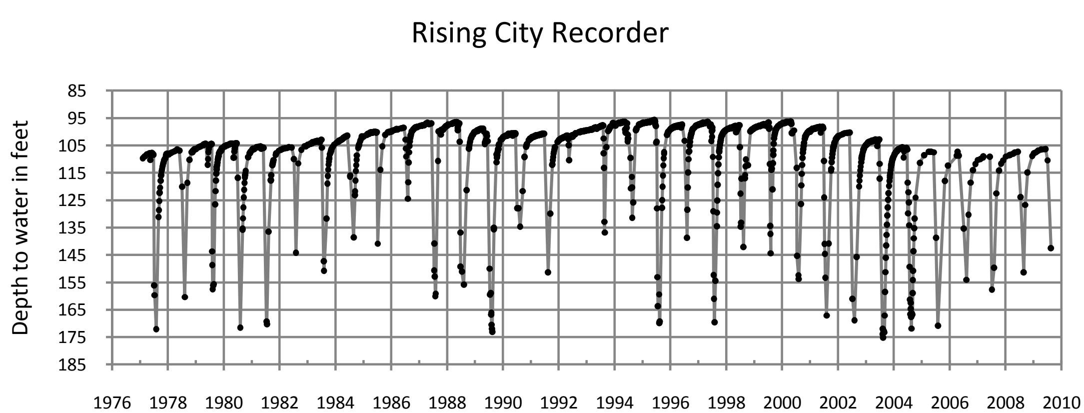



## Butler County

Dwight Recorder
ID#: 410612096592601
Legal: 13-4E-17 AB
Elevation: 1605 ft. a.s.l.
Estimated predevelopment
water level: 160 ft. b.g.s.

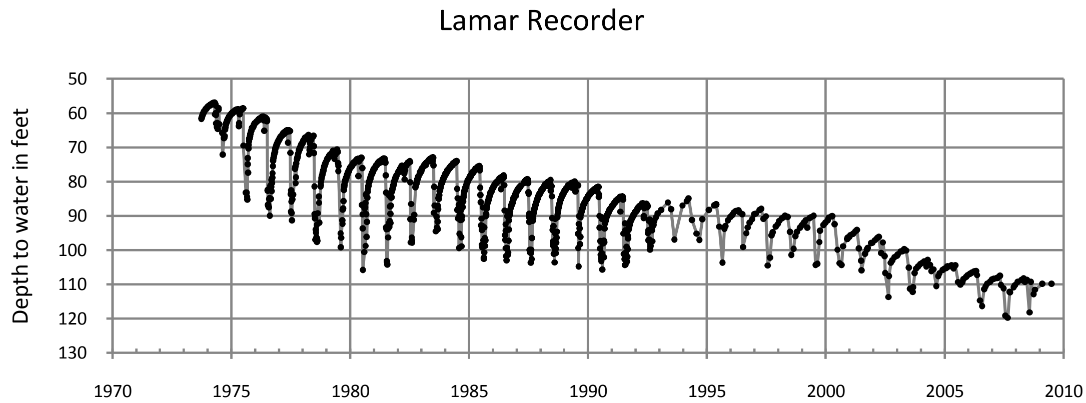



Rising City Recorder
ID#: 411420097173002
Legal: 15-1E-27 DDDD
Elevation: 1618 ft. a.s.l.
Estimated predevelopment
water level: 103 ft. b.g.s.

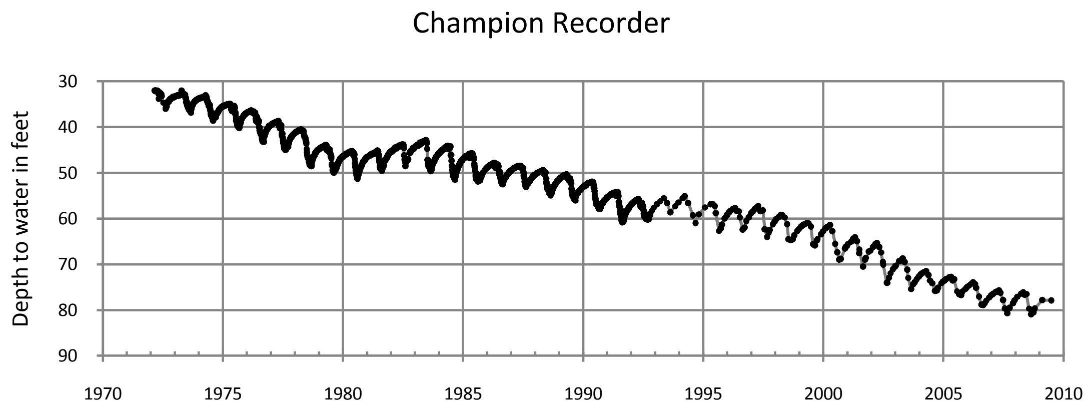


## Chase County

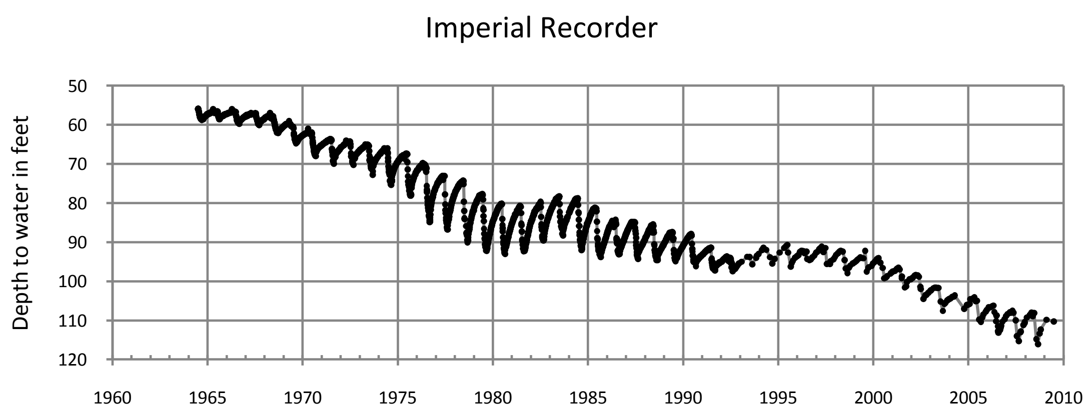
Lamar Recorder
ID#: 403516101560601
Legal: 7-41W-11 DAA
Elevation: 3506 ft. a.s.l.
Estimated predevelopment
water level: 48 ft. b.g.s.




Champion Recorder
ID#: 402757101591201
Legal: 6-41W-21 CCC
Elevation: 3513 ft. a.s.l.
Estimated predevelopment
water level: 30 ft. b.g.s.

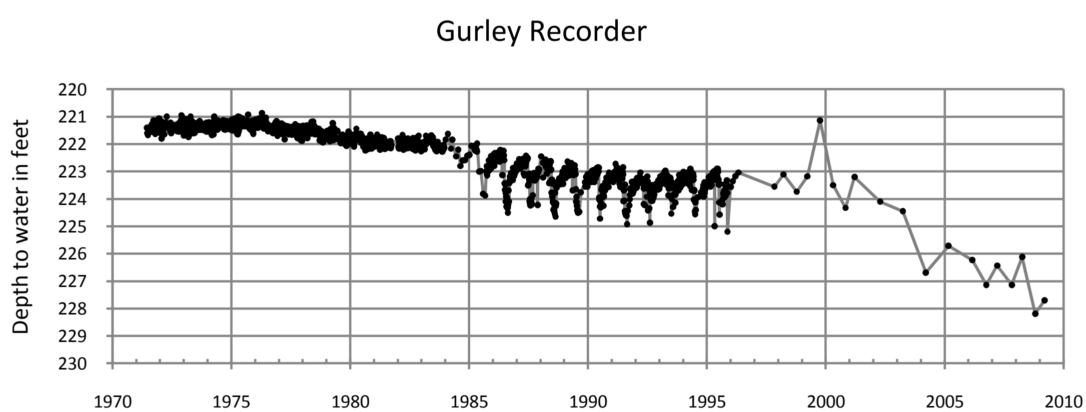



Imperial Recorder
ID#: 403235101395501
Legal: 7-38W-29 CBB
Elevation: 3290 ft. a.s.l.
Estimated predevelopment
water level: 56 ft. b.g.s.



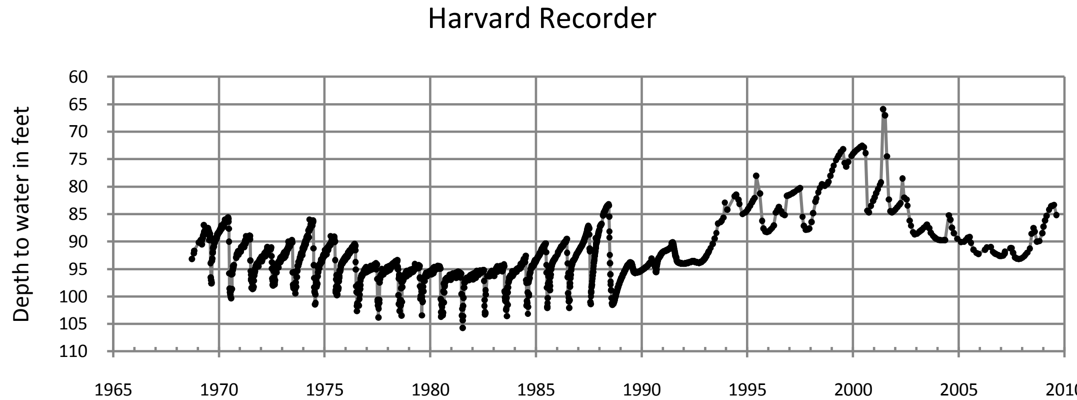

## Cheyenne County

Gurley Recorder
ID#: 412100102592401
Legal: 16-49W-19 BBB
Elevation: 4281 ft. a.s.l.
Estimated predevelopment
water level: 221 ft. b.g.s.

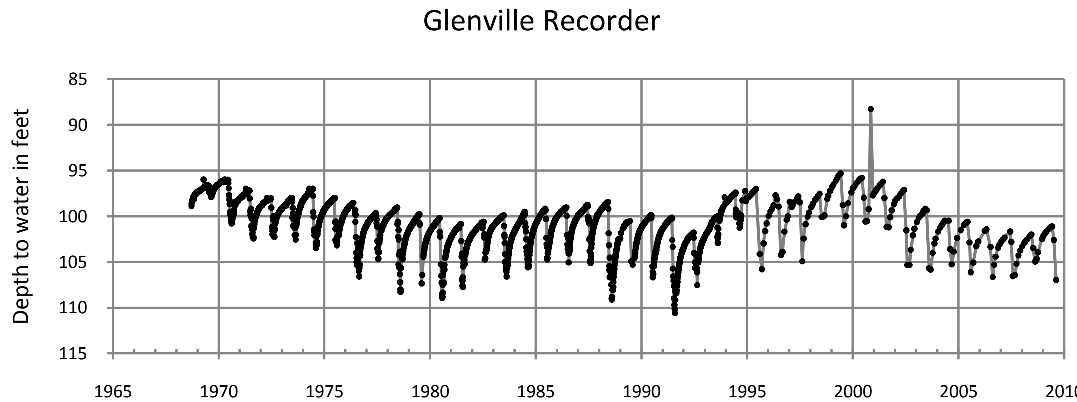


## Clay County

Harvard Recorder
ID#: 403910098051401
Legal: 8-7W-23 BB
Elevation: 1812 ft. a.s.l.
Estimated predevelopment water level: 79 ft. b.g.s.

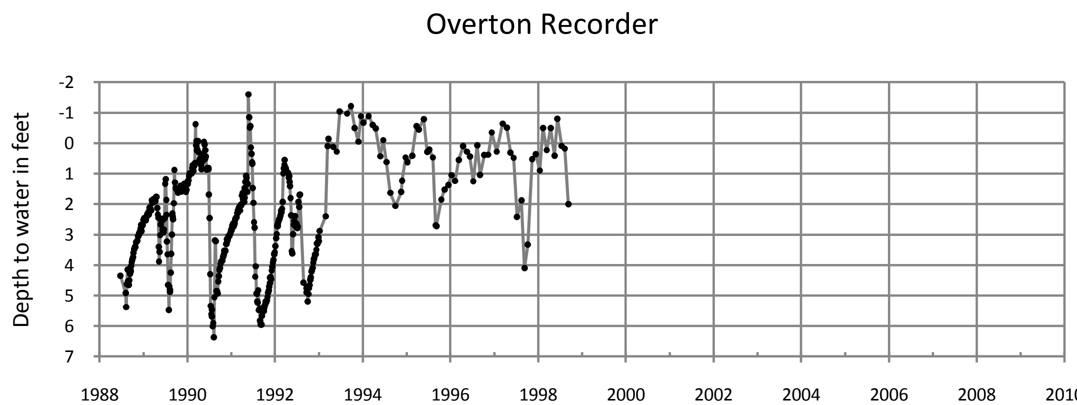



Glenville Recorder
ID#: 402806098132501
Legal: 6-8W-21 DD
Elevation: 1800 ft. a.s.l.
Estimated predevelopment water level: 93 ft. b.g.s.

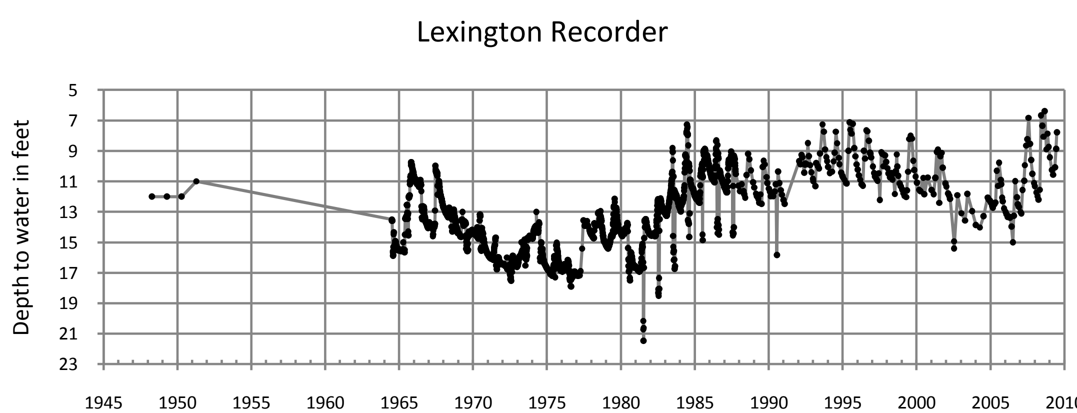



## Dawson County

Overton Recorder
ID#: 404553099341301
Legal: 9-20W-10 ADDD
Elevation: 2327 ft. a.s.l.
Estimated predevelopment water level: n.a.

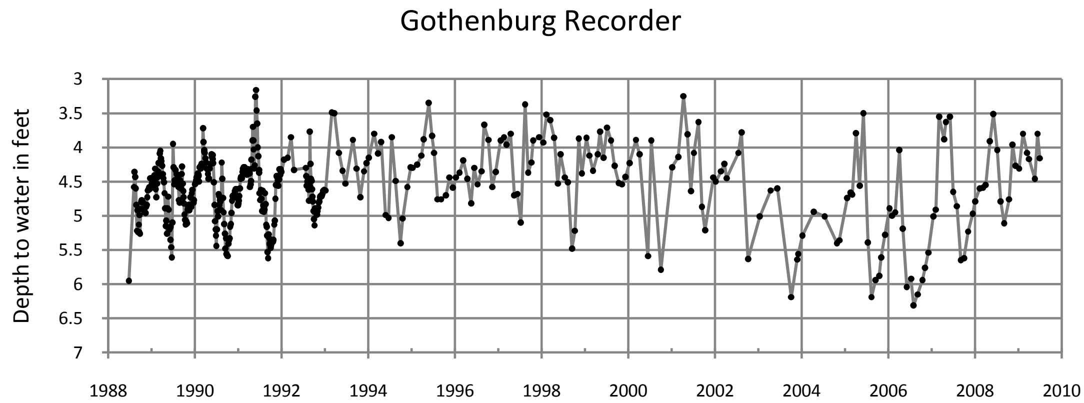



Lexington Recorder
ID#: 404949099445701
Legal: 10-21W-18 DDD
Elevation: 2421 ft. a.s.l.
Estimated predevelopment water level: 12 ft. b.g.s.



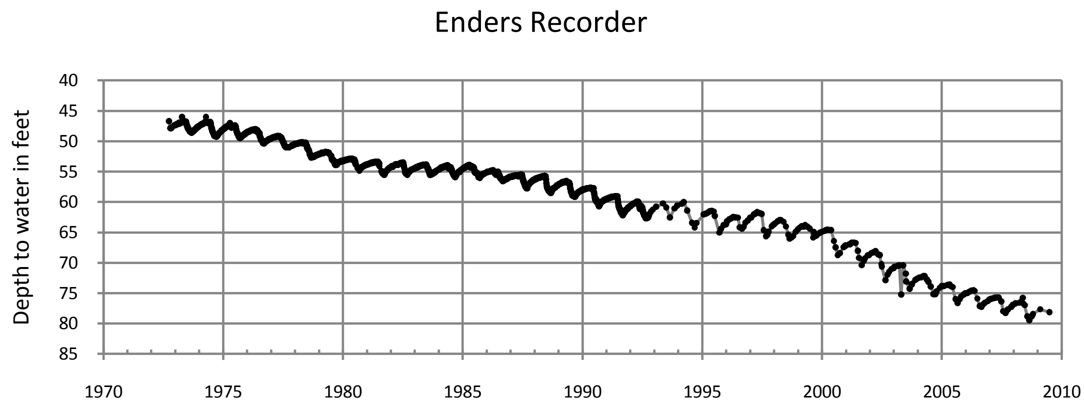
## Dawson County

Gothenburg Recorder
ID#: 405445100074001
Legal: 11-25W-24 BCB
Elevation: 2545 ft. a.s.l.
Estimated predevelopment
water level: 5 ft. b.g.s.

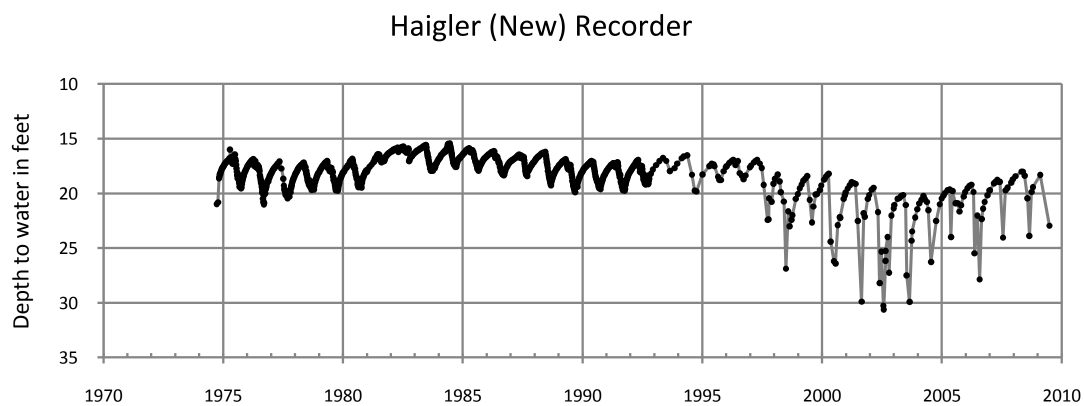



## Dundy County

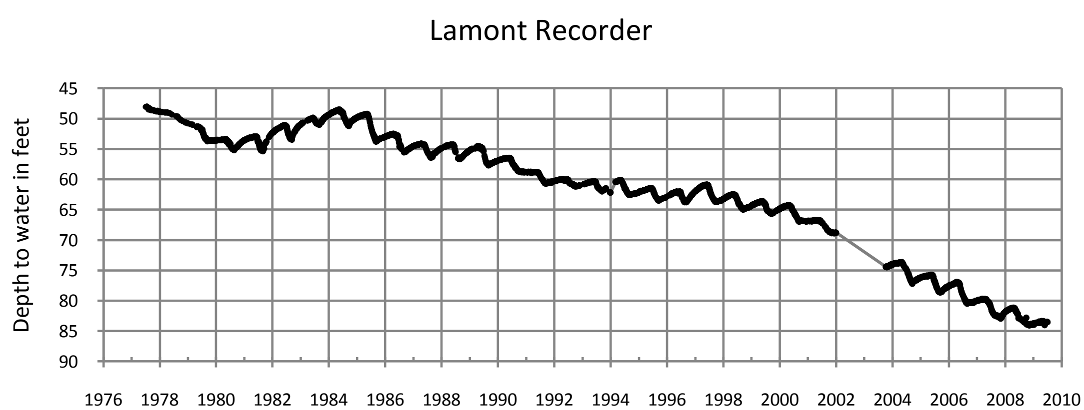
Enders Recorder
ID#: 401703101394801
Legal: 4-38W-30 BCC
Elevation: 3317 ft. a.s.l.
Estimated predevelopment
water level: 46 ft. b.g.s.




Haigler (New) Recorder
ID#: 400155101521302
Legal: 1-40W-29 BB
Elevation: 3025 ft. a.s.l.
Estimated predevelopment
water level: 13 ft. b.g.s.

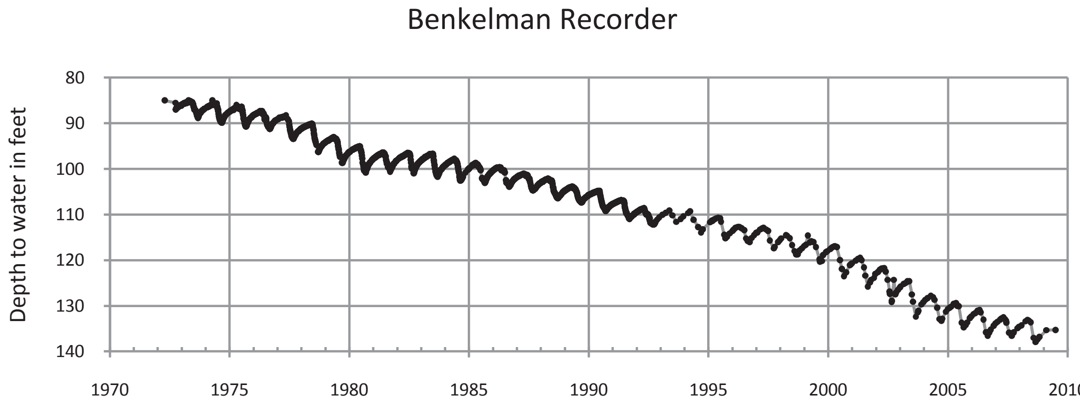



Lamont Recorder
ID#: 401401101510701
Legal: 3-40W-16 BBB
Elevation: 3458 ft. a.s.l.
Estimated predevelopment
water level: n.a.



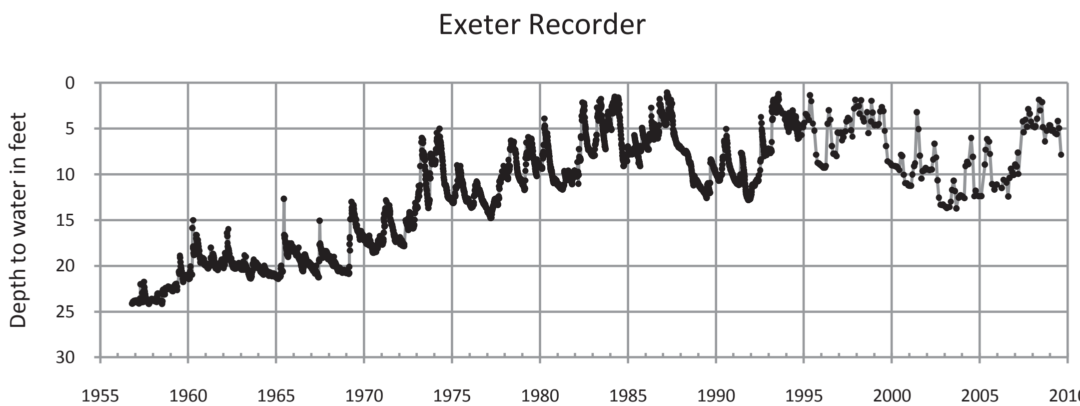
## Dundy County

Benkelman Recorder
ID#: 400852101352701
Legal: 2-38W-10 DD
Elevation: 3265 ft. a.s.l.
Estimated predevelopment
water level: 84 ft. b.g.s.

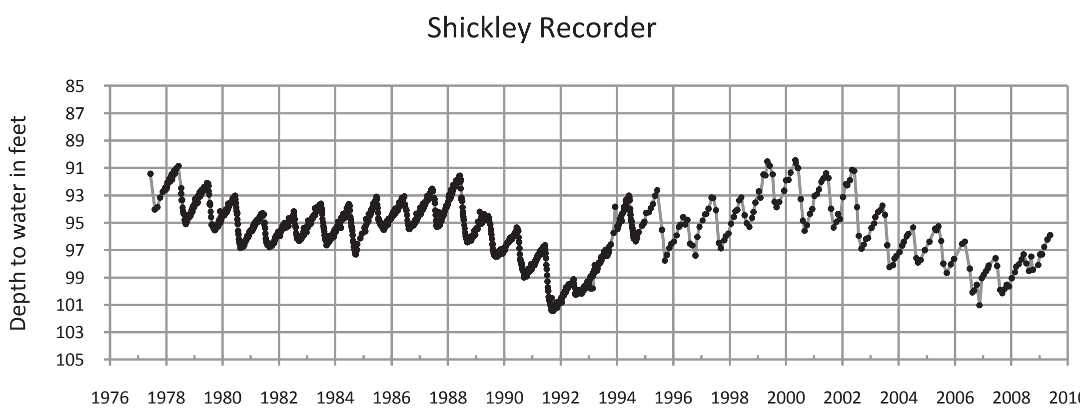



## Fillmore County

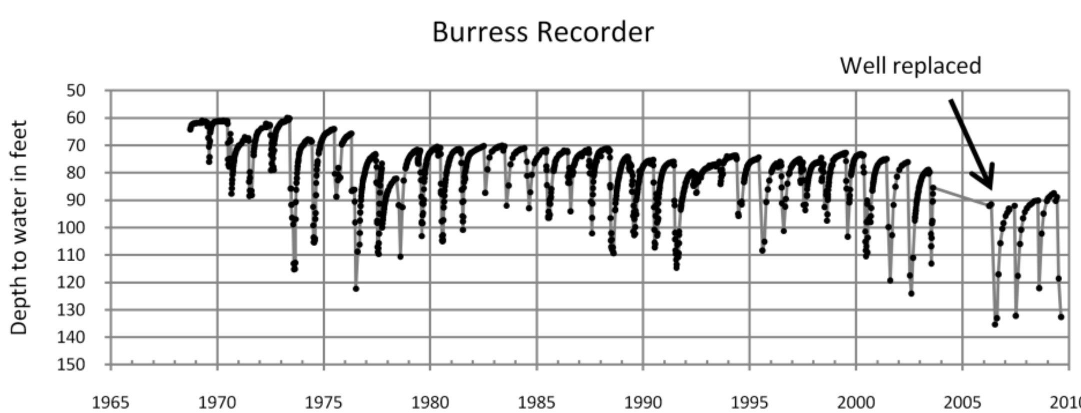
Exeter Recorder
ID#: 403800097300701
Legal: 8-2W-26 AD
Elevation: 1610 ft. a.s.l.
Estimated predevelopment
water level: 24 ft. b.g.s.




Shickley Recorder
ID#: 402504097432201
Legal: 5-4W-12 BDC
Elevation: 1651 ft. a.s.l.
Estimated predevelopment
water level: 82 ft. b.g.s.

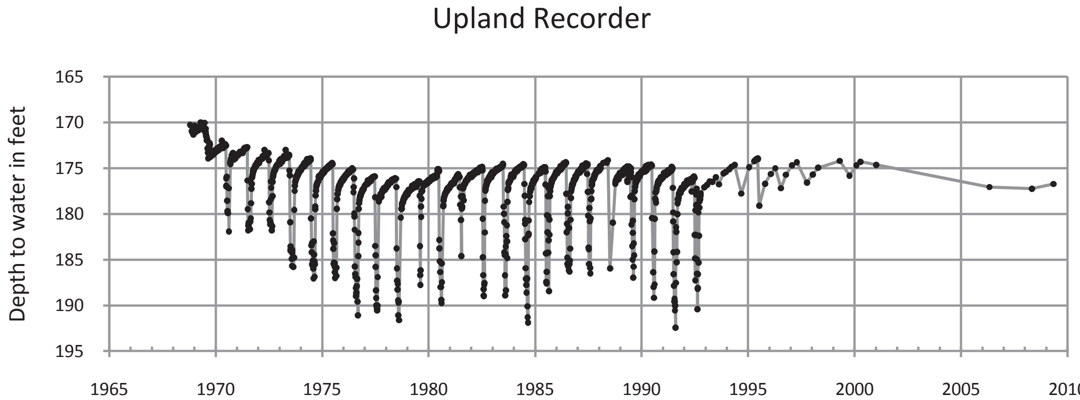



Burress Recorder
ID#: 403356097275602
Legal: 7-1W-19 AA
Elevation: 1615 ft. a.s.l.
Estimated predevelopment
water level: 57 ft. b.g.s.



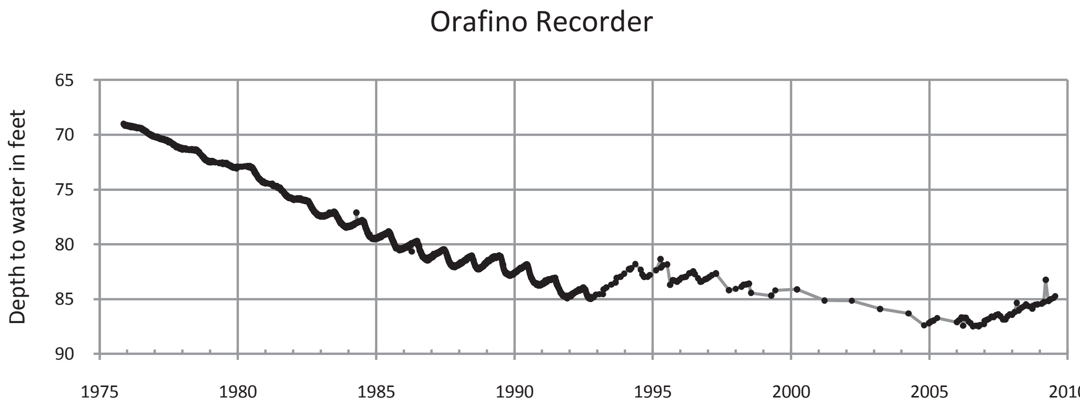
## Franklin County

Upland Recorder
ID#: 401735098522701
Legal: 4-14W-23 CCDA
Elevation: 2120 ft. a.s.l.
Estimated predevelopment water level: 170 ft. b.g.s.



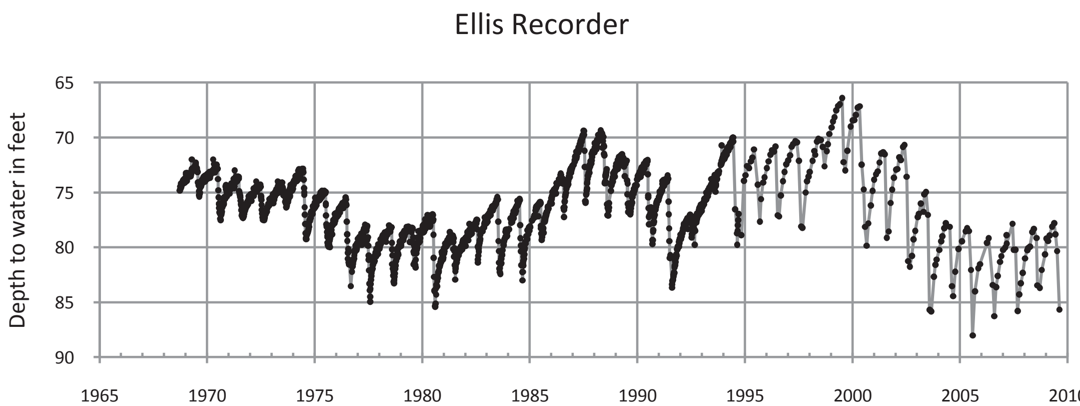

## Frontier County

Orafino Recorder
ID#: 403042100093201
Legal: 6-25W-4 DD
Elevation: 2500 ft. a.s.l.
Estimated predevelopment water level: 65 ft. b.g.s.

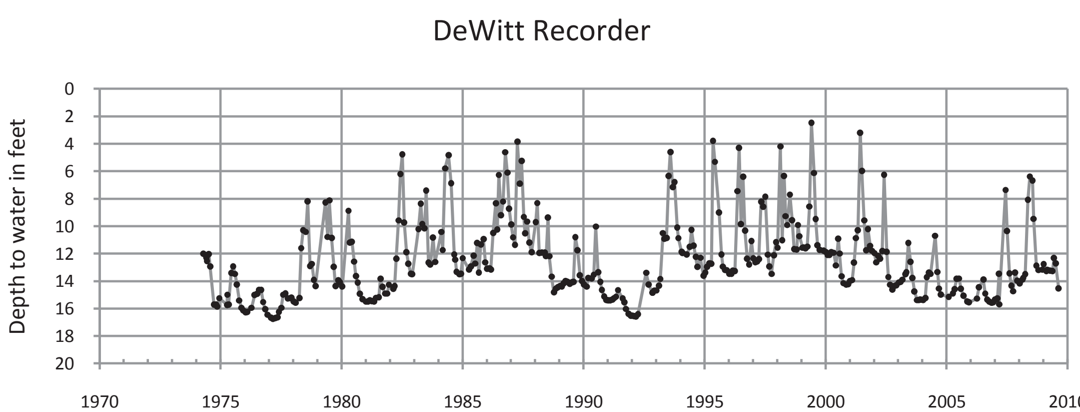



## Gage County

Ellis Recorder
ID#: 400917096525101
Legal: 2-5E-8 AD
Elevation: 1360 ft. a.s.l.
Estimated predevelopment water level: 70 ft. b.g.s.

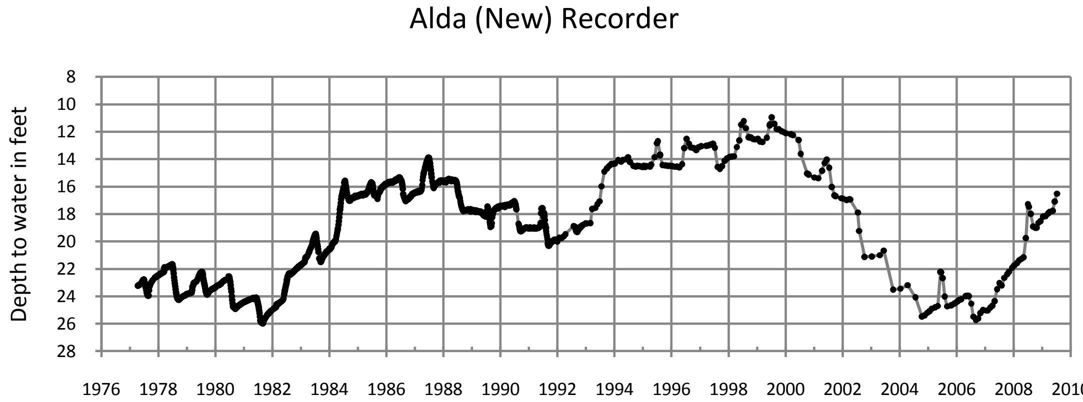



DeWitt Recorder
ID#: 402155096523101
Legal: 5-5E-32 AAAA
Elevation: 1278 ft. a.s.l.
Estimated predevelopment water level: 12 ft. b.g.s.

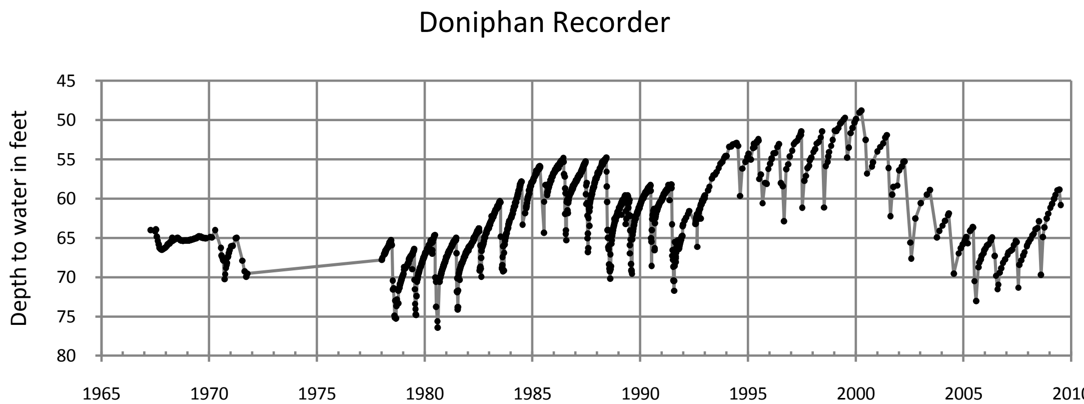


# Hall County

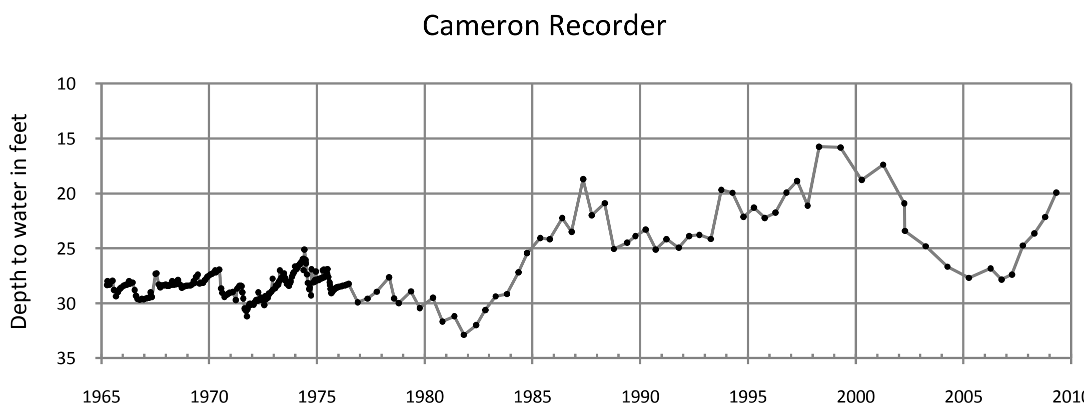
Alda (New) Recorder
ID#: 405315098304302
Legal: 11-11W-25 CC
Elevation: 1924 ft. a.s.l.
Estimated predevelopment water level: 15 ft. b.g.s.




Doniphan Recorder
ID#: 404513098181201
Legal: 9-9W-14 AAB
Elevation: 1915 ft. a.s.l.
Estimated predevelopment water level: 53 ft. b.g.s.

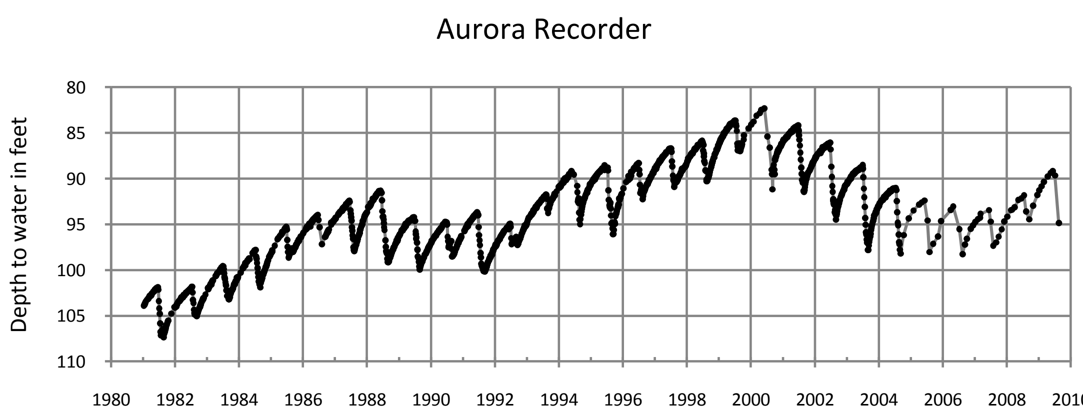



Cameron Recorder
ID#: 405553098363001
Legal: 11-12W-12 DDD
Elevation: 1942 ft. a.s.l.
Estimated predevelopment water level: 21 ft. b.g.s.



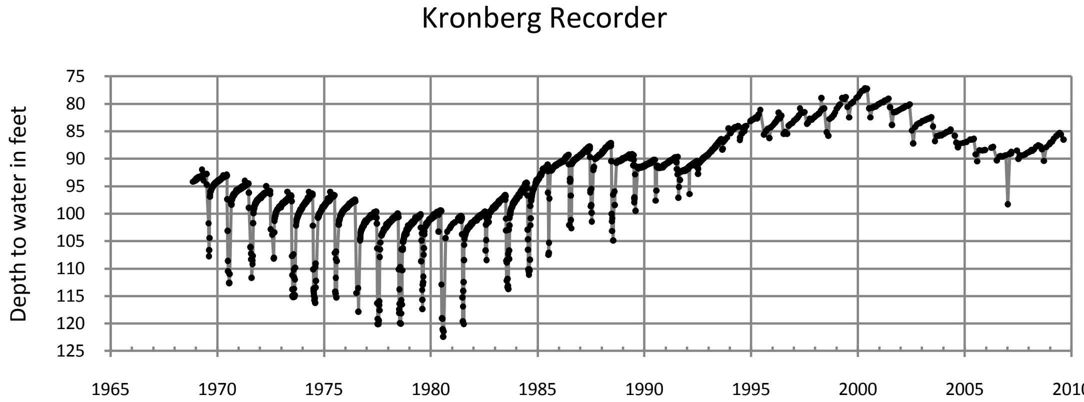

# Hamilton County

Aurora Recorder
ID#: 404836097584101
Legal: 10-6W-27 ACAA
Elevation: 1791 ft. a.s.l.
Estimated predevelopment water level: 91 ft. b.g.s.

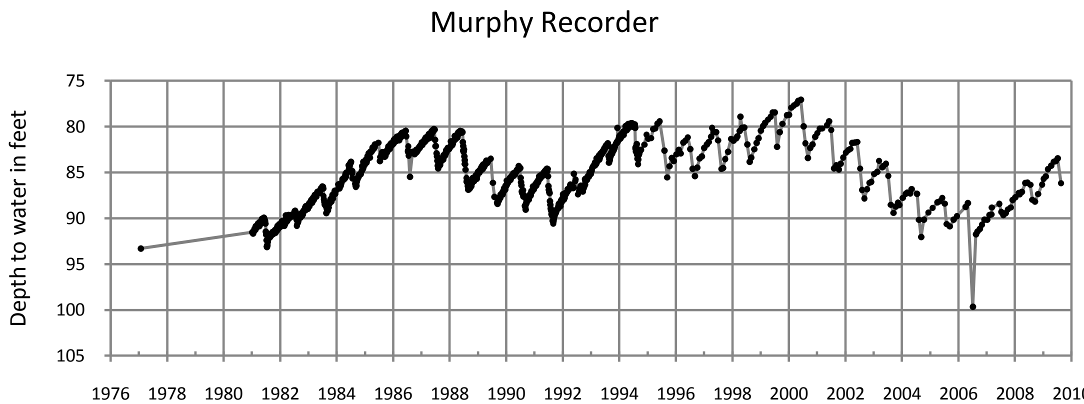


# Hamilton County

Kronberg Recorder
ID#: 405921097514701
Legal: 12-5W-23 CCC
Elevation: 1774 ft. a.s.l.
Estimated predevelopment water level: 81 ft. b.g.s.

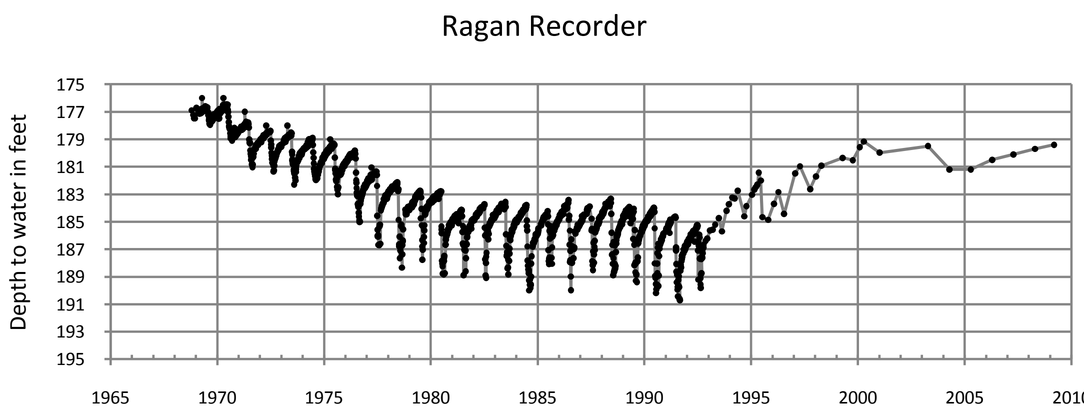



Murphy Recorder
ID#: 405648098064201
Legal: 11-7W-3 CCB
Elevation: 1846 ft. a.s.l.
Estimated predevelopment water level: 85 ft. b.g.s.

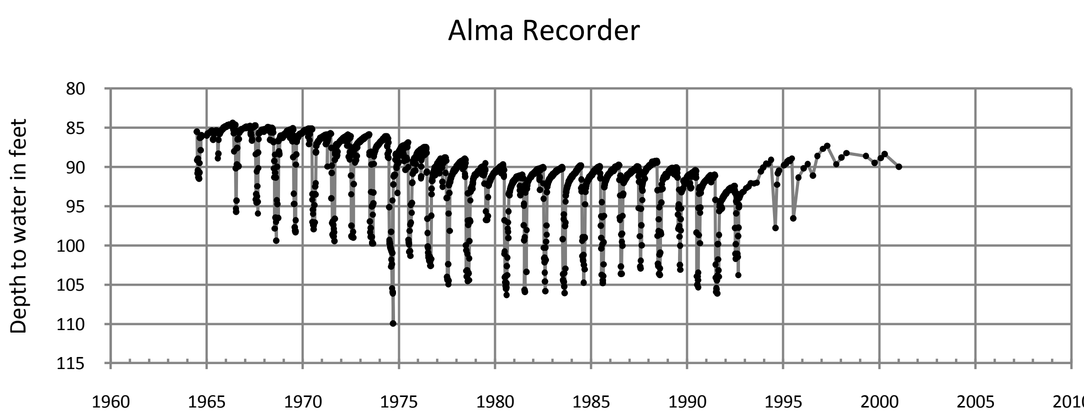



# Harlan County

Ragan Recorder
ID#: 401857099195201
Legal: 4-18W-15 AD
County: Harlan
Elevation: 2290 ft. a.s.l.
Estimated predevelopment water level: 173 ft. b.g.s.

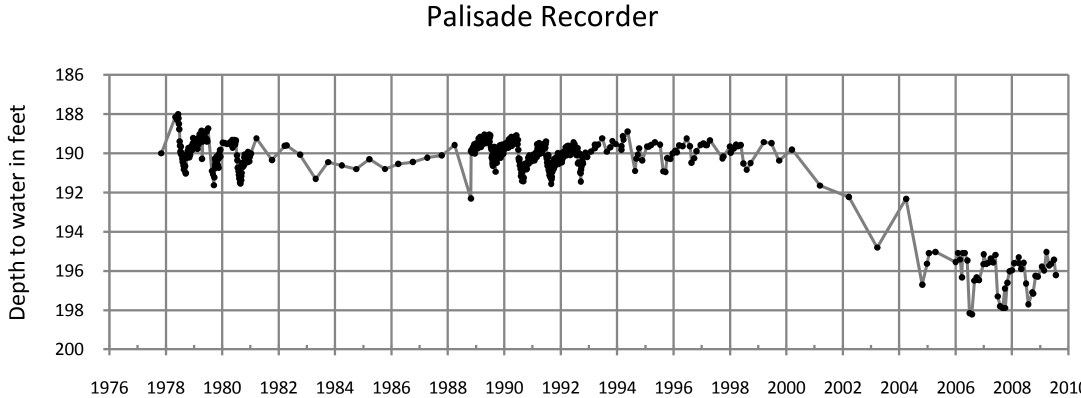



Alma Recorder
ID#: 400920099215501
Legal: 2-18W-9 BCC
Elevation: 2120 ft. a.s.l.
Estimated predevelopment water level: n.a.



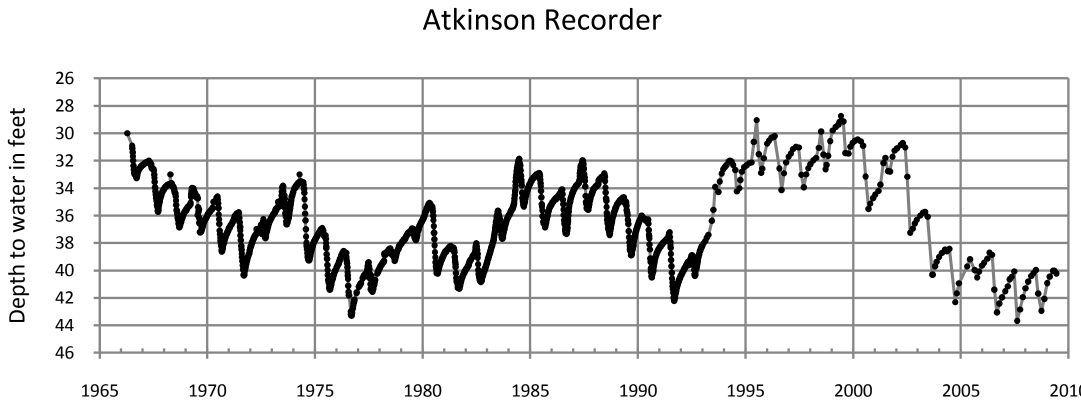
# Hitchcock County

Palisade Recorder
ID#: 401548101080501
Legal: 4-34W-34 DDD
Elevation: 2975 ft. a.s.l.
Estimated predevelopment
water level: 187 ft. b.g.s.

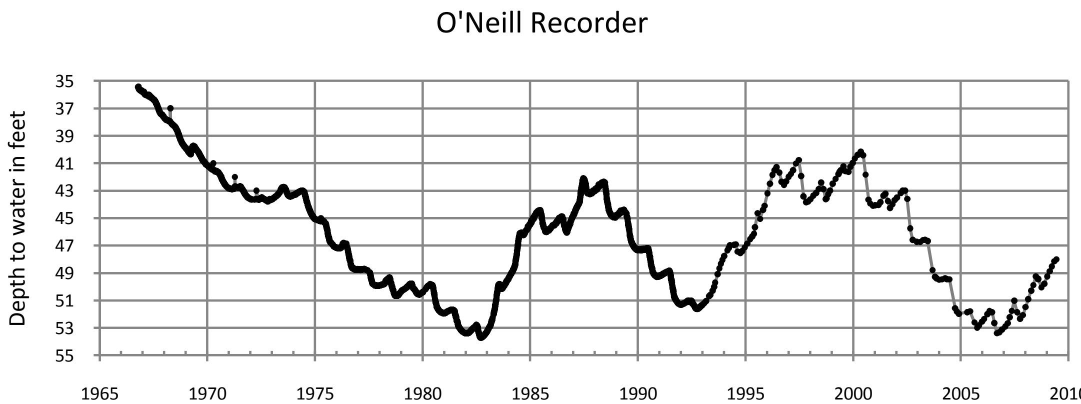



# Holt County

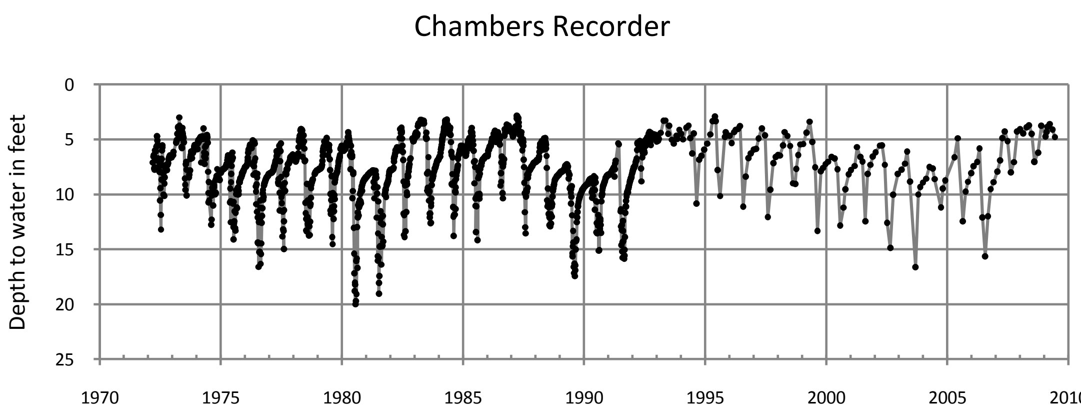
Atkinson Recorder
ID#: 423730098560001
Legal: 31-14W-27 DDD
Elevation: 2080 ft. a.s.l.
Estimated predevelopment
water level: 30 ft. b.g.s.




O'Neill Recorder
ID#: 423148098300601
Legal: 30-10W-32 DAA
Elevation: 1952 ft. a.s.l.
Estimated predevelopment
water level: 31 ft. b.g.s.

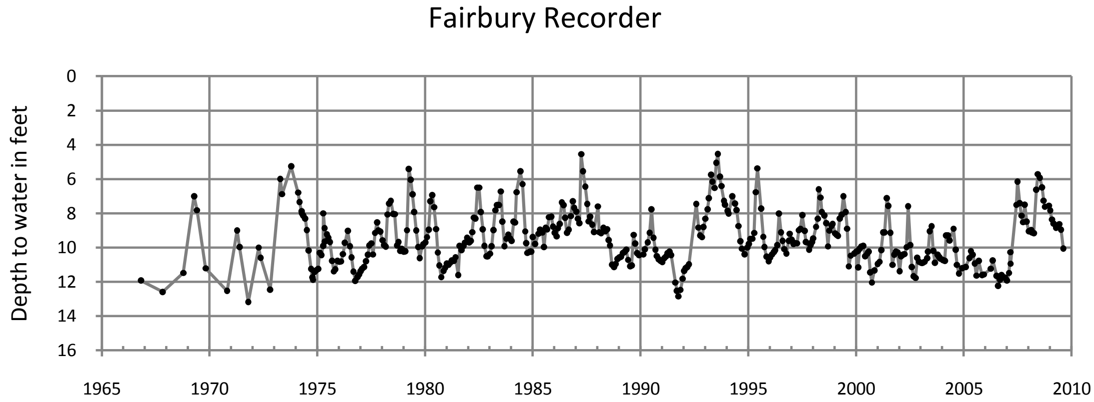



Chambers Recorder
ID#: 421210098402001
Legal: 26-12W-26 AAA
Elevation: 2060 ft. a.s.l.
Estimated predevelopment
water level: 6 ft. b.g.s.

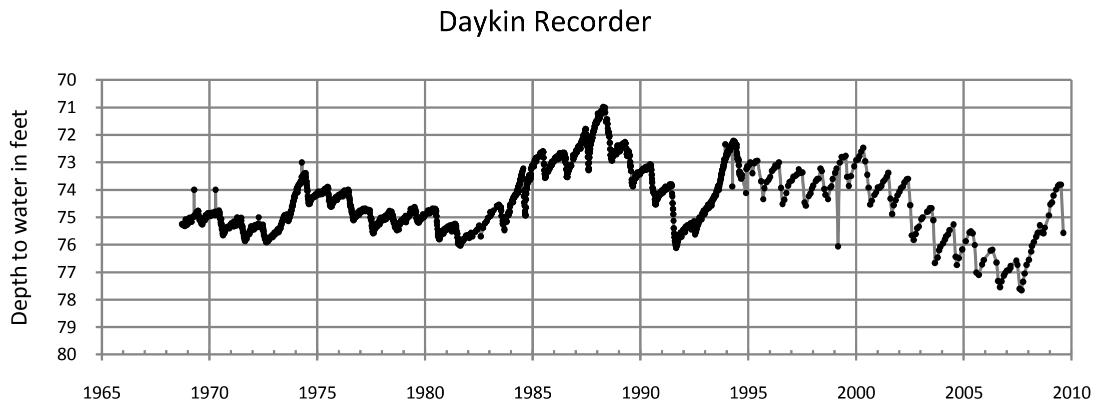


# Jefferson County

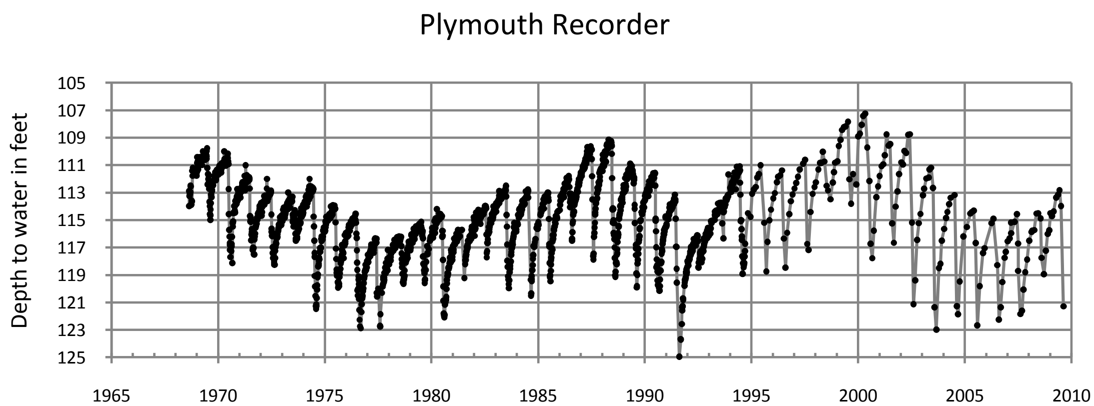
Fairbury Recorder
ID#: 400813097112401
Legal: 2-2E-15 CAD
Elevation: 1314 ft. a.s.l.
Estimated predevelopment water level: 9 ft. b.g.s.



Daykin Recorder
ID#: 401626097210701
Legal: 4-1E-31 AA
Elevation: 1480 ft. a.s.l.
Estimated predevelopment water level: 73.5 ft. b.g.s.

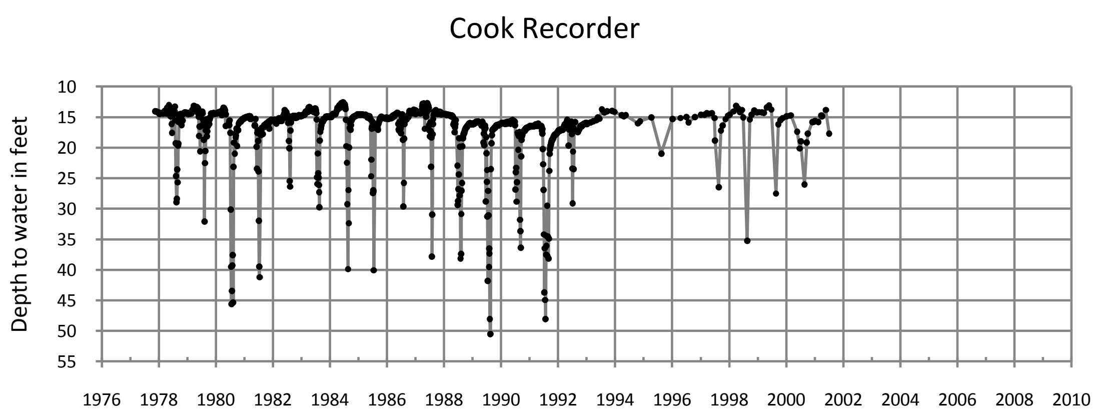


Plymouth Recorder
ID#: 401837097015301
Legal: 4-3E-13 DA
Elevation: 1440 ft. a.s.l.
Estimated predevelopment water level: 107 ft. b.g.s.



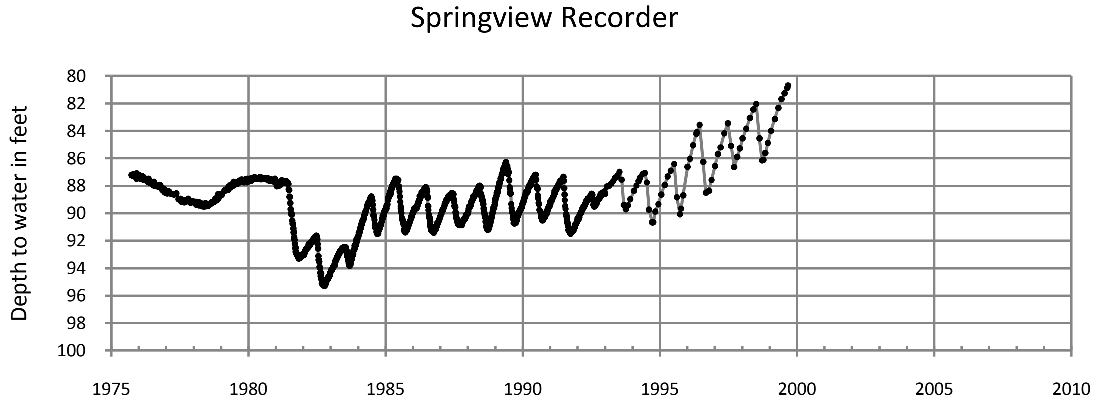
# Johnson County

Cook Recorder
ID#: 403032096104801
Legal: 6-11E-4 DDDD
County: Johnson
Elevation: 1070 ft. a.s.l.
Estimated predevelopment water level: n.a.



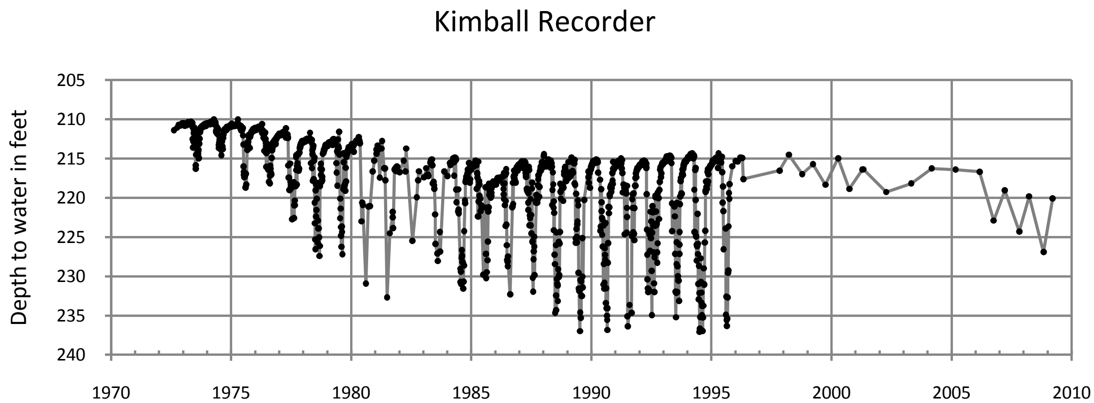
## Keya Paha County

Springview Recorder
ID#: 424837099425201
Legal: 33-20W-19 DCDD
Elevation: 2446 ft. a.s.l.
Estimated predevelopment water level: n.a.



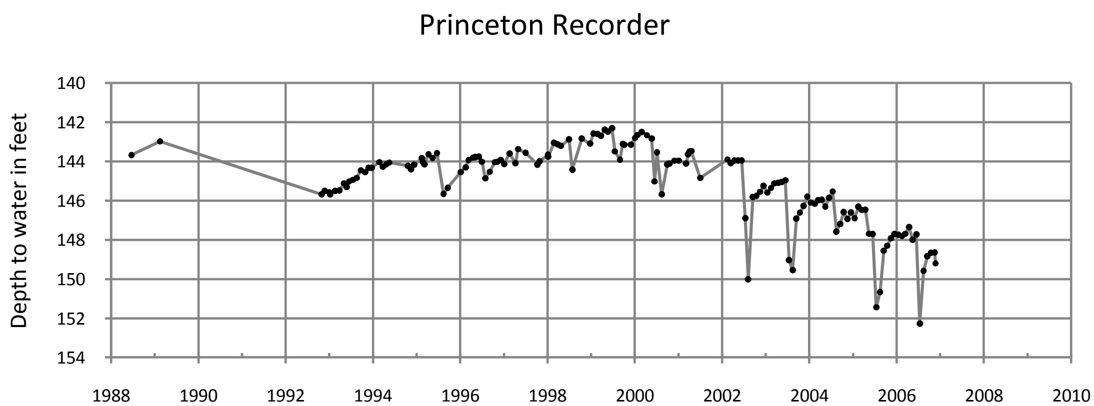

## Kimball County

Kimball Recorder
ID#: 411739103401501
Legal: 15-55W-7 ABB
Elevation: 4874 ft. a.s.l.
Estimated predevelopment water level: 210 ft. b.g.s.

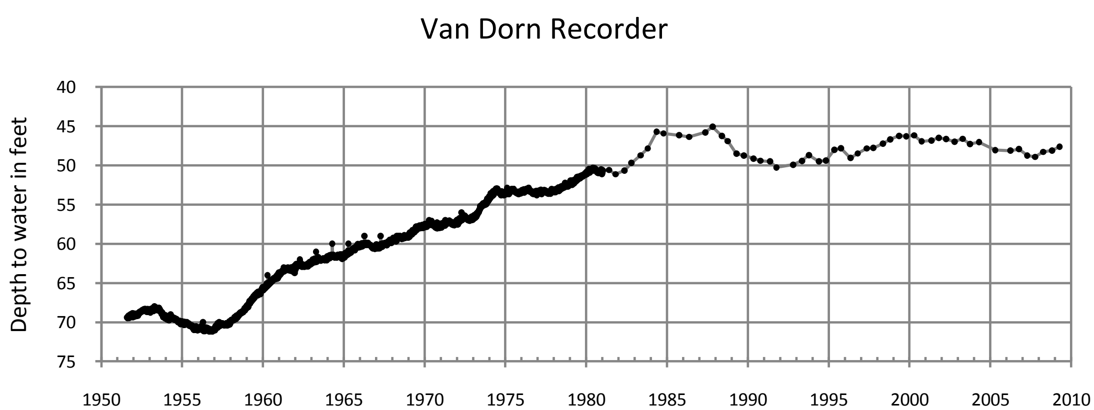



## Lancaster County

Princeton Recorder
ID#: 403400096435501
Legal: 7-6E-15 DCCC
Elevation: 1450 ft. a.s.l.
Estimated predevelopment water level: n.a.

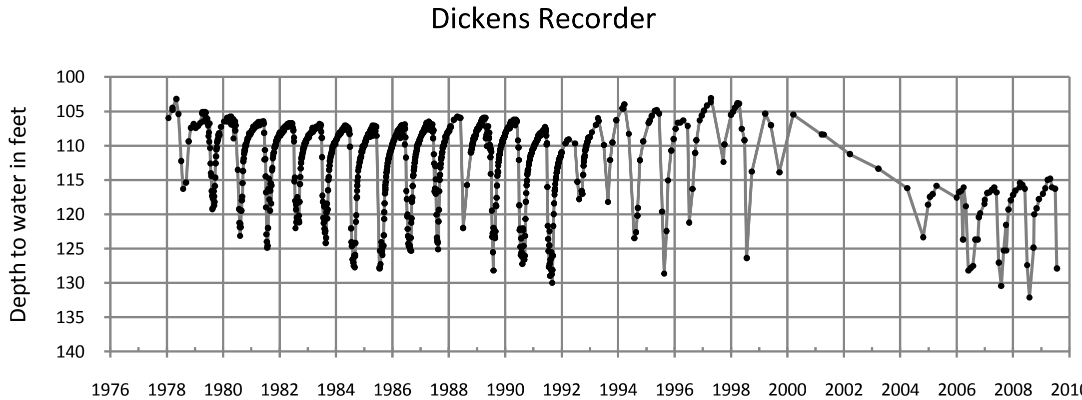



Van Dorn Recorder
ID#: 404706096413001
Legal: 10-6E-36 CDD
Elevation: 1200 ft. a.s.l.
Estimated predevelopment water level: 68 ft. b.g.s.

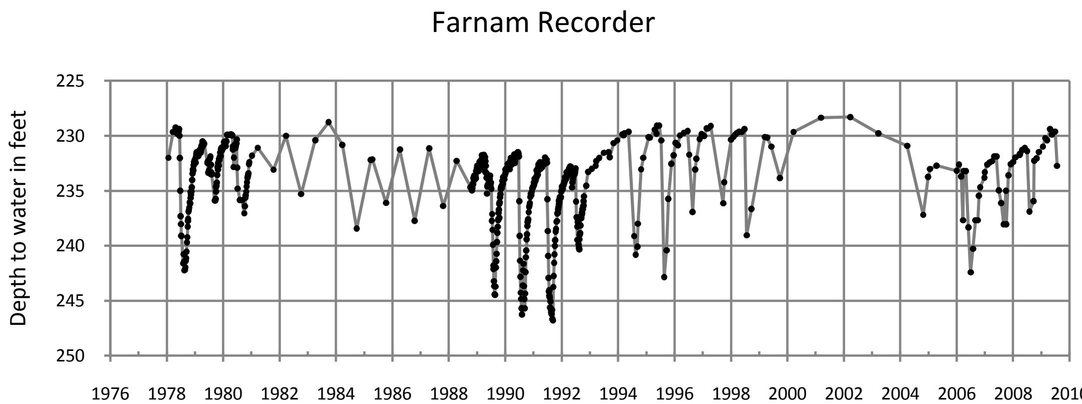


# Lincoln County

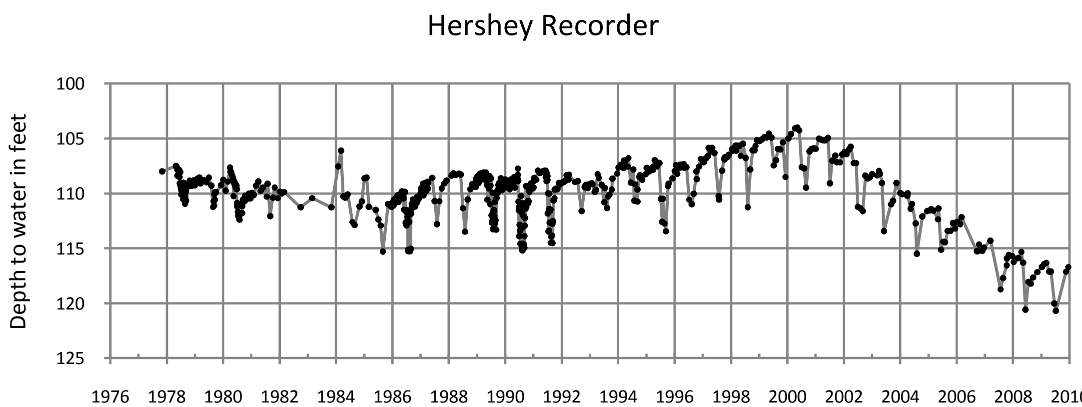
Dickens Recorder
ID#: 404742101010801
Legal: 10-33W-36 ADD
Elevation: 3089 ft. a.s.l.
Estimated predevelopment water level: 105 ft. b.g.s.



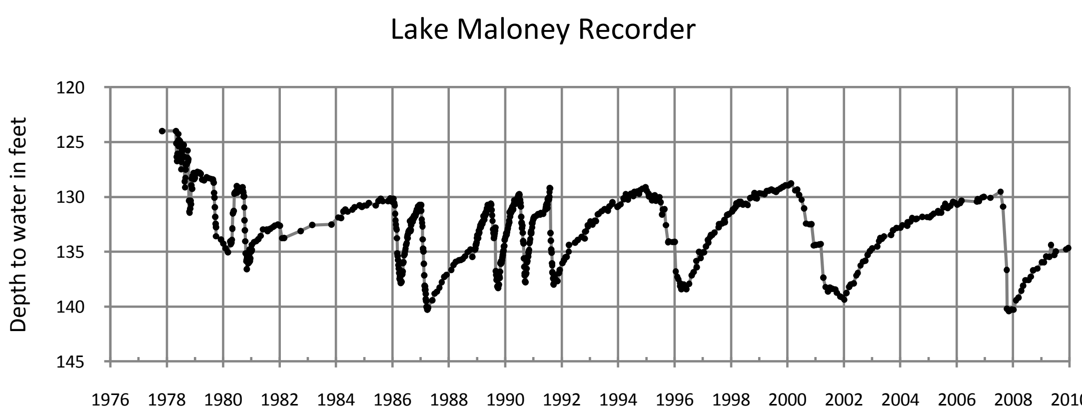

Farnam Recorder
ID#: 404233100132301
Legal: 9-26W-36 ADD
Elevation: 2785 ft. a.s.l.
Estimated predevelopment water level: 228 ft. b.g.s.




Hershey Recorder
ID#: 410250101004201
Legal: 12-32W-6 BAB
Elevation: 3088 ft. a.s.l.
Estimated predevelopment water level: n.a.

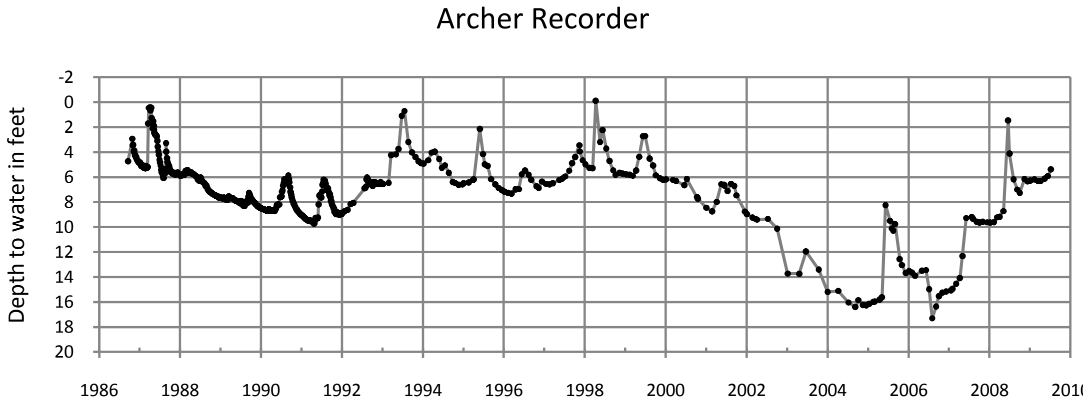



Lake Maloney Recorder
ID#: 405732100531201
Legal: 11-31W-5 BBB
Elevation: 3081 ft. a.s.l.
Estimated predevelopment water level: n.a.

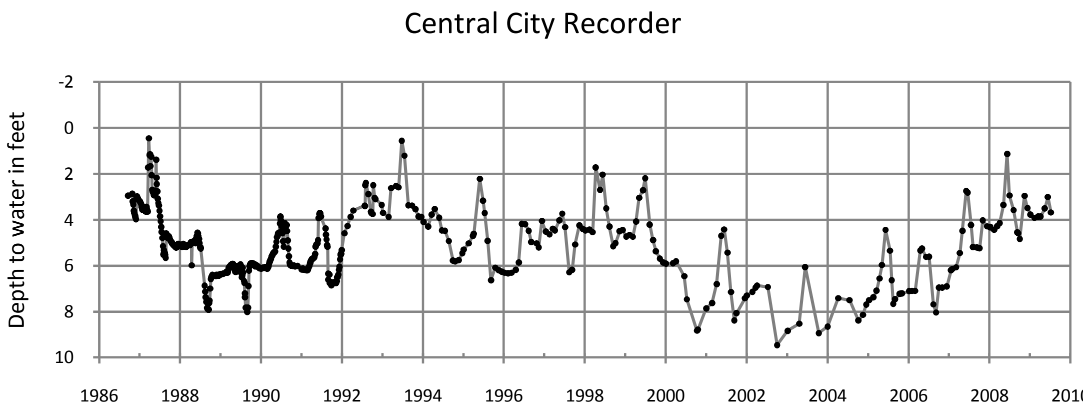


## Merrick County

Archer Recorder
ID#: 410618098113401
Legal: 13-8W-11 DDDD
Elevation: 1772 ft. a.s.l.
Estimated predevelopment water level: 3.5 ft. b.g.s.

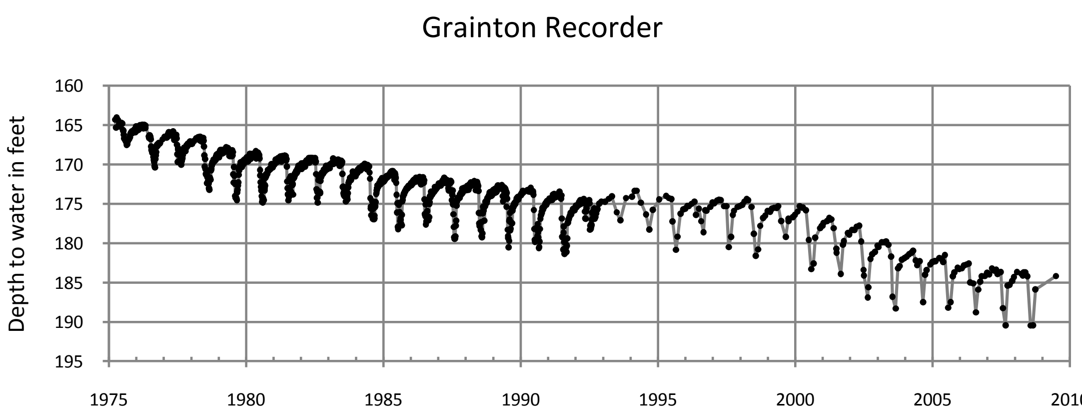



Central City Recorder
ID#: 410943097575001
Legal: 14-6W-26 AAAA
Elevation: 1673 ft. a.s.l.
Estimated predevelopment water level: n.a.

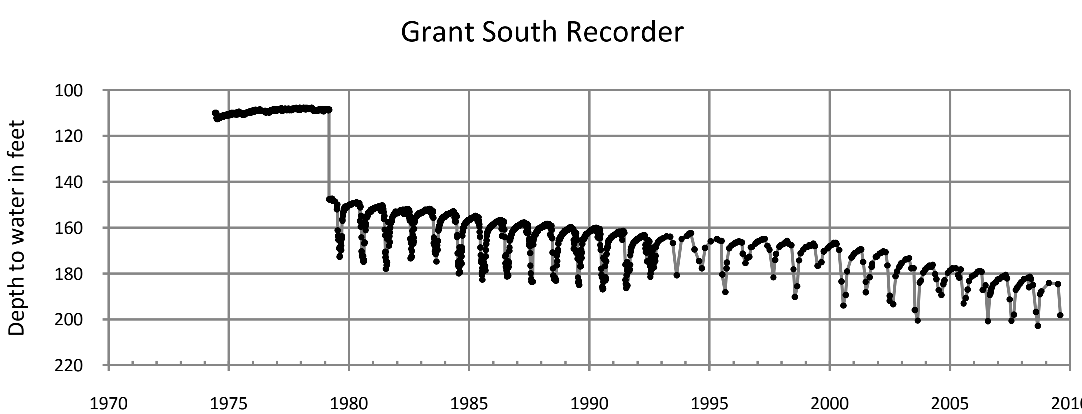



## Perkins County

Grainton Recorder
ID#: 404519101170301
Legal: 9-35W-23 BBB
Elevation: 3245 ft. a.s.l.
Estimated predevelopment water level: 165 ft. b.g.s.

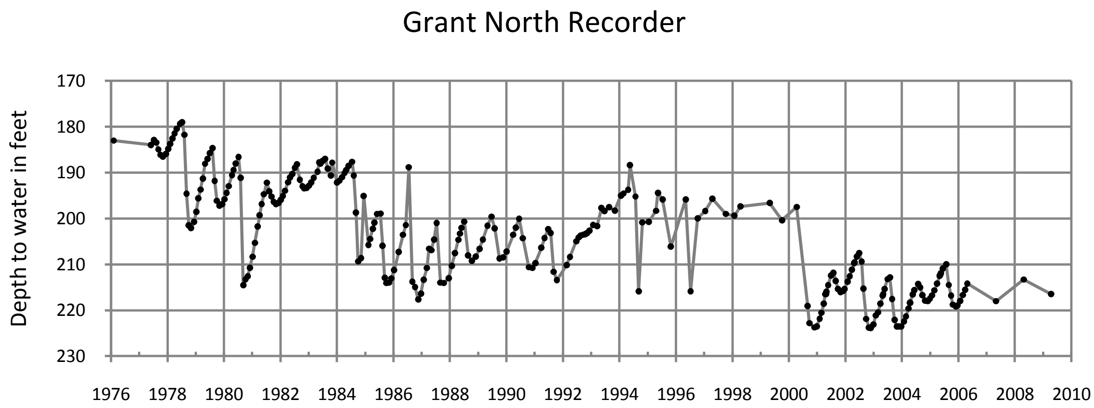



Grant South Recorder
ID#: 404620101433401
Legal: 9-39W-2 DDDD
Elevation: 3413 ft. a.s.l.
Estimated predevelopment water level: 142 ft. b.g.s.



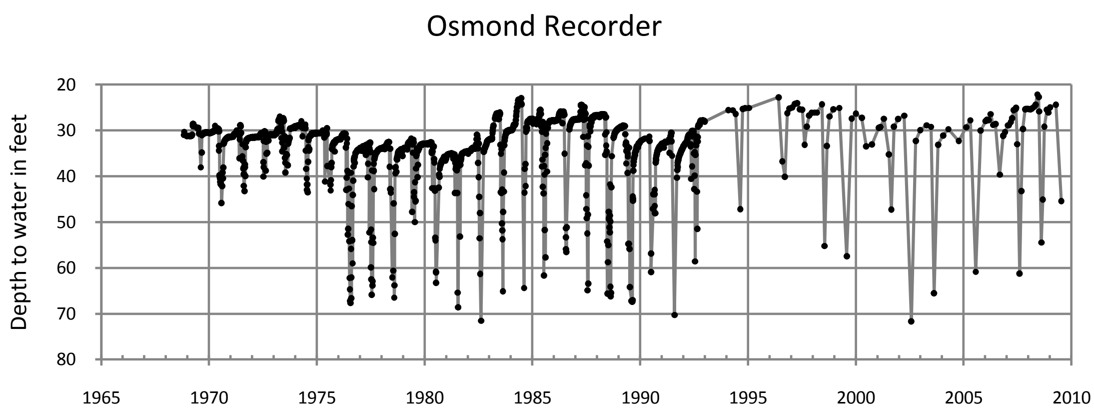
## Perkins County

Grant North Recorder
ID#: 405738101423202
Legal: 12-38W-31 CCCC
Elevation: 3423 ft. a.s.l.
Estimated predevelopment water level: 183 ft. b.g.s.



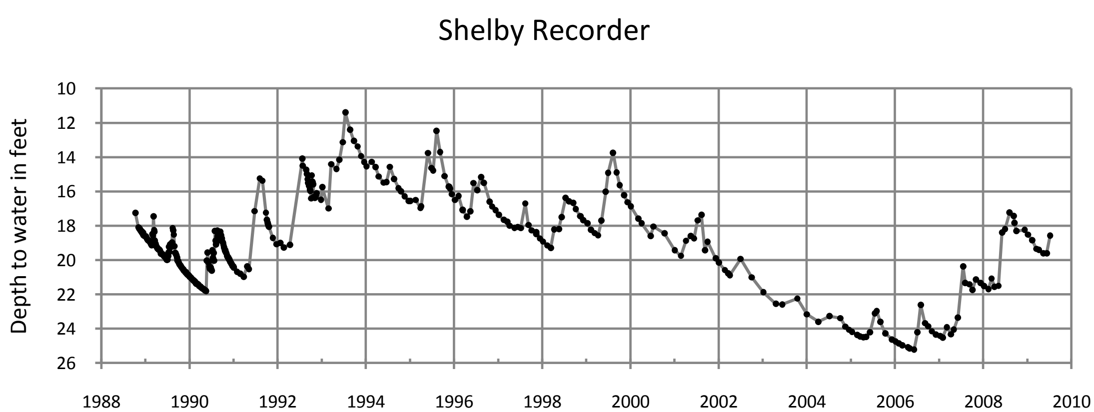

## Pierce County

Osmond Recorder
ID#: 422150097402401
Legal: 28-3W-33 BA
Elevation: 1673 ft. a.s.l.
Estimated predevelopment water level: 26 ft. b.g.s.

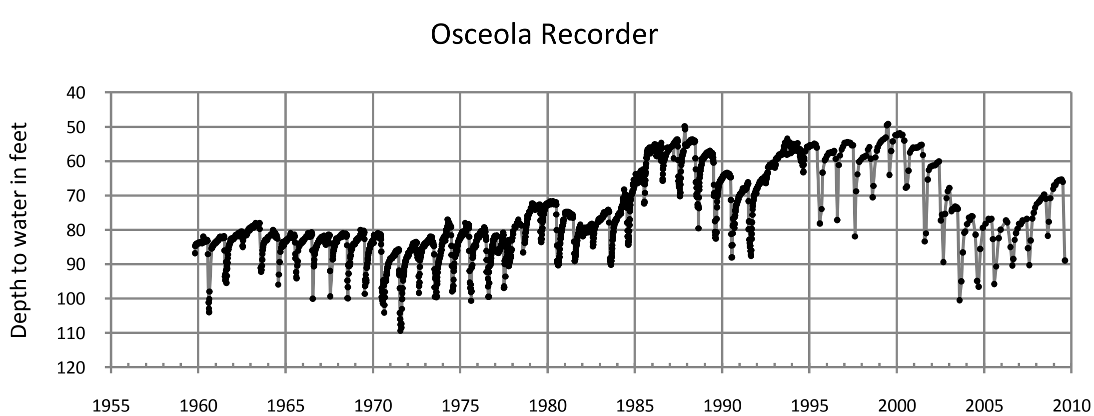



## Polk County

Shelby Recorder
ID#: 411738097264301
Legal: 15-1W-9 BBBB
Elevation: 1525 ft. a.s.l.
Estimated predevelopment water level: n.a.

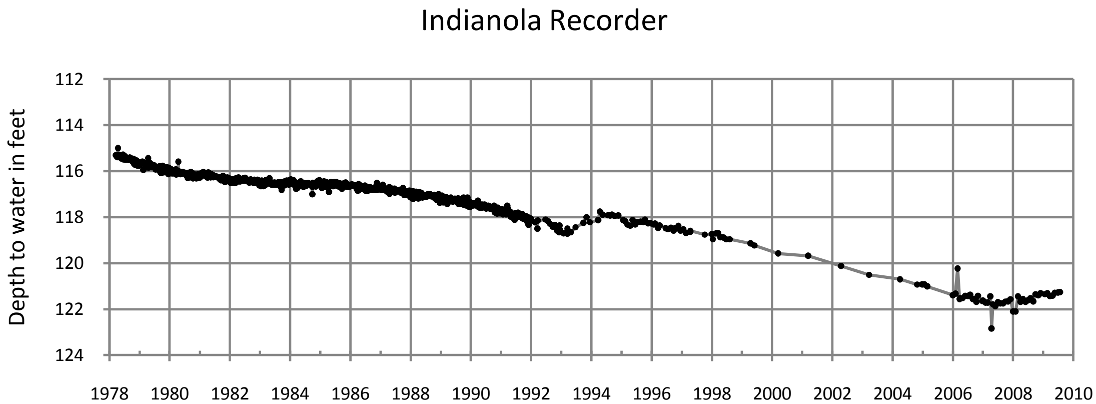



Osceola Recorder
ID#: 411012097325201
Legal: 14-2W-21 DB
Elevation: 1662 ft. a.s.l.
Estimated predevelopment water level: 80 ft. b.g.s.



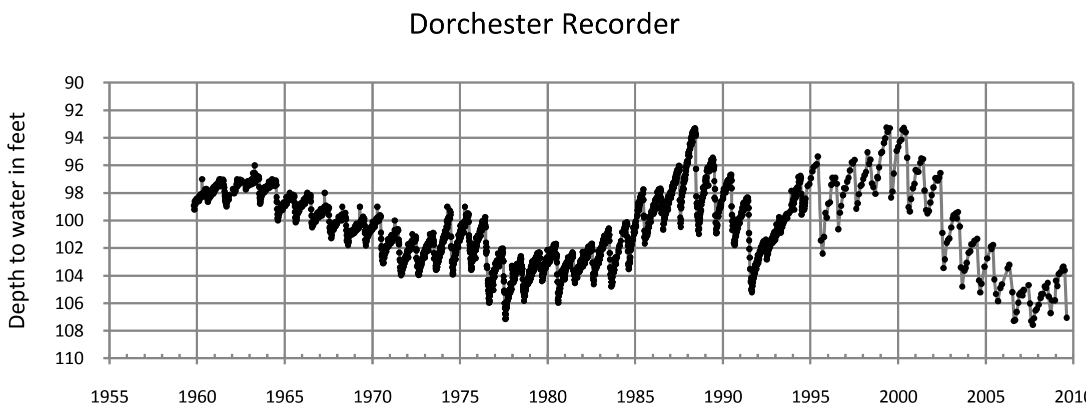
## Red Willow County

Indianola Recorder
ID#: 401919100223001
Legal: 4-27W-17 ABB
Elevation: 2575 ft. a.s.l.
Estimated predevelopment water level: 115 ft. b.g.s.



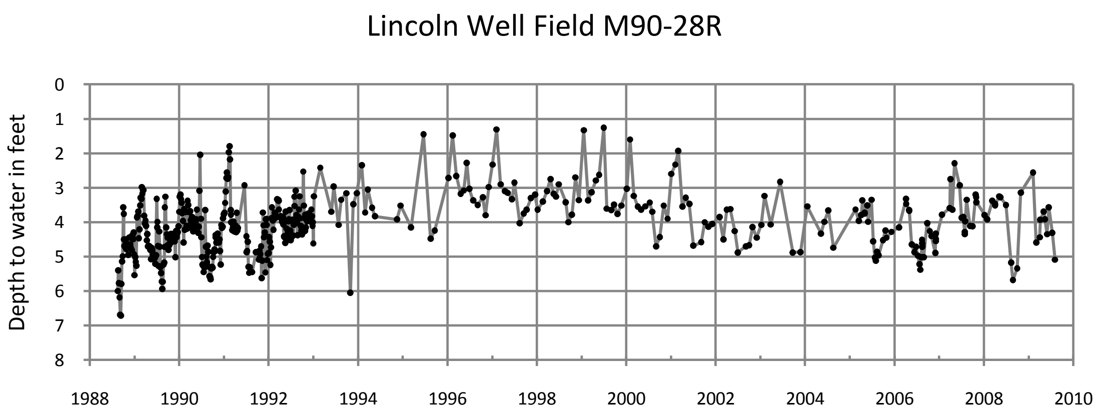

## Saline County

Dorchester Recorder
ID#: 403855097072501
Legal: 8-3E-19 ADA
Elevation: 1496 ft. a.s.l.
Estimated predevelopment water level: 96 ft. b.g.s.



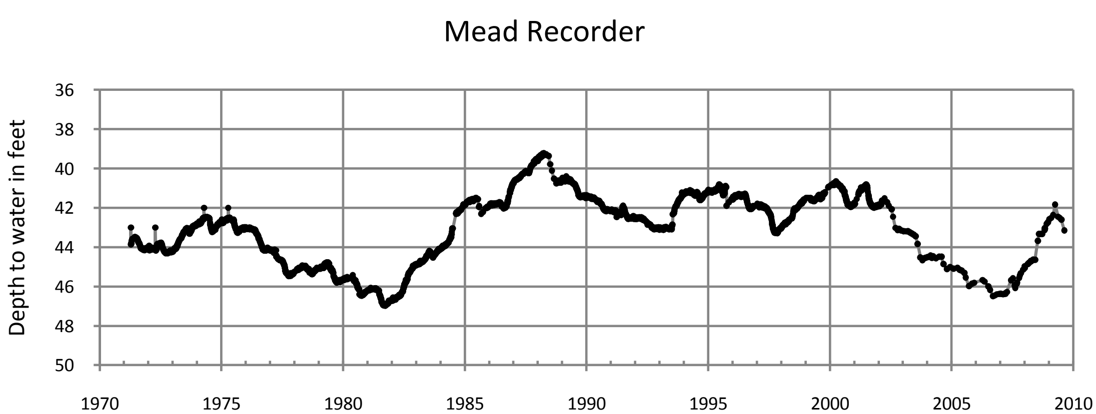

## Sarpy County

Lincoln Well Field M90-28R
ID#: 410308096190701
Legal: 13-10E-32 DBBA
Elevation: 1055 ft. a.s.l.
Estimated predevelopment water level: n.a.



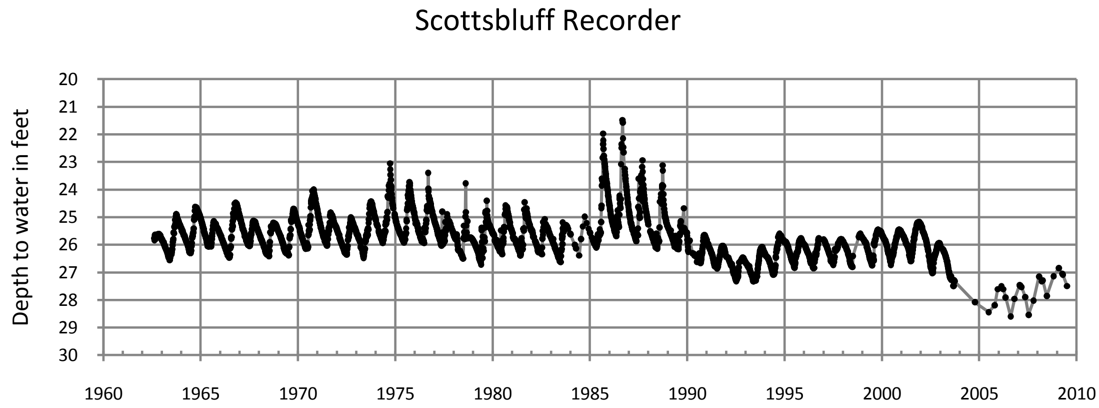

## Saunders County

Mead Recorder
ID#: 411005096281502
Legal: 14-8E-24 ACD
Elevation: 1171 ft. a.s.l.
Estimated predevelopment water level: 40.5 ft. b.g.s.



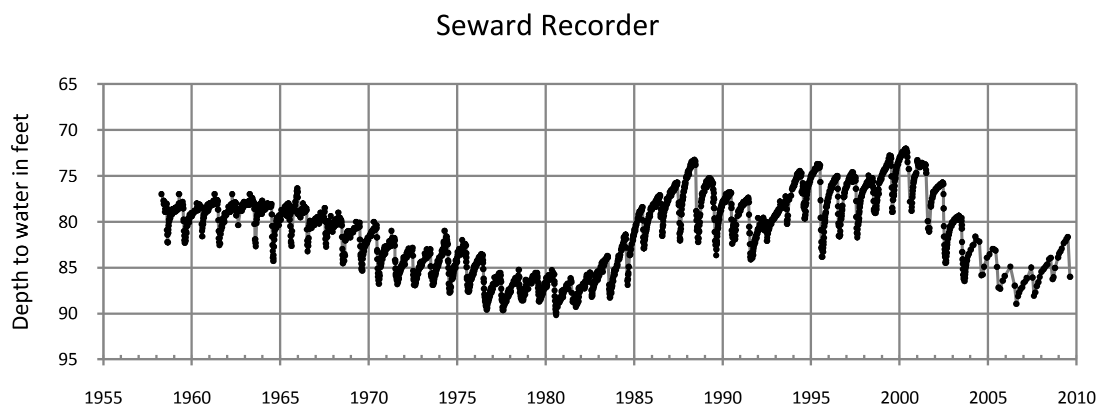
## Scottsbluff County

Harvard Recorder
Scottsbluff Recorder
ID#: 415325103392801
Legal: 22-55W-11
Elevation: 3950 ft. a.s.l.
Estimated predevelopment \
water level: n.a.



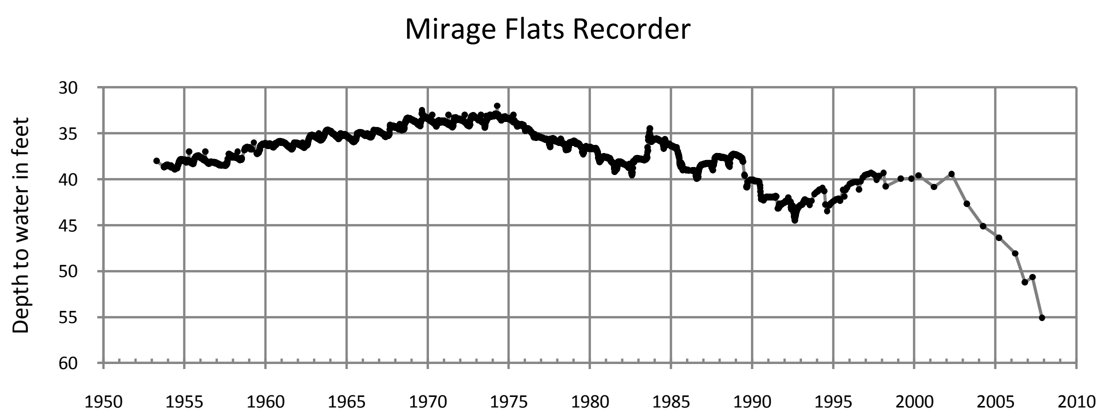

## Seward County

Seward Recorder
ID#: 405406097115001
Legal: 11-2E-21 DD
Elevation: 1550 ft. a.s.l.
Estimated predevelopment
water level: 74 ft. b.g.s.



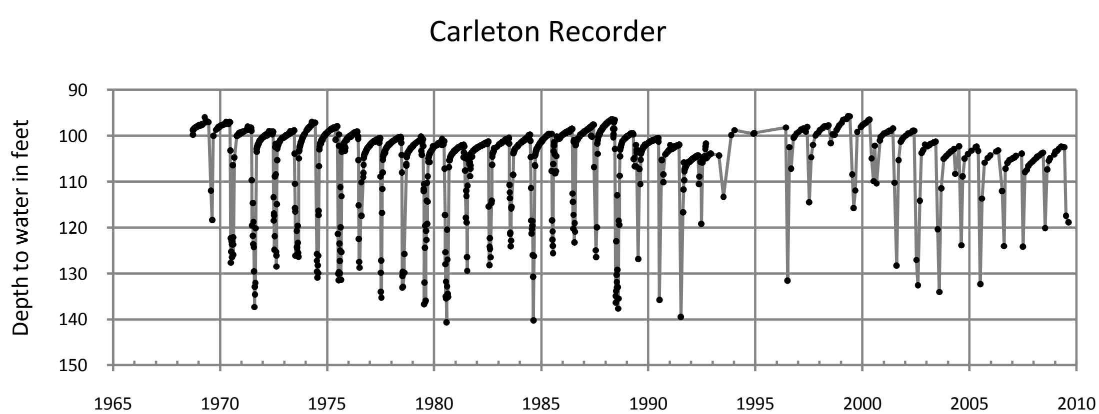

## Sheridan County

Mirage Flats Recorder
ID#: 423034102415001
Legal: 29-46W-10 AA
Elevation: 3794 ft. a.s.l.
Estimated predevelopment
water level: 38.5 ft. b.g.s.



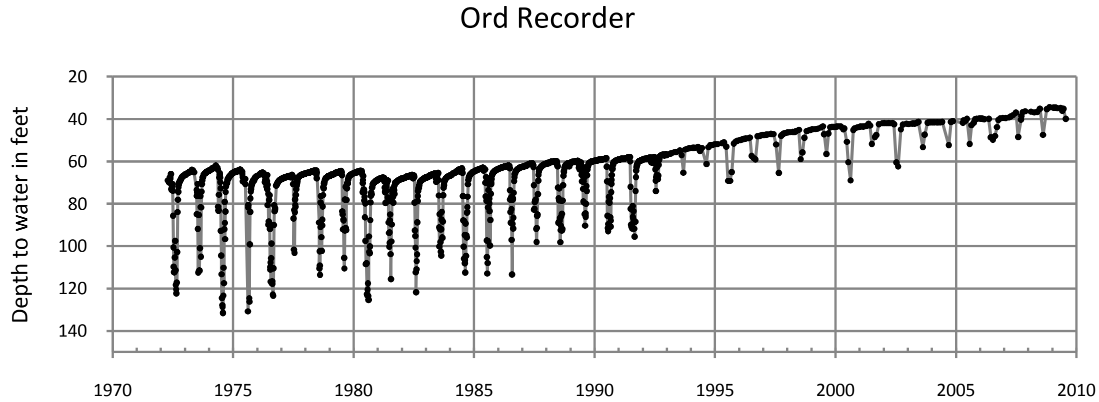

## Thayer County

Carleton Recorder
ID#: 401537097434101
Legal: 3-4W-2 AA
Elevation: 1605 ft. a.s.l.
Estimated predevelopment
water level: 96 ft. b.g.s.



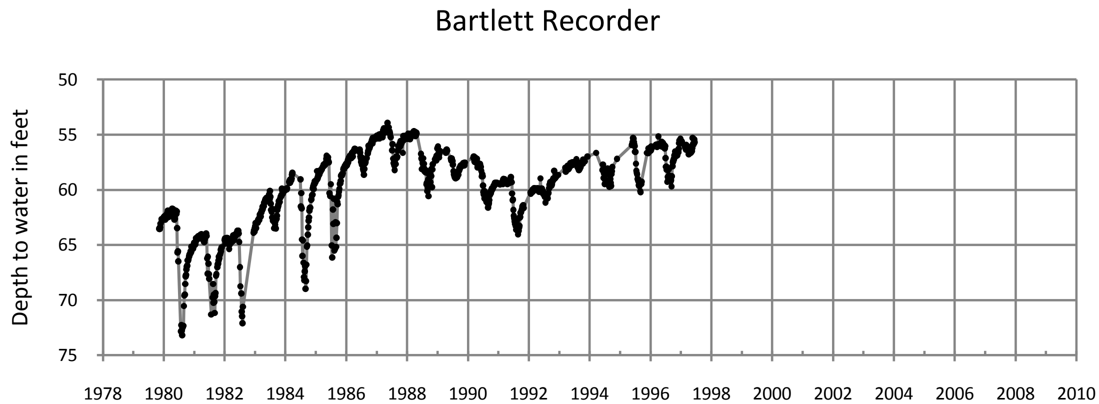
# Valley County

Ord Recorder
ID#: 413156098591201
Legal: 18-15W-13 ACD
Elevation: 2160 ft. a.s.l.
Estimated predevelopment
water level: 69 ft. b.g.s.



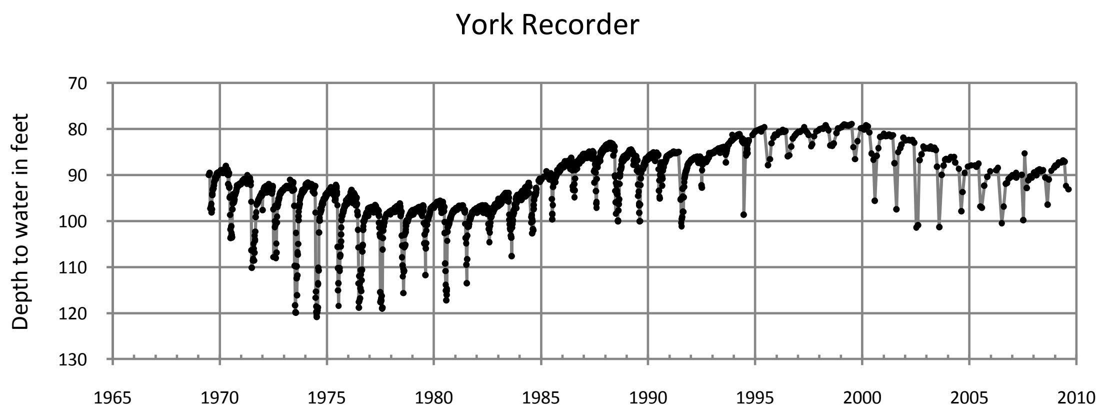

# Wheeler County

Bartlett Recorder
ID#: 415445098252501
Legal: 22-10W-1
Elevation: 2070 ft. a.s.l.
Estimated predevelopment
water level: n.a.

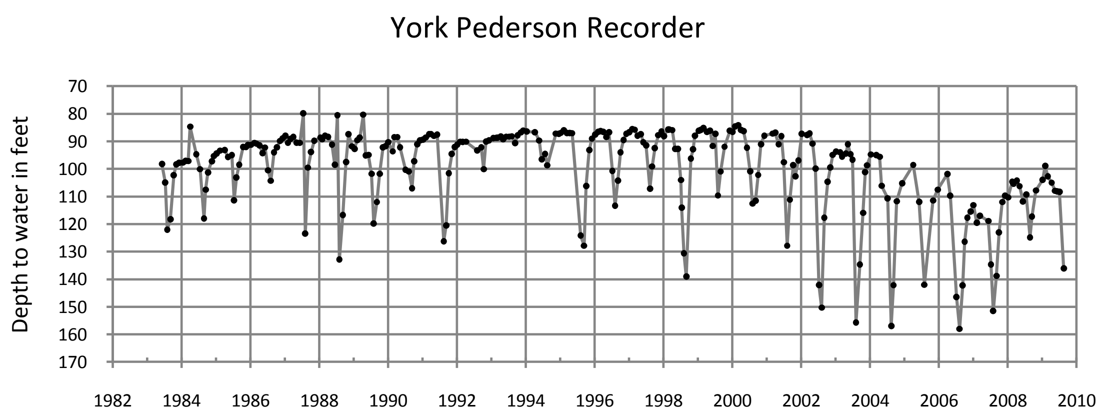



# York County

York Recorder
ID#: 405305097351503
Legal: 11-2W-31 BA
Elevation: 1659 ft. a.s.l.
Estimated predevelopment
water level: 80 ft. b.g.s.




York Pederson Recorder
ID#: 405305097351504
Legal: 11-2W-31 BAD
Elevation: 1659 ft. a.s.l.
Estimated predevelopment
water level: 85 ft. b.g.s.



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**Groundwater-Level Changes in Nebraska Map Series**

Available on-line at http://snr.unl.edu/data/water/groundwatermaps.asp

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|---|---|---|
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