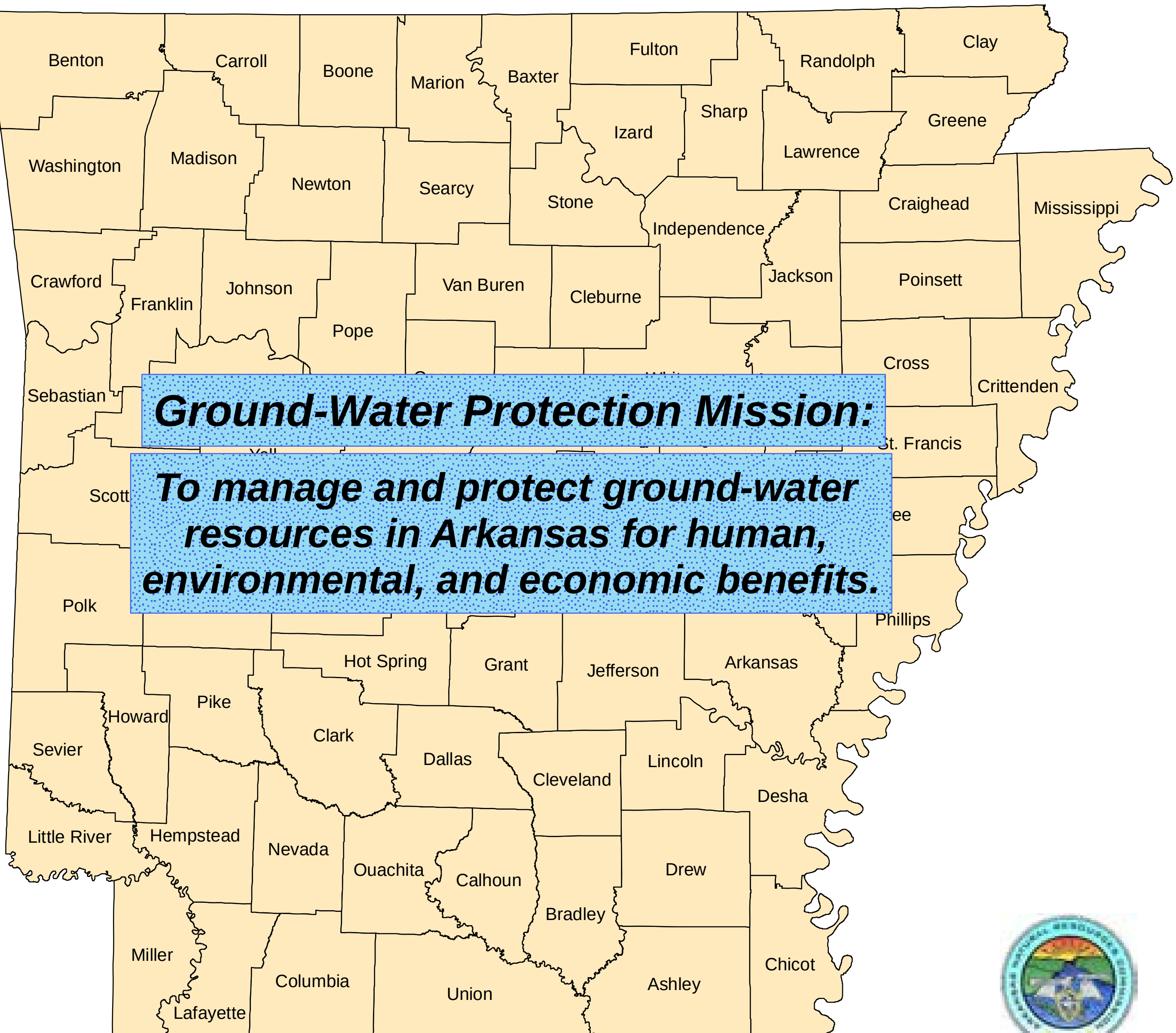
Arkansas Ground-Water Protection and Management Report for 2010



Ground-Water Protection Mission:

To manage and protect ground-water resources in Arkansas for human, environmental, and economic benefits.

March 2011

STATE OF ARKANSAS

ARKANSAS NATURAL RESOURCES COMMISSION
101 EAST CAPITOL, SUITE 350
LITTLE ROCK, ARKANSAS 72201

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GOVERNOR

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D. Todd Fugitt, R.P.G.	Geology Supervisor
James L. Battreal, R.P.G.	Professional Geologist
Jay Johnston, C.P.G.,R.P.G.	Professional Geologist
Chris Kelley	GIS Analyst
Michael Ritchey	Chief Construction Inspector
Perry Dotson	Water Well Inspector
Jacob Harvey	Engineer Technician
Jackie Broach	Administrative Assistant III
Edward Swaim	Chief, Water Resources Management Division

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Arkansas Geological Survey.

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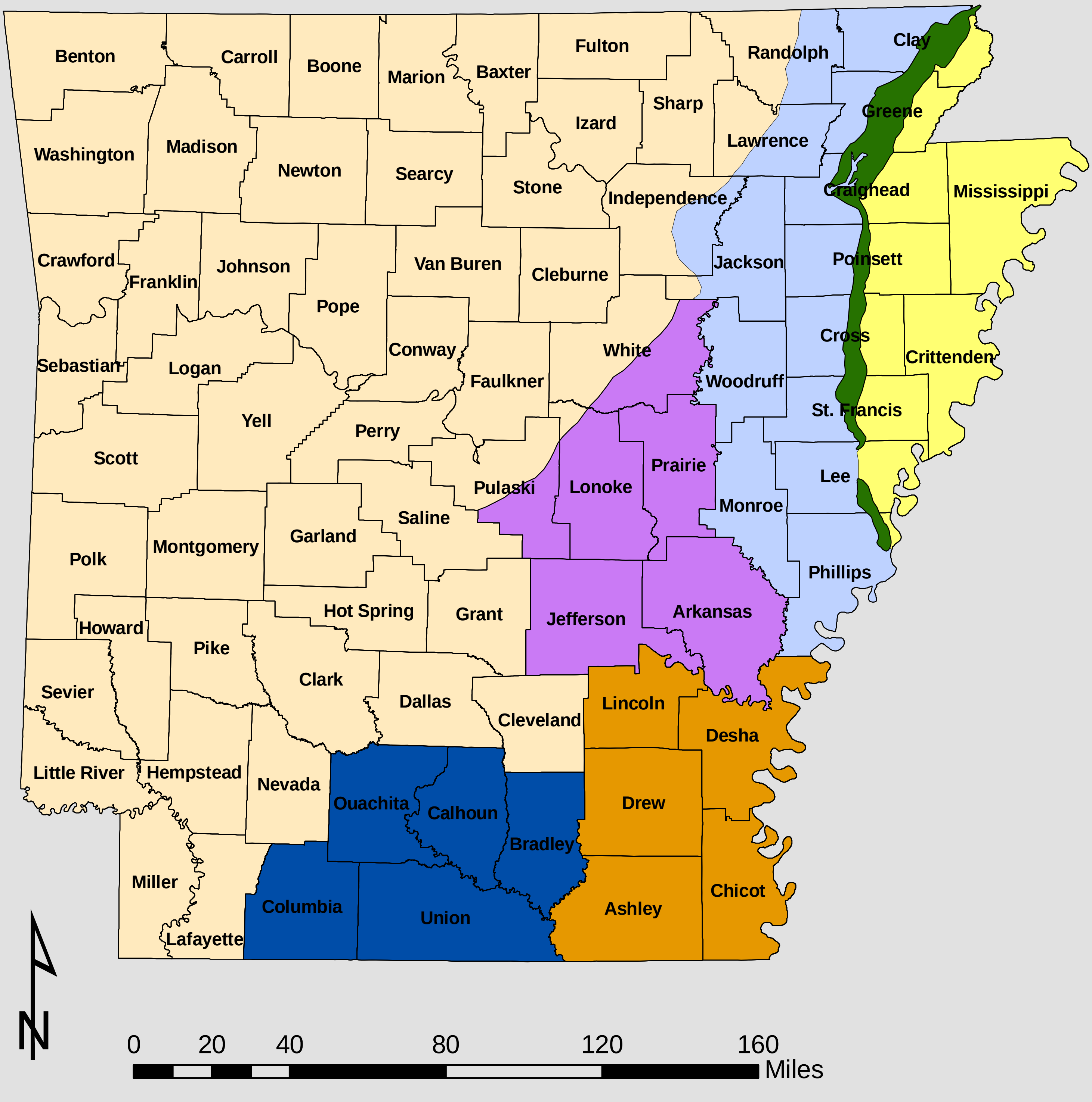
ABSTRACT

The Arkansas Ground-Water Protection and Management Report is produced annually by the Arkansas Natural Resources Commission (ANRC) pursuant to the Arkansas Ground Water Protection and Management Act of 1991, Arkansas Code Annotated 15-22-906. This report provides a summary of ground-water protection and conservation programs administered by the ANRC during the year 2010, including water-level monitoring, the development of water-quality standards, studies of water use trends, and administration of the Arkansas Water Well Construction Commission program. This report covers water level data from the spring of 2009 to the spring of 2010, as well as other ground-water activities through the end of 2010. The general trend in Arkansas's long-term water-level change is that the ground-water levels are declining in response to continued withdrawals at a rate which is not sustainable. Based on 2008 water use data, approximately 42.6 percent of the current alluvial aquifer withdrawal of 7,022.95 million gallons per day, and 55.2 percent of the Sparta/Memphis aquifer withdrawal of 157.45 million gallons per day, is sustainable. At these pumping rates, water-level declines and the adverse impacts on the state's ground-water system will continue to be observed. As the competition for ground water becomes more intense, the challenge before Arkansas water resources users, scientists, and conservationists is to continue to work toward conservation, education, and the conjunctive use of ground water and excess surface water in a manner that brings about the wise and sustainable use of our valuable water resources.

INTRODUCTION

This annual ground-water report is prepared to provide the State of Arkansas with a comprehensive water-quantity and water-quality document to be utilized in accordance with the Arkansas Water Plan, as a guide for water resources conservation and protection programs. It includes data, analysis, and recommendations for the ground-water protection and management program, water-quality standards activities, the Arkansas Water Well Construction Commission administrative program, and water use studies. This report and all programs described herein are built on a strong cooperative program with other appropriate State, Federal, and local water resources agencies.

Arkansas Ground Water Study Areas



Legend

- South Arkansas
- Boeuf-Tensas
- Grand Prairie
- St. Francis
- Cache
- Crowleys Ridge
- County Boundaries

Fig. 1

Some of the programs described in this report are partially funded through federal grants from Region VI of the Environmental Protection Agency.

Each spring approximately 700 wells are monitored in the alluvial aquifer resulting in the largest number of water level measurements for any one aquifer in the state. This number will vary from year to year depending on the resources available. There are approximately 350 wells that are monitored for water levels in the Sparta/Memphis aquifer. A monitoring schedule has been established to obtain data from the alluvial aquifer and the Sparta/Memphis aquifer on an annual basis. These measurements are taken each spring so as to be the least affected by seasonal pumping for irrigation. The drawdown that results from seasonal pumping is also determined by the NRCS and ANRC taking measurements of the alluvial aquifer in both the spring and fall. The USGS also maintains the Arkansas Masterwell Program that supplies long term ground-water quality monitoring in 25 wells from 14 aquifers. These Masterwells are located throughout 21 counties and each year 5 sites are sampled for a variety of water-quality constituents. (Fig.4) Hydrogeologic data is collected statewide; however resources are focused on study areas where water-level declines and water-quality degradation have been observed historically.

The amount of rainfall is taken into account each monitoring period to observe the change of water levels during times of drought or excess rainfall. Higher than normal precipitation continued throughout 2009, which finished as the all time record for precipitation in Arkansas at 81.79 inches. The monitoring period which covers the calendar year of 2010 for static water level change was completed in the spring. The data for 2009-2010 indicates a rise in 183 of 279 wells, with a maximum rise of about 24.6 feet, and an average of about 1.6 feet. (Appendix A). The total rainfall average for Arkansas in 2010 was 38.38 inches according to the National Weather Service and this is well below average which should result in more declines in next years reporting. A preliminary investigation of the ANRC's monitoring wells in the Grand Prairie area indicate that 11 of 13 wells showed a decline in static water levels from December 2010 to December 2011 with an average change of -0.98 feet during this time.

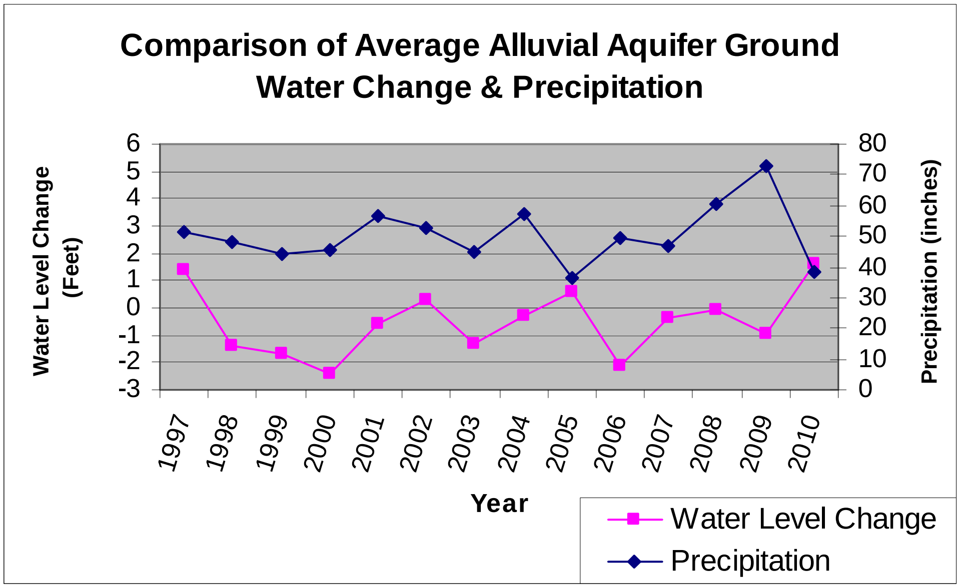


Table 1.

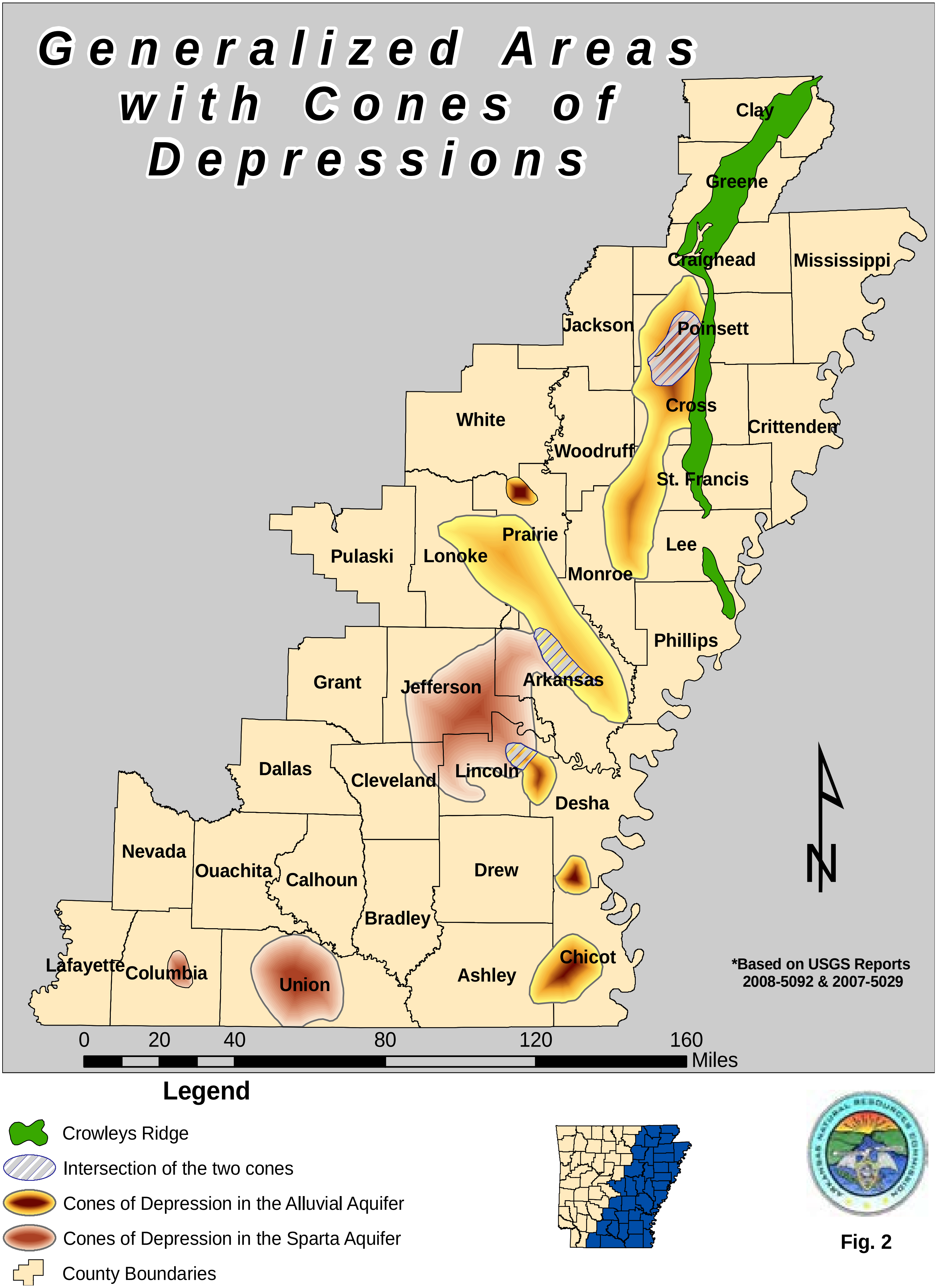
Long-term water-level data collected over a 25-year period indicate a statewide decline of 0.8 feet per year in the Sparta-Memphis aquifer (USGS, 2004-5055), and 0.3 feet per year in the alluvial aquifer over a 24 year period (USGS, 2006-5128). Such long-term data is valuable in revealing water-level change trends that can be masked by short-term climate variations and local pumping rates. There are areas of the state experiencing ground-water withdrawals of such magnitude that demand on the aquifer exceeds the sustainable yield, resulting in consistently falling ground-water levels, and the development of cones of depression. These areas are depressions in the potentiometric surface, and occur in both the alluvial and Sparta/Memphis aquifers. (Fig. 2) Water-level declines are consistently observed in areas where water use is highest, such as portions of the Grand Prairie area, and in the Cache study area west of Crowley's Ridge. Other programs are focused on the core Arkansas Nonpoint Source Pollution Management Program, the Section 106 water-quality data management and GIS activities, and the administration of the Arkansas Water Well Construction Commission Program.

The most recent water quality data collected by the USGS showed wells with an increased specific conductance (>/= 1,000 microsiemens/cm) in the alluvial aquifer in Arkansas, Cross, Desha, Greene, Lincoln, Prairie and Chicot counties. (Schrader, T.P., 2010) An increase in the level of specific conductance indicates an increased level of dissolved solids in the ground water. In certain areas these dissolved solids are chlorides leading to the ground-water becoming unsuitable for particular irrigation purposes.

WATER POLICY

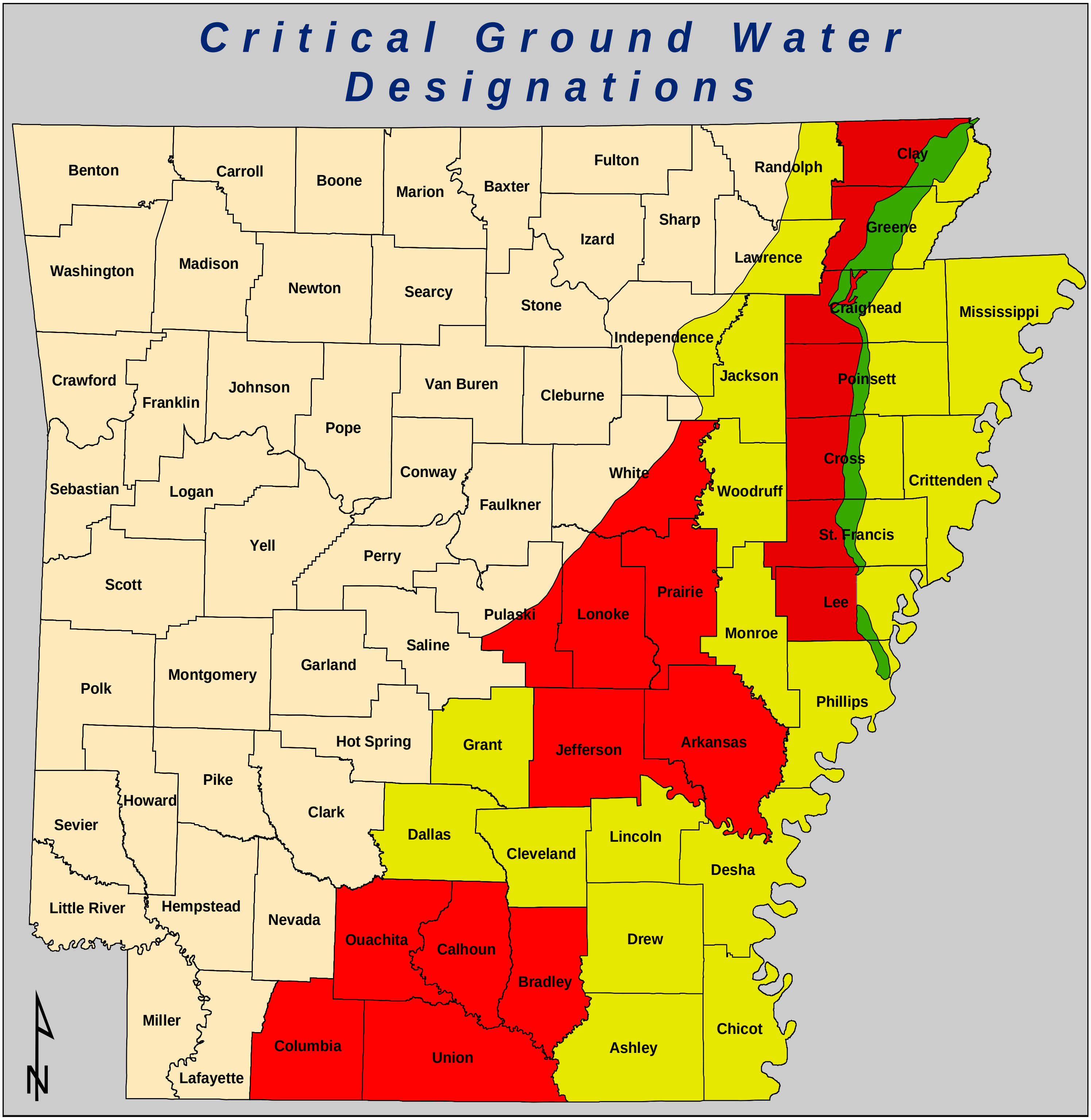
Water-resources policy in Arkansas was established in the Arkansas Water Plan, 1991, in which the ANRC advocates conservation, education, and the conjunctive use of ground and surface water, along with the development of excess surface water to meet future water use needs. It is hoped that protection of the State's ground-water resources can be achieved through these measures rather than management strategies that may require allocation of water. If conservation and the development of excess surface water are not successfully implemented in the impaired areas in the very near future, the State will have to consider regulatory alternatives to preserve the aquifers at a sustainable level.

All water-use strategies must consider the wise use of our State's water resources while protecting the sustainable yield of the State's aquifers. Stream flow needs of the State's surface-water flow system must also be taken into account if our water resources are to be protected for future generations to utilize and enjoy. The ANRC advocates that the State move toward a sustainable yield pumping strategy through conservation utilizing critical ground water area designation wherever needed to focus resources and minimize water-level declines. Designation as a Critical Ground Water Area brings about enhanced tax credits for conservation activities, focused educational programs, and sets the area as a priority for possible federal programs and funding.



Generalized Areas with Cones of Depressions
Clay
Greene
Craighead
Mississippi
Poinsett
Jackson
Cross
Crittenden
White
Woodruff
St. Francis
Prairie
Lee
Pulaski
Lonoke
Monroe
Phillips
Arkansas
Grant
Jefferson
Dallas
Cleveland
Lincoln
Desha
Nevada
Ouachita
Calhoun
Drew
Bradley
Chicot
Lafayette
Columbia
Union
Ashley
*Based on USGS Reports 2008-5092 & 2007-5029
N
0
20
40
80
120
160
Miles
Legend
Crowleys Ridge
Intersection of the two cones
Cones of Depression in the Alluvial Aquifer
Cones of Depression in the Sparta Aquifer
County Boundaries

Fig. 2



Legend

- Crowley's Ridge
- Current Study Areas
- Current Critical Areas
- County Boundary

South Arkansas Study Area for Sparta in 1996

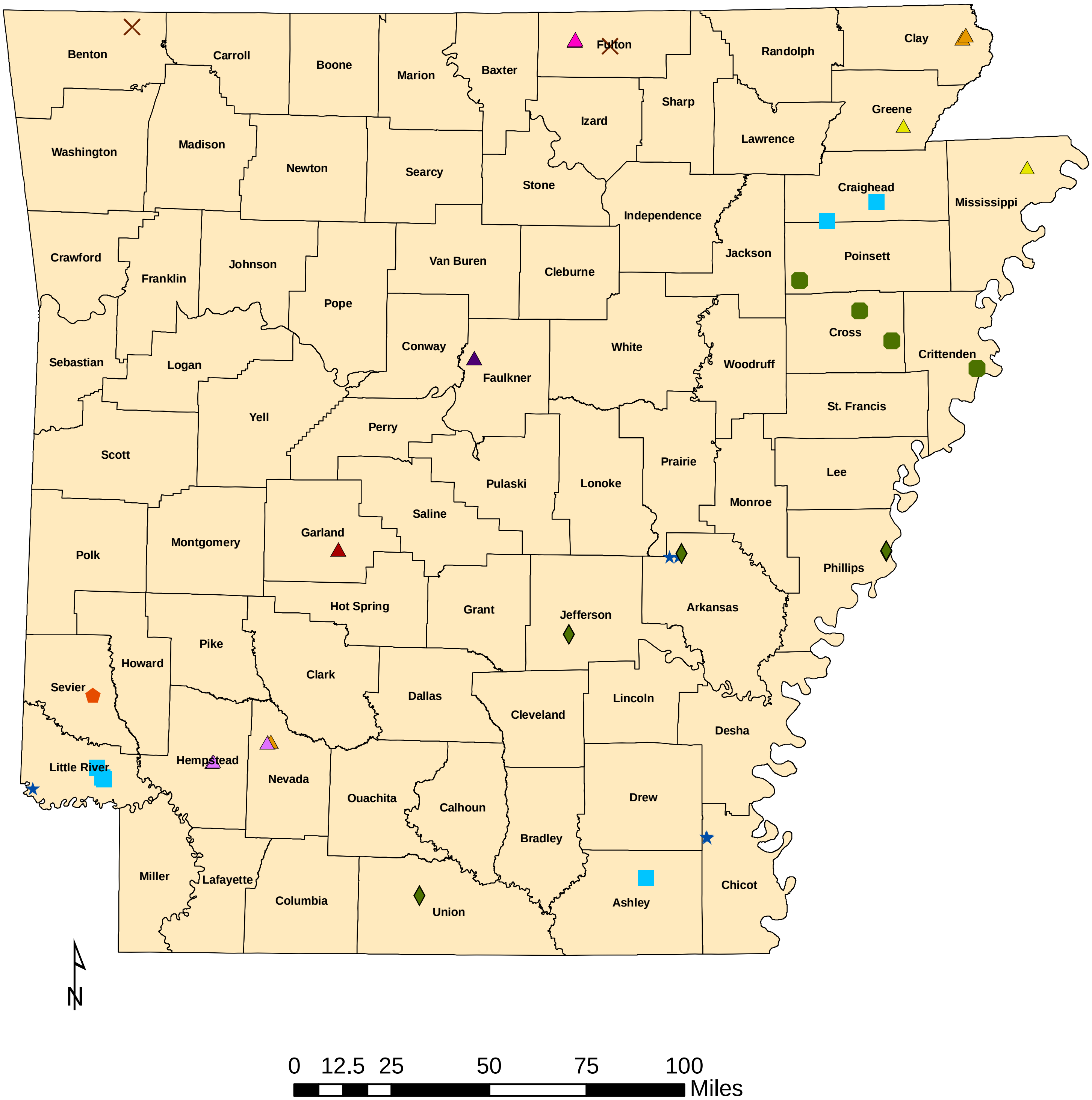
Grand Prairie Study Area for Sparta & Alluvial in 1998

Cache Study Area for Sparta/Memphis Sand & Alluvial in 2009

Fig. 3

0 12.5 25 50 75 100 Miles

USGS Master Well Locations



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- USGS Wilcox Group Master Wells (2 Wells)
- USGS Trinity Group Master Well (1 Well)
- USGS Master Wells in Terrace Deposits (6 Wells)
- USGS Sparta Master Well (5 Wells)
- USGS Tokio Formation Master Wells (3 Wells)
- USGS Nacatoch Sand Master Wells (4 Wells)
- USGS Memphis Sand Master Wells (4 Wells)
- USGS Roubidoux Master Wells (2 Wells)
- USGS Gunter Sand Master Wells (2 Wells)
- USGS Big Fork Chert Master Well
- USGS Atoka Master Well
- USGS Alluvial Master Wells (5 Wells)
- County Boundaries

Fig. 4

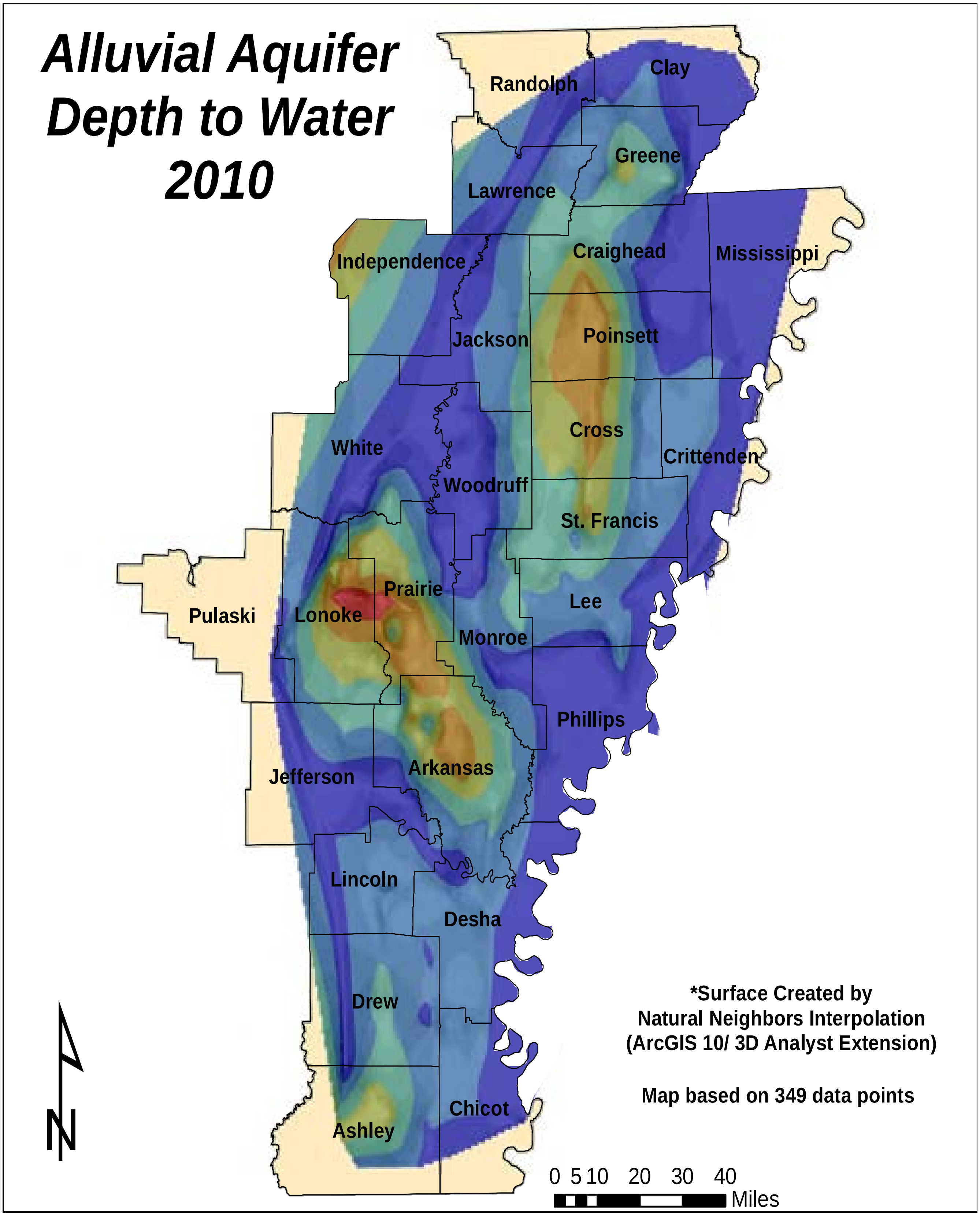
Hydrogeology and Statewide Water-Level Trends

Alluvial Aquifer

The Mississippi River Valley alluvial aquifer extends north from Arkansas into Missouri, south into Louisiana, and under the Mississippi River into Tennessee and Mississippi. For the purpose of this report, the term alluvial aquifer refers to the portion of the aquifer inside the state boundaries of Arkansas. This area generally is bounded by the Fall-Line or contact with outcropping Tertiary formations to the west, the Mississippi River to the east, and the state lines to the north and south. The aquifer is the uppermost aquifer in the Mississippi Embayment and is composed of 50 to 150 feet of sand and gravel, grading from coarse gravel at the bottom to fine sand at the top. It generally is overlain by the Mississippi River Confining Unit, which is composed of 0 to 50 feet of fine-grained sand, silt, and clay. The alluvial aquifer is underlain by confining units composed of aquifers and confining units of the Mississippi Embayment, which are less permeable than the alluvial aquifer. The alluvial aquifer is connected hydraulically with several rivers and drainage areas.

Due mostly to the use of ground water for agriculture in the region, the aquifer has been pumped in ever-increasing amounts since records were kept from the early 1900's. In 2008 Arkansas had ground-water withdrawals estimated to be 7,022.95 million gallons per day (Mgal/d). That is approximately a 470% increase from the amount used in 1965. (Holland, T.W. 2005, 2008).

In 2008 there was 7,022.95 Mgal/d pumped from the alluvial aquifer. The estimated sustainable yield for the alluvial aquifer is 2,987 Mgal/d, leaving an unmet demand of 4,035.95 Mgal/d (57.5%). Ground water furnishes 63% of the state's total consumption of water, and 95% of the ground water used comes from the alluvial aquifer. Agriculture accounts for 96% of the total water that is pumped from the alluvial aquifer. Figures 5 and 6 are illustrations of the 2010 depth to water, and 5-year water level change map. Increased pumping from this aquifer has resulted in decreased outflow <u>to</u> rivers, increased inflow <u>from</u> rivers, increased inflow <u>from</u> the overlying confining unit, regional changes in ground-water flow, regional water level declines, reduction of aquifer storage, and decreases in well yields (Ackerman, 1996).



Legend

Depth to Water, Below Land Surface

- 1 ft. - 24 ft.
- 25 ft. - 48 ft.
- 49 ft. - 71 ft.
- 72 ft. - 95 ft.
- 96 ft. - 118 ft
- 119 ft.- 142 ft.
- County Boundaries

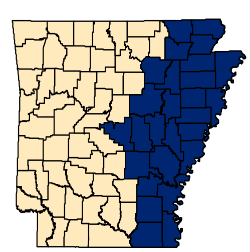
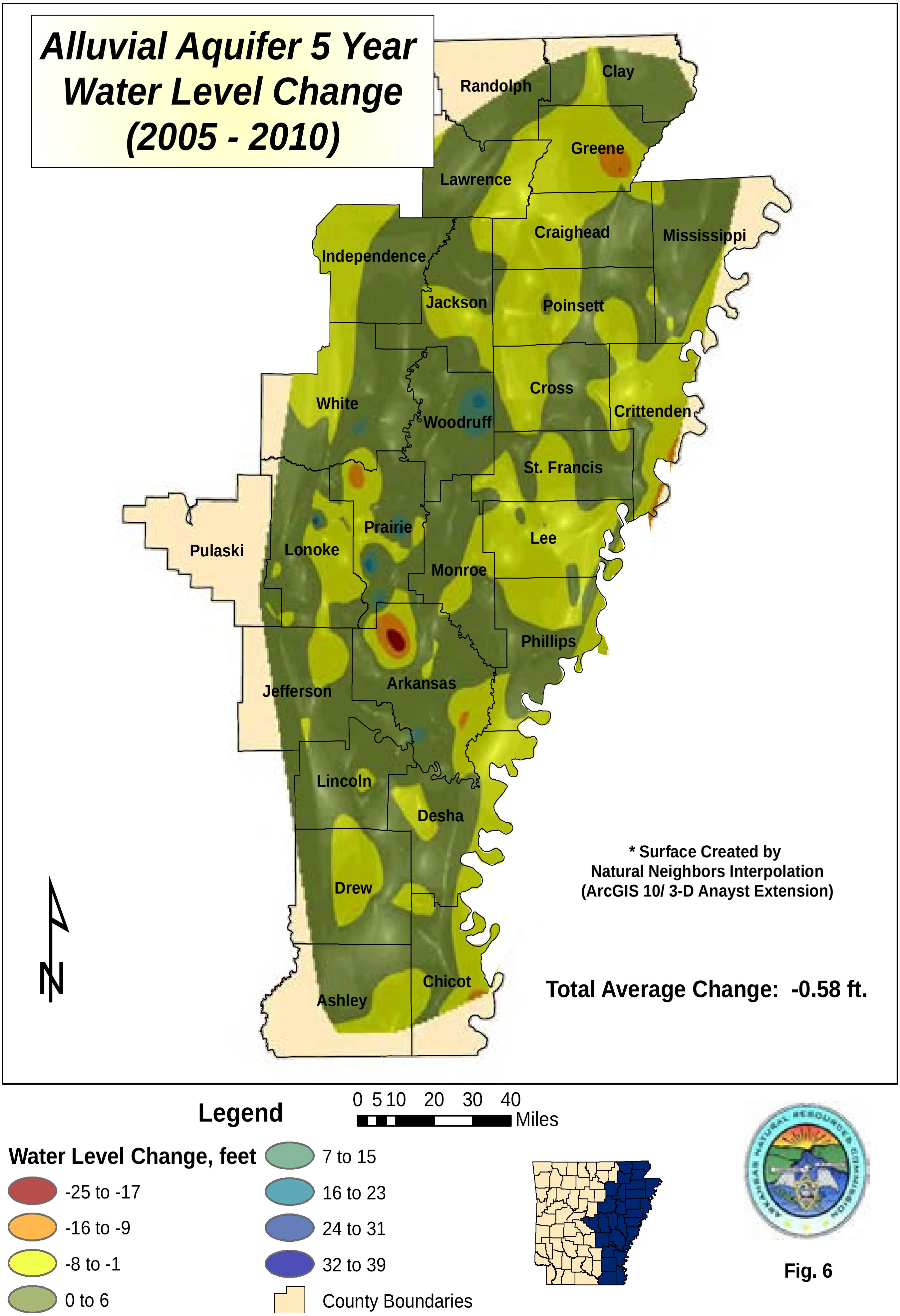
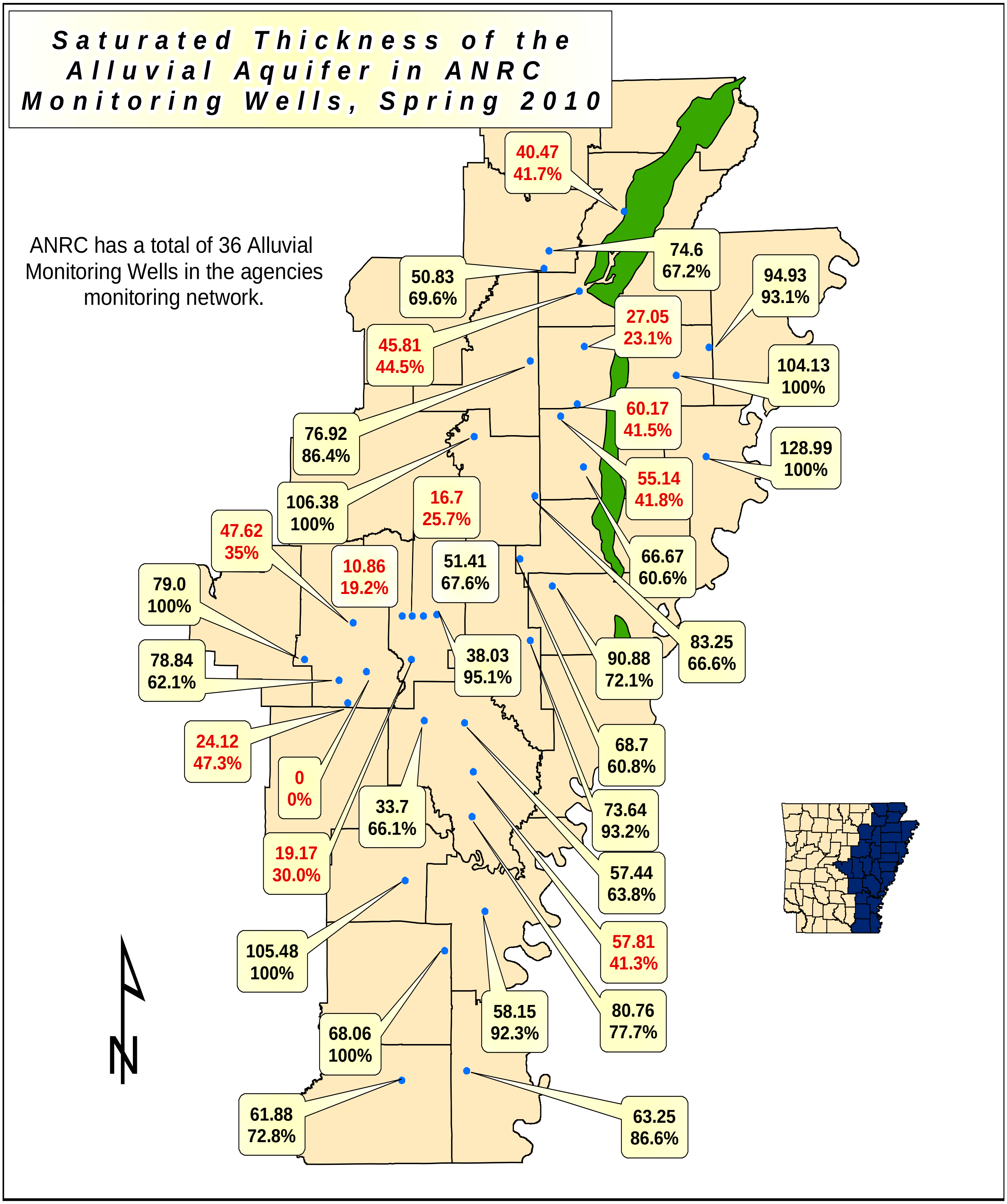


Fig. 5



Alluvial Aquifer 5 Year Water Level Change (2005 - 2010)
Randolph
Clay
Greene
Lawrence
Craighead
Mississippi
Independence
Jackson
Poinsett
White
Woodruff
Cross
Crittenden
St. Francis
Prairie
Lee
Pulaski
Lonoke
Monroe
Phillips
Jefferson
Arkansas
Lincoln
Desha
Drew
Chicot
Ashley
* Surface Created by
Natural Neighbors Interpolation
(ArcGIS 10/ 3-D Anayst Extension)
Total Average Change: -0.58 ft.
N
Legend
0 5 10 20 30 40
Miles
Water Level Change, feet
-25 to -17
-16 to -9
-8 to -1
0 to 6
7 to 15
16 to 23
24 to 31
32 to 39
County Boundaries

Fig. 6



Legend

- ANRC Wells
- Crowleys Ridge
- County Boundaries

Top number is Saturated Thickness (Feet)
Bottom Number is Percentage of Formation Saturated

Saturated Thickness less than 50% is in red.

0 12.5 25 50 75 100 Miles

Fig. 7

There were 279 alluvial aquifer wells monitored for water-level change in both 2009 and 2010, out of these 96 (24.7%) had a decline in the static water level. The overall water-level average change was 1.62 ft. The 2009 precipitation for Arkansas was approximately 80 inches, which is above the statewide average of 49.19 inches. Of 320 alluvial aquifer wells monitored in both 2005 and 2010, 199 (62.2%) of these had declining static water levels. Over a 10-year period of time from 2000 to 2010, 31 of 85 wells (36.5%) monitored showed declines in the alluvial aquifer. The average change over the entire aquifer during the 2009-2010 monitoring period was 1.62 feet; the 5-year average change was -0.58 feet; and the 10-year average change was 2.22 feet respectively. The greatest declines over the last 5 year period are apparent in Figure 5. Significant declines are seen in northwest and southeast Arkansas county, northwest Prairie county, and south-central Greene county. As seen in Figure 5 the deepest part of the cone of depression in the grand prairie has shifted to the northwest and is located in east-central Lonoke county and west-central Prairie county. Appendix A is a table of specific water level monitoring data for the alluvial aquifer. Appendix B is a series of selected hydrographs for alluvial aquifer wells. This water-level change data reflects the exceptionally high rainfall during the data collection period of Spring 2009 to Spring 2010. During such years, ground-water withdrawals are reduced, while recharge is typically greater.

Sparta/Memphis Aquifer

The Sparta/Memphis aquifer of Tertiary Age is located in the south, southeast, and east regions of Arkansas, as well as portions of Texas, Louisiana, and Mississippi. The aquifer outcrops in Dallas, Hot Spring, Saline, Grant, Nevada, Columbia, and Ouachita counties throughout the state. The Sparta/Memphis Sand aquifer thickness averages approximately 600 feet, ranging from a thickness of approximately 200 to 300 feet thick in the outcrop area, to about 900 feet thick in the southeastern part of the state. The majority of the area discussed in this report is a confined aquifer underlain by the Cane River Formation and overlain by the Cook Mountain Formation, both of which are effective confining units.

The Sparta aquifer in south Arkansas consists of two units, separated by the confining unit located between them: the upper Greensand aquifer and the lower El Dorado aquifer.

The Sparta is composed mainly of sand with considerable amounts of silt, clay, shale, and lignite, which are found in lenses throughout the unit. Lithologically, it varies considerably both vertically and laterally. Glauconite, a green hydrous potassium iron silicate mineral, is sometimes found in sand lenses in the upper levels of the aquifer, hence the name "Greensand".

The Memphis Sand aquifer in eastern Arkansas is part of a thick sand section in the middle and lower portions of the Claiborne Group. It includes the Sparta Sand, the predominantly sandy facies of the Cane River, and the Carrizo Sand. The Memphis aquifer is the major source of quality drinking water in the area.

Ground-water levels were collected from 237 water wells in the Sparta/Memphis aquifer throughout the south and east portions of Arkansas in 2009 and 2010. Fifty-five of those wells (23.2%) showed declines in the static water level. The average change over the entire aquifer during the 2009-2010 monitoring period was 4.61 feet. During the monitoring period from 2005 to 2010, 299 wells were monitored for water-level change, with 90 of these wells (39.3%) showed a decline in static water levels. During the 10-year monitoring period, 72 wells were monitored with 26 (36.1%) of these wells showing declines. Appendix C is a table of specific water level monitoring data for the Sparta/Memphis aquifer. For the Sparta/Memphis aquifer the USGS Conjunctive Use Optimization Model estimates that only 55.2 percent of the 2008 withdrawal of 157.5 Mgal/d is sustainable.

Data beginning in 1965 has been plotted as hydrographs for selected wells throughout the study area. Trend line analysis indicates that the general trend for most wells included in this study is that of a lowered potentiometric surface (Fig. 8). This decline in potentiometric surface in the aquifer can be attributed to a statewide increase in water use from 139 million gallons per day (Mgal/d) in 1970 to 157.5 Mgal/d in 2008. The estimated sustainable yield for the aquifer is 87 Mgal/d leaving an unmet demand of 70.5 Mgal/d. The most recent significant increase in water use from the Sparta has been for agricultural supply in the Grand Prairie and Cache Study Areas.

The exception to this rule is the data from the South Arkansas Study Area, where local education, conservation, and the use of excess surface water has led to significantly fewer declines, as well as some rebound in water levels in some areas. The potentiometric surface in five wells has actually risen over 90 feet respectively, over a 10-year period from 2000 to

2010. The figure below shows a graph of a well in the USGS Sparta Recovery Project. Appendix D is a series of hydrographs for Sparta/Memphis aquifer wells in Arkansas.

On April 21, 2008 the U.S. Department of the Interior awarded the Union County Water Conservation Board's Sparta Aquifer Recovery Project in southern Arkansas with the 2008 Cooperative Conservation Award, which recognizes the cooperative efforts of the board, along with many other contributors to this effort including the Arkansas Natural Resources Commission and the U.S. Geological Survey, Arkansas District. This project continues to be recognized across the nation as a success story in the field of natural resources conservation and protection.

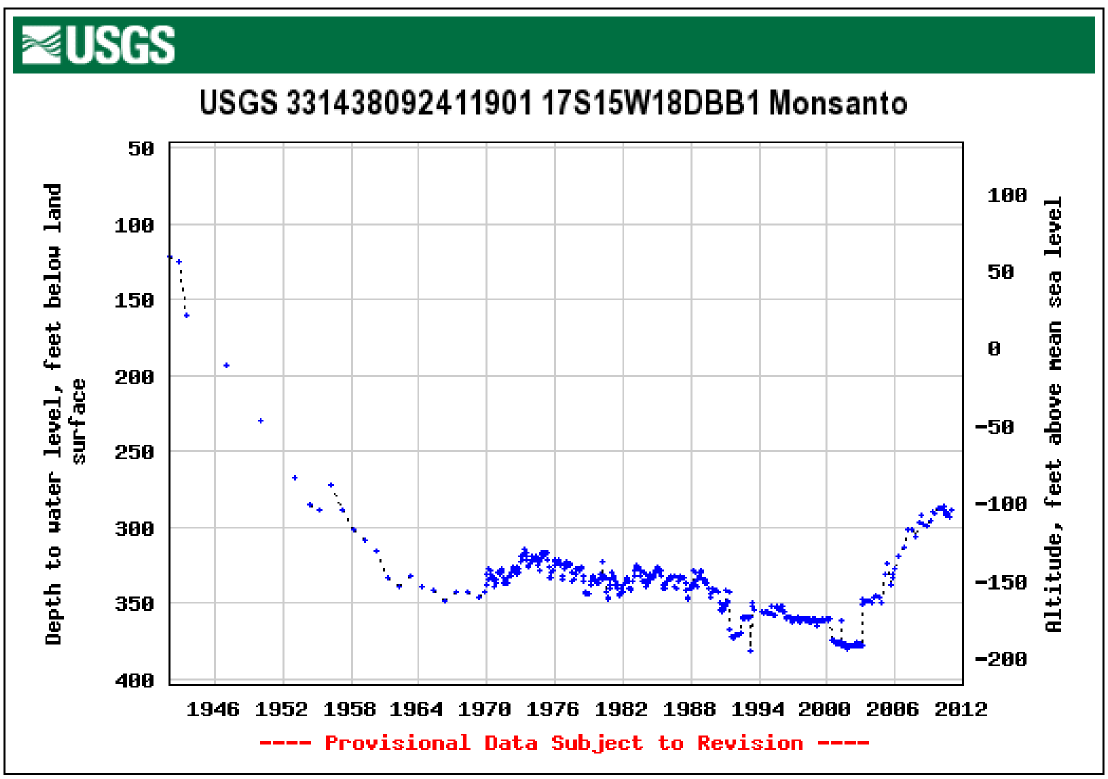


Table 2.

Nacatoch and Tokio Aquifers

During the spring of 2008 the USGS studied the Nacatoch Sand and Tokio Formation aquifers. The Nacatoch Sand and the Tokio Formation are both utilized in Sevier, Little River, Howard, Pike, Hempstead, Nevada and Clark counties in southwest Arkansas. The Nacatoch Sand is also utilized as an aquifer in Greene and Clay counties in northeast Arkansas. The monitoring wells there showed an average change of -1.2 feet over the last 20 years in the northeast, and various changes ranging from -2.0 feet in a 3-year period to +17.6 feet in a 5 year period.

Monitoring wells located in the Tokio Formation also showed fluctuations in the potentiometric surface that may be associated with changing water demands from the aquifer. A long-term USGS monitoring well in this formation showed an average change of -3.8 feet from 1971 to 2008. (Schrader and Blackstock 2010) Below is a USGS hydrograph of a well monitored in the Nacatoch Sand in Clay County.

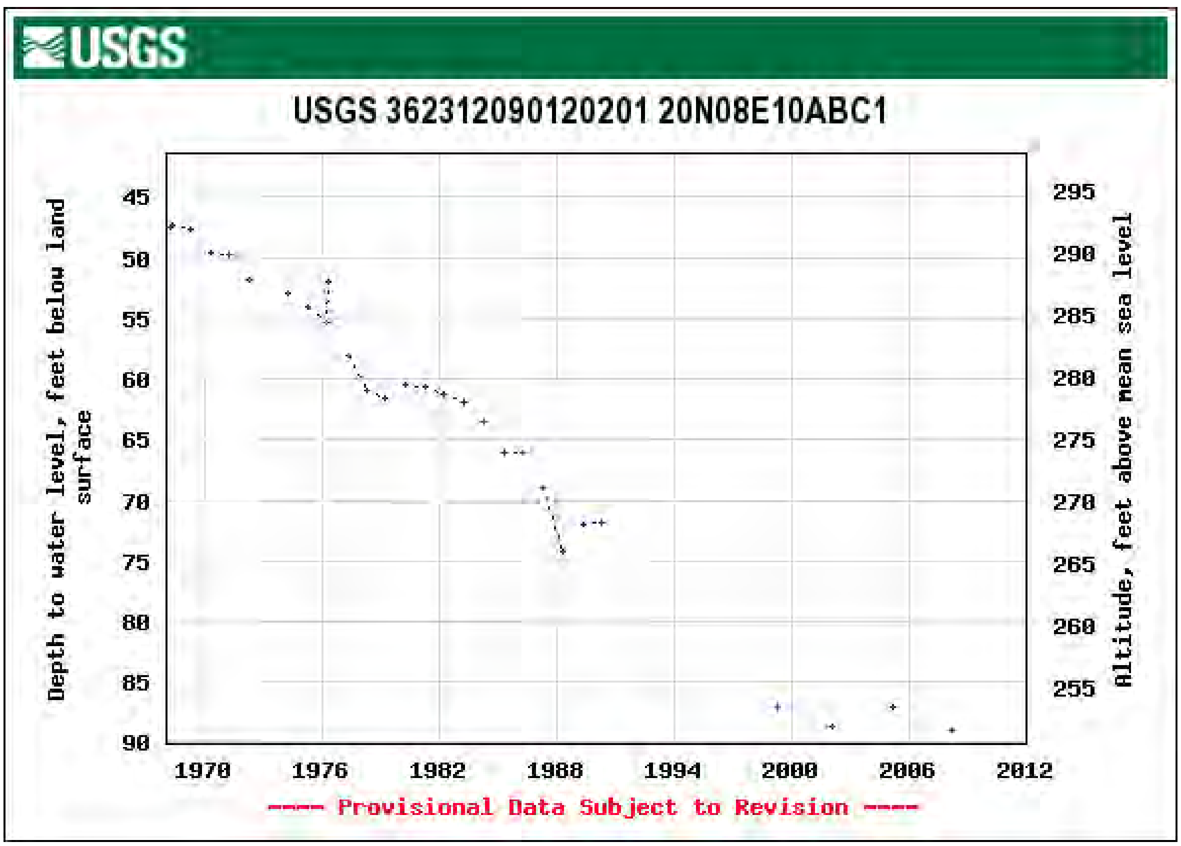
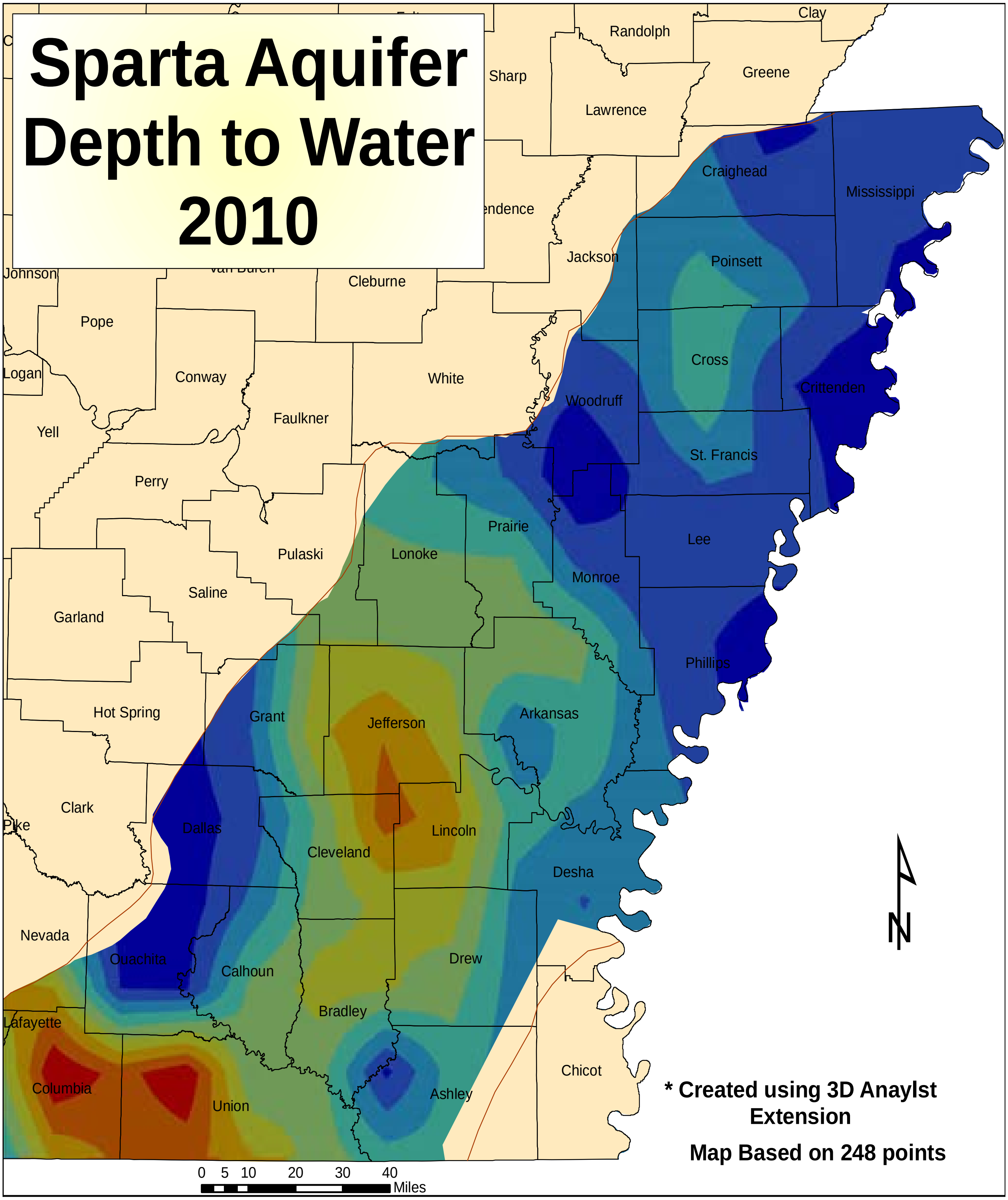


Table 3.



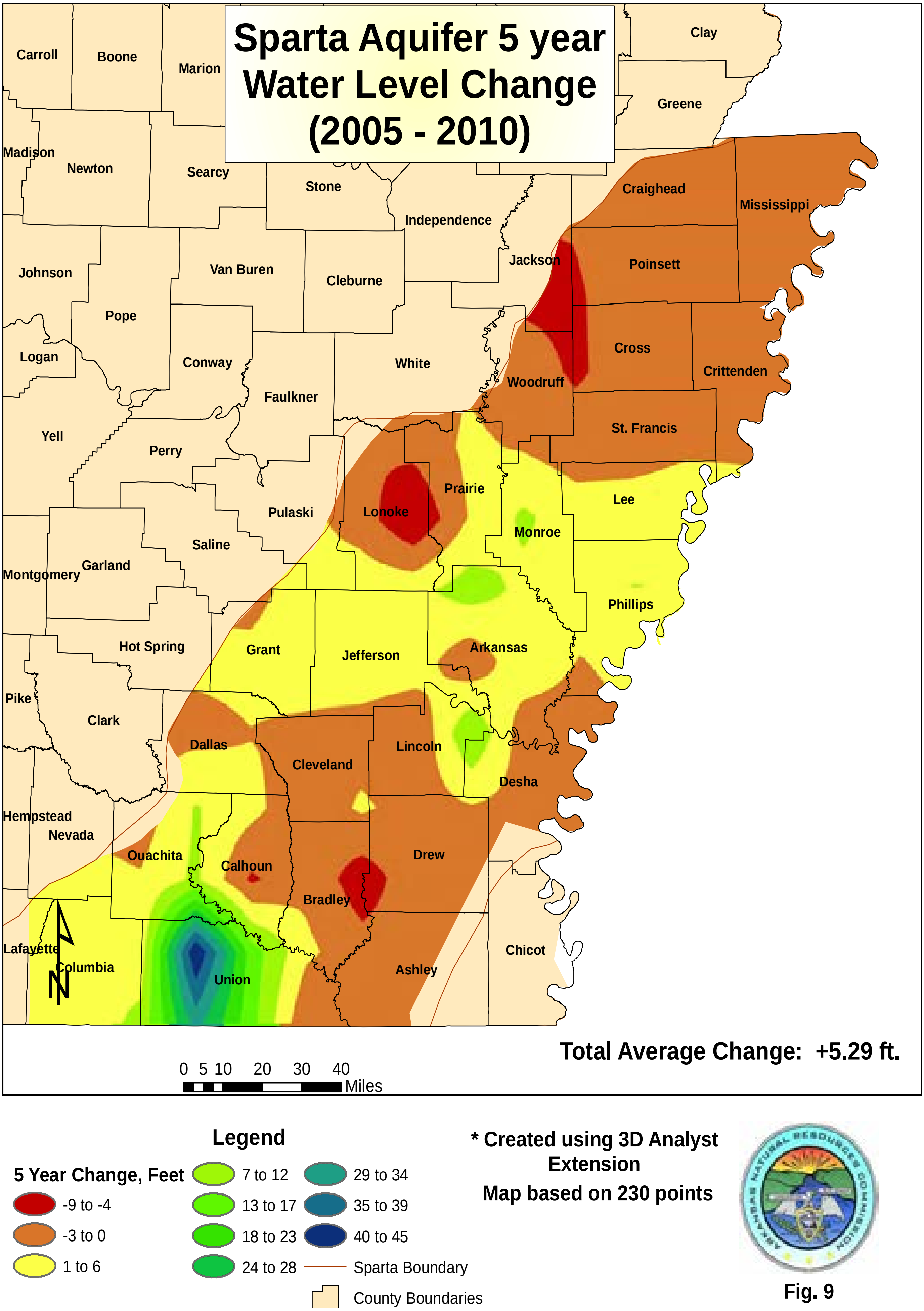
Legend

Sparta Boundary

Sparta Depth to Water, Feet

- 14 - 44
- 45 - 74
- 75 - 104
- 105 - 133
- 134 - 163
- 164 - 193
- 194 - 223
- 224 - 252
- 253 - 282
- County Boundaries

Fig. 8



Sparta Aquifer 5 year Water Level Change (2005 - 2010)
Carroll
Boone
Marion
Clay
Greene
Madison
Newton
Searcy
Stone
Craighead
Mississippi
Independence
Johnson
Van Buren
Cleburne
Jackson
Poinsett
Pope
Logan
Conway
White
Faulkner
Cross
Woodruff
Crittenden
Yell
Perry
St. Francis
Prairie
Pulaski
Lonoke
Lee
Monroe
Saline
Garland
Montgomery
Phillips
Hot Spring
Grant
Jefferson
Arkansas
Pike
Clark
Dallas
Lincoln
Cleveland
Desha
Hempstead
Nevada
Ouachita
Calhoun
Drew
Bradley
Lafayette
Columbia
Union
Ashley
Chicot
N
0 5 10 20 30 40
Miles
Total Average Change: +5.29 ft.
Legend
5 Year Change, Feet
-9 to -4
-3 to 0
1 to 6
7 to 12
13 to 17
18 to 23
24 to 28
29 to 34
35 to 39
40 to 45
Sparta Boundary
County Boundaries
* Created using 3D Analyst Extension
Map based on 230 points

Fig. 9

GROUND-WATER LEVELS AND WATER-LEVEL CHANGE

MONITORING PROTOCOL

The United States Geological Survey (USGS), in cooperation with the Arkansas Natural Resources Commission (ANRC), the Arkansas Geological Commission (AGC), and the Natural Resource Conservation Service (NRCS), monitor wells throughout the entire state for general ground water quality as well as to record water levels. In addition, several agencies continually monitor wells throughout the state in an effort to detect significant changes and/or trends in ground-water levels and ground-water quality. The ANRC has recently added to this monitoring network by constructing 50 wells primarily in the eastern part of the state used exclusively for monitoring purposes, with more to be added in the near future. (Fig.36) All water level data collected by the USGS and ANRC is collected in accordance with USGS data collection protocol.

Water-level measurements are made each spring for a designated portion of the monitoring network of approximately 1,200 wells statewide. A schedule of monitoring has been established based upon existing funding and the ANRC's management and protection responsibilities as mandated by the Arkansas General Assembly. The monitoring schedule has been set up to obtain data annually from the alluvial and Sparta/Memphis aquifers. Other aquifers with less usage are measured at least once every five years. Measurements of water levels in the alluvial and Sparta/Memphis aquifers are taken each spring to obtain as close to true static water level data as possible. This allows the water level data to be the least affected by summer pumping. Measurements in the alluvial aquifer are obtained each spring and fall by the NRCS and are helpful in evaluating the zones of drawdown that result from seasonal pumping for irrigation of crops.

SOUTH ARKANSAS CRITICAL GROUND-WATER AREA

The South Arkansas Critical Ground-Water Area is composed of the Sparta aquifer in Bradley, Calhoun, Columbia, Ouachita, and Union Counties. In 1996 this area was the first to be designated as a critical ground water area for the Sparta aquifer pursuant to the Arkansas Groundwater Protection and Management Act of 1991.

Continued monitoring of Sparta aquifer ground-water levels show that some ground-water levels in this region have stabilized or risen, while others continue to decline. The South Arkansas Study Area as a whole had an average change of +4.04 feet during the 2009-2010 monitoring period, with only 29 of the 93 wells monitored showing declines (Fig.10). The diminishing declines in average change seem to indicate that the education, conservation, and development of surface water from the Ouachita River in Union county have made an impact on ground-water levels.

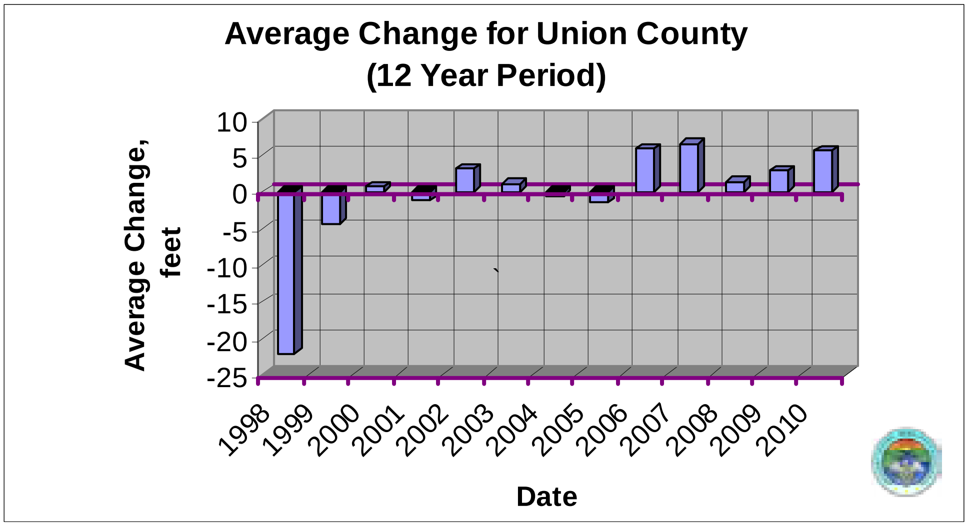


Table 4.

The USGS reports that water levels have risen in all eight of the Sparta Recovery wells since the summer of 2003. The "Monsanto" well is a good example of the recovery because it is located near the center of the cone of depression in this area. A graph of this well can be seen in table 3 on page 24.

Since the lowest water level recorded in this well 10 years ago, to the level recorded in December of 2010, the cone of depression in this study area has rebounded more than 90 feet.

During the 5-year monitoring period, from 2005 to 2010, the South Arkansas Study Area had an average change of +12.23 feet. 89 wells were monitored over this time, with 22 of them showing a decline in static water levels. Union county had an average change of +28.09 feet during this time. (Fig. 11)

Though the trend of water level increases in the South Arkansas Study Area have been encouraging, many of the wells in the area still show the potentiometric surface below the top of the formation. This criteria alone is enough for the study area to keep the designation of a Critical Ground-Water Area. The USGS ground-water flow models indicate that the withdrawals in Union county must be reduced to 28 percent of the 1997 pumping rate (4.84 Mgal/d) to maintain water levels at or above the top of the Sparta Sand. (Hays, 2000) Union county's use of 7.0 Mgal/d in 2008 is still 2.16 Mgal/d (31%) unmet demand.

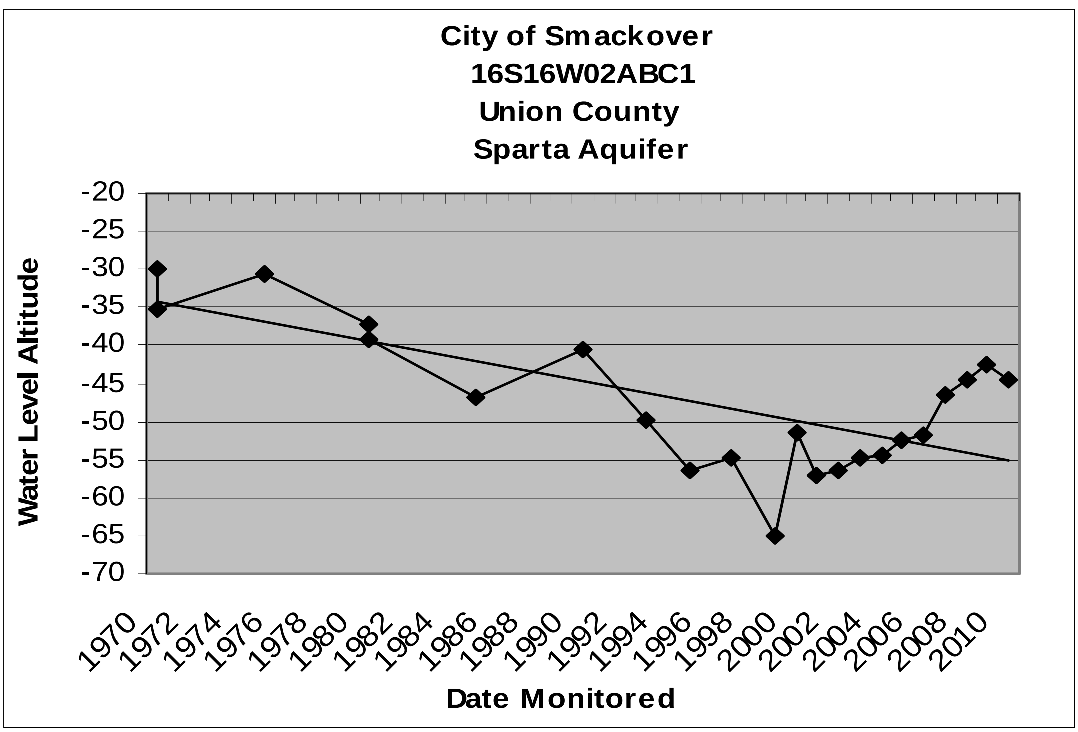
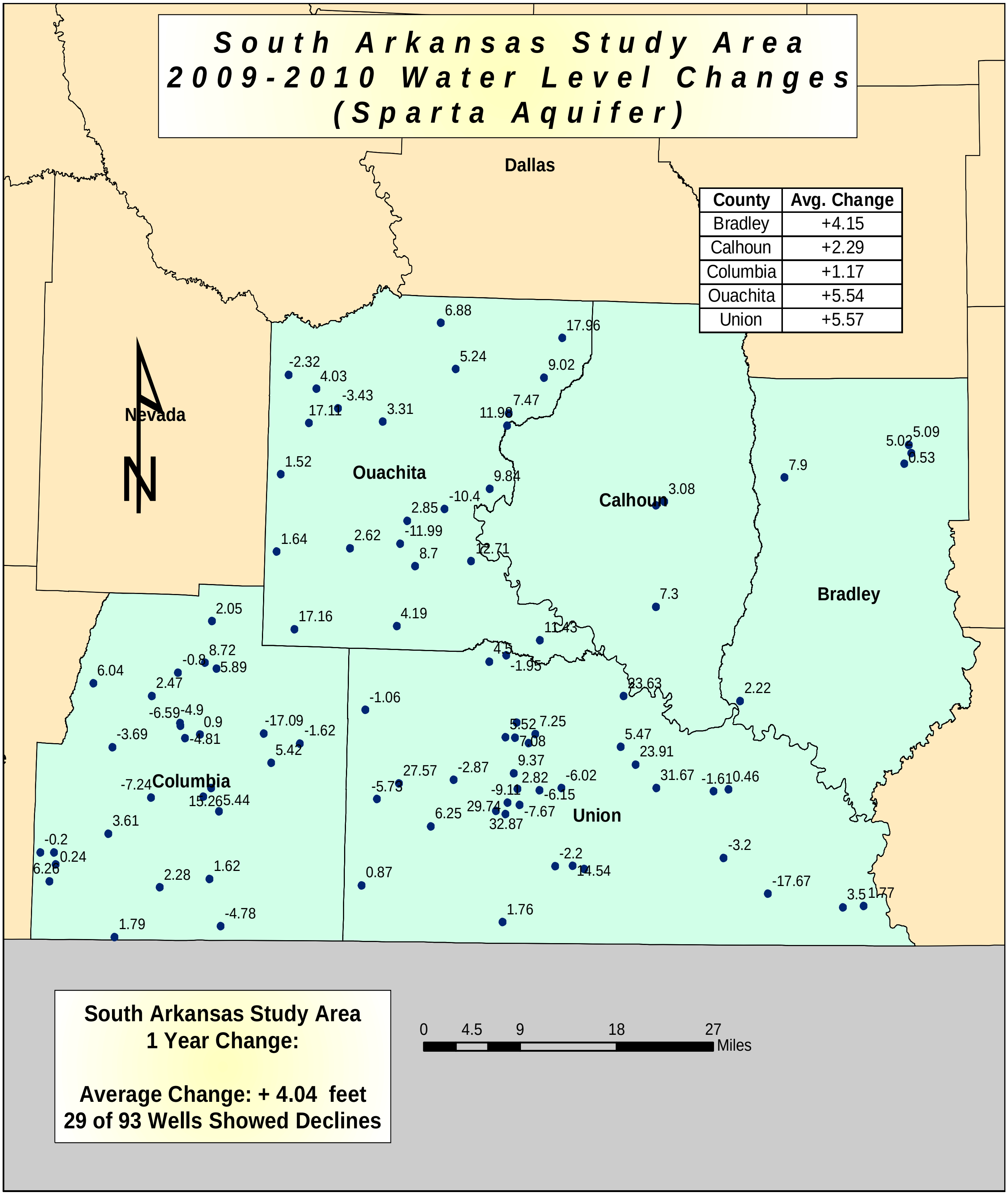


Table 5.

South Arkansas Study Area
2009-2010 Water Level Changes
(Sparta Aquifer)



County	Avg. Change
Bradley	+4.15
Calhoun	+2.29
Columbia	+1.17
Ouachita	+5.54
Union	+5.57

Legend

Wells

South Arkansas Study Area

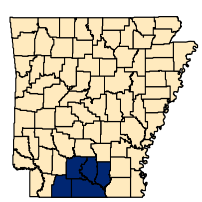
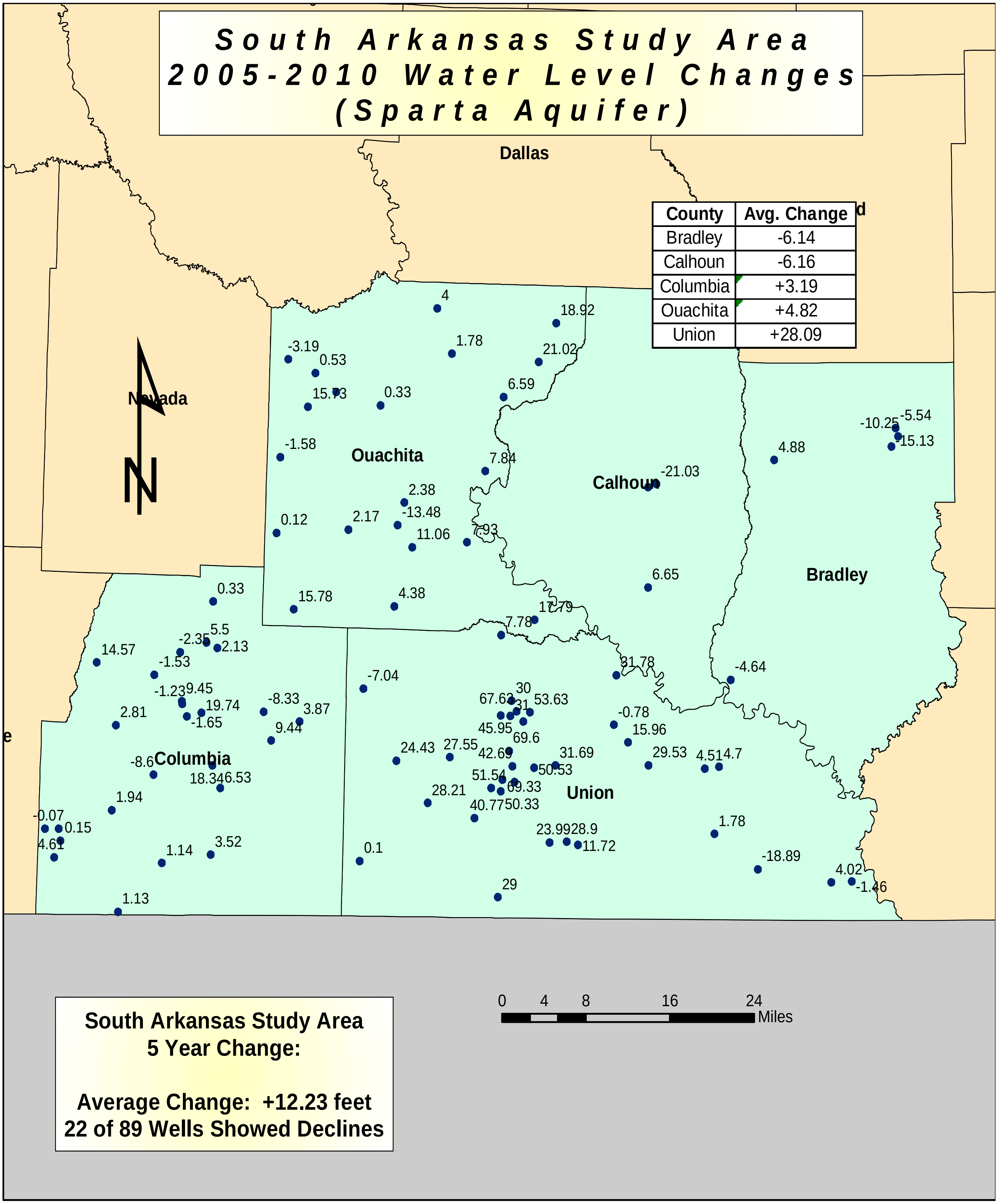


Fig. 10



Legend

- Wells
- South Arkansas Study Area

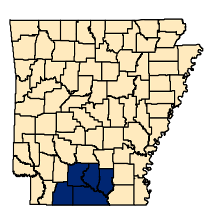
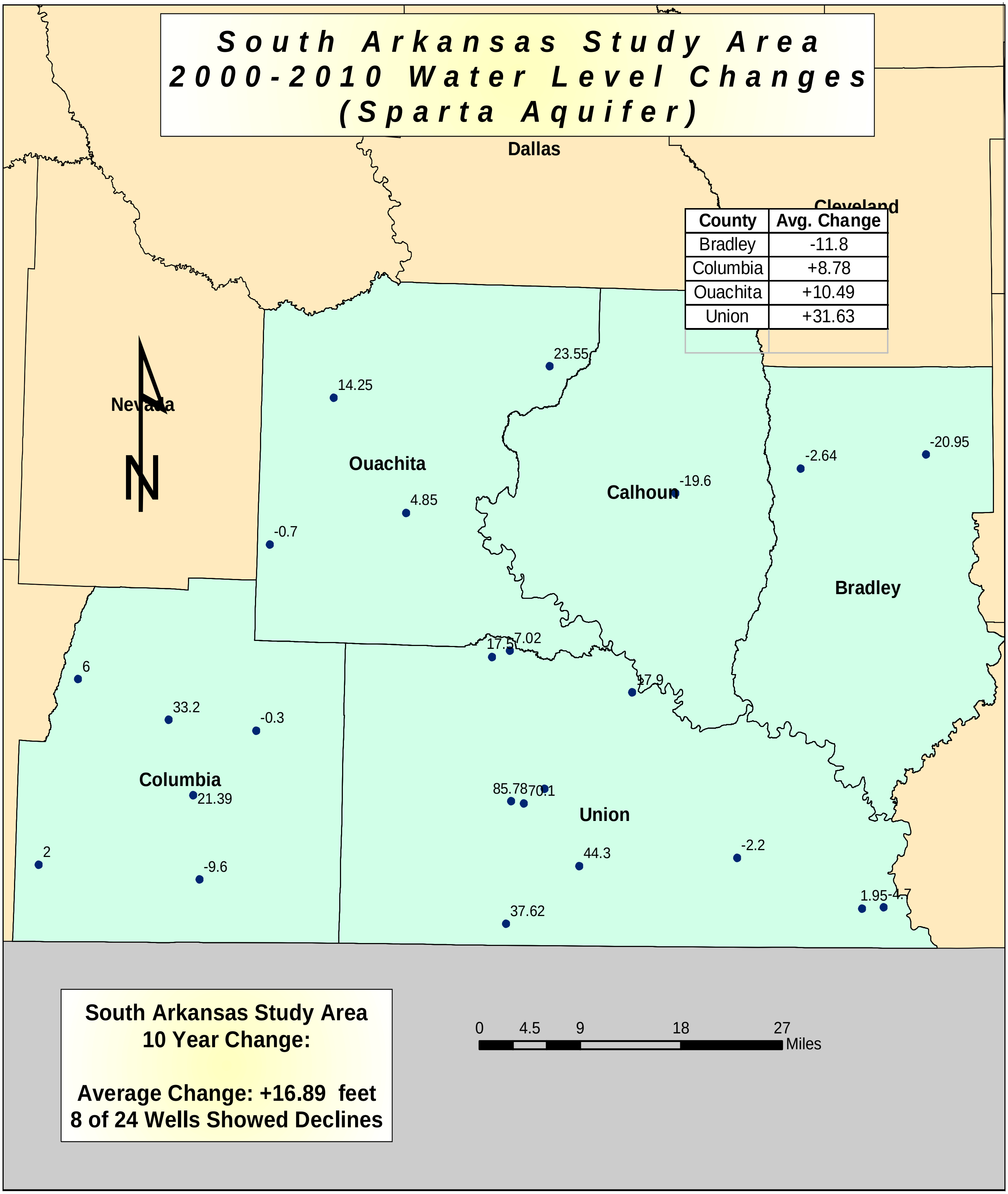


Fig. 11



Legend

Wells

South Arkansas Study Area

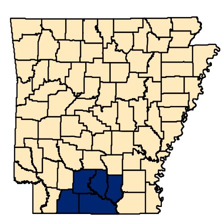


Fig. 12

GRAND PRAIRIE CRITICAL GROUND-WATER AREA

The designation "Grand Prairie" varies according to authors, but is commonly used to designate the area bounded on the south and west by the Arkansas River and on the north and east by the White and Little Red Rivers. (Ackerman, 1996) (Fig.1) This area was designated as a critical ground-water area for the alluvial aquifer and for the Sparta/Memphis aquifer in July 1998. Since designation, water levels have continued to decline throughout much of the Grand Prairie in both the alluvial and Sparta/Memphis aquifers.

During the 2009-2010 monitoring period there were 59 wells monitored with 9 (15.3%) showing average declines in the Sparta/Memphis aquifer throughout the counties in this study area. (Fig.12)

The entire Grand Prairie Study Area averaged a +2.39 foot change during this 5-year period from 2005 to 2010 in the Sparta/Memphis aquifer, with 24 of 59 (40.7%) of the wells monitored showing declines. (Fig.13)

Over the 10-year period from 2000 to 2010 the Sparta/Memphis aquifer has shown an average change of +7.66 feet. There were 22 wells monitored during this time, with 5 (22.7%) showing declines in water level. (Fig. 14)

Withdrawals form the Sparta Aquifer in Arkansas county have increased from an estimated 20.3 Mgal/d in 1970 (Halburg, 1972) to a reported water use of 41.05 Mgal/d in 2008, an increase of 198% over this time period. While there is still a significant cone of depression in the Sparta aquifer in this study area, the record rainfall of 2009 resulted in less pumping; therefore, less drawdown during this monitoring period.

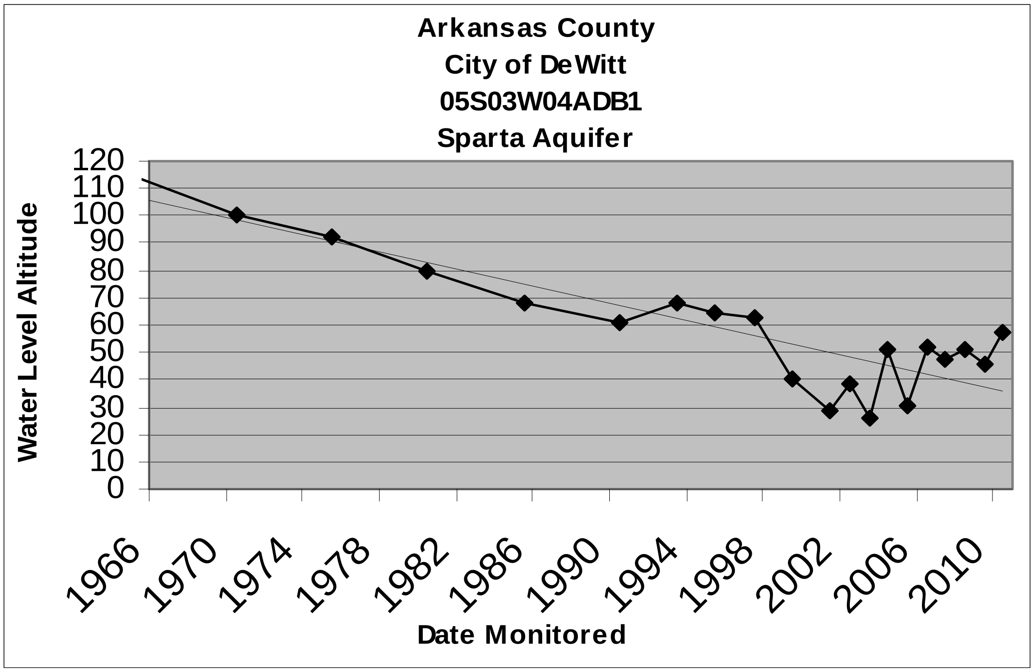


Table 6.

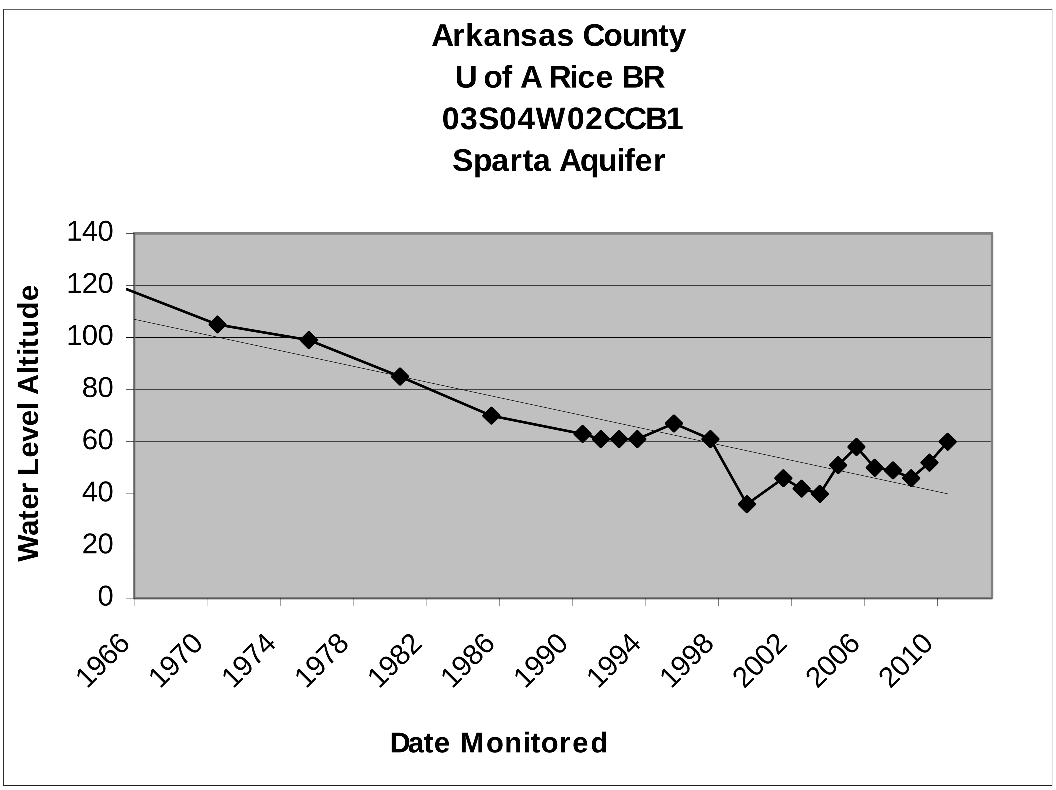
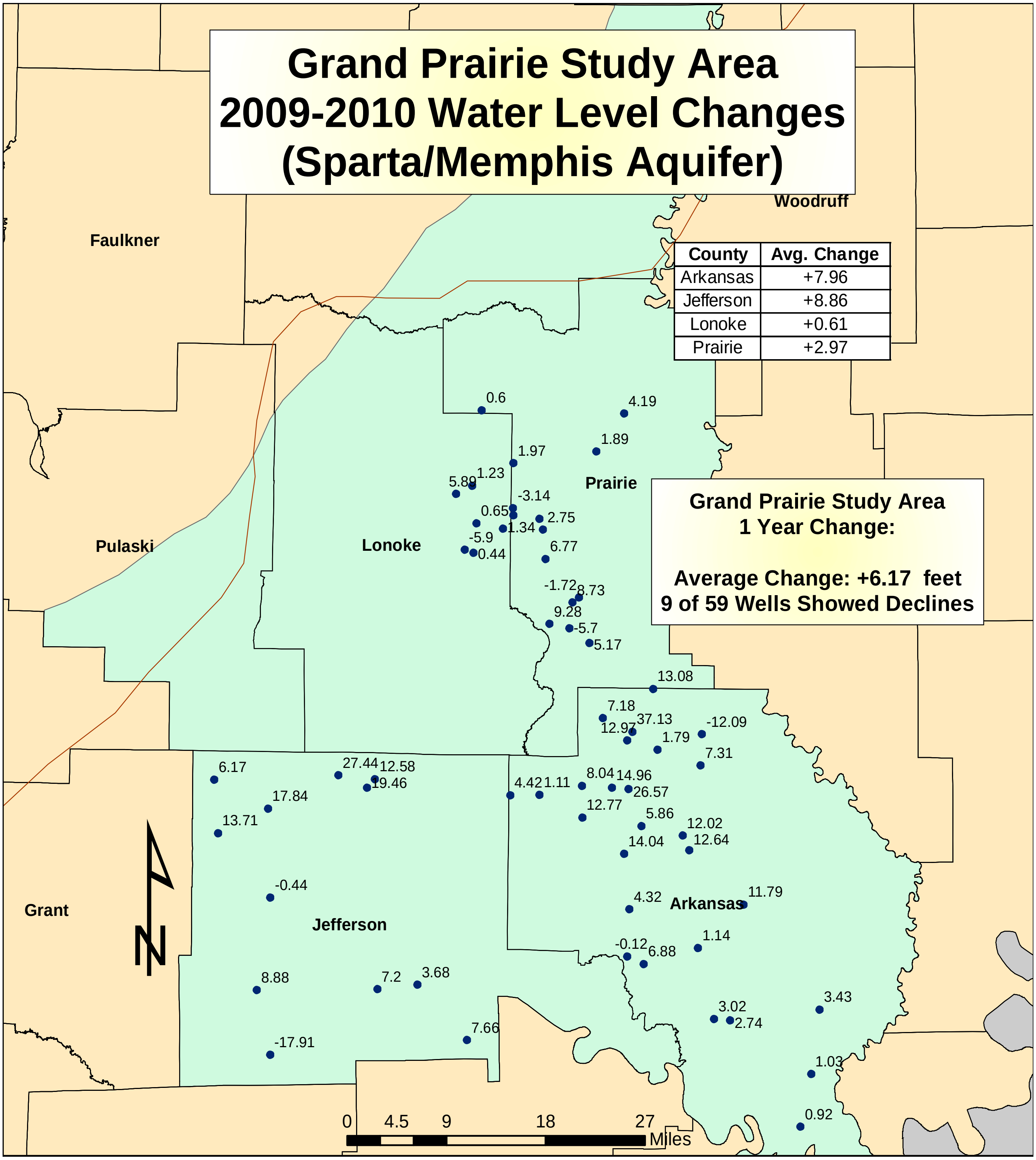


Table 7.



County	Avg. Change
Arkansas	+7.96
Jefferson	+8.86
Lonoke	+0.61
Prairie	+2.97

Legend

- Wells
- Sparta Boundary
- Grand Prairie Study Area

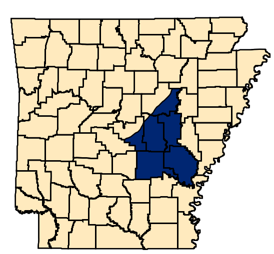
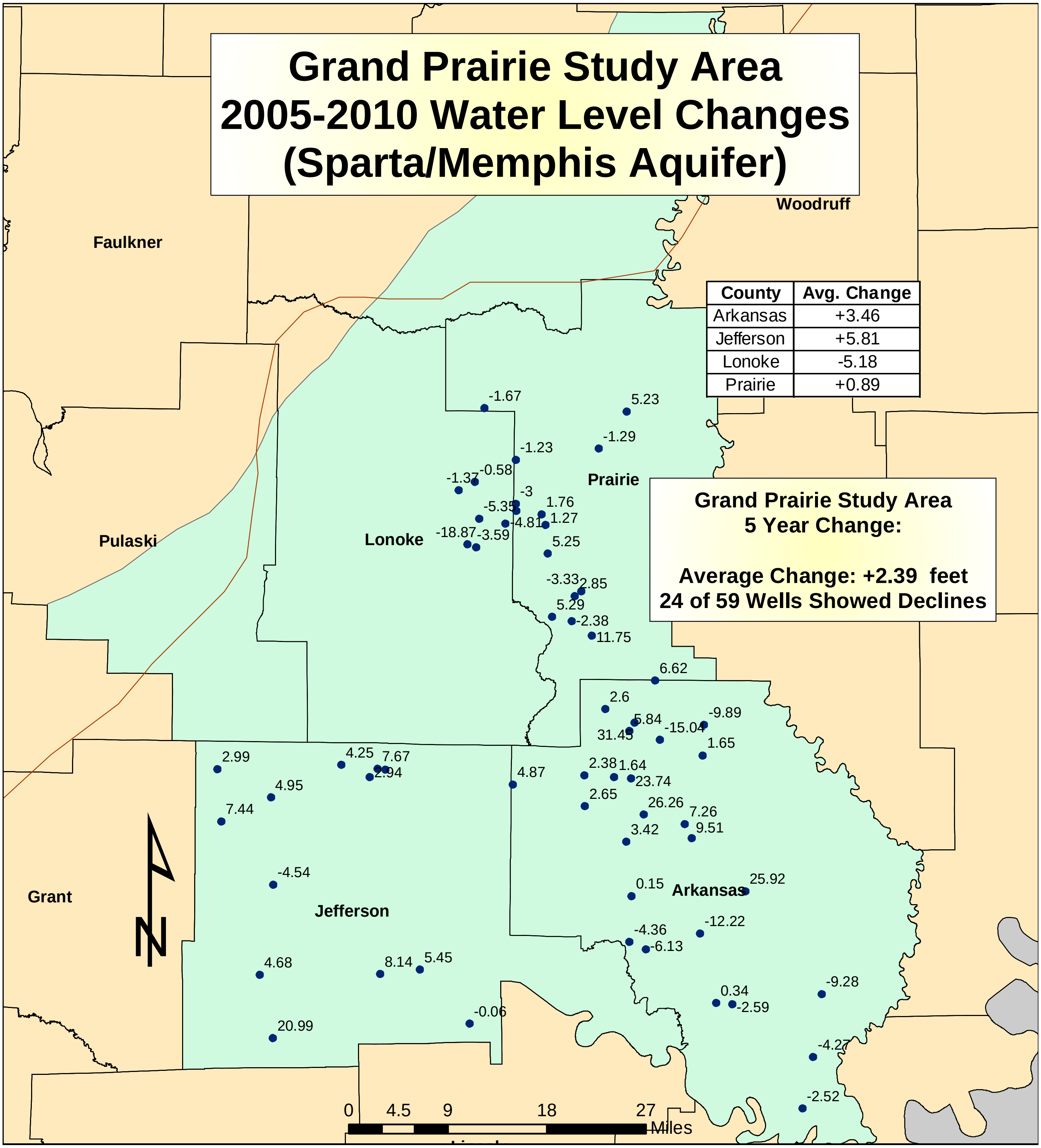


Fig. 13



Legend

- Wells
- Sparta Boundary
- Grand Prairie Study Area

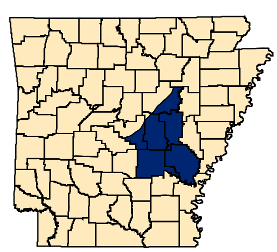
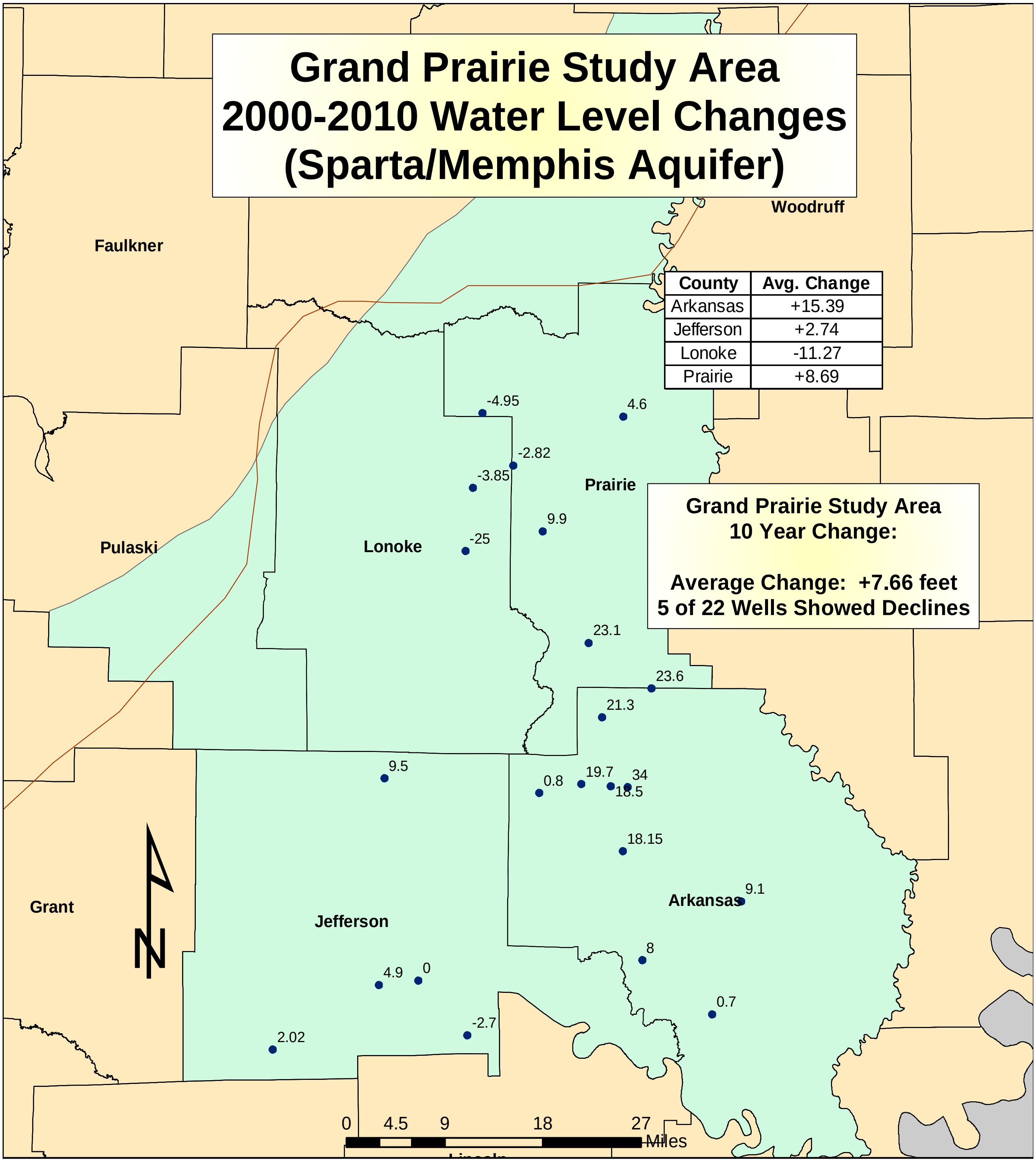


Fig. 14

Grand Prairie Study Area 2000-2010 Water Level Changes (Sparta/Memphis Aquifer)



County	Avg. Change
Arkansas	+15.39
Jefferson	+2.74
Lonoke	-11.27
Prairie	+8.69

Legend

- Wells
- Sparta Boundary
- Grand Prairie Study Area

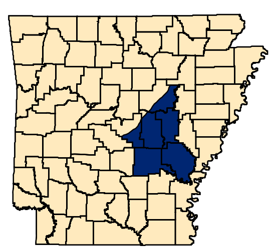


Fig. 15

In the alluvial aquifer Grand Prairie Critical Ground Water Area, there were 92 wells monitored with 31 showing declines from 2009 to 2010. The average change for the entire study area was +1.50 feet. (Fig.16)

During the 5-year monitoring period from 2005 to 2010, the Grand Prairie Study Area had an average change of +0.28 feet with 70 of the 124 wells (56.5%) monitored showing declines. (Fig.17)

From 2000 to 2010 the alluvial aquifer in the Grand Prairie Study Area had an average change of +5.74 feet, with 10 of 33 (30.3%) wells monitored showing declines. (Fig.18)

For the alluvial aquifer in the Grand Prairie Study Area, the USGS Conjunctive Use Optimization Model indicated that the ground-water use in this area is substantially more than is sustainable. Based on the 1997 pumping rates, Jefferson County could sustain 90.1% of the counties reported use for 2008, Prairie County 64.7%, Arkansas County 47.6%, and Lonoke County 45.8% respectively. (Fig.41) The Grand Prairie Irrigation Project, once in place, is expected to significantly help reduce these counties' unmet demands for irrigation.

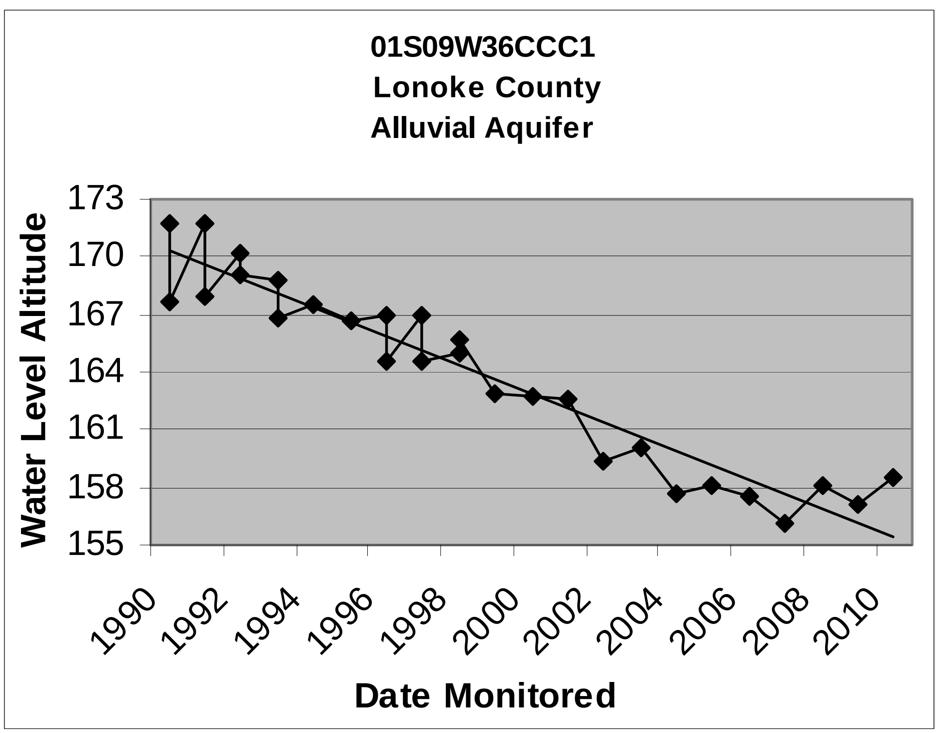


Table 8.

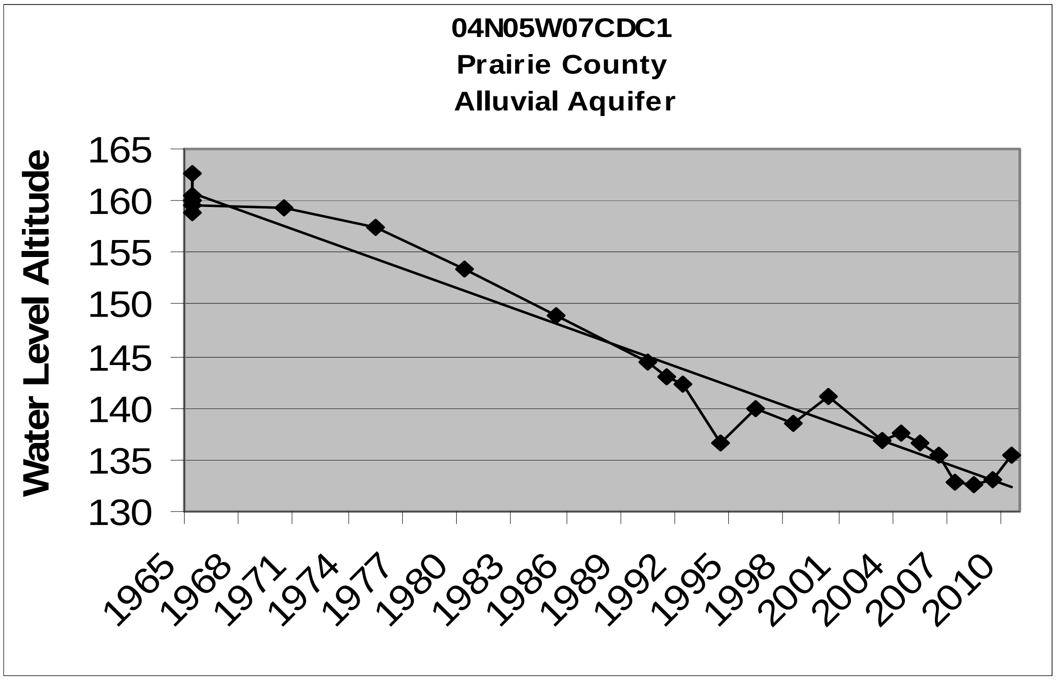


Table 9.

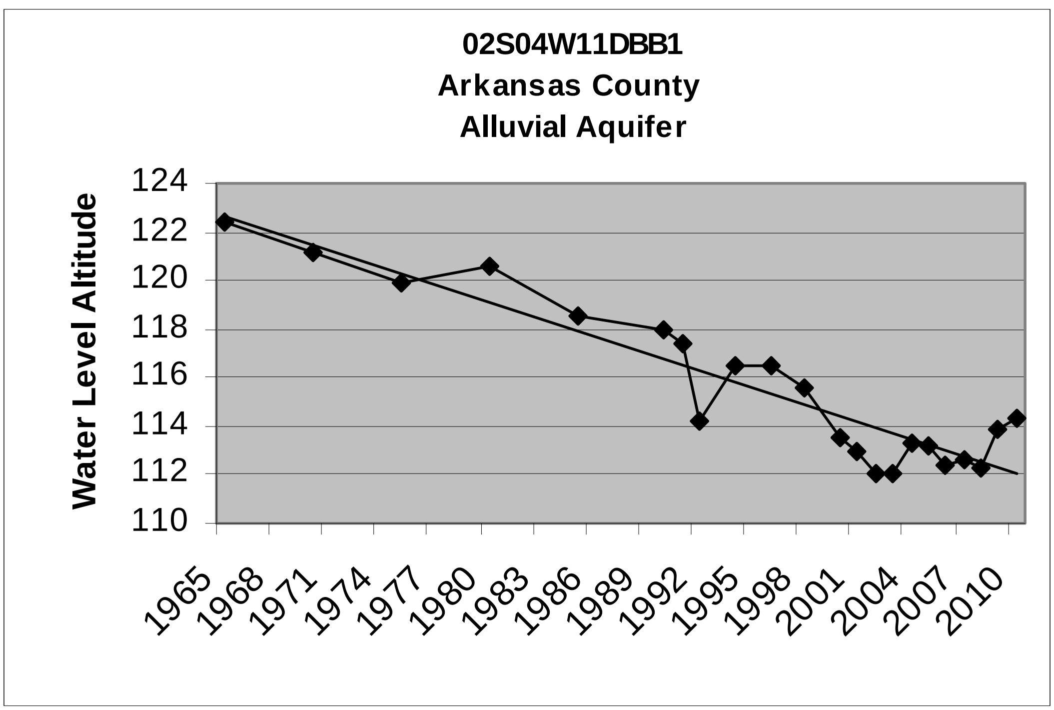
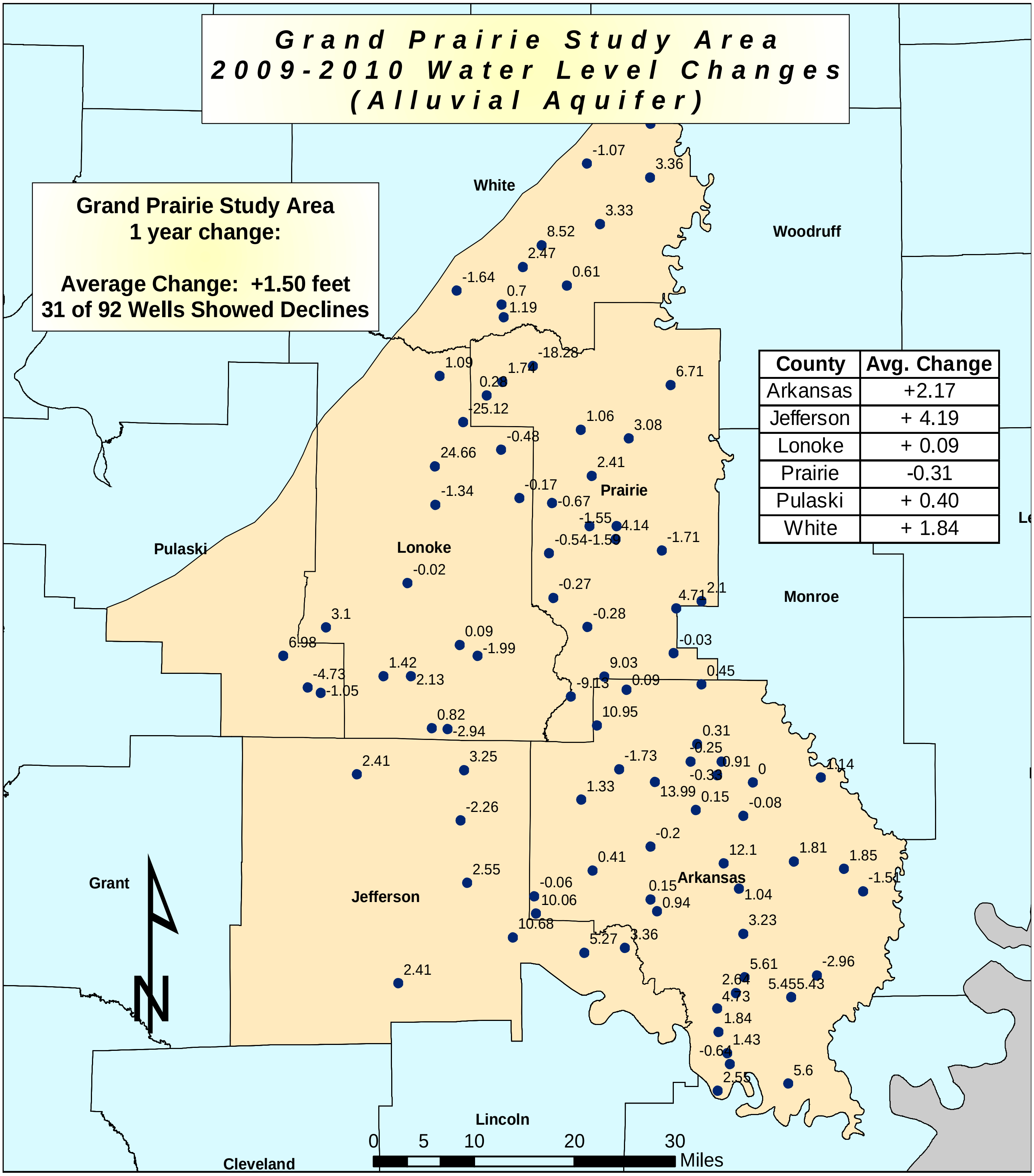


Table 10.



County	Avg. Change
Arkansas	+2.17
Jefferson	+ 4.19
Lonoke	+ 0.09
Prairie	-0.31
Pulaski	+ 0.40
White	+ 1.84

Legend

- Wells
- Grand Prairie Study Area

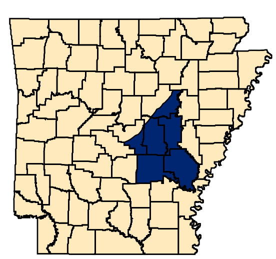
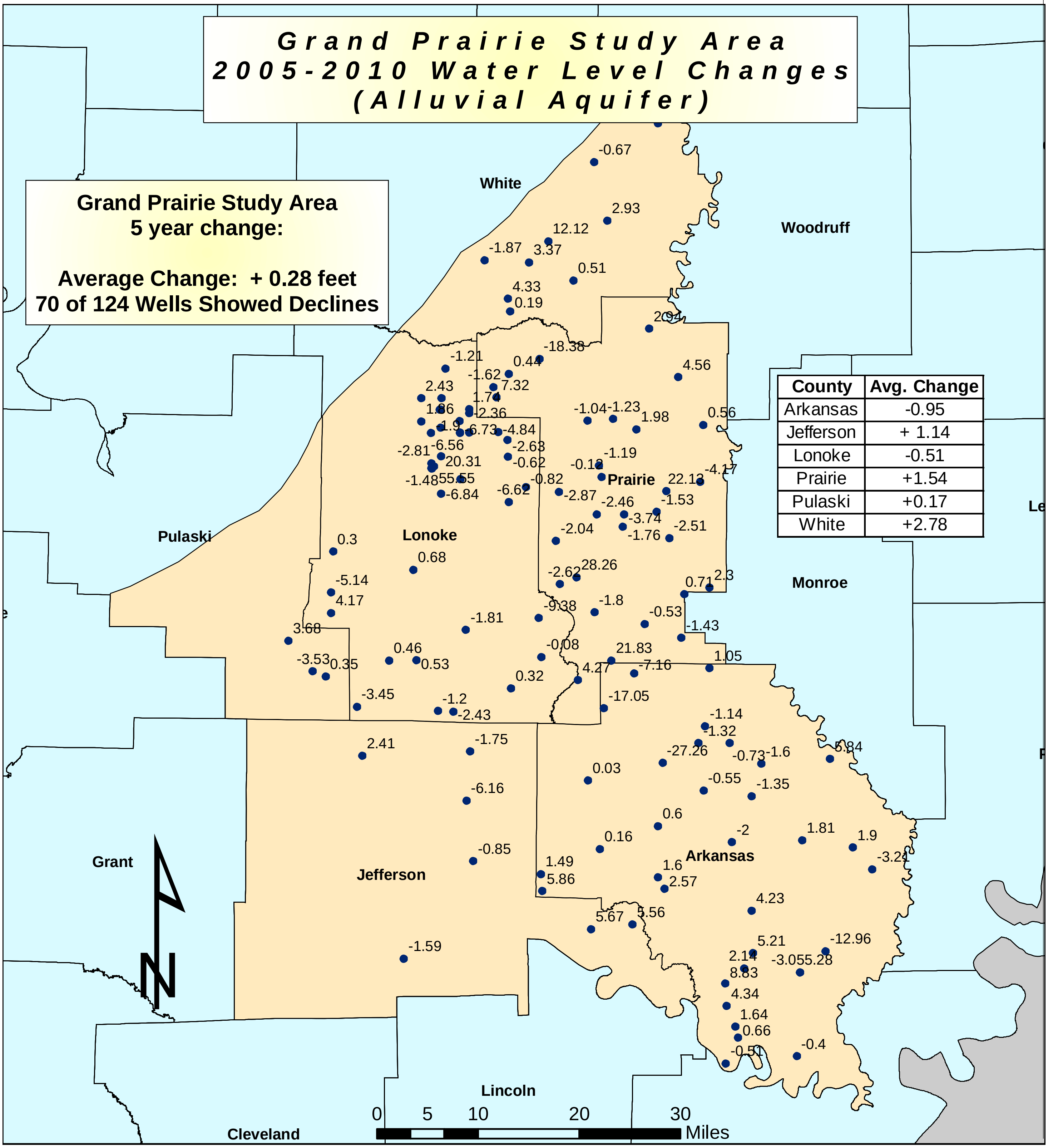


Fig. 16



County	Avg. Change
Arkansas	-0.95
Jefferson	+ 1.14
Lonoke	-0.51
Prairie	+1.54
Pulaski	+0.17
White	+2.78

Legend

- Wells
- Grand Prairie Study Area

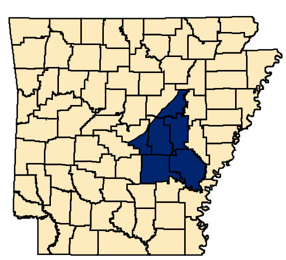
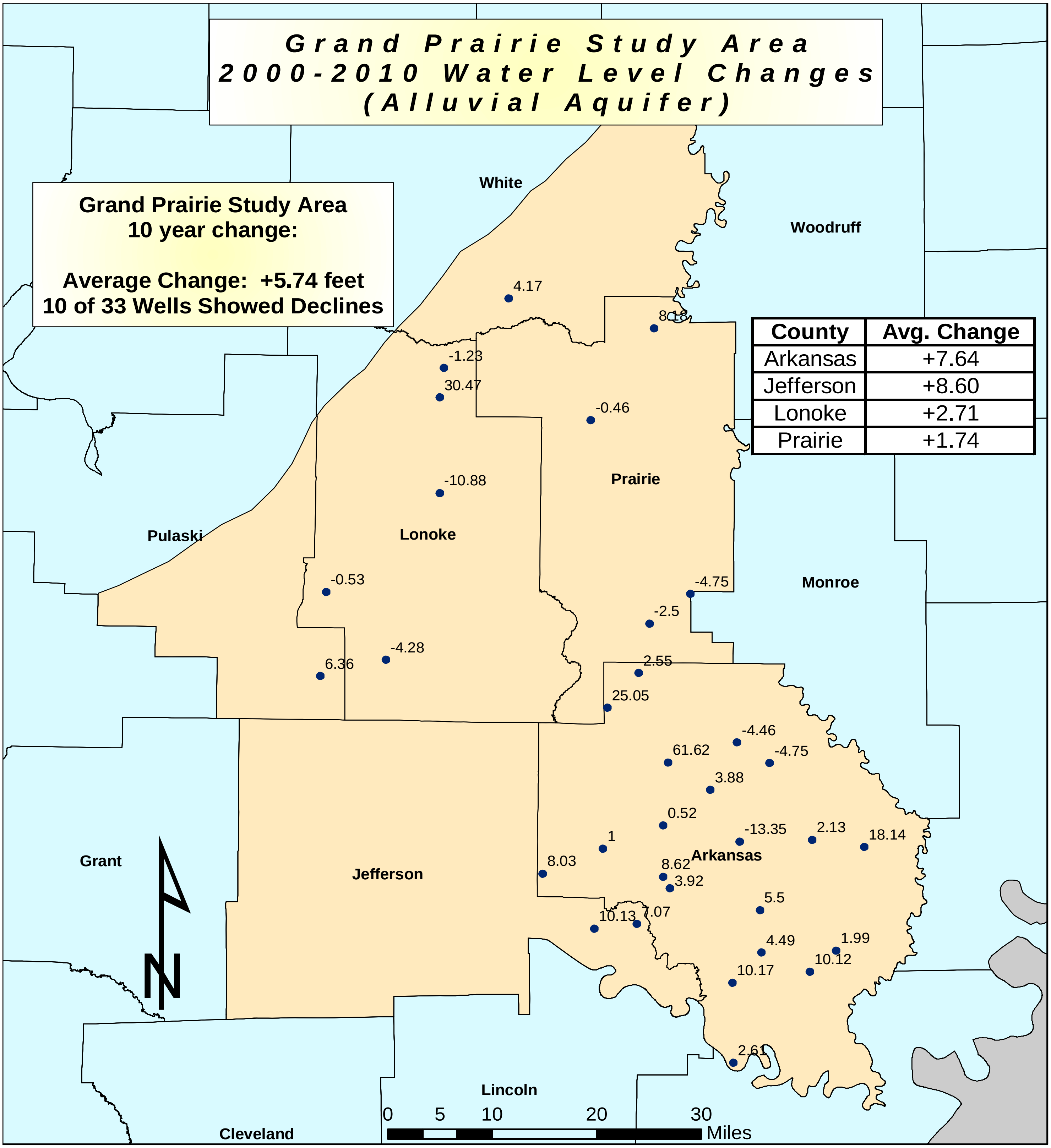


Fig. 17



County	Avg. Change
Arkansas	+7.64
Jefferson	+8.60
Lonoke	+2.71
Prairie	+1.74

Legend

- Wells
- Grand Prairie Study Area

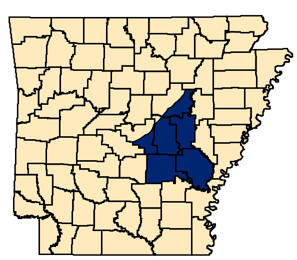


Fig. 18

CACHE CRITICAL GROUND WATER AREA

The Cache Study Area is defined as the 7300 square mile region between Crowley's Ridge to the east, the Fall Line to the west, the state line to the north, and the White River to the south. (Ackerman, 1996) This study area includes portions of Craighead, Poinsett, Cross, St. Francis, Lee, Phillips, Monroe, Woodruff, Jackson, Lawrence, Greene, and Clay Counties. (Fig.1) Areas west of Crowley's Ridge in the Cache Study Area have been designated a Critical Ground Water Area as of 2010. (Fig.3)

Monitoring of the alluvial aquifer in this study area from 2009 to 2010 showed declines in 24 of the 105 wells monitored (22.9%). The study area showed an average change of +1.27 feet during this time. (Fig. 19)

The alluvial aquifer in the Cache Study Area was also evaluated for change in water levels for a 5-year time period from 2005 to 2010. For this period the study area had an average change of -0.95 feet, with 70 of the 106 (66.0%) wells monitored showing declines. (Fig.20)

Average change was also compared in the alluvial aquifer for a 10-year timeframe for the Cache Study Area. Of the 29 wells monitored, 13 of these (44.8%) showed an average decline. The average change for the study area over this time was a decline of +0.90 feet. (Fig.21)

Based on the USGS's Conjunctive-Use Optimization Models of the Alluvial aquifer, sustainable yields were acquired based on the 1997 pumping rates. The percentage of the sustainable yield for each county in the model is shown in figure 41 and is based on the 2008 withdrawals. Water-use data shown in Table 1 is the reported use for 2008. Based on the reported water use for 2008, as well as the sustainable yields estimated from the USGS models, the percentage of water use that was sustainable in 2008 for each county in the Cache Study Area are as follows; Craighead County 66.4%, Cross County 26.9%, Greene County 32.0%, Jackson County 52.7%, Lawrence County 100%, Lee County 24.3%, Monroe County 76.0%, Phillips County 36.4%, Poinsett County 27.2%, Randolph County 62.3%, Woodruff County 45.7% and St. Francis County 25.4% respectively. It should be noted that Clay County was "allowed" 100% of its 1997 pumping rate by the USGS model as part of the optimization. When the County's pumping rate went from 234.9 Mgal/d in 1997 to 642.6 Mgal/d in 2008, this dropped the sustainable yield to 36.6%. While the 234.9 Mgal/d in 1997 may not have been the maximum volume sustainable in this county, the model assigned it

100% sustainable as part of the optimization. This should be noted when taking into account the 35.0% sustainable figure for 2007. Another factor that should be considered is the hydrogeologic boundary that is Crowley's Ridge. Due to the separation of the alluvial aquifer by the ridge in some counties in the Cache Study Area, the sustainable yields may be even lower west of the ridge, as the total county volume of ground-water was taken into account for the 1997 and 2008 pumping rates.

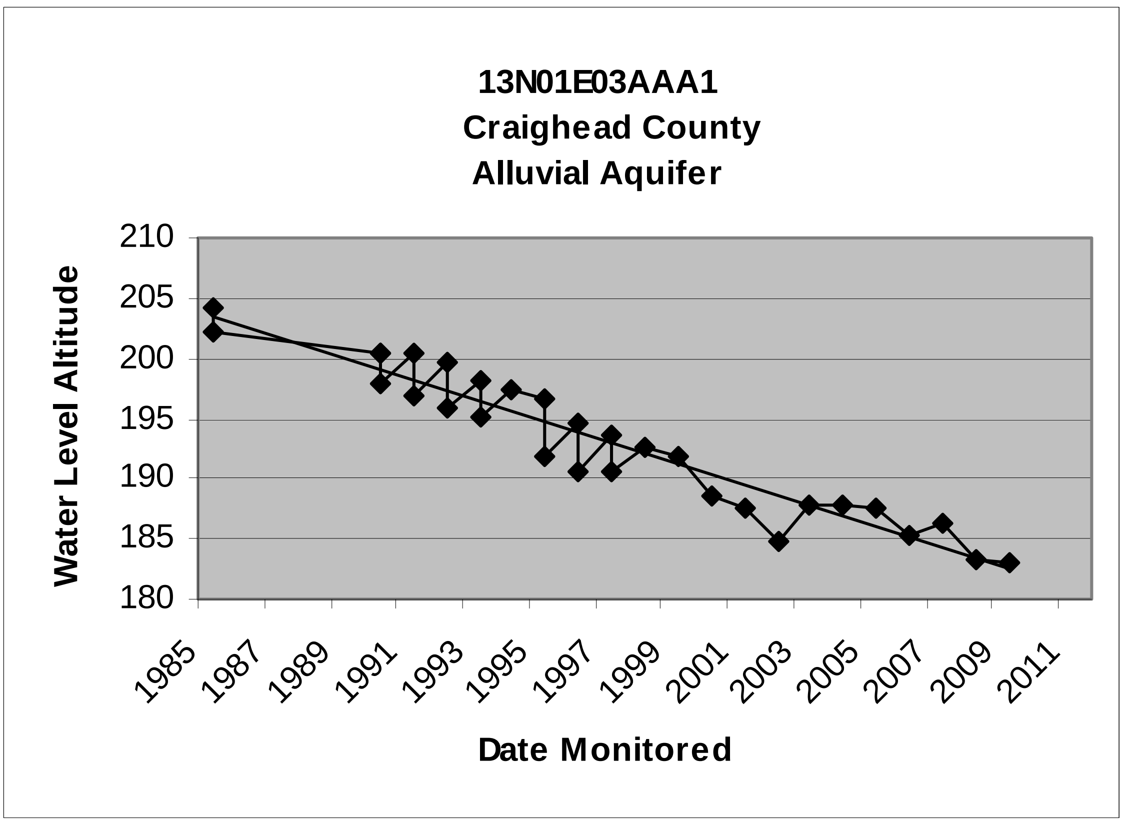


Table 11.

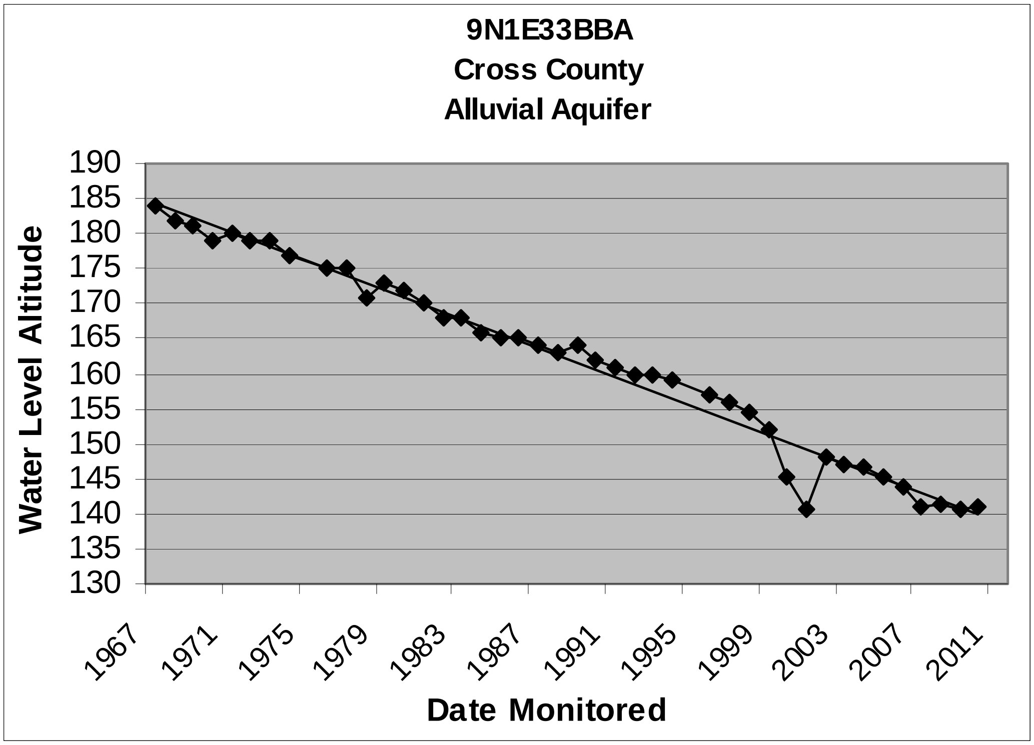


Table 12.

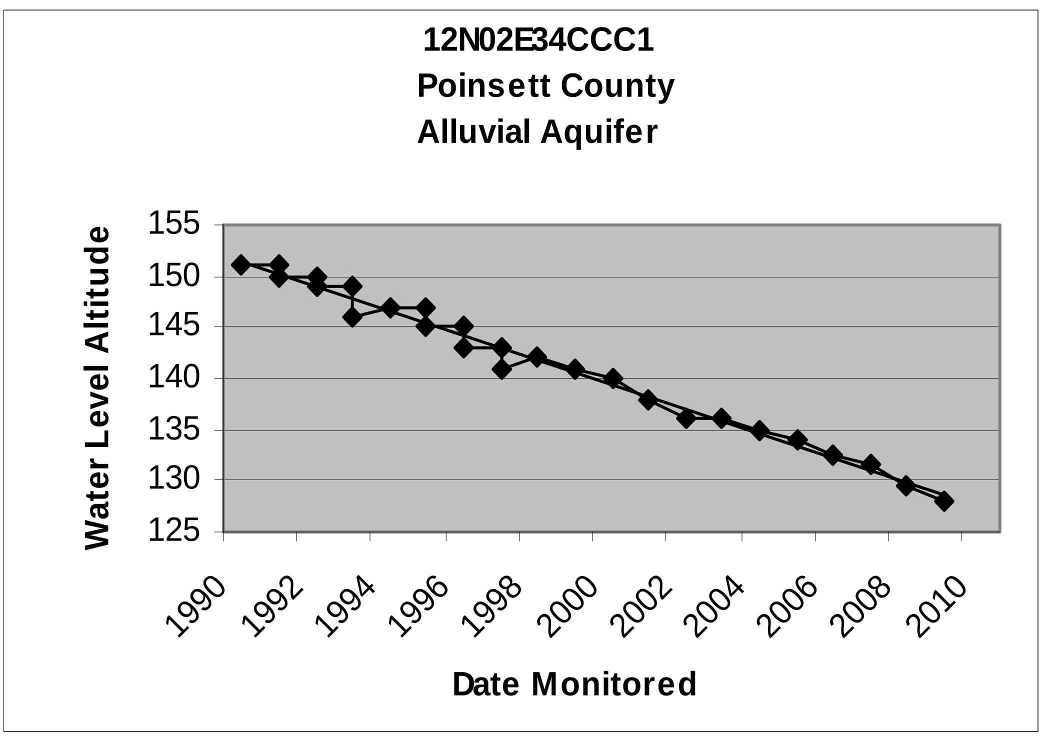
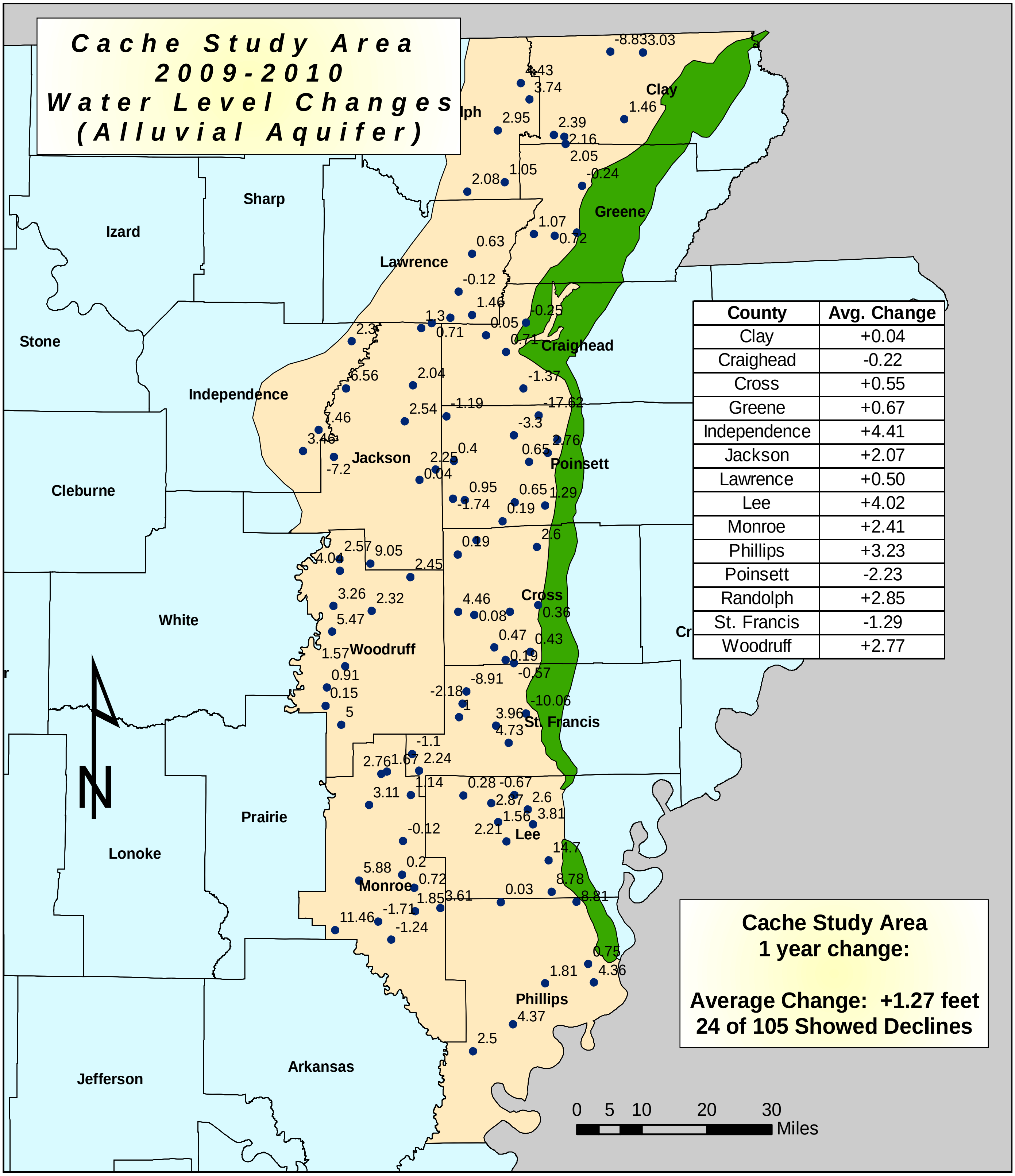


Table 13.

Cache Study Area 2009-2010 Water Level Changes (Alluvial Aquifer)



County	Avg. Change
Clay	+0.04
Craighead	-0.22
Cross	+0.55
Greene	+0.67
Independence	+4.41
Jackson	+2.07
Lawrence	+0.50
Lee	+4.02
Monroe	+2.41
Phillips	+3.23
Poinsett	-2.23
Randolph	+2.85
St. Francis	-1.29
Woodruff	+2.77

Cache Study Area
1 year change:

Average Change: +1.27 feet
24 of 105 Showed Declines

Legend

- Wells
- Crowleys Ridge
- Cache Study Area

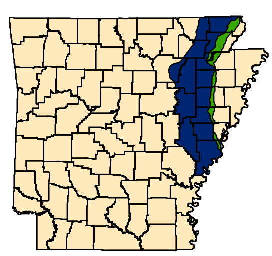
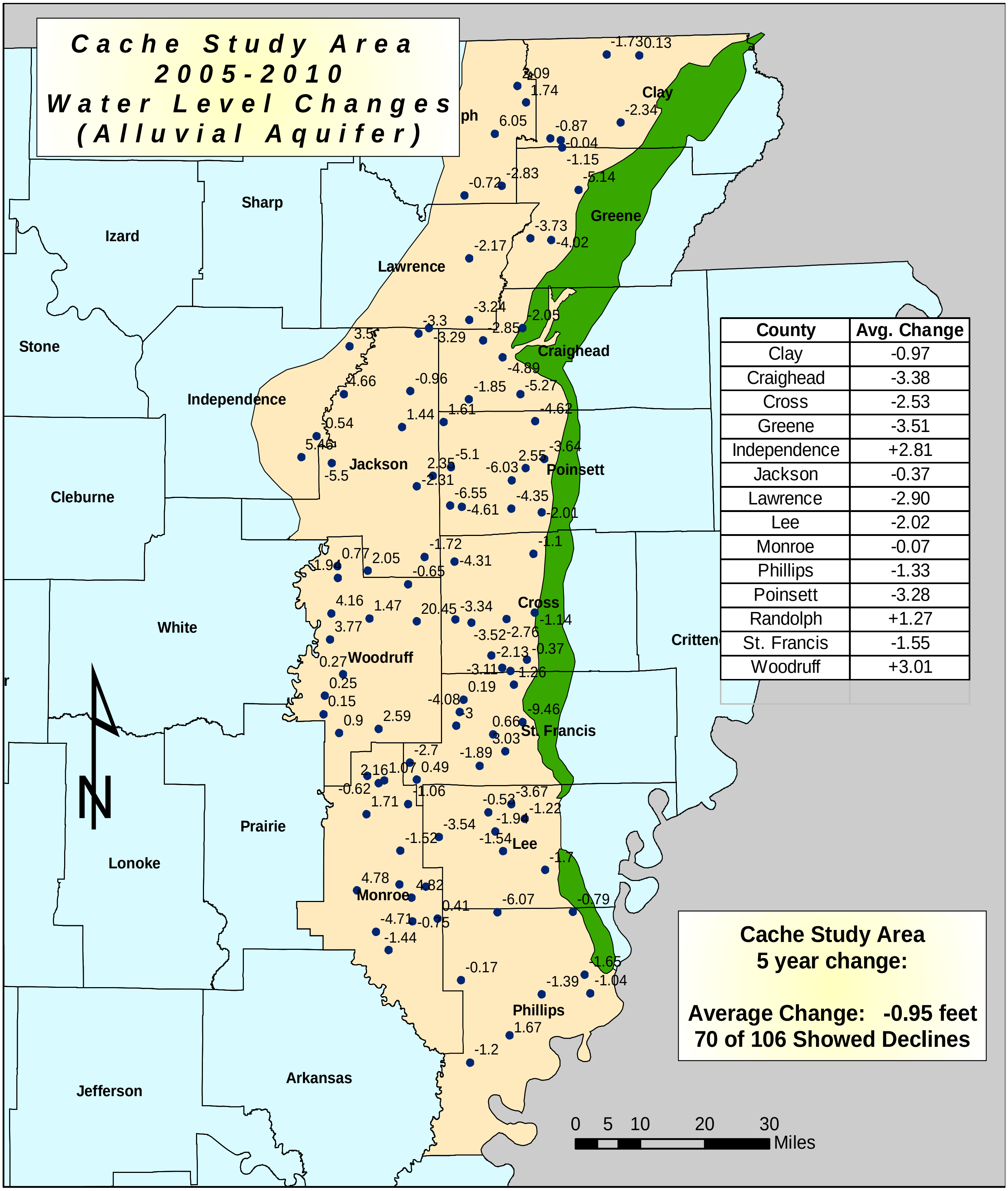


Fig. 19

Cache Study Area 2005-2010 Water Level Changes (Alluvial Aquifer)



County	Avg. Change
Clay	-0.97
Craighead	-3.38
Cross	-2.53
Greene	-3.51
Independence	+2.81
Jackson	-0.37
Lawrence	-2.90
Lee	-2.02
Monroe	-0.07
Phillips	-1.33
Poinsett	-3.28
Randolph	+1.27
St. Francis	-1.55
Woodruff	+3.01

Cache Study Area
5 year change:

Average Change: -0.95 feet
70 of 106 Showed Declines

Legend

- Wells
- Crowleys Ridge
- Cache Study Area

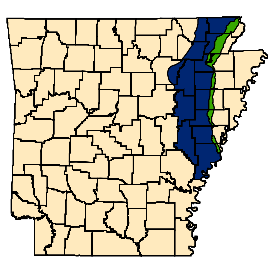
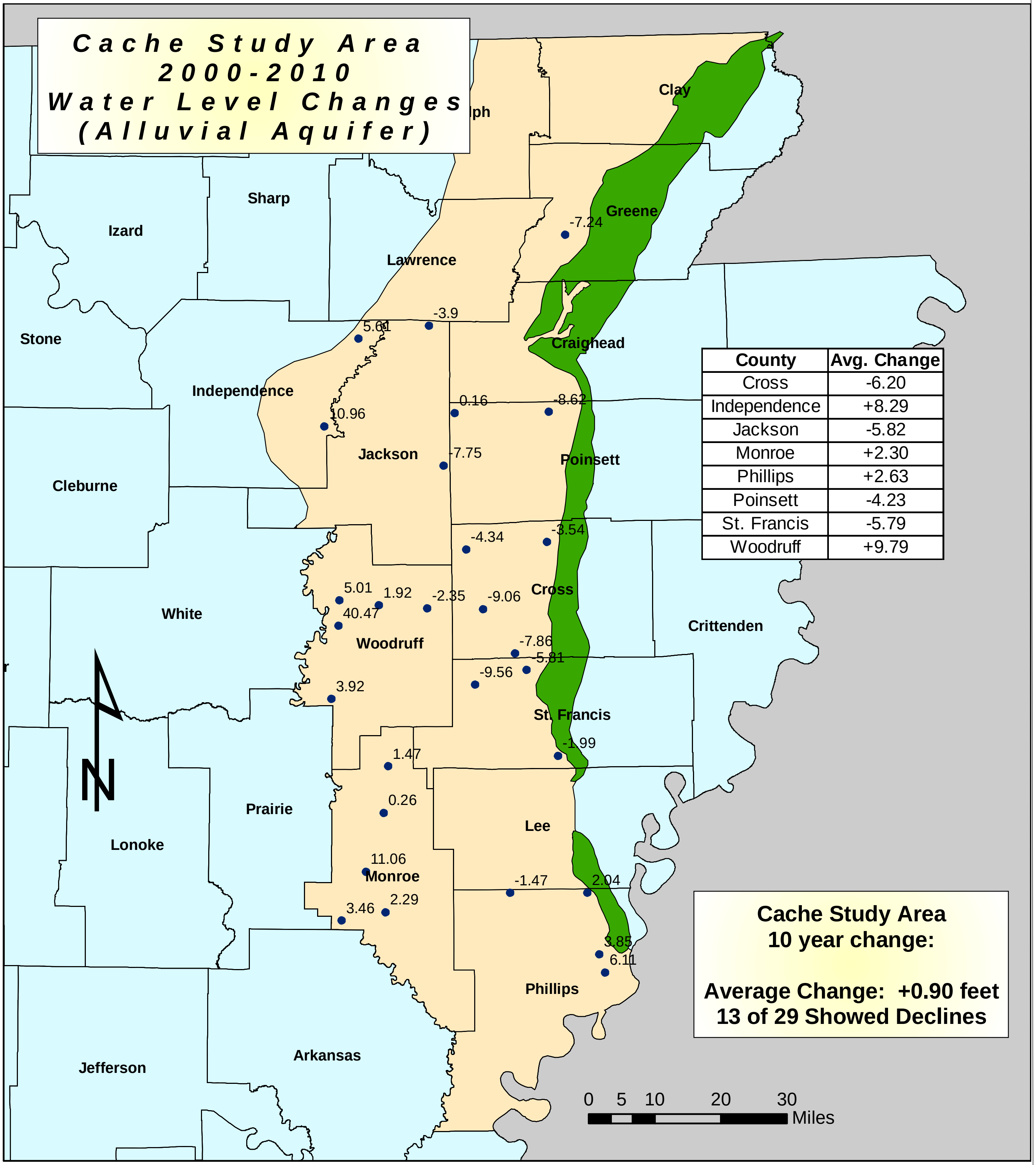


Fig. 20



County	Avg. Change
Cross	-6.20
Independence	+8.29
Jackson	-5.82
Monroe	+2.30
Phillips	+2.63
Poinsett	-4.23
St. Francis	-5.79
Woodruff	+9.79

Legend

- Wells
- Crowleys Ridge
- Cache Study Area

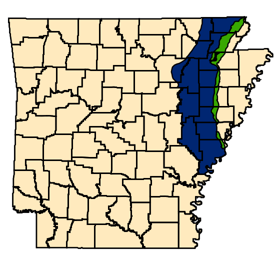


Fig. 21

Monitoring of the Sparta/Memphis aquifer in the Cache Critical Ground Water Area from 2009 to 2010 showed that the study area had an overall average change in static water level of +4.28 feet. Although there are not as many irrigation wells in the Sparta/Memphis aquifer as there are in the alluvial aquifer in this study area, there has been an increase in recent years as the water level in the alluvial aquifer continues to drop. Seven of the 31 wells (22.6%) monitored showed declines during this time period. (Fig.22)

During the 2005 to 2010 monitoring period the Sparta/Memphis aquifer in the Cache Study Area had an average water level decline of -0.17 feet, with 15 of the 29 wells monitored (51.7%) showed decline. (Fig. 23)

Of the 11 wells monitored from 2000 to 2010, 6 (54.5%) show declines over this time. The average ground water level change for the Sparta/Memphis Aquifer in the study area was +0.54 feet over this 10-year period. (Fig.24)

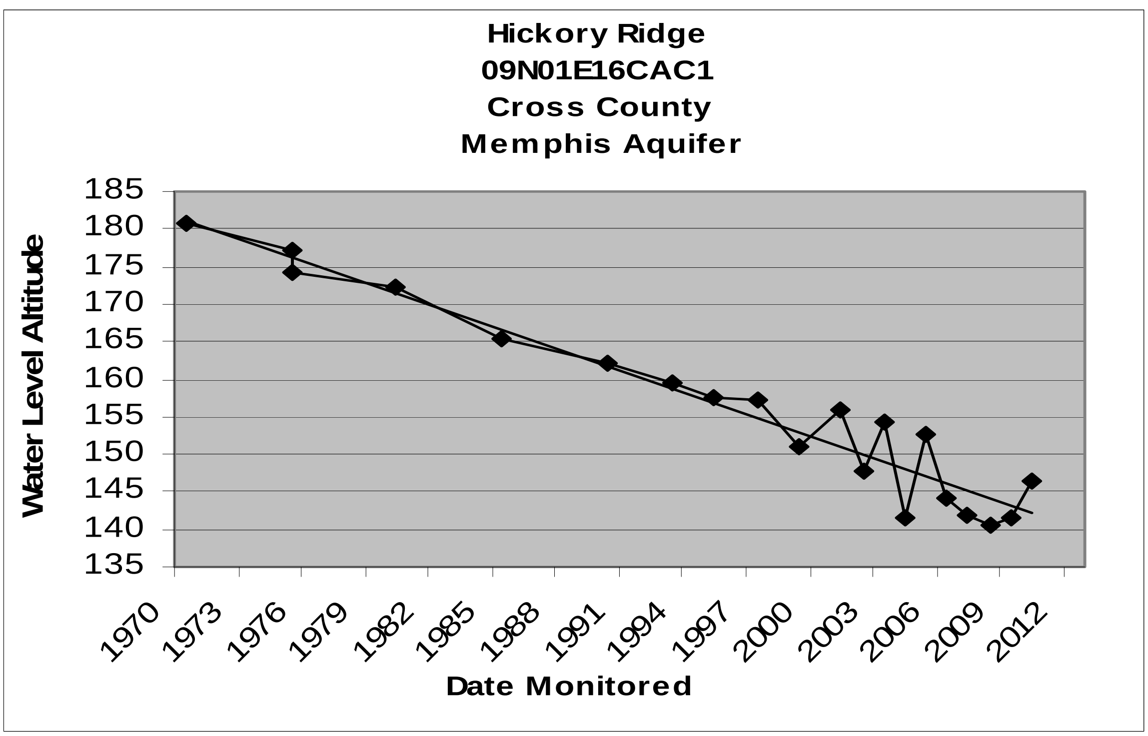
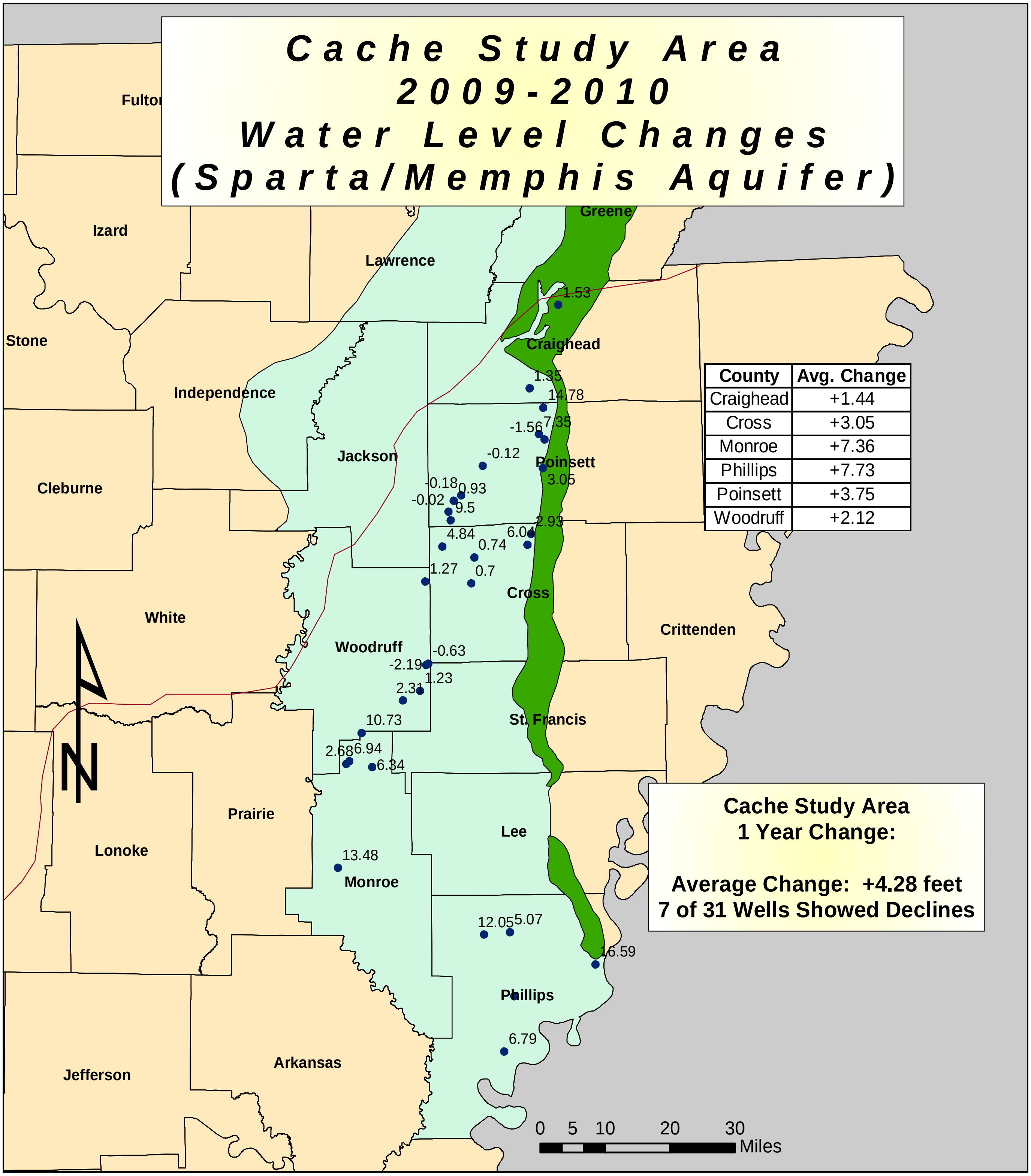


Table 14.



Legend

- Wells
- Sparta Boundary
- Crowleys Ridge
- Cache Study Area

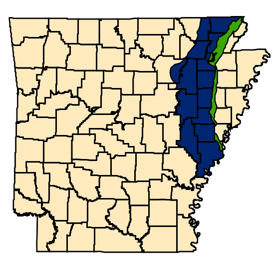
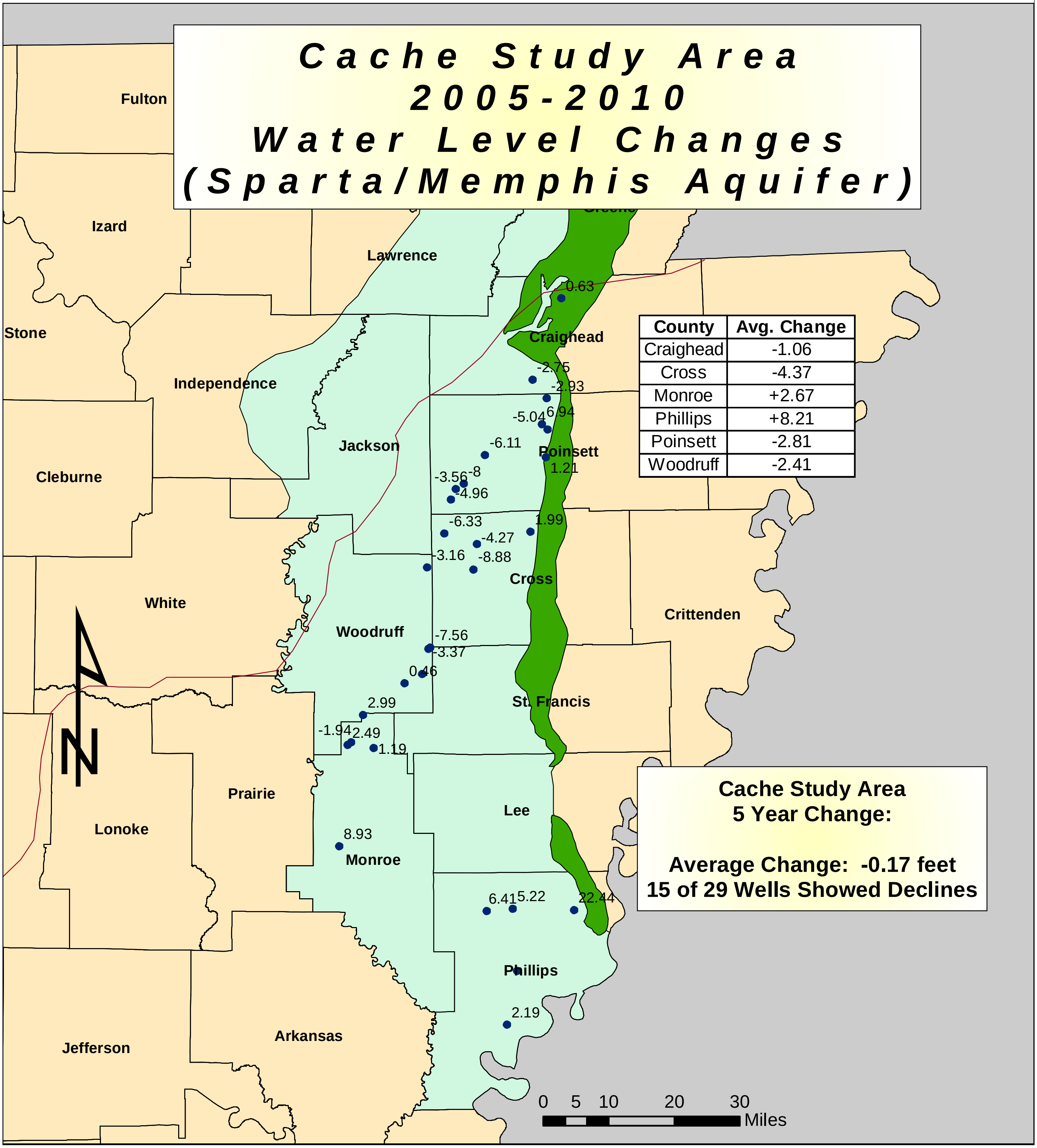


Fig. 22



County	Avg. Change
Craighead	-1.06
Cross	-4.37
Monroe	+2.67
Phillips	+8.21
Poinsett	-2.81
Woodruff	-2.41

Legend

- Wells
- Sparta Boundary
- Crowleys Ridge
- Cache Study Area

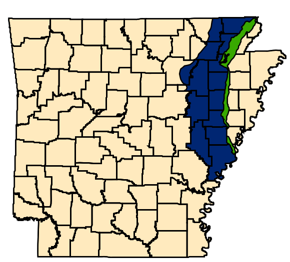
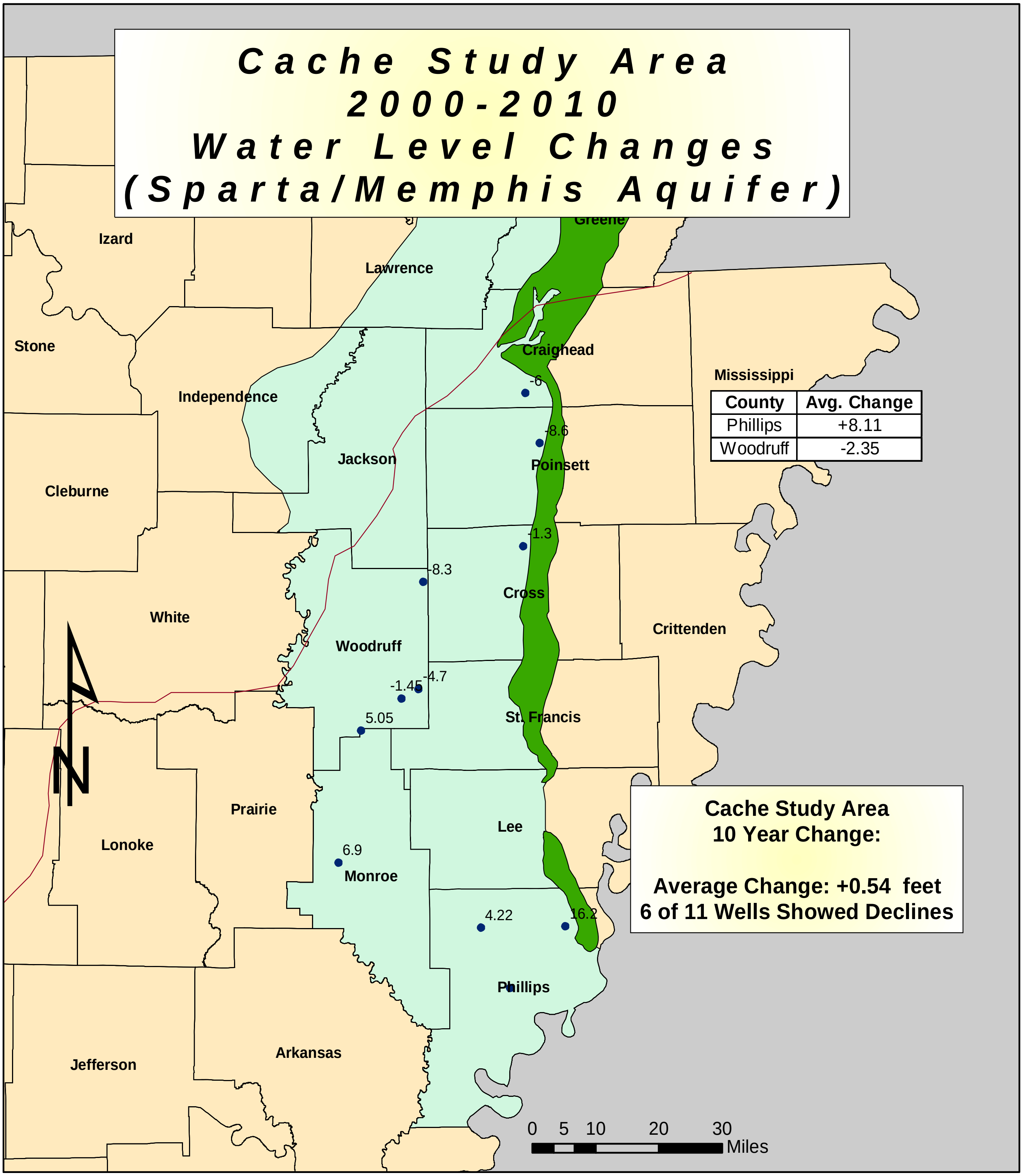


Fig. 23


Cache Study Area
2000-2010
Water Level Changes
(Sparta/Memphis Aquifer)
Izard
Stone
Lawrence
Greene
Craighead
Independence
Jackson
Mississippi
Cleburne
Poinsett
White
Cross
Crittenden
Woodruff
St. Francis
Prairie
Lonoke
Lee
Monroe
Phillips
Jefferson
Arkansas
County
Avg. Change
Phillips
+8.11
Woodruff
-2.35
-6
-8.6
-1.3
-8.3
-4.7
-1.45
5.05
6.9
4.22
16.2
Cache Study Area
10 Year Change:
Average Change: +0.54 feet
6 of 11 Wells Showed Declines
0 5 10 20 30
Miles
N

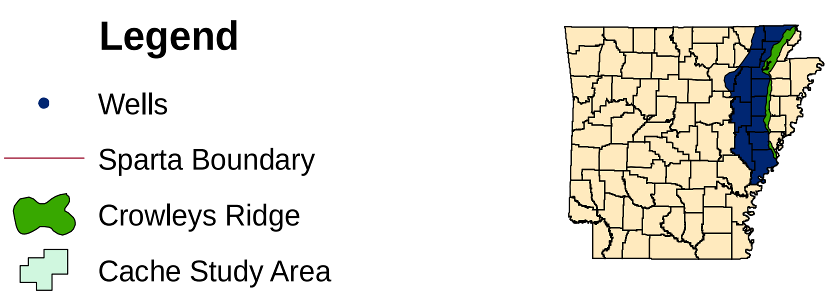

Legend
Wells
Sparta Boundary
Crowleys Ridge
Cache Study Area

Fig. 24

BOEUF-TENSAS STUDY AREA

The Boeuf-Tensas study area in southeast Arkansas is comprised of Ashley, Chicot, Desha, Drew, and Lincoln Counties. This hydrologic basin extends into Louisiana, but for the purposes of this study, will be bounded by the Arkansas state line to the south.

The alluvial aquifer data in the Boeuf-Tensas Study Area for the monitoring period of 2009-2010 showed the entire study area having an average change of +1.90 feet. There were 40 wells monitored for this aquifer over this time period with 3 (7.5%) monitored having declines in static water level. (Fig.25)

During the 5-year monitoring period from 2005 to 2010 the study area had an average change of -1.32 feet in the alluvial aquifer, with 25 of the 41 wells monitored (61.0%) showing declines. (Fig.26)

The data for the 10-year change in the Boeuf-Tenses showed the entire study area having an average change of -0.28 feet during this period in the alluvial aquifer, with 4 of 8 wells monitored showing declines. (Fig.27)

The Boeuf-Tensas area of southeastern Arkansas has been identified as a study area for years because of concerns with water-level declines as well as water-quality degradation. When compared to other areas of the State, such as the Grand Prairie, Cache or South Arkansas study areas, the degree of ground-water depletion is observed to be much less severe. However, potentiometric surface maps do indicate the initial stages of the formation of a cone-of-depression. Conservation practices in this area could prove to be a valuable and proactive measure that may prevent adverse impacts on the aquifer as well as water users.

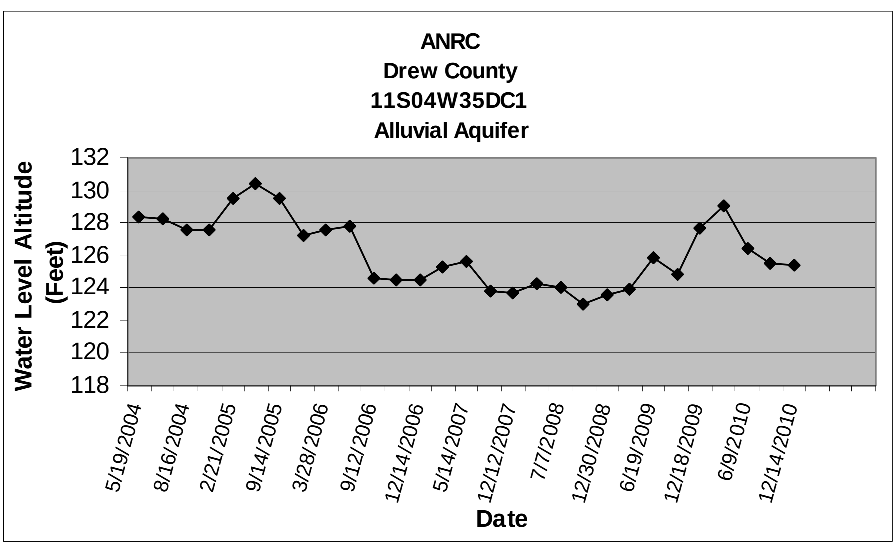
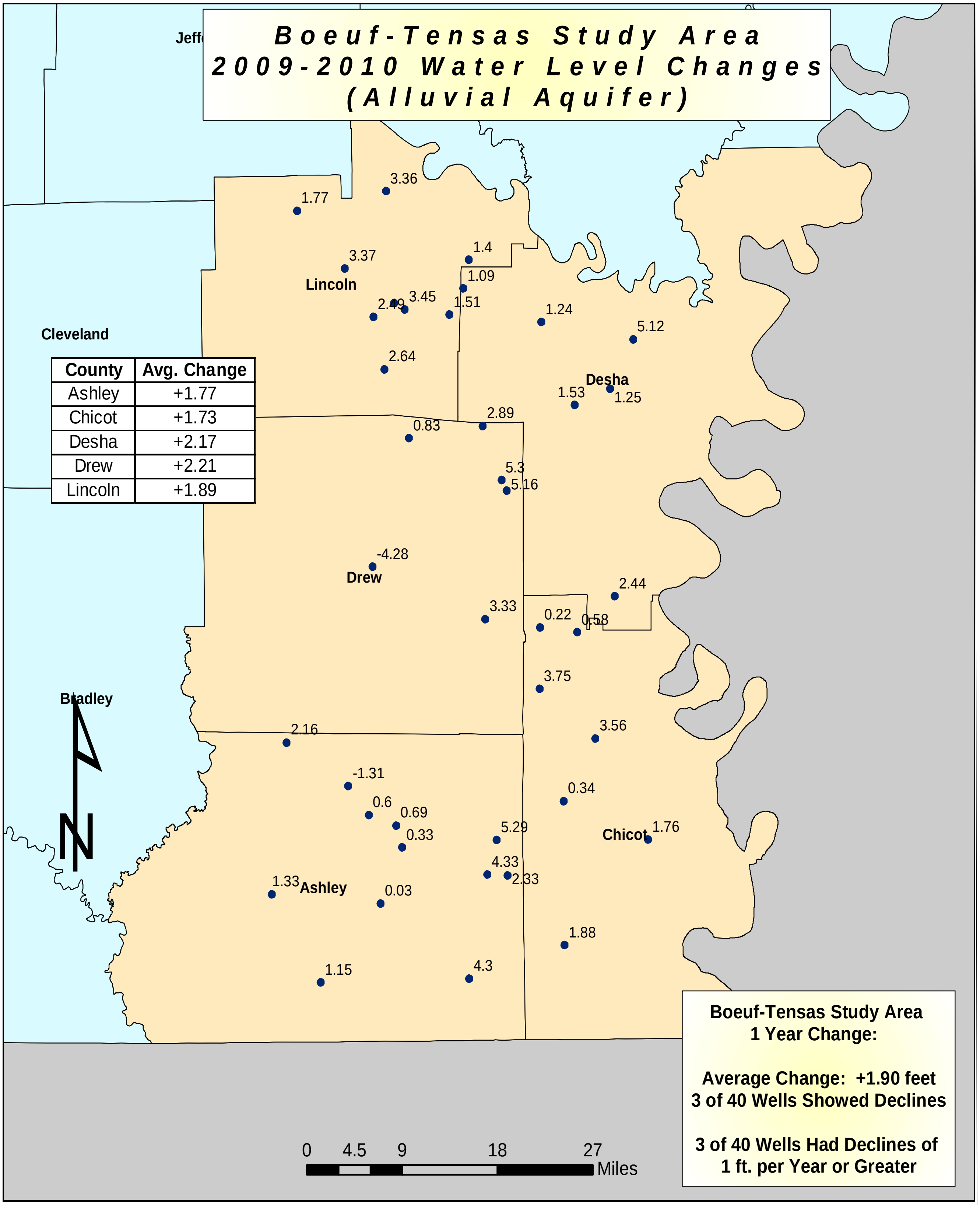


Table 15.

Boeuf-Tensas Study Area
2009-2010 Water Level Changes
(Alluvial Aquifer)



County	Avg. Change
Ashley	+1.77
Chicot	+1.73
Desha	+2.17
Drew	+2.21
Lincoln	+1.89

Boeuf-Tensas Study Area
1 Year Change:

Average Change: +1.90 feet
3 of 40 Wells Showed Declines

3 of 40 Wells Had Declines of 1 ft. per Year or Greater

Legend

- Wells
- Beouf-Tensas Study Area

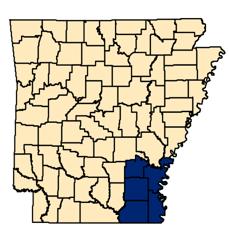
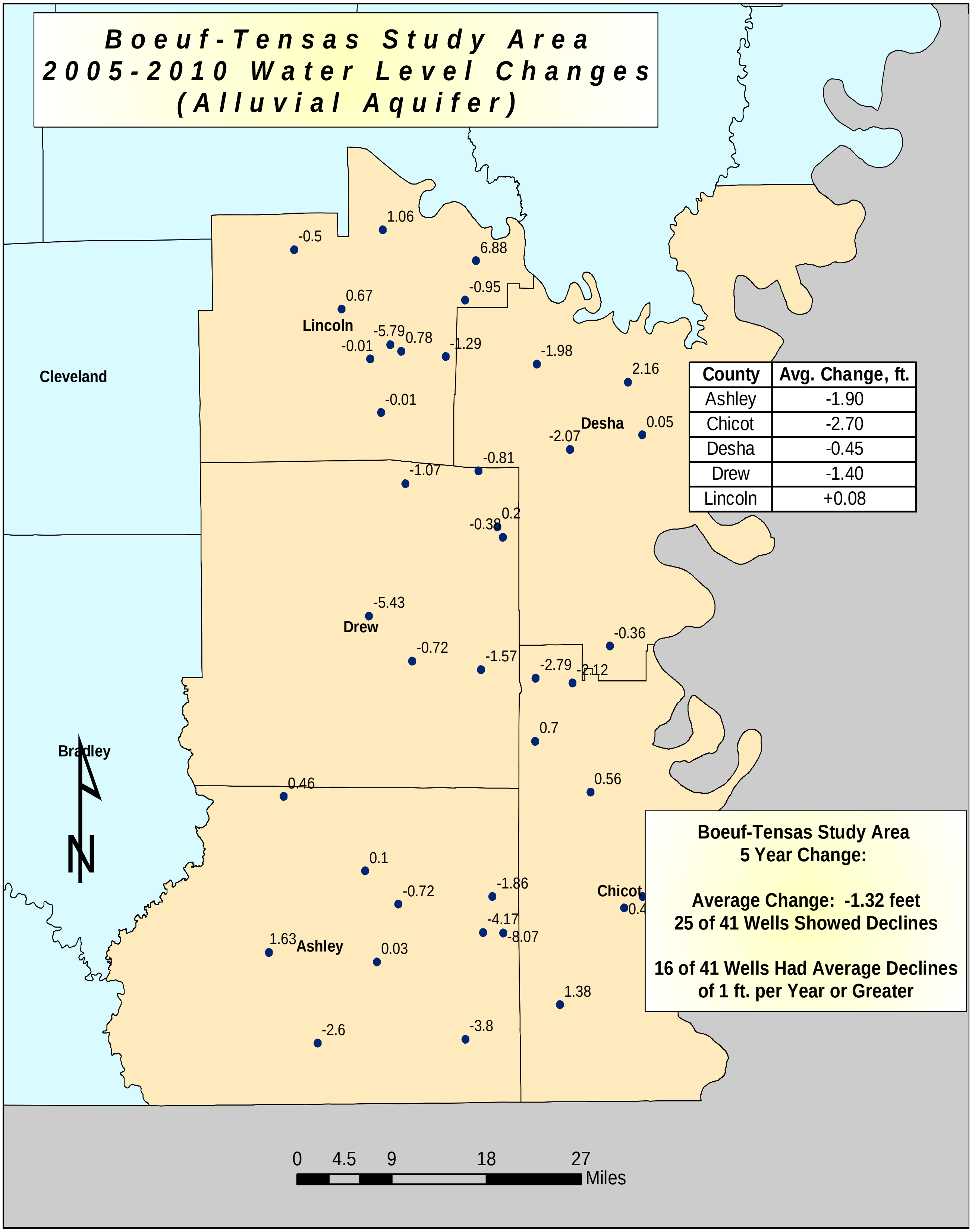


Fig. 25



County	Avg. Change, ft.
Ashley	-1.90
Chicot	-2.70
Desha	-0.45
Drew	-1.40
Lincoln	+0.08

Boeuf-Tensas Study Area
5 Year Change:

Average Change: -1.32 feet
25 of 41 Wells Showed Declines

16 of 41 Wells Had Average Declines of 1 ft. per Year or Greater

Legend

- Wells
- Beouf-Tensas Study Area

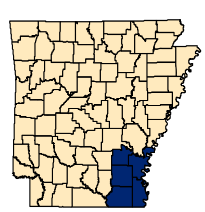
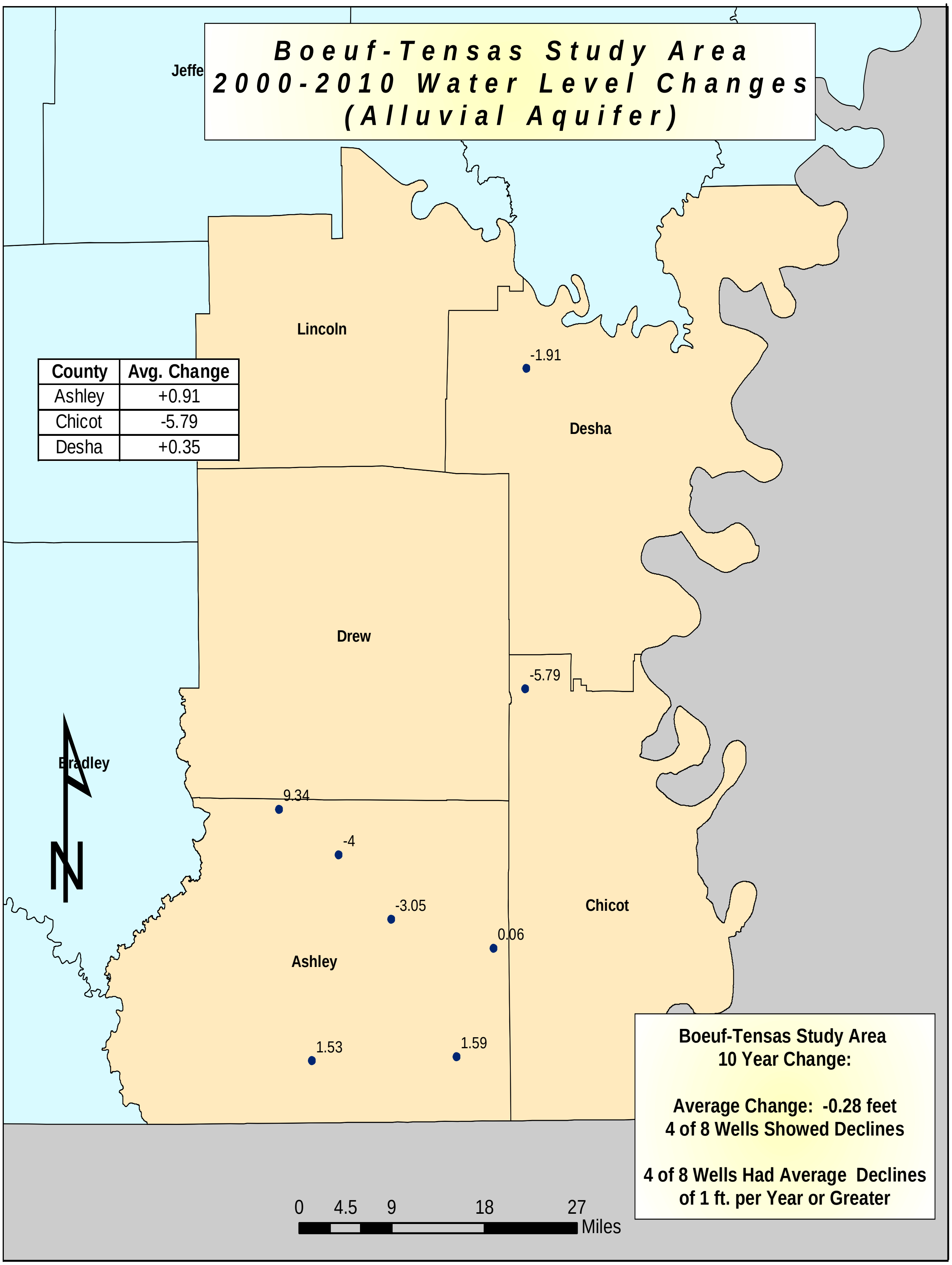


Fig. 26



County	Avg. Change
Ashley	+0.91
Chicot	-5.79
Desha	+0.35

Legend

Wells

Beouf-Tensas Study Area

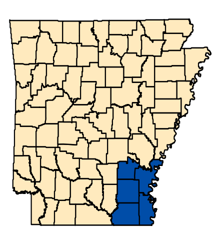


Fig. 27

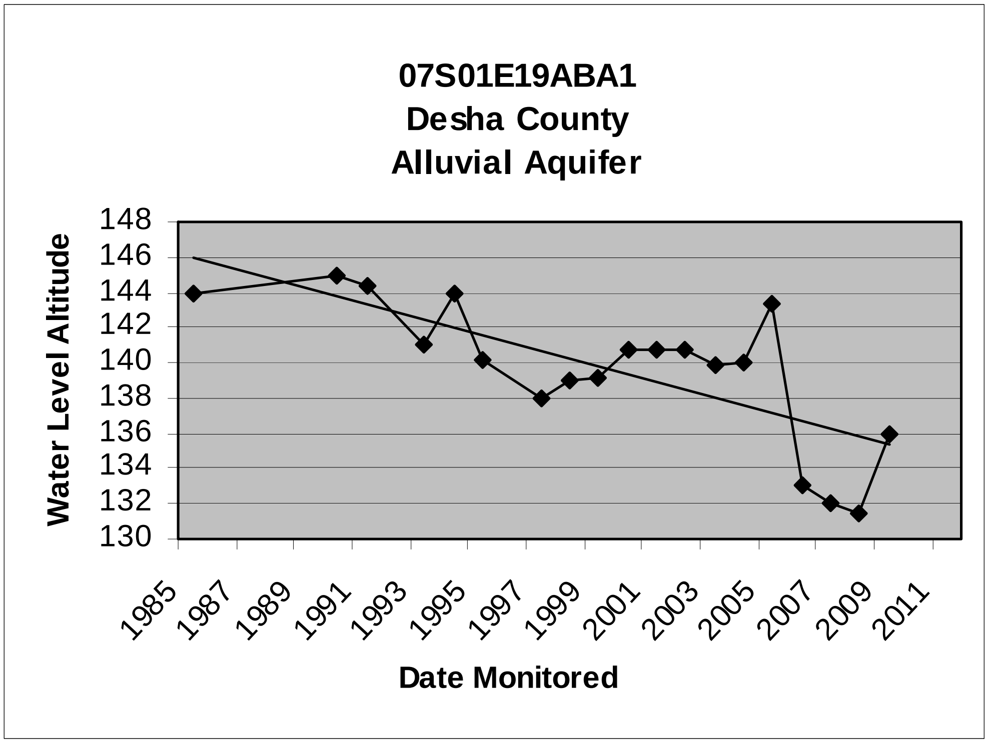


Table 16.

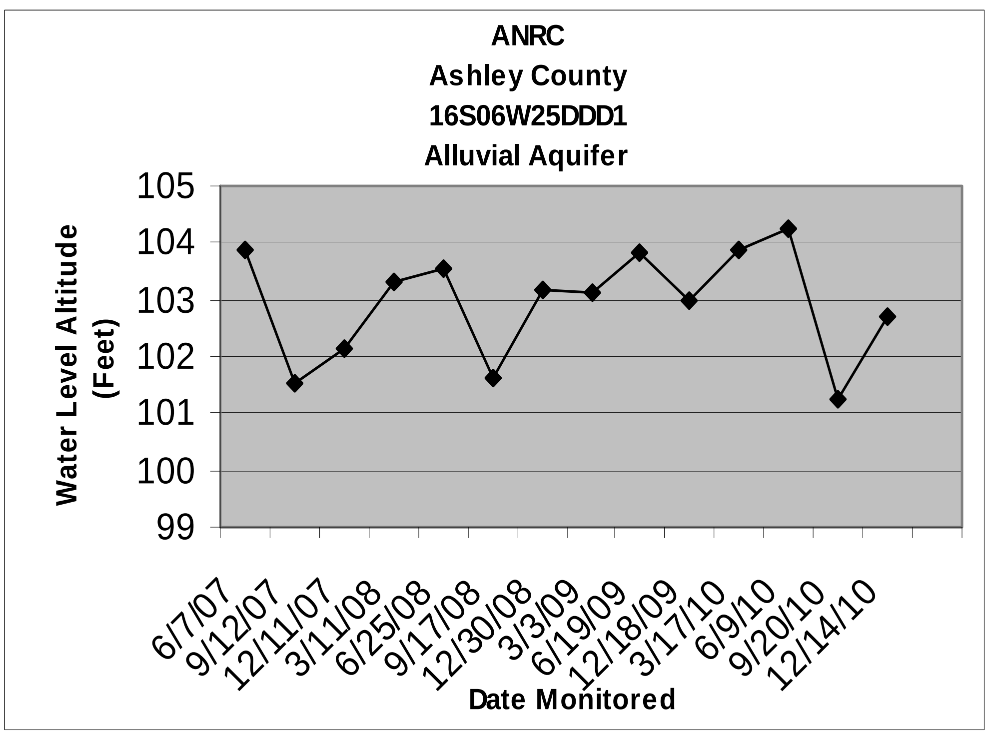


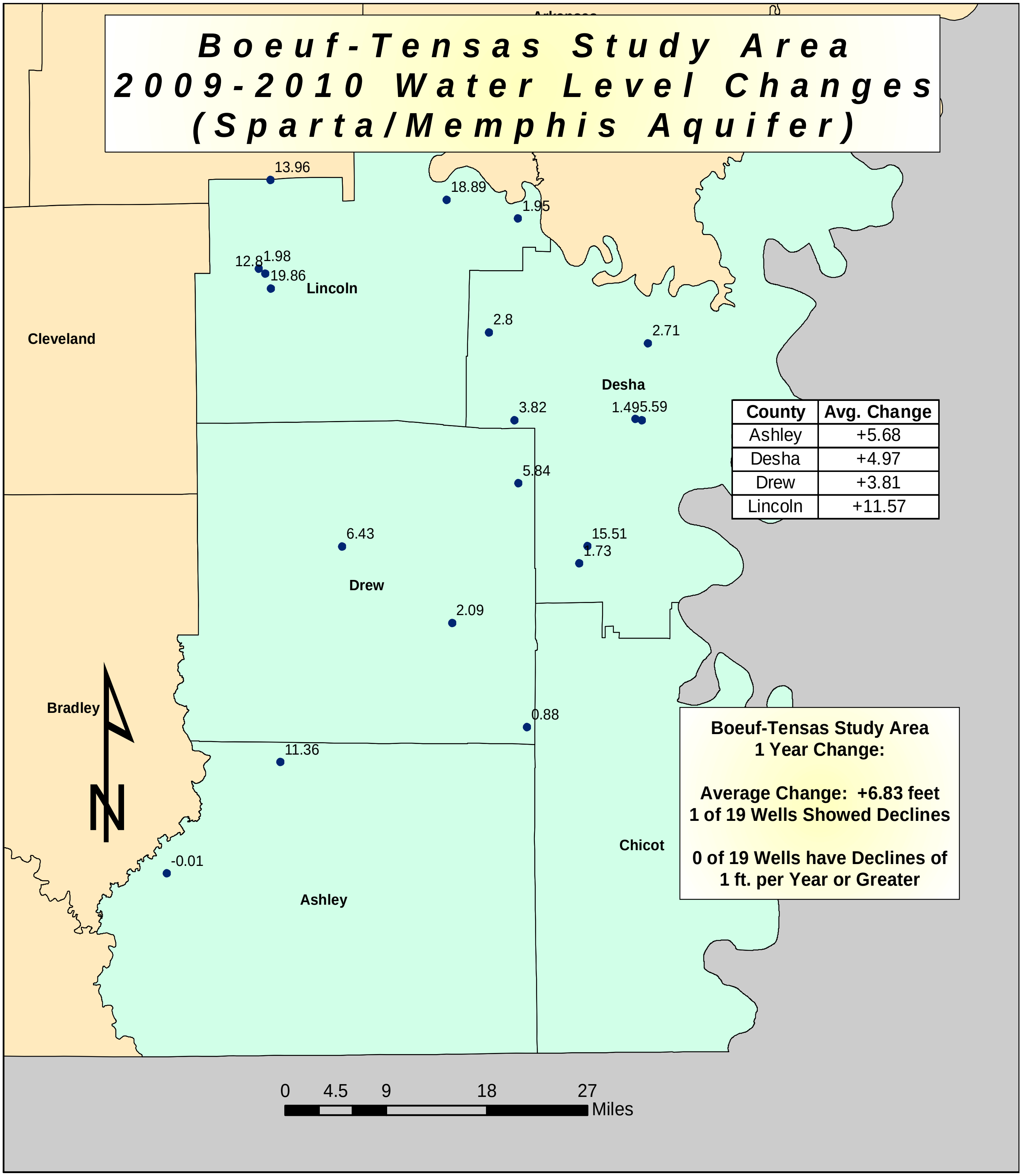
Table 17.

Continued monitoring of the ground-water levels in the Sparta aquifer of the Boeuf-Tensas Study Area shows mixed results, mostly because of the relative lack of wells that are drilled into the aquifer in this part of the state. The ANRC, as well as the USGS, continue to add Sparta aquifer wells to the database from this study area, and the historical data continues to improve each year.

During the 2009-2010 monitoring period the Boeuf-Tenses Study Area an average change of +6.83 feet in the Sparta/Memphis aquifer was observed, with only one of the 19 wells monitored showing a decline. (Fig.28)

During the 5-year monitoring period, from 2005 to 2010, 9 of the 19 wells monitored in the Sparta/Memphis aquifer (47.4%) showed water-level declines in this study area. The entire study area had an average change of -0.21 feet during this time. (Fig.29)

From 2000 to 2010 the entire Boeuf-Tensas Study Area had an average change of +0.34 feet in the Sparta/Memphis aquifer. Six of the 8 wells monitored during this 10-year period showed declines. (Fig. 30) Most noteworthy in this study area is the average decline in the northwest portion of the area in the Sparta Aquifer in the 5-year change. (Fig.29) Also as seen in Figure 2, this is a possible long-term average decline due to the expansion of the cone of depression to the southeast out of Jefferson County. Also, water use from the Sparta Aquifer in Lincoln County has increased from 1.53 Mgal/day in 2006 to 1.72 Mgal/day in 2007 and 168.55 Mgal/day in 2008.



County	Avg. Change
Ashley	+5.68
Desha	+4.97
Drew	+3.81
Lincoln	+11.57

Legend

- Wells
- Boeuf- Tensas Study Area

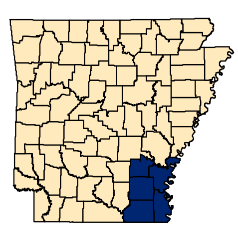
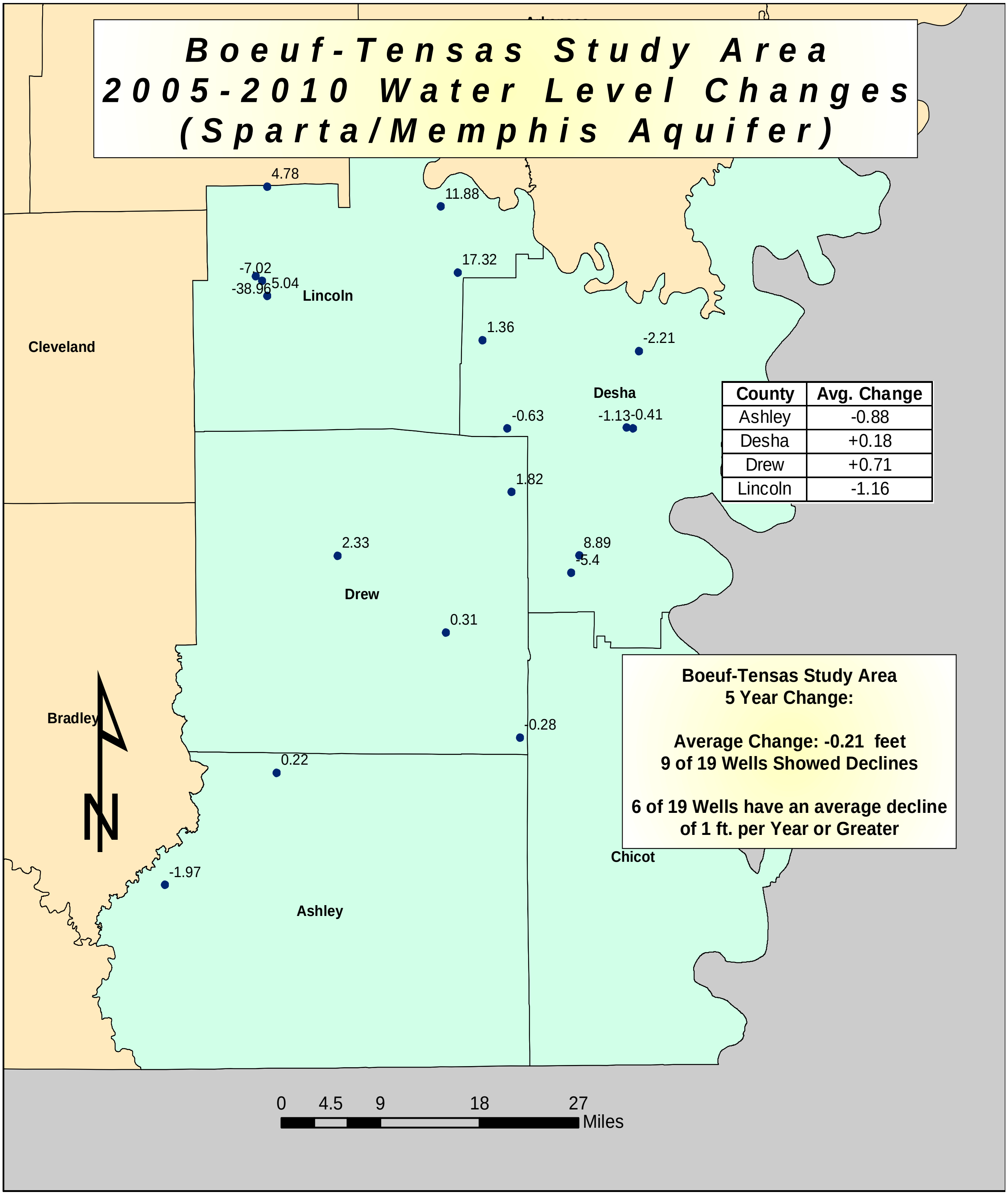


Fig. 28



County	Avg. Change
Ashley	-0.88
Desha	+0.18
Drew	+0.71
Lincoln	-1.16

Legend

- Wells
- Boeuf- Tensas Study Area

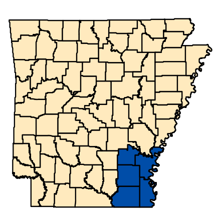
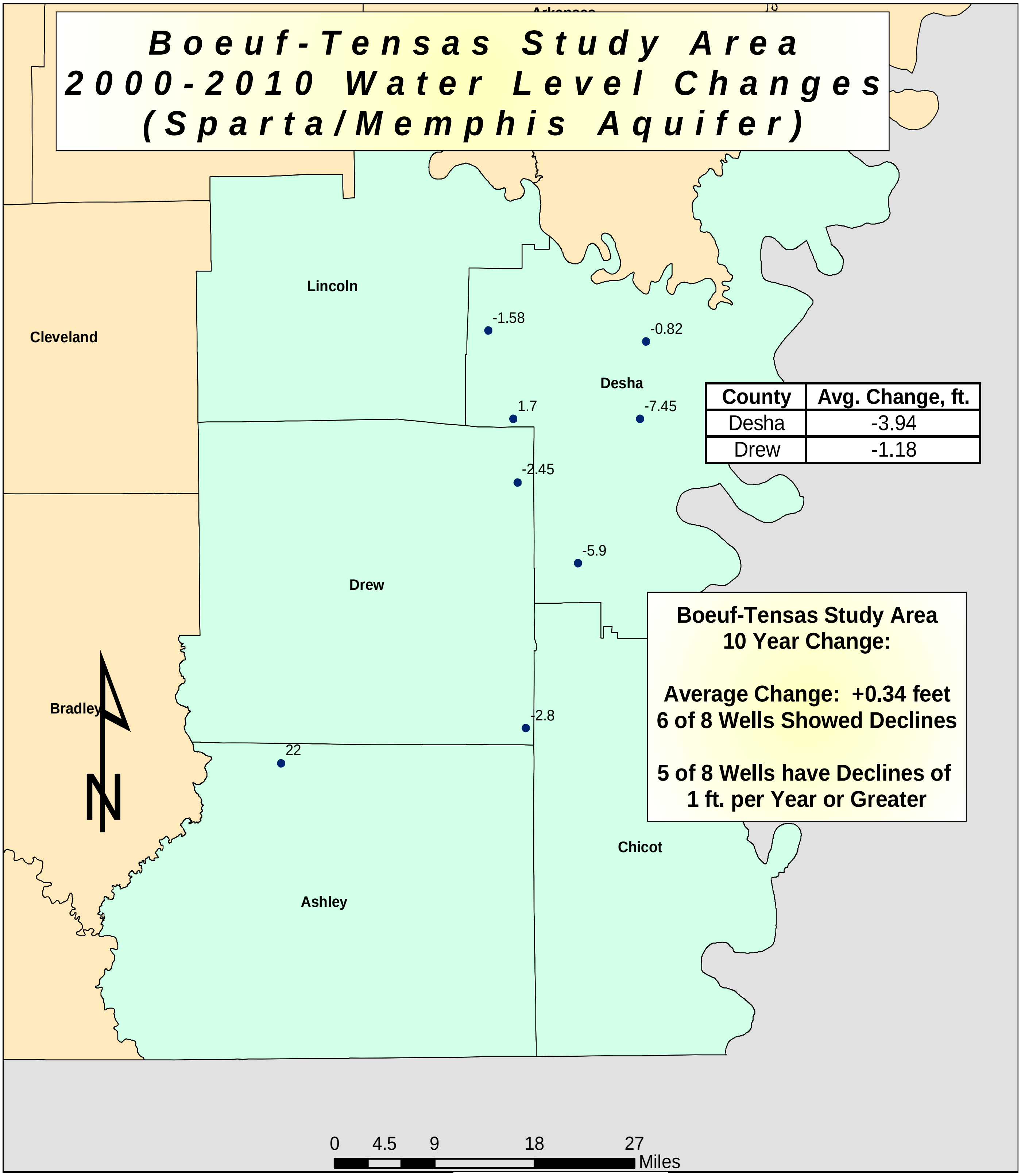


Fig. 29



County	Avg. Change, ft.
Desha	-3.94
Drew	-1.18

Legend

- Wells
- Boeuf- Tensas Study Area

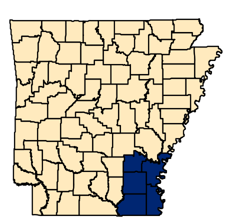


Fig. 30

ST. FRANCIS STUDY AREA

The St. Francis Study Area is defined as the area west of the Mississippi River, east of Crowley's Ridge, and south and east of the subcrop of the McNairy-Nacatoch aquifer (6900 square miles) (Ackerman, 1996). For the purpose of this report, only the area inside the boundaries of Arkansas is considered. (Fig.1)

During the 2009-2010 monitoring period there were declines in average static water levels in the alluvial aquifer in 3 of the 36 wells monitored (8.3%) with an average change of +2.60. (Fig.31)

During the 5-year monitoring timeframe, from 2005 to 2010 the alluvial aquifer in this study area had an average change of -1.24 feet, with 34 of the 49 wells monitored (69.4%) showing declines. (Fig.32)

A 10-year average change was also done in the St. Francis Study Area for the alluvial aquifer static water levels. There was an average change of -2.32 feet over the entire study area for this period, with 4 of the 13 wells monitored (31.0%) showing declines. (Fig. 33)

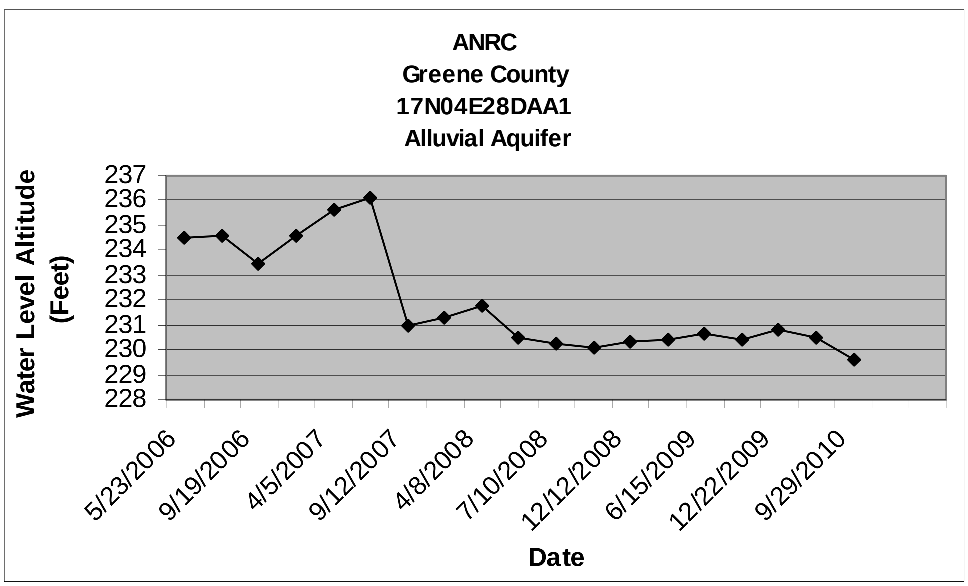
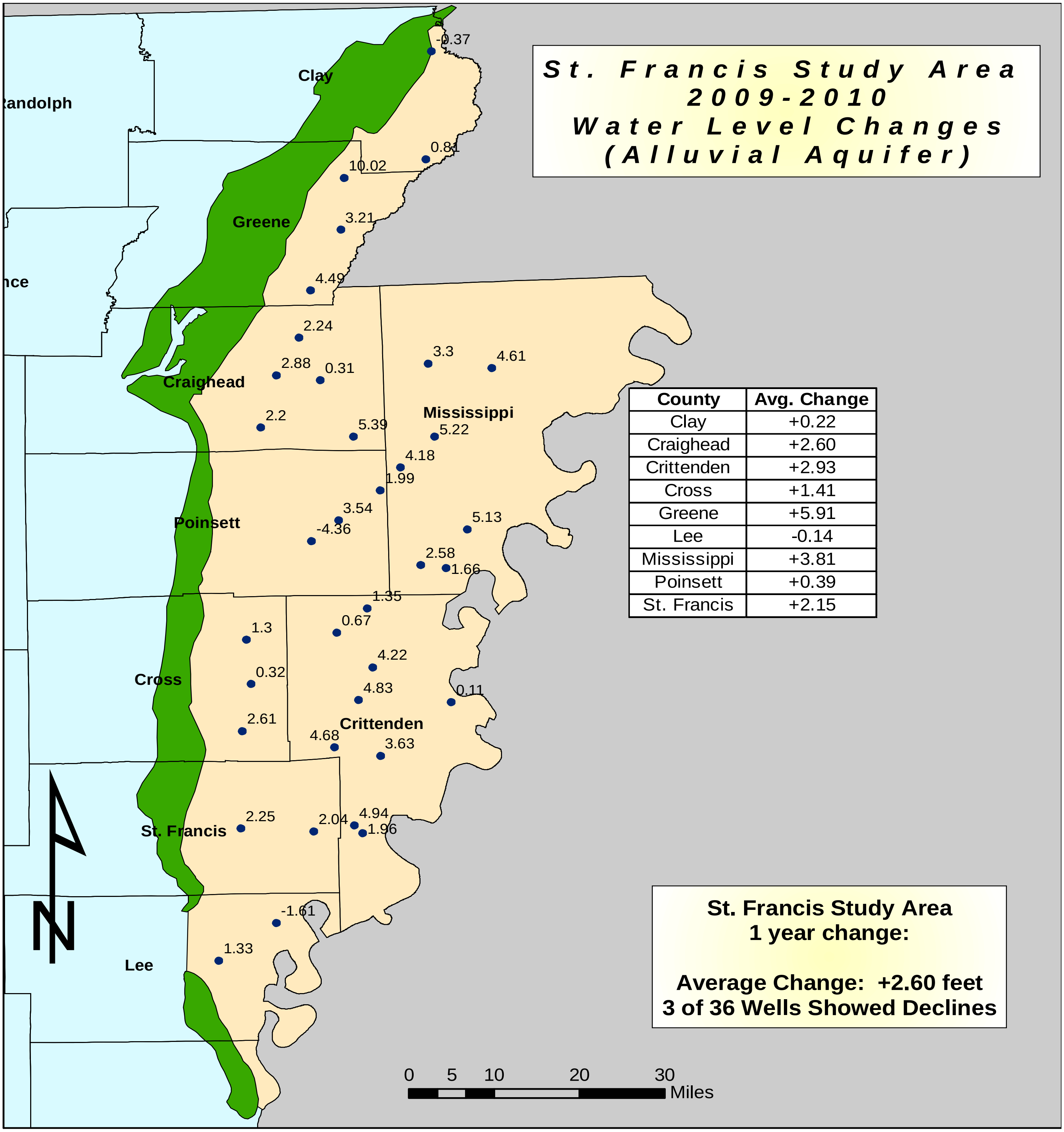


Table 18.



County	Avg. Change
Clay	+0.22
Craighead	+2.60
Crittenden	+2.93
Cross	+1.41
Greene	+5.91
Lee	-0.14
Mississippi	+3.81
Poinsett	+0.39
St. Francis	+2.15

St. Francis Study Area
1 year change:

Average Change: +2.60 feet
3 of 36 Wells Showed Declines

Legend

- Wells
- Crowleys Ridge
- St. Francis Study Area

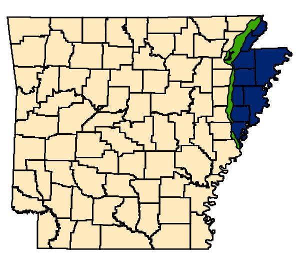
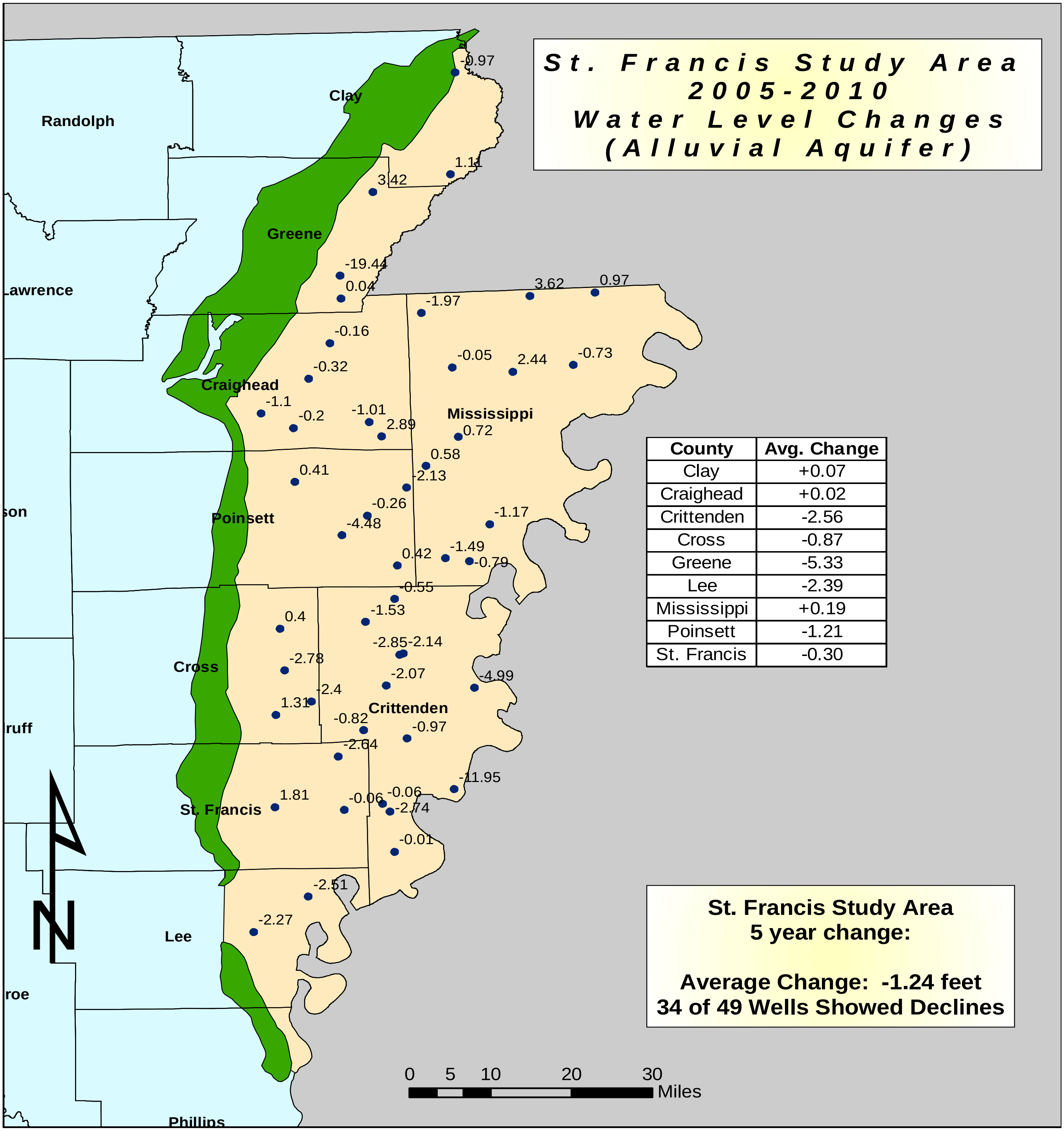


Fig. 31

St. Francis Study Area 2005-2010 Water Level Changes (Alluvial Aquifer)



County	Avg. Change
Clay	+0.07
Craighead	+0.02
Crittenden	-2.56
Cross	-0.87
Greene	-5.33
Lee	-2.39
Mississippi	+0.19
Poinsett	-1.21
St. Francis	-0.30

St. Francis Study Area
5 year change:

Average Change: -1.24 feet
34 of 49 Wells Showed Declines

Legend

- Wells
- Crowleys Ridge
- St. Francis Study Area

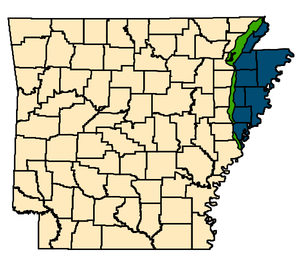
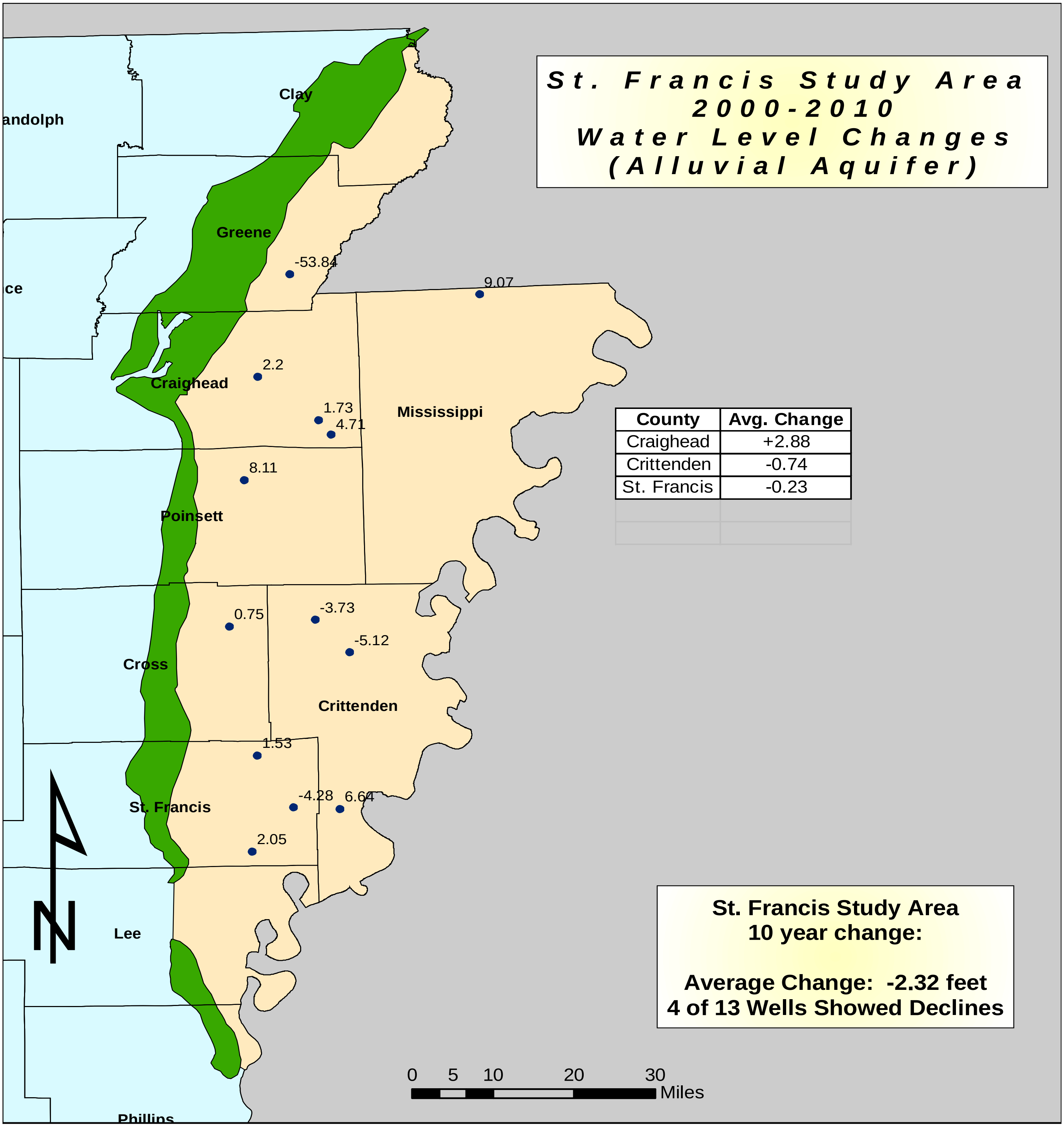


Fig. 32

St. Francis Study Area 2000-2010 Water Level Changes (Alluvial Aquifer)



County	Avg. Change
Craighead	+2.88
Crittenden	-0.74
St. Francis	-0.23

St. Francis Study Area
10 year change:

Average Change: -2.32 feet
4 of 13 Wells Showed Declines

Legend

- Wells
- Crowleys Ridge
- St. Francis Study Area

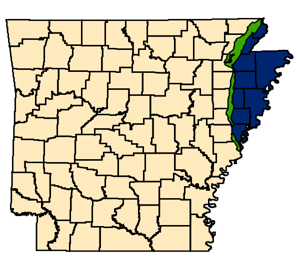


Fig. 33

Just as in the Boeuf-Tensas Study Area, the St. Francis Study Area has a limited number of wells drilled into the Sparta/Memphis aquifer. This should be taken into account when looking at the county changes in the figures. There are more wells being drilled into these areas as the water level in the alluvial aquifer continues to decline. USGS, as well as the ANRC, will continue to add monitoring points in these areas for the Sparta/Memphis aquifer. The hydrographs below are good representations of the static water level changes over time. Figures 34 and 35 show the actual measurements taken for the 1, and 10 year periods respectively.

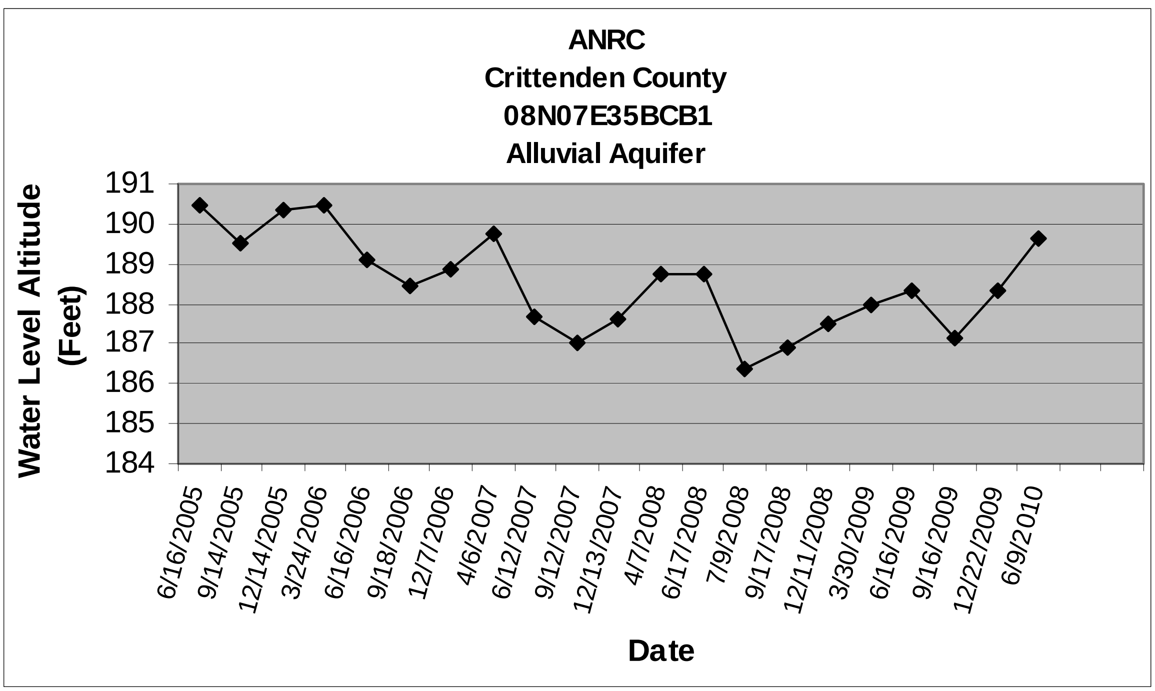
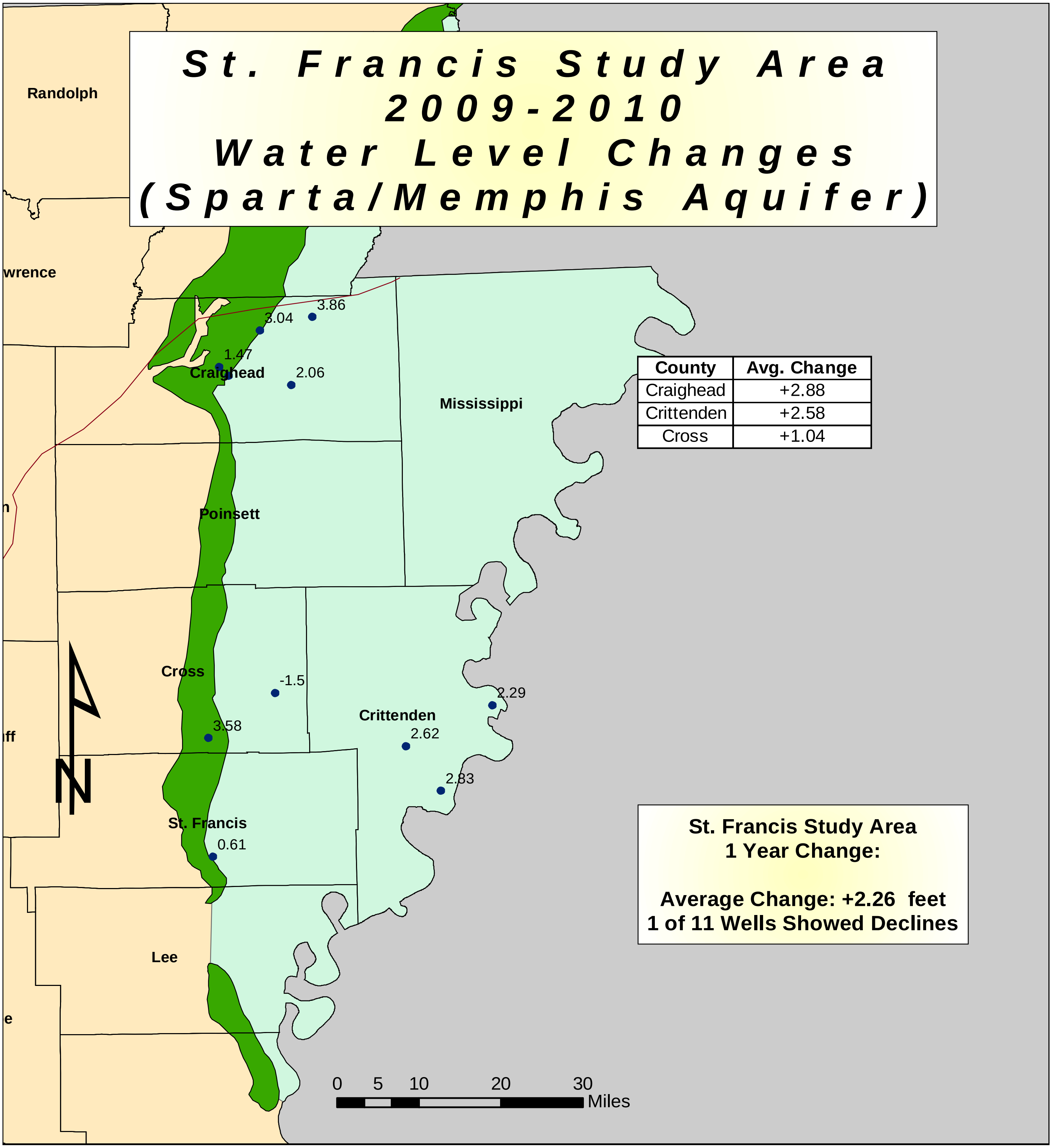


Table 19.



County	Avg. Change
Craighead	+2.88
Crittenden	+2.58
Cross	+1.04

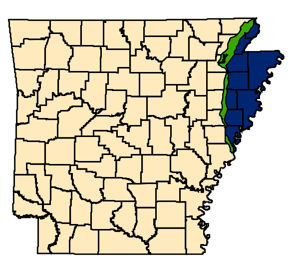
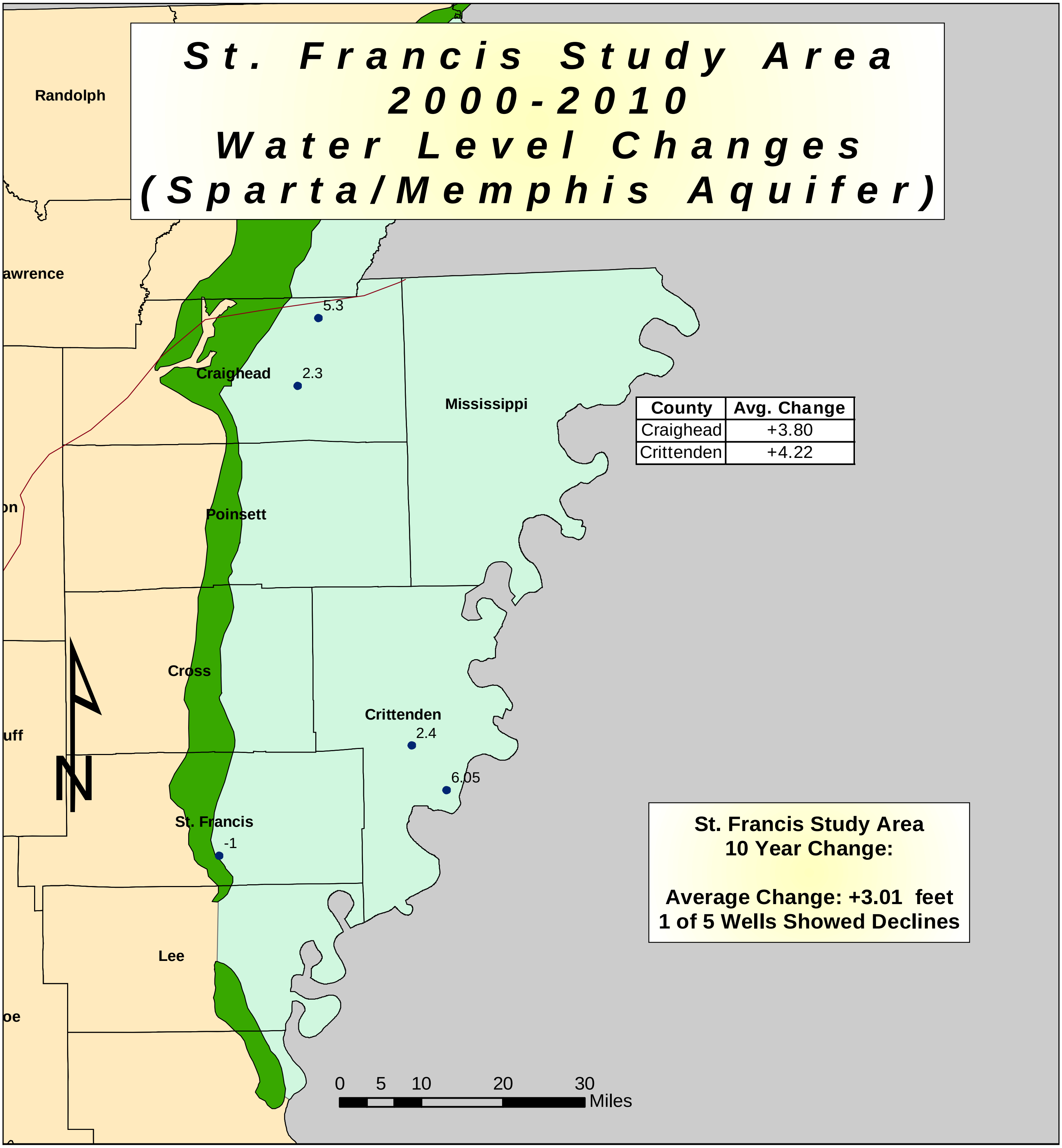


Fig. 34



Legend

- Wells
- Sparta Boundary
- Crowleys Ridge
- St. Francis Study Area

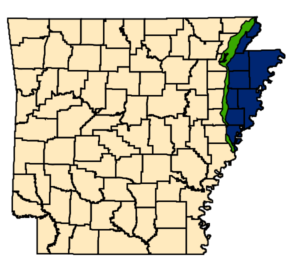


Fig. 35

Nonpoint Source Program

Introduction

ANRC staff continued work on ground-water quality standards in 2010. This task involves development of comprehensive standards that will provide an overview of water quality conditions in the State's aquifers, and assist in planned revision of the State Water Plan. The goals of standards are to establish a ground-water protection policy through source water protection, which emphasizes State and local partnerships and focuses on the prevention of pollution, with special provisions that target drinking water wells. Ground-water monitoring can then provide an overview of ground-water conditions, establish baselines and identify trends in ground-water quality.

Ground-Water Quality Standards

ANRC has developed an appropriate model for standards development and a draft document has been prepared. Classification of aquifers in Arkansas has been performed with work continuing on provisions and specifications for standards development.

Scientific investigation in 2010 concentrated on establishing numeric standards for specific chemicals, involving intensive review of the chemical properties and toxicity of individual compounds. Ground-water standard's utility for chemicals currently used in Arkansas are ranked highly for assignment of numerical values.

The model states: Illinois (primary), Colorado, New Jersey, North Carolina, and Rhode Island are utilized to derive the form, structure, and content of Arkansas's standards. Investigation into the various attributes of the model state's standards continued, with selection of specific elements for inclusion into Arkansas's standards. Numeric values from the model states are utilized whenever possible, however, some values must be derived from other selected states, including California, Michigan, Washington, and Wisconsin.

Ground-water standards shall establish criteria through which ground water can be protected by defining various uses of ground water and establishing the numerical maximum chemical concentrations necessary to protect those uses. Ground-water standards will also coordinate State and federal ground water protection programs and establish a regulatory structure which defines the risk of contamination and level of control required to aid in prevention of future ground water contamination. This will be acheived by relying on a framework of uses to be protected.

Nonpoint Source Program

The Arkansas Nonpoint Source Pollution Management Program is supported by Section 319 of the federal Clean Water Act. Grant Funds provide 60 percent of the total program funding. Work concentrated on two nonpoint source ground-water projects in 2010, with the primary effort directed toward development of ground-water quality standards (described in previous section).

Additional effort in 2010 was directed toward evaluation of potential ground-water impacts of sandstone mining that is now being performed in Izard County. The St. Peter and Calico Rock Sandstones (Ordovician) have excellent character to supply international demand for fracturing sand utilized in the shale-gas industry. Two mines have currently been permitted by AR Department of Environmental Quality (ADEQ), and additional mines are anticipated in the future. ANRC is also currently evaluating the potential ground-water impacts on water wells in the southern Ozarks from Conway to White Counties, where the predominance of shale-gas drilling is occurring.

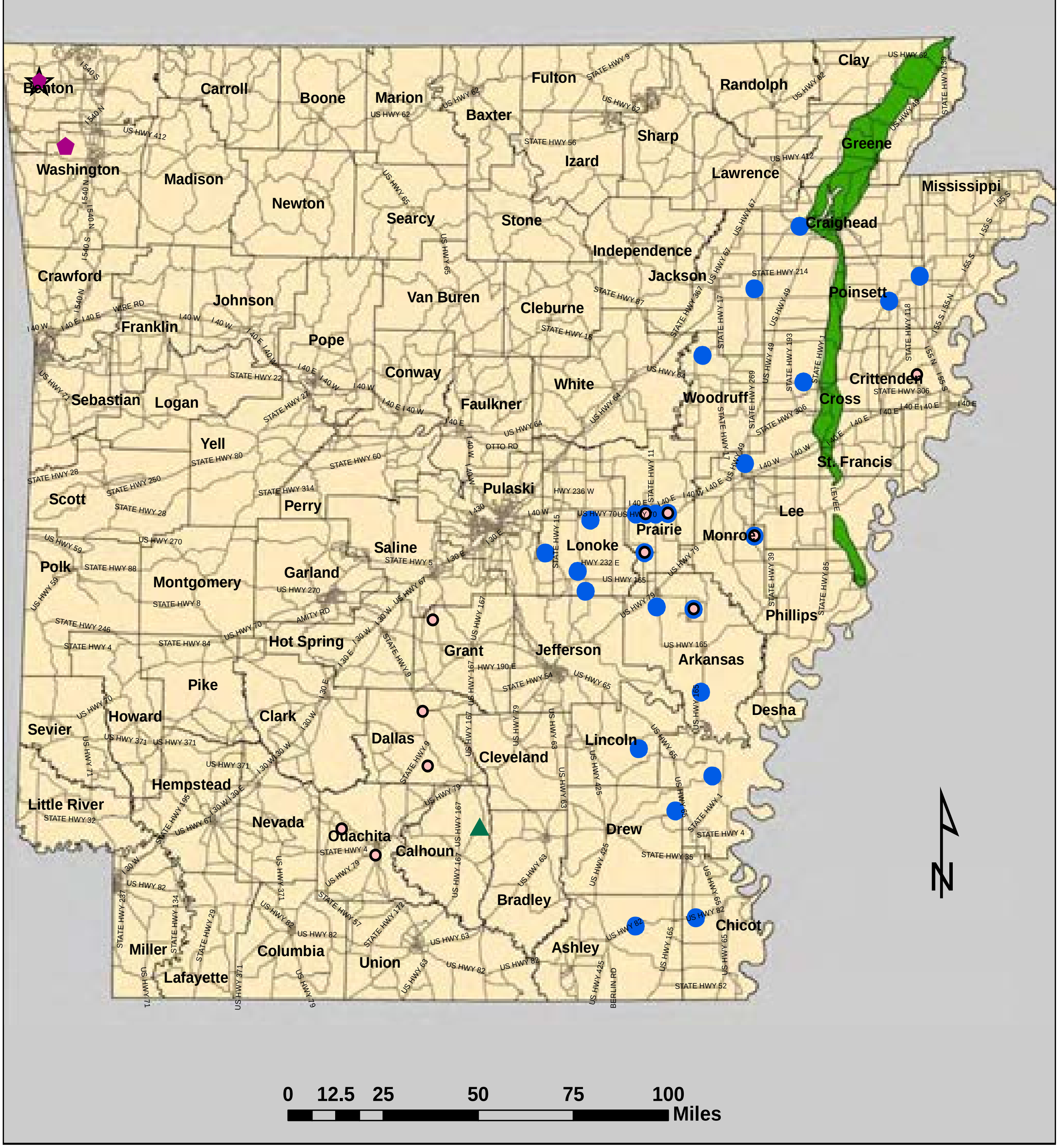
Another non-point project involves the mapping of karst features in northern Arkansas. Initiated in 2005 and 2006, draft sinkhole and lineament maps were generated along with identification of critical soils which allow rapid recharge in each county underlain by karst strata. ANRC continues to map karst features identified in recent mapping by the AR Geological Survey (AGS) as well as those presented in USGS publications. Additional sinkhole locations are also being provided by AR Department of Health (ADH), Designated Representatives (DRs) and Environmental Health Specialists (EHSs). ANRC will continue to document karst features, including sinkholes, lineaments, and losing streams with assistance from AGS, ADH, and USGS.

Karst and fractured rock training for ADH personnel began in 2006. The purpose of this training is to inform ADH personnel involved with design of septic and alternative, individual sewage disposal systems, of the potential for ground-water contamination by these systems in these terrains, to result in more efficient design of these systems.

Karst feature recognition training occurred at the annual EHS training event in Fayetteville on December 8th. Karst training for DRs occurred on November 3rd and 4th in Fayetteville and Russellville, and in Newport on December 1st. Also in December, contacts with EHS personnel obtained names and email addresses of all EHS personnel who have not attended this presentation in the Northwest and Northeast ADH-EHS Regions. Currently, names of EHS personnel in the Southwest and Central ADH Environmental Health Regions are being obtained. The karst/fractured rock presentations will be emailed to all ADH-EHS personnel in the karst and fractured rock terrain of Arkansas whom have not viewed it to-date. The advantages of email presentations will establish email/phone contact, and allow new EHS personnel to view the presentation when hired. In addition, the presentation can be designed to accommodate the proper terrain that underlies that particular county, (i.e. Karst, fractured rock, and a single terrain type or combination).

These projects represent the State's commitment to improve ground-water quality as part of the Nonpoint Source Pollution Management Program.

ANRC
Section 319 Core Program
Monitoring Enhancement Wells



Legend

- Alluvial Wells (36 Wells)
- Sparta Wells (11 Wells)
- Cockfield Well
- Wells in Boone Formation (2 Wells)
- Everton Well
- Crowleys Ridge
- County Boundaries

Fig. 36

ARKANSAS WATER WELL CONSTRUCTION COMMISSION

WATER WELL CONSTRUCTION PROGRAM

The Arkansas Water Well Construction Commission (AWWCC) is designed to insure "that the general health, safety, and welfare be protected by providing a means for the proper development of the natural resource of underground water in an orderly, sanitary, reasonable, and safe manner, without waste, so that sufficient potable supplies for the continued economic growth of our state may be assured" (Arkansas Water Well Construction Act, 1969). The commission is composed of seven members. The members consist of: the director of the Department of Health or a designated representative, the director of the Arkansas Natural Resources Commission or a designated representative, one member involved in the heat pump industry, and four members involved the water well drilling industry.

The commission achieves its goal by monitoring the construction of water wells in the state. Any person who engages in water well construction must obtain a water well contractors license from the commission. The contractor must keep a current bond and obtain six hours of continuing education each year to keep their license. In addition to monitoring the water well drilling industry the commission also provides services to licensed drillers as well as to the public. Some of the services include providing information on water levels in wells, construction information about wells in an area, and proper well abandonment procedures. The commission also is equipped to assist drillers in the assessment of repair work, which may be needed in damaged wells.

One way the commission keeps up with where well construction is taking place is through its relationship with Arkansas Department of Health. The Health Department has an Environmental Health Specialist in each county. These health specialists know where in the county wells would be required, and often lay out lots showing landowners where to place their septic system and well on their property. The commission's inspectors try to visit each county health office at least once a year. The commission also conducts well inspections in each county. These inspections are to insure the protection of our ground water, through compliance with the rules and regulations set forth by the commission.

The inspectors also visit licensed contractors during their county surveys and inspections gaining valuable insight about the area and industry. The local water well contractor knows more about drilling wells in his area than anyone else. This knowledge, along with grouting and sealing requirements in the commission's rules, ensure the customer clean safe water and protect this precious resource.

During the 2009 legislative sessions, amendments were made to section 5.8 of the rules and regulations in regard to abandonment of wells. These changes should allow the water well contractor to restore geologic and hydrogeologic conditions that existed prior to well construction. The changes allow the use of some natural material along with Bentonite. The rules also require the filing of an abandonment form with the AWWCC within 90 days of the abandonment.

The Commission fields complaints from the public about water well construction, as well as inspecting wells for violations of the Commissions rules and regulations. The Commission also issues licenses to water well contractors.

There are 172 water well contractors licensed (drill and/or pump) to work in Arkansas as of 2010. The larger contractors usually employ several registered drillers and/or pump installers and can have more than one rig permitted. A new category, Drill Only, was added in 2009. The following is a break-down of the licensed contractors, drillers, pump installers, and permitted rigs for 2004-2010.

AWWCC LICENSE SUMMARY

	Contractors License Drill and Pump	Drill only Contractors	Pump Installer Contractors	Drillers Registrations	Pump Installers Registrations	Driller Apprentice Registrations	Pump Installers Apprentice Registrations	Rigs
2004	148		37	283	271			375
2005	142		34	276	254			362
2006	149		34	305	271			392
2007	148		32	286	282	17	27	375
2008	140		31	276	268	16	29	362
2009	121	22	32	280	275	17	36	357
2010	172	23	31	287	271	15	35	362

Table 20.

There were 2,296 wells reported to the Commission in 2008. Of these 2,296 wells, only 765 were domestic water wells, or 33.3% of the total number of wells drilled. There were 1,264 irrigation wells reported, which is 55.1% of the total number of wells drilled in Arkansas.

The remaining wells were: livestock / poultry wells; monitoring wells; public or semi public supply wells; test wells; and geothermal wells for heat pump installations. The Commission typically only has geothermal contractors submit one report form for the entire loop field accounting for the total number of wells drilled.

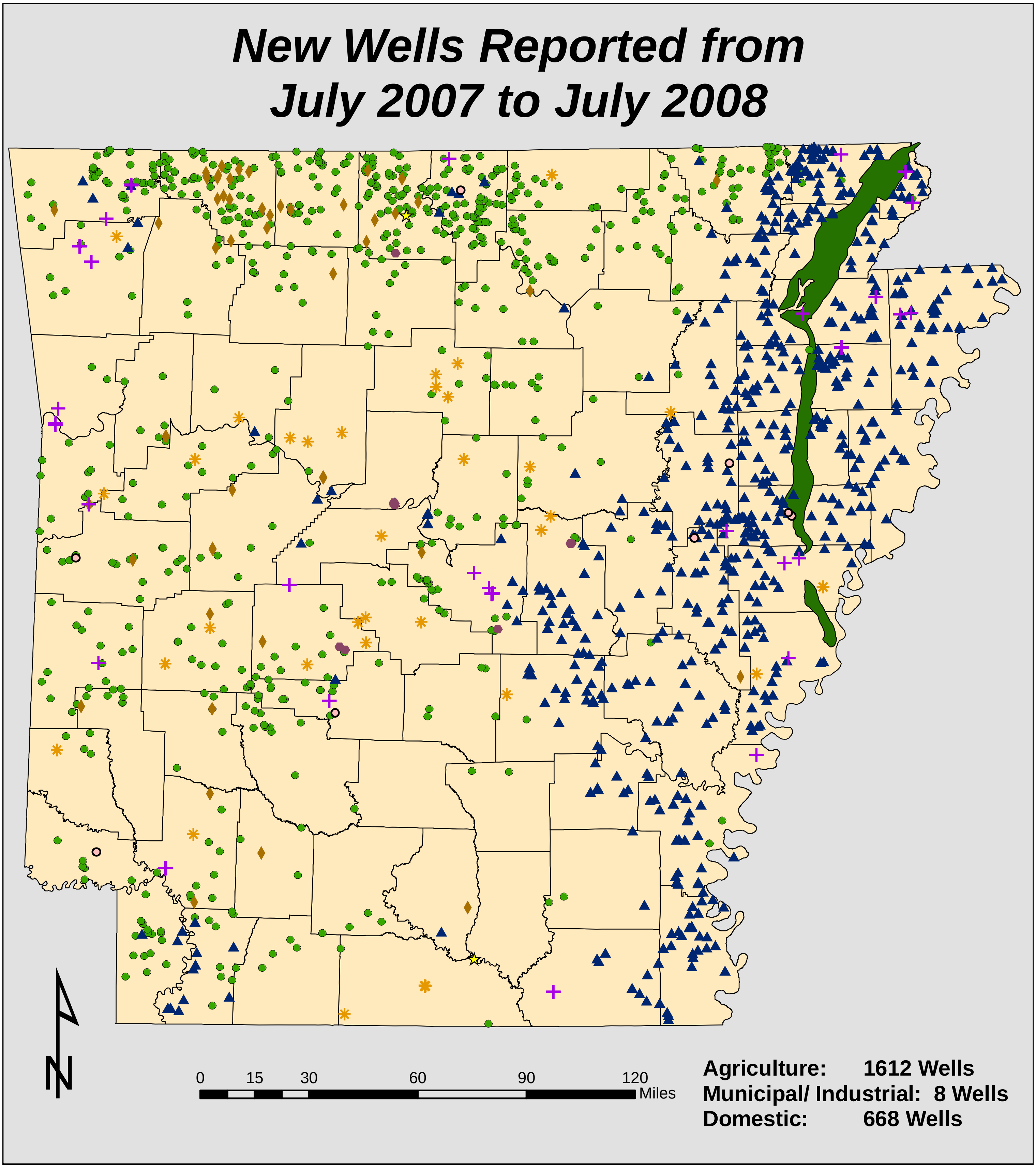

New Wells Reported from
July 2007 to July 2008
0
15
30
60
90
120
Miles
N
Agriculture: 1612 Wells
Municipal/ Industrial: 8 Wells
Domestic: 668 Wells
Legend
Domestic
Public Supply
Irrigation
Livestock/Poultry
Monitoring
Semi-Public
Test Wells
Other
Crowleys Ridge
County Boundaries

Fig. 38

GROUND WATER USE

REGISTERED WELLS

In accordance with Act 1051 of 1985, all wells in Arkansas that have the capacity to produce fifty thousand (50,000) gallons per day must be registered with the ANRC. Domestic wells are exempt. The quantity used must be reported by March 1st of the following year. The USGS reports for 2008 show there were approximately 49,029 registered wells reported in the State. Of this total, 48,048 (98 %) are agricultural wells, most of which are irrigation wells, located primarily in eastern Arkansas. The remaining 981 reported wells are used predominately for commercial, industrial, and public water supply purposes.

REPORTED WATER USE

In 2008 an estimated 7,451.15 million gallons per day (Mgal/d) of water were reported to be withdrawn from the State's aquifers. The greatest reported volume is pumped from the alluvial aquifer and used primarily for irrigation. Clay County, Poinsett County and Cross County used the most alluvial water of all counties, with 642.6 Mgal/d, 631.25 Mgal/d, and 546.48 Mgal/d respectively. The reported total ground-water use from the alluvial aquifer during 2008 was 7,022.95 Mgal/d. The Sparta/Memphis aquifer is the second largest aquifer in terms of withdrawals. The reported ground-water use from the Sparta/Memphis aquifer for 2008 was 157.5 Mgal/d, mostly used for municipal and industrial purposes. Jefferson county was the largest user of Sparta/Memphis water of all the counties, with an average withdrawal rate of 48.72 Mgal/d, followed by Arkansas County with a rate of 41.05 Mgal/d. (Holland, 2010)

Table 21 contains the reported ground-water use by aquifer per county in Arkansas for 2008 and is also broken down by category of use. This is the most recent information as supplied to the ANRC by the USGS.

The Sparta/Memphis aquifer had a reported average withdrawal of 157.5 Mgal/d during the 2008 reporting period. It is important to note that mainly due to increases in the Sparta/Memphis aquifer for irrigation in the area, Arkansas County is now the second largest user of this aquifer's resources, with a withdrawal of 41.05 Mgal/d. Jefferson County is the largest user of Sparta/Memphis ground-water, with a withdrawal of 48.72 Mgal/d. (Table 21)

Figure 38 shows water use in million gallons per day for the entire state from 1965 to 2008 in increments of 5 years. Figure 40 shows the quantity of ground water use for each county in Arkansas as reported.

The estimated sustainable yield of the Sparta/Memphis aquifer is discussed in the following section of this report, however the relation to this figure and reported water use are significant. The 2008 reported ground-water use from the Sparta/Memphis aquifer was an estimated 33% for agricultural uses, 43% for public supply use, and 23% for industrial uses, which combine with other uses for an estimated total use of 157.5 Mgal/d. The estimated sustainable use for the entire aquifer is 87 Mgal/d based on 1997 reported water use. This leaves a deficit of 70.5 Mgal/day, or 41.8% of the 1997 rate that is an unmet demand. (Holland, 2003, 2007, 2010)

In 2010, a letter of understanding (LOU) was signed between the Arkansas Natural Resources Commission (ANRC), the Arkansas Geological Survey (AGS), and the Arkansas District of the US Geological Survey (USGS), which created the Arkansas Water Inventory System. This database system combines the water use registration system with the water well construction report database, along with other data, to provide an extremely helpful tool for locating water use and well construction information statewide. The system currently contains water use information on 49,029 water wells, along with water well construction information on approximately 60,000 wells statewide and can be accessed at http://www.accessarkansas.org/awwcc/FramesConstructionReports.htm .

Table 21

2008 Withdrawals of Ground Water from Aquifers in Arkansas Counties by Use Type

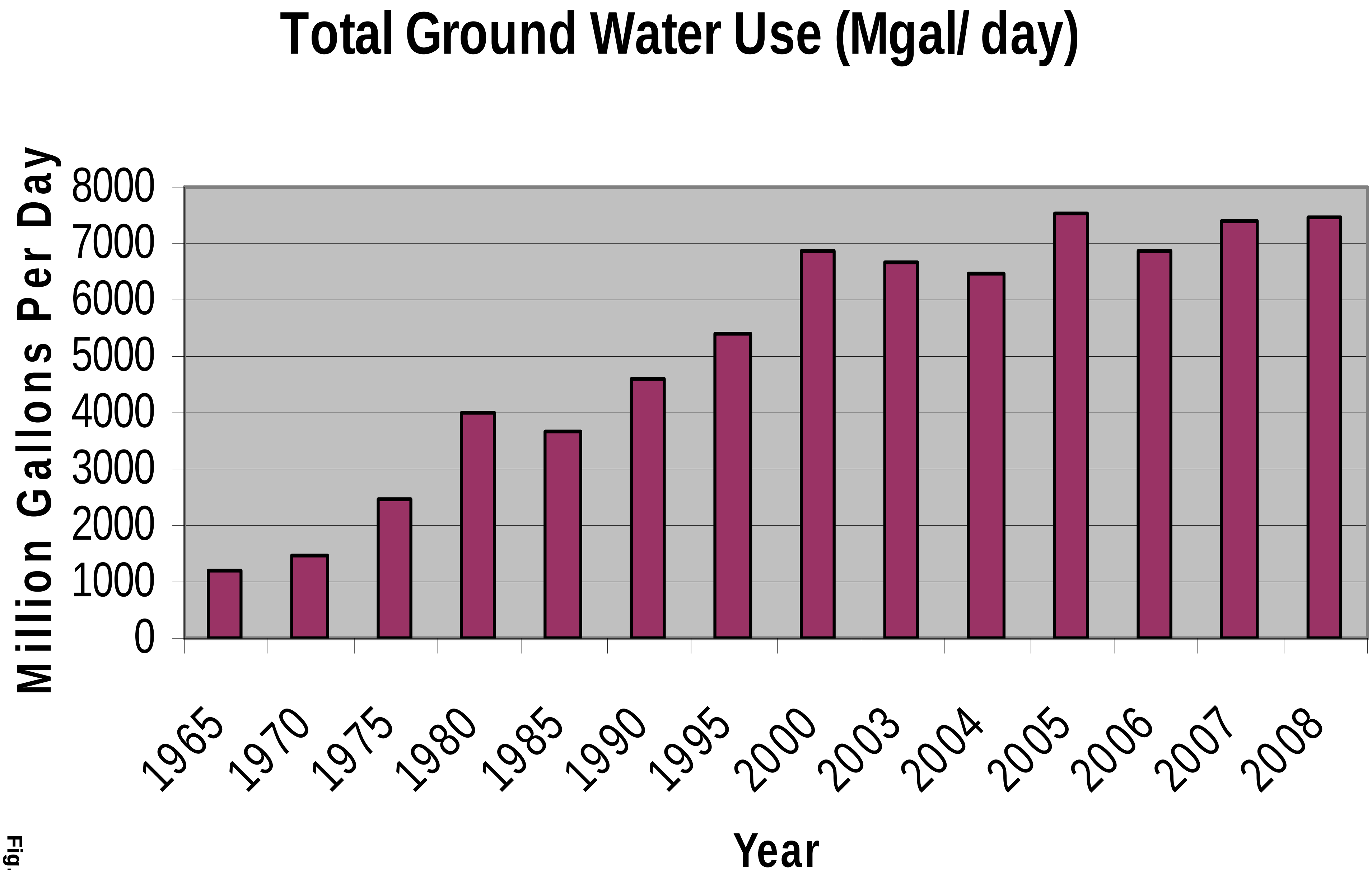
(in million gallons per day; —, no data available)

County	Use Type	Deposits of Quaternary Age		Cockfield Formation		Cane River		Sparta Memphis Sand		Wilcox Group		Clayton Formation		Nacatoch Sand		Tokio Formation		Trinity Group		ROCKS PALEOZOIC AGE		All Other Aquifers		Use Type total	
		Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well	Mgal/day	# of Well
ARKANSAS	AG/IR	379.99	2888	0.22	5	—	—	37.49	114	—	—	—	—	—	—	—	—	—	—	—	—	5.38	22	423.08	2265
	IN/CO/MI	—	—	—	—	—	—	0.27	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.27	5
	WS	0	4	—	—	—	—	3.29	13	—	—	—	—	—	—	—	—	—	—	—	—	0.05	1	3.34	18
Totals		379.99	2892	0.22	5	—	—	41.05	132	—	—	—	—	—	—	—	—	—	—	—	—	5.43	23	426.69	2284
ASHLEY	AG/IR	155.97	1843	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.88	6	156.85	1849
	IN/CO/MI	—	—	8.43	7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	8.43	7
	WS	—	—	14.41	12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.15	2	14.56	14
Totals		155.97	1843	22.84	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.03	8	179.84	1870
BAXTER	IN/CO/MI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	2	—	—	0	2
	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.47	21	—	—	0.47	21
Totals		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.47	23	—	—	0.47	23
BENTON	AG/IR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.02	2	—	—	0.02	2
	IN/CO/MI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	3	—	—	0	3
	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.19	12	0.23	3	0.42	15
Totals		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.21	17	0.23	3	0.44	20
BOONE	AG/IR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	1	—	—	0	1
	IN/CO/MI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	1	—	—	0	1
	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.66	13	—	—	0.66	13
Totals		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.66	15	—	—	0.66	15
BRADLEY	IN/CO/MI	—	—	—	—	—	—	0.4	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.4	3
	WS	—	—	0.14	2	—	—	0.23	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.37	5
Totals		—	—	0.14	2	—	—	0.63	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.77	8
CALHOUN	AG/IR	—	—	—	—	—	—	0	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	1
	IN/CO/MI	—	—	—	—	—	—	0	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	1
	WS	—	—	—	—	—	—	0.29	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.29	4
Totals		—	—	—	—	—	—	0.29	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.29	6
CARROLL	IN/CO/MI	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04	6	0	3	0.04	9
	WS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.63	90	0.02	4	0.65	94
Totals		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.67	96	0.02	7	0.69	103
CHICOT	AG/IR	199.82	1474	0.81	5	—	—	0.05	1	—	—	—	—	—	—	—	—	—	—	—	—	0.47	5	201.15	1485
	WS	—	—	0.94	8	—	—	0.5	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.44	11
Totals		199.82	1474	1.75	13	—	—	0.55	4	—	—	—	—	—	—	—	—	—	—	—	—	0.47	5	202.59	1496
CLARK	IN/CO/MI	—	—	—	—	—	—	—	—	—	—	—	—	0.1	3	—	—	—	—	0	3	0	1	0.1	7
	WS	—	—	—	—	—	—	—	—	—	—	0	1	0	4	0.06	2	—	—	—	—	—	—	0.06	7
Totals		—	—	—	—	—	—	—	—	—	—	0	1	0.1	7	0.06	2	—	—	0	3	0	1	0.16	14
CLAY	AG/IR	642.23	2026	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.92	12	54.82	174	700.97	2212
	IN/CO/MI	0	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	2
	WS	0.37	3	—	—	—	—	—	—	—	—	—	—	0.95	8	—	—	—	—	—	—	—	—	1.32	11
Totals		642.6	2031	—	—	—	—	—	—	—	—	—	—	0.95	8	—	—	—	—	3.92	12	54.82	174	702.29	2225
CLEBURNE	AG/IR	0.24	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.24	1
Totals		0.24	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.24	1
CLEVELAND	WS	—	—	—	—	—	—	0.45	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.45	6
Totals		—	—	—	—	—	—	0.45	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.45	6
COLUMBIA	AG/IR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	1	0	1
	IN/CO/MI	—	—	—	—	—	—	2.08	37	—	—	—	—	—	—	—	—	0.07	1	—	—	—	—	2.15	38
	WS	—	—	—	—	—	—	0.58	16	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.58	16
Totals		—	—	—	—	—	—	2.62	53	—	—	—	—	—	—	—	—	0.07	1	—	—	0	1	2.69	55
CONWAY	AG/IR	0.46	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.01	1	0.47	11
Totals		0.46	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.01	1	0.47	11
CRAIGHEAD	AG/IR	332.23	3066	—	—	—	—	2.25	25	—	—	—	—	—	—	—	—	—	—	—	—	11.28	125	345.76	3216
	IN/CO/MI	0.05	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.05	1
	WS	1.89	5	—	—	—	—	10.8	22	0.4	5	—	—	—	—	—	—	—	—	—	—	—	—	13.09	32
Totals		334.17	3072	—	—	—	—	13.05	47	0.4	5	—	—	—	—	—	—	—	—	—	—	11.28	125	358.9	3249
CRAWFORD	AG/IR	0.01	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.01	5
Totals		0.01	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.01	5
CRITTENDEN	AG/IR	159.08	1351	0.4	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5.11	7	164.59	1359
	IN/CO/MI	0.07	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.23	2	0.3	5
	WS	—	—	—	—	—	—	—	—	4.67	12	—	—	—	—	—	—	—	—	—	—	0.09	2	4.76	14
Totals		159.15	1354	0.4	1	—	—	—	—	4.67	12	—	—	—	—	—	—	—	—	—	—	5.43	11	169.65	1378
CROSS	AG/IR	545.14	2247	—	—	—	—	4.06	5	—	—	—	—	—	—	—	—	—	—	—	—	15.37	74	564.57	2326
	IN/CO/MI	0.36	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.36	4
	WS	0.98	5	—	—	—	—	0.96	4	0.25	2	—	—	—	—	—	—	—	—	—	—	—	—	2.19	11
Totals		546.48	2256	—	—	—	—	5.02	13	0.25	2	—	—	—	—	—	—	—	—	—	—	15.37	74	567.12	2345
DALLAS	WS	0	1	—	—	0	2	0.15	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.15	8
Totals		0	1	—	—	0	2	0.15	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.15	8
DESHA	AG/IR	278.72	1974	1.62	7	—	—	0.08	5	—	—	—	—	—	—	—	—	—	—	—	—	11.69	103	292.11	2089
	IN/CO/MI	—	—	0.17	1	—	—	3.01	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3.18	3
	WS	—	—	—	—	—	—	0.82	5	—	—	—	—	—	—	—	—	—	—	—	—	0.02	1	0.84	6
Totals		278.72	1974	1.79	8	—	—	3.91	12	—	—	—	—	—	—	—	—	—	—	—	—	11.71	104	296.14	2098
DREW	AG/IR	47.42	564	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04	1	47.46	565
	WS	—	—	—	—	—	—	2.41	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.41	5
Totals		47.42	564	—	—	—	—	2.41	5	—	—	—	—	—	—	—	—	—	—	—	—	0.04	1	49.87	570

FAULKNER	AC/IR	1.14	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.14	12
	IN/CO/MI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	-	-	0	2
	WS	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	8	-	-	0	9
Totals		1.14	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	10	-	-	1.14	23
FRANKLIN	AC/IR	0	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	6
	IN/CO/MI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	-	-	0	1
Totals		0	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	1	0	7
FULTON	AC/IR	0.16	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.27	1	-	-	0.43	2
	IN/CO/MI	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	0	3
	WS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.67	6	-	-	0.67	6
Totals		0.16	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.94	7	0	2	1.1	11
GARLAND	IN/CO/MI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	0.01	2	0.01	6
	WS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	3	-	-	0	3
Totals		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7	0.01	2	0.01	9
GRANT	AC/IR	0.18	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.18	1
	IN/CO/MI	-	-	-	-	-	-	0.26	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.26	6
	WS	-	-	-	-	-	-	1.44	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.44	11
Totals		0.18	1	-	-	-	-	1.7	17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.88	18
GREENE	AC/IR	355.45	2116	-	-	-	-	-	-	1.71	15	-	-	-	-	-	-	-	-	-	-	0.35	1	357.51	2132
	IN/CO/MI	0.1	2	-	-	-	-	-	-	0.17	3	-	-	0.02	1	-	-	-	-	-	-	-	-	0.29	7
	WS	-	-	-	-	-	-	-	-	3.86	9	-	-	0.43	4	-	-	-	-	-	-	-	-	4.29	13
Totals		355.55	2118	-	-	-	-	-	-	5.74	28	-	-	0.45	5	-	-	-	-	-	-	0.35	1	362.29	2152
HEMPSTEAD	AC/IR	-	-	-	-	-	-	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1
	IN/CO/MI	-	-	-	-	-	-	-	-	-	-	-	-	0	1	-	-	-	-	-	-	0	1	0	2
	WS	-	-	-	-	-	-	-	-	-	-	-	-	0.5	6	1.94	12	-	-	-	-	-	-	2.44	18
Totals		-	-	-	-	-	-	0	1	-	-	-	-	0.5	7	1.94	12	-	-	-	-	0	1	2.44	21
HOT SPRING	IN/CO/MI	0	1	-	-	-	-	0	1	-	-	-	-	-	-	-	-	-	-	0.02	4	-	-	0.02	6
	WS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	1	-	-	0.03	1
Totals		0	1	-	-	-	-	0	1	-	-	-	-	-	-	-	-	-	-	0.05	5	-	-	0.05	7
HOWARD	WS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	4	-	-	-	-	-	-	0.1	4
Totals		-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	4	-	-	-	-	-	-	0.1	4
INDEPENDENCE	AC/IR	27.11	308	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.58	2	27.69	310
	WS	0.71	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0.71	8
Totals		27.82	315	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.58	3	28.4	318
IZARD	WS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	11	-	-	0.03	11
Totals		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	11	-	-	0.03	11
JACKSON	AC/IR	390.30	2627	-	-	-	-	0.37	1	-	-	-	-	-	-	-	-	-	-	-	-	0.35	2	391.02	2630
	IN/CO/MI	0.52	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.52	1
	WS	0.34	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	0.34	17
Totals		390.88	2643	-	-	-	-	0.37	1	-	-	-	-	-	-	-	-	-	-	-	-	0.35	4	391.59	2648
JEFFERSON	AC/IR	215.84	1668	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	1	215.86	1669
	IN/CO/MI	5.45	7	-	-	-	-	35.48	30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	40.93	37
	WS	-	-	-	-	-	-	13.24	45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.24	45
Totals		221.29	1675	-	-	-	-	48.72	75	-	-	-	-	-	-	-	-	-	-	-	-	0.02	1	270.03	1751
JOHNSON	AC/IR	0	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	11
	IN/CO/MI	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1
Totals		0	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	12
LAFAYETTE	AC/IR	25.82	252	0.81	3	-	-	0.3	31	0.81	15	-	-	-	-	-	-	-	-	0	1	1.05	11	28.79	313
	IN/CO/MI	-	-	-	-	-	-	0	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2
	WS	-	-	-	-	0.44	7	0.1	4	-	-	-	-	-	-	-	-	-	-	-	-	0.16	1	0.7	12
Totals		25.82	252	0.81	3	0.44	7	0.4	37	0.81	15	-	-	-	-	-	-	-	-	0	1	1.21	12	29.49	327
LAWRENCE	AC/IR	560.11	1258	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.48	5	0.77	64	561.36	1327
	IN/CO/MI	0	1	-	-	-	-	-	-	-	-	-	-	0	1	-	-	-	-	-	-	-	-	0	2
	WS	0.99	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.61	7	0	1	1.6	17
Totals		561.1	1268	-	-	-	-	-	-	-	-	-	-	0	1	-	-	-	-	1.09	12	0.77	65	562.96	1346
LEE	AC/IR	242.54	2275	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	242.54	2275
	WS	-	-	-	-	-	-	0.78	2	0.04	1	-	-	-	-	-	-	-	-	-	-	0.33	2	1.15	5
Totals		242.54	2275	-	-	-	-	0.78	2	0.04	1	-	-	-	-	-	-	-	-	-	-	0.33	2	243.69	2280
LINCOLN	AC/IR	168.55	1176	-	-	-	-	0.75	7	-	-	-	-	-	-	-	-	-	-	-	-	0.82	6	170.12	1189
	WS	-	-	-	-	-	-	0.97	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.97	11
Totals		168.55	1176	-	-	-	-	1.72	18	-	-	-	-	-	-	-	-	-	-	-	-	0.82	6	171.09	1200
LITTLE RIVER	AC/IR	3.59	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.59	33
	IN/CO/MI	0.06	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	3
	WS	0.06	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	7
Totals		3.71	43	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.71	43
LOGAN	AC/IR	0.19	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.19	12
Totals		0.19	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.19	12
LONOKE	AC/IR	284.56	2536	-	-	-	-	7.72	35	0.05	1	-	-	-	-	-	-	-	-	-	-	17.84	54	310.17	2626
	IN/CO/MI	0.64	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.64	4
	WS	3.81	28	0.34	2	-	-	1.67	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.82	38
Totals		289.01	2568	0.34	2	-	-	9.39	43	0.05	1	-	-	-	-	-	-	-	-	-	-	17.84	54	316.63	2668
MADISON	AC/IR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	-	-	0	1
Totals		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	-	-	0	1
MARION	IN/CO/MI	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	0	1	0	2
	WS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	-	-	0	2
Totals		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	3	0	1	0	4
MILLER	AC/IR	18.76	77	-	-	-	-	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.76	78

	IN/COMM	–	–	–	–	–	–	–	–	0.01	2	–	–	–	–	0.16	3	–	–	–	–	0	2	0.17	7
	WS	0.05	1	–	–	–	–	0	1	0.05	2	–	–	–	–	–	–	–	–	–	–	0	1	0.10	5
Totals		10.85	78	–	–	–	–	0	2	0.1	4	–	–	–	–	0.16	3	–	–	–	–	0	3	11.11	90
MISSISSIPPI	AG/R	291.99	2247	–	–	–	–	–	–	0.49	1	–	–	–	–	–	–	–	–	–	–	8.56	5	292.64	2253
	IN/COMM	0.06	1	–	–	–	–	–	–	2.33	10	–	–	–	–	–	–	–	–	–	–	0.90	1	3.37	12
	WS	–	–	–	–	–	–	–	–	3.14	23	–	–	–	–	–	–	–	–	–	–	0.21	3	3.37	26
Totals		292.05	2248	–	–	–	–	–	–	5.96	34	–	–	–	–	–	–	–	–	–	–	1.37	7	299.38	2289
MONROE	AG/R	263.55	2226	0.73	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.05	1	264.37	2235
	IN/COMM	0	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	1
	WS	0.21	1	–	–	–	–	0.88	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.09	5
Totals		263.76	2227	0.73	8	–	–	0.88	4	–	–	–	–	–	–	–	–	–	–	–	–	0.05	1	265.42	2235
MONTGOMERY	AG/R	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	1	–	–	0	1
	IN/COMM	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01	5	0.05	2	0.06	7
Totals		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01	6	0.05	2	0.06	8
NEVADA	IN/COMM	0	2	–	–	–	–	–	–	–	–	0.01	1	–	–	–	–	–	–	–	–	–	–	0.01	3
	WS	–	–	–	–	–	–	–	–	0.05	2	–	–	0	2	–	–	–	–	–	–	–	–	0.05	4
Totals		0	2	–	–	–	–	–	–	0.05	2	0.01	1	0	2	–	–	–	–	–	–	–	–	0.06	7
NEWTON	WS	0.04	9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.29	1	0	3	0.33	13
Totals		0.04	9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.29	1	0	3	0.33	13
OUACHITA	WS	–	–	–	–	–	–	0.93	12	–	–	–	–	0	1	–	–	–	–	–	–	0	1	0.93	14
Totals		–	–	–	–	–	–	0.93	12	–	–	–	–	0	1	–	–	–	–	–	–	0	1	0.93	14
PERRY	IN/COMM	0	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	1
	WS	0.01	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01	2
Totals		0.01	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01	3
PHILLIPS	AG/R	245.82	1922	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.12	1	245.94	1923
	IN/COMM	0.07	1	0	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.07	2
	WS	–	–	–	–	–	–	2.93	15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.93	15
Totals		245.89	1923	0	1	–	–	2.93	15	–	–	–	–	–	–	–	–	–	–	–	–	0.12	1	248.89	1940
PIKE	AG/R	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	1	–	–	0	1
	WS	0.05	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.05	1
Totals		0.05	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	1	–	–	0.05	2
POINSETT	AG/R	630.17	2836	–	–	–	–	1.17	4	–	–	–	–	–	–	–	–	–	–	–	–	0.31	1	631.65	2841
	IN/COMM	0	2	–	–	–	–	0.07	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.07	3
	WS	1.08	8	–	–	–	–	0.07	4	1.07	5	–	–	–	–	–	–	–	–	–	–	–	–	2.22	17
Totals		631.25	2846	–	–	–	–	1.31	9	1.07	5	–	–	–	–	–	–	–	–	–	–	0.31	1	633.94	2861
POLK	IN/COMM	0.3	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01	2	0.01	3	0.32	9
Totals		0.3	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01	2	0.01	3	0.32	9
POPE	IN/COMM	0.01	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01	3
Totals		0.01	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01	3
PRAIRIE	AG/R	170.93	1800	–	–	–	–	0.49	42	2.06	11	–	–	–	–	–	–	–	–	–	–	9.43	78	185.91	1932
	WS	0.6	19	–	–	–	–	0.22	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.82	12
Totals		170.53	1819	–	–	–	–	0.71	44	2.06	11	–	–	–	–	–	–	–	–	–	–	9.43	78	186.73	1944
PULASKI	AG/R	17.73	223	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	17.73	223
	IN/COMM	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	1	0	1
	WS	2.68	12	–	–	–	–	0.26	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.94	15
Totals		20.41	235	–	–	–	–	0.26	3	–	–	–	–	–	–	–	–	–	–	–	–	0	1	20.67	239
RANDOLPH	AG/R	101.35	652	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.92	3	102.27	655
	WS	0.06	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.21	4	–	–	0.27	7
Totals		101.41	655	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.21	4	0.92	3	102.54	662
ST FRANCIS	AG/R	260.64	2841	0.54	5	–	–	0.07	1	–	–	–	–	–	–	–	–	–	–	–	–	1.07	5	262.32	2852
	WS	3.63	12	–	–	–	–	–	–	0.26	1	–	–	–	–	–	–	–	–	–	–	–	–	3.89	13
Totals		264.27	2853	0.54	5	–	–	0.07	1	0.26	1	–	–	–	–	–	–	–	–	–	–	1.07	5	266.21	2865
SALINE	AG/R	–	–	–	–	–	–	–	–	0	1	–	–	–	–	–	–	–	–	–	–	–	–	0	1
	WS	0.36	2	–	–	–	–	0.21	2	0.42	9	–	–	–	–	–	–	–	–	–	–	–	–	1.19	13
Totals		0.36	2	–	–	–	–	0.21	2	0.42	10	–	–	–	–	–	–	–	–	–	–	–	–	1.19	14
SCOTT	IN/COMM	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	2	–	–	0	2
Totals		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	2	–	–	0	2
SEARCY	WS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.21	6	0.13	2	0.34	8
Totals		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.21	6	0.13	2	0.34	8
Totals		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	0
SEVIER	IN/COMM	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	1	0	1
	WS	0.06	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.14	4	–	–	–	–	0.2	5
Totals		0.06	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.14	4	–	–	0	1	0.2	6
SHARP	IN/COMM	0	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	1
	WS	0	1	–	–	–	–	–	–	–	–	–	–	–	–	0.01	2	–	–	0.77	10	–	–	0.78	13
Totals		0	2	–	–	–	–	–	–	–	–	–	–	–	–	0.01	2	–	–	0.77	10	–	–	0.78	14
STONE	AG/R	0.07	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.07	1
	IN/COMM	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.01	1	–	–	0.01	1
	WS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.03	1	–	–	0.03	1
Totals		0.07	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.04	2	–	–	0.11	3
UNION	AG/R	0.17	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.17	1
	IN/COMM	–	–	–	–	–	–	1.28	16	–	–	–	–	–	–	–	–	–	–	–	–	0.36	2	1.64	18
	WS	0.04	1	–	–	–	–	5.72	36	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.76	37
Totals		0.21	2	–	–	–	–	7	52	–	–	–	–	–	–	–	–	–	–	–	–	0.36	2	7.57	56
Totals		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	0

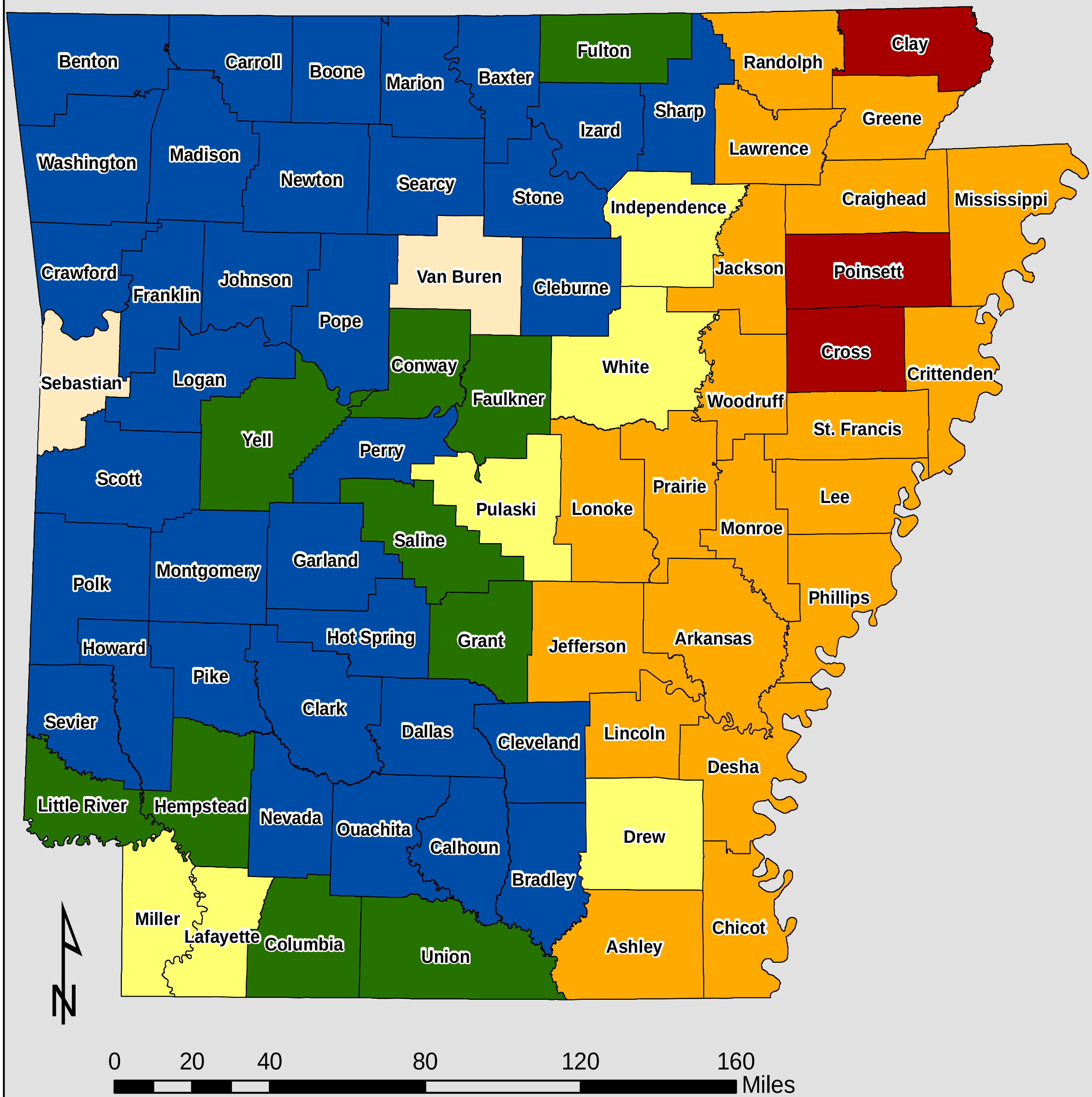
WASHINGTON	W/CO/MI	0	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	1	0	2
Totals		0	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	1	0	2
WHITE	AG/IR	22.91	437	—	—	—	—	—	—	0.54	1	—	—	—	—	—	—	—	—	—	—	0.65	21	24.1	459
	W/CO/MI	0.04	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.04	1
	WS	0.71	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.71	6
Totals		23.66	444	—	—	—	—	—	—	0.54	1	—	—	—	—	—	—	—	—	—	—	0.65	21	24.85	466
WOODRUFF	AG/IR	371.24	1944	—	—	—	—	1.96	8	—	—	—	—	—	—	—	—	—	—	—	—	68.92	319	434.12	2271
	W/CO/MI	0	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	2
	WS	0.4	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.4	5
Totals		371.64	1951	—	—	—	—	1.96	8	—	—	—	—	—	—	—	—	—	—	—	—	68.92	319	434.52	2278
YELL	W/CO/MI	0	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0	3
	WS	2.04	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.04	9
Totals		2.04	12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2.04	12
State Totals		7027.95	46,264	20.76	63	0.64	9	157.45	600	23.97	120	0.01	2	2	31	2.27	23	0.21	5	18.38	984	282.51	1,548	7451.15	49,829



Total Ground Water Use (Mgal/ day)
Million Gallons Per Day
8000
7000
6000
5000
4000
3000
2000
1000
0
1965
1970
1975
1980
1985
1990
1995
2000
2003
2004
2005
2006
2007
2008
Year

Fig.38

Ground Water Use in Arkansas as of 2008 (Mgal/day)



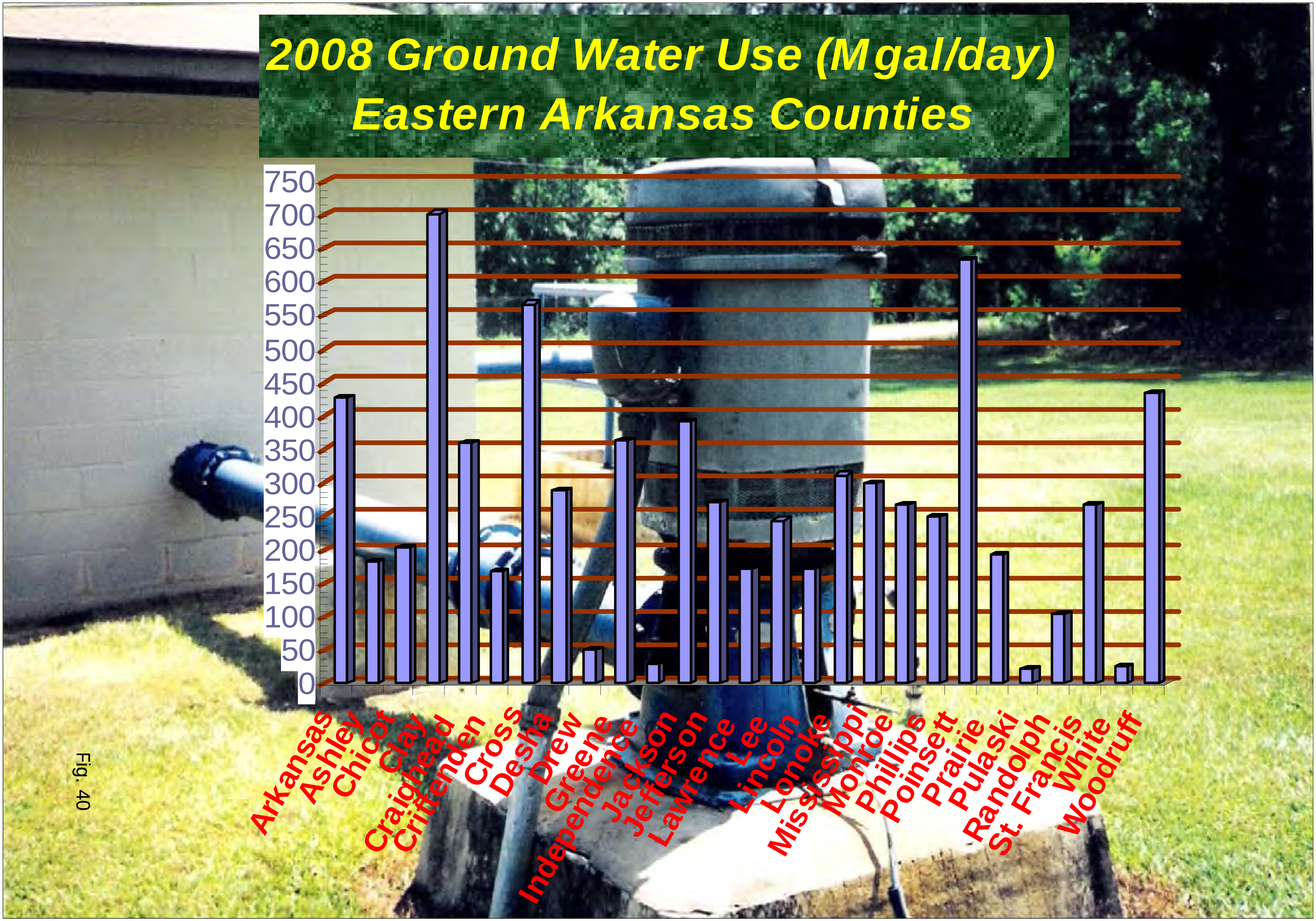
Legend

- 0 - 1 Mgal/ Day
- Greater than 1 -10 Mgal/day
- Greater than 10 - 100 Mgal/day
- Greater than 100 - 560 Mgal/day
- Greater than 560 - 740 Mgal/day
- No Data Available

Total Use (Mgal/day): 7451.15

***Data Obtained from United States Geological Survey**

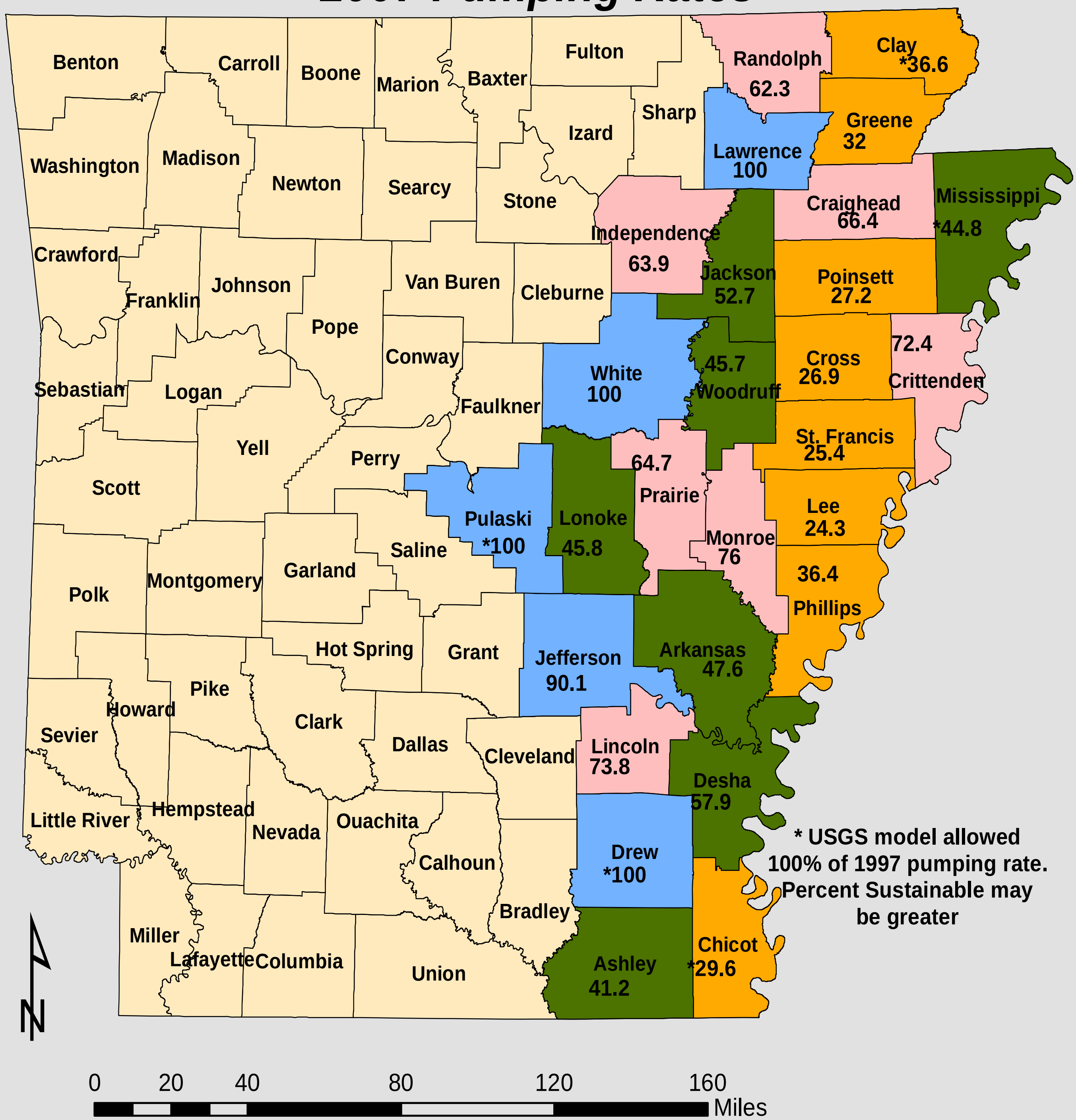
Fig. 39



2008 Ground Water Use (Mgal/day)
Eastern Arkansas Counties
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
Arkansas
Ashley
Chicot
Clay
Craighead
Crittenden
Cross
Desha
Drew
Greene
Independence
Jackson
Jefferson
Lawrence
Lee
Lincoln
Lonoke
Mississippi
Monroe
Phillips
Poinsett
Prairie
Pulaski
Randolph
St. Francis
White
Woodruff

Fig. 40

Percentage of Sustainable Yield for the Alluvial Aquifer based on 2007 Pumping Rates



* USGS model allowed 100% of 1997 pumping rate. Percent Sustainable may be greater

Legend

- 21 - 40%
- 41 - 60%
- 61 - 80%
- 81 - 100%
- County Boundaries

Modified from USGS Reports 2003-4230 &2007-5241

Total Alluvial Water Use: 7,022.95 Mgal/day
Total Sustainable Yield: 42.6%

Fig. 41

2008 Total Withdrawals of Ground Water (Mgal/day) by Aquifer

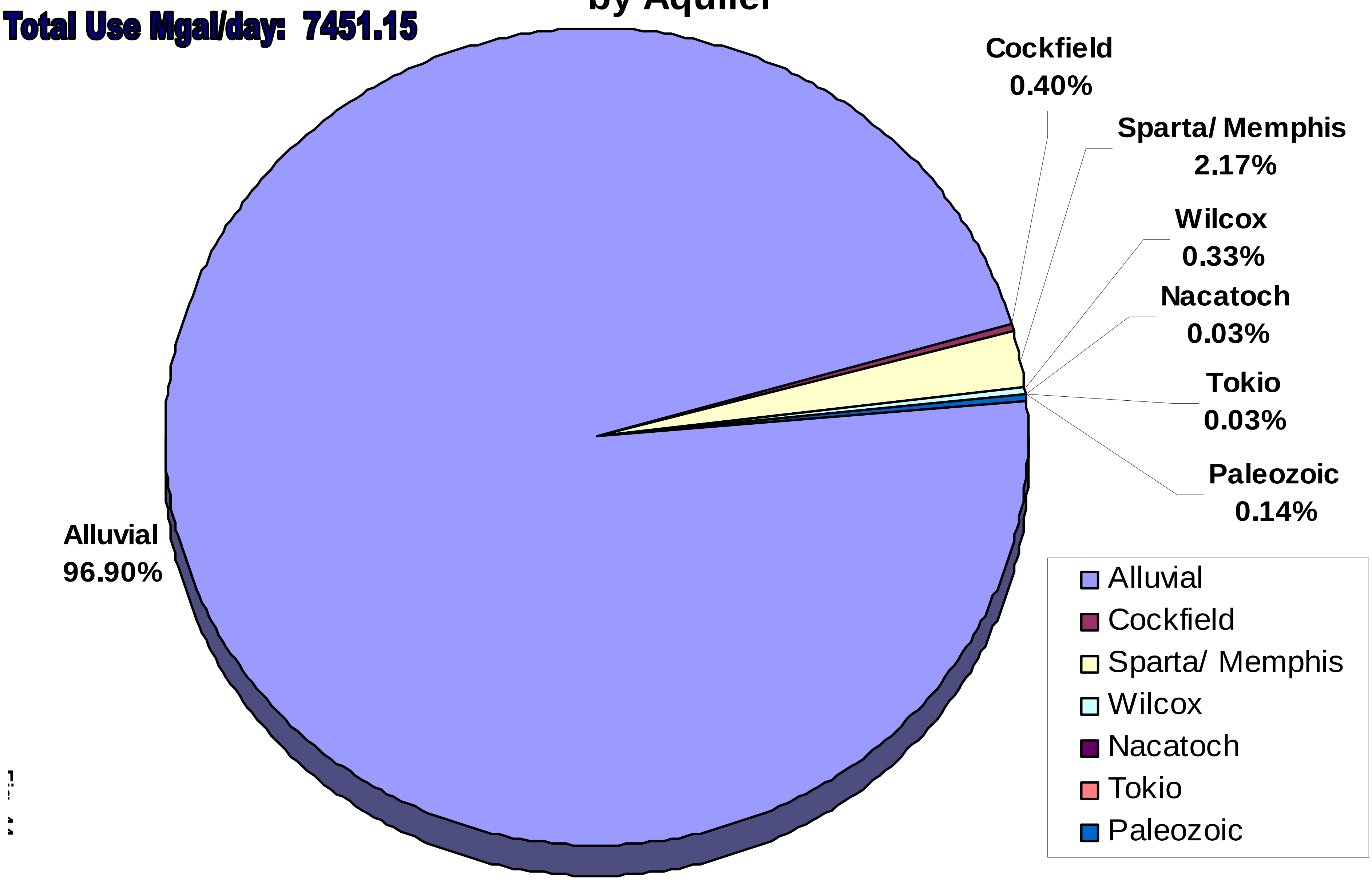


Fig. 42

2008 Withdrawal of Ground Water from the Alluvial Aquifer by Use Type

Aquifer Use Mgal/day: 7022.95

Sustainable Yield: 43%

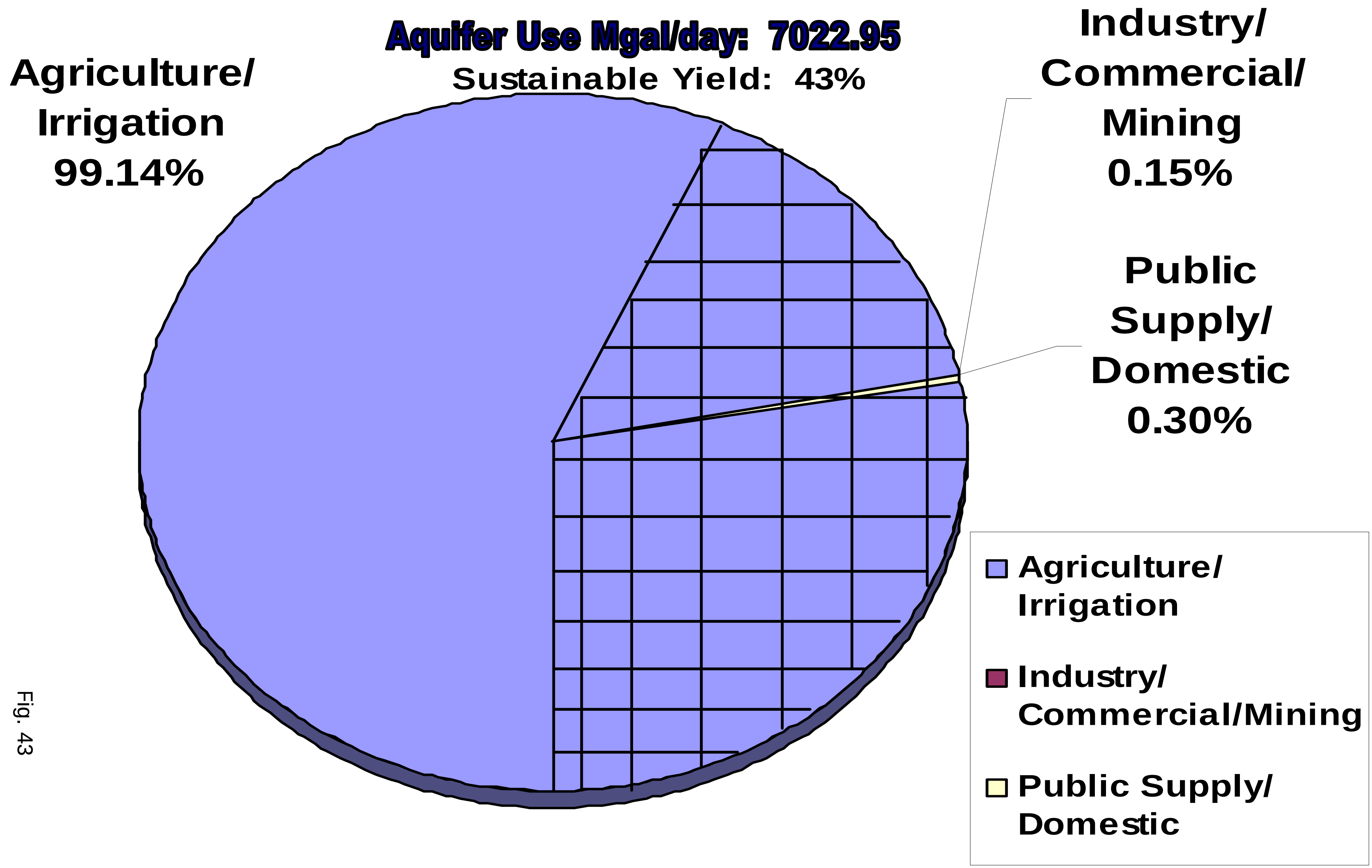


Fig. 43

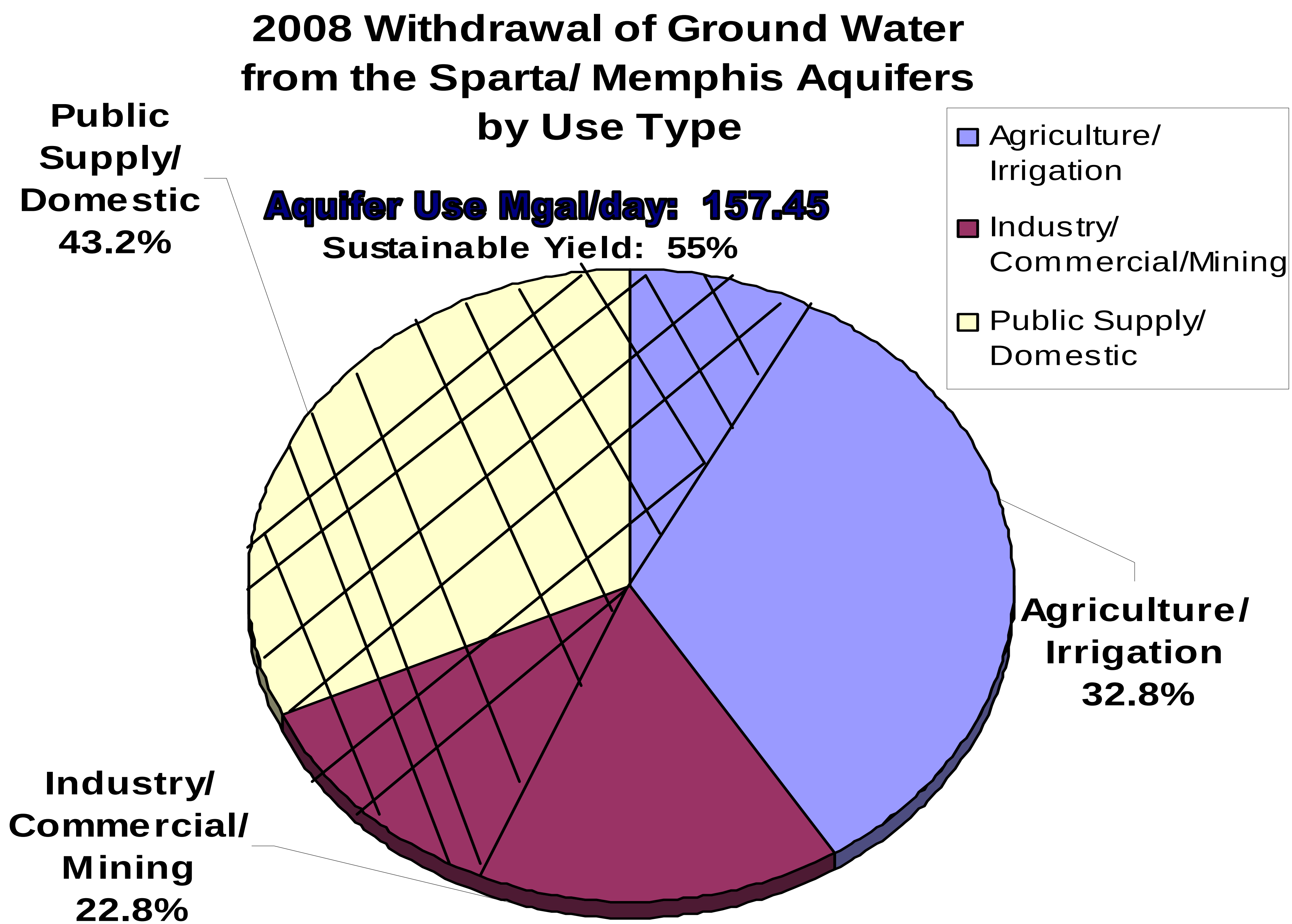

2008 Withdrawal of Ground Water
from the Sparta/ Memphis Aquifers
by Use Type
Aquifer Use Mgal/day: 157.45
Sustainable Yield: 55%
Agriculture/ Irrigation
Industry/ Commercial/Mining
Public Supply/ Domestic
Public Supply/ Domestic 43.2%
Agriculture/ Irrigation 32.8%
Industry/ Commercial/ Mining 22.8%

Fig. 44

SUMMARY

The Ground Water Protection and Management Report for 2010 is a summary of the activities and significant findings of the Arkansas Natural Resources Commission (ANRC). This report is prepared annually in response to legislative mandates that direct the ANRC to study the State's ground-water resources. The report also describes ground-water protection activities administered through Region VI of the U.S. Environmental Protection Agency, which are funded through Sections 106 and 319 of the Clean Water Act.

The purposes of the programs outlined in this report are to monitor the condition of the State's ground-water resources and to evaluate trends in water level and water quality fluctuations. The ANRC, the NRCS, and the USGS monitor over 1,700 water wells each year for water levels and prescribed water quality parameters. This monitoring is accomplished through a cooperative agreement with the ANRC, the USGS, and the Arkansas Geological Survey (AGS).

Spring water level measurements from 2009 to 2010 provided short term data indicating an overall average increase in water levels. The overall change in the alluvial aquifer for spring 2009 to spring 2010 was an increase of 1.62 feet with 24.7 percent of measured wells showing a water-level decline. Over the same time period the Sparta aquifer had an average change of +4.61 feet. The water levels in the Cache Study area had an average change of +4.28 feet in the Sparta/Memphis Aquifer from 2009 to 2010. The areas of heightened concern due to water-level decline continue to be in the Grand Prairie, South Arkansas, and Cache Study Areas. Fluctuations may be observed in ground-water levels over a short time period, however long term records illustrate the seriousness of the declines in ground-water levels as illustrated by the hydrographs and long term change maps. These hydrographs for both the alluvial and Sparta/Memphis aquifers are included as Appendix B and Appendix D.

Arkansas is withdrawing ground water from the alluvial and Sparta aquifers in eastern and southern Arkansas at a rate, which is far above sustainable. With this in mind, the ANRC should continue to promote conservation, education, and the conjunctive use of ground- and surface- water at rates that are sustainable for current and future water use needs.

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Appendix A

Alluvial Aquifer Water Level Monitoring Data

Alluvial Aquifer
00-05-09-10
Wl Change

County	Station ID	Latitude	Longitude	LSA	Date	2010	WL	WL	WL	WL	09-10	05-10	00-10
					Measured	meas.	Alt. 10	Alt. 09	Alt. 05	Alt. 00	Change	Change	Change
Arkansas	02S04W11DBB1	343232.89	912415.21	213.04	3/17/2010	98.75	114.29	113.84	113.24		0.45	1.05	
Arkansas	02S05W15AAB1	343212.68	913126.72	213.00	3/18/2010	113.56	99.44	99.35	106.60	96.89	0.09	-7.16	2.55
Arkansas	02S05W31BBB1	342936.71	913536.22	198.00	3/18/2010	33.05	164.95	154.00	182.00	139.90	10.95	-17.05	25.05
Arkansas	03S02W27ABB1	342447.92	911251.01	197.00	3/16/2010	61.96	135.04	133.90	129.20		1.14	5.84	
Arkansas	03S03W05CCD1	342737.02	912131.83	201.00	3/17/2010	98.33	102.67	103.00	103.40	107.13	-0.33	-0.73	-4.46
Arkansas	03S03W18CCC1	342553	912251	196.00	4/5/2010	99.56	96.44	95.53			0.91		
Arkansas	03S03W27BBC1	342454.73	911944.08	195.00	3/17/2010	92.50	102.50	102.50	104.10	107.25	0.00	-1.60	-4.75
Arkansas	03S04W02BBB1	342831	912454	197.63	3/17/2010	92.99	104.64	104.33	105.78		0.31	-1.14	
Arkansas	03S04W03DCA16	342753.04	912515.37	205.00	4/19/2010	101.12	103.88	104.13	105.20		-0.25	-1.32	
Arkansas	03S05W13AC1	342630	913307	211.00	4/4/2010	108.80	102.20	103.93			-1.73		
Arkansas	03S05W24DAA1	342525	912922	207.00	3/18/2010	44.01	162.99	149.00	190.25	101.37	13.99	-27.26	61.62
Arkansas	03S06W35ADD1	342411.4	913651.67	190.00	3/18/2010	52.77	137.23	135.90	137.20		1.33	0.03	
Arkansas	04S01W31DCB1	341753	910947	179.00	3/16/2010	50.15	128.85	127.00	126.95	110.71	1.85	1.90	18.14
Arkansas	04S02W29CCC1	341846.35	911538.5	191.00	3/16/2010	82.14	108.86	107.05	107.05	106.73	1.81	1.81	2.13
Arkansas	04S03W17ADD1	342101.87	912058.11	200.00	3/17/2010	108.48	91.52	91.60	92.87		-0.08	-1.35	
Arkansas	04S03W32BCB1	341820.31	912202.18	192.00	3/17/2010	118.10	73.90	61.80	75.90	87.25	12.10	-2.00	-13.35
Arkansas	04S04W02ABB1	342313.2	912423.69	200.00	3/17/2010	109.05	90.95	90.80	91.50	87.07	0.15	-0.55	3.88
Arkansas	04S05W24DAA1	342001.3	912929.57	198.00	3/15/2010	89.70	108.30	108.50	107.70	107.78	-0.20	0.60	0.52
Arkansas	05S01W16BAB1	341551.59	910729.49	183.00	3/16/2010	48.71	134.29	135.80	137.50		-1.51	-3.21	
Arkansas	05S03W09CBA1	341624	912046	196.00	3/18/2010	112.19	83.81	82.77			1.04		
Arkansas	05S04W07CCC1	341555.36	912931.61	194.00	3/15/2010	72.85	121.15	121.00	119.55	112.53	0.15	1.60	8.62
Arkansas	05S04W32BBA1	341315.97	912821.81	191.00	3/15/2010	56.56	134.44	133.50	131.87	130.52	0.94	2.57	3.92
Arkansas	05S06W02DDD1	341723.66	913650.8	182.93	3/15/2010	19.69	163.24	162.83	163.08	162.24	0.41	0.16	1.00
Arkansas	05S06W07DDC1	341641.5	914129.68	180.48	3/18/2010	1.66	178.82	178.88	177.33	170.79	-0.06	1.49	8.03
Arkansas	06S02W23DCD1	340852.62	911206.48	188.00	3/16/2010	63.46	124.54	127.50	137.50	122.55	-2.96	-12.96	1.99
Arkansas	06S03W10BBA1	341135.97	911953.82	184.00	3/16/2010	77.27	106.73	103.50	102.50	101.23	3.23	4.23	5.50
Arkansas	06S03W27AAA1	340857.58	911912.78	183.14	3/16/2010	61.49	121.65	116.04	116.44	117.16	5.61	5.21	4.49
Arkansas	06S03W32DDA	340740	912115	180.00	3/18/2010	54.24	125.76	123.12	123.62		2.64	2.14	
Arkansas	07S02W04BBB1	340707.15	911451.89	176.00	3/16/2010	39.05	136.95	131.50	140.00		5.45	-3.05	
Arkansas	07S02W17BBA1	340707.15	911451.89	184.00	3/16/2010	43.27	140.73	135.30	135.45	130.61	5.43	5.28	10.12
Arkansas	07S03W16CCD1	340435.28	912316.09	186.18	3/16/2010	39.66	146.52	144.68	142.18		1.84	4.34	
Arkansas	07S03W32BBC1	340240	912216	176.92	3/16/2010	23.17	153.75	152.32	152.11		1.43	1.64	
Arkansas	07S04W01DDD1	340625.25	912327.15	186.00	3/16/2010	37.67	148.33	143.60	139.50	138.16	4.73	8.83	10.17
Arkansas	08S02W08ACA1	340041.03	911505.57	179.00	3/16/2010	40.15	138.85	133.25	139.25		5.60	-0.40	
Arkansas	08S03WT2299	340147.45	912202.5	178.00	3/16/2010	20.34	157.66	158.30	157.00		-0.64	0.66	
							Declines/Wells:				9/35	14/32	3/19
							Average Change:				2.17	-0.95	7.64

Alluvial Aquifer
00-05-09-10
Wl Change

County	Station ID	Latitude	Longitude	LSA	Date Measured	2010 meas.	WL Alt. 10	WL Alt. 09	WL Alt. 05	WL Alt. 00	09-10 Change	05-10 Change	00-10 Change
Ashley	15S07W21CBA1	332315.7	915001.37	210.00	3/9/2010	4.24	205.76	203.60	205.30	196.42	2.16	0.46	9.34
Ashley	16S06W08CAA1	331941	914438	185.00	3/9/2010	78.31	106.69	108.00		110.69	-1.31		-4.00
Ashley	16S06W25DDD1	331640	913958	182.00	3/9/2010	78.17	103.83	103.14			0.69		
Ashley	16S06W27BAB1	331729	914240	182.00	3/9/2010	83.45	98.55	97.95	98.45		0.60	0.10	
Ashley	17S04W03ABB1	331528	913010	124.00	3/9/2010	27.31	96.69	91.40	98.55		5.29	-1.86	
Ashley	17S04W15DDC1	331252.48	912954.09	116.00	3/9/2010	26.47	89.53	87.20	97.60	89.47	2.33	-8.07	0.06
Ashley	17S04W21ABA1	331252	913108	117.00	3/9/2010	21.87	95.13	90.80	99.30		4.33	-4.17	
Ashley	17S06W01ADD1	331517.9	913956.26	182.00	3/9/2010	83.77	98.23	97.90	98.95	101.28	0.33	-0.72	-3.05
Ashley	17S06W35CAC1	331049	914136	179.00	3/9/2010	72.27	106.73	106.70	106.70		0.03	0.03	
Ashley	18S08W01AAB1	331014.97	915225.12	181.00	3/9/2010	84.92	96.08	94.75	94.45		1.33	1.63	
Ashley	19S04W06BAB2	330504	913328.6	110.00	3/9/2010	23.40	86.60	82.30	90.40	85.01	4.30	-3.80	1.59
Ashley	19S06W07BCC1	330403.56	914607.92	134.70	3/9/2010	29.95	104.75	103.60	107.35	103.22	1.15	-2.60	1.53
								Declines/Wells:			1/12	6/10	2/6
								Average Change:			1.77	-1.90	0.91
Chicot	13S03W34BAA1	333110.24	912539.38	133.00	3/10/2010	42.28	90.72	90.50	93.51	96.51	0.22	-2.79	-5.79
Chicot	13S03W35BAC1	333154.1	912245.5	134.00	3/10/2010	40.92	93.08	92.50	95.20		0.58	-2.12	
Chicot	14S03W32CDB2	332613.47	912551.45	134.00	3/10/2010	34.75	99.25	95.50	98.55		3.75	0.70	
Chicot	15S02W20DDC1	332226.59	911919.83	126.00	3/10/2010	27.64	98.36	94.80	97.80		3.56	0.56	
Chicot	17S01W06BCC1	331501.18	911505.22	115.00	3/10/2010	19.64	95.36	93.60	94.20		1.76	1.16	
Chicot	17S01E17CDA1	331258	910716	118.00	3/10/2010	19.39	98.61		115.50			-16.89	
Chicot	17S01E18ADA1	331325.7	910758.2	121.00	3/10/2010	10.30	110.70		117.40			-6.70	
Chicot	17S02W10AAA1	331429	911712	114.00	3/10/2010	24.66	89.34		88.90			0.44	
Chicot	18S03W22ABA2	330728	912341	103.00	3/10/2010	10.22	92.78	90.90	91.40		1.88	1.38	
Chicot	16S03W15DAD1	331818	912334	118.00	3/17/2010	31.75	86.25	85.91			0.34		
								Declines/Wells:			0/7	4/9	1/1
								Average Change:			1.73	-2.70	-5.79
Clay	18N08E03DAB1	361323.23	901153.03	257.00	4/6/2010	6.19	250.81	250.00	249.70		0.81	1.11	
Clay	19N03E24AAA1	361655	904157.1	278.00	4/6/2010	19.84	258.16	256.00	258.20		2.16	-0.04	
Clay	19N04E19AAA1	361654.4	904050	282.00	4/6/2010	30.15	251.85	249.80	253.00		2.05	-1.15	
Clay	20N05E34DBA1	361939.3	903117.2	285.00	4/6/2010	30.09	254.91	253.45	257.25		1.46	-2.34	
Clay	21N05E17ABB1	362755.47	903328.9	298.00	4/6/2010	22.73	275.27	284.10	277.00		-8.83	-1.73	
Clay	21N06E28BBB1	362604.92	902807.97	292.50	4/6/2010	16.87	275.63	272.60	275.50		3.03	0.13	
Clay	21N08E36ABB1	362502	900958	283.00	4/6/2010	3.57	279.43	279.80	280.40		-0.37	-0.97	
								Declines/Wells:			2/7	5/7	
								Average Change:			0.04	-0.71	

Alluvial Aquifer
00-05-09-10
Wl Change

County	Station ID	Latitude	Longitude	LSA	Date	2010	WL	WL	WL	WL	09-10	05-10	00-10
					Measured	meas.	Alt. 10	Alt. 09	Alt. 05	Alt. 00	Change	Change	Change
Craighead	13N01E23DAA1	354435.4	905651.69	242.00	4/1/2010	71.35	170.65		172.50			-1.85	
Craighead	13N03E29AAA1	354403.31	904712.98	251.00	4/1/2010	107.47	143.53	144.90	148.80		-1.37	-5.27	
Craighead	13N04E12ABB1	354635	903656	231.00	4/1/2010	23.00	208.00		209.10			-1.10	
Craighead	13N05E22BAD1	354449	903243	226.00	4/1/2010	11.80	214.20	212.00	214.40		2.20	-0.20	
Craighead	13N07E20BBA1	354439.77	902216.44	223.20	4/1/2010	3.41	219.79		220.80	218.06		-1.01	1.73
Craighead	14N02E18BDD1	355040.91	905419.37	242.00	4/1/2010	52.95	189.05	189.00	191.90		0.05	-2.85	
Craighead	14N02E27AA	354918	905125	255.00	4/20/2010	81.24	173.76	173.05	178.65		0.71	-4.89	
Craighead	14N05E25ABB1	354920.85	903025.35	238.00	4/1/2010	17.32	220.68	217.80	221.00	218.48	2.88	-0.32	2.20
Craighead	14N07E26DBB1	354833.6	901843.4	228.00	4/1/2010	4.75	223.25						
Craighead	14N06E27AAB1	354911.46	902559.08	225.93	4/1/2010	1.59	224.34	224.03			0.31		
Craighead	15N03E31ADA1	355313.6	904807.3	270.00	4/1/2010	60.75	209.25	209.50	211.30		-0.25	-2.05	
Craighead	15N06E20DDD1	355426	902739	234.00	4/1/2010	7.66	226.34	224.10	226.50		2.24	-0.16	
								Declines/Wells:			**2/8**	**10/10**	**0/2**
								Average Change:			**0.85**	**-1.97**	**1.97**
Crittenden	04N07E21AAD1	345643.8	902121.5	202.00	3/31/2010	8.01	193.99		194.00			-0.01	
Crittenden	05N07E28CBA1	350121.32	902139.85	201.00	3/31/2010	13.56	187.44	182.50	187.50		4.94	-0.06	
Crittenden	05N07E34BAB1	350059.39	902029.86	203.00	3/31/2010	13.54	189.46	187.50	192.20	182.82	1.96	-2.74	6.64
Crittenden	05N08E11CCD2	350344.8	901308.2	211.00	3/31/2010	21.95	189.05		201.00			-11.95	
Crittenden	06N07E13BAA1	350849.58	901807.57	205.00	3/31/2010	18.37	186.63	183.00	187.60		3.63	-0.97	
Crittenden	07N07E05DAD1	351504	902129	215.00	3/31/2010	30.12	184.88	180.05	186.95		4.83	-2.07	
Crittenden	07N07E31CCC1	351041.9	902358.97	207.00	3/31/2010	34.12	172.88	168.20	173.70		4.68	-0.82	
Crittenden	07N09E05CDD1	351453.34	900933.58	214.00	3/31/2010	11.89	202.11	202.00	207.10		0.11	-4.99	
Crittenden	08N07E13CCC2	351828.34	901811.95	221.00	3/31/2010	31.25	189.75	185.53	192.60	194.87	4.22	-2.85	-5.12
Crittenden	08N07E14DAA2	351854.41	901832.68	219.00	3/31/2010	31.29	187.71		189.85			-2.14	
Crittenden	09N07E10DDA1	352447.58	901924.64	221.00	3/31/2010	29.05	191.95	190.60	192.50		1.35	-0.55	
Crittenden	09N07E31BAB1	352159.85	902326.57	221.00	3/31/2010	33.83	187.17	186.50	188.70	190.90	0.67	-1.53	-3.73
								Declines/Wells:			**0/9**	**12/12**	**2/3**
								Average Change:			**2.93**	**-2.56**	**-0.74**
Cross	07N01E05CDA1	351517.52	910049.05	217.00	3/30/2010	75.84	141.16	136.70	144.50		4.46	-3.34	
Cross	07N01E11AAA1	351501.25	905705.29	217.00	3/30/2010	78.92	138.08	138.00	141.60	147.14	0.08	-3.52	-9.06
Cross	07N02E02CCD1	351544	905140	225.00	6/8/2010	83.33	141.67	142.38	144.43		-0.71	-2.76	
Cross	07N02E29DDC1	351138.09	905409.17	220.00	3/30/2010	73.13	146.87	146.40	149.00		0.47	-2.13	
Cross	07N03E05ADA1	351548.89	904738.6	254.00	3/30/2010	111.94	142.06	141.70	143.20		0.36	-1.14	
Cross	07N03E32DCC1	351045.29	904810.28	251.00	3/30/2010	97.07	153.93	153.50	154.30		0.43	-0.37	
Cross	07N05E19CCC1	351237.7	903644.9	207.00	3/31/2010	37.19	169.81	167.20	168.50		2.61	1.31	
Cross	07N05E25ABA1	351228.87	903044.79	205.00	3/31/2010	38.50	166.50		168.90			-2.40	

Alluvial Aquifer
00-05-09-10
Wl Change

County	Station ID	Latitude	Longitude	LSA	Date	2010	WL	WL	WL	WL	09-10	05-10	00-10
					Measured	meas.	Alt. 10	Alt. 09	Alt. 05	Alt. 00	Change	Change	Change
Cross	08N05E32ADD1	351631.65	903440.45	204.00	3/31/2010	29.38	174.62	174.30	177.40		0.32	-2.78	
Cross	09N01E12CBB1	352505	905653	226.00	6/8/2010	94.86	131.14	132.59			-1.45		
Cross	09N01E33BBA2	352202.76	910000.6	225.00	3/30/2010	84.11	140.89	140.70	145.20	145.23	0.19	-4.31	-4.34
Cross	09N03E17DDC1	352408.8	904725.6	251.00	3/30/2010	107.00	144.00	141.40	145.10	147.54	2.60	-1.10	-3.54
Cross	08N05E32BDB1	352150.53	903512.11	210.00	3/31/2010	30.30	179.70	178.40	179.30	178.95	1.30	0.40	0.75
								Declines/Wells:			2/12	10/12	3/4
								Average Change:			0.89	-1.85	-4.05
Desha	08S03W33ABD1	335802.92	912338.18	165.04	3/11/2010	5.35	159.69	157.14	160.20	157.08	2.55	-0.51	2.61
Desha	09S02W26DDC1	335256.57	911529.64	149.27	4/13/2010	26.57	122.70	117.58	120.54		5.12	2.16	
Desha	09S03W17DCB1	335448.23	912456.66	155.08	3/11/2010	34.56	120.52	119.28	122.50	122.43	1.24	-1.98	-1.91
Desha	09S04W06BCA1	335756.1	913243	161.00	3/11/2010	36.11	124.89	123.80			1.09		
Desha	10S02W20ADA1	334916	911825	148.00	3/11/2010	40.05	107.95	106.70			1.25		
Desha	10S02W24DBC1	334849.63	911453.44	143.00	3/11/2010	25.65	117.35		117.30			0.05	
Desha	10S03W26CAA1	334806	912144.55	155.00	3/11/2010	46.27	108.73	107.20	110.80		1.53	-2.07	
Desha	13S02W27CAC1	333223.99	911734.76	133.00	3/11/2010	30.06	102.94	100.50	103.30		2.44	-0.36	
								Declines/Wells:			0/7	4/6	1/2
								Average Change:			2.17	-0.45	0.35
Drew	11S04W08DBA1	334531.98	913136.2	160.00	3/11/2010	24.31	135.69	132.80	136.50		2.89	-0.81	
Drew	11S04W35DC1	334144	912842	154.00	3/17/2010	24.94	129.06	123.90	129.44		5.16	-0.38	
Drew	11S05W08CCC1	334546.48	913837.16	185.00	3/11/2010	36.37	148.63	147.80	149.70		0.83	-1.07	
Drew	12S04W03ABB1	334133.92	912946.13	155.00	3/10/2010	22.20	132.80	127.50	132.60		5.30	0.20	
Drew	13S04W33BAA1	333206	913100	138.00	3/10/2010	17.27	120.73	117.40	122.30		3.33	-1.57	
Drew	13S05W29ADA1	333248	913747	185.00	3/10/2010	45.52	139.48		140.20			-0.72	
Drew	13S06W03DDC1	333544.69	914201.6	191.00	3/10/2010	63.18	127.82	132.10	133.25		-4.28	-5.43	
								Declines/Wells:			1/6	6/7	
								Average Change:			2.21	-1.40	
Greene	16N03E03BA1	360315.87	904515.85	260.00	4/7/2010	32.53	227.47	226.40	231.20		1.07	-3.73	
Greene	16N06E03CCC1	360224.07	902625.9	258.00	4/6/2010	60.54	197.46		216.90	251.30		-19.44	-53.84
Greene	16N06E28ABB1	355938.31	902657.01	251.00	4/6/2010	22.36	228.64	224.15	228.60		4.49	0.04	
Greene	17N04E28DAA1	360431	903917	319.00	6/8/2010	88.53	230.47	230.72			-0.25		
Greene	17N04E30CDC1	360409.09	904217.57	265.00	4/7/2010	39.42	225.58	224.86	229.60	232.82	0.72	-4.02	-7.24
Greene	17N07E16ABB1	360638.5	902234.7	245.00	4/6/2010	6.89	238.11	234.90			3.21		
Greene	18N04E21CBD1	361052.32	903724.76	294.00	4/7/2010	59.44	234.56	234.80	239.70		-0.24	-5.14	
Greene	18N07E20BBA1	361110.37	902113.23	257.00	4/6/2010	2.08	254.92	244.90	251.50		10.02	3.42	

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County	Station ID	Latitude	Longitude	LSA	Date Measured	2010 meas.	WL Alt. 10	WL Alt. 09	WL Alt. 05	WL Alt. 00	09-10 Change	05-10 Change	00-10 Change
Greene	19N03E26AD1	361600.72	904258.43	281.00	4/7/2010	28.51	252.49	250.10	253.36		2.39	-0.87	
								Declines/Wells:			2/8	5/7	2/2
								Average Change:			2.68	-4.25	-30.54
Independence	12N04W14DD1	353929.42	912236.26	231.00	4/8/2010	16.54	214.46	207.00	215.00	203.50	7.46	-0.54	10.96
Independence	12N04W34CBB1	353720.1	912512.5	231.00	4/8/2010	13.64	217.36	213.90	211.90		3.46	5.46	
Independence	14N03W14DAA2	355106	911640.42	230.00	4/8/2010	0.50	229.50	227.20	226.00	223.89	2.30	3.50	5.61
								Declines/Wells:			0/3	1/3	0/2
								Average Change:			4.41	2.81	8.29
Jackson	09N01W22ADD1	352331.57	910432.57	215.00	4/8/2010	62.42	152.58		154.30			-1.72	
Jackson	09N02W32CBB1	352151.79	911347.79	220.00	4/8/2010	26.95	193.05	184.00	191.00		9.05	2.05	
Jackson	11N01W26AAD1	353329.77	910323.21	227.00	4/8/2010	68.95	158.05	155.80	155.70	165.80	2.25	2.35	-7.75
Jackson	11N01W29AAD1	353338.7	910635.3	225.00	4/8/2010	42.36	182.64	182.60	184.95		0.04	-2.31	
Jackson	11N03W06DAB1	353655.13	912008.5	223.00	4/7/2010	20.80	202.20	209.40	207.70		-7.20	-5.50	
Jackson	12N02W25ABB2	353909.97	910852.17	234.00	4/7/2010	32.46	201.54	199.00	200.10		2.54	1.44	
Jackson	13N01W20AAA1	354514.14	910627.47	242.00	4/7/2010	40.16	201.84	199.80	202.80		2.04	-0.96	
Jackson	13N03W15CDD1	354525.9	911749.46	232.00	4/7/2010	8.94	223.06	216.50	218.40		6.56	4.66	
Jackson	14N01W09AAA1	355220.36	910515.16	251.00	4/7/2010	42.70	208.30	207.00	211.60	212.20	1.30	-3.30	-3.90
								Declines/Wells:			1/8	5/9	2/2
								Average Change:			2.07	-0.37	-5.82
Jefferson	03S08W24BBC1	342620.37	914953.19	202.00	3/15/2010	50.75	151.25	148.00	153.00		3.25	-1.75	
Jefferson	03S09W29CBD1	342516.81	920023.32	216.00	3/15/2010	24.79	191.21	188.80	188.80		2.41	2.41	
Jefferson	04S08W13DCB1	342122.85	914926.45	204.00	3/15/2010	46.96	157.04	159.30	163.20		-2.26	-6.16	
Jefferson	05S06W31CAA1	341329.94	914206.1	189.22	3/15/2010	9.94	179.28	169.22	173.42		10.06	5.86	
Jefferson	05S08W12DAA1	341712	914907	194.25	3/15/2010	14.85	179.40	176.85	180.25		2.55	-0.85	
Jefferson	06S05W15BCA1	341022.95	913245	177.14	3/15/2010	12.14	165.00	161.64	159.44	157.93	3.36	5.56	7.07
Jefferson	06S06W23AAD1	341006.74	913712.2	189.01	3/15/2010	11.93	177.08	171.81	171.41	166.95	5.27	5.67	10.13
Jefferson	06S07W14BAA1	341124.96	914425	199.00	3/15/2010	7.62	191.38	180.70			10.68		
Jefferson	07S08W08BAA1	340858.53	915647.26	202.31	3/12/2010	17.59	184.72	182.31	186.31		2.41	-1.59	
								Declines/Wells:			1/9	4/8	0/2
								Average Change:			4.19	1.14	8.60
Lawrence	15N01E09ABD1	355714	905900	259.00	6/8/2010	56.40	202.60	202.72			-0.12		
Lawrence	15N01E26DDA1	355412	905651	251.00	4/7/2010	52.84	198.16	196.70	201.40		1.46	-3.24	

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County	Station ID	Latitude	Longitude	LSA	Date Measured	2010 meas.	WL Alt. 10	WL Alt. 08	WL Alt. 05	WL Alt. 00	09-10 Change	05-10 Change	00-10 Change
Lawrence	15N01E32BAA1	355352	910027	254.00	6/8/2010	54.17	199.83	200.00			-0.17		
Lawrence	15N01W35CBB1	355336.15	910356.33	250.00	4/7/2010	46.99	203.01	202.30	206.30		0.71	-3.29	
Lawrence	16N01E11DAC2	360203.04	905639.37	262.00	4/7/2010	49.57	212.43	211.80	214.60		0.63	-2.17	
							Declines/Wells:				2/5	3/3	
							Average Change:				0.50	-2.90	
Lee	01N03E02BBC1	344339.29	904601.14	236.43	3/29/2010	40.10	196.33	181.63	198.03		14.70	-1.70	
Lee	01N03E35BBA1	343923	904549	202.00	3/29/2010	5.42	196.58	187.80			8.78		
Lee	02N01W12BAA1	344828.3	910329	185.00	3/29/2010	45.69	139.31		142.85			-3.54	
Lee	02N02E08ADC1	344807.34	905338.75	201.00	3/29/2010	44.44	156.56	155.00	158.50		1.56	-1.94	
Lee	02N02E21ABC1	344621.6	905358.2	200.00	3/29/2010	38.39	161.61	159.40	163.15		2.21	-1.54	
Lee	02N03E08AAD1	344810	904837	211.00	3/29/2010	42.19	168.81	165.00			3.81		
Lee	02N04E15DAC1	344636.73	903950.39	192.00	3/29/2010	18.57	173.43	172.10	175.70		1.33	-2.27	
Lee	03N01E15CC1	345206	905947	205.00	3/29/2010	64.44	140.56	140.28			0.28		
Lee	03N02E13BBA1	345237.4	905107.32	212.00	3/29/2010	51.17	160.83	161.50	164.50		-0.67	-3.67	
Lee	03N02E29DAD1	345013.62	905429.78	205.00	3/29/2010	42.83	162.17	159.30	162.70		2.87	-0.53	
Lee	03N03E32CAB1	344932.65	904926.23	204.00	3/29/2010	46.72	157.28	154.68	158.50		2.60	-1.22	
Lee	03N05E14DDA1	345148.08	903203.25	193.00	3/29/2010	13.71	179.29	180.90	181.80		-1.61	-2.51	
							Declines/Wells:				2/11	9/9	
							Average Change:				3.26	-2.10	
Lincoln	08S04W08BBB2	340253.9	913100.8	171.00	3/11/2010	22.12	148.88		142.00			6.88	
Lincoln	08S04W31CBA1	335901.09	913149.69	161.90	3/11/2010	34.00	127.90	126.50	128.85		1.40	-0.95	
Lincoln	08S06W02ACB1	340338.84	913957.73	181.03	3/11/2010	40.04	140.99	137.63	139.93		3.36	1.06	
Lincoln	08S07W05DDD1	340301	914903	190.00	3/11/2010	29.50	160.50	158.73	161.00		1.77	-0.50	
Lincoln	09S05W14ABC1	335553.02	913439.08	172.50	3/11/2010	38.49	134.01	132.50	135.30		1.51	-1.29	
Lincoln	09S05W17BCB1	335551.59	913819.95	171.00	3/11/2010	42.29	128.71	131.70	134.50		-2.99	-5.79	
Lincoln	09S06W04BCD1	335821.38	914345.83	181.00	3/11/2010	39.43	141.57	138.20	140.90		3.37	0.67	
Lincoln	09S06W23CDB1	335439.57	914136.37	175.00	3/11/2010	29.51	145.49	143.00	145.50		2.49	-0.01	
Lincoln	10S05W05CB	335528	913832	172.00	3/17/2010	24.52	147.48	144.03	146.70		3.45	0.78	
Lincoln	10S05W06DCC1	335155.3	913907.96	175.00	3/11/2010	26.16	148.84	146.20	148.85		2.64	-0.01	
							Declines/Wells:				1/9	6/10	
							Average Change:				1.89	0.08	
Lonoke	01N09W13DAB1	344235.17	915517.01	226.00	4/5/2010	86.82	139.18	139.20	138.50		-0.02	0.68	
Lonoke	01N10W11BBD1	344355	920321	240.00	4/7/2010	28.50	211.50		211.20			0.30	
Lonoke	01S06W31ABB1	343459.39	914131.48	200.00	3/26/2010	78.43	121.57		121.65			-0.08	

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County	Station ID	Latitude	Longitude	LSA	Date Measured	2010 meas.	WL Alt. 10	WL Alt. 09	WL Alt. 05	WL Alt. 00	09-10 Change	05-10 Change	00-10 Change
Lonoke	01S07W12ABA1	343834.3	914229.8	207.00	3/26/2010	71.08	135.92		145.30			-9.38	
Lonoke	01S07W19DC1	343609	914746	206.00	3/16/2010	86.59	119.41	121.40			-1.99		
Lonoke	01S08W24CDD1	343605.64	914912.37	210.00	4/5/2010	82.56	127.44	127.35	129.25		0.09	-1.81	
Lonoke	01S09W36CCC1	343435.31	915618.98	220.00	3/26/2010	61.48	158.52	157.10	158.06	162.80	1.42	0.46	-4.28
Lonoke	01S10W01ACB1	343926.84	920214.96	236.00	4/5/2010	44.34	191.66		196.80	192.19		-5.14	-0.53
Lonoke	01S10W11CCB1	343839	920337	235.00	3/16/2010	26.00	209.00	205.90	204.83		3.10	4.17	
Lonoke	02N07W16BAB1	344815.2	914539.5	240.00	4/15/2010	144.02	95.98		102.60			-6.62	
Lonoke	02N08W16ABC1	344806.48	915113.61	230.00	4/15/2010	124.94	105.06	106.40	111.90	115.94	-1.34	-6.84	-10.88
Lonoke	02S07W10CCB1	343246.5	914524.7	201.00	4/5/2010	61.98	139.02		138.70			0.32	
Lonoke	02S08W06AAB1	343430	915447	221.00	3/16/2010	66.16	154.84	152.71	154.31		2.13	0.53	
Lonoke	02S08W28CDC	343008	915237	211.00	3/16/2010	60.88	150.12	149.30	151.32		0.82	-1.20	
Lonoke	02S08W34DBB1	343003	915149.8	214.00	4/5/2010	66.44	147.56	150.50	149.99		-2.94	-2.43	
Lonoke	02S09W30CDD1	343014.34	920116.01	226.00	3/26/2010	39.85	186.15		189.60			-3.45	
Lonoke	03N07W08BDB1	345406.6	914638.3	250.00	4/21/2010	97.62	152.38		157.22			-4.84	
Lonoke	03N07W15DBC2	345252.79	914416.62	227.00	4/15/2010	83.98	143.02	143.50	145.65		-0.48	-2.63	
Lonoke	03N07W29ADA1	345128.53	914558.4	234.00	4/21/2010	92.62	141.38		142.00			-0.62	
Lonoke	03N07W35CDC2	344957.16	914332.11	232.00	4/15/2010	116.42	115.58	115.75	116.40		-0.17	-0.82	
Lonoke	03N08W03BAA1	345518.5	915053.5	260.00	4/21/2010	98.72	161.28		168.01			-6.73	
Lonoke	03N08W03CCC1	355429.9	915123.2	260.00	4/21/2010	106.58	153.42		159.60			-6.18	
Lonoke	03N08W05CCC1	345429.4	915323.5	257.00	1/22/2010	80.87	176.13		178.03			-1.90	
Lonoke	03N08W08ABA1	345427	915247.9	258.00	1/22/2010	96.49	161.51		167.55			-6.04	
Lonoke	03N08W10ACB1	345414.7	915052.7	250.00	4/21/2010	94.43	155.57		162.13			-6.56	
Lonoke	03N08W10ADD1	345401.1	915022.8	250.00	4/21/2010	97.02	152.98		160.50			-7.52	
Lonoke	03N08W11ABD1	345419.1	914935.9	260.00	1/22/2010	106.77	153.23		157.97			-4.74	
Lonoke	03N08W11ACA1	345412.7	914934.3	256.00	4/21/2010	103.73	152.27		156.66			-4.39	
Lonoke	03N08W21BCC1	345220.2	915220.2	247.00	4/15/2010	83.69	163.31	138.65	143.00		24.66	20.31	
Lonoke	03N08W29BBB1	345147.1	915332.8	249.00	4/21/2010	112.86	136.14		137.62			-1.48	
Lonoke	03N08W29BBC1	345125	915333.4	250.00	4/21/2010	130.06	119.94		122.75			-2.81	
Lonoke	03N08W32ABB2	345057	915258	250.00	4/15/2010	119.25	130.75		132.06			-1.31	
Lonoke	03N08W32ABB3	345058.68	915255.43	250.00	4/15/2010	62.24	187.76		132.21			55.55	
Lonoke	03N08W34ADD1	345034.9	915028.3	240.00	4/21/2010	118.27	121.73		122.21			-0.48	
Lonoke	04N08W15BCB2	345832.92	915121.25	225.00	4/15/2010	33.41	191.59	190.50	192.80	192.82	1.09	-1.21	-1.23
Lonoke	04N08W16DCC1	345757.3	915154	225.00	4/21/2010	46.83	178.17		180.16	147.70		-1.99	30.47
Lonoke	04N08W19BBB1	345753.4	915431.8	300.00	4/21/2010	4.15	295.85		293.42			2.43	
Lonoke	04N08W26AAD1	345652.2	914916.8	246.00	1/21/2010	68.28	177.72		175.98			1.74	
Lonoke	04N08W28CAC1	345620.3	915215.8	235.00	4/21/2010	56.41	178.59		181.26			-2.67	
Lonoke	04N08W28CAD1	345626.1	915204	249.00	1/21/2010	71.91	177.09		180.02			-2.93	
Lonoke	04N08W28CCC1	345614.6	915225.3	240.00	4/21/2010	62.12	177.88		180.69			-2.81	
Lonoke	04N08W31CBB2	345547.4	915439.1	283.00	1/22/2010	24.94	258.06		256.20			1.86	
Lonoke	04N08W36DBB1	345540	914914.4	259.00	4/21/2010	92.12	166.88	192.00	169.24		-25.12	-2.36	

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County	Station ID	Latitude	Longitude	LSA	Date Measured	2010 meas.	WL Alt. 10	WL Alt. 09	WL Alt. 05	WL Alt. 00	09-10 Change	05-10 Change	00-10 Change
							Declines/Wells:				7/14	31/42	4/5
							Average Change:				0.09	-0.51	2.71
Mississippi	10N08E22ABA2	352850.89	901312.16	224.00	3/31/2010	24.09	199.91	197.33	201.40		2.58	-1.49	
Mississippi	10N09E08ACC1	352949.05	900925.66	230.00	3/31/2010	13.49	216.51	214.85	217.30		1.66	-0.79	
Mississippi	11N09E34BBB1	353217.73	900715.17	235.00	3/31/2010	14.07	220.93	215.80	222.10		5.13	-1.17	
Mississippi	12N08E08BCB1	354047.06	901559.25	225.00	3/31/2010	5.42	219.58	215.40	219.00		4.18	0.58	
Mississippi	13N09E30CCD1	354247.81	901028.63	230.00	3/31/2010	6.28	223.72	218.50	223.00		5.22	0.72	
Mississippi	14N08E12DAB1	355104.17	901051.94	235.00	4/1/2010	3.85	231.15	227.85	231.20		3.30	-0.05	
Mississippi	14N10E18ABC1	355022.36	900345.36	236.00	4/1/2010	8.99	227.01	222.40	224.57		4.61	2.44	
Mississippi	14N11E03BCB1	355158.11	895432.97	247.00	4/1/2010	3.43	243.57		244.30			-0.73	
Mississippi	15N08E08DBC2	355604.96	901526.26	236.00	4/1/2010	10.47	225.53		227.50			-1.97	
Mississippi	16N10E28BBD1	355906.13	900156.03	238.00	4/1/2010	4.93	233.07		229.45	224.00		3.62	9.07
Mississippi	16N11E23ADA1	355947.24	895231.23	255.00	4/1/2010	9.73	245.27		244.30			0.97	
							Declines/Wells:				0/7	6/11	0/1
							Average Change:				3.81	0.19	
Monroe	01N01W21CDC2	344037.18	910706.66	181.00	3/22/2010	38.08	142.92	142.20	138.10		0.72	4.82	
Monroe	01N01W15CBD1	344139	910542	185.00	4/20/2010	51.88	133.12		138.06			-4.94	
Monroe	01N02W12CBC1	344242.3	911031.9	182.00	3/22/2010	41.13	140.87	140.67	144.92		0.20	-4.05	
Monroe	01N03W24BBB1	344135.21	911650.59	185.00	3/22/2010	21.62	163.38	157.50	158.60	152.32	5.88	4.78	11.06
Monroe	01N04W33BBB2	343959.52	912648.52	218.00	3/22/2010	97.39	120.61	115.90	119.90	125.36	4.71	0.71	-4.75
Monroe	01S01W13CDD1	343610.94	910340.54	178.00	3/22/2010	17.39	160.61	157.00	160.20		3.61	0.41	
Monroe	01S01W18DCD1	343617.76	910849.2	178.00	3/22/2010	22.25	155.75	153.90	156.50		1.85	-0.75	
Monroe	01S02W20BBB1	343612.7	911456.1	170.00	3/22/2010	11.71	158.29	160.00	163.00	156.00	-1.71	-4.71	2.29
Monroe	01S03W20BBA1	343538.3	912117.7	210.00	3/22/2010	73.54	136.46	125.00		133.00	11.46		3.46
Monroe	01S04W01BAB1	343905.86	912316.73	210.00	3/22/2010	73.30	136.70	134.60	134.40		2.10	2.30	
Monroe	02N01W19BBA1	344645.21	910912.46	191.00	3/25/2010	54.12	136.88	137.00	138.40		-0.12	-1.52	
Monroe	02S02W11DAC1	343208.97	911100.58	164.00	3/25/2010	9.14	154.86	156.10	156.30		-1.24	-1.44	
Monroe	03N01W20ABA1	345201.18	910722.83	189.00	3/25/2010	47.86	141.14	140.00	142.20		1.14	-1.06	
Monroe	03N02W31ADC1	344958.3	911447.2	190.00	3/25/2010	36.87	153.13			152.87			0.26
Monroe	03N03W36AAA1	345026.65	911547.12	176.00	3/25/2010	16.39	159.61	156.50	157.90		3.11	1.71	
Monroe	04N02W27CDD3	345540.22	911149.73	200.00	3/25/2010	44.13	155.87	154.20	154.80		1.67	1.07	
Monroe	04N02W28DDD3	345535.05	911220.68	192.00	3/25/2010	30.49	161.51	158.75	159.35	160.04	2.76	2.16	1.47
Monroe	04N02W30BBB1	345627.9	911524.7	185.16	3/25/2010	11.32	173.84		174.46			-0.62	
							Declines/Wells:				3/15	8/16	1/6
							Average Change:				2.41	-0.07	2.30

Alluvial Aquifer
00-05-09-10
Wl Change

County	Station ID	Latitude	Longitude	LSA	Date Measured	2010 meas.	WL Alt. 10	WL Alt. 09	WL Alt. 05	WL Alt. 00	09-10 Change	05-10 Change	00-10 Change
Phillips	01S02E09CBB1	343718.73	905434.06	185.00	3/24/2010	13.27	171.73	171.70	177.80	173.20	0.03	-6.07	-1.47
Phillips	01S04E05DCD1	343802	904151	230.00	3/24/2010	42.16	187.84	179.03	188.63	185.80	8.81	-0.79	2.04
Phillips	02S01E28CCB1	342916.37	910058.18	174.00	3/24/2010	14.47	159.53		159.70			-0.17	
Phillips	02S04E27AAC1	342931.57	904001.09	179.00	3/24/2010	6.55	172.45	171.70	174.10	168.60	0.75	-1.65	3.85
Phillips	03S02E35DDA1	342256.24	905129.93	163.00	3/24/2010	16.73	146.27	141.90	144.60		4.37	1.67	
Phillips	03S03E04DAA1	342735	904710	171.00	3/24/2010	18.44	152.56	150.75	153.95		1.81	-1.39	
Phillips	03S04E02CAA1	342732	903918	176.00	3/24/2010	9.19	166.81	162.45	167.85	160.70	4.36	-1.04	6.11
Phillips	04S01E23CCA1	341931.3	905852.62	156.00	3/24/2010	9.90	146.10	143.60	147.30		2.50	-1.20	
							Declines/Wells:				0/7	7/8	1/4
							Average Change:				3.23	-1.33	2.63
Poinsett	10N01E14CC1	352909.77	905813.38	231.00	4/2/2010	95.01	135.99	135.04	140.60		0.95	-4.61	
Poinsett	10N01E16CCB1	352921.87	910005.35	225.00	4/2/2010	79.20	145.80	147.54	152.35		-1.74	-6.55	
Poinsett	10N02E13BCC1	352948.52	905026.29	237.00	4/2/2010	105.75	131.25	130.60	135.60		0.65	-4.35	
Poinsett	10N02E34BBB1	352726	905231	236.00	4/20/2010	101.89	134.11	133.92			0.19		
Poinsett	10N03E14DAB1	352947.21	904404.93	263.00	4/2/2010	119.31	143.69	142.40	145.70		1.29	-2.01	
Poinsett	10N07E22AAC1	352847	901935	215.00	4/6/2010	27.58	187.42		187.00			0.42	
Poinsett	11N01E17DDD1	353436.83	910013.21	230.00	4/8/2010	81.40	148.60	148.20	153.70		0.40	-5.10	
Poinsett	11N02E26AAB1	353350.31	905034.19	241.00	4/2/2010	111.53	129.47		135.50			-6.03	
Poinsett	11N03E10DDA1	353545.69	904456.54	243.00	4/2/2010	106.99	136.01	133.25	139.65		2.76	-3.64	
Poinsett	11N03E18BAB1	353537.8	904852.4	243.00	4/2/2010	107.75	135.25	134.60	132.70		0.65	2.55	
Poinsett	11N07E18CAB1	353435	902320	217.00	4/6/2010	13.86	203.14	199.60	203.40		3.54	-0.26	
Poinsett	12N01E07CDA1	354053.69	910141.25	236.00	4/8/2010	56.64	179.36	180.55	177.75	179.20	-1.19	1.61	0.16
Poinsett	12N02E26DDA1	353831	905024	245.00	6/8/2010	115.60	129.40	132.70			-3.30		
Poinsett	12N03E04DAD1	354158.01	904600.16	247.00	4/2/2010	107.62	139.38	157.00	144.00	148.00	-17.62	-4.62	-8.62
Poinsett	12N03E36ACB1	353749	904318	250.00	4/2/2010	101.05	148.95	158.80			-9.85		
Poinsett	12N05E34ABA1	353805.38	903230.45	215.00	4/6/2010	4.14	210.86		210.45	202.75		0.41	8.11
Poinsett	12N07E04BAA1	354201.95	902059.69	223.00	4/6/2010	2.71	220.29	214.90	217.40	215.58	5.39	2.89	4.71
Poinsett	12N07E25DC1	353740	901802	226.00	6/9/2010	16.45	209.55	207.56	211.68		1.99	-2.13	
Poinsett	11N06E34AB1	353224	902646	211.00	6/9/2010	16.70	194.30	198.66	198.78		-4.36	-4.48	
							Declines/Wells:				6/16	11/16	1/4
							Average Change:				-1.27	-2.24	1.09
Prairie	01N06W05CCB1	344352.97	914049.08	220.00	3/18/2010	118.84	101.16	101.70	103.20		-0.54	-2.04	
Prairie	01N06W26CDD1	344014.88	913707.61	218.00	3/18/2010	48.69	169.31		141.05			28.26	
Prairie	01N06W29DDD1	344017.54	913951.46	223.00	3/18/2010	118.07	104.93	105.20	107.55		-0.27	-2.62	
Prairie	01S04W28BDB1	343522.68	912629.73	205.00	3/18/2010	98.03	106.97	107.00	108.40		-0.03	-1.43	
Prairie	01S05W14BBC1	343722	913108.8	211.00	3/18/2010	108.78	102.22		102.75	104.72		-0.53	-2.50

Alluvial Aquifer
00-05-09-10
Wl Change

County	Station ID	Latitude	Longitude	LSA	Date	2010	WL	WL	WL	WL	09-10	05-10	00-10
					Measured	meas.	Alt. 10	Alt. 09	Alt. 05	Alt. 00	Change	Change	Change
Prairie	01S05W31DDA1	343416	913431	206.00	3/18/2010	104.77	101.23	92.20	79.40		9.03	21.83	
Prairie	01S06W12BAB1	343826	913613	228.00	3/17/2010	119.77	108.23	108.51	110.03		-0.28	-1.80	
Prairie	02N04W02BCB1	344916.31	912418.61	188.00	3/18/2010	19.97	168.03		172.20			-4.17	
Prairie	02N04W32CCB1	344436.43	912737.79	221.00	3/18/2010	84.71	136.29	138.00	138.80		-1.71	-2.51	
Prairie	02N05W06BAB1	344957.63	913420.77	221.00	3/18/2010	88.29	132.71		132.83			-0.12	
Prairie	02N05W13AAB1	344805.45	912854.34	223.00	3/18/2010	52.57	170.43		148.30			22.13	
Prairie	02N05W21CB1	344649	913300	225.00	3/16/2010	111.31	113.69	115.24	117.43		-1.55	-3.74	
Prairie	02N05W24ACB	344659	912937	225.00	3/16/2010	88.27	136.73		138.26			-1.53	
Prairie	02N05W29DDB2	344544	913308	228.00	3/18/2010	119.36	108.64	104.50	110.40		4.14	-1.76	
Prairie	02N06W17ABB1	344809.48	913859.44	235.00	3/18/2010	125.07	109.93	110.60	112.80		-0.67	-2.87	
Prairie	02S06W14BBB1	343213.38	913728.62	201.00	3/18/2010	73.63	127.37	136.50	123.10		-9.13	4.27	
Prairie	02N06W24CAA1	344651	913551	233.00	3/16/2010	120.20	112.80	114.39	115.26		-1.59	-2.46	
Prairie	03N04W03AAC1	345439.23	912424.37	187.00	3/19/2010	19.44	167.56		167.00			0.56	
Prairie	03N05W03BDD2	345444.06	913115.35	207.00	3/19/2010	60.22	146.78	143.70	144.80		3.08	1.98	
Prairie	03N06W01BCB1	345454.54	913601.39	216.00	3/19/2010	82.04	133.96	132.90	135.00	134.42	1.06	-1.04	-0.46
Prairie	04N04W07ADC1	345850.31	912733.07	195.00	3/19/2010	15.89	179.11	172.40	174.55		6.71	4.56	
Prairie	04N05W07CDC1	345042.62	913440.92	212.00	3/25/2010	76.59	135.41	133.00	136.60		2.41	-1.19	
Prairie	04N05W31DDC1	345513.7	913405.8	206.00	3/19/2010	77.23	128.77		130.00			-1.23	
Prairie	04N06W05CCC1	345933.76	914017.96	206.00	3/19/2010	78.38	127.62	145.90	146.00		-18.28	-18.38	
Prairie	04N07W03DCB1	345942.1	914412.48	255.00	3/25/2010	86.16	168.84	167.10	168.40		1.74	0.44	
Prairie	04N07W20DDB1	345709.2	914607	255.00	4/21/2010	102.01	152.99		145.67			7.32	
Prairie	04N07W28BBA1	345700.53	914544.88	258.00	3/25/2010	96.52	161.48	161.20	163.10		0.28	-1.62	
Prairie	05N05W14DCD1	350252.43	913034.06	205.00	3/19/2010	29.56	175.44		172.50	167.26		2.94	8.18
								Declines/Wells:			**10/18**	**18/28**	**2/3**
								Average Change:			**-0.31**	**1.54**	**1.74**
Pulaski	01S10W29CC1	343537.78	920707.66	239.00	4/5/2010	9.82	229.18	222.20	225.50		6.98	3.68	
Pulaski	02S10W14DC1	343204.71	920333.75	225.00	4/5/2010	21.15	203.85	204.90	203.50	197.49	-1.05	0.35	6.36
Pulaski	02S10W16CCA1	343216.99	920549.36	230.76	4/5/2010	21.83	208.93	213.66	212.46		-4.73	-3.53	
								Declines/Wells:			**2/3**	**1/3**	**0/1**
								Average Change:			**0.40**	**0.17**	
Randolph	18N01E34AAC1	360942.69	905729.13	266.00	4/7/2010	15.62	250.38	248.30	251.10		2.08	-0.72	
Randolph	18N02E22DCD1	361045.76	905104.7	273.00	4/7/2010	38.85	234.15	233.10	236.98		1.05	-2.83	
Randolph	19N02E09DCA1	361759	905158	267.00	4/7/2010	5.25	261.75	258.80	255.70		2.95	6.05	
Randolph	20N02E01ADD1	362424.2	904811.4	280.00	4/7/2010	8.31	271.69	267.26	269.60		4.43	2.09	
Randolph	20N03E28BA1	362113.53	904537.97	276.00	4/7/2010	8.26	267.74	264.00	266.00		3.74	1.74	

Alluvial Aquifer
00-05-09-10
Wl Change

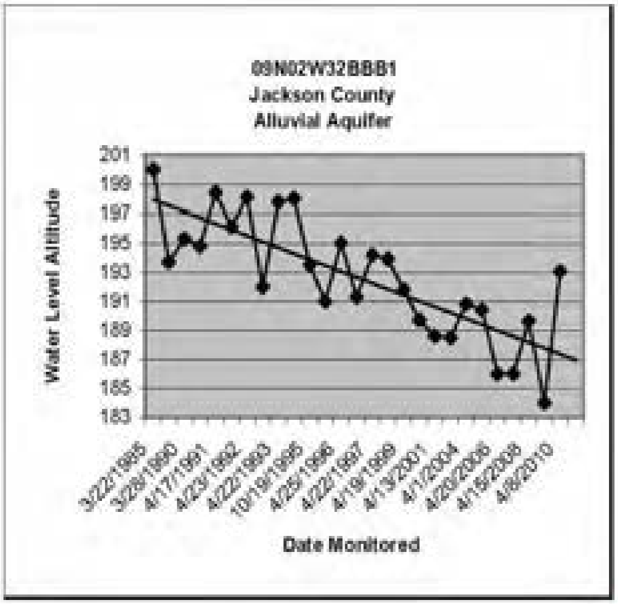
County	Station ID	Latitude	Longitude	LSA	Date Measured	2010 meas.	WL Alt. 10	WL Alt. 09	WL Alt. 05	WL Alt. 00	09-10 Change	05-10 Change	00-10 Change
							Declines/Wells:				0/5	2/5	
							Average Change:				2.85	1.27	
St. Francis	04N01W17CBC1	345735	910801	208.00	6/9/2010	61.60	146.40	147.50	149.10		-1.10	-2.70	
St. Francis	04N01W28CDD1	345535.26	910633.55	208.00	3/29/2010	71.06	136.94	134.70	136.45		2.24	0.49	
St. Francis	04N02E03DDD3	345848	905218	210.00	3/30/2010	41.27	168.73	164.00	165.70		4.73	3.03	
St. Francis	04N02E19BBB1	345701	905633	209.00	3/30/2010	61.49	147.51		149.40			-1.89	
St. Francis	04N03E21DAD1	345623.1	904655.3	236.00	3/30/2010	59.36	176.64			178.63			-1.99
St. Francis	04N05E22BBB1	345650.6	903356.8	200.00	3/30/2010	26.87	173.13			171.08			2.05
St. Francis	05N01E15BCB1	350302.57	905942.41	209.00	3/30/2010	69.88	139.12	141.30	143.20		-2.18	-4.08	
St. Francis	05N01E27BBA1	350135.73	905928.78	209.00	3/30/2010	69.50	139.50	138.50	142.50		1.00	-3.00	
St. Francis	05N02E20ADC1	350156.9	905437.16	211.00	3/30/2010	53.34	157.66	153.70	157.00		3.96	0.66	
St. Francis	05N03E20AAB2	350214.31	904800.83	250.00	3/30/2010	104.96	145.04	155.10	154.50		-10.06	-9.46	
St. Francis	05N05E19DCA1	350128	903629	203.00	3/30/2010	30.05	172.95	170.70	171.14		2.25	1.81	
St. Francis	05N06E34CAB1	350025.57	902656.87	200.00	3/30/2010	25.16	174.84	172.80	174.90	179.12	2.04	-0.06	-4.28
St. Francis	06N01E33ACA2	350552.33	905941.6	211.00	3/30/2010	69.41	141.59	150.50	141.40	151.15	-8.91	0.19	-9.56
St. Francis	06N02E13DCA1	350812.64	905002.71	231.00	3/30/2010	75.37	155.63	156.20	159.10		-0.57	-3.47	
St. Francis	06N02E15BDD1	350841.91	905247.31	214.64	3/30/2010	62.31	152.33	152.14	155.44	160.19	0.19	-3.11	-7.86
St. Francis	06N02E24AAA1	350755.19	905002.42	232.00	3/30/2010	73.14	158.86		157.60	164.67		1.26	-5.81
St. Francis	06N05E22ACC1	350723.4	903252.2	200.00	3/30/2010	43.31	156.69			155.16			1.53
St. Francis	06N06E20ABB2	350747.06	902841.2	200.00	3/30/2010	37.54	162.46		165.10			-2.64	
							Declines/Wells:				5/12	9/15	5/7
							Average Change:				-0.53	-1.53	-3.70
White	05N07W09AAA1	350446.87	914441.48	205.00	4/15/2010	9.80	195.20	194.50	190.87	191.03	0.70	4.33	4.17
White	05N07W10CCC1	350400.22	914436	203.00	4/15/2010	8.01	194.99	193.80	194.80		1.19	0.19	
White	06N06W04BAA1	351047.21	913909.91	220.00	4/15/2010	22.13	197.87	189.35	185.75		8.52	12.12	
White	06N06W18BBC1	350851.33	914151.92	210.00	4/15/2010	9.83	200.17	197.70	196.80		2.47	3.37	
White	06N06W34AAB1	350623.57	913753.55	213.00	4/15/2010	59.69	153.31	152.70	152.80		0.61	0.51	
White	06N07W17DCC1	350822.47	914634.73	217.00	4/15/2010	12.37	204.63		206.50			-1.87	
White	06N08W26DDB1	350639	914931	230.00	4/15/2010	12.64	217.36	219.00			-1.64		
White	07N05W01AAA1	351552	912858	205.00	4/15/2010	8.64	196.36	193.00			3.36		
White	07N05W32BAB1	351136.63	913406.19	213.70	4/15/2010	21.87	191.83	188.50	188.90		3.33	2.93	
White	08N04W06CCB1	352028.21	912846.51	214.00	4/15/2010	11.36	202.64	201.70	198.50		0.94	4.14	
White	08N05W32CBC1	351615.66	913416.96	199.00	4/15/2010	2.07	196.93	198.00	197.60		-1.07	-0.67	
							Declines/Wells:				2/10	2/9	0/1
							Average Change:				1.84	2.78	

Alluvial Aquifer
00-05-09-10
Wl Change

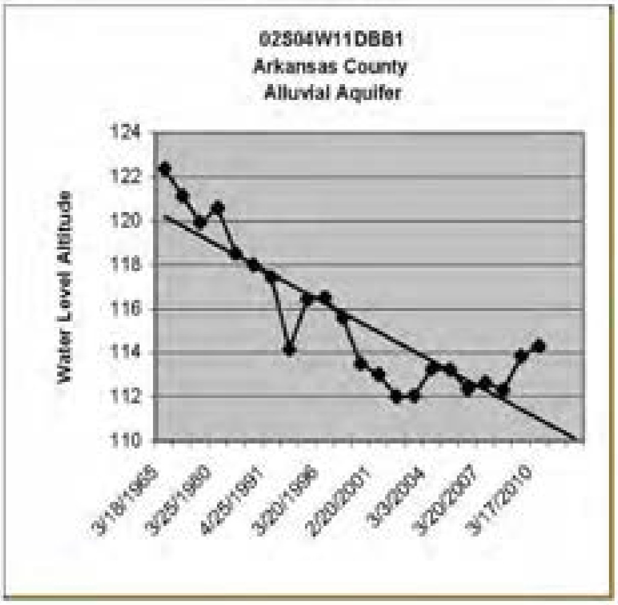
County	Station ID	Latitude	Longitude	LSA	Date	2010	WL	WL	WL	WL	09-10	05-10	00-10
					Measured	meas.	Alt. 10	Alt. 09	Alt. 05	Alt. 00	Change	Change	Change
Woodruff	04N03W03AB1	350020.93	911819.87	185.00	4/9/2010	8.70	176.30	171.30	175.40		5.00	0.90	
Woodruff	05N02W20DCB1	350207.8	911356.2	192.00	4/9/2010	8.41	183.59		181.00			2.59	
Woodruff	05N04W12DBA1	350426.8	912210.8	186.00	4/9/2010	3.78	182.22	182.07	182.07	178.30	0.15	0.15	3.92
Woodruff	06N03W15BAB1	350903.06	911807.41	188.79	4/9/2010	3.93	184.86	183.29	184.59		1.57	0.27	
Woodruff	06N03W31BCB1	350623	912144	185.00	4/9/2010	1.19	183.81	182.90	183.56		0.91	0.25	
Woodruff	07N01W04ACB1	351541	910626	225.00	4/20/2010	59.55	165.45		145.00	167.80		20.45	-2.35
Woodruff	07N03W19AAA1	351335	912025.42	202.59	4/8/2010	5.33	197.26	191.79	193.49	156.79	5.47	3.77	40.47
Woodruff	08N01W06DDD1	352028	910747	218.00	4/8/2010	43.75	174.25	171.80	174.90		2.45	-0.65	
Woodruff	08N02W31DDD1	351611	911411	194.55	4/8/2010	2.28	192.27	189.95	190.80	190.35	2.32	1.47	1.92
Woodruff	08N03W04BBB1	352128	911919	221.00	6/8/2010	12.14	208.86	204.82	206.92		4.04	1.94	
Woodruff	08N03W31AAD1	351655	912028	212.00	4/8/2010	17.34	194.66	191.40	190.50	189.65	3.26	4.16	5.01
Woodruff	09N03W29AAD1	352258	911921	220.00	4/8/2010	18.13	201.87	199.30	201.10		2.57	0.77	
							Declines/Wells:				0/10	1/12	1/5
							Average Change:				2.77	3.01	9.79
					Total Declines/Wells:						61/273	200/319	31/82
											22.3%	62.6%	37.8%
					Total Average Change:						1.62	-0.58	2.22

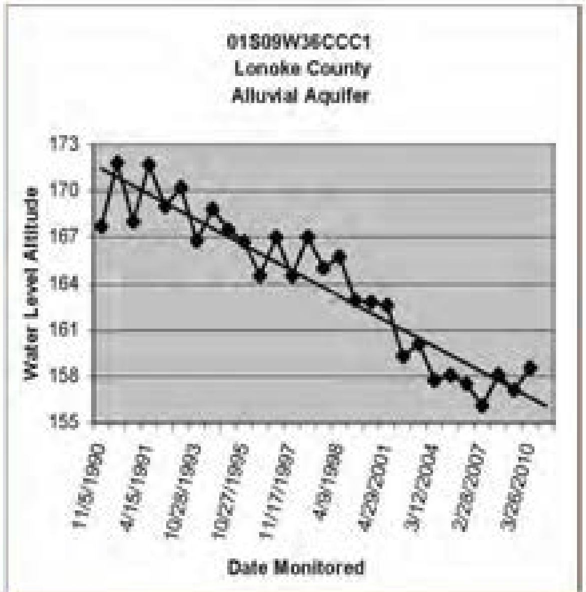
Appendix B

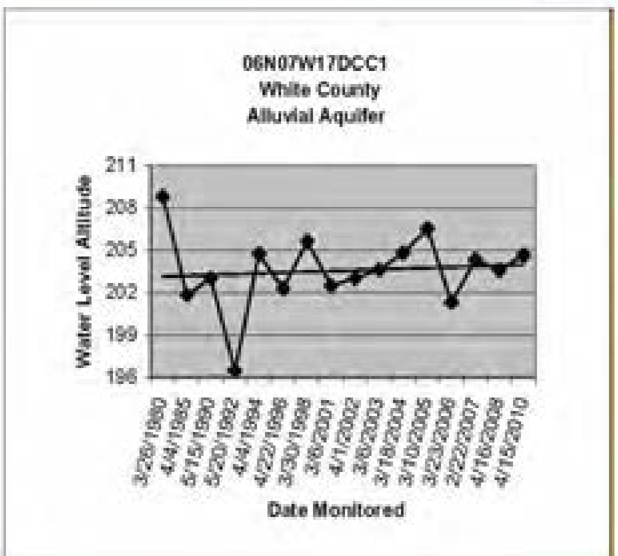
Selected Alluvial Aquifer Well Hydrographs

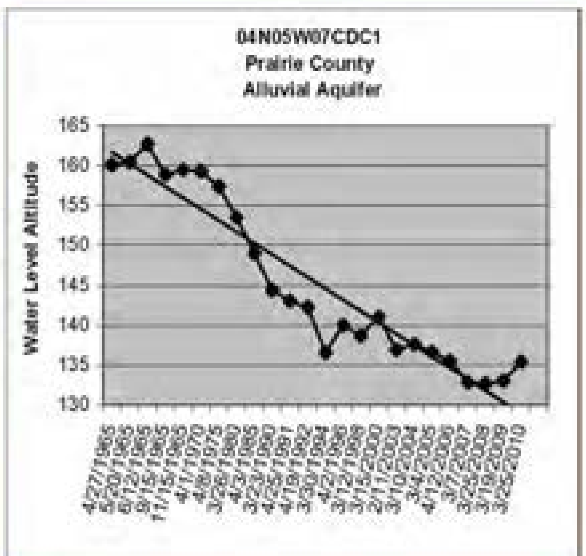

09N02W32BBB1
Jackson County
Alluvial Aquifer
Water Level Altitude
Date Monitored
201
199
197
195
193
191
189
187
185
183

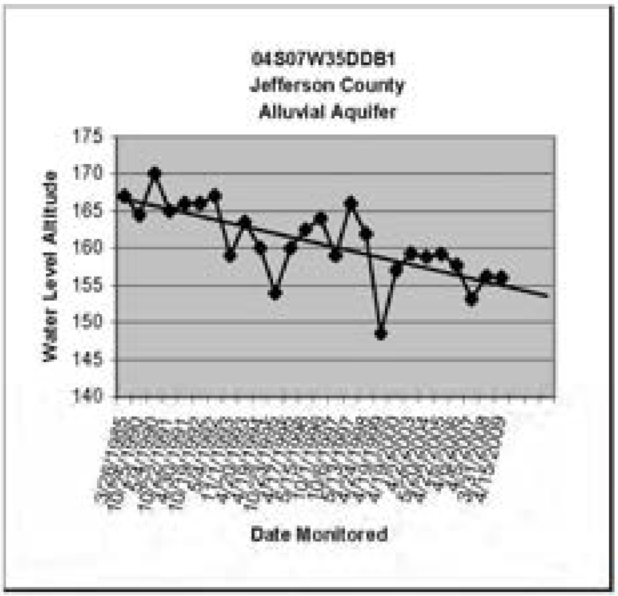

07S03W18CCD1
Arkansas County
Alluvial aquifer
Water Level Altitude
150
147
144
141
138
135
3/28/1980
4/3/1985
4/15/1992
3/19/1996
2/29/2000
2/20/2001
3/6/2002
2/19/2003
3/4/2004
2/22/2005
4/6/2006
3/22/2007
3/20/2008
3/25/2009
3/16/2010
Date Monitored

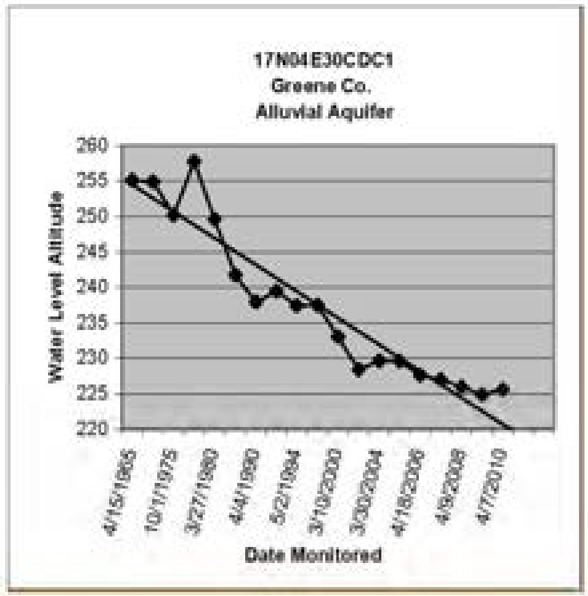

02S04W11DBB1
Arkansas County
Alluvial Aquifer
Water Level Altitude
124
122
120
118
116
114
112
110

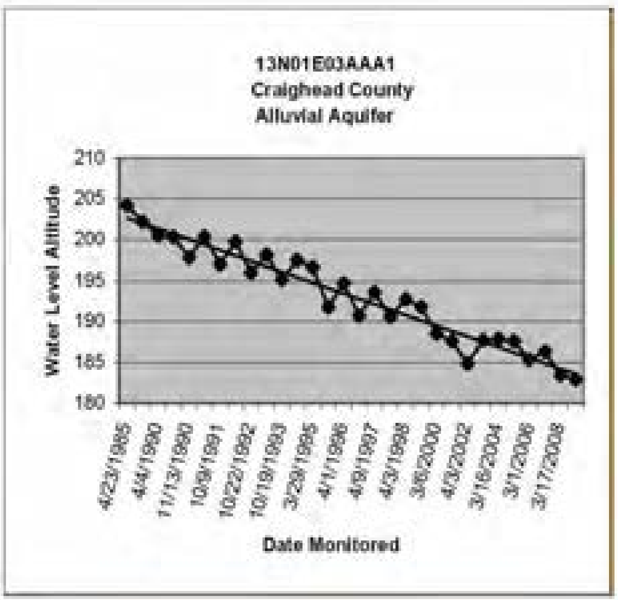

01S09W36CCC1
Lonoke County
Alluvial Aquifer
Water Level Altitude
173
170
167
164
161
158
155
Date Monitored

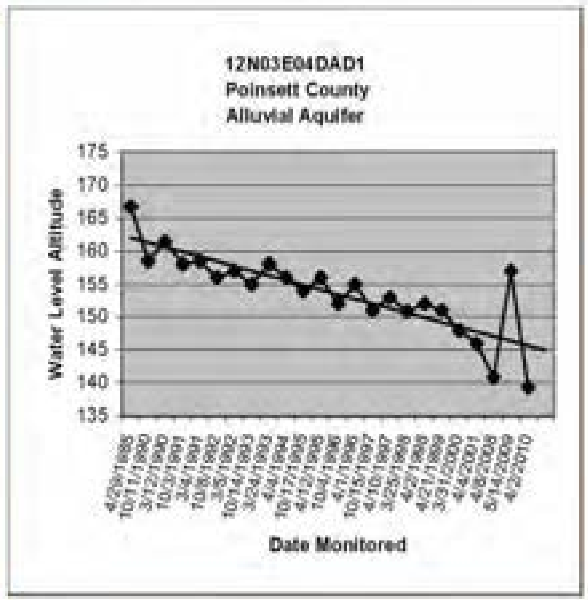

06N07W17DCC1
White County
Alluvial Aquifer
Water Level Altitude
211
208
205
202
199
196
Date Monitored

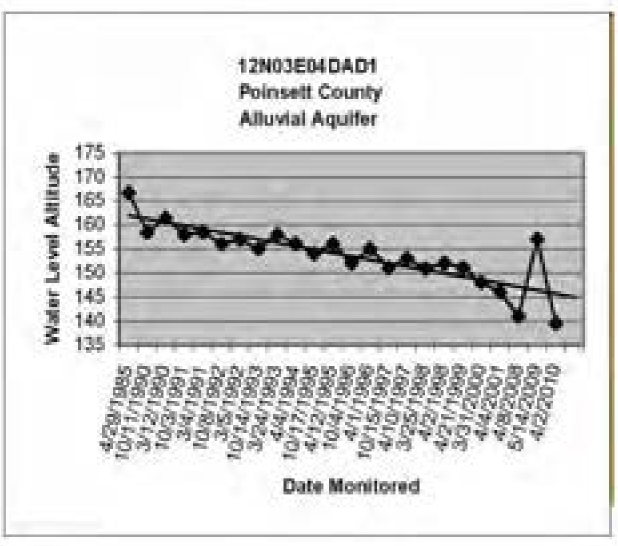

04N05W07CDC1
Prairie County
Alluvial Aquifer
Water Level Altitude
165
160
155
150
145
140
135
130

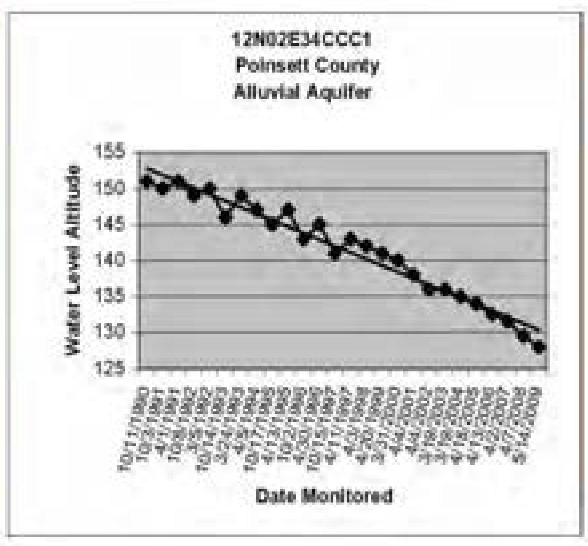

04S07W35DDB1
Jefferson County
Alluvial Aquifer
Water Level Altitude
175
170
165
160
155
150
145
140
Date Monitored


17N04E30CDC1
Greene Co.
Alluvial Aquifer
Water Level Altitude
260
255
250
245
240
235
230
225
220
4/15/1965
10/1/1975
3/27/1980
4/4/1990
5/2/1994
3/10/2000
3/30/2004
4/18/2006
4/5/2008
4/7/2010
Date Monitored

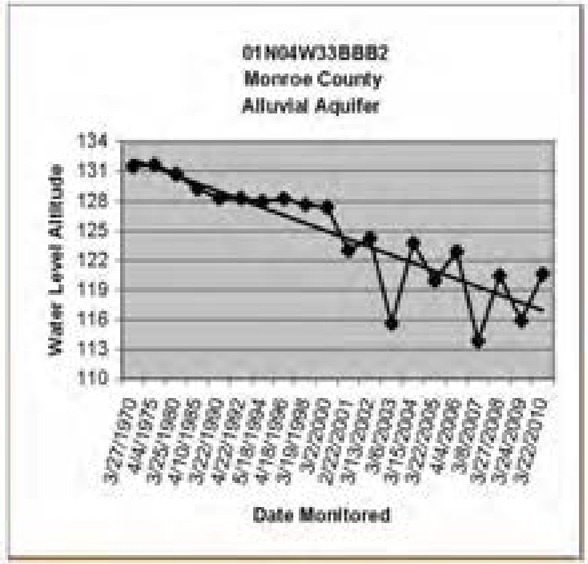

13N01E03AAA1
Craighead County
Alluvial Aquifer
Water Level Altitude
210
205
200
195
190
185
180
4/23/1985
4/4/1990
11/13/1990
10/9/1991
10/22/1992
10/19/1993
3/29/1995
4/1/1996
4/9/1997
4/3/1998
3/6/2000
4/9/2002
3/18/2004
3/1/2006
3/17/2008
Date Monitored

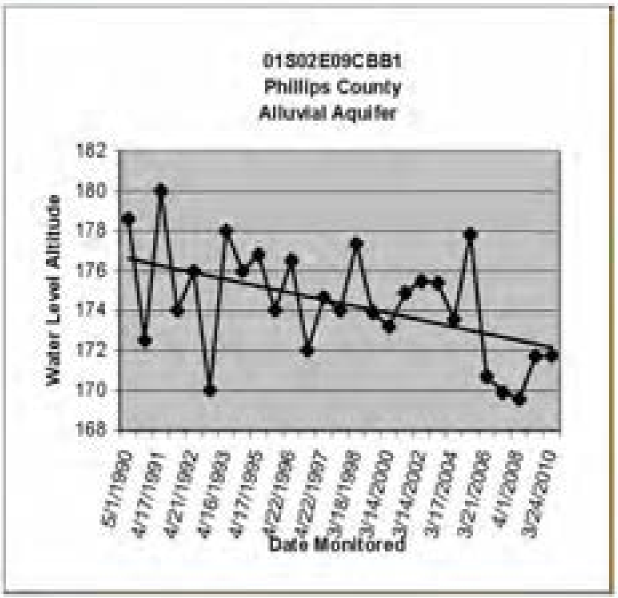

12N03E04DAD1
Poinsett County
Alluvial Aquifer
Water Level Altitude
175
170
165
160
155
150
145
140
135
Date Monitored

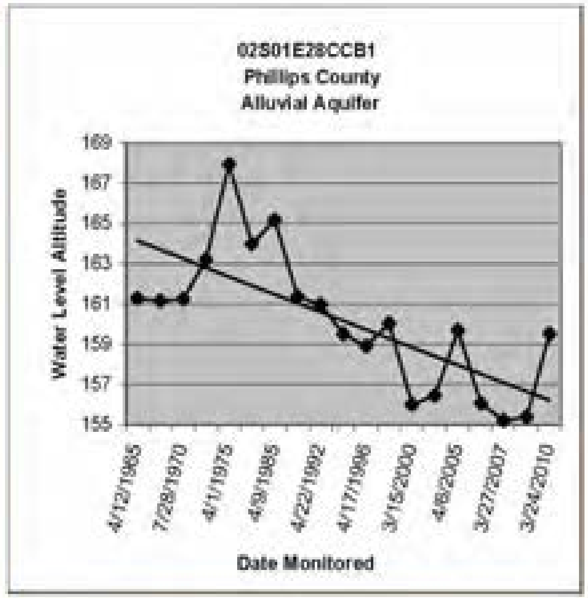

12N03E04DAD1
Poinsett County
Alluvial Aquifer
Water Level Altitude
175
170
165
160
155
150
145
140
135
Date Monitored

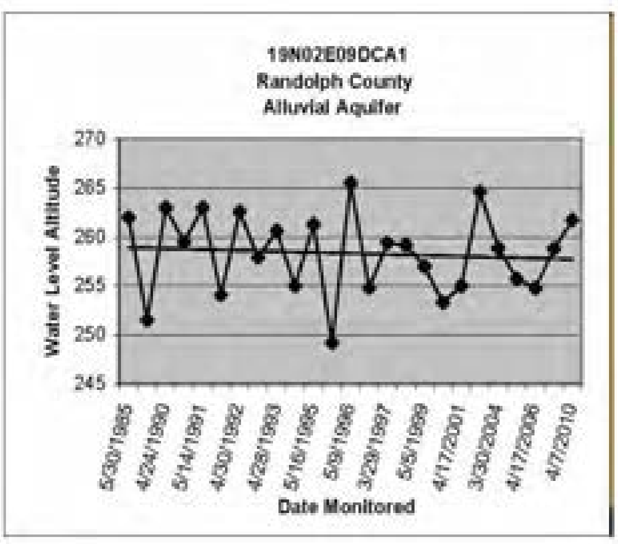

12N02E34CCC1
Poinsett County
Alluvial Aquifer
Water Level Altitude
155
150
145
140
135
130
125
Date Monitored

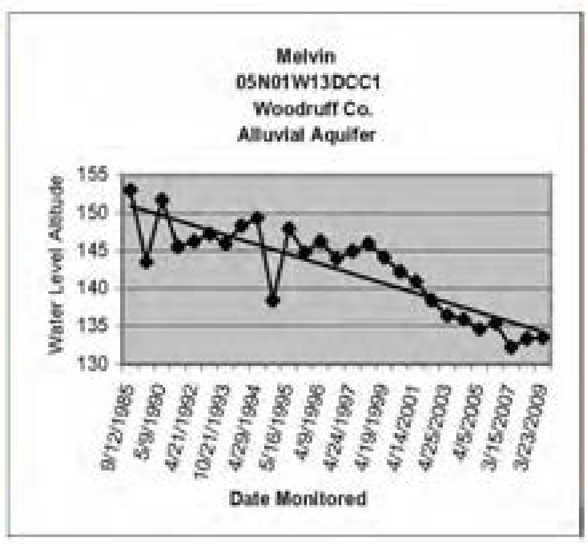

9N1E33BBA
Cross County
Alluvial Aquifer
Water Level Altitude
Date Monitored
190
185
180
175
170
165
160
155
150
145
140
135
130


01N04W33BBB2
Monroe County
Alluvial Aquifer
Water Level Altitude
Date Monitored
134
131
128
125
122
119
116
113
110


01S02E09CBB1
Phillips County
Alluvial Aquifer
Water Level Altitude
Date Monitored
182
180
178
176
174
172
170
168


02S01E28CCB1
Phillips County
Alluvial Aquifer
Water Level Altitude
Date Monitored
169
167
165
163
161
159
157
155


19N02E09DCA1
Randolph County
Alluvial Aquifer
Water Level Altitude
Date Monitored
270
265
260
255
250
245


Melvin
05N01W13DCC1
Woodruff Co.
Alluvial Aquifer
Water Level Altitude
Date Monitored
155
150
145
140
135
130

Appendix C

Sparta / Memphis Aquifer Water Level Monitoring Data

Sparta Aquifer
00-05-09-10 WL Change

County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Arkansas	02S04W06CDB1	343311.54	912849.29	212.00	4/15/2010	147.90	64.10	51.02	57.48	40.50	13.08	6.62	23.60
Arkansas	02S04W23DAA1	343044.22	912354.53	208.00	4/15/2010	153.50	54.50	66.59	64.39		-12.09	-9.89	
Arkansas	02S04W33BBB1	342922.14	912702.68	205.00	5/15/2010	165.00	40.00	38.21	55.04		1.79	-15.04	
Arkansas	02S05W16CBC1	343143	913318	216.00	4/15/2010	165.50	50.50	43.32	47.90	29.20	7.18	2.60	21.30
Arkansas	02S05W34BDA1	342924.58	913148.02	216.00	4/15/2010	168.80	47.20	34.23	41.36		12.97	5.84	
Arkansas	02S05W35AAB1	342929.98	913035.31	216.00	4/15/2010	139.60	76.40	39.27	44.95		37.13	31.45	
Arkansas	03S04W02CCB1	342747.58	912458.04	202.00	4/15/2010	142.40	59.60	52.29	57.95		7.31	1.65	
Arkansas	03S05W13BDC1	342631.15	913004.57	210.00	4/13/2010	148.00	62.00	35.43	38.26	28.00	26.57	23.74	34.00
Arkansas	03S05W15CBB1	342633.21	913229.33	206.00	4/13/2010	161.90	44.10	29.14	42.46	25.60	14.96	1.64	18.50
Arkansas	03S05W18CAB1	342633	913523	196.00	4/13/2010	153.90	42.10	34.06	39.72	22.40	8.04	2.38	19.70
Arkansas	03S06W21ACB1	342554	913927	200.00	4/13/2010	150.20	44.80	43.69		44.00	1.11		0.80
Arkansas	03S06W30BBD1	342515.54	914216.15	191.00	4/13/2010	156.40	34.60	30.18	29.73		4.42	4.87	
Arkansas	04S04W11BCC1	342158.96	912501.52	198.00	4/15/2010	143.20	54.20	42.18	46.94		12.02	7.26	
Arkansas	04S04W22DAA1	342006.89	912515.15	195.00	4/15/2010	146.00	49.00	36.36	39.49		12.64	9.51	
Arkansas	04S05W01BAA1	342322.23	912956.46	196.00	4/13/2010	162.30	33.70	27.84	7.44		5.86	26.26	
Arkansas	04S05W05ACC1	342302.67	913412.84	186.00	4/13/2010	148.40	37.60	24.83	34.95		12.77	2.65	
Arkansas	04S05W15AAA1	342132.16	913133.29	201.00	4/13/2010	155.75	45.25	31.21	41.83	27.10	14.04	3.42	18.15
Arkansas	04S05W36DCC1	341752.00	913003.63	196.00	4/18/2010	153.70	42.30	37.98	42.15		4.32	0.15	
Arkansas	05S03W04ADB1	341734.14	912007.11	188.00	4/19/2010	130.60	57.40	45.61	31.48	48.30	11.79	25.92	9.10
Arkansas	05S04W26ACA1	341358	912435	188.00	4/19/2010	132.00	56.00	54.86	68.22		1.14	-12.22	
Arkansas	05S05W26CDD1	341324	913119	188.00	4/19/2010	34.75	153.25	153.37	157.61		-0.12	-4.36	
Arkansas	05S05W36DAA	341247	912946	180.00	4/19/2010	140.00	40.00	33.12	46.13	32.00	6.88	-6.13	8.00
Arkansas	06S02W22CDB1	340904	911331.06	186.00	4/19/2010	107.40	78.60	75.17	87.88		3.43	-9.28	
Arkansas	06S03W27BAA1	340859.22	912008.98	181.00	4/19/2010	115.10	65.90	63.16	68.49		2.74	-2.59	
Arkansas	07S02W28ABA1	340339.67	911411.01	181.00	4/19/2010	102.50	78.50	77.47	82.77		1.03	-4.27	
Arkansas	07S03W06ABC1	340701.89	912247.68	185.00	3/27/2010	122.50	62.50	59.48	62.16	61.80	3.02	0.34	0.70
Arkansas	08S02W09BCC1	340031.06	911447.66	174.00	4/19/2010	98.40	75.60	74.68	78.12		0.92	-2.52	
								Declines/Wells:			2/27	9/26	0/10
								Average Change:			7.96	3.46	15.39

Sparta Aquifer
00-05-09-10 WL Change

County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Ashley	15S07W32CDD1	332117.77	915101.06	190.00	3/9/2010	138.50	51.50	40.14	51.28	29.50	11.36	0.22	22.00
Ashley	17S09W15ACC1	331333.66	920116.44	100.00	3/9/2010	19.94	80.06	80.07	82.03		-0.01	-1.97	
								Declines/Wells:			1/2	1/2	0/1
								Average Change:			5.68	-0.88	
Bradley	12S09W31CCB1	333711.24	920444.21	231.00	3/16/2010	191.90	39.10	34.01	44.64		5.09	-5.54	
Bradley	13S09W06ACA1	333647.9	920437.48	235.00	3/16/2010	172.95	28.05	27.52	43.18	49.00	0.53	-15.13	-20.95
Bradley	13S09W06ACB3	333647	920407	208.00	3/16/2010	181.00	31.00	25.98	41.25		5.02	-10.25	
Bradley	13S11W17BCD1	333453.65	921607.25	250.00	3/16/2010	196.14	53.86	45.96	48.98	56.50	7.90	4.88	-2.64
Bradley	16S12W21CAA1	331839	922052	100.00	3/17/2010	78.90	21.10	18.88	25.74		2.22	-4.64	
								Declines/Wells:			0/5	4/5	2/2
								Average Change:			4.15	-6.14	-11.80
Calhoun	13S13W32CDA1	333226.81	922741.66	208.00	4/20/2010	191.30	16.70	13.62	37.73	36.30	3.08	-21.03	-19.60
Calhoun	14S13W05BBD1	333206.66	922801.55	189.00	4/22/2010	159.70	29.30	30.19	32.64		-0.89	-3.34	
Calhoun	14S13W12CCB1	333040.05	922403.54	205.00	4/22/2010	177.80	27.20	27.52	34.11		-0.32	-6.91	
Calhoun	15S13W20BDC1	332410.97	922806.59	109.00	4/21/2010	24.10	90.90	83.60	84.25		7.30	6.65	
								Declines/Wells:			2/4	3/4	1/1
								Average Change:			2.29	-6.16	
Cleveland	08S09W06BBA1	340349	920237	300.00	3/16/2010	267.90	32.10	153.13					
Cleveland	09S11W11CDB1	335622.66	921250.52	233.00	3/16/2010	161.75	71.25	70.81	71.06		0.44	0.19	
Cleveland	10S09W23CDC1	334917.94	920020.5	220.00	3/16/2010	171.15	48.85	56.96	57.44		-8.11	-8.59	
Cleveland	10S09W35ACD1	334758	915956	219.00	3/16/2010	157.80	74.20	60.29	64.16		13.91	10.04	
Cleveland	10S12W12BDD1	335132.99	921743.38	220.00	3/16/2010	123.70	96.30	98.56	100.96		-2.26	-4.66	
								Declines/Wells:			2/4	2/4	
								Average Change:			0.99	-0.75	

Sparta Aquifer
00-05-09-10 WL Change

County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Columbia	15S20W20CCB1	332453.37	931215.01	372.00	4/27/2010	215.80	156.20	154.15	155.87		2.05	0.33	
Columbia	16S20W08DCC1	332114.08	931141.34	402.00	4/27/2010	315.10	86.90	81.01	84.77		5.89	2.13	
Columbia	16S20W18ACD1	332052.93	931237.40	337.00	4/27/2010	257.00	80.00	71.28	74.50		8.72	5.50	
Columbia	16S21W14CBB1	332049	931516	281.00	5/4/2010	200.66	80.34	81.14	82.69		-0.80	-2.35	
Columbia	16S21W20DAD1	331955.06	931736.47	350.00	5/4/2010	249.77	100.23	97.76	101.76		2.47	-1.53	
Columbia	16S22W22CCD1	331947.61	932224.89	340.00	5/5/2010	132.30	207.70	201.66	193.13	201.70	6.04	14.57	6.00
Columbia	17S19W15ABD1	331537	930328	325.00	4/27/2010	269.00	56.00	57.62	52.13		-1.62	3.87	
Columbia	17S19W17ACA1	331538.06	930536.26	303.00	5/4/2010	260.50	14.50						
Columbia	17S19W18CBD1	331516.81	930655.59	305.00	5/4/2010	277.40	27.60	44.69	35.93	27.90	-17.09	-8.33	-0.30
Columbia	17S19W30ABB1	331406.12	930650.14	248.00	4/27/2010	212.30	35.70	30.28	26.26		5.42	9.44	
Columbia	17S20W17CDA1	331519.76	931200.69	325.10	5/4/2010	297.50	27.60	26.70	7.86		0.90	19.74	
Columbia	17S21W01BBC1	331743.07	931423.65	305.00	5/4/2010	260.30	44.70	49.60	35.25	11.50	-4.90	9.45	33.20
Columbia	17S21W11DCC2	331608.55	931448.61	303.00	5/4/2010	279.80	23.20	29.79	24.43		-6.59	-1.23	
Columbia	17S21W11DCC3	331609.3	931449.35	298.00	5/4/2010	279.80	18.20	23.01	19.85		-4.81	-1.65	
Columbia	17S22W22ABB1	331521	932209	318.00	5/5/2010	82.10	235.90						
Columbia	17S22W23BBB1	331519	932136	318.00	5/5/2010	133.30	184.70	188.39	181.89		-3.69	2.81	
Columbia	18S20W06DDC1	331142	931248	300.00	4/28/2010	280.01	19.99	4.35		-1.40	15.64		21.39
Columbia	18S20W08CBC1	331114.79	931227.04	263.00	5/4/2010	270.90	7.90	-7.36	-10.44		15.26	18.34	
Columbia	18S20W10CAA1	331054.37	931015.76	290.00	4/28/2010	270.98	19.02	13.58	12.49		5.44	6.53	
Columbia	18S21W17ACD1	331033.97	931758.51	315.00	4/28/2010	237.40	77.60	84.84	86.20		-7.24	-8.60	
Columbia	18S22W27DDD1	330834.57	932158.59	312.00	4/29/2010	131.70	180.30	176.69	178.36		3.61	1.94	
Columbia	19S20W09CBD1	330555.38	931128.72	332.00	4/28/2010	262.40	69.60	67.98	66.08	79.20	1.62	3.52	-9.60
Columbia	19S20W34BDD1	330239.09	931030.67	290.00	4/28/2010	206.50	83.50	88.28			-4.78		
Columbia	19S21W16DBB1	330517.2	931724.2	284.00	4/28/2010	172.10	111.90	109.62	110.76		2.28	1.14	
Columbia	19S23W10ABD1	330643.92	932833.33	242.00	5/5/2010	45.29	196.71	196.91	198.48		-0.20	-1.77	
Columbia	19S23W11CDA2	330609.39	932744.02	248.00	5/5/2010	52.30	195.70	195.46	195.55	193.70	0.24	0.15	2.00
Columbia	19S23W11DDB1	330604.93	932722.12	246.00	5/4/2010	54.10	191.90	192.24	191.97		-0.34	-0.07	
Columbia	19S23W14BAB2	330555.24	932752.38	244.00	5/5/2010	45.85	198.15	191.89	193.54		6.26	4.61	
Columbia	20S22W03DCC1	330138.44	932236.27	214.00	4/28/2010	104.27	109.73						
Columbia	20S22W11ACD1	330109.20	932133.20	271.00	4/28/2010	106.00	165.00	163.21	163.87		1.79	1.13	
								Declines/Wells:			11/27	8/25	2/6
								Average Change:			1.17	3.19	8.78

Sparta Aquifer
00-05-09-10 WL Change

County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Craighead	13N03E23CDD1	354404.17	904432.83	248.00	3/24/2010	89.90	158.10	156.75	160.85	164.10	1.35	-2.75	-6.00
Craighead	14N04E22CBD1	354928.92	903920.99	256.00	3/25/2010	58.20	197.80	196.33	200.73		1.47	-2.93	
Craighead	14N04E28DBD1	354836.94	903953.27	254.00	3/31/2010	60.90	193.10	189.11	193.69		3.99	-0.59	
Craighead	14N05E36CBC1	354750.84	903100.18	220.00	3/31/2010	11.10	208.90	206.84	209.24	206.60	2.06	-0.34	2.30
Craighead	15N04E20ADB1	355506.01	904043.21	438.00	3/31/2010	117.55	320.45	318.92	319.82		1.53	0.63	
Craighead	15N05E29DBB1	355359.83	903432.73	258.00	3/31/2010	22.20	235.80	232.76	236.92		3.04	-1.12	
Craighead	15N06E18ACA1	355544.42	902858.20	230.00	3/31/2010	14.80	215.20	211.34	214.69	209.90	3.86	0.51	5.30
								Declines/Wells:			**0/7**	**5/7**	**1/3**
								Average Change:			**2.47**	**-0.94**	**0.53**
Crittenden	05N08E11CCA2	350344.68	901300.21	211.00	4/21/2010	23.05	187.95	185.12	188.06	181.90	2.83	-0.11	6.05
Crittenden	06N07E01DAD2	350958.04	901738.42	209.00	4/21/2010	23.60	185.40	182.78	186.47	183.00	2.62	-1.07	2.40
Crittenden	07N09E14BAC1	351348.14	900628.23	217.00	4/21/2010	28.20	188.80	186.51	189.58		2.29	-0.78	
								Declines/Wells:			**0/3**	**3/3**	**0/2**
								Average Change:			**2.58**	**-0.65**	**4.22**
Cross	06N04E06ACA1	351004.29	904237.72	358.00	3/10/2010	202.00	156.00	152.42	156.08		3.58	-0.08	
Cross	07N05E04ADD1	351538.11	903329.85	209.00	3/10/2010	37.30	171.70	173.20	172.92		-1.50	-1.22	
Cross	08N02E18BDB1	351908	905538	228.00	3/10/2010	91.60	136.40	135.70	145.28		0.70	-8.88	
Cross	09N01E16CAC1	352405.00	905950.75	234.00	3/10/2010	87.70	146.30	141.46	152.63		4.84	-6.33	
Cross	09N01E25AAD1	352244.31	905554.00	227.00	3/10/2010	90.80	136.20	135.46	140.47		0.74	-4.27	
Cross	09N03E22AAB2	352403.82	904518.39	277.00	3/10/2010	126.30	150.70	147.77			2.93		
Cross	09N03E22AAD1	352403.2	904511.77	278.00	3/10/2010	128.20	149.80	143.76	147.81	151.10	6.04	1.99	-1.30
								Declines/Wells:			**1/7**	**5/6**	**1/1**
								Average Change:			**2.48**	**-3.13**	
Dallas	07S16W20CAB1	340559	924541	322.00	4/12/2010	21.05	300.95	295.05	297.03		5.90	3.92	
Dallas	08S15W34BDC1	335853	923658	240.00	4/13/2010	26.30	213.70	213.68	214.37		0.02	-0.67	
Dallas	08S16W18ACC1	940152	922446	252.00	4/12/2010	15.78	236.22	236.45	235.97		-0.23	0.25	
Dallas	08S16W27DDD1	335935	924307	275.00	4/13/2010	30.60	241.40	241.71	242.23		-0.31	-0.83	
Dallas	09S13W35CCD1	335304	922413	200.00	4/13/2010	71.30	128.70	128.53	128.64		0.17	0.06	

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County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Dallas	09S16W19CAA1	335605.48	924701.17	260.00	4/12/2010	7.10	252.90	252.75	253.97		0.15	-1.07	
Dallas	10S13W34ACA2	334829.46	922457.61	272.00	4/14/2010	152.30	119.70	120.92	120.53		-1.22	-0.83	
Dallas	10S14W27CDB1	334907.60	923137.99	270.00	4/14/2010	30.70	239.30	237.64	238.07	226.10	1.66	1.23	13.20
Dallas	10S15W18BCC1	335119.53	924120.08	328.00	4/14/2010	72.29	255.71	251.56	252.22	250.60	4.15	3.49	5.11
								Declines/Wells:			3/9	4/9	0/2
								Average Change:			1.14	0.62	9.16
Desha	09S02W26AAC1	335346.00	911520.82	153.00	3/11/2010	71.12	81.88	79.17	84.09	82.70	2.71	-2.21	-0.82
Desha	09S04W28DDD1	335309.60	913006.71	165.00	3/11/2010	111.18	53.82	51.02	52.46	55.40	2.80	1.36	-1.58
Desha	10S02W26CCC2	334750.23	911623.99	148.00	3/11/2010	71.65	76.35	70.76	76.76		5.59	-0.41	
Desha	11S02W03CCA1	334615.78	911711.03	139.00	3/11/2010	70.15	68.85	67.36	69.98	76.30	1.49	-1.13	-7.45
Desha	12S03W26CBB1	333748.60	912259.18	143.00	3/10/2010	81.50	56.50	40.99	47.61		15.51	8.89	
Desha	12S03W34DAD1	333643.44	912305.04	147.00	3/10/2010	82.90	64.10	62.37	69.50	70.00	1.73	-5.40	-5.90
								Declines/Wells:			0/6	4/6	4/4
								Average Change:			4.97	0.18	-3.94
Drew	11S04W02ACA2	334631.87	912826.56	153.00	3/10/2010	94.10	58.90	55.08	59.53	57.20	3.82	-0.63	1.70
Drew	11S04W25CB2	334249.46	912706.98	148.00	3/10/2010	84.05	63.95	58.11	62.13	66.40	5.84	1.82	-2.45
Drew	12S06W30BBD1	333807.15	914543.08	271.00	3/10/2010	207.50	49.50	43.07	47.17		6.43	2.33	
Drew	13S05W36ACB1	333150.88	913407.59	169.00	3/10/2010	90.00	79.00	76.91	78.69		2.09	0.31	
Drew	15S04W12DDA1	332429.38	912723.69	125.00	3/10/2010	62.60	62.40	61.52	62.68	65.20	0.88	-0.28	-2.80
								Declines/Wells:			0/5	2/5	2/3
								Average Change:			3.81	0.71	-1.18
Grant	03S13W12AAA1	342845.65	922106.24	361.00	4/5/2010	130.40	230.60	226.53	229.99		4.07	0.61	
Grant	03S15W26DAA1	342600.52	923447.01	337.00	4/7/2010	10.94	326.06	325.02	327.13		1.04	-1.07	
Grant	05S13W03CAA1	341843.97	922400.47	260.00	4/5/2010	85.50	174.50	169.93	177.91		4.57	-3.41	
Grant	05S13W03CDA4	341837.64	922401.95	281.00	4/5/2010	107.50	173.50	164.61	170.37		8.89	3.13	
Grant	05S13W07ADB1	341810	922649.75	270.00	4/5/2010	80.10	177.90						
Grant	05S14W06DCC1	341842.5	923326.69	293.00	4/7/2010	83.00	210.00	203.43	206.53		6.57	3.47	
Grant	05S15W05ABD1	341923.78	923826.87	236.00	4/7/2010	13.30	218.70	219.59	219.03		-0.89	-0.33	
Grant	06S11W05ACD1	341340.82	921413.01	269.00	4/5/2010	190.50	89.50						

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County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Grant	06S15W26ACA1	341021.99	923537.59	280.00	4/7/2010	58.60	221.40	204.53	214.47		16.87	6.93	
Grant	07S12W21BDB1	340558.11	921952.7	223.00	4/6/2010	3.39	219.61	220.63	220.88		-1.02	-1.27	
								Declines/Wells:			**2/8**	**4/8**	
								Average Change:			**5.01**	**1.01**	
Hot Spring	05S16W35ACA1	341459.51	924151.12	342.00	4/8/2010	32.90	309.10	306.53			2.57		
								Declines/Wells:			**0/1**		
								Average Change:					
Jefferson	03S08W19BAD1	342623.76	915443.67	217.00	3/31/2010	163.80	53.20	40.62	45.53		12.58	7.67	
Jefferson	03S08W19BBD1	342628.36	915504.54	215.00	3/31/2010	163.80	51.20	31.74	48.26		19.46	2.94	
Jefferson	03S08W19BDB1	342618.71	915455.22	215.00	3/31/2010	157.70	57.30		46.62	47.80		10.68	9.50
Jefferson	03S09W23BBD1	342626.95	915712.96	222.00	3/31/2010	161.20	60.80	33.36	56.55		27.44	4.25	
Jefferson	03S10W27AAD1	342502.05	920433.81	222.00	3/25/2010	121.30	100.70	82.86	95.75		17.84	4.95	
Jefferson	03S11W22ABC1	342650.81	921058.27	310.00	3/24/2010	172.00	138.00	131.83	135.01		6.17	2.99	
Jefferson	04S10W29ADB1	341814	920512	267.55	3/24/2010	212.50	55.05	55.49	59.59		-0.44	-4.54	
Jefferson	04S11W14BAD1	342219.74	921000.07	400.00	3/24/2010	302.32	97.68	83.97	90.24		13.71	7.44	
Jefferson	06S08W16CCC1	341143.07	915517.06	202.42	3/1/2010	247.60	-45.18	-52.38	-53.32	-50.08	7.20	8.14	4.90
Jefferson	06S08W25ADC1	341024.86	915116.18	203.48	3/1/2010	220.20	-16.72	-20.40	-22.17	-16.72	3.68	5.45	0.00
Jefferson	06S10W23ACA2	341123.09	920503.93	235.00	3/30/2010	219.00	16.00	7.12	11.32		8.88	4.68	
Jefferson	07S07W24BAB1	340632.68	914522.99	188.00	3/30/2010	164.90	23.10	15.44	23.16	25.80	7.66	-0.06	-2.70
Jefferson	07S10W24CAC1	340548.70	920420.81	311.00	3/30/2010	284.18	26.82	44.73	5.83	24.80	-17.91	20.99	2.02
								Declines/Wells:			**2/12**	**2/13**	**1/5**
								Average Change:			**8.86**	**5.81**	**2.74**
Lincoln	07S07W30CDC1	340443.93	915042.86	208.00	3/17/2010	175.60	32.40	18.44	27.62		13.96	4.78	
Lincoln	08S05W03BAA2	340309.54	913453.58	180.00	3/18/2010	135.70	44.30	25.41	32.42		18.89	11.88	
Lincoln	08S05W35ACC1	335906.6	913337.26	166.00	3/18/2010	121.65	43.35		26.03			17.32	
Lincoln	08S04W22AAA1	340104.86	912752.79	167.00	3/18/2010	114.73	52.27	50.32			1.95		
Lincoln	08S08W35DBB1	335858.35	915222.4	250.00	3/16/2010	209.00	41.00	28.20	48.02		12.80	-7.02	
Lincoln	08S08W35DCB1	335850.57	915217.37	270.00	3/16/2010	249.50	20.50	18.52	59.48		1.98	-38.96	

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County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Lincoln	09S07W07DAD1	335633.89	915128.31	296.00	3/26/2010	263.50	32.50	12.64	27.46		19.86	5.04	
								Declines/Wells:			**0/6**	**2/6**	
								Average Change:			**11.57**	**-1.16**	
Lonoke	01N07W03BCC1	344425.34	914503.28	223.00	3/30/2010	131.50	91.50	91.06	95.09		0.44	-3.59	
Lonoke	02N07W06ACD1	344939.05	914737.03	241.00	3/25/2010	122.85	118.15	112.26	119.52		5.89	-1.37	
Lonoke	02N07W09AAA1	344906.42	914500.30	232.00	3/25/2010	99.35	132.65	131.42	133.23	136.50	1.23	-0.58	-3.85
Lonoke	02N07W22DBA1	344651.49	914425.68	227.00	3/25/2010	133.80	93.20	92.55	98.55		0.65	-5.35	
Lonoke	02N07W24DAC1	344650.23	914209.37	231.00	3/25/2010	151.35	79.65	78.31	84.46		1.34	-4.81	
Lonoke	02N07W32DDD1	344448	914618	226.00	3/30/2010	148.20	77.80	83.70	96.67	102.80	-5.90	-18.87	-25.00
Lonoke	03N07W03CAA1	345444.90	914426.30	235.00	3/25/2010	79.95	155.05	154.45	156.72	160.00	0.60	-1.67	-4.95
								Declines/Wells:			**1/7**	**7/7**	**3/3**
								Average Change:			**0.61**	**-5.18**	**-11.27**
Monroe	01N03W14CCB1	344143.93	911801.12	172.00	4/20/2010	63.80	108.20	94.72	99.27	101.30	13.48	8.93	6.90
Monroe	04N02W28DDD4	345535	911221	192.00	4/20/2010	29.30	162.70	156.36	161.51		6.34	1.19	
Monroe	04N02W30BAC1	345617.03	911503.95	182.00	4/20/2010	10.10	169.90	167.22	167.41		2.68	2.49	
Monroe	04N02W30BAD1	345617.24	911514.62	176.00	4/20/2010	11.80	164.20	157.26	166.14		6.94	-1.94	
								Declines/Wells:			**0/4**	**1/4**	**0/1**
								Average Change:			**7.36**	**2.67**	
Ouachita	11S15W27ABD1	334440.87	923725.58	200.00	4/27/2010	52.80	147.20	129.24	128.28		17.96	18.92	
Ouachita	11S17W14CAC1	334631.35	924927.46	146.00	5/4/2010	14.70	131.30	124.42	127.30		6.88	4.00	
Ouachita	11S17W36CCA1	334341.11	924834.21	133.00	5/4/2010	5.40	127.60	122.36	125.82		5.24	1.78	
Ouachita	12S15W09BBA1	334223.32	923922.44	213.00	4/27/2010	49.55	163.45	154.43	142.43	139.90	9.02	21.02	23.55
Ouachita	12S16W25BDC1	333929.4	924210.82	140.00	4/30/2010	22.50	117.50	105.52			11.98		
Ouachita	12S16W26ABD1	333945.55	924304.12	137.00	4/30/2010	28.10	108.90	101.43	102.31		7.47	6.59	
Ouachita	12S18W19CDC1	334018	925948	235.00	5/4/2010	26.85	208.15	211.58	227.00	193.90	-3.43	-18.85	14.25
Ouachita	12S18W25CAB1	333937.19	925441.87	187.00	5/5/2010	77.10	109.90	106.59	109.57		3.31	0.33	
Ouachita	12S19W09BAB1	334251.46	930351.94	290.00	5/5/2010	13.20	276.80	279.12	279.99		-2.32	-3.19	
Ouachita	12S19W14AAA1	334143.44	930104.54	237.00	5/5/2010	4.50	232.50	228.47	231.97		4.03	0.53	
Ouachita	12S19W35BDD1	333901.13	930145.97	350.00	5/5/2010	140.50	209.50	192.39	193.77		17.11	15.73	

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County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Ouachita	13S16W28ADD1	333416.22	924450.63	106.00	4/30/2010	24.35	81.65	71.81	73.81		9.84	7.84	
Ouachita	13S19W28BCD1	333433.86	930417.81	230.00	4/28/2010	37.80	192.20	190.68	193.78		1.52	-1.58	
Ouachita	14S16W32BDB1	332815.62	924639.52	231.00	4/28/2010	15.60	219.40	206.69	211.47		12.71	7.93	
Ouachita	14S17W02ABB1	333252	924926	131.00	5/4/2010	17.20	102.80	113.20			-10.40		
Ouachita	14S17W05CAD1	333238.01	925254.64	157.00	4/22/2010	34.55	122.45	119.60	120.07	117.60	2.85	2.38	4.85
Ouachita	14S17W19DBB1	333002.20	925345.44	259.00	4/28/2010	15.70	234.30	246.29	247.78		-11.99	-13.48	
Ouachita	14S17W32CAD1	332803.41	925251.18	220.00	4/29/2010	70.80	149.20	140.50	138.14		8.70	11.06	
Ouachita	14S18W27BDC1	332917.60	925703.97	309.00	4/28/2010	41.30	267.80	265.18	265.63		2.62	2.17	
Ouachita	14S19W29ABB1	332941.45	930513.43	280.00	4/28/2010	87.40	192.60	190.96	192.48	193.30	1.64	0.12	-0.70
Ouachita	15S15W32DBB2	332233.72	924027.13	119.00	4/29/2010	158.60	-39.60	-51.03	-57.39		11.43	17.79	
Ouachita	15S18W36ADD1	332310.75	925436.06	160.00	4/29/2010	91.05	68.95	64.76	64.57		4.19	4.38	
Ouachita	15S19W21CDD2	332438.02	930431.9	272.00	4/28/2010	190.60	89.40	72.24	73.62		17.16	15.78	
								Declines/Wells:			4/23	4/21	1/4
								Average Change:			5.54	4.82	10.49
Phillips	01S02E32DDC1	343324.32	905455.41	211.00	4/14/2010	74.38	136.62	124.57	130.21	132.40	12.05	6.41	4.22
Phillips	02S02E01ADC1	343323.48	905056.27	176.00	4/14/2010	31.40	144.60	139.53	139.38		5.07	5.22	
Phillips	02S04E02DBA1	343242.87	903906.98	250.00	4/14/2010	90.40	159.60		137.16	143.40		22.44	16.20
Phillips	02S05E16BCB1	343108.32	903525.64	190.00	4/14/2010	29.20	160.80	152.41	156.48		8.39	4.32	
Phillips	02S05E29CCC1	342850.81	903635.44	179.00	4/19/2010	15.70	163.30	146.71			16.59		
Phillips	03S03E30DAA1	342402.88	904914.59	172.00	4/14/2010	39.10	132.90	134.77	128.12	129.00	-1.87	4.78	3.90
Phillips	04S02E25CCC1	341824.20	905121.49	166.00	4/14/2010	33.80	132.20	125.41	130.01		6.79	2.19	
								Declines/Wells:			1/6	0/6	0/3
								Average Change:			7.84	7.56	8.11
Poinsett	10N01E12BDC1	353026.35	905629.57	234.00	3/24/2010	103.10	130.90	131.08	138.90		-0.18	-8.00	
Poinsett	10N01E15DBB1	352930.54	905825.14	232.00	3/17/2010	98.30	133.70	132.77	137.26		0.93	-3.56	
Poinsett	10N01E33ABA1	352724.90	905924.05	221.00	3/24/2010	80.40	140.60	140.62	145.56		-0.02	-4.96	
Poinsett	10N01E34BAA1	352724	905846	231.00	3/17/2010	93.30	137.70	128.20			9.50		
Poinsett	11N02E16CCC1	353448.21	905321.22	243.00	3/17/2010	111.60	131.40	131.52	137.51		-0.12	-6.11	
Poinsett	11N03E25BDD1	353324.54	904323.28	269.00	3/16/2010	123.50	149.50	146.45	148.29		3.05	1.21	
Poinsett	12N03E12BBB1	354137.44	904340.09	246.00	3/24/2010	99.60	146.40	131.62	149.33		14.78	-2.93	

Sparta Aquifer

00-05-09-10 WL Change

County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Poinsett	12N03E35BCC1	353744.78	904455.7	244.00	3/24/2010	95.30	148.70	141.35	141.76		7.35	6.94	
Poinsett	12N03E35DDA1	353727.35	904353.06	247.00	3/16/2010	106.40	140.60	142.16	145.64	149.20	-1.56	-5.04	-8.60
								Declines/Wells:			**4/9**	**6/8**	**1/1**
								Average Change:			**3.75**	**-2.81**	
Prairie	01N05W19CDC1	344113.1	913505.27	212.00	4/1/2010	142.80	69.20	70.92	72.53		-1.72	-3.33	
Prairie	01N06W02ABB1	344442.4	913700.96	221.00	4/1/2010	112.40	110.60	103.83	105.35		6.77	5.25	
Prairie	01N06W34CBB1	343943.01	913846.17	226.00	4/1/2010	150.50	75.50	66.22	70.21		9.28	5.29	
Prairie	01S05W06BCB1	343903.98	913531.63	220.00	4/1/2010	145.80	74.20	65.47	71.35		8.73	2.85	
Prairie	01S05W20ABB1	343639.91	913351.89	220.00	4/1/2010	147.10	72.90	67.73	61.15	49.80	5.17	11.75	23.10
Prairie	01S06W11DBD1	343748.99	913654.24	226.00	4/1/2010	167.10	58.90	64.60	61.28		-5.70	-2.38	
Prairie	02N06W19AAB1	344718.24	914049.95	236.00	3/20/2010	148.77	87.23	90.54	97.79		-3.31	-10.56	
Prairie	02N06W20BCB1	344706.57	914032.97	236.00	3/30/2010	145.00	91.00	94.14	94.00		-3.14	-3.00	
Prairie	02N06W21DAD1	344644.15	913829.47	232.00	4/1/2010	118.60	113.40	110.65	112.13	103.50	2.75	1.27	9.90
Prairie	02N06W22BDD1	344653.66	913800.68	233.00	4/1/2010	117.20	115.80	104.03	114.04		11.77	1.76	
Prairie	03N05W03ADA2	345451.65	913042.51	205.00	3/30/2010	54.80	150.20	146.01	144.97	145.60	4.19	5.23	4.60
Prairie	03N05W20CCC1	345144.72	913356.35	213.00	3/17/2010	71.70	141.30	139.41	142.59		1.89	-1.29	
Prairie	03N06W20CDD1	345140.24	914003.93	225.00	3/30/2010	85.02	139.98	138.01	141.21	142.80	1.97	-1.23	-2.82
								Declines/Wells:			**4/13**	**6/13**	**1/4**
								Average Change:			**2.97**	**0.89**	**8.69**
St. Francis	04N04E18BAB1	345743.38	904319.00	220.00	3/9/2010	67.30	152.70	152.09	156.72	153.70	0.61	-4.02	-1.00
								Declines/Wells:			**0/1**		**1/1**
								Average Change:					
Union	16S14W15CAB1	331944.03	923218.09	94.00	5/11/2010	129.10	-35.10	-58.73	-66.88	-53.00	23.63	31.78	17.90
Union	16S15W31ACC1	331717.09	924128.90	168.00	5/11/2010	264.15	-96.15	-91.78	-126.15		-4.37	30.00	
Union	16S16W02ABC1	332205	924330	116.00	5/11/2010	160.58	-44.58	-42.63	-52.36	-51.60	-1.95	7.78	7.02
Union	16S16W03CBB1	332138	924507	200.00	5/14/2010	212.00	-12.00	-16.50		-29.50	4.50		17.50
Union	16S18W34ABC2	331805	925709	251.00	5/12/2010	212.30	38.70	39.76	45.74		-1.06	-7.04	
Union	17S12W31DDD1	331206.4	922225.88	220.00	5/11/2010	233.60	-13.60	-11.99	-18.11		-1.61	4.51	

Sparta Aquifer
00-05-09-10 WL Change

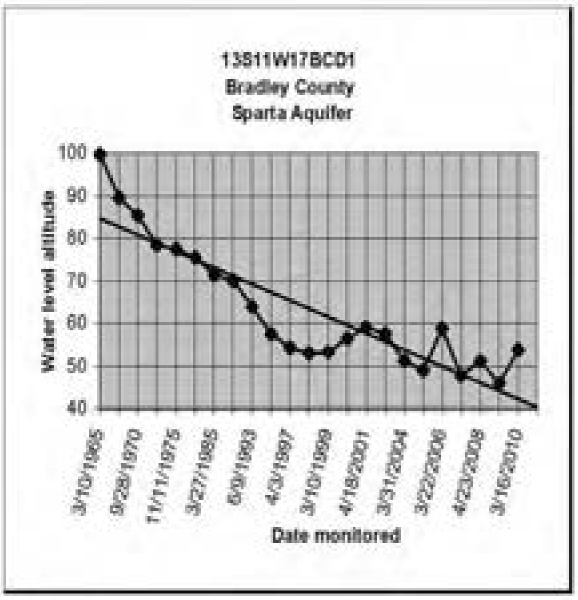
County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Union	17S12W32BBC1	331202.09	922219.02	231.00	5/11/2010	245.88	-14.88	-15.34	-19.58		0.46	4.70	
Union	17S13W31BAC1	331200.17	922915.7	216.00	5/11/2010	276.60	-60.60	-92.27	-90.13		31.67	29.53	
Union	17S14W10DCC1	331456.79	923203.26	182.00	5/11/2010	93.80	88.20	82.73	88.98		5.47	-0.78	
Union	17S14W15ABA1	331451.3	923159.8	169.00	5/11/2010	85.00	95.00	71.09	79.04		23.91	15.96	
Union	17S15W06BAA1	331645.6	924133.99	170.00	5/18/2010	223.95	-53.95	-61.03	-84.95		7.08	31.00	
Union	17S15W08CDD1	331504.77	924027.41	174.92	5/19/2010	271.95	-97.03	-104.28	-150.66		7.25	53.63	
Union	17S15W18DBB1	331438.96	924129.21	182.93	5/19/2010	292.41	-109.48	-112.83	-148.17		3.35	38.69	
Union	17S15W28DBA1	331246.08	923909.78	230.00	5/19/2010	340.27	-110.27	-104.12	-160.80	-188.90	-6.15	50.53	78.63
Union	17S15W31DCA1	331145.05	924116.74	272.00	5/19/2010	388.40	-116.40	-108.73	-153.27	-186.50	-7.67	36.87	70.10
Union	17S15W31DDA1	331143.75	924104.87	261.00	5/19/2010	372.30	-111.30	-114.12	-153.99		2.82	42.69	
Union	17S16W01BAA1	331649.04	924232.96	188.84	5/18/2010	262.58	-73.74	-79.26	-119.69		5.52	45.95	
Union	17S16W12CDD1	331505.81	924232.01	221.58	5/18/2010	338.68	-117.10		-184.73			67.63	
Union	17S16W24BDB1	331357.24	924248.47	205.00	5/18/2010	324.44	-119.44	-128.81	-189.04		9.37	69.60	
Union	17S17W25DBA2	331256	924837	250.00	5/18/2010	331.45	-81.45	-78.58	-109.00		-2.87	27.55	
Union	17S17W30DCD1	331257.41	925355.54	280.00	5/12/2010	297.50	-17.50	-45.07	-41.93		27.57	24.43	
Union	18S12W33BBB1	330650.66	922119.92	112.00	5/11/2010	139.40	-27.40	-24.20	-29.18	-25.20	-3.20	1.78	-2.20
Union	18S15W03DAB1	331103.78	923802.12	240.00	5/11/2010	342.03	-102.03	-96.01	-133.72		-6.02	31.69	
Union	18S15W33ADA1	330659.32	923858.48	253.00	5/13/2010	350.04	-97.04	-94.84	-121.03		-2.20	23.99	
Union	18S15W35DAC1	330635	923707	201.00	5/13/2010	261.30	-60.30	-74.84	-89.20	-104.60	14.54	28.90	44.30
Union	18S16W11DAC1	331011.23	924316.37	272.00	5/19/2010	372.20	-100.20	-129.94	-150.53		29.74	50.33	
Union	18S16W10CDD1	331000.38	924445.32	182.00	5/12/2010	276.00	-94.00	-126.87	-145.54		32.87	51.54	
Union	18S16W12ACB1	331028.75	924231.85	302.00	5/19/2010	400.32	-98.32	-89.21	-167.65	-184.10	-9.11	69.33	85.78
Union	18S16W28BBB1	330809.22	924611.13	225.00	5/19/2010	290.45	-65.45		-106.22			40.77	
Union	18S17W22BDD1	330855.91	925056.48	285.00	5/12/2010	325.33	-40.33	-46.58	-68.54		6.25	28.21	
Union	18S18W11ACD2	331050.91	925615.1	245.00	5/12/2010	267.40	-22.40	-16.67			-5.73		
Union	19S10W16CBC1	330329	920903	82.00	5/20/2010	88.10	-6.10	-7.87	-4.64	-1.40	1.77	-1.46	-4.70
Union	19S11W25AAA1	330217.84	921113.03	135.00	5/29/2010	148.25	-13.25	-16.75	-17.27	-15.20	3.50	4.02	1.95
Union	19S12W13AAA1	330411.26	921716.78	191.00	5/11/2010	165.72	14.28	31.95	33.17		-17.67	-18.89	
Union	19S15W01CCA1	330534.81	923845.01	192.00	5/13/2010	56.70	135.30	123.07	123.58		12.23	11.72	
Union	19S16W35DDC1	330108.86	924325.54	175.00	5/13/2010	218.08	-43.08	-44.84	-72.08	-80.70	1.76	29.00	37.62
Union	19S18W14ADA1	330451.70	925607.90	243.00	5/12/2010	191.28	51.72	50.85	51.62		0.87	0.10	
								Declines/Wells:			13/35	4/35	2/11
								Average Change:			5.57	28.09	31.63

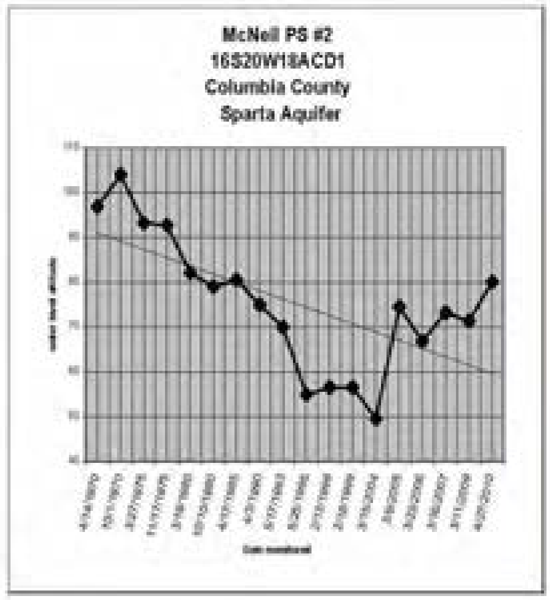
Sparta Aquifer
00-05-09-10 WL Change

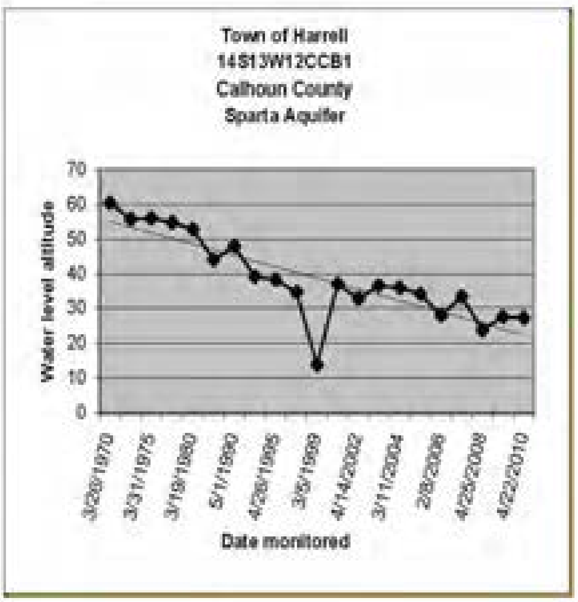
County	Station	Latitude	Longitude	LSA	Date Measured	2010 Meas.	WL Alt.10	WL Alt.09	WL Alt.05	WL Alt.00	09-10 Change	05-10 Change	00-10 Change
Woodruff	05N01W11ABA1	350425.81	910407.19	211.00	4/8/2010	59.60	151.40	150.17	155.24	156.10	1.23	-3.84	-4.70
Woodruff	05N01W17DBB1	350310.68	910727.11	210.00	4/13/2010	45.15	164.85	162.54	164.39	166.30	2.31	0.46	-1.45
Woodruff	05N02W31DCB3	350026.9	911455.9	193.00	4/18/2010	8.65	184.35	173.62	181.36	179.30	10.73	2.99	5.05
Woodruff	06N01W13ABA1	350851	910255	212.00	4/13/2010	70.60	141.40	142.03	148.96		-0.63	-7.56	
Woodruff	06N01W13ADC1	350827.39	910246.74	212.00	4/13/2010	69.40	142.60	144.79	145.97		-2.19	-3.37	
Woodruff	08N01W12CDA1	351932	910310	225.00	4/13/2010	75.20	149.80	148.53	152.96	158.10	1.27	-3.16	-8.30
								Declines/Wells:			2/6	4/6	3/4
								Average Change:			2.12	-2.41	-2.35
							Total Declines/Wells:				55/237	90/229	26/72
											23.20%	39.30%	36.10%
							Total Average Change:				4.61	5.29	8.55

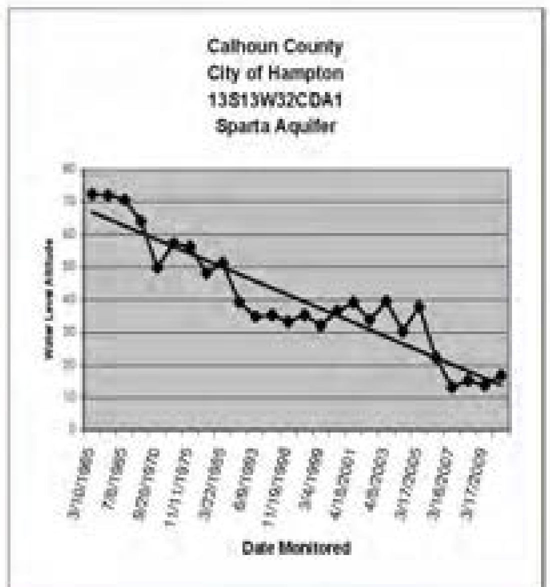
Appendix D

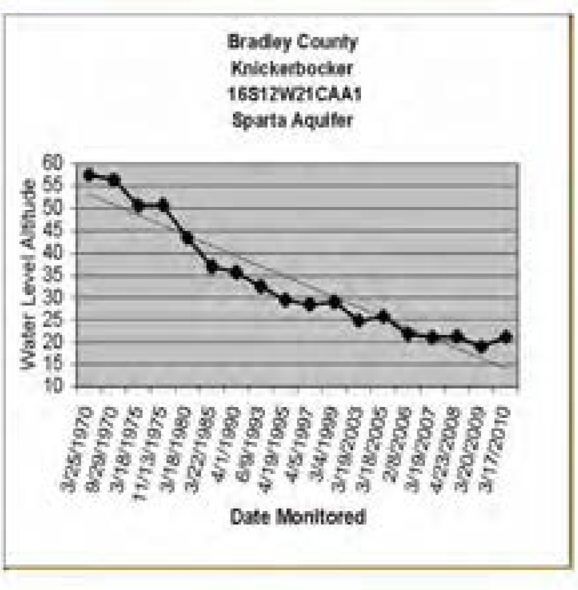
Selected Sparta / Memphis Aquifer Well Hydrographs

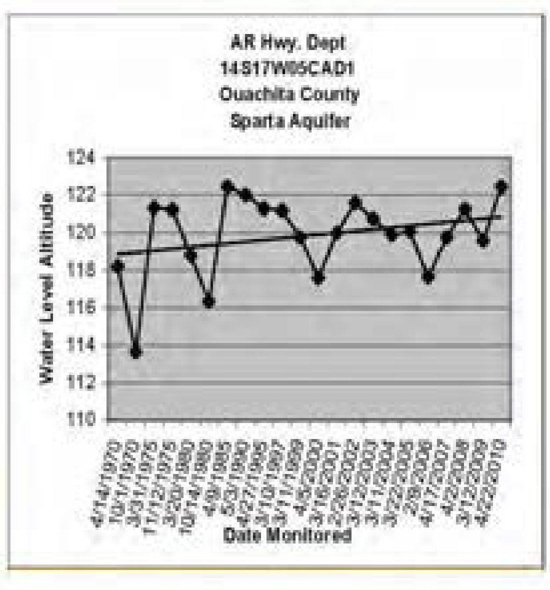

13S11W17BCD1
Bradley County
Sparta Aquifer
Water level altitude
100
90
80
70
60
50
40
3/10/1965
9/29/1970
11/11/1975
3/27/1985
6/9/1993
4/3/1997
3/10/1999
4/18/2001
3/31/2004
3/22/2006
4/23/2008
3/16/2010
Date monitored

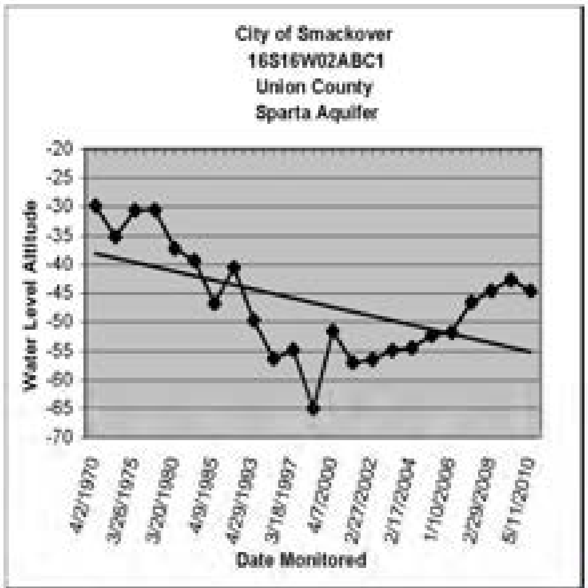

McNeil PS #2
16S20W18ACD1
Columbia County
Sparta Aquifer

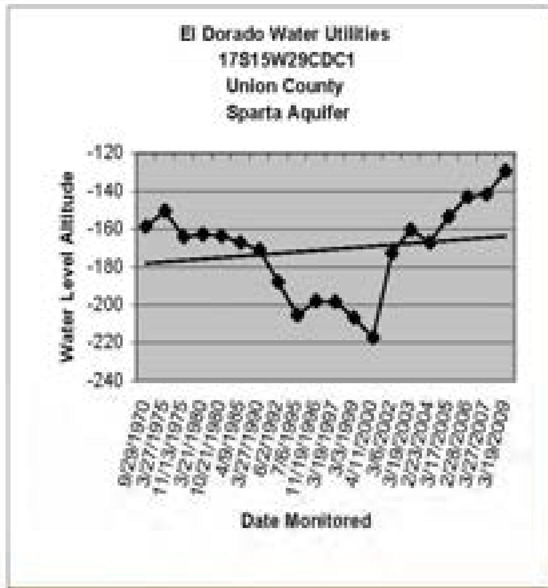

Town of Harrell
14S13W12CCB1
Calhoun County
Sparta Aquifer
Water level altitude
70
60
50
40
30
20
10
0
3/26/1970
3/31/1975
3/19/1980
5/1/1990
4/26/1995
3/5/1999
4/14/2002
3/11/2004
2/8/2006
4/25/2008
4/22/2010
Date monitored

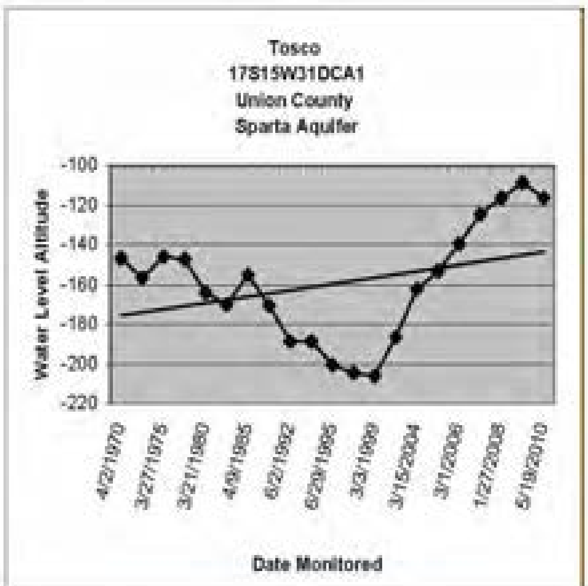

Calhoun County
City of Hampton
13S13W32CDA1
Sparta Aquifer
Water Level Altitude
Date Monitored

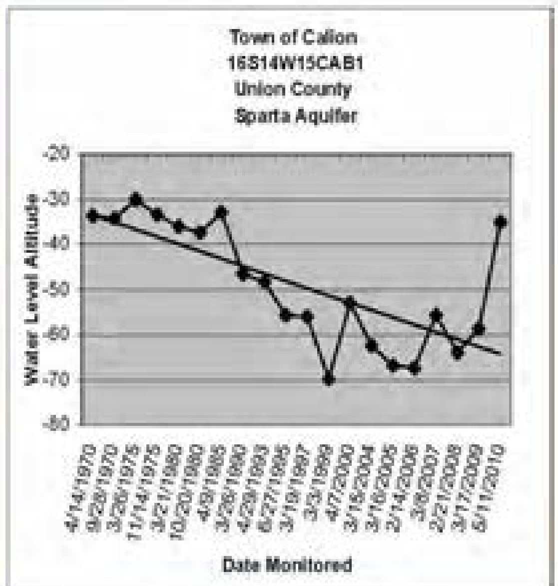

Bradley County
Knickerbocker
16S12W21CAA1
Sparta Aquifer
Water Level Altitude
60
55
50
45
40
35
30
25
20
15
10
3/25/1970
9/29/1970
3/18/1975
11/13/1975
3/18/1980
3/22/1985
4/1/1990
6/9/1993
4/19/1995
4/5/1997
3/4/1999
3/19/2003
3/18/2005
2/8/2006
3/19/2007
4/23/2008
3/20/2009
3/17/2010
Date Monitored

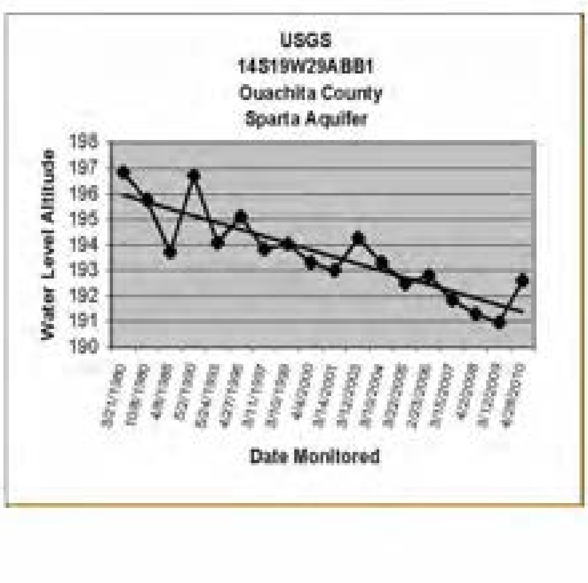

AR Hwy. Dept
14S17W05CAD1
Ouachita County
Sparta Aquifer
Water Level Altitude
124
122
120
118
116
114
112
110
4/14/1970
10/1/1970
3/31/1975
11/12/1975
3/20/1980
10/14/1980
4/9/1985
5/3/1990
4/27/1995
3/10/1997
3/11/1999
4/6/2000
3/16/2001
2/28/2002
3/12/2003
3/22/2004
3/22/2005
2/8/2006
4/17/2007
4/2/2008
3/12/2009
4/22/2010
Date Monitored

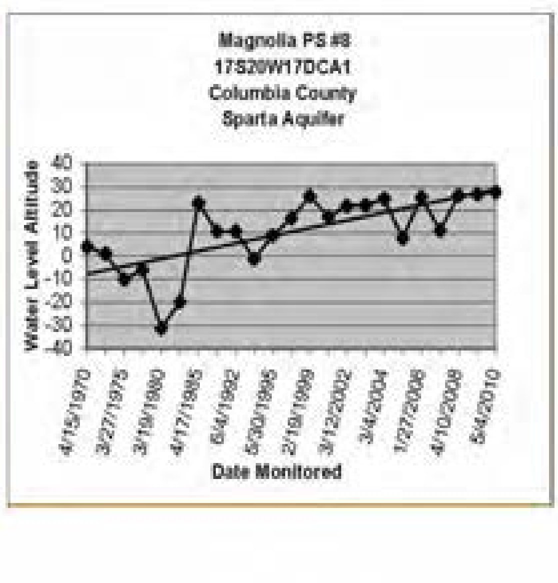

City of Smackover
16S16W02ABC1
Union County
Sparta Aquifer
Water Level Altitude
-20
-25
-30
-35
-40
-45
-50
-55
-60
-65
-70
4/2/1970
3/26/1975
3/20/1980
4/9/1985
4/20/1993
3/18/1997
4/7/2000
2/27/2002
2/17/2004
1/10/2006
2/29/2008
5/11/2010
Date Monitored

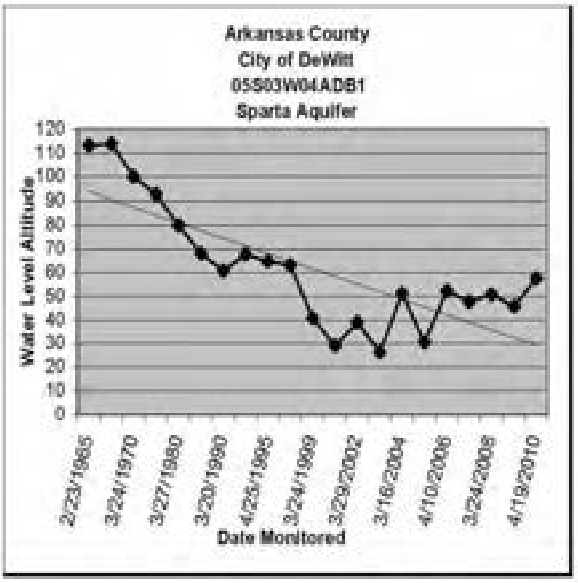

El Dorado Water Utilities
17S15W29CDC1
Union County
Sparta Aquifer
Water Level Altitude
-120
-140
-160
-180
-200
-220
-240
Date Monitored

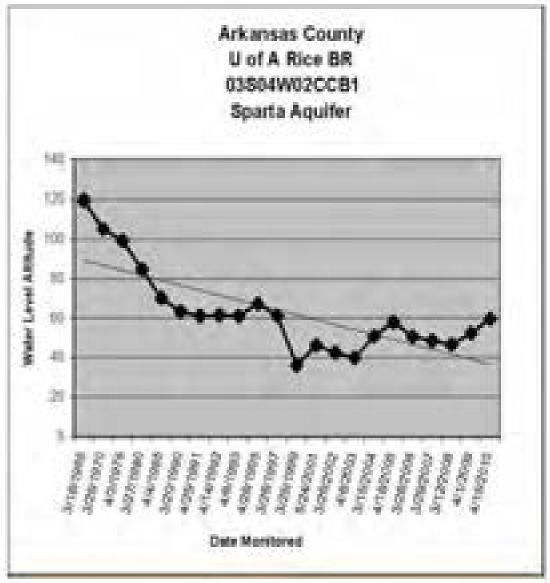

Tosco
17S15W31DCA1
Union County
Sparta Aquifer
Water Level Altitude
-100
-120
-140
-160
-180
-200
-220
4/2/1970
3/27/1975
3/21/1980
4/9/1985
6/2/1992
6/29/1995
3/3/1999
3/15/2004
3/1/2006
1/27/2008
5/19/2010
Date Monitored

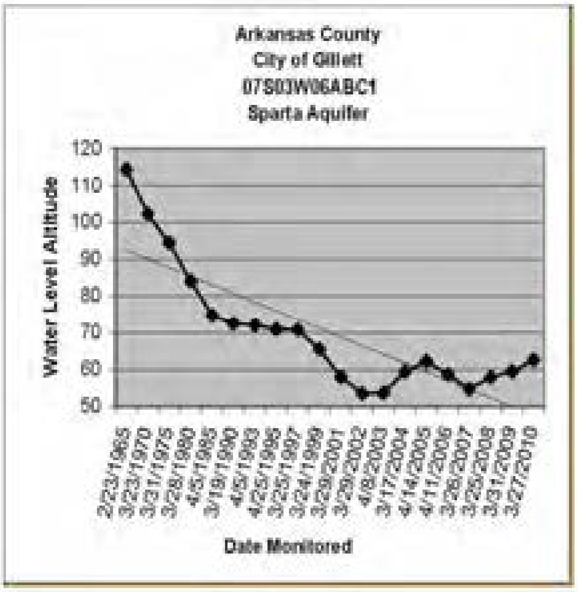

Town of Calion
16S14W15CAB1
Union County
Sparta Aquifer
Water Level Altitude
-20
-30
-40
-50
-60
-70
-80
Date Monitored

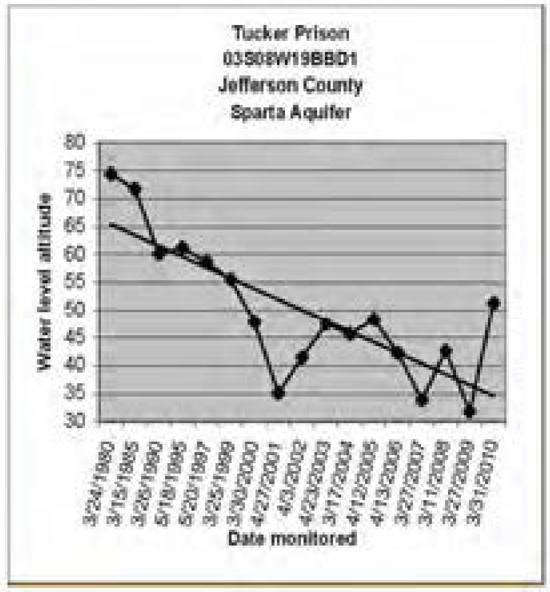

USGS
14S19W29ABB1
Ouachita County
Sparta Aquifer
Water Level Altitude
198
197
196
195
194
193
192
191
190
Date Monitored

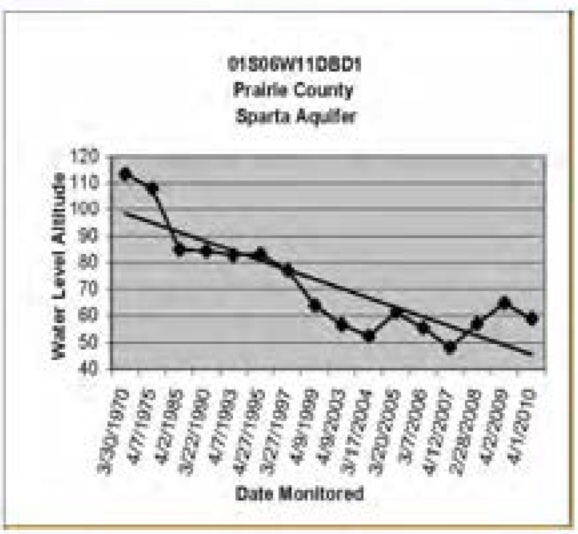

Magnolia PS #8
17S20W17DCA1
Columbia County
Sparta Aquifer
Water Level Altitude
40
30
20
10
0
-10
-20
-30
-40
4/15/1970
3/27/1975
3/19/1980
4/17/1985
6/4/1992
5/30/1995
2/19/1999
3/12/2002
3/4/2004
1/27/2006
4/10/2008
5/4/2010
Date Monitored


Arkansas County
City of DeWitt
05S03W04ADB1
Sparta Aquifer
Water Level Altitude
120 110 100 90 80 70 60 50 40 30 20 10 0
2/23/1965 3/24/1970 3/27/1980 3/20/1990 4/25/1995 3/24/1999 3/29/2002 3/16/2004 4/10/2006 3/24/2008 4/19/2010
Date Monitored


Arkansas County
U of A Rice BR
03S04W02CCB1
Sparta Aquifer
140 120 100 80 60 40 20 0
Date Monitored


Arkansas County
City of Gillett
07S03W06ABC1
Sparta Aquifer
Water Level Altitude
120 110 100 90 80 70 60 50
2/23/1965 3/23/1970 3/31/1975 3/28/1980 4/5/1985 3/19/1990 4/5/1993 4/25/1996 3/25/1997 3/24/1999 3/29/2001 3/29/2002 4/8/2003 3/17/2004 4/14/2005 4/11/2006 3/26/2007 3/25/2008 3/31/2009 3/27/2010
Date Monitored


Tucker Prison
03S08W19BBD1
Jefferson County
Sparta Aquifer
Water level altitude
80 75 70 65 60 55 50 45 40 35 30
3/24/1980 3/15/1985 3/26/1990 5/18/1995 5/20/1997 3/25/1999 3/30/2000 4/27/2001 4/3/2002 4/23/2003 3/17/2004 4/12/2005 4/13/2006 3/27/2007 3/11/2008 3/27/2009 3/31/2010
Date monitored


01S06W11DBD1
Prairie County
Sparta Aquifer
Water Level Altitude
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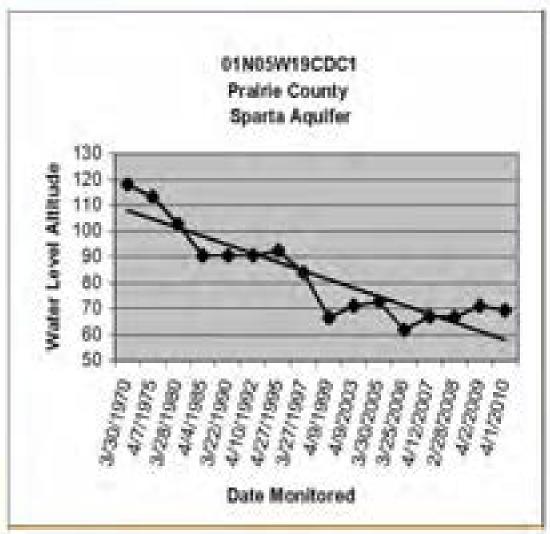
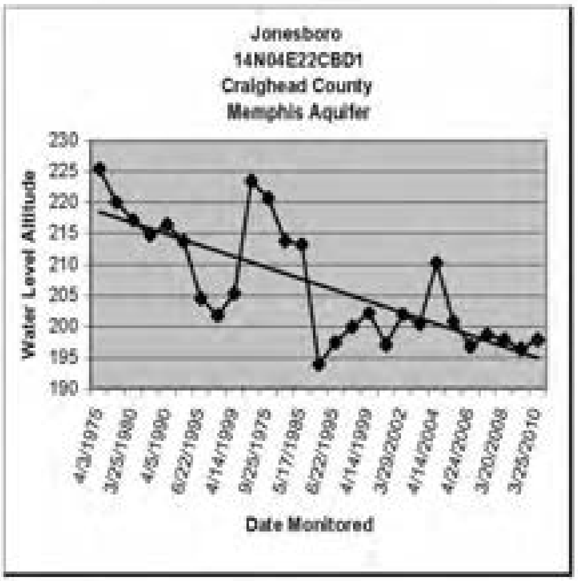
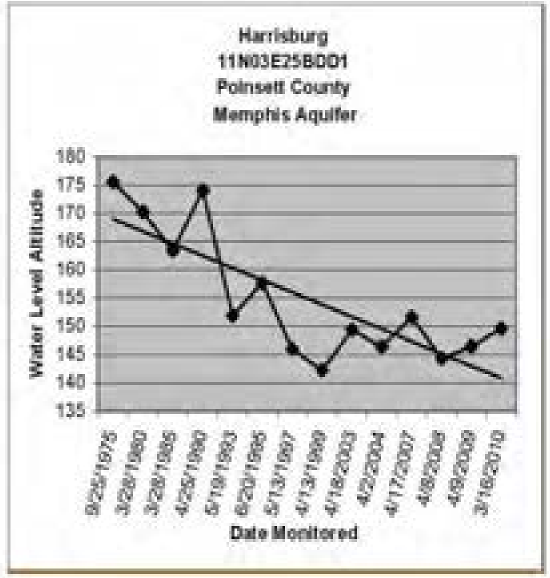
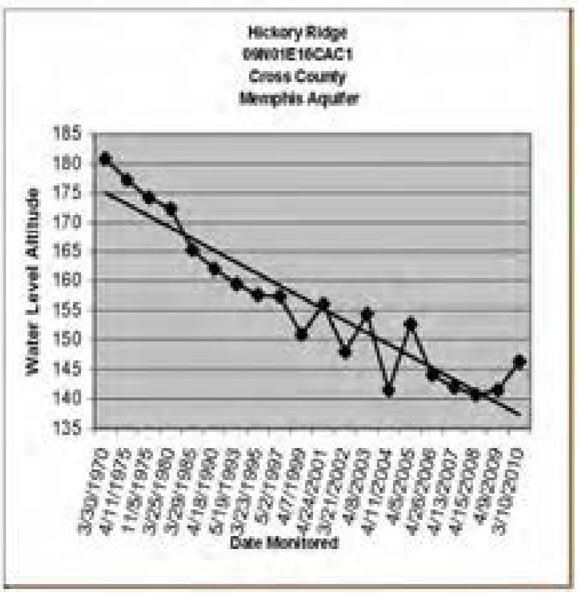
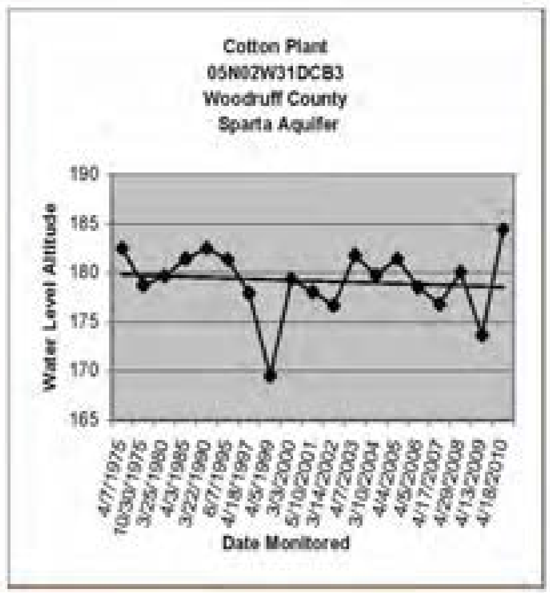
3/30/1970 4/7/1975 4/2/1985 3/22/1990 4/7/1993 4/27/1995 3/27/1997 4/9/1999 4/9/2003 3/17/2004 3/30/2005 3/7/2006 4/12/2007 2/28/2008 4/2/2009 4/1/2010
Date Monitored

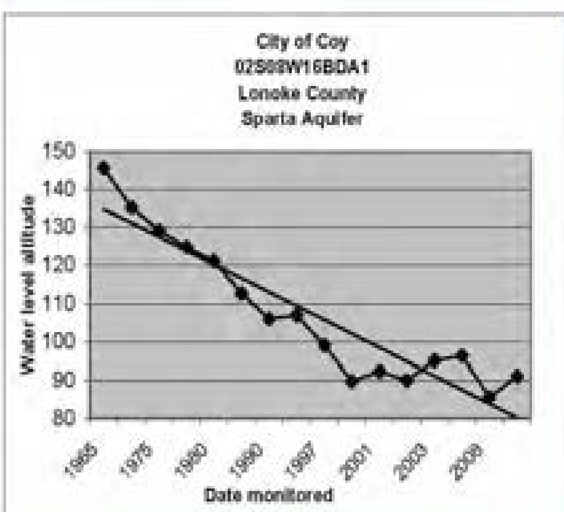

01N05W19CDC1
Prairie County
Sparta Aquifer
Water Level Altitude
130 120 110 100 90 80 70 60 50
3/30/1970 4/7/1975 3/28/1980 4/4/1985 3/22/1990 4/10/1992 4/27/1995 3/27/1997 4/9/1999 4/9/2003 3/30/2005 3/25/2006 4/12/2007 2/28/2008 4/2/2009 4/1/2010
Date Monitored

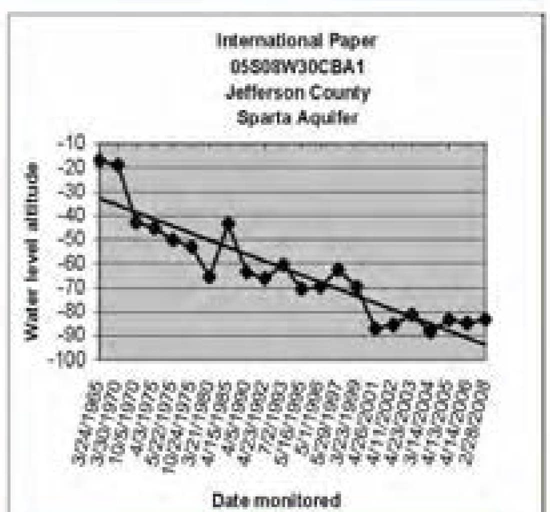

Jonesboro
14N04E22CBD1
Craighead County
Memphis Aquifer
Water Level Altitude
Date Monitored


Harrisburg
11N03E25BDD1
Poinsett County
Memphis Aquifer
Water Level Altitude
Date Monitored


Hickory Ridge
09N01E16CAC1
Cross County
Memphis Aquifer
Water Level Altitude
Date Monitored


Cotton Plant
05N02W31DCB3
Woodruff County
Sparta Aquifer
Water Level Altitude
Date Monitored


City of Coy
02S08W16BDA1
Lonoke County
Sparta Aquifer
Water level altitude
Date monitored


International Paper
05S08W30CBA1
Jefferson County
Sparta Aquifer
Water level altitude
Date monitored

Appendix E

Hydrogeologic Evaluation of Sandstone Mining in Izard Co. AR

Hydrogeologic Evaluation of Sandstone Mining in Izard County, Arkansas.
Jay S. Johnston, C.P.G., R.P.G., D. Todd Fugitt, R.P.G.

Introduction

The St. Peter and Calico Rock Sandstones in north-central Arkansas are planned for surface mining in the immediate future. The purpose of this report is to evaluate the possible hydrogeologic impacts of ground-water use associated with this type of mining operation in the Salem Plateau of north-central Arkansas. Two surface mining permits (Evergreen and Bluebird) were approved by ADEQ early in 2010 (Figure 1). Mining interests in the area have also been expressed by other companies, and as many as 5 to 10 mines could be developed along the outcrop belt. These mines will provide economic benefit to the state and local communities, and assist the shale-gas resource industry by supplying "frac-sand" to serve expanding world-wide demand required in shale-gas resource development. Though there is no allocation of ground-water use in Arkansas, the planned mining activities will probably impact the states natural resources. Therefore, it is beneficial that all agencies and commissions involved with natural resources take a prudent view to the proposed mining operations of the study area, and consider all possible hydrologic impacts, as well as environmental, and economic impacts to the State, County, and citizens. This report is based on existing hydrogeologic data. Information on mining operation technology was obtained from Evergreen Inc., Crisp Industries, and Marshall, Miller, and Associates, and through web-site research.

The population of Izard County in 2000 was 13,249, and 89% of the population is served by municipal ground water. Estimates of domestic wells in the county equal ~650 wells serving ~1450 people. More than 300 relatively shallow (<600') Ozark domestic wells, serving ~700 citizens are estimated to occur within 5 miles of the proposed mining areas. Figure 2 shows all water wells appearing on the ANRC/USGS water well data base in the area (wells installed prior to ~1990 are not shown).

State Permitting Requirements

ADEQ requires permits for mining operations including construction storm water, air quality, and NPDES (National Pollutant Discharge Elimination System) permits. Submittal of a Notification of Intent prior to initiation of stone mining in Arkansas is required. This notice includes a map of the planned mined area, and information regarding planned reclamation of the mined area. NPDES permitting for discharges and stream buffering are included as part of the mining requirements. This permitting process provides an evaluation of water quality impacts. All hazardous wastes used in the mining operations process must adhere to ADEQ rules. The impacts regarding the ground-water system, water use and particularly private wells, are not considered in stone mining quarry operations in Arkansas.

The ANRC has authority to allocate surface water use in times of shortage, but there is no such ground-water allocation authority. Ground-water use requires only proper reporting and that wells be constructed by licensed water well contractors. However, if any water is transferred away from the riparian property, a non-riparian permit is required. Transfer to a different hydrologic unit requires an additional level of permit requirements and public hearings.

Proposed study area

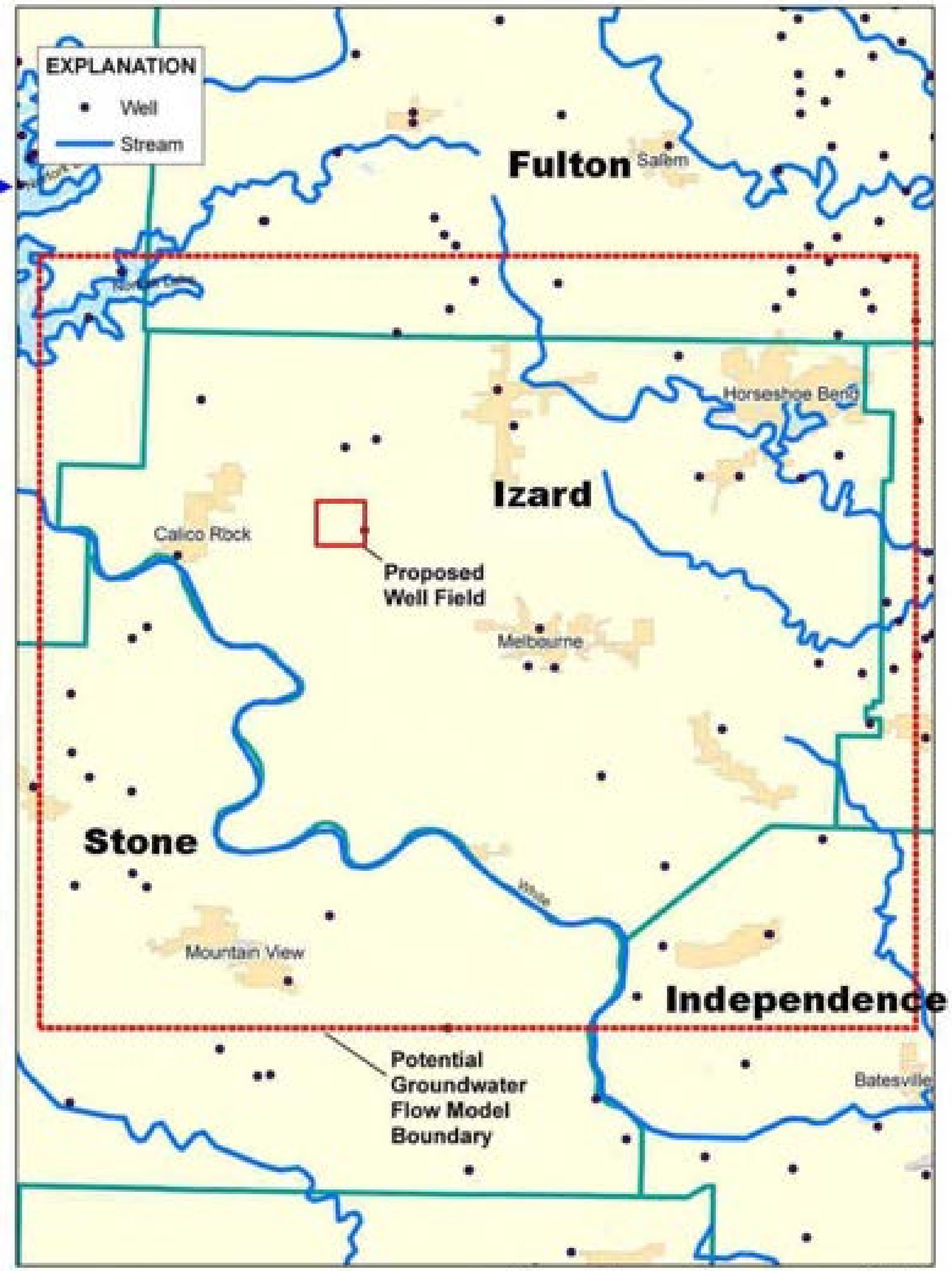
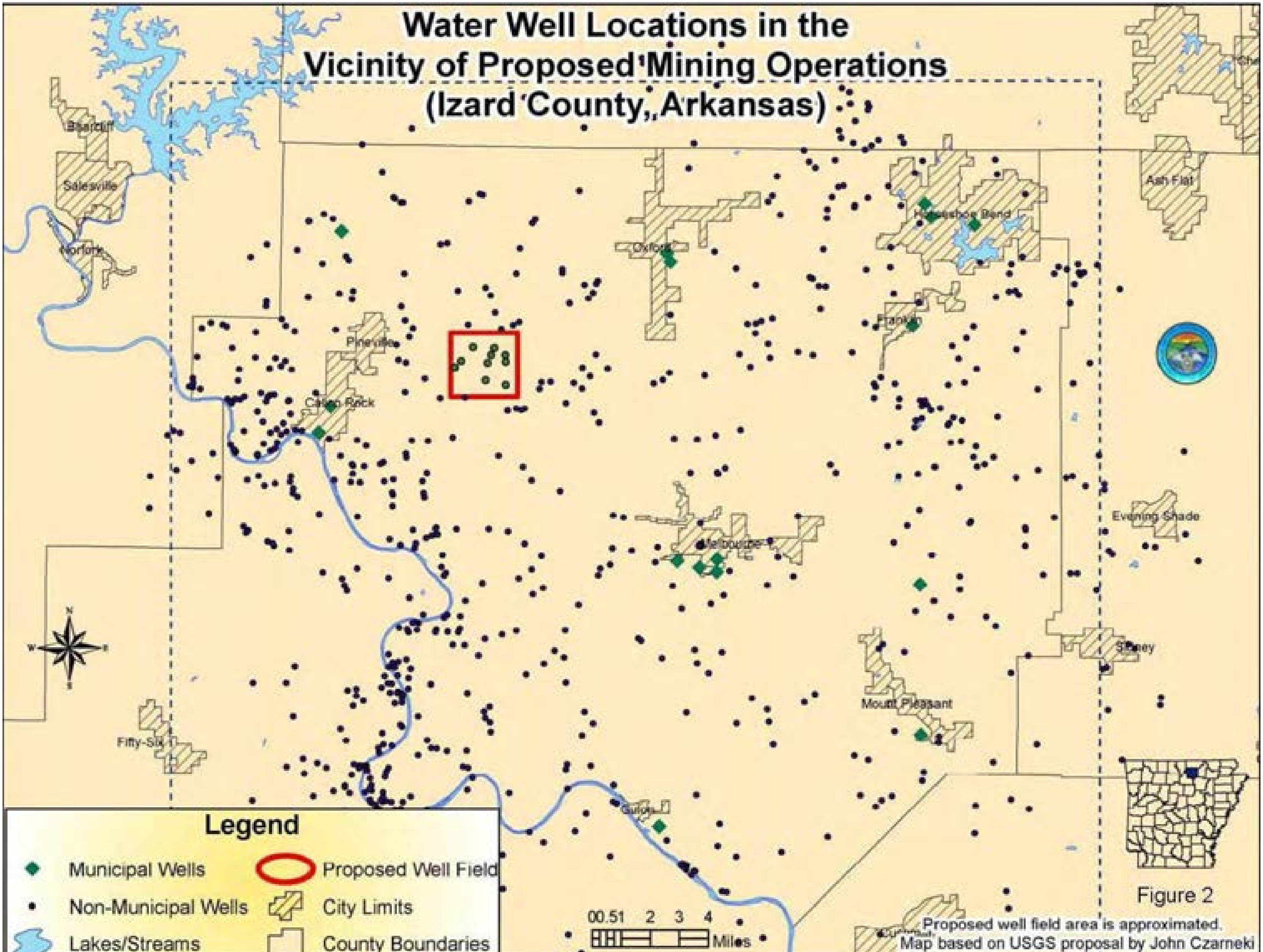


Figure1. Permitted Mining Locations and Potential Mining Areas

Taken from USGS Proposal by John Czarnecki

USGS


Water Well Locations in the
Vicinity of Proposed Mining Operations
(Izard County, Arkansas)
Salesville
Norfork
Oxford
Horseshoe Bend
Ash Flat
Franklin
Pineville
Calico Rock
Melbourne
Evening Shade
Mount Pleasant
Guion
Legend
Municipal Wells
Non-Municipal Wells
Lakes/Streams
Proposed Well Field
City Limits
County Boundaries
00.51 2 3 4
Miles
Proposed well field area is approximated.
Map based on USGS proposal by John Czarneki
Figure 2

Geology and Hydrogeology

Izard County is underlain by essentially flat-lying sedimentary strata of the Salem Plateau. The younger Springfield Plateau (Mississipian) underlies <10% of the extreme southern part of the county, just east of Guion, and north of the White River.

The St. Peter Sandstone unconformably overlies the Everton Formation which contains the Calico Rock Sandstone member. Both of these formations are middle Ordovician in age. Both sandstone units exhibit relatively clay-free, fine to medium grained, well-rounded quartz sand, which has excellent characteristics for the shale-gas, frac-sand industry. The St. Peter Sandstone is a typically massive formation which is approximately 175 feet in thickness. The formation generally is found at land surface throughout the proposed mining area, though some thickness of overlying regolith may be present.

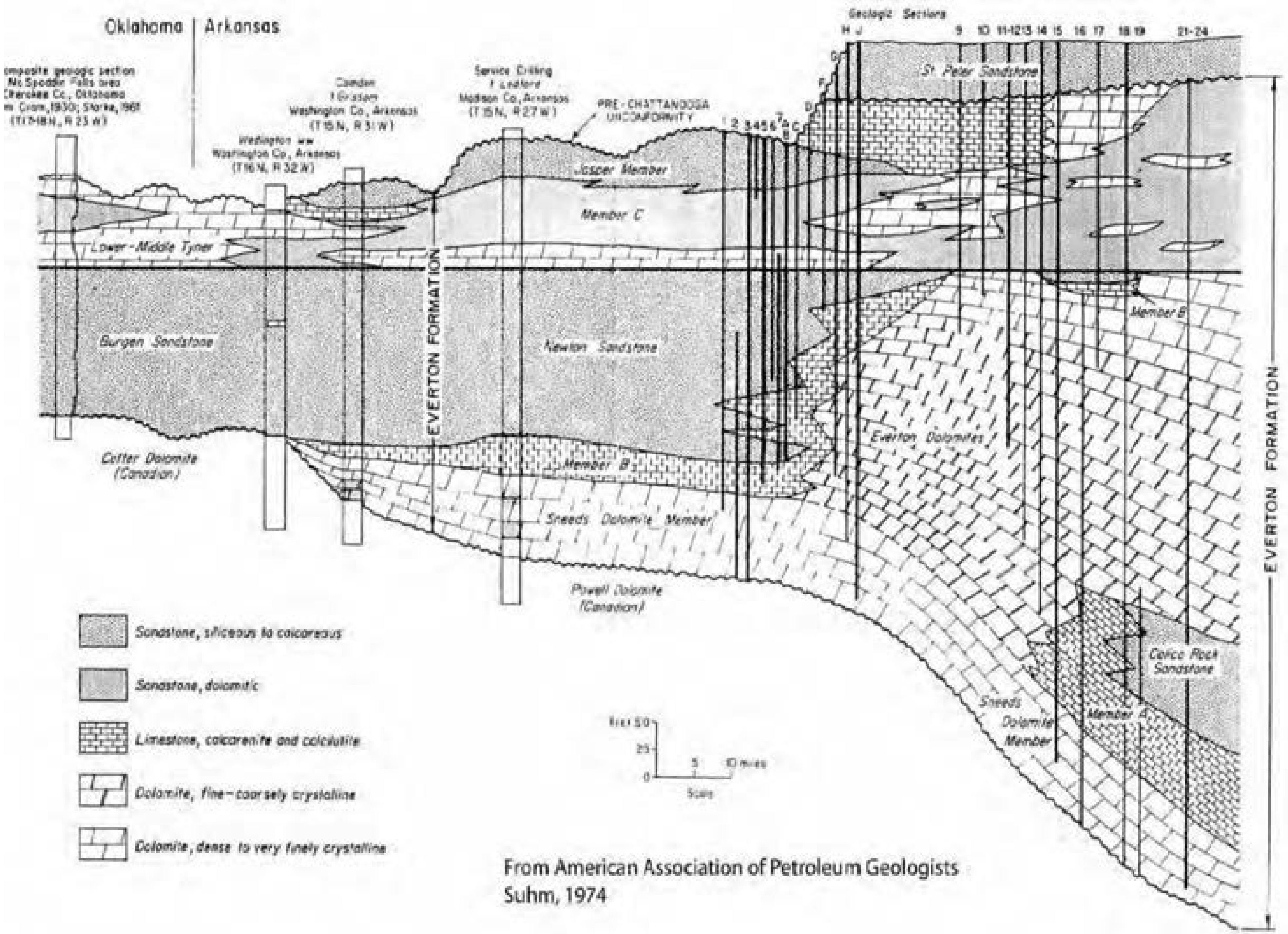
The Ozark aquifer in Arkansas ranges in thickness from approximately 1100 ft. to more than 4000 ft. The aquifer consists of an alternating sequence of dolostone, limestone, sandstone, chert, and shale (in order of dominance). The aquifer is a complex, semi-confined (unconfined near surface, and confined in deeper units), anisotropic/heterogeneous aquifer with considerable variability in structure and stratigraphy (Figure 3 shows a cross-section of the planned mining formations within the Ozark aquifer to portray the stratigraphic complexity of these units and demonstrate the complexity of the entire Ozark section). Table 1 shows a basic stratigraphic column that lists the various rock units of the Ozark aquifer and their hydrogeologic character. The Ozark confining unit is absent throughout the planned mining area, allowing the Ozark to be classified as an unconfined to semi-confined aquifer.

Water levels in the Ozark aquifer in Arkansas during the past 40 years have shown minimal drawdowns as demand has not exceeded potential yield of the aquifer (USGS, SIR 2008-5137). In Arkansas, some counties have shown declines while other counties have shown rising potentiometric heads. One well completed in the Cotter Dolomite in Izard County showed only a minimal annual decline of just over 1 foot per year. Greater water demand in growing population centers of Missouri Kansas, and Oklahoma, however, have shown development of cones of depression with noted drawdowns in the Ozark aquifer.

Stratigraphic Column and Hydrogeologic Properties of the Ozark Aquifer
(USGS, SIR2008-5137)

ERA	PERIOD	GEOLOGIC UNIT	HYDROGEOLOGIC UNIT	LITHOLOGY	THICKNESS (feet)	HYDROGEOLOGY
Paleozoic	Devonian	Chattanooga Shale	Ozark confining unit	Shale unit that crops out in a narrow band that outlines the Ozark aquifer and is missing where the Ozark aquifer is exposed at the surface.	0 - 200	Unit is relatively impermeable because of large shale content.
		Clifty Limestone	Ozark aquifer	Chert with lenses of limestone, dolomite, and cherty sandstone.	0 - 250	The residual cherty rubble, weathered from cherty limestone and sandstone of the unit, may yield 2 to 5 gallons per minute.
		Penters Chert				
	Silurian	Lafferty Limestone		Limestone, dolomite, sandstone, and minor amounts of shale	0 - 2,000	The limestones and dolomites commonly yield 5 to 10 gallons per minute from solution channels, bedding planes, and fractures. Similar yields may be obtained from the sandstone where it is porous or fractured. These units contain many springs. Yields from springs and some wells may exceed 50 gallons per minute.
		St. Clair Limestone				
		Brassfield Limestone				
	Ordovician	Cason Shale				
		Fernvale Limestone				
		Kimmswick Limestone				
		Plattin Limestone				
		Joachim Dolomite				
		St. Peter Sandstone				
		Everton Formation				
		Smithville Formation		Dolomite, dolomitic limestone, and minor amounts of sandstone and shale.	100 - 1,000	The solution channels and fractures in the dolomite and dolomitic limestone commonly yield 5 to 10 gallons per minute. Wells that tap large solution channels may yield more than 50 gallons per minute, but large yields are uncommon. These units yield water to several large springs.
		Powell Dolomite				
		Cotter Dolomite				
		Jefferson City Dolomite				
		Roubidoux Formation		Sandstone and sandy dolomite. Not exposed in Arkansas.	100 - 250	Yields of as much as 450 gallons per minute may be obtained from some wells, but yields are highly variable and generally average less than 150 gallons per minute.
		Gasconade Dolomite		Dolomite, sandy dolomite, and sandstone. Not exposed in Arkansas.	350 - 650	The most productive water-bearing part of this unit is the Van Buren Formation. Wells that tap into the Van Buren Formation commonly yield 150 to 300 gallons per minute and may yield as much as 500 gallons per minute.
		Gunter Sandstone member of the Van Buren Formation				
	Cambrian	Eminence Dolomite				
		Potosi Dolomite				
		Doe Run Dolomite	St. Francois confining unit	Shale and shaley dolomite, siltstone, and limestone conglomerate. Shales present both as distinct beds and disseminated throughout dolomite matrix. Not exposed in Arkansas.	0 - 750	Permeability is minimal to moderate. Unit is more permeable where transected by fault and fracture zones.
		Derby Dolomite				
		Davis Formation				

Table 1. Stratigraphy and Hydrogeologic Properties of the Ozark Aquifer



From American Association of Petroleum Geologists
Suhm, 1974

Water Use and Hydrogeologic Impacts

Investigation into sand mining operations in other states and the mining industry has provided data for estimated mining water requirements in Arkansas. Much information has also been provided by Crisp Industries and Marshall Miller and Associates. Surface water is currently used for sand mining in this area, but may not be readily available at all proposed mining sites. Springs have been identified as a potential source of water supply; however, springs in this area may or may not provide adequate volume to meet water use demands depending on the design of the mining operations. ANRC Ground Water Section has estimated potential hydrogeologic impacts and water use at these mining and sand processing plants, and has predicted potential hydrologic impacts expected from the mining process which includes development of water wells in the Ozark aquifer.

Total water use at a single mine may vary, depending on the mining methodology. The reported water use by existing sand-mining operation Unimin Corporation is 2064 gallons per minute (gpm). This is an open-loop mining operations which relies on surface water. Although water is required to mine the sand (via slurry transport) at some mining locations, no water is expected to be required to mine the sand in Arkansas mines. Water is needed, however, to wash and separate the sand (remove fines and sieve) to segregate size particles for its specific use. Total water use at a single sand washing facility may be large; however, much of the water is reused. Evergreen and Crisp Industries have reported water use would not exceed 200 gpm (6 hr. pumping days = 72,000 GPD- gal/day) and would average about 175 gpm at their operating plant. The proposed source of water at this plant is a surface water site (spring). However, research into the sand washing equipment web-site, indicates that more water may be required for some mines due to less efficient technology utilized to remove fines materials. In the absence of plate press, a 10% water loss from a clarifier using 7400 gpm, could result in 740 gpm of lost water. If surface water is not available, the only alternative is the development of deep wells in the Ozark aquifer.

The mining operation proposed by Evergreen will utilize a surface water source, and utilizes an efficient "press plate" process which requires only 175 gpm. Total ground-water use at a comparable, with traditional, less efficient processing plant technology may be estimated to equal 940 gpm, which will equal 338,400 GPD (6 hr. operation days) or 451,200GPD (8 hr. operation days). Utilizing the less-efficient operating technology, five mines could require 2.25 MGD (million gal/day) (~6 times the current water use of municipalities reported in Izard County), and ten mines could require up to 4.5 MGD (8 hr. operation day), or ~12 times the water currently utilized by municipalities from the deep Ozark aquifers (Roubidoux and Gunter) in Izard County (Table 2). Total reported ground-water use in Izard County is currently, 1.79 MGD (Holland, 2005). Such an increase in water use would probably cause a noticeable decrease in water-levels; however, unless a surface water site is intercepted, significant impacts may not be noticed for several years.

ANRC attempted to determine the expected impacts that ground-water use for sandstone mining will have on the ground-water system in the vicinity of the planned mining operations of Izard County. The AR Dept. of Health was very helpful in providing a program which calculates expected drawdowns at specified distances from a pumping well. Specified hydrologic parameters for the Roubidoux aquifer were utilized in the program with the following results:

MUNICIPAL WELL USE in IZARD Co. 2007

Facility ID #	Facility Name	Pop. Served	Water Type	County	Lat.	Long.	Aquifer Code	Well Depth	Local Description	Water Year	Acre Ft. Per Yr.	
790023	BRUNNER HILL WATER ASSOC	1023	GW	IZARD	361300	920720	367GNTR	2,325	BRUNNER HILL #1	2007	75.61	
340000	CALICO ROCK WATER & SEWER	1860	GW	IZARD	360700	920815	367RBDX	1,729	WELL 5/NEAR PUMP HOUSE	2007	20.56	
340000	CALICO ROCK WATER & SEWER		GW	IZARD	360700	920815	367RBDX	2,134	WELL 6/NEAR PUMP HOUSE	2007	133.78	
340003	HORSESHOE BEND WATERWORK	2131	GW	IZARD	361259	914356	367GNTR	1,750	DIAMOND WELL	2007	175.21	
340005	MOUNT PLEASANT WATER DEPT	1256	GW	IZARD	360215	914605	367RBDX	2,495	WELL 3 (BONETOWN WELL)	2007	16.69	
											422	ACFT/YR
										Total from deep Ozark Aquifer		
340001	FRANKLIN WATERWORKS	265	GW	IZARD	361000	914615	300PLZC	1,250	CR 66 1/4 E OFF S MAIN	2007	16.47	
340006	OXFORD WATER DEPARTMENT	1100	GW	IZARD	361159	915510	300PLZC	1,200	WELL 2	2007	66.19	
											83	ACFT/YR
340000	CALICO ROCK WATER & SEWER		GW	IZARD	360700	920815	300PLZC	650	WELL 4/NEAR PUMP HOUSE	2007	3.87	
340000	CALICO ROCK WATER & SEWER		GW	IZARD	360700	920815	300PLZC	125	WELL 1/IN PUMP HOUSE	2007	45.96	
340000	CALICO ROCK WATER & SEWER		GW	IZARD	360700	920815	300PLZC	150	WELL 2/IN PUMP HOUSE	2007	70.88	
340003	HORSESHOE BEND WATERWORK		GW	IZARD	361314	914531	300PLZC	980	SHOPPING CENTER WELL	2007	11.97	
340004	MELBOURNE WATERWORKS	4155	GW	IZARD	360303	915502	367CTTR	826	WELL 03	2007	240.63	
340005	MOUNT PLEASANT WATER DEPT		GW	IZARD	355745	914608	367CTTR	480	WELL 02 (STELLA WELL)	2007	102.70	
340006	OXFORD WATER DEPARTMENT		GW	IZARD	361215	915517	367CTTR	650	WELL 1	2007	36.49	
	Total Populaton Served by Mun. GW	11790									595	ACFT/YR
										Total from shallow Ozark Aquifer		
	Total Populaton in County, 2000	13249										

	ACFT/YR			
Wells near mining area	230	deep	205272	-GPD from deep aquifer near mining area
	121	shallow	108015	-GPD from shallow aquifer near mining area
	351	TOTAL	313287	-TOTAL GPD near mining area

TOTAL MUNICIPAL WELL WATER USAGE IZARD CO. - 07

376712 - GPD from deep Ozark aquifer
531146 - GPD from shallow Ozark aquifer
907858 - GPD - Total Ozark Aquifer Use Izard Co.

Pumping 200 gpm from one proposed mine in the area (Evergreen's water use estimate) resulted in an estimated 14 feet of drawdown in a well, 5 miles from the pumping well in approximately 2 years, and 18 feet in 9 years (Figure 4). Though such a decline is more severe than the current declines observed in the county, and would be noticeable, the impact may not be adverse. Pumping 450 gpm (expected yield of 3 Roubidoux wells producing 150 gpm) resulted in drawdown of 32 feet, 5 miles from a pumping well in approximately 2 years, and 39 feet in 9 years (Figure 4). The closest municipal wells are approximately 6 miles from the proposed mining area, and about 40 shallow domestic wells are located in the immediate vicinity.

Currently, the potentiometric surface of the Ozark aquifer in the study area of Izard County generally is within 100 feet of land surface. The aquifer is approximately 1500 to 2000 feet in thickness in this vicinity; therefore, these declines could reduce the saturated thickness of a portion of the aquifer near the mining area to 50 percent in approximately 200 years at the lower water-use rate, to 90 years at the higher rate. (The 50 percent saturated thickness is a critical area criterion which reflects the state's current ground-water policy with respect to determination of severe water-level declines.) However, impacts on springs and streams, via stream capture, as well as increased pumping depth requirements may be observed much more quickly. Shallow domestic wells would also be especially vulnerable to water-level declines.

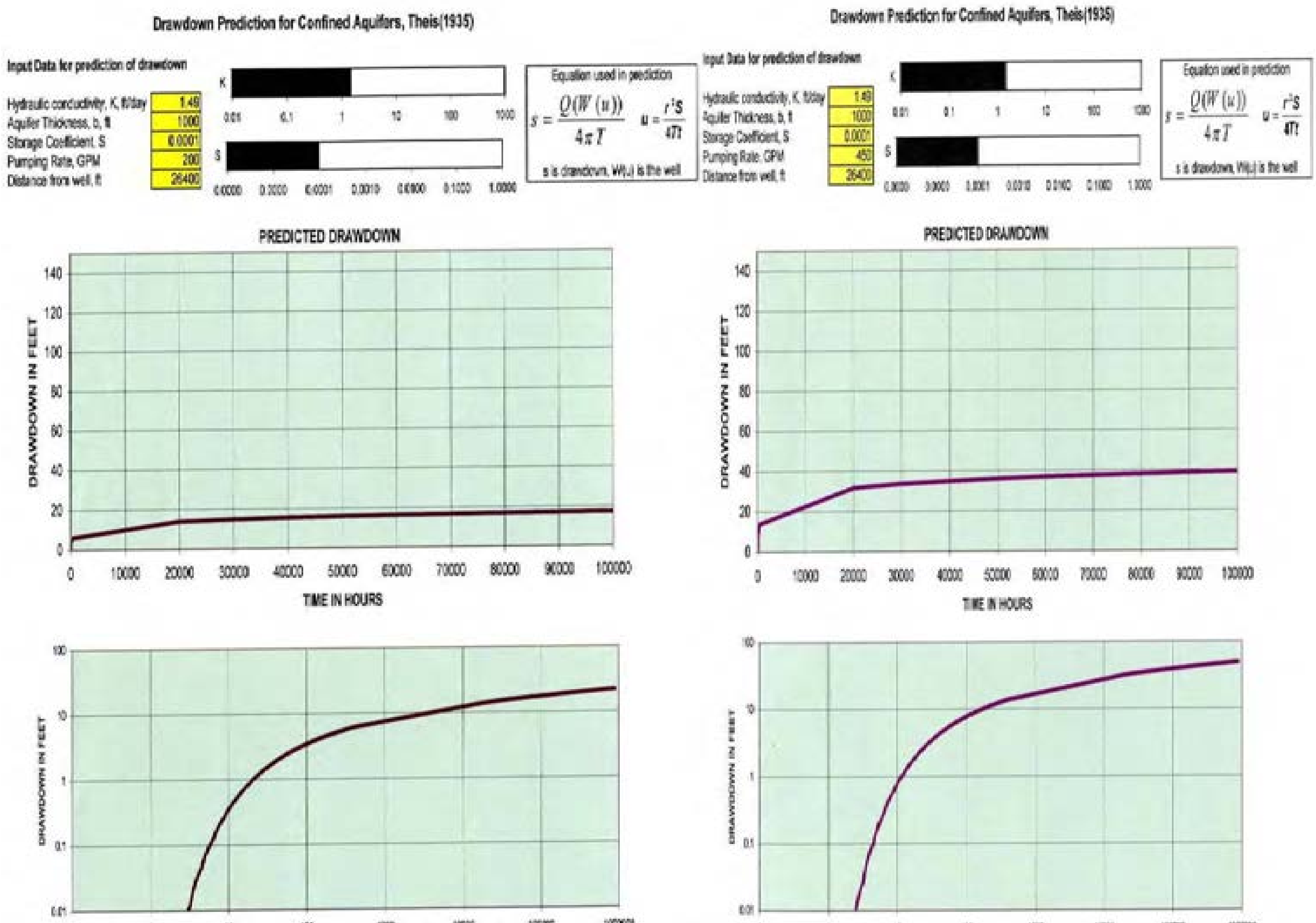
Further research (and perhaps a ground-water model) will be required to determine the total impact of pumping from the proposed mines on municipal wells in the county. The preliminary results, however, reflect the low storativity of the Ozark aquifer, and suggest that large drawdowns in the Ozark aquifer can be expected from the mining water use requirements, particularly if 5-10 mines begin operations. Depending on the degree of intercommunication between the shallow and deep Ozark aquifers, lowering of heads in shallow Ozark aquifers is also possible, as well as reduced flow to springs and streams.

Modeling Capabilities

Ground-water modeling is one valuable tool that may be used in many instances to predict aquifer response from pumping. Any two ground-water scientists may have considerable differing opinions regarding the value of predictive computer modeling in an aquifer such the Ozark. Most of the hydrologic parameters required to generate a computer model, such as Transmissivity (T) and Storage Coefficient (S), are derived from pumping test data. Equations utilized to calculate flow to a well often assume a homogeneous/isotropic aquifer, however, the heterogeneous and anisotropic character of the Ozark aquifer; render these equations of little value. Consequently, pumping test data and computer models in the Ozark aquifer must be used with caution and may have severe limitations.

Although ~35 aquifer tests have been performed (1940-06) for the Ozark aquifer, most have been Specific Capacity (S) tests in 12 Arkansas counties. Only 1 Cotter pumping test has been performed in Izard Co. Assumptions, regarding proper well construction and test methodology (completely penetrated unit test) were made, which may be incorrect.

S is calculated from estimation of Specific Storage. S and Sy (Specific yield in unconfined aquifers) can be measured during pumping tests, but estimates, particularly of Sy, are subject to error, making field measurements from pumping tests uncertain (Freeze and Cherry, 79). S values (derived from pumping tests) greatest value lies in determination of the potential yield of a well/pumping scenario at that particular location, and should be applied with caution over large



Drawdown Prediction for Confined Aquifers, Theis(1935)
Input Data for prediction of drawdown
Hydraulic conductivity, K, ft/day 1.49
Aquifer Thickness, b, ft 1000
Storage Coefficient, S 0.0001
Pumping Rate, GPM 200
Distance from well, ft 26400
Equation used in prediction
$s = \frac{Q(W(u))}{4\pi T}$ $u = \frac{r^2 S}{4Tt}$
s is drawdown, W(u) is the well
PREDICTED DRAWDOWN
DRAWDOWN IN FEET
TIME IN HOURS
Drawdown Prediction for Confined Aquifers, Theis(1935)
Input Data for prediction of drawdown
Hydraulic conductivity, K, ft/day 1.49
Aquifer Thickness, b, ft 1000
Storage Coefficient, S 0.0001
Pumping Rate, GPM 450
Distance from well, ft 26400
Equation used in prediction
$s = \frac{Q(W(u))}{4\pi T}$ $u = \frac{r^2 S}{4Tt}$
s is drawdown, W(u) is the well
PREDICTED DRAWDOWN
DRAWDOWN IN FEET
TIME IN HOURS

Figure 4

areas in anisotropic/heterogeneous aquifers such as the Ozark, and use in any model could introduce error. In addition, solutioned fractures or faulting can make these calculations and assignment of model grid values of little value. Consequently, a model in an aquifer such as the Ozark may or may not provide accurate prediction of drawdowns in the aquifer, and only post-audit validation and revision, with model refinement, could insure its accuracy. Though there are limitations when modeling in areas with limestone and dolostone lithology, they can be very effective with proper application. The model developed by the Dr. John Czarnecki with the USGS Water Sciences Center has been extremely useful in developing better understanding of the Ozark aquifer and its response to pumping in Arkansas, Kansas, Missouri, and Oklahoma.

Summary and Conclusions

Due to the low storativity of the Ozark aquifer, which includes the Roubidoux formation and Gunter sandstone, pumping of ground-water at volumes required to wash/sieve the sand will result in depletion of heads in the Ozark aquifer in close proximity to the mining operations proposed in the vicinity of the outcropping St. Peter Sandstone in Izard County, Arkansas. Though the impact of one mine utilizing efficient sand processing technology may be minimal, over extended time periods, lowering of heads could extend for 5-10 miles, and drawdowns of as much as 7 to 15 feet per year are possible. The thickness of the Ozark aquifer in the study area is over 1,000 feet. Therefore, declines in the potentiometric surface would not reduce the saturated thickness of the aquifer to 50 percent for over 70 years. Because of the faulting and variability of the aquifer and depending of the degree on hydraulic interconnection between the shallow and deep strata, potential for lowering of heads (and depletion) in shallow wells is also possible, as well as potential impacts on surface streams and springs. Less efficient sand processing operations would use more water and impact the ground-water system to a greater degree. Long-term impacts from five or more mining operations could adversely impact a much larger area including some public supply wells in Izard County. Only a pumping test of a properly installed well (with a nearby observation well) could determine the potential long-term effects of pumping at a particular mine location. In addition, further research (including ground-water flow modeling) is required to further estimate the long-term impact of mining water use on shallow and deep Ozark municipal and shallow domestic wells.

In the absence of a ground-water permitting program in Arkansas, detailed scientific evaluation of mining operations, with respect to impacts on the ground-water system, is not performed at this time. Hydrogeologic evaluation, including test wells, and ground-water flow modeling would allow more adequate evaluation, allow for sustainable use of the aquifer while providing greater information useful in resource protection for current and future water users.

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