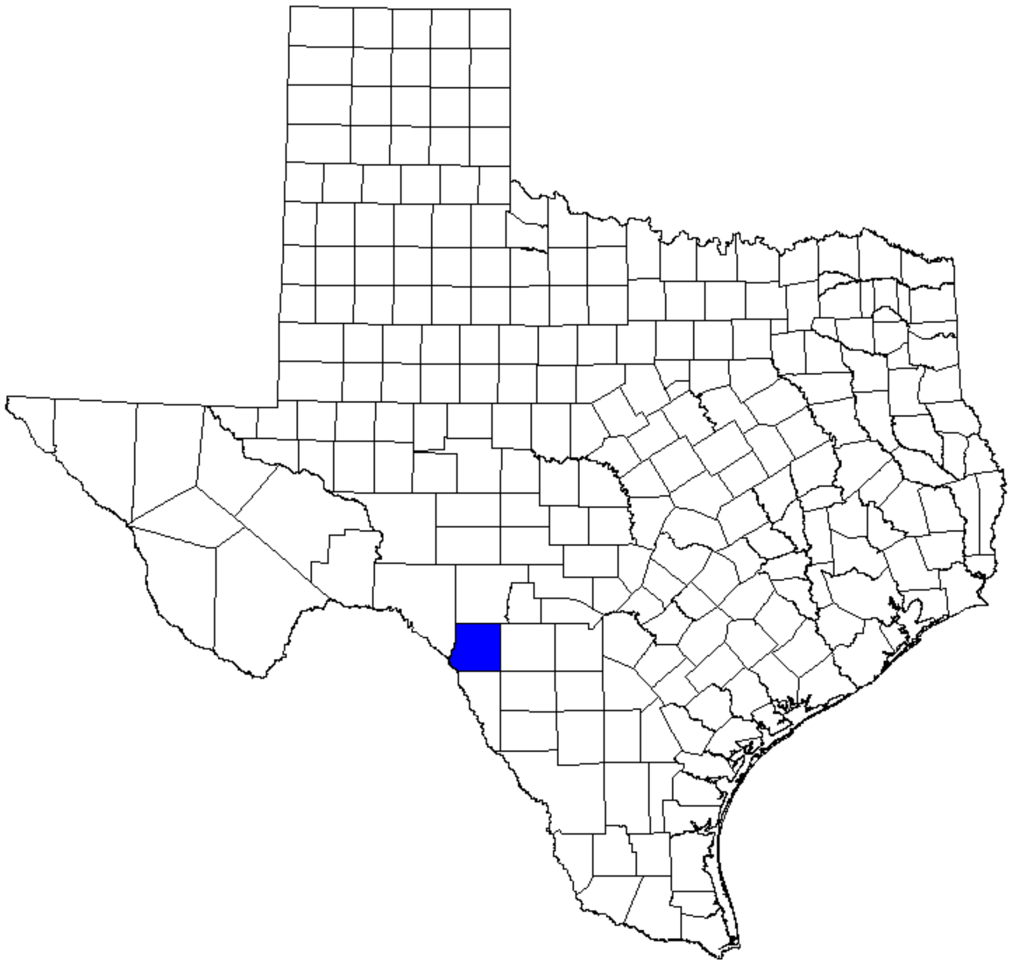
Kinney County Groundwater Conservation District
Groundwater Management Plan - 2023



Final Approved Plan

January 18, 2023

Kinney County Groundwater Conservation District
Groundwater Management Plan - 2023

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1.0 District Mission

The mission of the Kinney County Groundwater Conservation District is to develop, promote and implement water conservation and management strategies to conserve, preserve, and protect the groundwater supplies of the District, to protect and enhance recharge, prevent waste and pollution, and to promote efficient and beneficial use of groundwater within the District.

The District strives to strike a balance between conservation, preservation, efficient and beneficial use of groundwater, along with protection private property rights of landowners...all for the benefit of citizens/landowners of Kinney County...not only now, but for future generations.

2.0 Purpose of Management Plan

The Plan is developed to provide general guidelines for the development of the District rules and implementation of policies to support the District's mission. The purpose of this Management Plan is to provide guidance to the District for:

A. Managing the Production of Groundwater in the District

1. on a sustainable basis;
2. for beneficial use;
3. that allows the capture of water flowing through the county;
4. without jeopardizing the availability of water to the county during extended periods of low rainfall; and
5. without unduly increasing the frequency of the natural cycles of springs and intermittent streams going dry.

B. Resolving Conflicts of Groundwater Use Between the Various Interests Seeking to Put This Essential Natural and Renewable Resource To Beneficial Use

3.0 District Information

3.1 District Creation

In 2001, the Texas Legislature authorized the creation of the District during the 77th Regular Session through House Bill 3243 (Act of May 25, 2001, 77th Leg., R.S. ch. 1344, 2001 Tex. Gen. Laws 3329). The voters of Kinney County confirmed the creation of the District on January 12, 2002 with 87 percent of the voters casting favorable ballots.

3.2 Location and Geographical Information

The District is located in Kinney County, Texas. The boundaries of the District are the same boundaries that are used by Kinney County. Kinney County is in southwestern Texas and is bounded on the north by Edwards County, on the east by Uvalde County, on the south by Maverick County, and on the west by Val Verde County and Mexico. Kinney County has an area of 891,240 acres (1,391 square miles). Brackettville is the county seat and the largest town in the county.

3.3 Authority / Regulatory Framework

In the preparation of this Management Plan, the District has followed all procedures and satisfied all requirements mandated by Chapter 36 of the Texas Water Code and Chapter 356 of the Texas Water Development Board's (TWDB) rules contained in Title 31 of the Texas Administrative Code. The District exercises the powers that it was granted and authorized to use by and through the special and general laws that govern it, including Chapter 36, as amended, Texas Water Code. The District will collaborate with surrounding counties, Mexico and other groundwater conservation districts, groundwater management areas, and regional planning areas.

The 75th Texas Legislature in 1997 enacted Senate Bill 1 (SB 1, Act of June 2, 1997, 75th Leg. R.S., ch. 1010, 1997 Tex. Gen.Laws 3610). SB 1 established a comprehensive statewide water planning process and contained provisions which required groundwater conservation districts to formulate management plans to identify the water supply resources and water demands that will shape the decisions of each district. The management plans for the groundwater conservation districts also include the management goals that each district would establish to manage and conserve the groundwater resources within their boundaries.

3.4 Groundwater Resources of Kinney County

Groundwater in Kinney County generally occurs in three groups of Cretaceous rocks (youngest formations to oldest formations):

- Upper Cretaceous rocks (Austin Chalk and Buda Limestone)
- Edwards Limestone
- Trinity rocks (Glen Rose limestone)

The geographic extent of each of these groups in Kinney County is presented in Figures 1, 2, and 3.

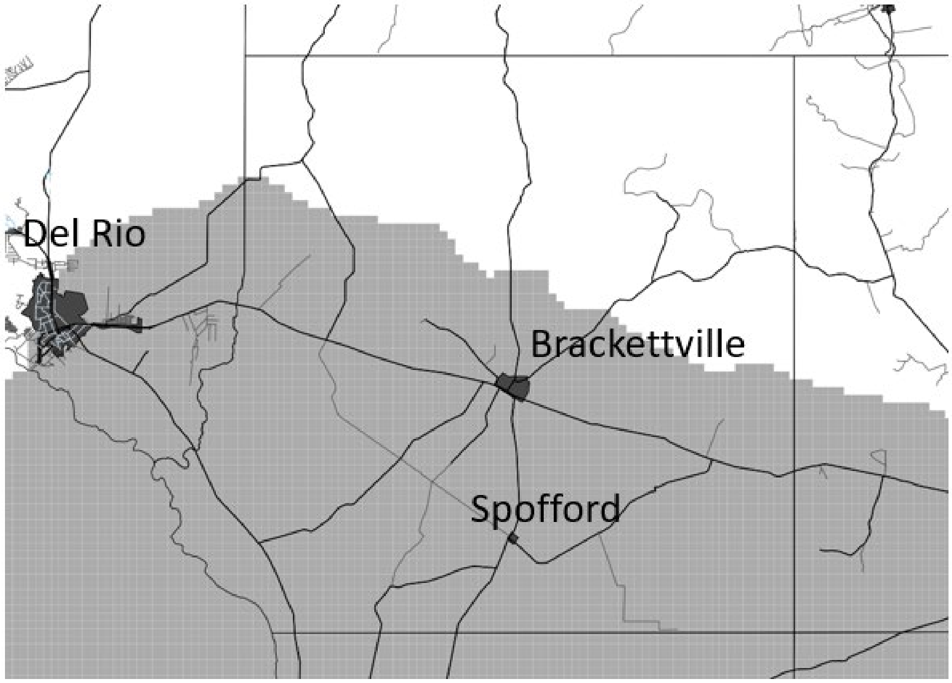


Figure 1. Upper Cretaceous Rocks

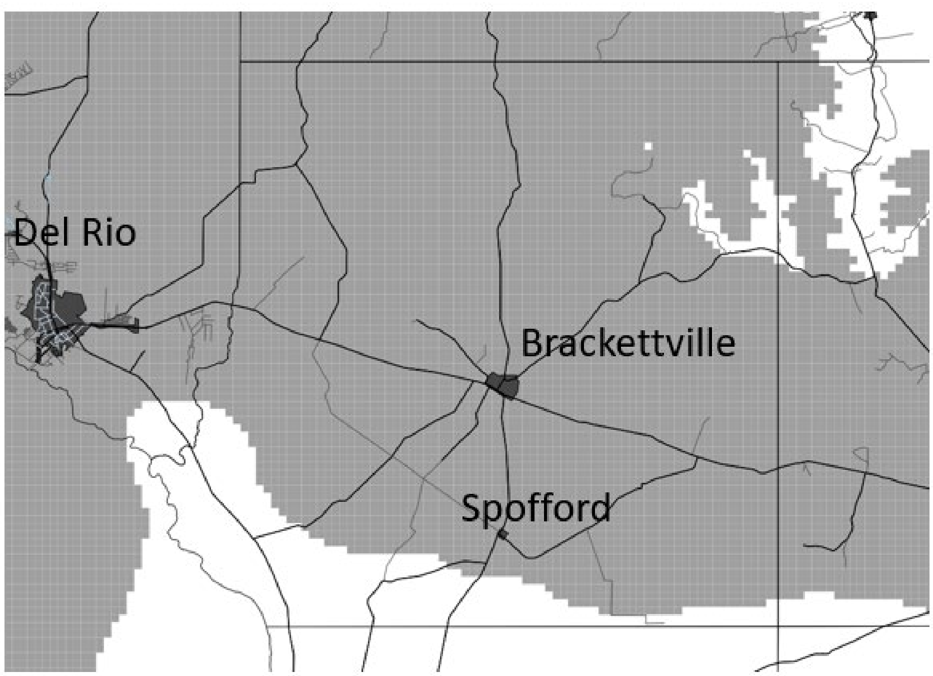


Figure 2. Edwards Limestone

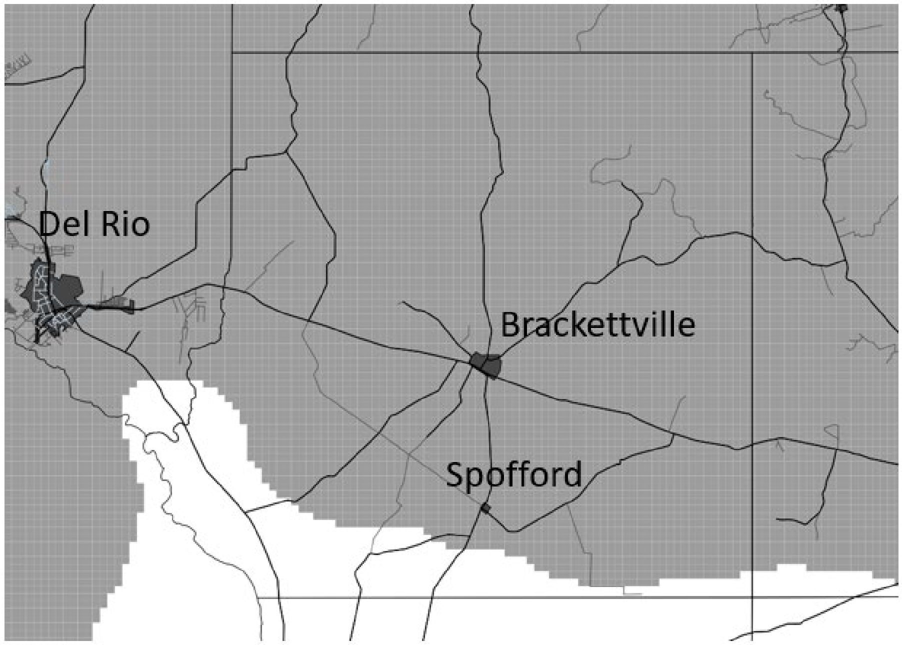


Figure 3. Trinity Rocks

Groundwater in Kinney County is recharged from rainfall. The groundwater monitoring program that the Kinney County Groundwater Conservation District initiated in 2013 demonstrates that precipitation events and increasing groundwater levels are correlated. Generally, groundwater levels rise after precipitation events. The monitoring data also generally show that groundwater levels decline during periods with no precipitation. This filling and draining of the aquifers in Kinney County also correlates with increasing and decreasing flow at Las Moras Springs. Based on an analysis of spring flow and groundwater levels from the monitoring network, three zones have been identified:

- Zone 1: Strong correlation between spring flow and groundwater levels
- Zone 2: Moderate correlation between spring flow and groundwater levels
- Zone 3: Weak or no correlation between spring flow and groundwater levels

Figure 4 shows the location of the monitoring points and Las Moras Springs. Please note that the well locations are color coded to the designated zone. Details of the analysis associated with zone definition are presented in Appendices A-1, A-2, and A-3.

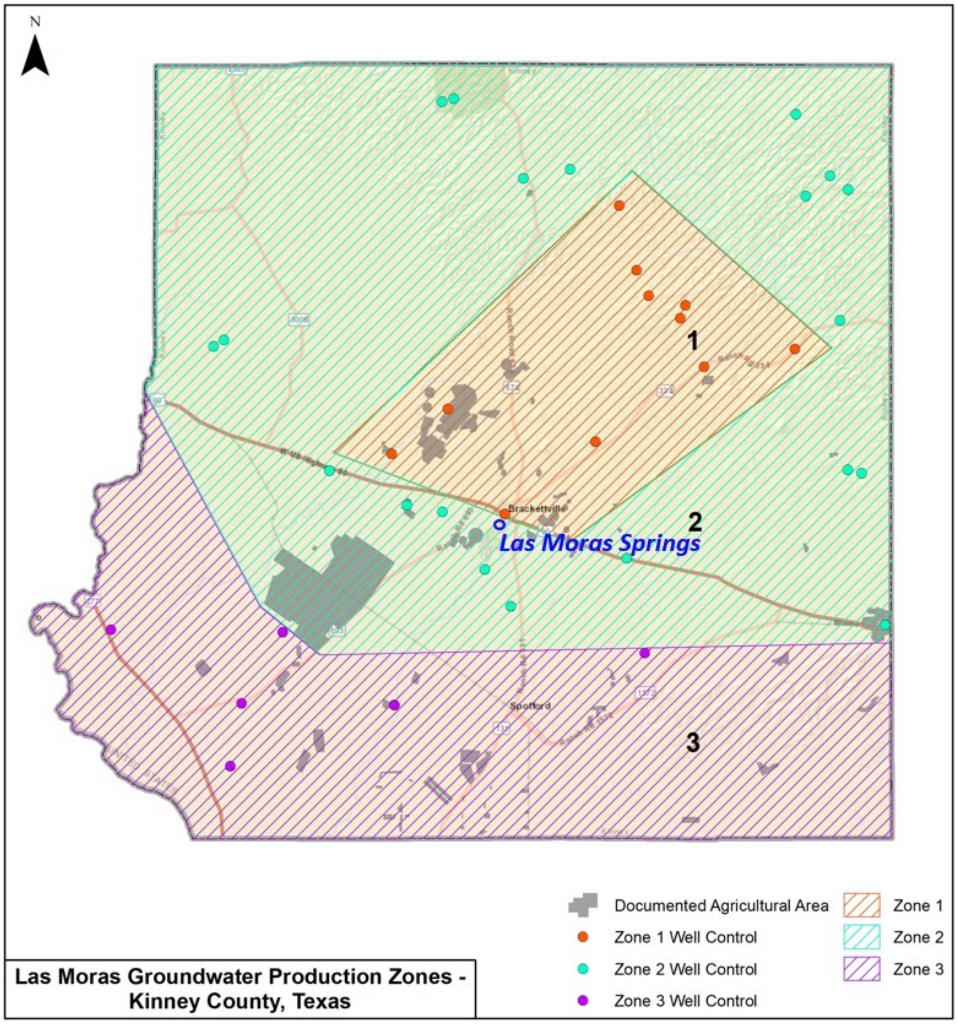


Figure 4. Zones of Correlation between Las Moras Springs Flow and Groundwater Levels

4.0 Technical Information Required by Texas Administrative Code

The information in this section is provided pursuant to statutes and rules as summarized in the TWDB Groundwater Conservation District Management Plan Checklist (dated December 6, 2012). The information is organized according to the order in the checklist.

4.1 Estimate of the Modeled Available Groundwater

Texas Water Code § 36.001 defines modeled available groundwater as "the amount of water that the executive administrator determines may be produced on an average annual basis to achieve a desired future condition established under Section 36.108".

Kinney County Groundwater Conservation District is within the boundaries of two Groundwater Management Areas: GMA 7 and GMA 10. The presentation and discussion of the modeled available groundwater for Kinney County for the GMA 7 portion of Kinney County and the GMA 10 portion of Kinney County are presented separately below.

4.1.2 GMA 7 Portion of Kinney County

GMA 7 adopted a desired future condition for Kinney County on August 19, 2021:

> *In Kinney County, that drawdown which is consistent with maintaining, at Las Moras Springs, an annual average flow of 23.9 [cubic feet per second] and a median flow of 24.4 [cubic feet per second] based on Scenario 3 of the Texas Water Development Board's flow model presented on July 27, 2010.*

The desired future condition was adopted after considering a set of alternative model simulations. Scenario 3 of that set of simulations was the basis of the adopted desired future conditions, as referenced in the resolution of GMA 7. Scenario 3 (and other alternative runs) is documented in TWDB Draft GAM Task 10-027 (Revised), dated February 9, 2011, which is attached as Appendix B to this plan.

The modeled available groundwater was calculated by the Texas Water Development Board and was provided in GAM Run 21-012 MAG, dated August 11, 2022, which is attached as Appendix C to this plan. The modeled available groundwater for the Edwards-Trinity (Plateau) Aquifer for the GMA 7 portion of Kinney County is 70,341 acre-feet per year.

4.1.3 GMA 10 Portion of Kinney County

GMA 10 adopted DFCs on October 26, 2021. However, to date, TWDB has sent a letter finding the submittal package administratively complete but has not issued an updated MAG report. The following represent the second-round DFCs and MAGs. The DFC adopted on October 26, 2021 is the same as the second round DFC, and the MAG is not expected to change.

GMA 10 adopted a desired future condition for Kinney County on October 26, 2021:

> *The water level in well number 70-38-902 shall not fall below 1184 feet mean sea level*

The modeled available groundwater was calculated by the Texas Water Development Board and was provided in GAM Run 16-033 MAG, dated July 20, 2018, which is attached as Appendix D to this plan. The modeled available groundwater for the Edwards-Trinity (Plateau) Aquifer for the GMA 10 portion of Kinney County is 6,321 acre-feet per year for decades 2010 through 2060.

4.2 Estimate of the Amount of Groundwater Being Used Within District on an Annual Basis

Please refer to Appendix E: Estimated Historical Use and 2022 State Water Plan Datasets, Kinney County Groundwater Conservation District.

4.3 Estimate of the Annual Amount of Recharge from Precipitation

Please refer to Appendix F: GAM Run 22-011, Kinney County Groundwater Conservation District Management Plan.

4.4 Estimate of the Annual Volume of Water That Discharges to Springs and Surface Water Bodies

Please refer to Appendix F: GAM Run 22-011, Kinney County Groundwater Conservation District Management Plan.

4.5 Estimate of the Annual Volume of Flow into the District, out of the District, and between Aquifers

Please refer to Appendix F: GAM Run 22-011, Kinney County Groundwater Conservation District Management Plan.

4.6 Estimate of the Projected Surface Water Supply within the District

Please refer to Appendix E: Estimated Historical Use and 2022 State Water Plan Datasets, Kinney County Groundwater Conservation District. These estimates show the only surface water supplies are run-of-the-river from the Rio Grande for irrigation (3,616 AF/yr).

4.7 Estimate of the Projected Total Demand for Water within District

Please refer to Appendix E: Estimated Historical Use and 2022 State Water Plan Datasets, Kinney County Groundwater Conservation District. These estimates were updated to reflect plumbing code savings found in Regional and State Water Plans. The sum of total demands are relatively constant (5,227 AF/yr in 2020 to 5,199 AF/yr in 2070).

4.8 Water Supply Needs

Please refer to Appendix E: Estimated Historical Use and 2022 State Water Plan Datasets, Kinney County Groundwater Conservation District. These estimates show that for seven of the eight categories listed, there is a projected surplus. The only listed need (deficit) is for livestock supply in the Nueces River Basin portion of Kinney County, and the listed need is small (27 AF/yr).

4.9 Water Management Strategies

Please refer to Appendix E: Estimated Historical Use and 2022 State Water Plan Datasets, Kinney County Groundwater Conservation District.

Page 7 of the Appendix E includes two specific groundwater-related water management strategies for Kinney County:

- An increase in the supply to Spofford (from City of Brackettville) with a new water line and storage of 6 AF/yr starting in 2030.
- An increase in storage facilities for Fort Clark Springs MUD of 620 AF/yr starting in 2030.

The third water management strategy is an anticipated demand reduction of 79 AF/yr resulting from a water loss audit and min-line repairs for Fort Clark Springs MUD.

These specific water management strategies were considered and included in the overall preparation of this management plan.

4.10 How the District Will Manage Groundwater Supplies

Kinney County Groundwater Conservation District will manage the production of groundwater in Kinney County in a sustainable manner. The adopted desired future conditions for both Groundwater Management Area 7 and Groundwater Management Area 10 represent long-term planning goals for the district.

The desired future conditions are linked to sustainable management via maintaining spring flow at historic amounts (GMA 7) and avoiding a specific threshold groundwater elevation (GMA 10). The threshold well used for the desired future condition in GMA 10 exhibits strong correlation with spring flow on an annual basis.

As developed in this management plan in Section 5.8, Las Moras Springs flow will be higher than the long-term average during wet periods and will be lower than the long-term average during dry periods. The review of spring flow and precipitation is completed annually. If the spring flow is outside the bounds of expected spring flow given the annual precipitation in the previous year, the District will consider a range of management options.

- Analyze the inconsistency with updated data and information from ongoing hydrogeologic studies to determine if the inconsistency is significant.
- Update the management goal with updated data and information that were not available at the time of the development of this management plan.
- Based on updated data and information from ongoing hydrogeologic studies, evaluate the need for pumping reductions, as appropriate, from a technical perspective and from a legal/property rights perspective.

In general, the District may develop and implement groundwater well spacing and production regulations that are specific to water availability, the geographic area and site specific to the well and the wells' behavior in the groundwater environment. Where appropriate and necessary to minimize interference**,** the District shall cause production monitor wells to be installed along the perimeter of a permittee's property and adjacent to a well field to monitor and regulate the cone of influence within the boundaries of a production unit.

Among the regulatory tools granted to districts, the Legislature empowered districts to protect current users of groundwater, which are those individuals or entities currently invested in or using groundwater resources within the District for a beneficial purpose. The District is also empowered to protect Historic and Existing permit users, which are those individuals or entities that used groundwater beneficially in the past. Most of the groundwater used in Kinney County has been applied to agricultural irrigation, domestic and livestock purposes. The District strives to protect such purposes to the extent practicable under the goals and objectives of this Management Plan. This shall be done without discriminating against any other lawful and beneficial purpose.

Cooperative agreements may be developed and executed between governmental entities pursuant to Texas Governmental Code to accomplish mutual objectives or may be between the District and any well owner to provide a vehicle for gathering site-specific information on well water levels and rainfall histories. These cooperative agreements should facilitate the District providing technical support on the status of the groundwater availability for each well**.**

The District, through this Management Plan and its rules, will attempt to manage groundwater withdrawals in the District at a level that will not cause depletion of these groundwater management zones in the future. The District should allow as much groundwater to be produced as possible for beneficial purposes while preventing the overproduction and mining of the groundwater resources of Kinney County.

In an effort to protect the springs, intermittent streams and long-term productivity of these groundwater resources, the District shall engage in scientific research and data collection in order to establish the amount of groundwater that can be produced from within the District. Current amounts used are based on TWDB and Region J data. The District's greatest challenge is determining, through scientific study, the actual groundwater resources of Kinney County. Proper science requires a diligent effort by the District and other interested parties to gather appropriate information and apply that information responsibly. As data becomes available, this Plan and its associated rules should be updated to reflect this additional information. Care should be exercised not to overestimate or underestimate the amount of groundwater available on incomplete, poorly applied science or speculative data.

The District has created a tiered process that categorizes groundwater use and allocates available groundwater in accordance with District rules. The tiered process prioritizes groundwater use for the protection of urban populations within the District, exempt well owners, existing permit users and historic permit users, as the District allocates the remaining available groundwater through the concept of "proportionate reduction" and "zone management processes" as defined in the District's rules.

The District will protect all permit users by establishing rules for permitting wells, transfer of water permits from one entity or individual to another, and the scientific data requirements for new or increased use. In conversion of permits for export the amount permitted shall not exceed the Maximum Historic Use as demonstrated by the applicant or suggested by agreements with other existing permittees.

As detailed in Section 5.0 of this plan, the General Manager of the District will prepare and submit an annual report ("Annual Report") to the Board of the District. The Annual Report will include an update on the District's performance in regard to achieving management goals and objectives. The General Manager of the District will present the Annual Report within ninety (90) days following the completion of the District's fiscal year audit, beginning with the fiscal year that starts October 1. Upon adoption, the Board will maintain a copy of the Annual Report on file, for public inspection, at the District's offices.

4.11 Actions, Procedures, Performance, and Avoidance

The District will implement the goals and provisions of this Management Plan and will utilize the objectives of this Management Plan as a guideline in its decision-making to be consistent with the provisions of this plan.

The District has adopted rules, in accordance with Chapter 36 of the Texas Water Code, that implement the Management Plan. The current version of the rules is dated October 13, 2022, and is attached as Appendix G. The rules can be downloaded from the Kinney County Groundwater Conservation District website:

https://www.kinneycountygcd.org/documents-and-forms.html

All rules will be followed and enforced. The District will amend the District rules as necessary to comply with changes to Chapter 36 of the Texas Water Code and to ensure the best management of the groundwater within the District. The development and enforcement of the rules of the District will be based on the best scientific and technical evidence available to the District. If, at any point, it appears the District will not be able to achieve the adopted Desired Future Conditions the Board of Directors will amend the rules as necessary to ensure the Desired Future Conditions will be achieved.

The District will encourage cooperation and coordination in the implementation of this plan. All operations and activities of the District will be performed in a manner that best encourages cooperation with the appropriate state, regional or local water entity. The Board meetings of the District will be noticed and conducted in accordance with the Texas Open Meetings Law. Official documents, reports, records and minutes of the District will be available for public inspection and copying in accordance with the Texas Public Information Act.

Annually, the District will appoint a Groundwater Management Plan Committee, chaired by a Board Director, to conduct a review of (a) science and knowledge of the water resources available for the District's regulation, permitting and conservation and (b) make recommendations for improved management of the resources over which the District has jurisdiction. The Committee's appointment, report and action by the Board in response to such recommendations shall each be noticed in a local publication distributed within Kinney County.

4.12 Evidence that the Plan was Adopted after Notice and Hearing

The notice for the public hearing was published in the Kinney County Post on December 29, 2022. The public hearing was held at the Kinney County Groundwater Conservation District during the regular Board meeting on January 12, 2023. There were no comments during the public hearing. The Board approved the plan on January 12, 2023 after the close of the public hearing.

Please refer to Appendix H for copies of the notice and agenda for the public hearing.

4.13 Evidence that District Coordinated with Regional Surface Water Management Entities Following Notice and Hearing

Please refer to Appendix I.

4.14 Site-Specific Information

Not Applicable

5.0 Management Goals

The General Manager of the District will prepare and submit an annual report ("Annual Report") to the Board of the District. The Annual Report will include an update on the District's performance in regard to achieving management goals and objectives. The General Manager of the District will present the Annual Report within ninety (90) days following the completion of the District's fiscal year audit, beginning with the fiscal year that starts October 1. Upon adoption, the Board will maintain a copy of the Annual Report on file, for public inspection, at the District's offices.

5.1 Providing the most efficient use of groundwater

5.1.1 Groundwater and Stream Flow Monitoring

Objective: Establish a monitoring network to measure groundwater quantity in a minimum of one (1) well per year in the major aquifers of the District and stream flow volume in Las Moras Creek and Pinto Creek**.**

Performance Standard: The District will monitor the water level in at least one well per year in the major aquifers of the District and stream flow volume in Las Moras Creek and Pinto Creek. A report on the data collected through this monitoring network will be included in the Annual Report.

5.2 Controlling and preventing waste of groundwater

5.2.1 Elimination of Wasteful Practices Using Groundwater

Objective: Increase public awareness within the District regarding the need for water conservation and encourage the elimination of wasteful practices regarding groundwater within the boundaries of the District.

Performance Standard – Submit an article annually regarding the elimination of wasteful practices and/or conservation of groundwater to a local publication for distribution in Kinney County and keep a copy in the District office for a period of three (3) years.

5.3 Controlling and preventing subsidence

The subsidence tool developed by the Texas Water Development Board was used to assess the potential for subsidence in the two aquifers in the District using the default values provided. The tool can be accessed at:

http://www.twdb.texas.gov/groundwater/models/research/subsidence/subsidence.asp

The tool provides a numeric total weighted risk factor that ranges from 0 (low risk) to 10 (high risk). The results of applying the default values from the tool yield the following scores:

- Edwards (BFZ) Aquifer = 2.03
- Edwards-Trinity (Plateau) = 2.97

Based on applying the tool and the geologic setting, this management goal is not applicable to the District due to the low risk of subsidence in Kinney County.

5.4 Addressing conjunctive surface water management issues

5.4.1 Regional Planning

Objective: By attending Region J meetings, there is the opportunity to participate in the discussions, planning and education concerning the interrelationship of the groundwater and surface water interface. The Board President or his/her appointed representative will attend 75% of Region J meetings annually.

Performance Standard: The minutes for all attended meetings of Region J will be maintained in the District for a period of three (3) years from their accepted date. A report of all attended meetings will be given to the Board at the regular meeting.

5.5 Addressing natural resource issues that impact the use and availability of groundwater and which are impacted by the use of groundwater

5.5.1 Joint Planning in GMA 7 and GMA 10

Objective: By attending GMA 7 and GMA 10 meetings, there is the opportunity to participate in discussions, planning and education concerning the interrelationship of groundwater with other natural resource issues. The Board President or his/her appointed representative will attend 75% of the GMA 7 and GMA 10 meetings annually.

Performance Standard: The minutes for all attended meetings of GMA 7 and GMA 10 will be maintained in the District for a period of three (3) years from their accepted date. A report of all attended meetings will be given to the Board at the regular meeting.

5.5.2 Communication with Governmental Agencies (Edwards Aquifer Authority)

Objective: The District will continue to seek opportunities to work in cooperation with the Edwards Aquifer Authority (EAA) in conducting groundwater studies, including model updates and dye trace studies.

Performance Standard: The District will annually maintain a file on the progress or results of the EAA research and any communications received from the EAA about the studies. This documentation will be maintained in the District office. A report on the progress or results of the any studies will be included in the Annual Report and/or provided to the District Board annually.

5.6 Addressing drought conditions

5.6.1 Drought Report

Objective: Each month, the District will download available drought information, for the District, from available websites on the internet such as (last accessed on October 6, 2022):

https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?TX

Performance Standard: The District will assess the status of drought in the District and prepare a briefing for the Board of Directors. The downloaded maps, reports, and information will be included on the regular monthly meeting agenda and retained in the meeting minutes kept at the District office.

5.7 Addressing conservation, recharge enhancement, rainwater harvesting, precipitation enhancement, and brush control where appropriate and cost effective

5.7.1 Addressing Conservation

Objective - Increase public awareness within the District regarding the need for water conservation.

Performance Standard - Submit an article annually regarding the elimination of wasteful practices and/or conservation of groundwater to a local publication for distribution in Kinney County and a copy kept in the District office for a period of three (3) years.

5.7.2 Addressing Recharge Enhancement

This management goal is not applicable to the District due to lack of available surface water of acceptable quality and cost effectiveness.

5.7.3 Addressing Rainwater Harvesting

Objective – The District will post an article or a link to an article annually, regarding rainwater harvesting on the District website.

Performance Standard – A copy of the article posted on the District website regarding rainwater harvesting will be included in the Annual Report to the Board of Directors.

5.7.4 Addressing Precipitation Enhancement

This management goal is not applicable to the District because of the generally low annual precipitation, and is considered not cost effective at this time.

5.7.5 Addressing Brush Control

This service is provided by NRCS in Kinney County as a function of the Federal Government. This management goal is not applicable to the District because the objective is not cost effective due to the sparse nature of the vegetation in the District and the fact that much of the recharge to the District's aquifers are outside the boundaries of the District.

5.8 Addressing the desired future conditions

5.8.1 GMA 7 – Las Moras Spring

The desired future condition for Kinney County in GMA 7 is expressed as an average spring flow and a median spring flow for Las Moras Spring based on Scenario 3 of TWDB Draft GAM Task 10-027 (Revised), dated February 9, 2011, which is attached as Appendix A to this plan. Please note that the average flow (23.9 cubic feet per second) and the median flow (24.4 cubic feet per second) were calculated based on a 56-year simulation under a constant pumping assumption. Also, it should be noted that the spring flow in the simulation is based on an end-of-year measurement. Thus, comparison of any individual measured spring flows to this average for purposes of demonstrating consistency with the desired future condition would be inappropriate.

Since the desired future condition is expressed in terms of a spring flow, data from the gage at Las Moras Springs are used to evaluate desired future condition consistency on a year-to-year basis. The analysis that was used in the 2013 and 2018 management plans was based on evaluating data from the old gage. The procedure using data from the new gage has been updated from those management plans. Details of the technical analysis are covered in Appendix A.

The record from the new spring gage location began in October of 2014, so there are only seven years with "end-of-the-year" data. As described in Appendix A, this record was extended with the results of an empirical model of monthly precipitation and end-of-month spring flow. Regional precipitation maintained by TWDB for Quad 807 were used in the analysis.

Figure 5 depicts the results of the empirical model (annual precipitation vs. December 31 Las Moras Springs flow from the new gage) for the years 1940 to 2013. Please note that the years are denoted in the figure. A best fit line is included in the figure.

Figure 6 depicts the same data with two bounding lines: one labeled "high flow limit" (based on the years 1969 and 1984), and one labeled "low flow limit" (based on the years 2007 and 2010). These represent the limits of the "historic data" (1940 to 2013).

Figure 7 depicts the same data and limits as Figure 6, but the actual data from 2014 to 2021 are now included to evaluate how recent data fit within the bounds of the historic data. Finally, Figure 8 removes the historic data so the actual data from 2014 to 2021 can be seen in the context of the two bounding lines.

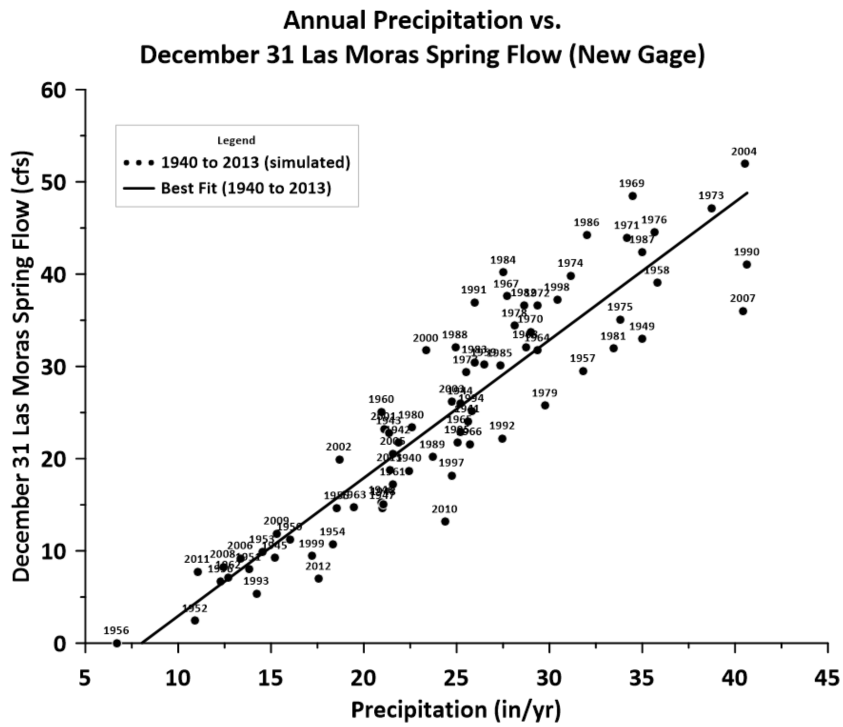


Figure 5. Precipitation vs. Spring Flow: Empirical Model Results (1940 to 2013)

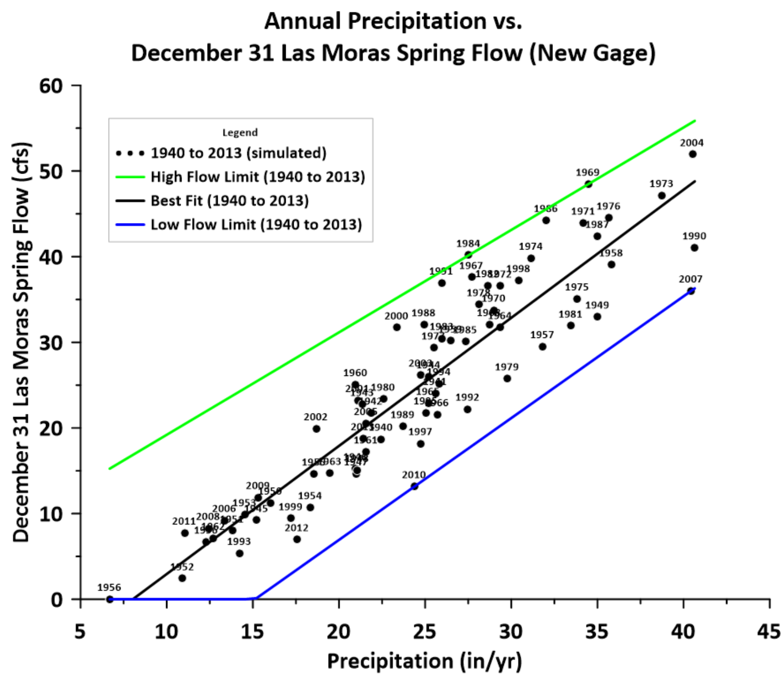


Figure 6. Precipitation vs. Spring Flow: Empirical Model Results with Bounding Limits (1940 to 2013)

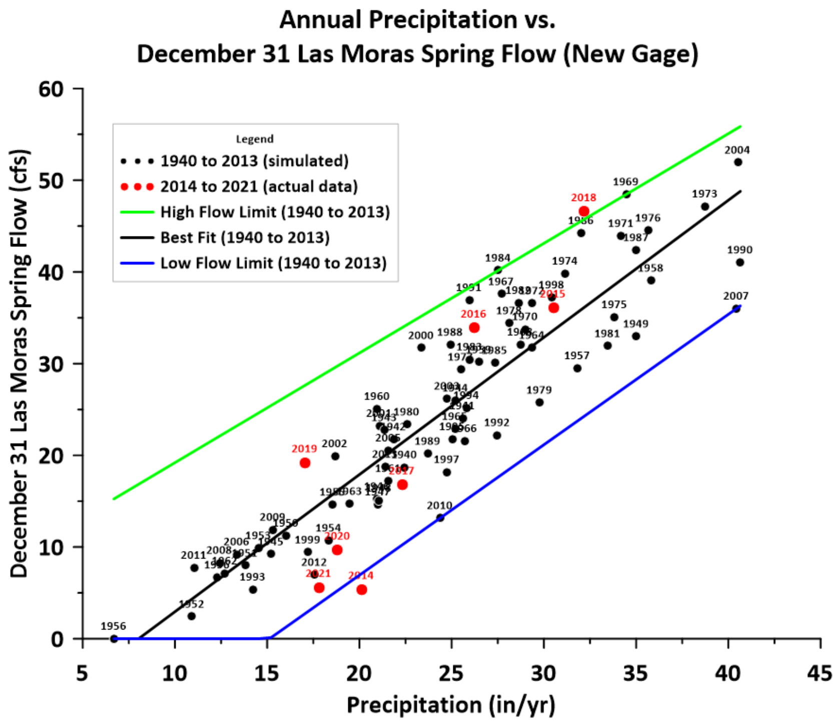


Figure 7. Precipitation vs. Spring Flow: Empirical Model Results, Bounding Limits and Actual Data from 2014 to 2021

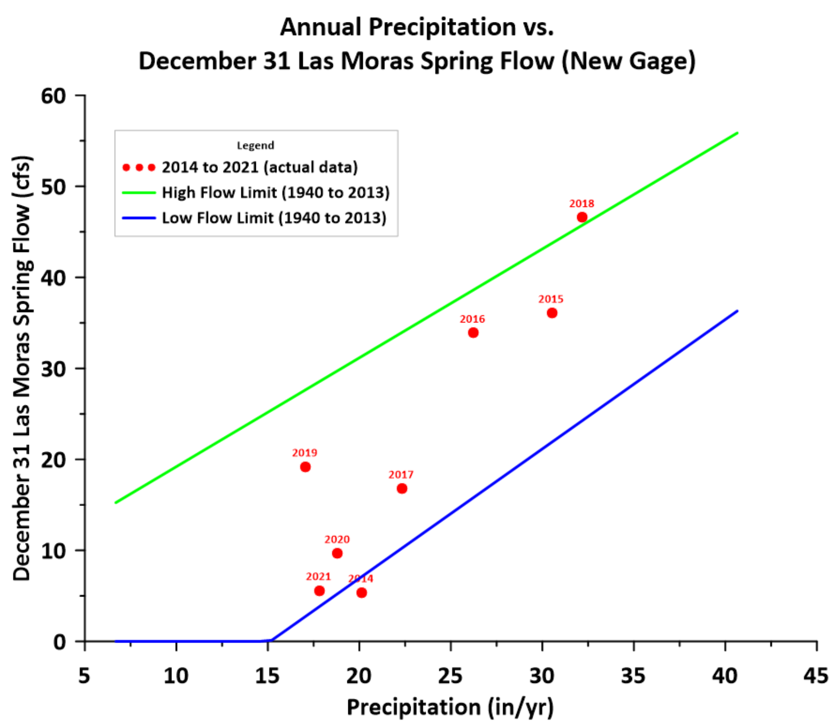


Figure 8. Precipitation vs. Spring Flow: Bounding Limits and Actual Data from 2014 to 2021

Please note that the results from 2014 plot below the “low flow limit” line and the results from 2018 plot above the “high flow limit” line. Average precipitation from 1940 to 2021 was 24.39 in/yr in Quad 807. The precipitation in 2013 was slightly below average (21.4 in), but the precipitation in 2011 and 2012 was significantly below average (11.04 and 17.57 in, respectively). This suggests that the effects of the long-term dry conditions impacted the 2014 spring flow relative to the annual precipitation, which was below average (20.44 in). The fact that the 2015 and 2016 points are well within the bounds of the “low flow limit” and “”high flow limit” during years with higher-than-average precipitation (30.51 and 26.21 in, respectively) suggest that the recovery in groundwater levels associated with high precipitation years essentially “reset” the groundwater system. This suggests that, in the future, some additional analysis is required if a point drops below the “low flow limit” line.

Similarly, the results from 2018 plot above the “high flow limit” line. Precipitation in 2018 was 32.18 in, and precipitation in the two of the preceding three years were also above average (30.51 inches in 2015, 26.21 inches in 2016, and 22.32 inches in 2017). This suggests that effects of long-term wet conditions impacted 2018 spring flow relative to the annual precipitation.

Objective – The District will assess annually the end-of-year Las Moras spring flow and annual precipitation to evaluate consistency with the desired future condition.

Performance Standard – Each year, data on annual precipitation from Quad 807 (obtained from TWDB) and end-of-year Las Moras spring flow will be collected. The results will be reported as an agenda item at the first Board meeting after the annual precipitation data are available from TWDB, and final (not provisional) Las Moras Springs flow data are available from the USGS.

Precipitation data from TWDB are obtained at:

https://waterdatafortexas.org/lake-evaporation-rainfall

Las Moras Springs flow data from the USGS are available at:

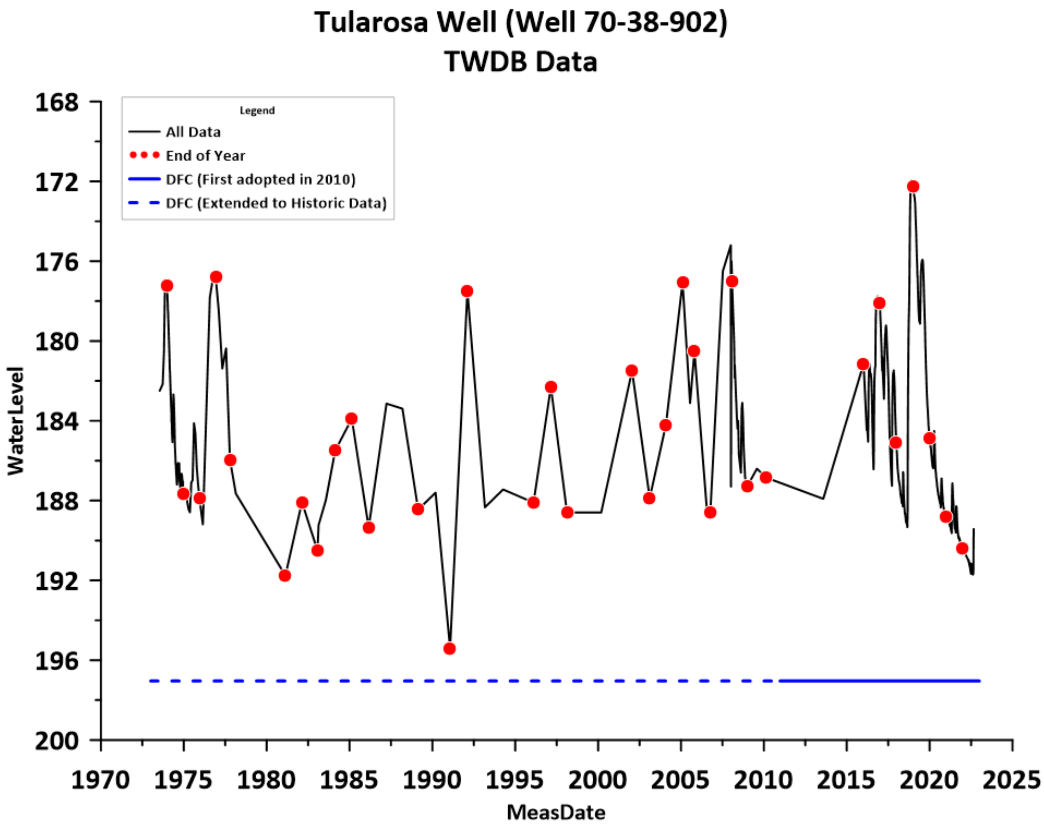
https://waterdata.usgs.gov/monitoring-location/08456310/#parameterCode=00065&period=P7D

5.8.2 GMA 10 – Well 70-38-902

The desired future condition in the GMA 10 portion of Kinney County is that the groundwater elevation in Well 70-38-902 (also known as the Tularosa Well) shall not fall below 1,184 feet mean sea level. Because this condition was based on a model run that considered end-of-year groundwater elevations, data collected at the end of the year would be used for comparison purposes.

There is a discrepancy in reported measuring point elevation. TWDB reports a measuring point elevation of 1381.042 ft MSL and 1382 ft MSL in different locations. This means the desired future condition expressed as a depth to water in the well is either 197.042 ft or 198 ft. TWDB installed an automatic recorder in the well on March 14, 2016, which facilitates the analysis of groundwater level fluctuations in this well.

All the monitoring data from this well are summarized in a hydrograph (Figure 9). The full record of depth-to-water data are shown as a black line, and the end-of-year data that would be used for this comparison is shown as red points. Please note that the depth to water data are presented along with the desired future condition (solid line after the date of adoption and dashed line before the date of adoption).



Please note that the desired future condition was based on a model simulation. The recent inclusion of this well in the automated recorder program has provided more detailed data than were available at the time of model development (2010) and at the time of the establishment of the original desired future condition (also in 2010). It appears that the desired future condition is lower than the historic minimum of the well (recorded in the early 1990s) and is significantly lower than recent times. Consequently, it appears that the desired future condition for the GMA 10 portion of Kinney County be reevaluated and changed to a higher depth to water. Additional analyses and studies are ongoing to provide technical recommendations to the Board prior to the deadline for the next proposed desired future conditions (May 1, 2026).

Objective - The District use the groundwater elevation measured in Well 70-38-902 by the Texas Water Development Board to check consistency with the desired future condition. This well is currently one of the automated recorder wells and the data are available online at:

https://waterdatafortexas.org/groundwater/well/7038902

Performance Standard – The measured groundwater elevation in Well 70-38-902 taken at the end of the year and the desired future condition minimum elevation will be reported to the Board at the first meeting of the calendar year when the data are made available by TWDB.

Appendix A-1

PowerPoint Presentation – July 14, 2022

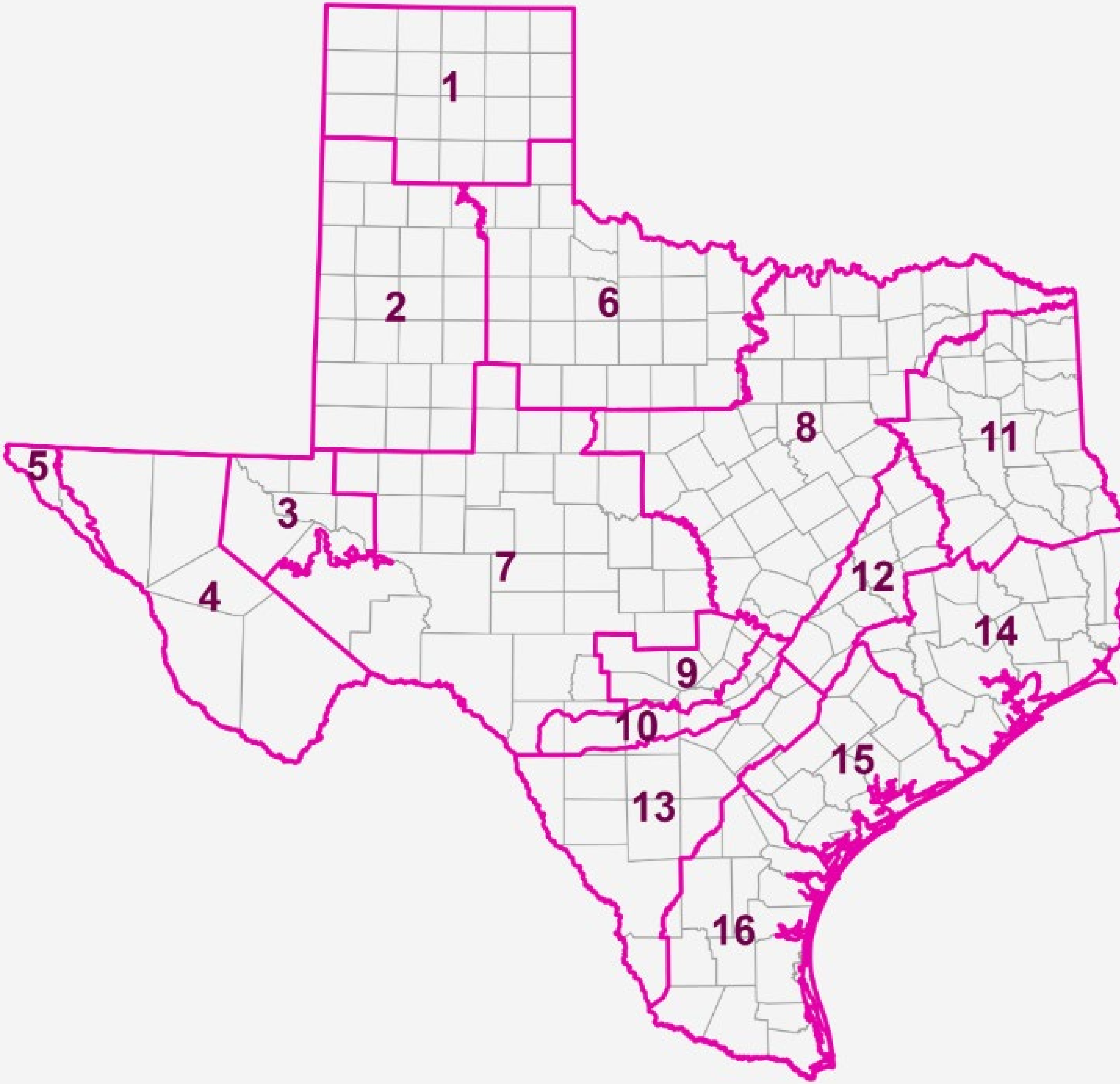
Kinney County GCD Board Meeting

Bill Hutchison

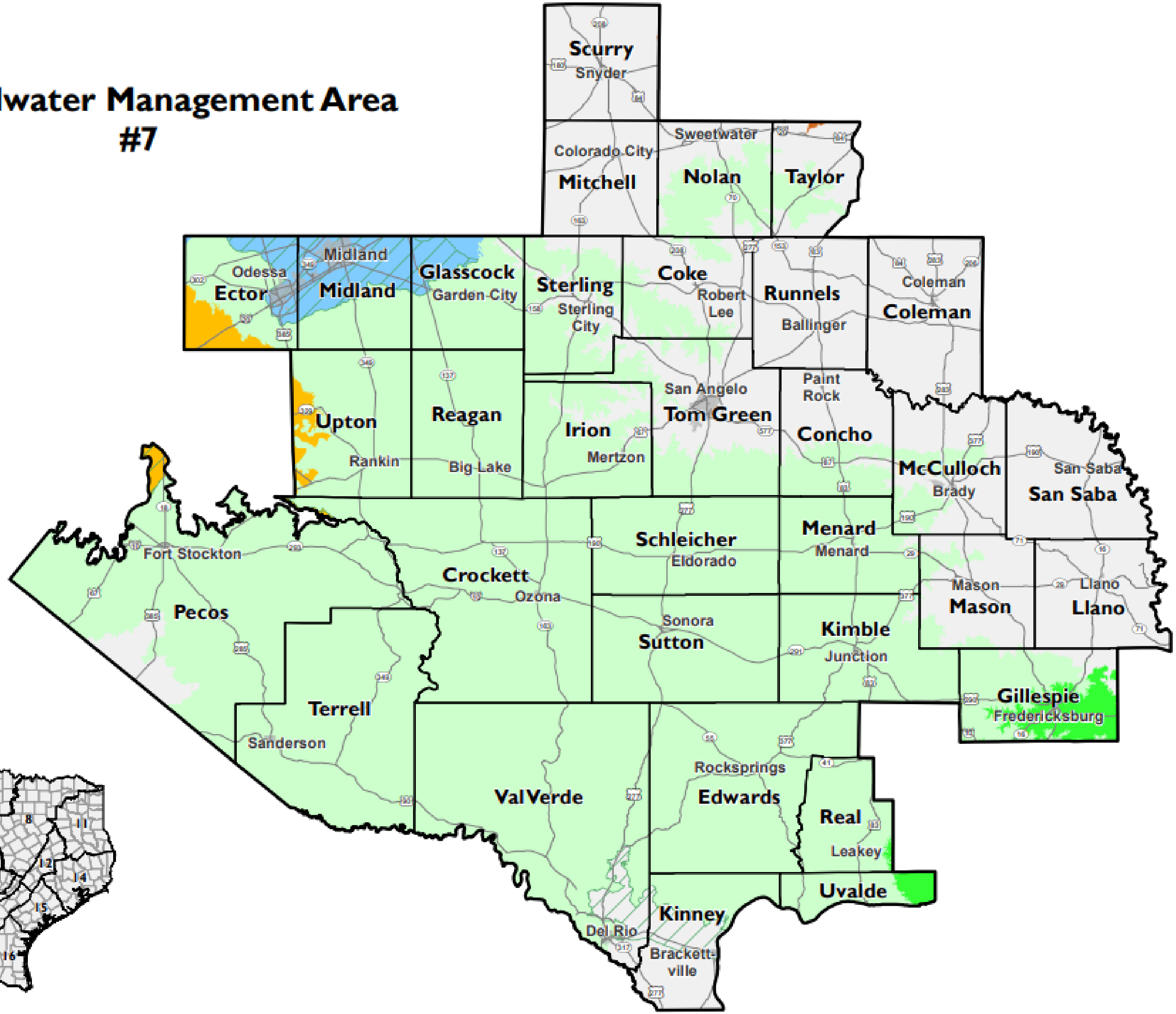
July 14, 2022

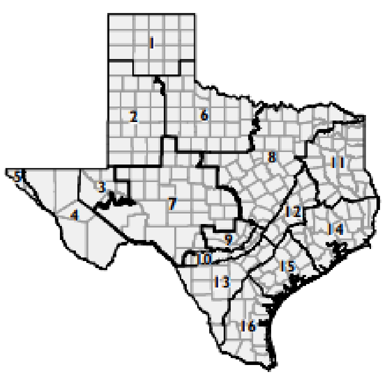
Planning vs. Management vs. Regulation

- Planning (Joint Planning Process in GMA 7 and GMA 10)
  - Desired future conditions (DFC)
  - Modeled available groundwater (MAG)
- Management (GCD Management Plan)
  - Goal 8 (Addressing in a quantitative manner the desired future conditions (DFC) of the groundwater resources in the District)
- Regulation (GCD Rules)
  - Permitting
  - Drought Management


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

Groundwater Management Area #7





County boundaries
County seats
Major roadways
Pecos Valley aquifer
Seymour aquifer
Ogallala aquifer
Edwards-Trinity Plateau aquifer (outcrop)
Edwards-Trinity Plateau aquifer (subcrop)
Trinity aquifer (outcrop)
Trinity aquifer (subcrop)

0 10 20
Miles

DISCLAIMER: This map was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of all mapped data are approximate. Map date: 05/19/2021

TNRIS

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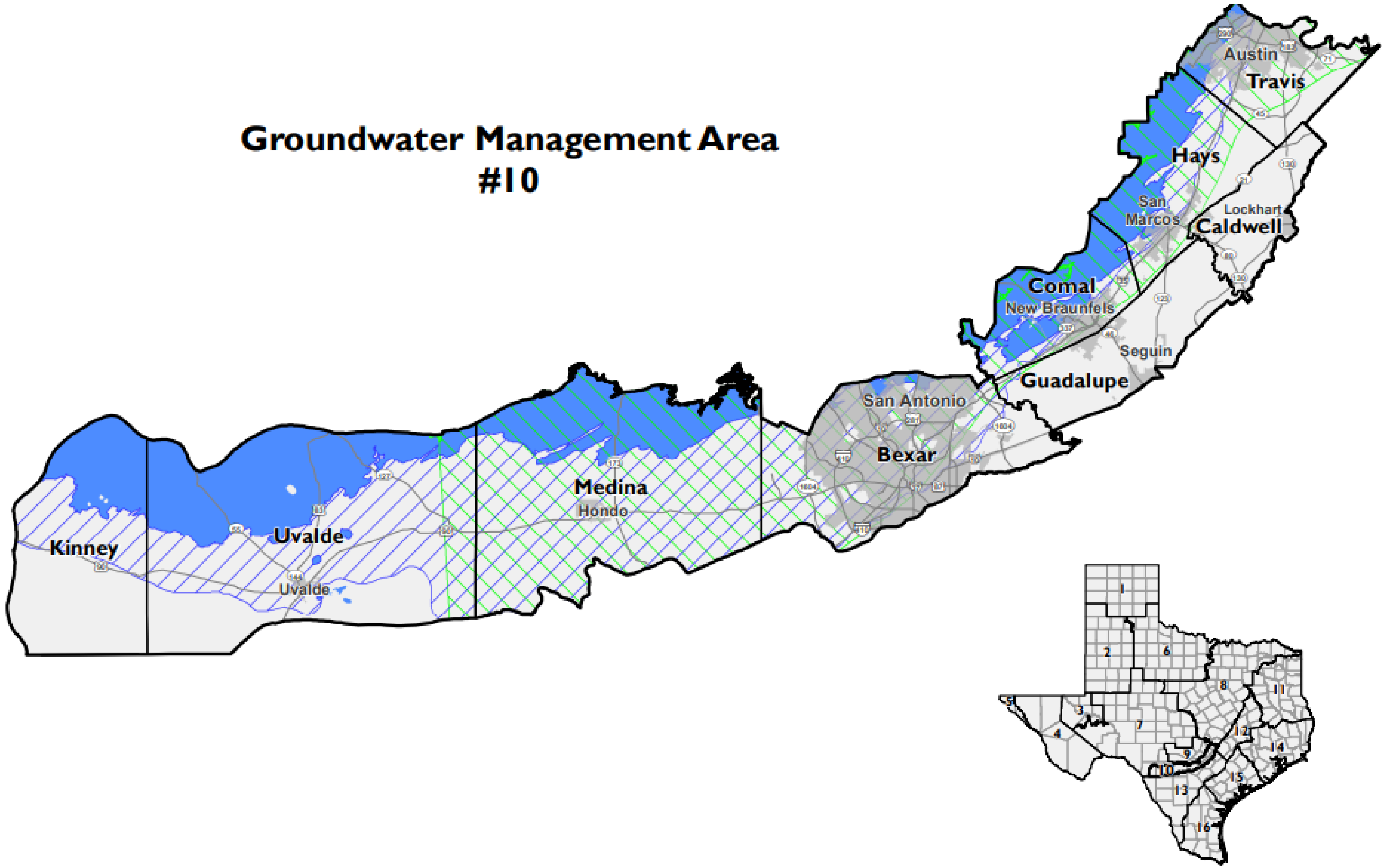
Texas Water Development Board

Groundwater Management Area #10



DISCLAIMER: This map was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of all mapped data are approximate. Map date: 05/19/2021

County boundaries
County seats
Major roadways

Edwards (Balcones Fault Zone) aquifer (outcrop)
Edwards (Balcones Fault Zone) aquifer (subcrop)
Trinity aquifer (outcrop)
Trinity aquifer (subcrop)

0 5 10
Miles

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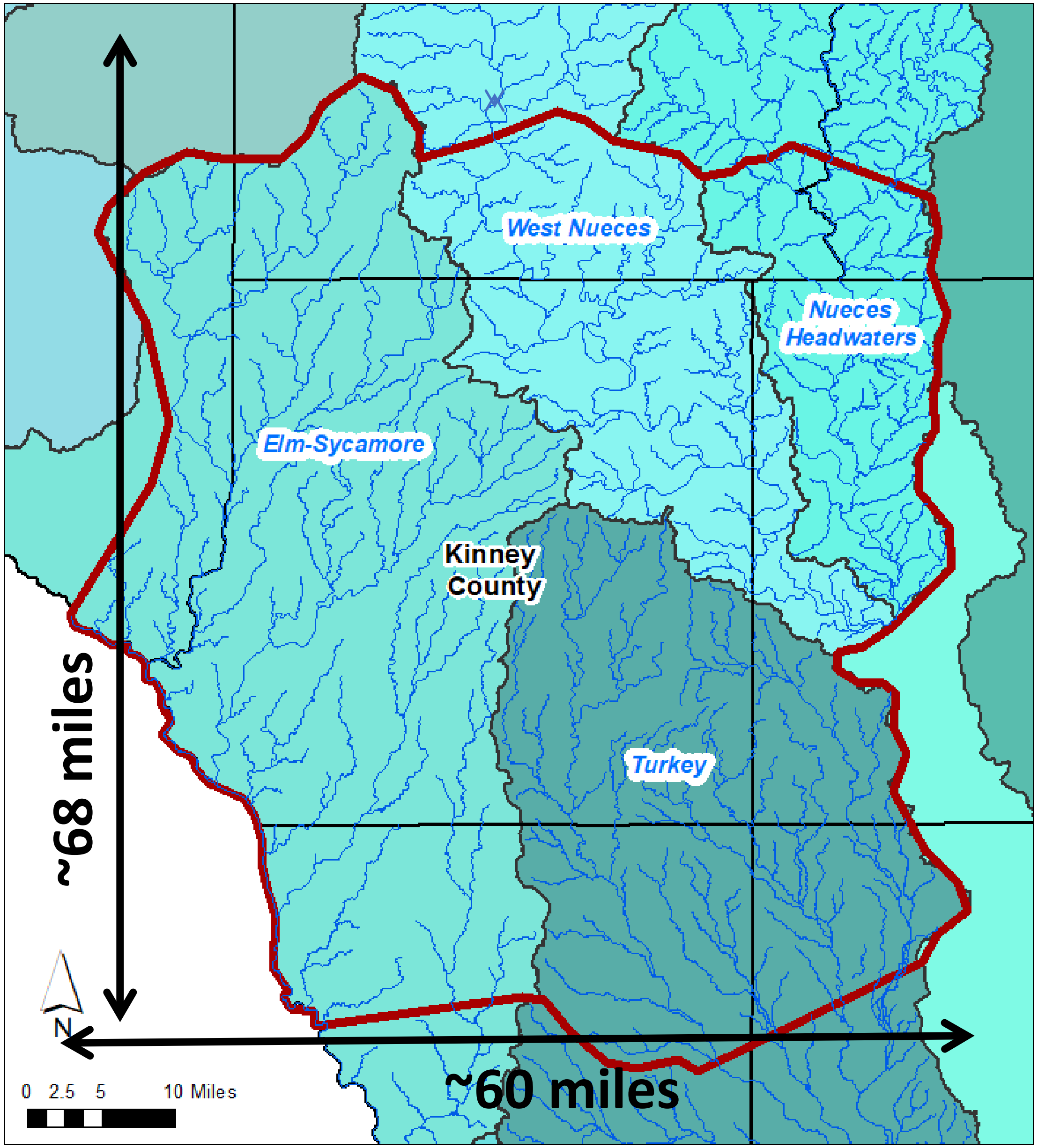
Surface Water Drainage and Model Domain



- Northern and Southern Boundaries cut across watersheds approximately 10-15 miles from the Kinney County line.
- Eastern Boundary is defined by the edge of the Nueces and Turkey Watersheds
- Western Boundary is defined by the Rio Grande Elm-Sycamore watershed and cuts off the drainage to the reservoir.

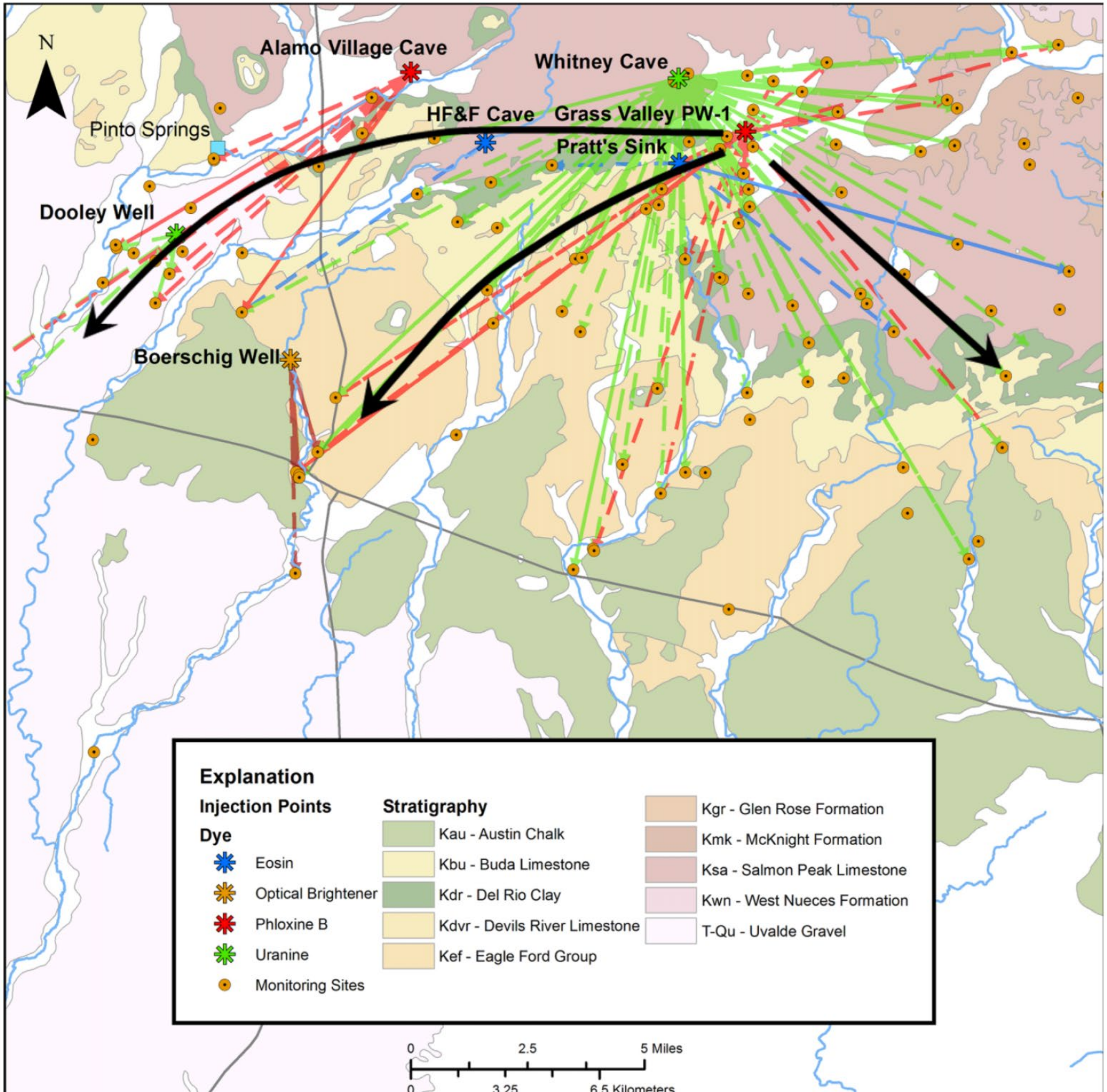
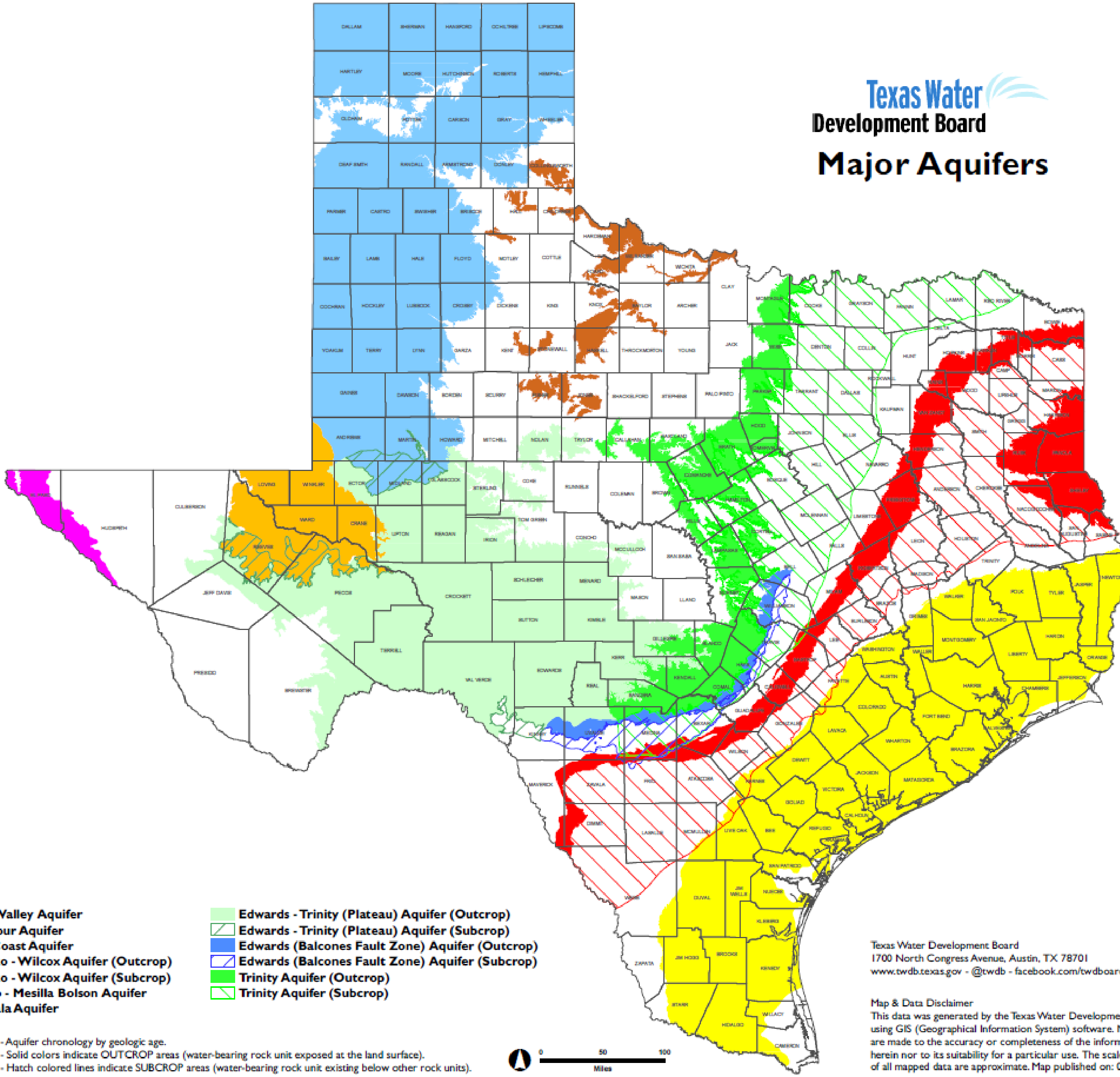


Figure 39. Groundwater Flowpaths (black arrows) Interpreted from Tracer Tests

Texas Water Development Board

Major Aquifers



- Pecos Valley Aquifer
- Seymour Aquifer
- Gulf Coast Aquifer
- Carrizo - Wilcox Aquifer (Outcrop)
- Carrizo - Wilcox Aquifer (Subcrop)
- Hueco - Mesilla Bolson Aquifer
- Ogallala Aquifer
- Edwards - Trinity (Plateau) Aquifer (Outcrop)
- Edwards - Trinity (Plateau) Aquifer (Subcrop)
- Edwards (Balcones Fault Zone) Aquifer (Outcrop)
- Edwards (Balcones Fault Zone) Aquifer (Subcrop)
- Trinity Aquifer (Outcrop)
- Trinity Aquifer (Subcrop)

- Aquifer chronology by geologic age.
- Solid colors indicate OUTCROP areas (water-bearing rock unit exposed at the land surface).
- Hatch colored lines indicate SUBCROP areas (water-bearing rock unit existing below other rock units).

0 50 100
Miles

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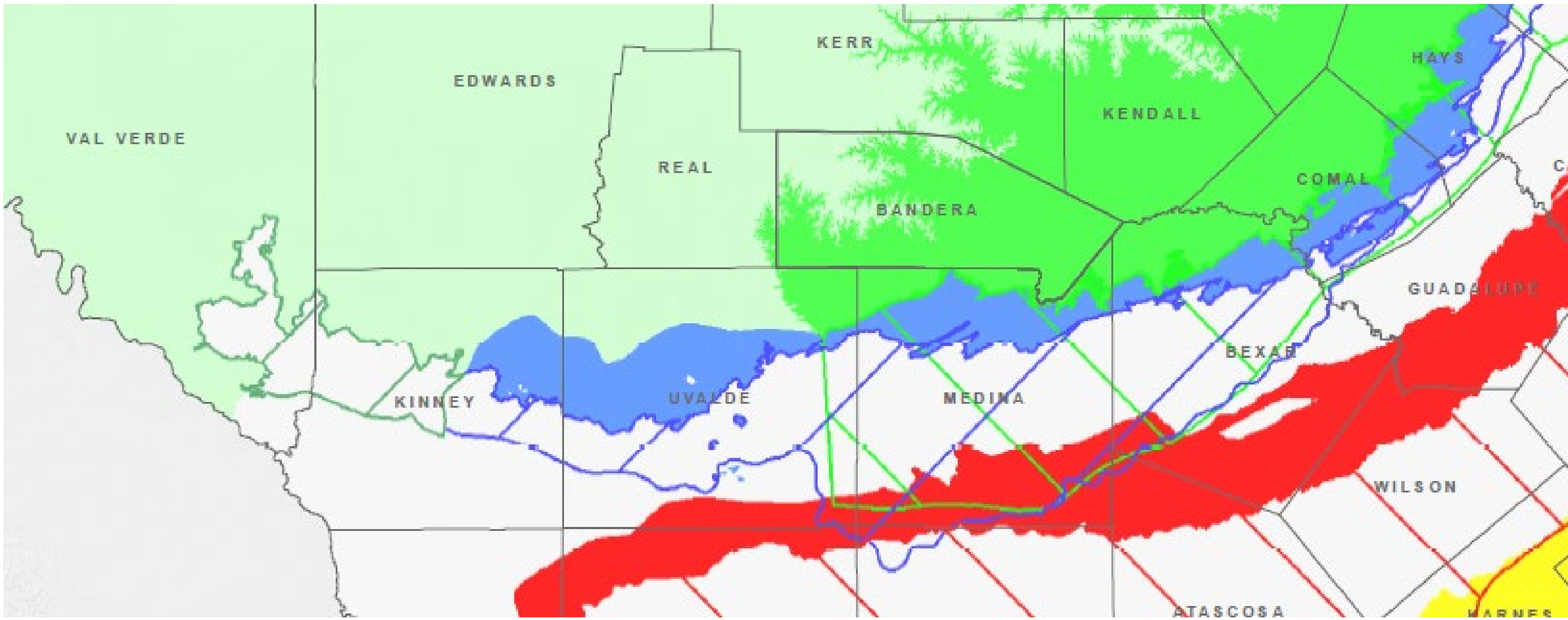
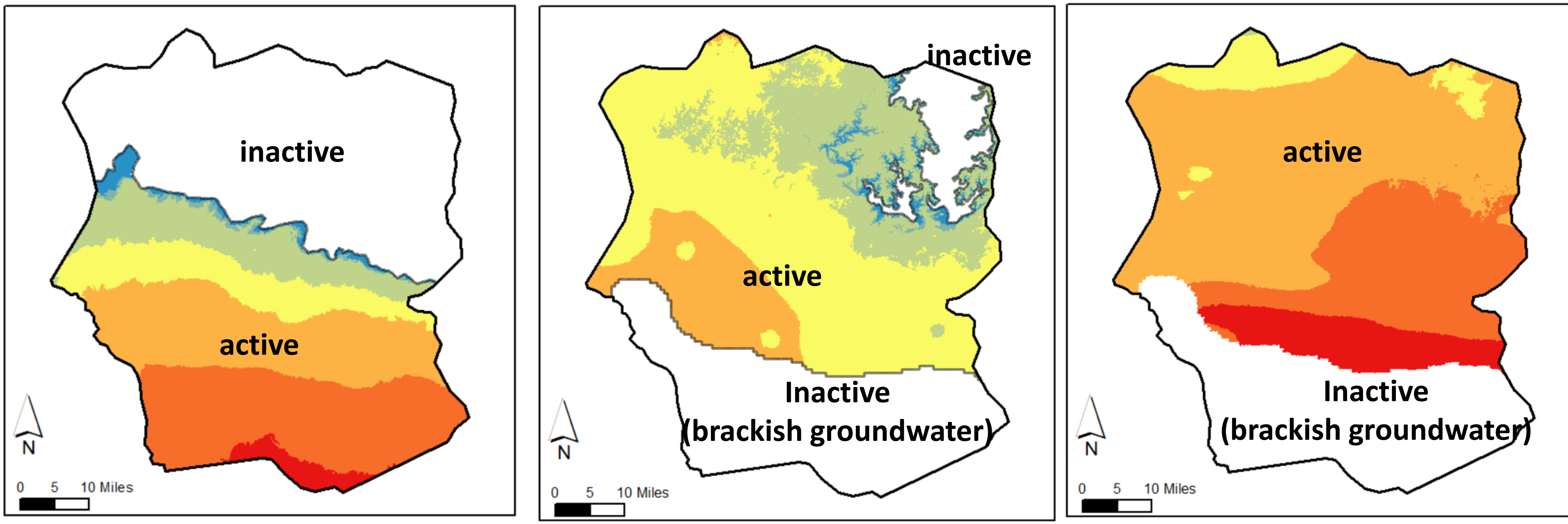
Map & Data Disclaimer
This data was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein nor to its suitability for a particular use. The scale and location of all mapped data are approximate. Map published on: 01/01/2019



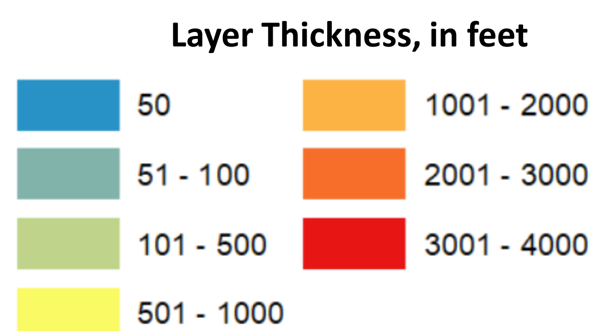
KERR
EDWARDS
HAYS
KENDALL
VAL VERDE
REAL
COMAL
BANDERA
GUADALUPE
BEXAR
KINNEY
UVALDE
MEDINA
WILSON
ATASCOSA

Model Layer Thickness

Layer 1 Upper Cretaceous | **Layer 2 Edwards** | **Layer 3 Trinity**

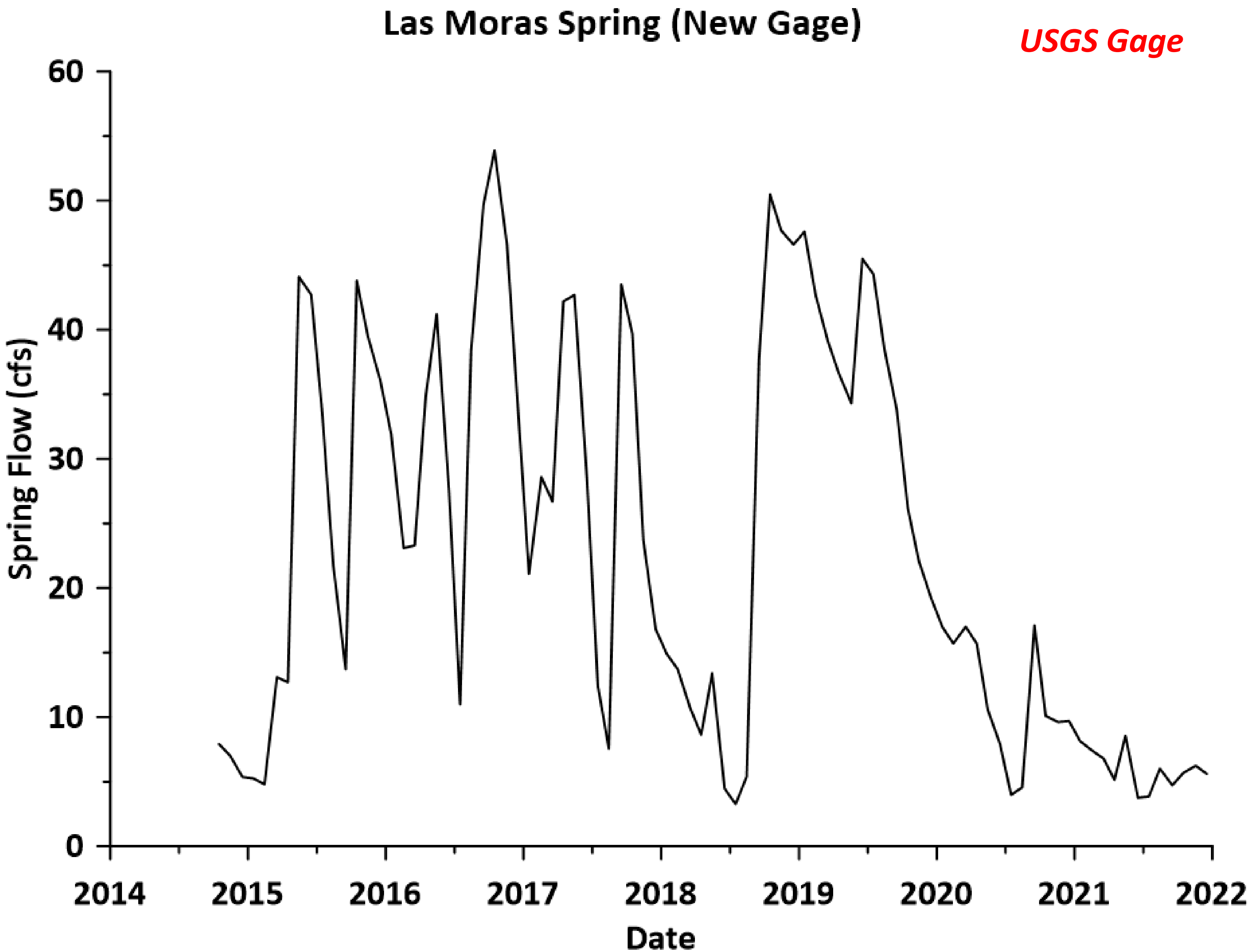


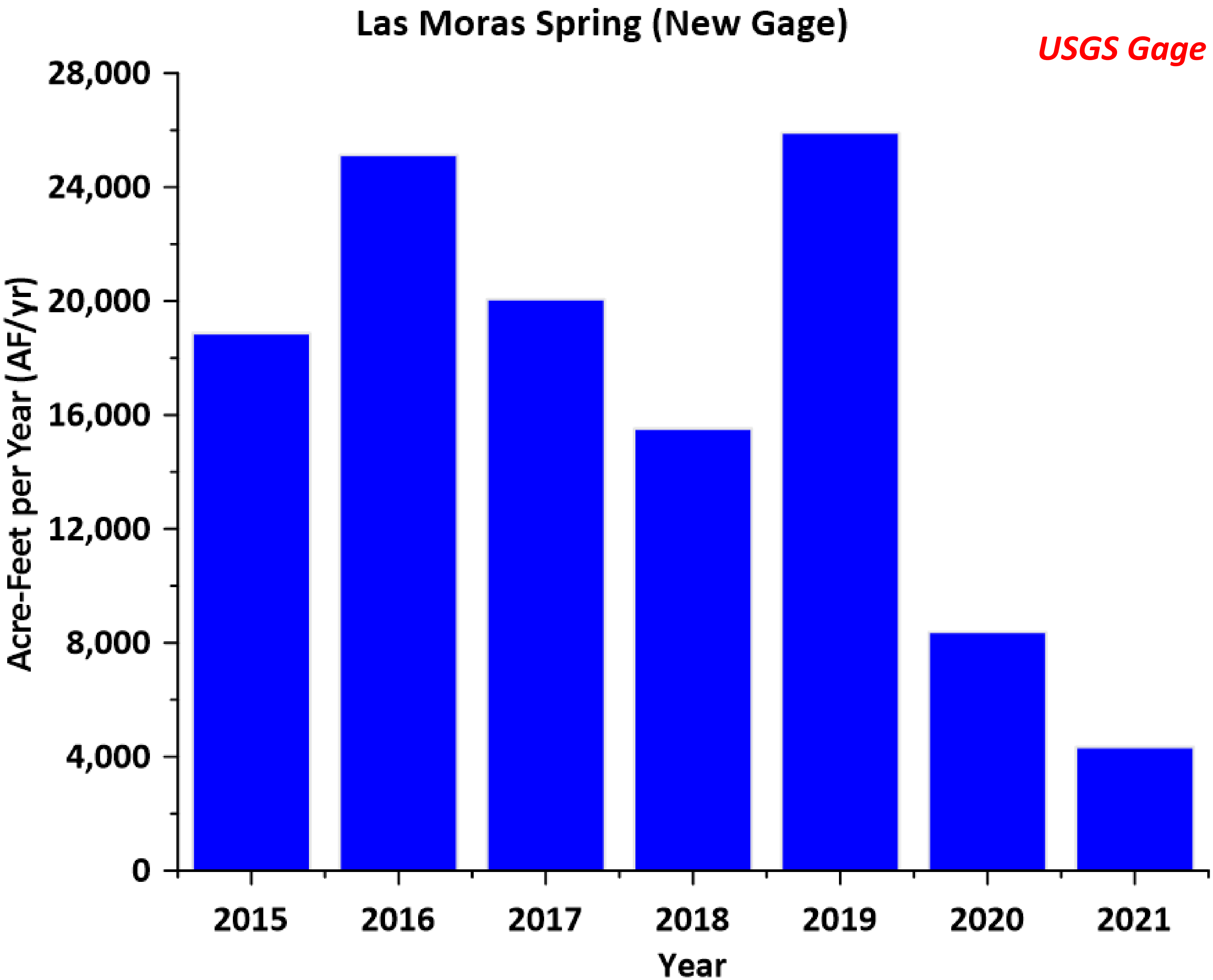
- Elevations for layers at surface uses a high Resolution Land Surface DEM
- Layer bottom elevations are defined by the regional model.
- A minimum thickness is set to 50 feet.

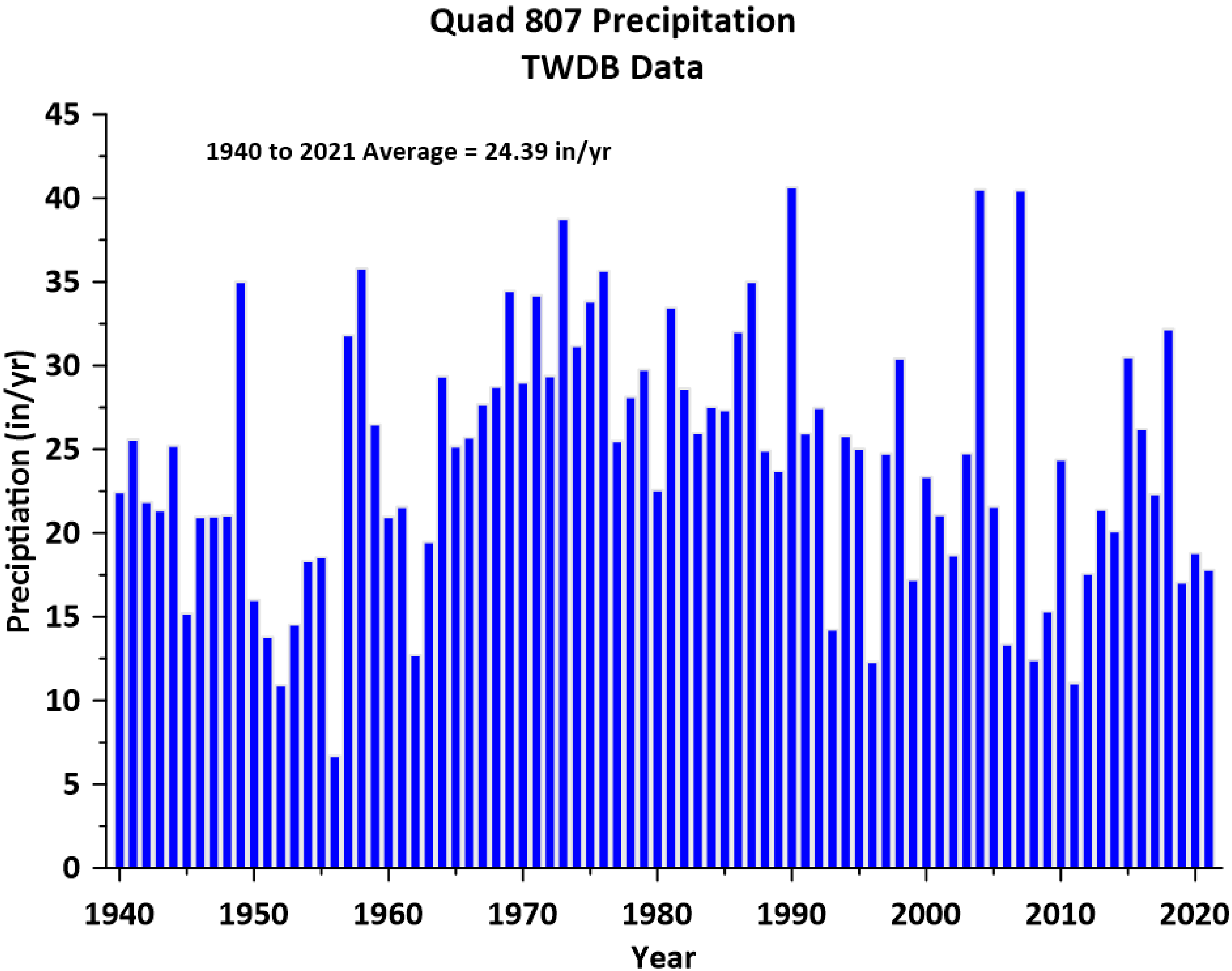


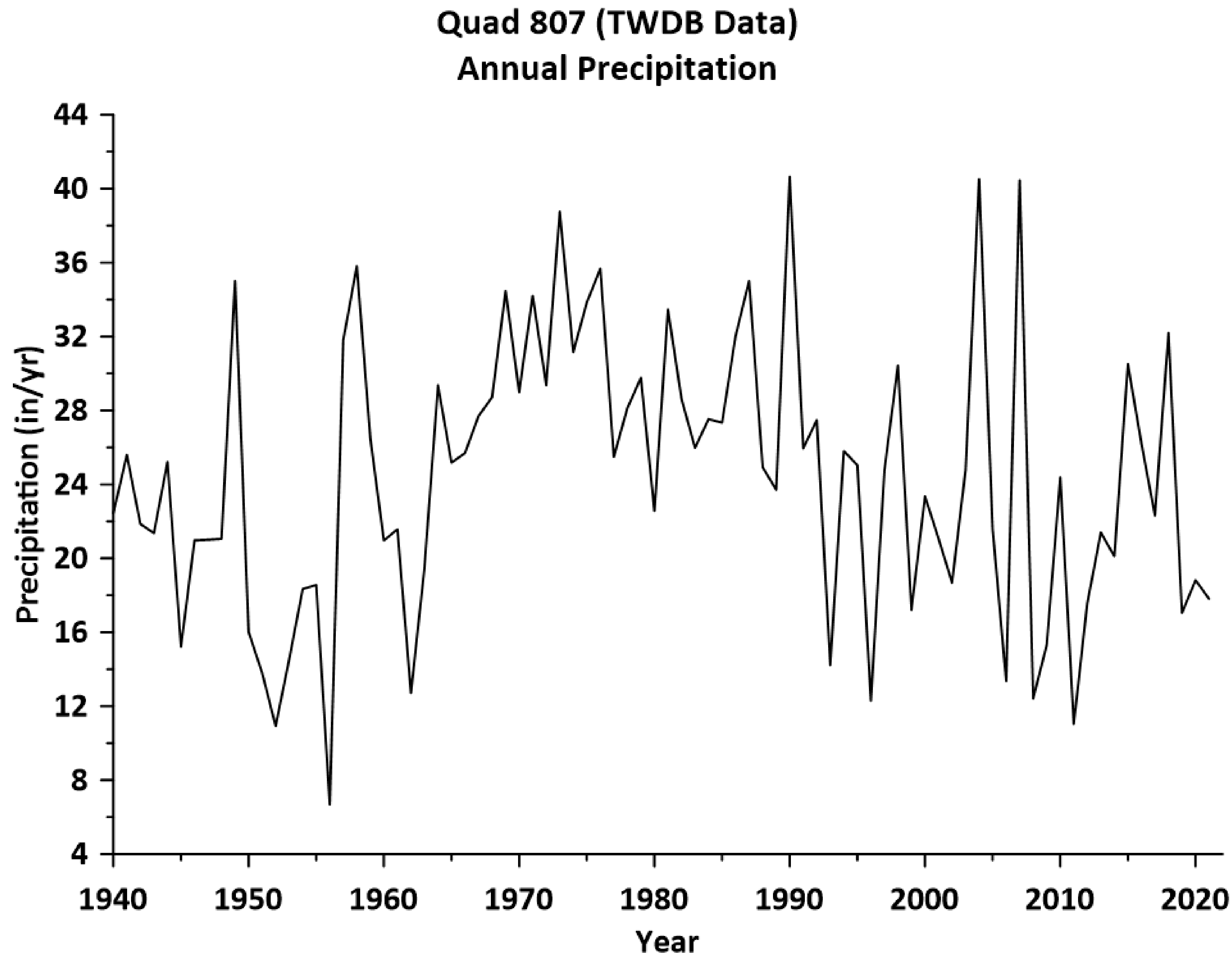
Numbers and Units

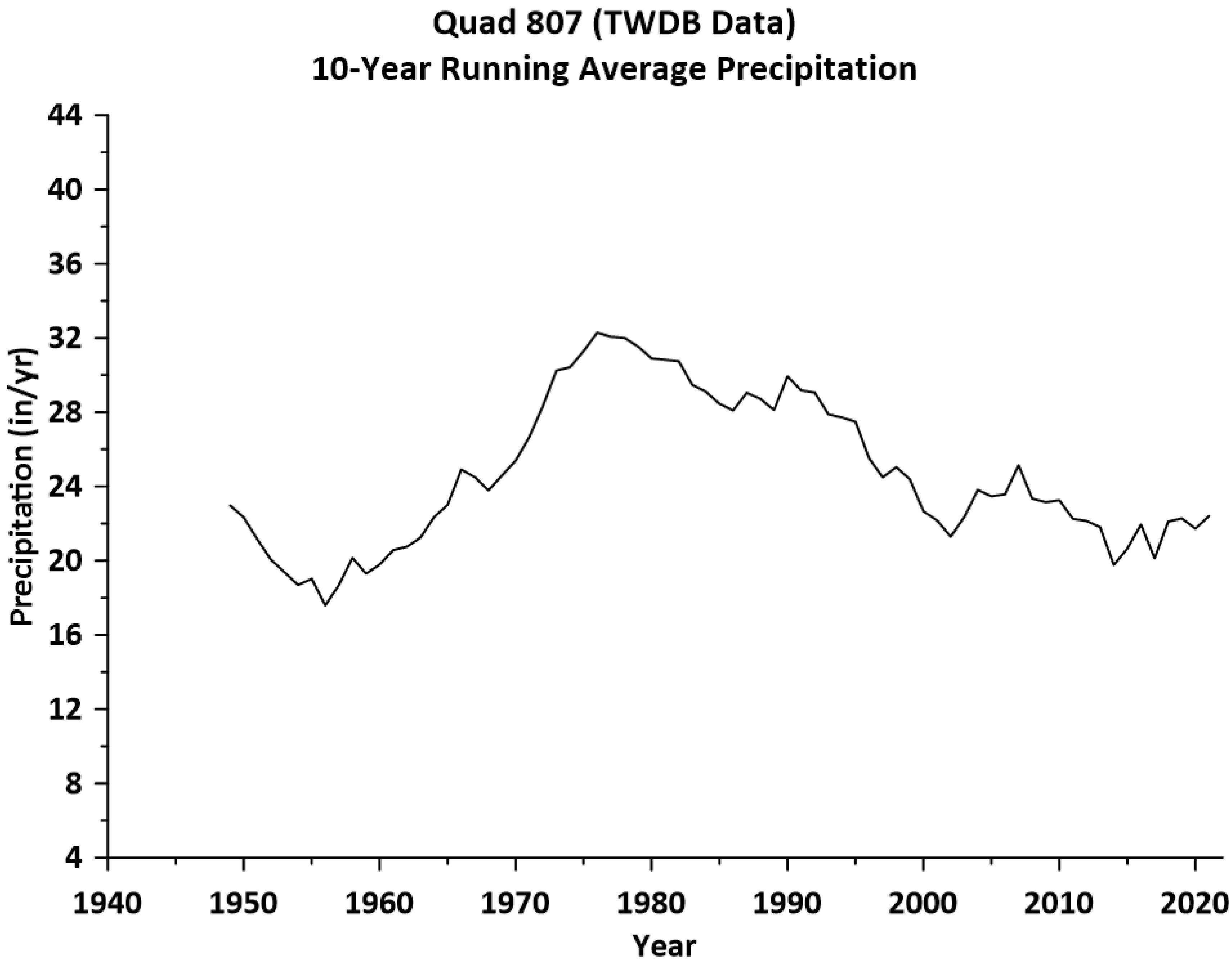
- Spring Flow (cubic feet per second or cfs)
- Rainfall (inches)
- Pumping (acre-feet)

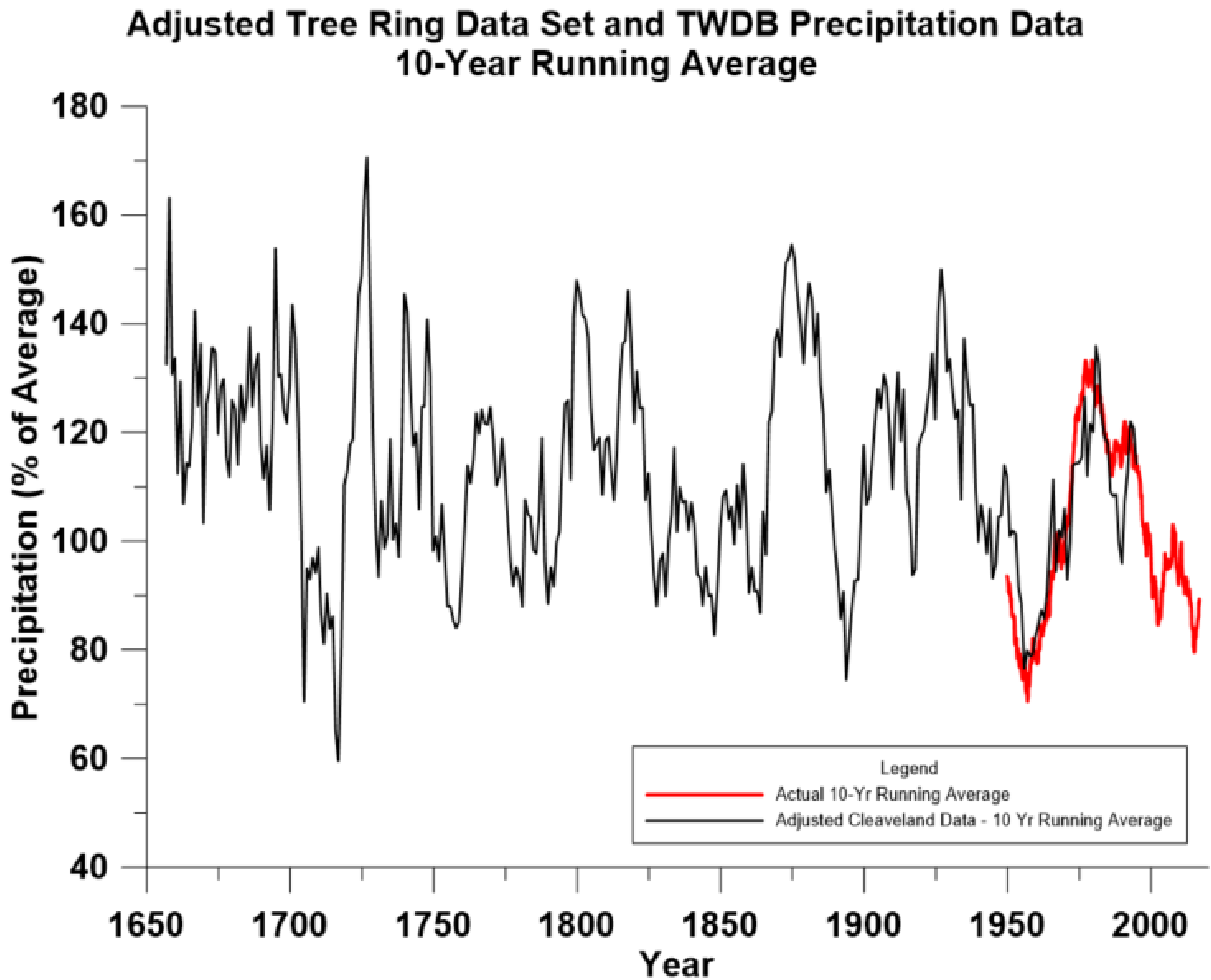

Las Moras Spring (New Gage)
USGS Gage
Spring Flow (cfs)
0
10
20
30
40
50
60
2014
2015
2016
2017
2018
2019
2020
2021
2022
Date


Las Moras Spring (New Gage)
USGS Gage
Acre-Feet per Year (AF/yr)
28,000
24,000
20,000
16,000
12,000
8,000
4,000
0
2015
2016
2017
2018
2019
2020
2021
Year


Quad 807 Precipitation
TWDB Data
1940 to 2021 Average = 24.39 in/yr
Precipitation (in/yr)
0
5
10
15
20
25
30
35
40
45
1940
1950
1960
1970
1980
1990
2000
2010
2020
Year


Quad 807 (TWDB Data)
Annual Precipitation
Precipitation (in/yr)
44
40
36
32
28
24
20
16
12
8
4
1940
1950
1960
1970
1980
1990
2000
2010
2020
Year


Quad 807 (TWDB Data)
10-Year Running Average Precipitation
Precipitation (in/yr)
44
40
36
32
28
24
20
16
12
8
4
1940
1950
1960
1970
1980
1990
2000
2010
2020
Year


Adjusted Tree Ring Data Set and TWDB Precipitation Data
10-Year Running Average
Precipitation (% of Average)
180
160
140
120
100
80
60
40
1650
1700
1750
1800
1850
1900
1950
2000
Year
Legend
Actual 10-Yr Running Average
Adjusted Cleaveland Data - 10 Yr Running Average

Recharge = % of Precipitation

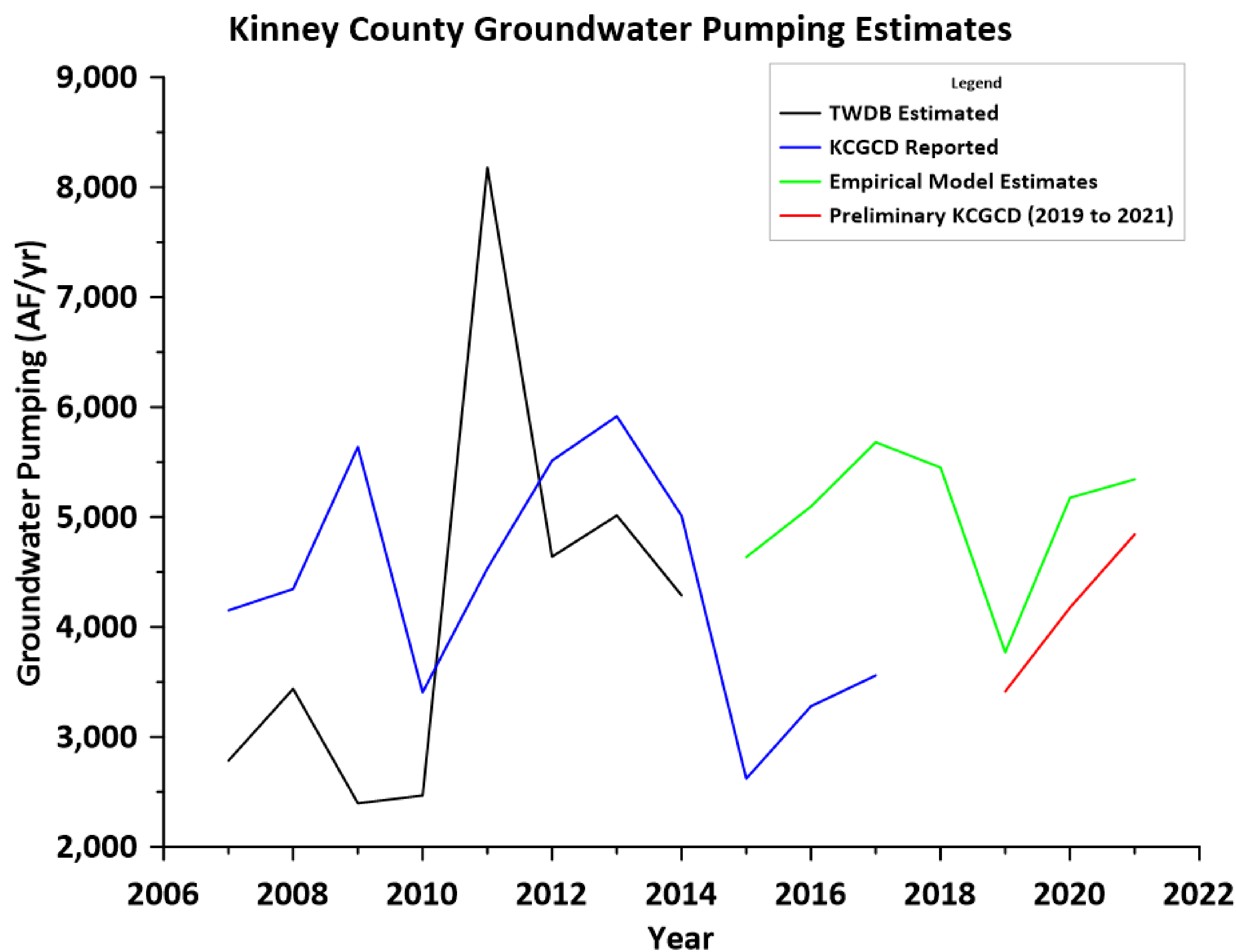
- Variable number (5% to 15%)
  - Depends on intensity of storms
  - Depends on location of storms
  - Depends on previous conditions (wet or dry) when storm occurs

Recharge (inches to acre-feet)

- Kinney County area = 1,365 square miles
  - 873,600 acres
- Important recharge area is northern “half” of county = 436,800 acres
- 1 in of recharge per year = 36,400 AF/yr
- 2 in of recharge per year = 72,800 AF/yr
- Does not consider groundwater underflow from Edwards County (substantial)

Pumping

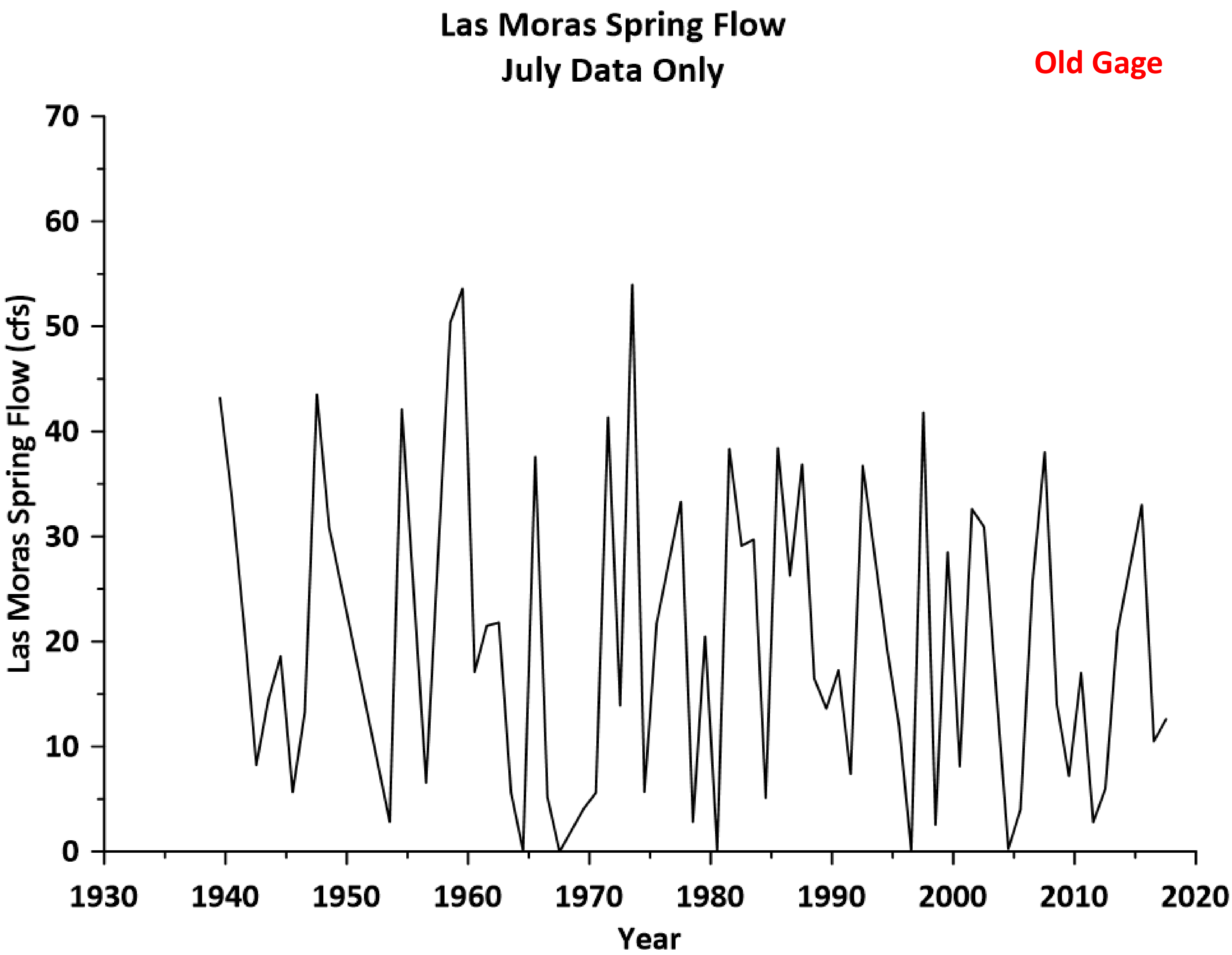
- TWDB Estimates (from KCGCD management plan)
- Permit reported pumping
- Empirical model estimates
  - Based on analysis of variation in spring flow and precipitation

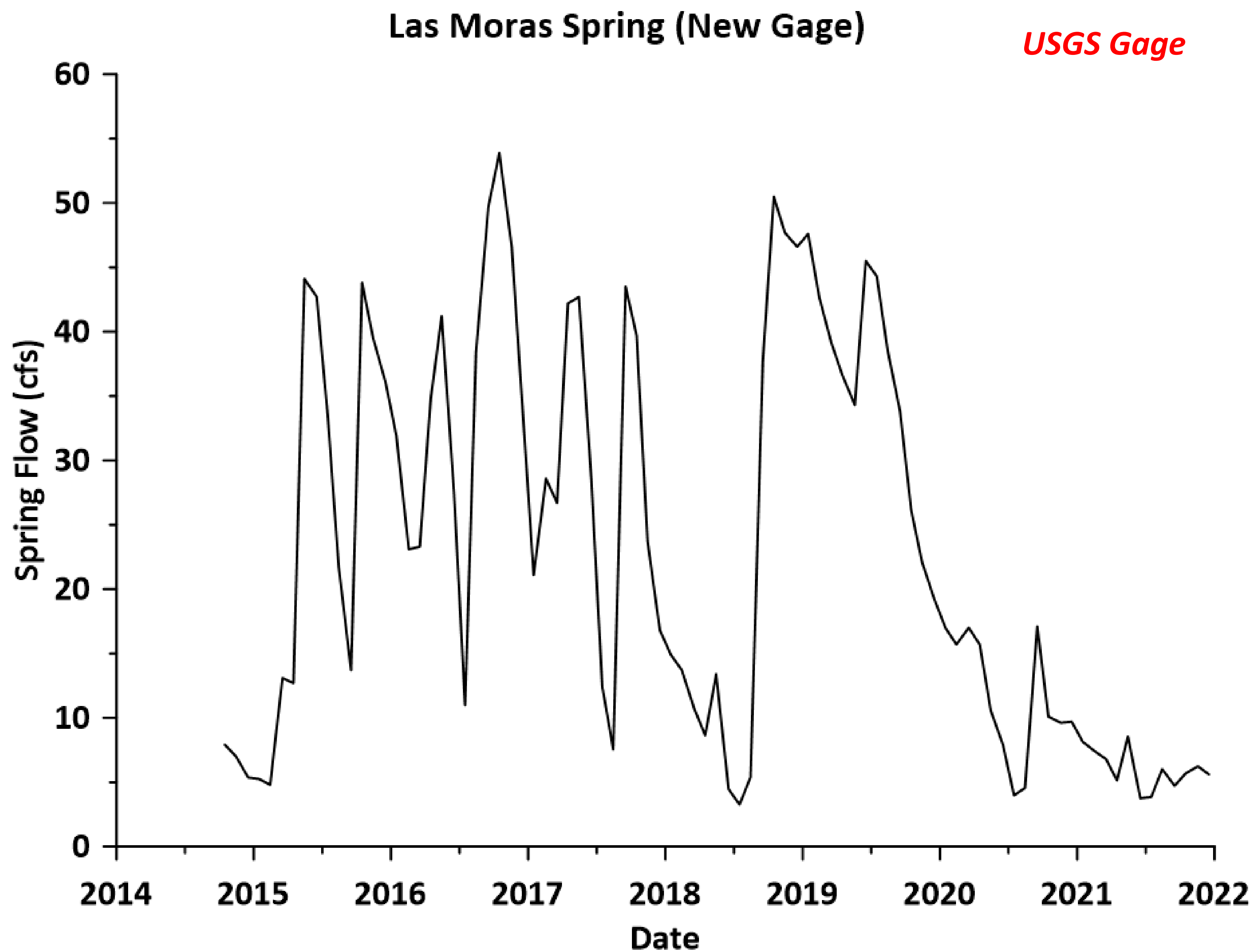


Kinney County Groundwater Pumping Estimates
Legend
TWDB Estimated
KCGCD Reported
Empirical Model Estimates
Preliminary KCGCD (2019 to 2021)
Groundwater Pumping (AF/yr)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
2006
2008
2010
2012
2014
2016
2018
2020
2022
Year

Example of Pumping Uncertainty

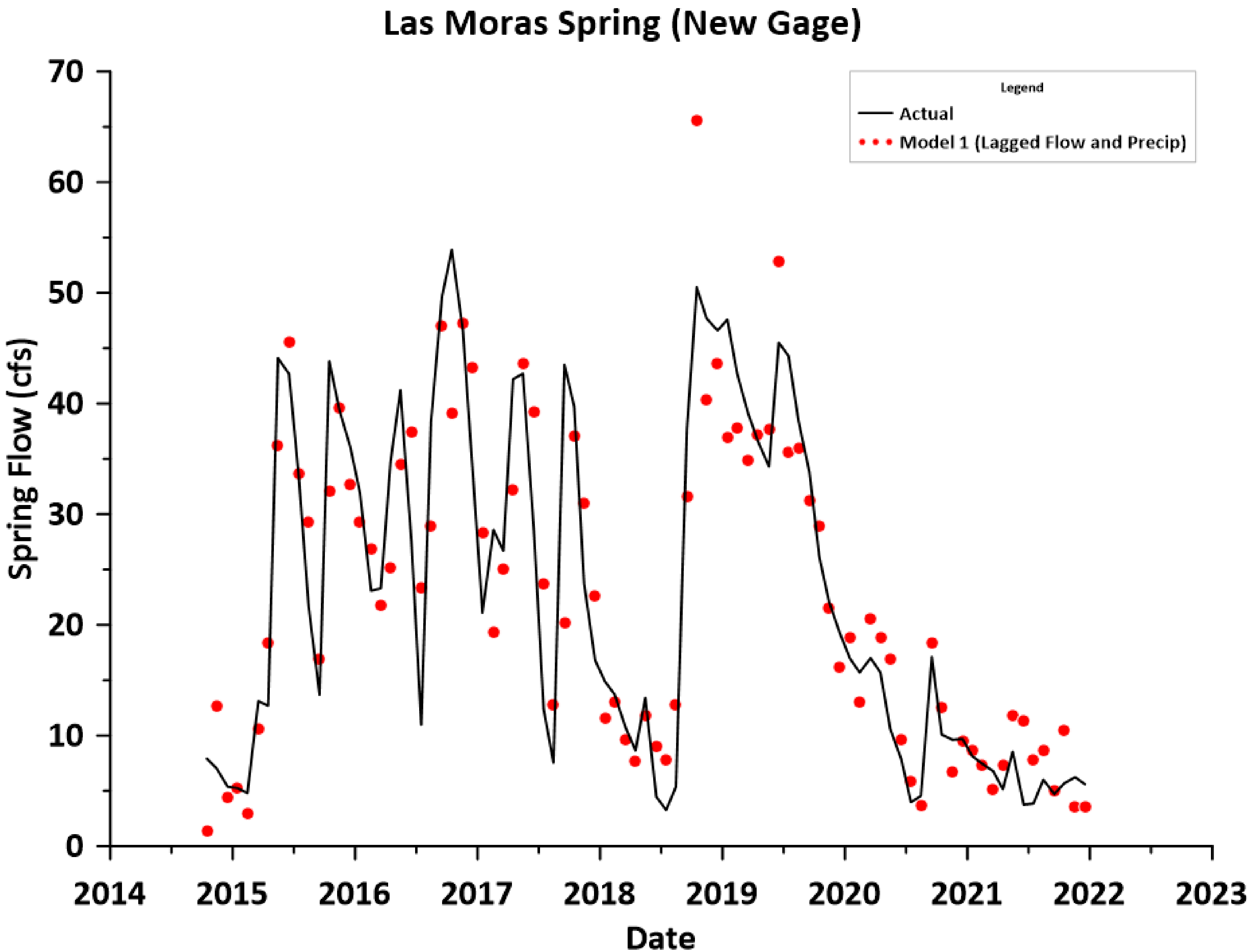
- Submitted to KCGCD (single well, single month)
  - 37.62 AF
  - 166 hours @1,000 gpm
- 166 hours * 1,000 gpm = 30.57 AF
- 37.62 AF in 166 hours = 1,231 gpm


Las Moras Spring Flow
July Data Only
Old Gage
Las Moras Spring Flow (cfs)
Year
0
10
20
30
40
50
60
70
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020

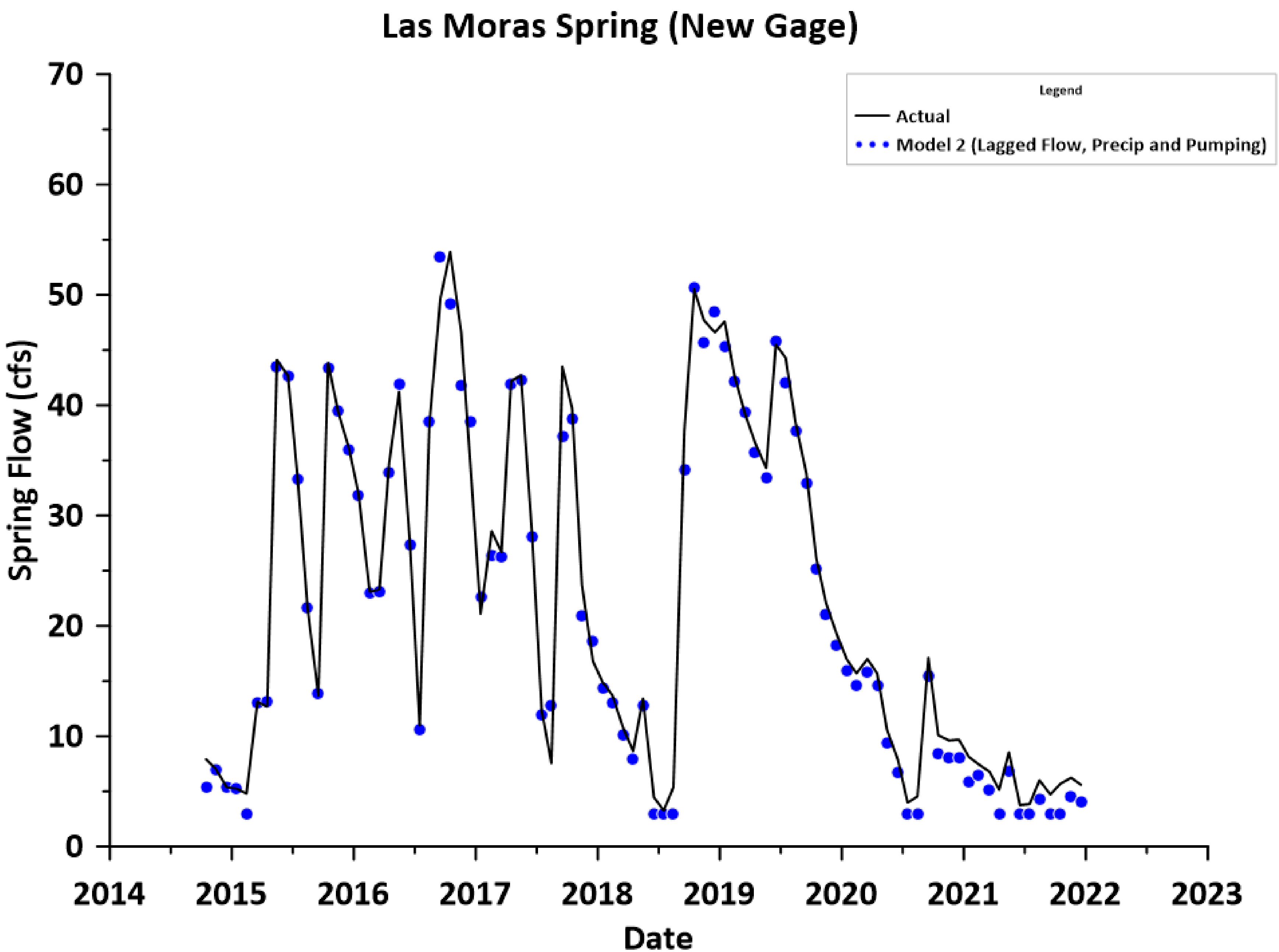

Las Moras Spring (New Gage)
USGS Gage
Spring Flow (cfs)
0
10
20
30
40
50
60
2014
2015
2016
2017
2018
2019
2020
2021
2022
Date

Empirical Model

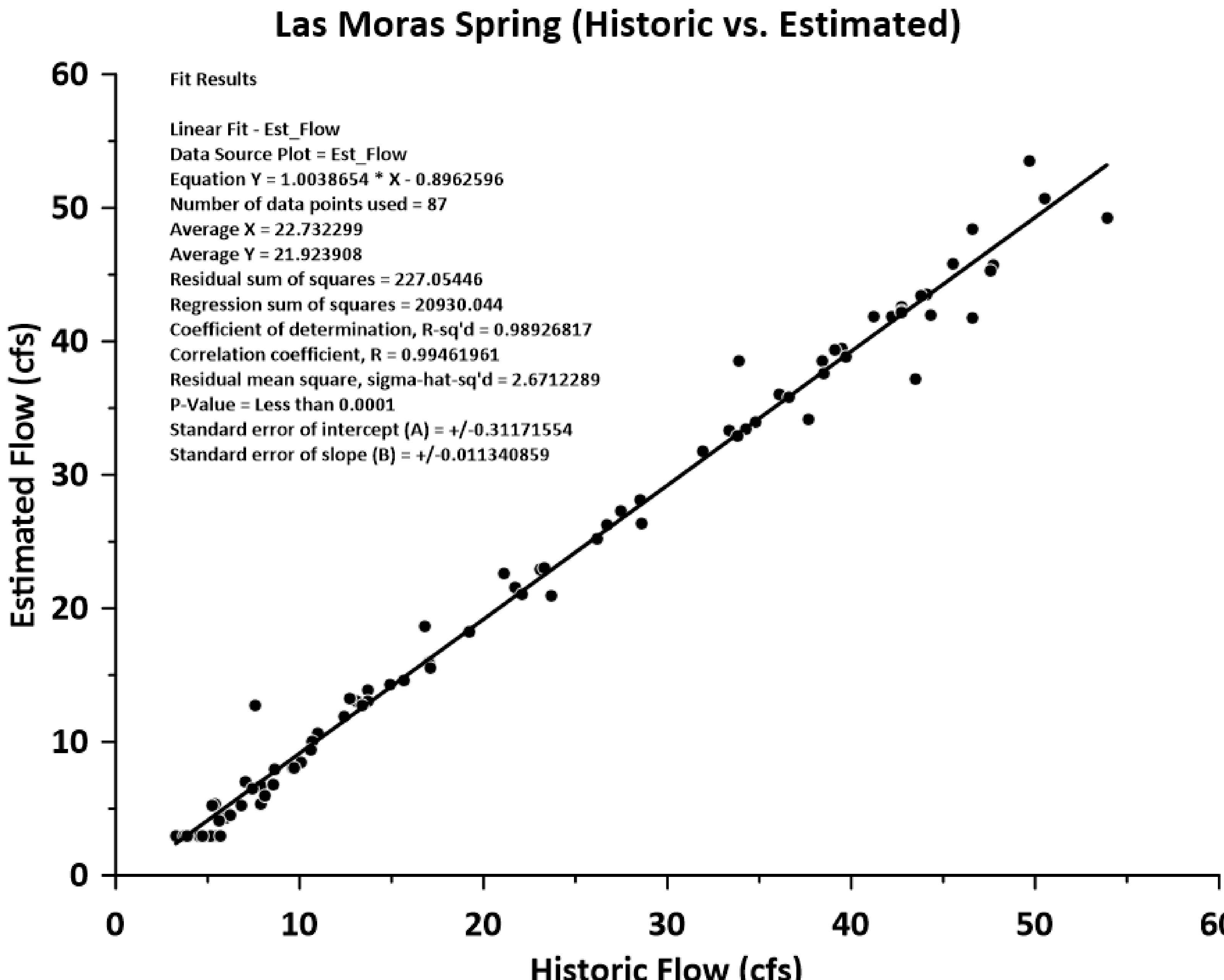
- Estimate monthly spring flow
- Step 1
  - Previous month spring flow
  - Monthly precipitation
- Step 2
  - Previous month spring flow
  - Monthly precipitation
  - Monthly pumping



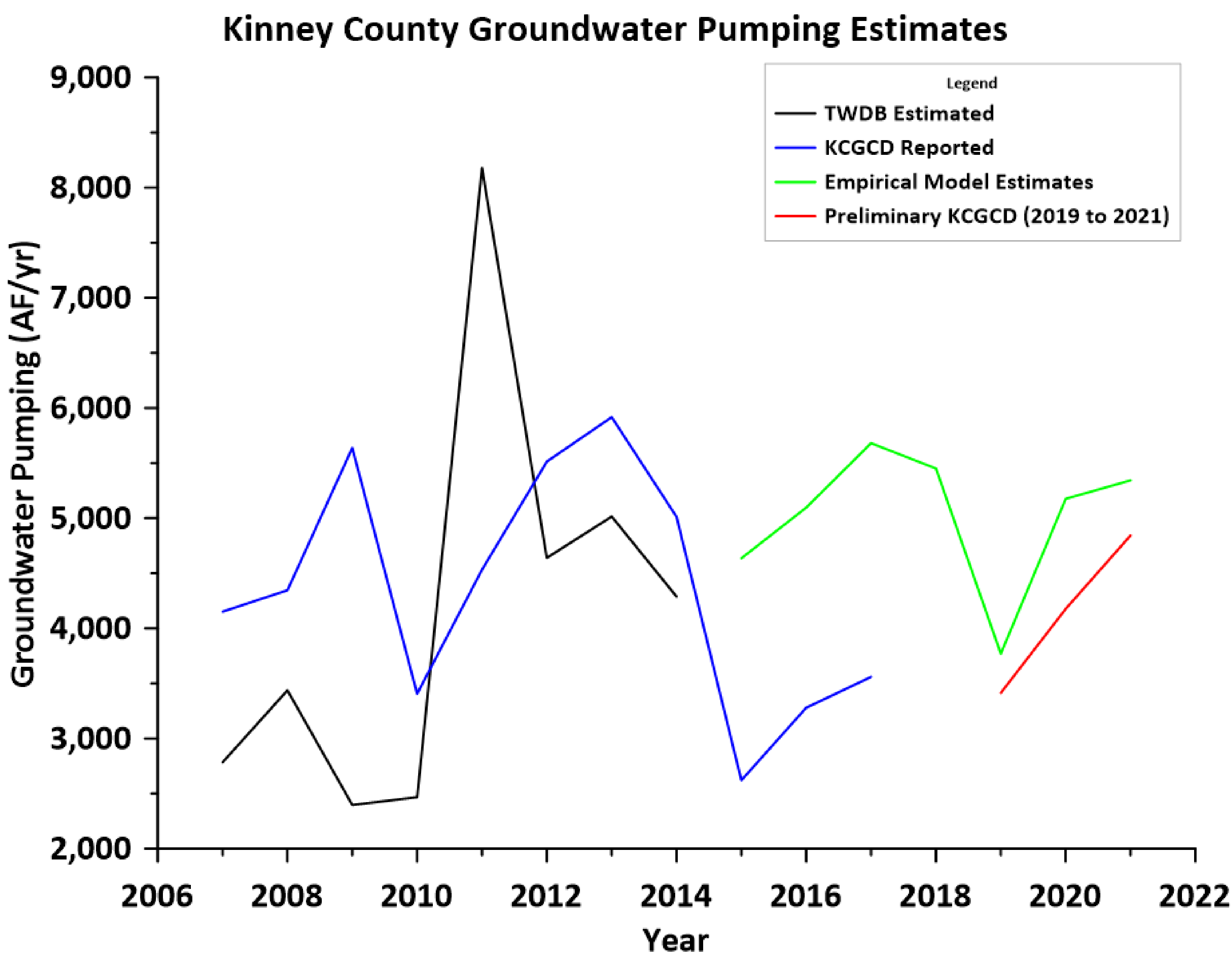
Las Moras Spring (New Gage)
Legend
Actual
Model 1 (Lagged Flow and Precip)
Spring Flow (cfs)
0
10
20
30
40
50
60
70
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Date



Las Moras Spring (New Gage)
Legend
Actual
Model 2 (Lagged Flow, Precip and Pumping)
Spring Flow (cfs)
0
10
20
30
40
50
60
70
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Date



Las Moras Spring (Historic vs. Estimated)
Fit Results
Linear Fit - Est_Flow
Data Source Plot = Est_Flow
Equation Y = 1.0038654 * X - 0.8962596
Number of data points used = 87
Average X = 22.732299
Average Y = 21.923908
Residual sum of squares = 227.05446
Regression sum of squares = 20930.044
Coefficient of determination, R-sq'd = 0.98926817
Correlation coefficient, R = 0.99461961
Residual mean square, sigma-hat-sq'd = 2.6712289
P-Value = Less than 0.0001
Standard error of intercept (A) = +/-0.31171554
Standard error of slope (B) = +/-0.011340859
Estimated Flow (cfs)
Historic Flow (cfs)
0
10
20
30
40
50
60

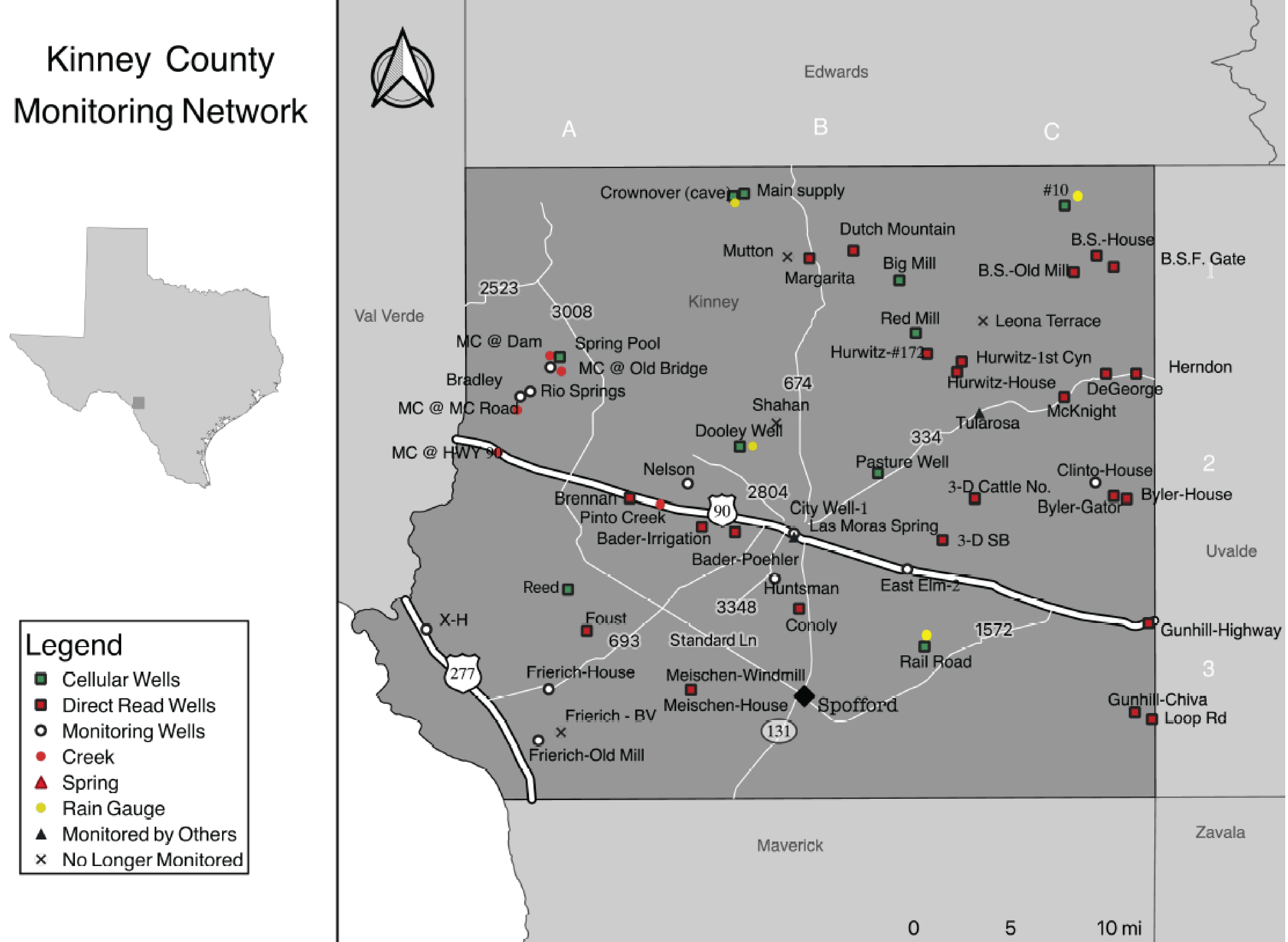


Kinney County Groundwater Pumping Estimates
Legend
TWDB Estimated
KCGCD Reported
Empirical Model Estimates
Preliminary KCGCD (2019 to 2021)
Groundwater Pumping (AF/yr)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
2006
2008
2010
2012
2014
2016
2018
2020
2022
Year

Number Comparison (AF/yr)

- Recharge:
  - 2 in = 72,800 AF/yr (<10% of average precipitation)
  - Average Rainfall = 24.39 in (1940 to 2021)
- Spring Flow (new gage)
  - 4,343 AF/yr in 2021
  - 25,906 AF/yr in 2019
- Groundwater Pumping (estimated from empirical spring model)
  - 3,769 AF/yr in 2019
  - 5,681 AF/yr in 2017

Kinney County Monitoring Network



Map prepared by EcoKai Environmental Inc., Mar 2022
Coordinate Reference System: WGS 84

Appendix A-2

Update on Data Analysis and Model Development

PowerPoint Presentation – September 15, 2022

Update on Data Analysis and Model Development

Bill Hutchison

Kinney County GCD Board Meeting

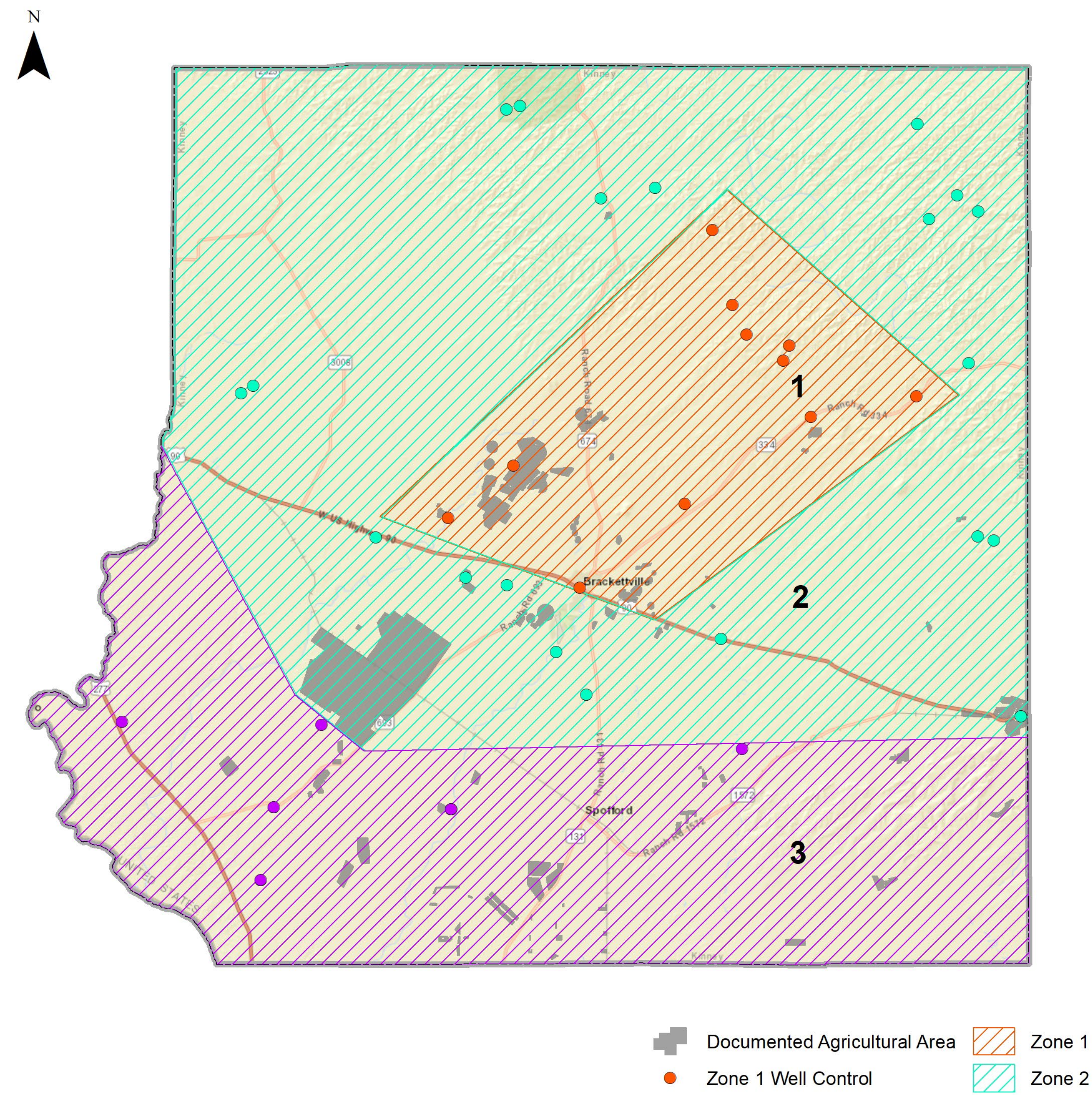
September 15, 2022

Topics

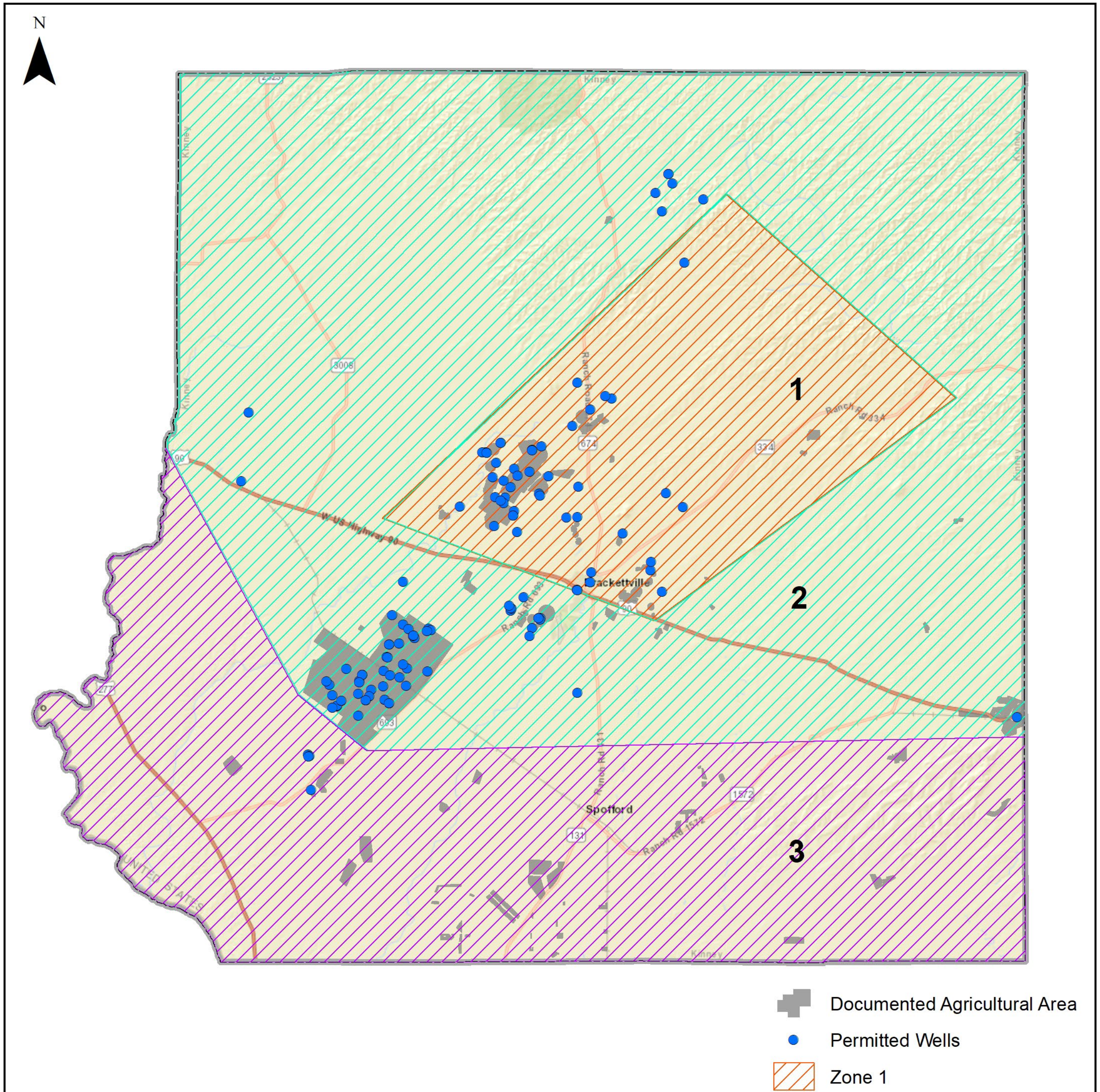
- Monitoring well data
  - Cross plot end-of-month monitoring well data with end-of-month Las Moras spring flow
  - Possible update to management zone concept based on cross plots
- Landsat analysis of irrigation acreage (ARS LLC)
  - Estimates of irrigation pumping based on irrigation acreage
  - Comparison with other estimates of pumping
- Next Steps

Monitoring Well Data

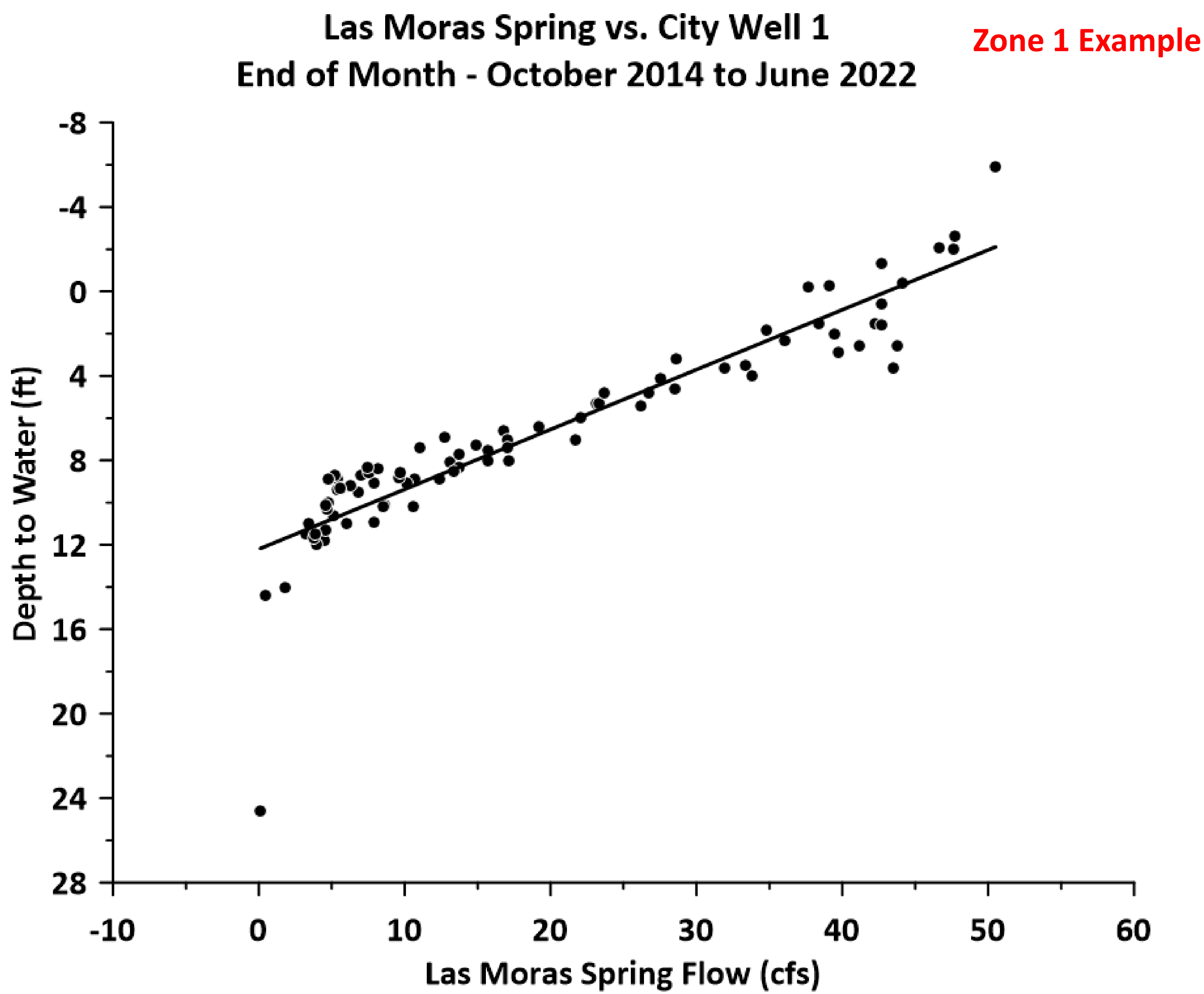
- Processed all downloaded data
  - Determine “end-of-month” data for 39 wells (excluded wells with short records)
- Cross plot with end-of-month Las Moras spring flow data to map areas of influence (“springshed”)
  - Zone 1 = strong correlation
  - Zone 2 = moderate correlation
  - Zone 3 = weak or no correlation

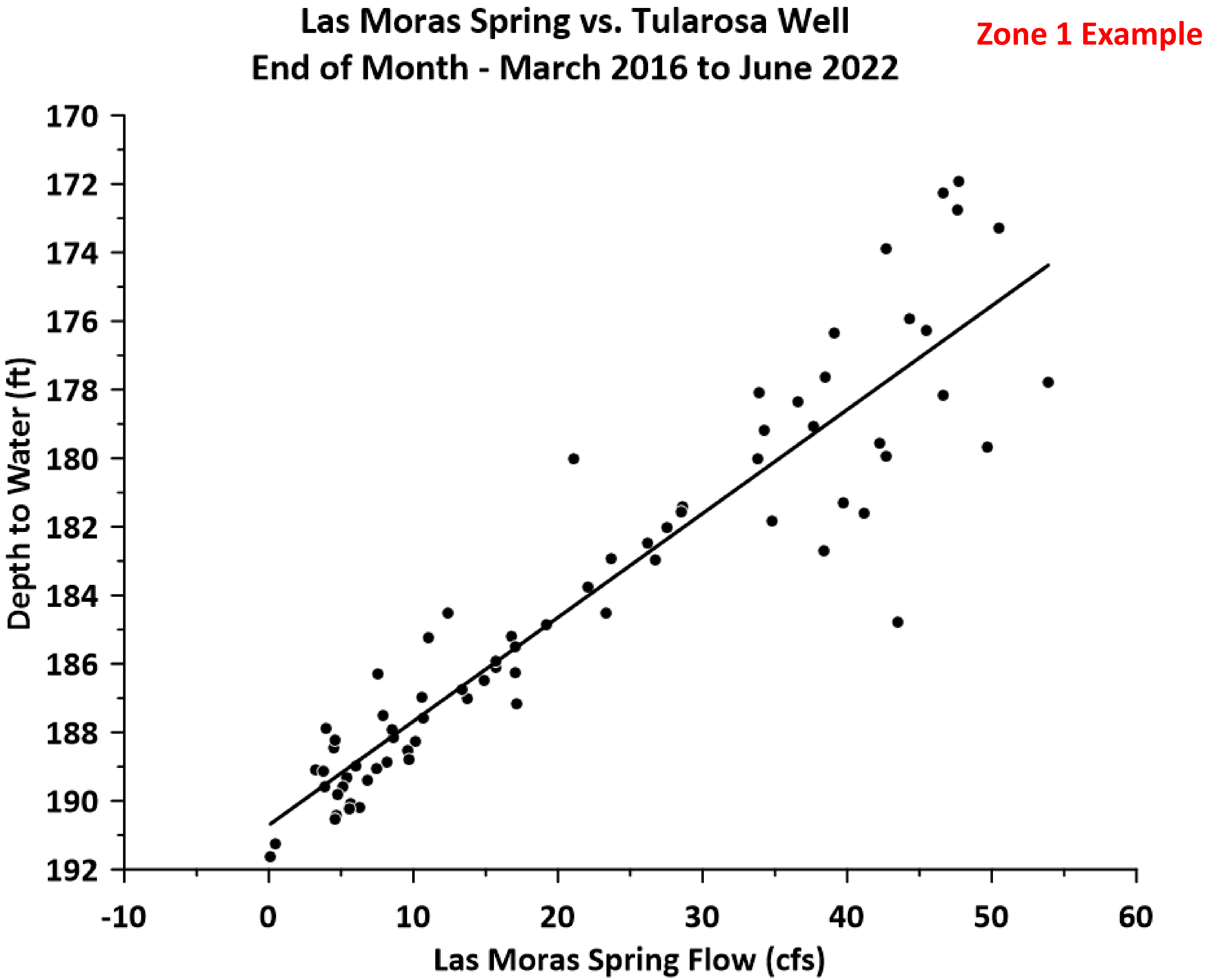


Las Moras Groundwater Production Zones - Kinney County, Texas

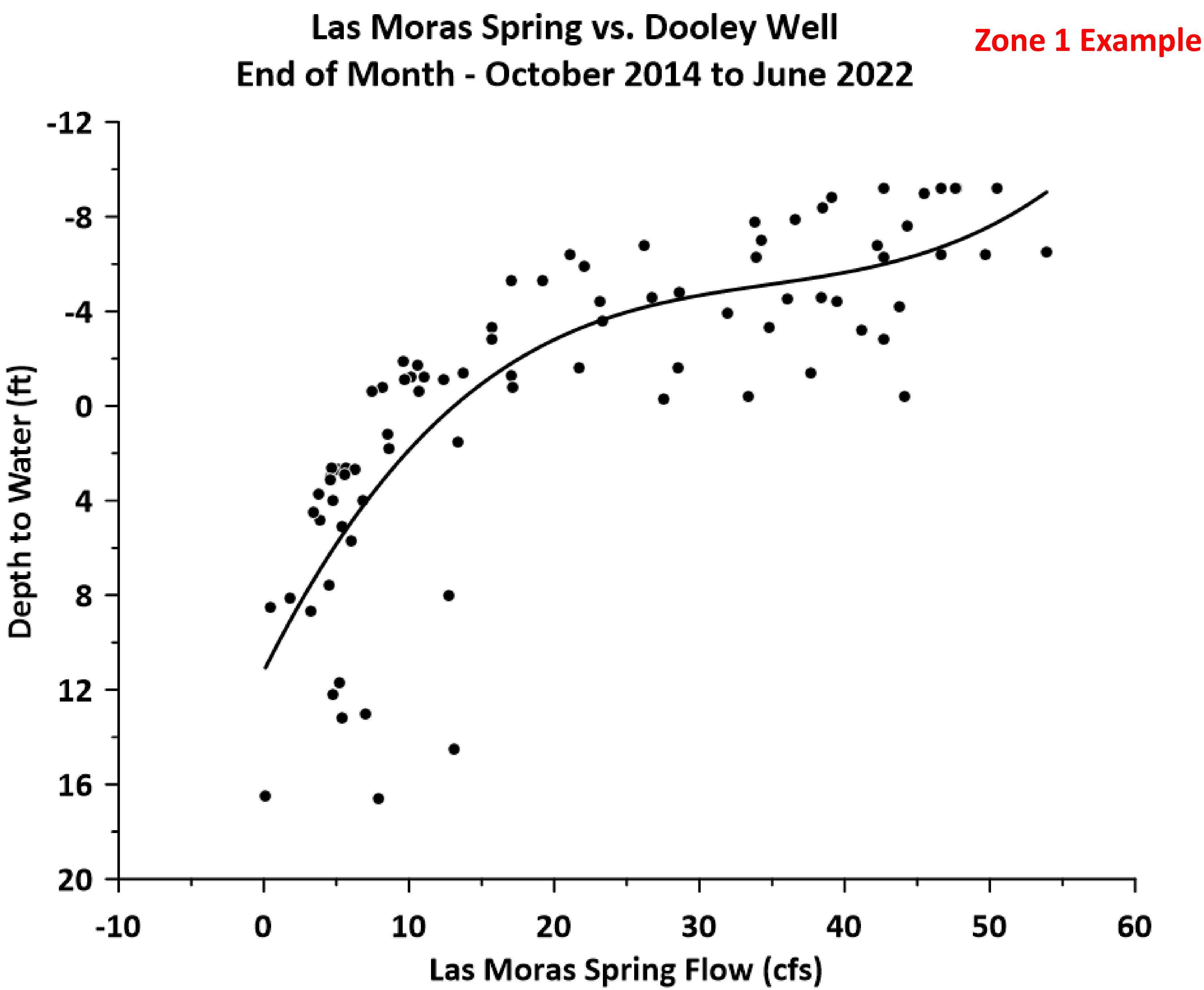


Las Moras Groundwater Production Zones - Kinney County, Texas

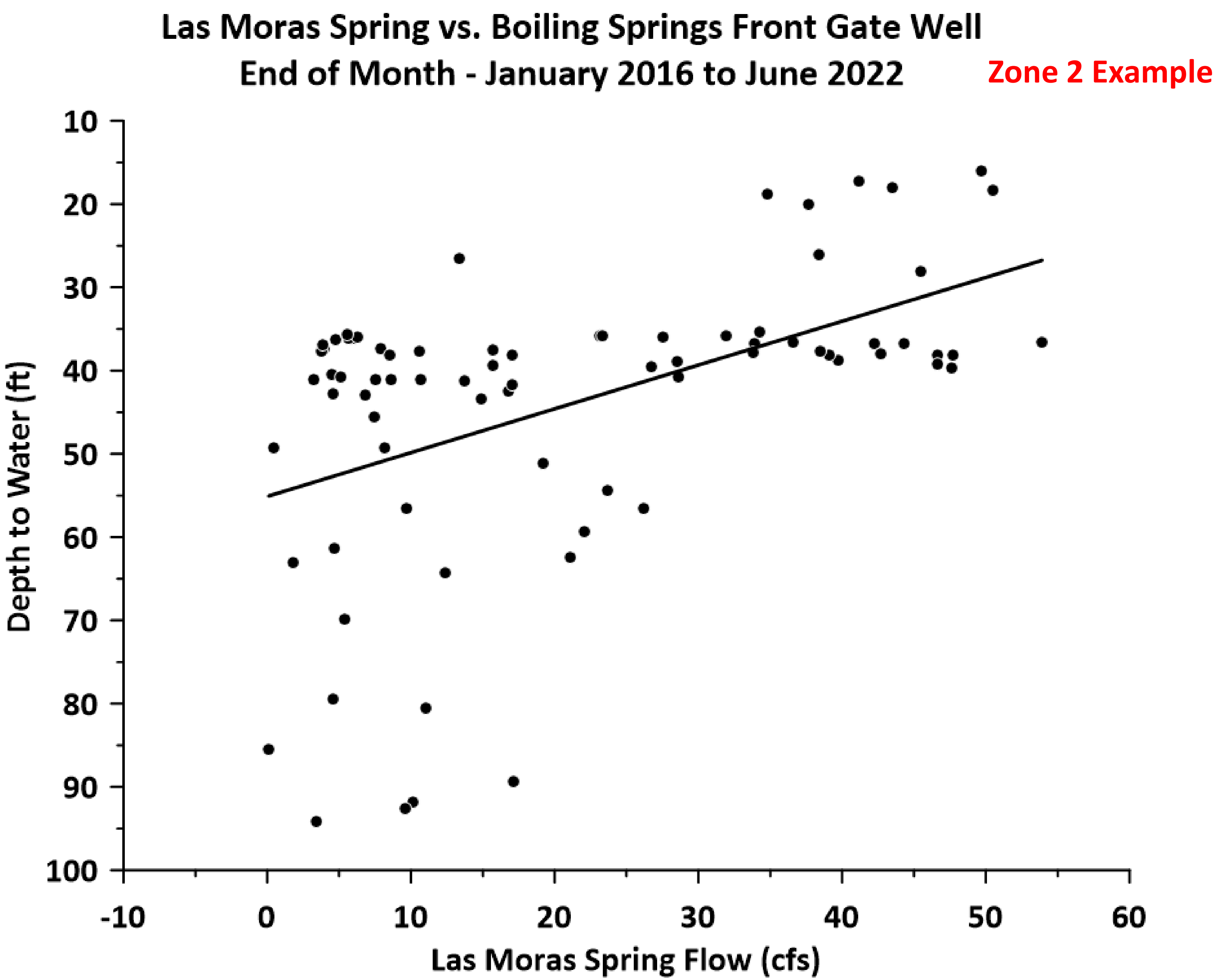

Las Moras Spring vs. City Well 1
End of Month - October 2014 to June 2022
Zone 1 Example
Depth to Water (ft)
-8
-4
0
4
8
12
16
20
24
28
-10
0
10
20
30
40
50
60
Las Moras Spring Flow (cfs)

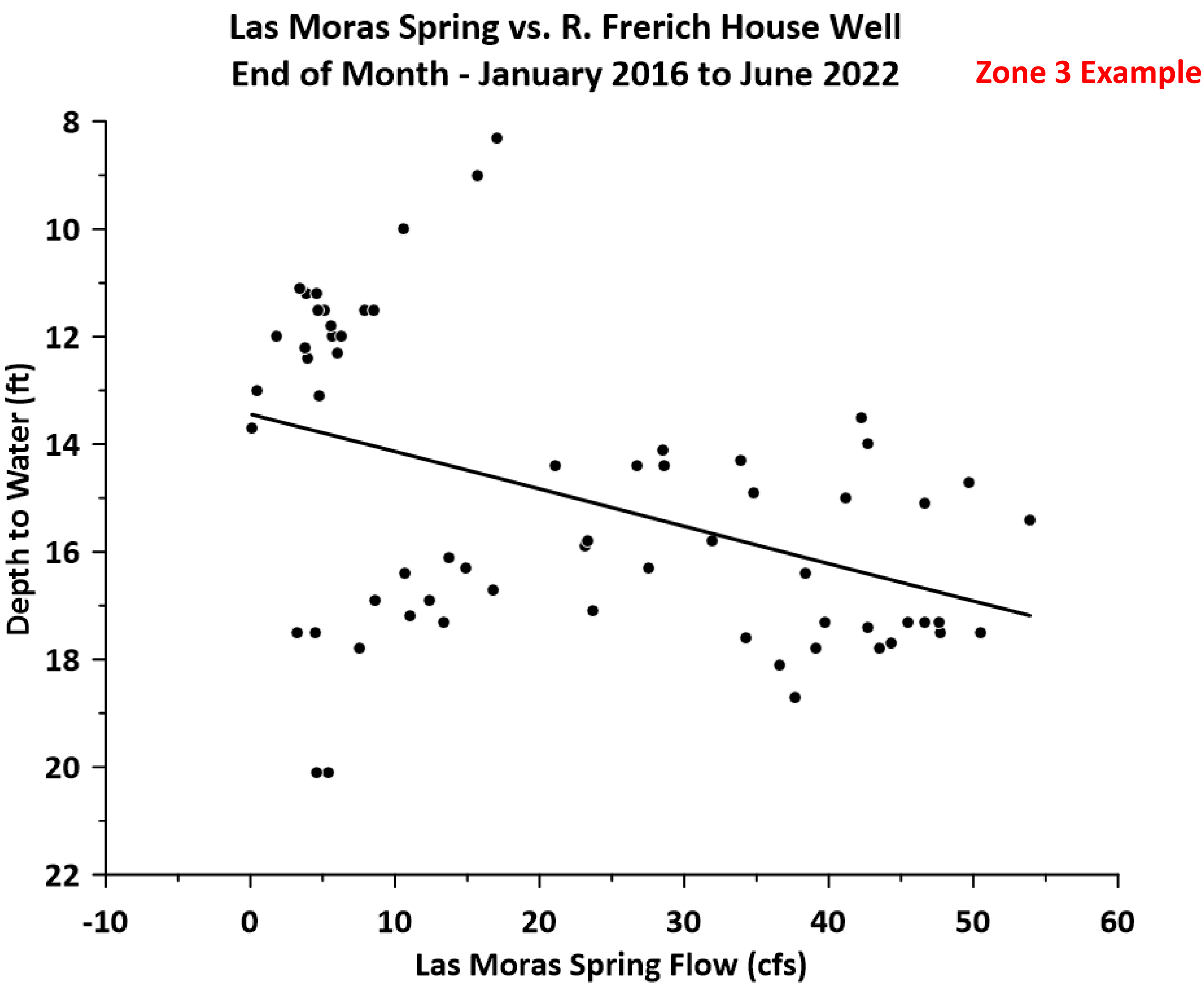


Las Moras Spring vs. Tularosa Well
End of Month - March 2016 to June 2022
Zone 1 Example
Depth to Water (ft)
170
172
174
176
178
180
182
184
186
188
190
192
-10
0
10
20
30
40
50
60
Las Moras Spring Flow (cfs)



Las Moras Spring vs. Dooley Well
End of Month - October 2014 to June 2022
Zone 1 Example
Depth to Water (ft)
-12
-8
-4
0
4
8
12
16
20
-10
0
10
20
30
40
50
60
Las Moras Spring Flow (cfs)


Las Moras Spring vs. Boiling Springs Front Gate Well
End of Month - January 2016 to June 2022
Zone 2 Example
Depth to Water (ft)
10
20
30
40
50
60
70
80
90
100
-10
0
10
20
30
40
50
60
Las Moras Spring Flow (cfs)



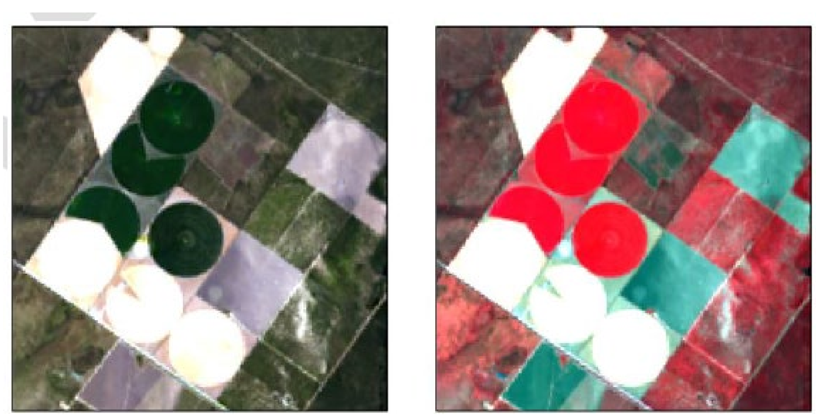
Las Moras Spring vs. R. Frerich House Well
End of Month - January 2016 to June 2022
Zone 3 Example
Depth to Water (ft)
8
10
12
14
16
18
20
22
-10
0
10
20
30
40
50
60
Las Moras Spring Flow (cfs)

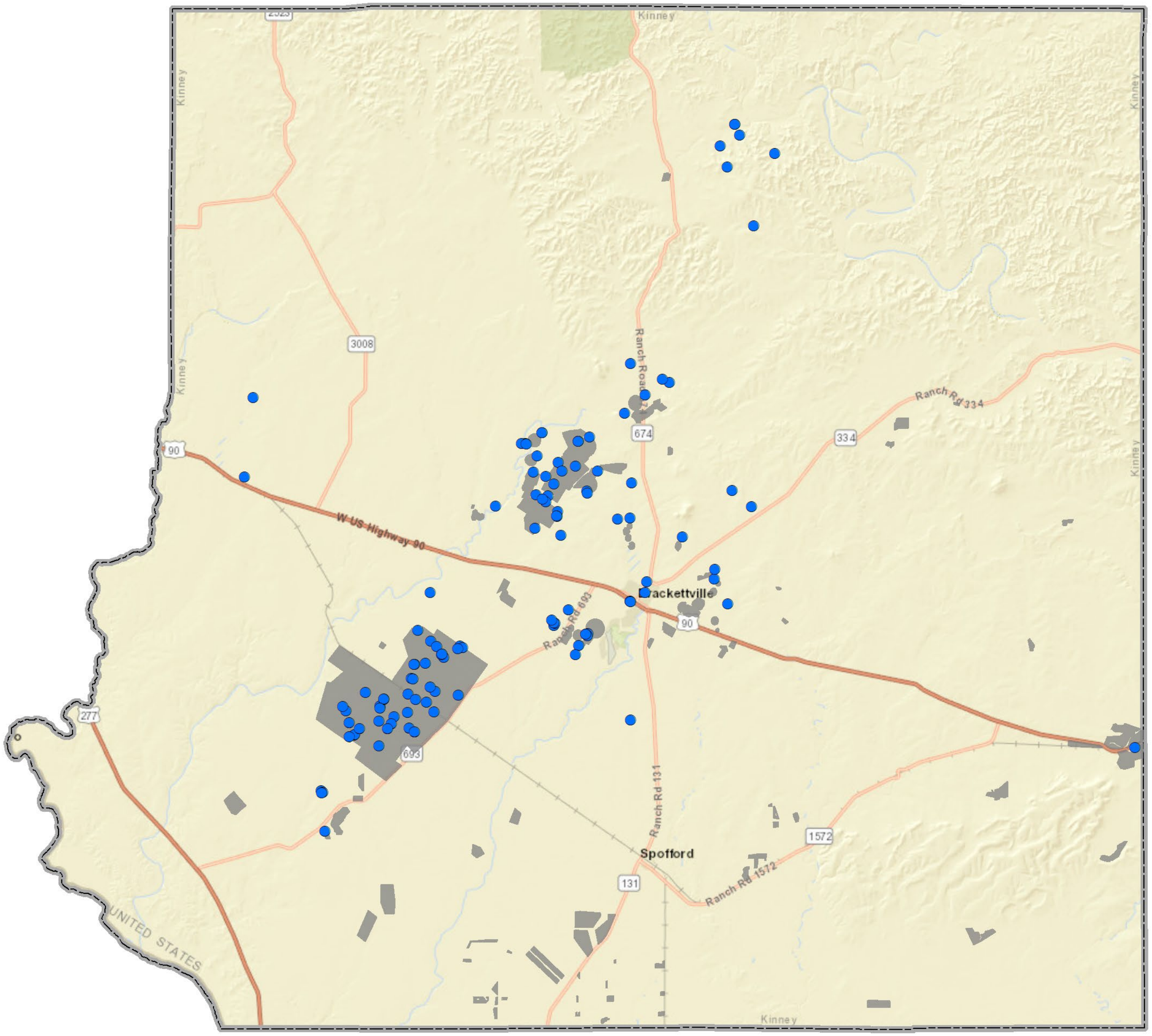
Landsat Analysis of Irrigation Acreage (ARS LLC)

- Identified historic irrigation areas
- Identified actual irrigation (odd years) 1995 to 2021
  - Summer and Winter
  - Also included summer 2022
  - Summer 2005 possible overestimate (recent rains)
  - Summer 2007 not available (cloud cover)
  - Summer 2013 possible overestimate (recent rains)
  - Winter 2015 possible underestimate (imagery issues)
  - 2017 (winter and summer) not available
- Subtotals based on springshed zones

Landsat Background

- Near infrared band useful for vegetation analysis
  - “False” color (red) shows healthy vegetation (well watered)
- Limitations:
  - Cloud cover, airborne particulates (e.g. dust, smoke), recent rainfall events
  - No differentiation in crop type, irrigation frequency etc.
  - Resolution of 30 meters
    - No small tract (< 5 acres) irrigation





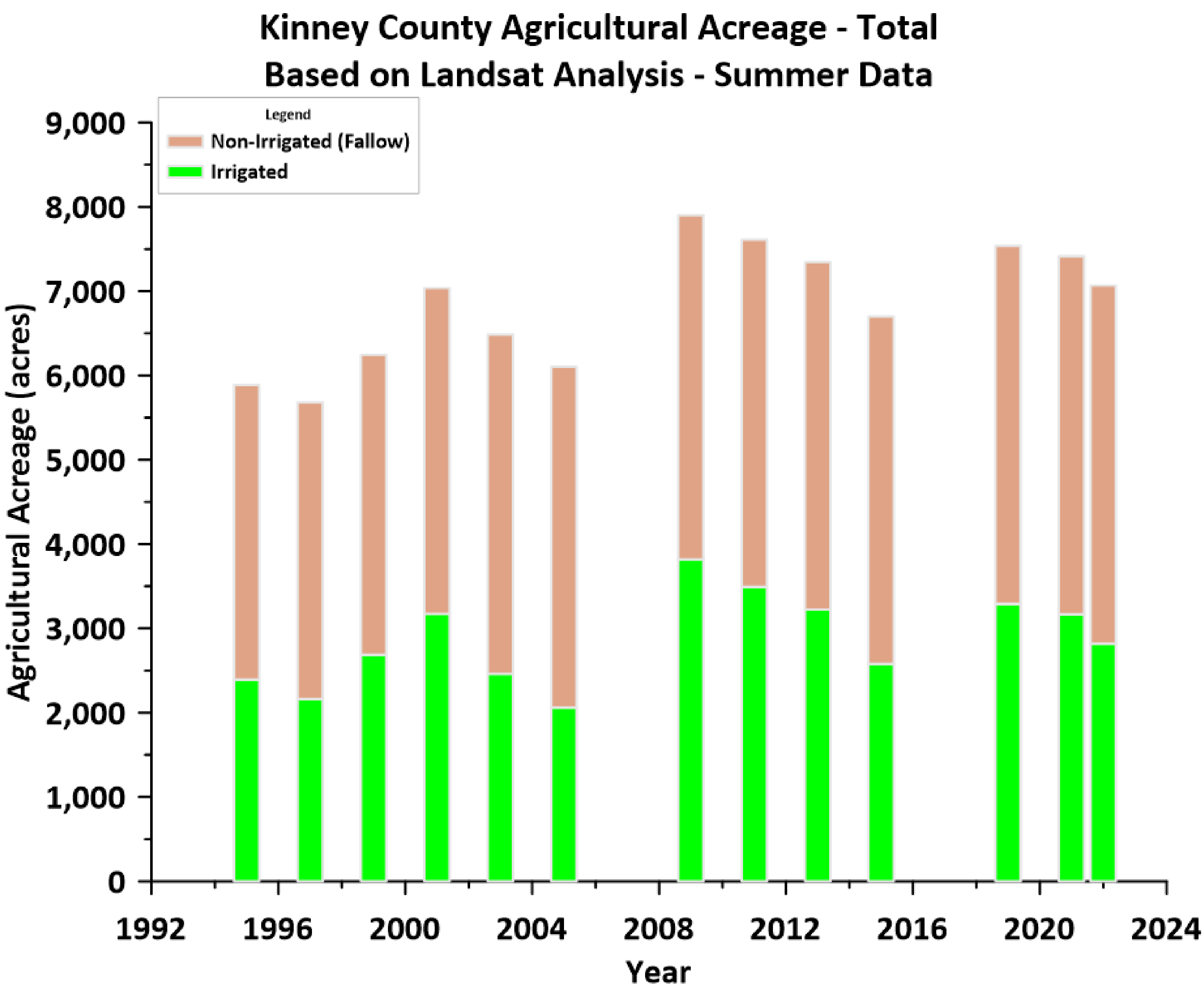
Documented Agricultural Areas 1995-2022
Kinney County, Texas

Documented Agricultural Area

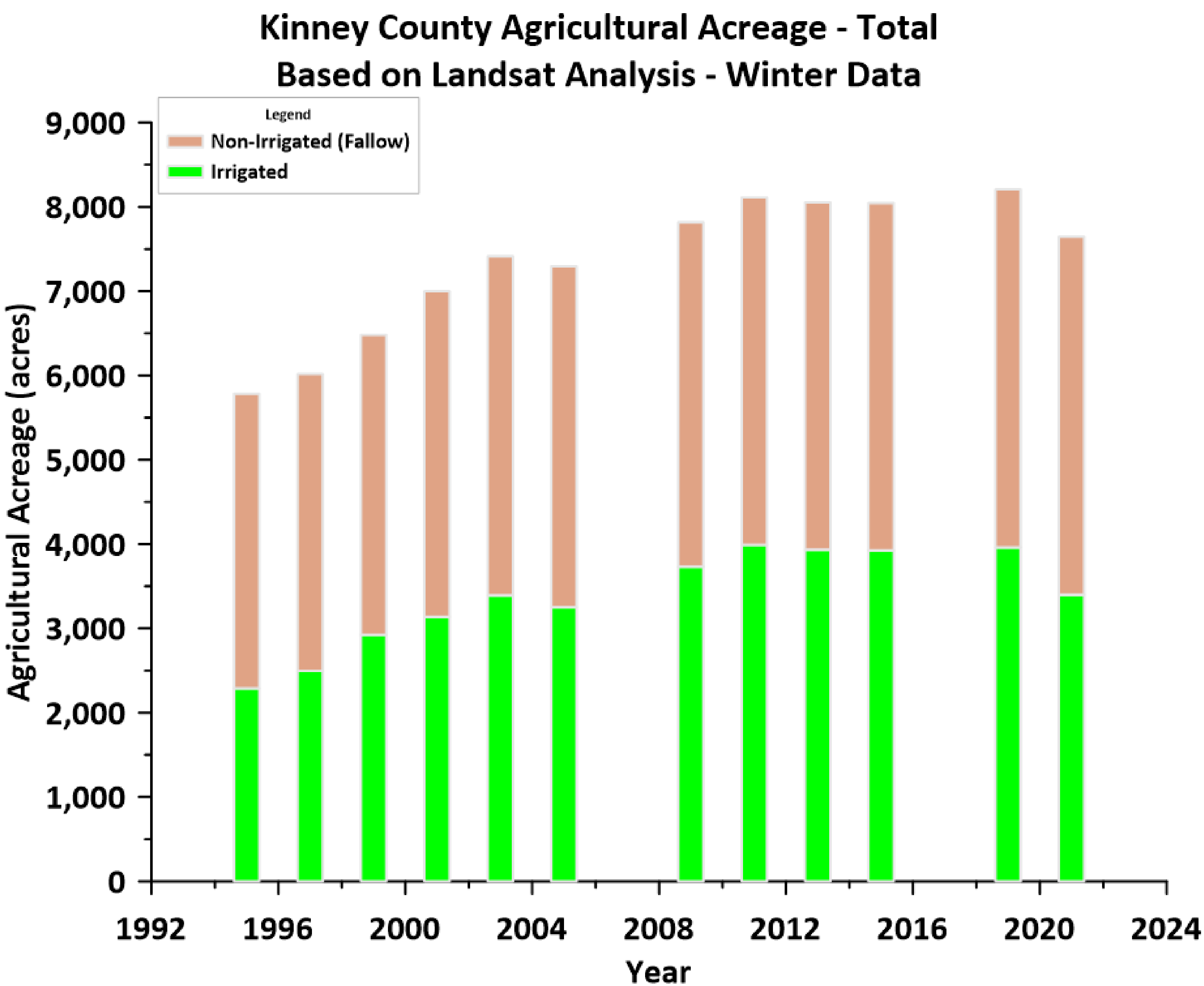
Permitted Wells

Example Graphs

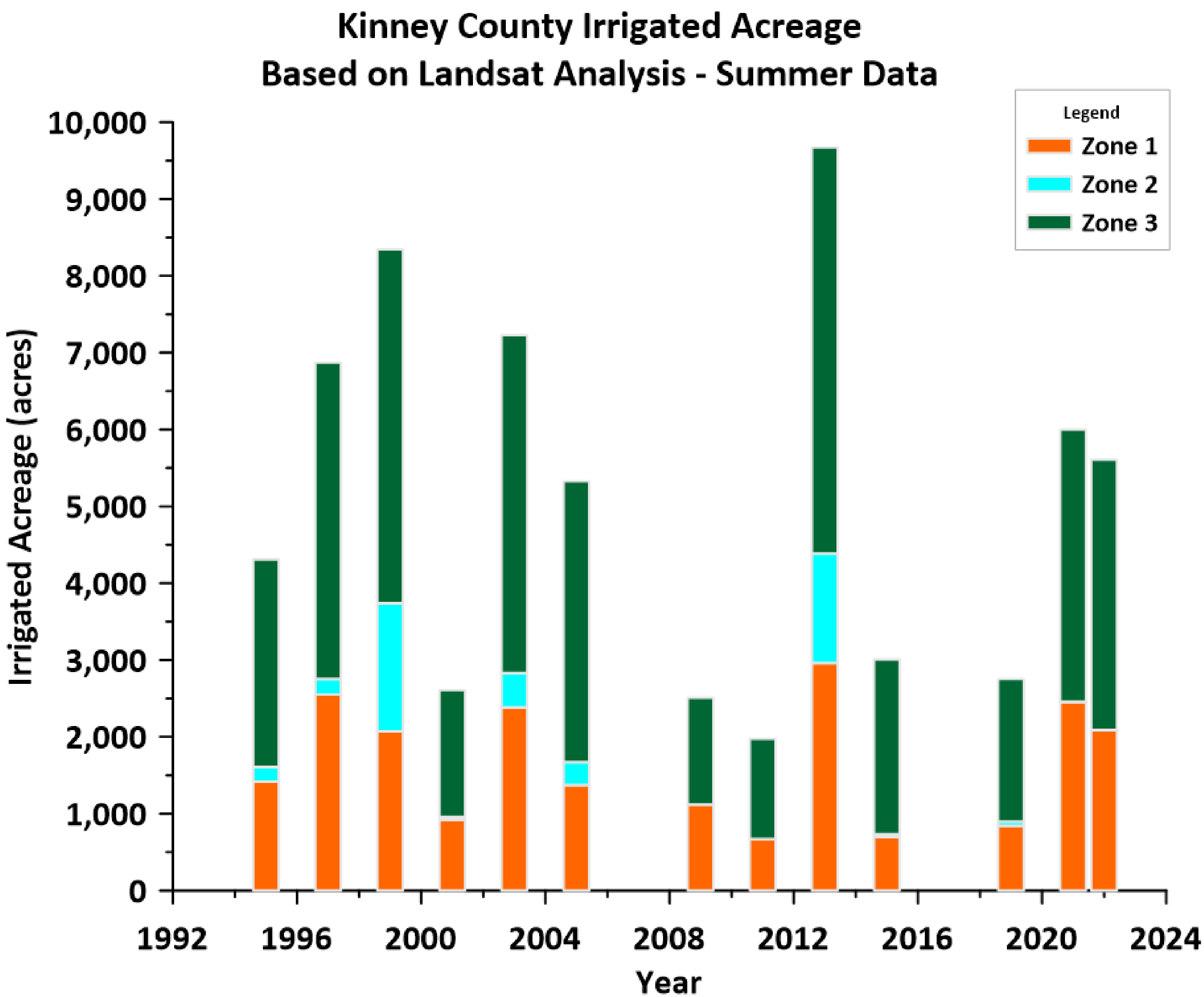
- Kinney County Irrigated and Fallow ag acreage
- Kinney County Irrigated acreage by zone
- Zone 1 Irrigated and Fallow ag acreage
- Kinney County estimated water use by zone
  - Comparison with reported permitted water use
- Zone 1 and Zone 2 estimated water use
  - Comparison with pumping estimates from empirical spring flow model

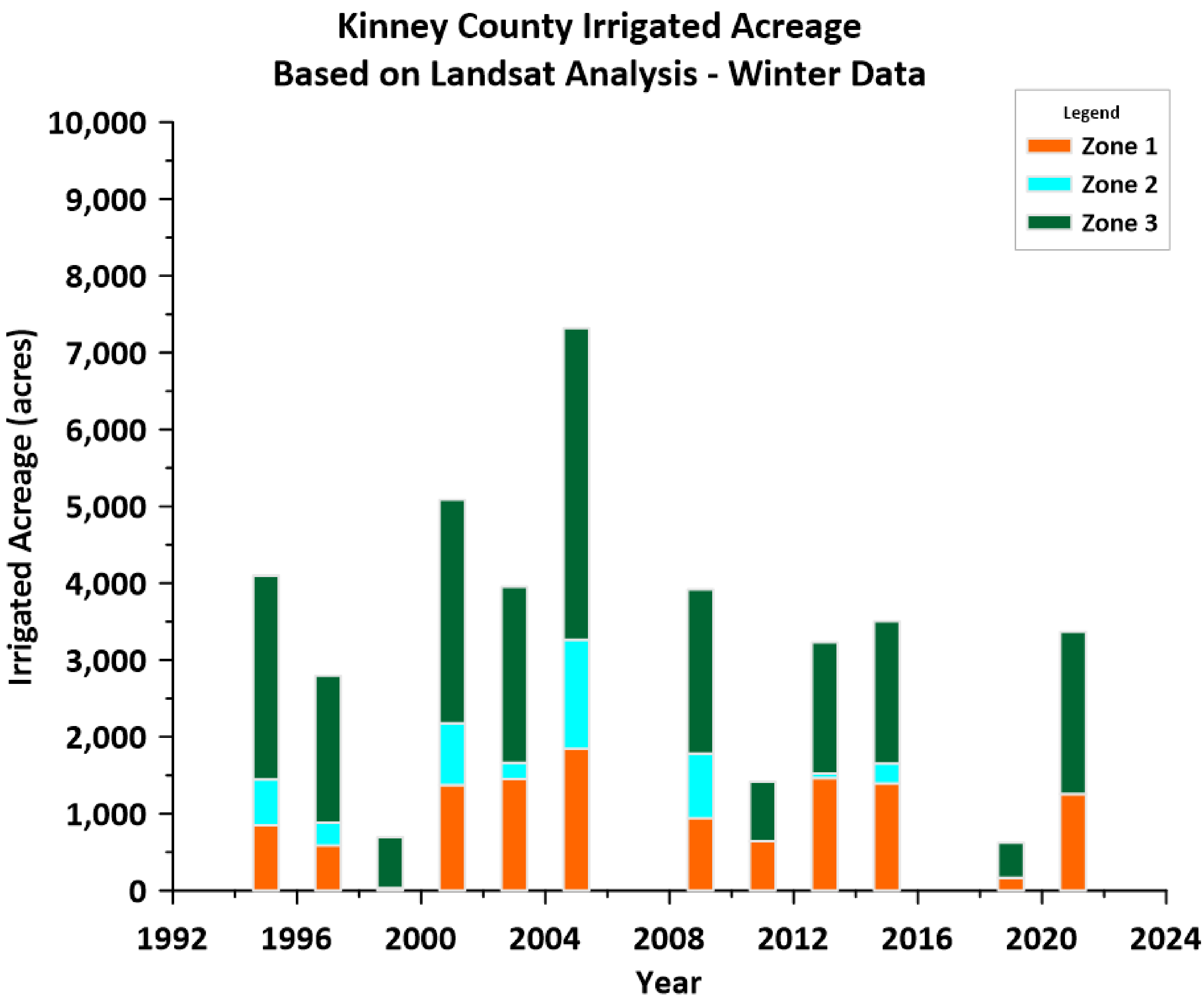


Kinney County Agricultural Acreage - Total
Based on Landsat Analysis - Summer Data
Legend
Non-Irrigated (Fallow)
Irrigated
Agricultural Acreage (acres)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year

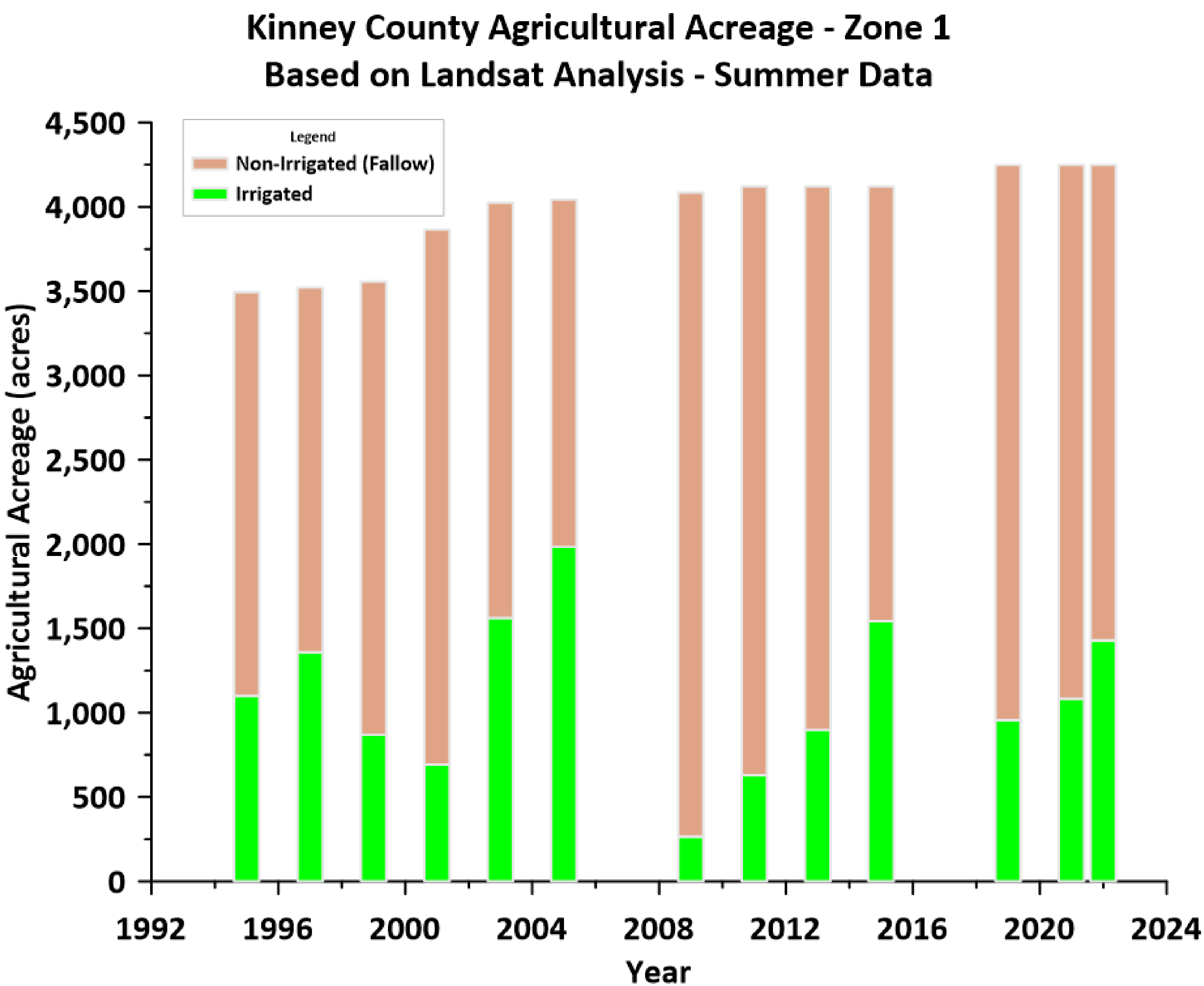


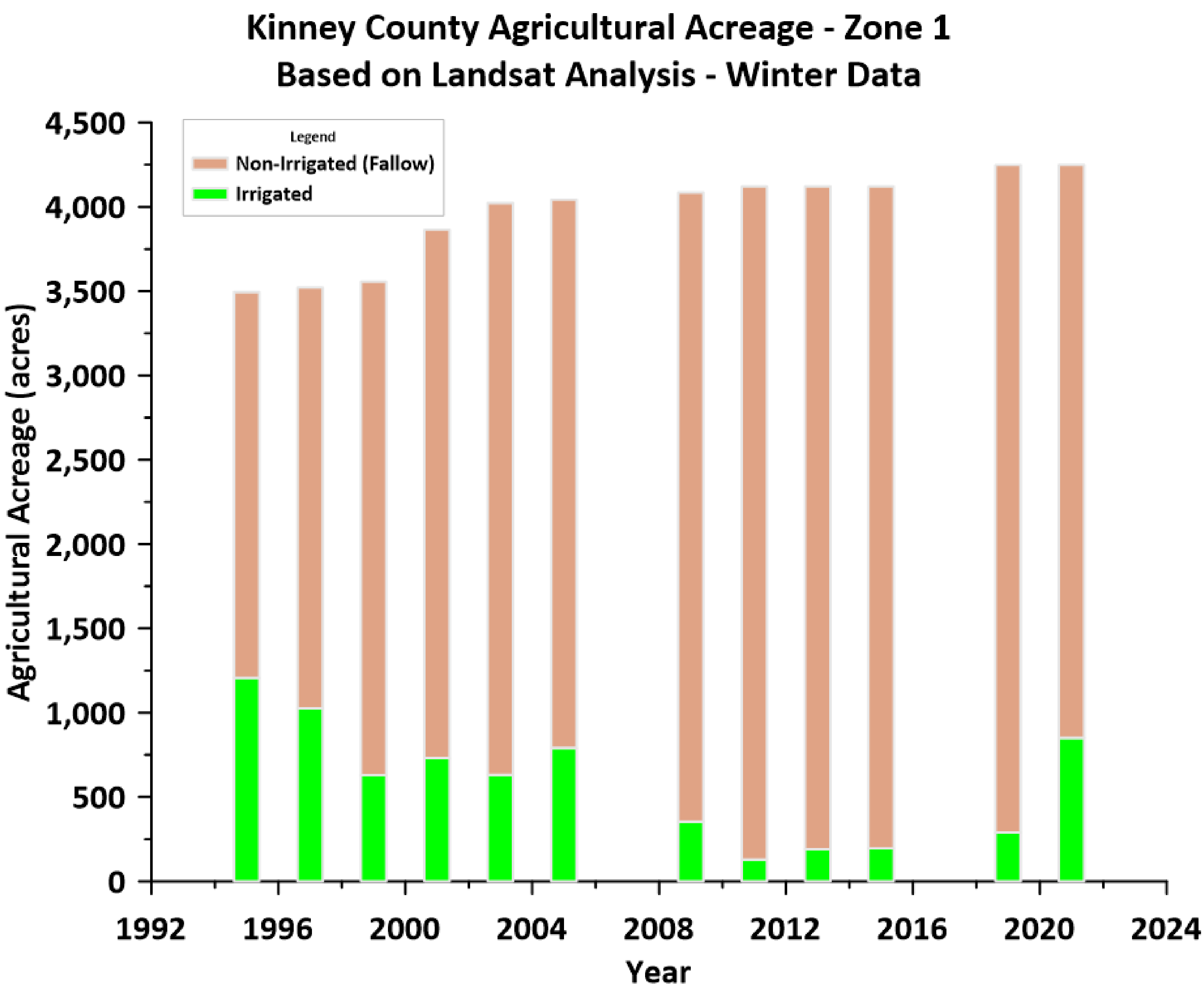
Kinney County Agricultural Acreage - Total
Based on Landsat Analysis - Winter Data
Legend
Non-Irrigated (Fallow)
Irrigated
Agricultural Acreage (acres)
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year

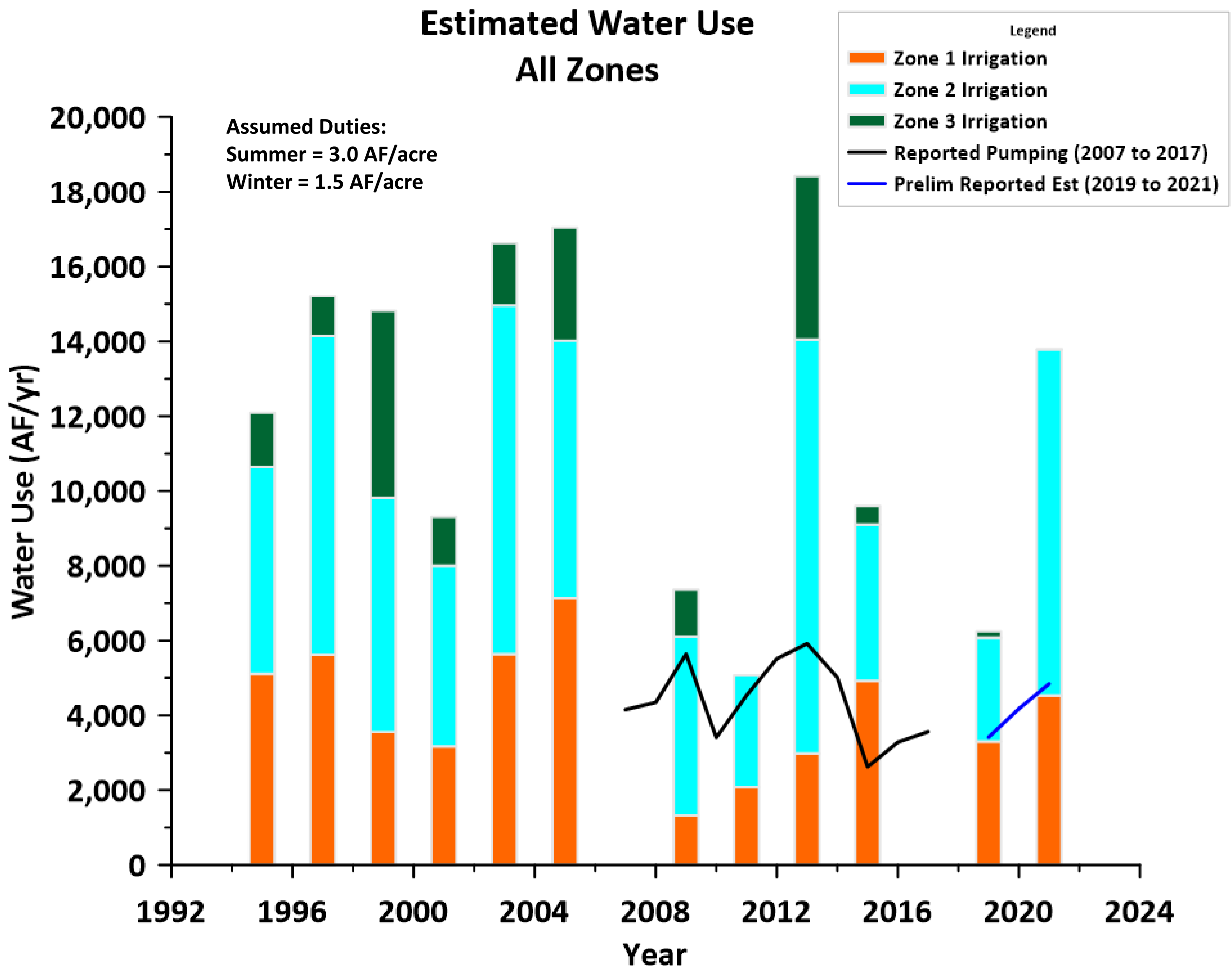

Kinney County Irrigated Acreage
Based on Landsat Analysis - Summer Data
Legend
Zone 1
Zone 2
Zone 3
Irrigated Acreage (acres)
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year



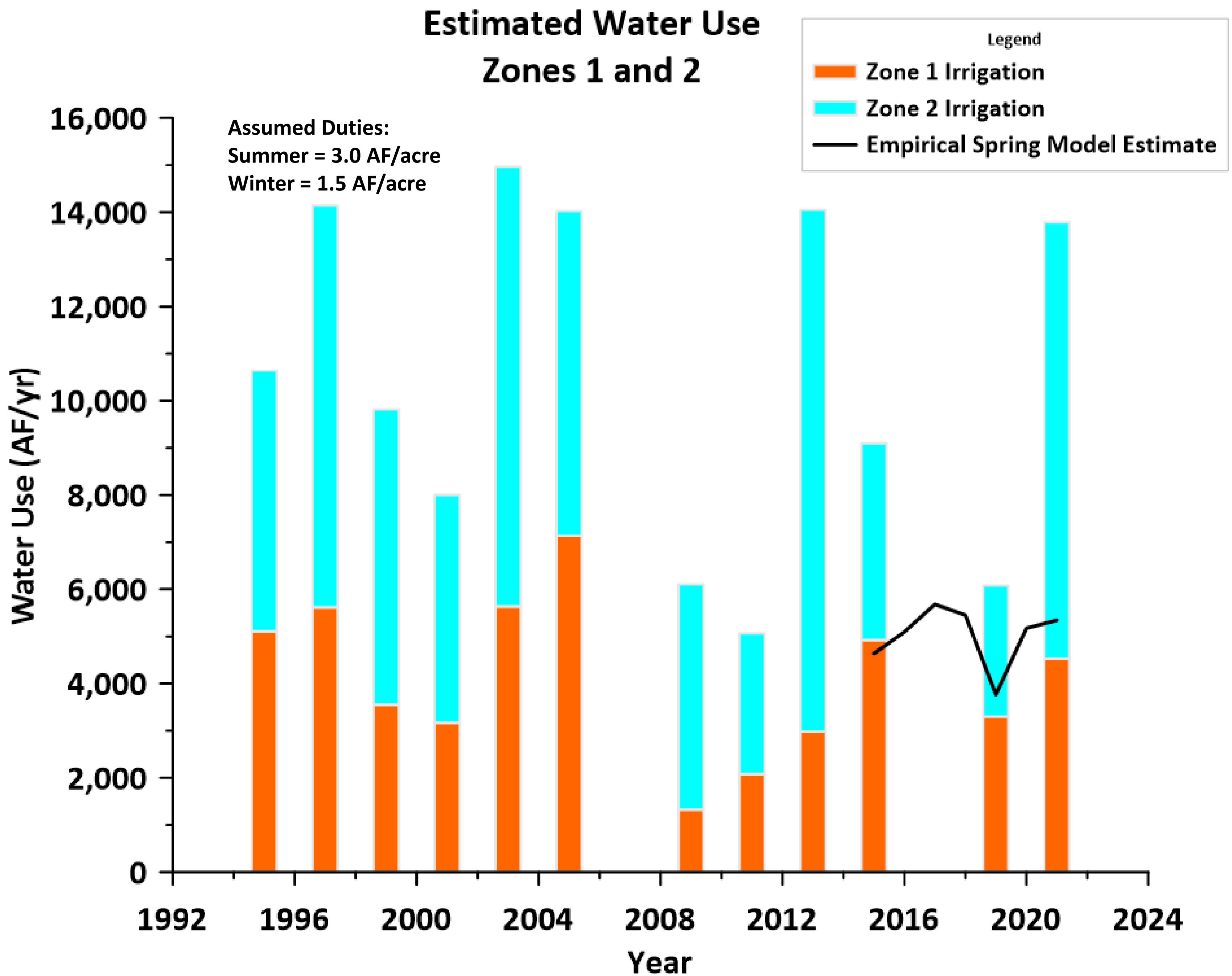
Kinney County Irrigated Acreage
Based on Landsat Analysis - Winter Data
Legend
Zone 1
Zone 2
Zone 3
Irrigated Acreage (acres)
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year


Kinney County Agricultural Acreage - Zone 1
Based on Landsat Analysis - Summer Data
Legend
Non-Irrigated (Fallow)
Irrigated
Agricultural Acreage (acres)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year


Kinney County Agricultural Acreage - Zone 1
Based on Landsat Analysis - Winter Data
Legend
Non-Irrigated (Fallow)
Irrigated
Agricultural Acreage (acres)
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year



Estimated Water Use
All Zones
Legend
Zone 1 Irrigation
Zone 2 Irrigation
Zone 3 Irrigation
Reported Pumping (2007 to 2017)
Prelim Reported Est (2019 to 2021)
Assumed Duties:
Summer = 3.0 AF/acre
Winter = 1.5 AF/acre
Water Use (AF/yr)
20,000
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year


Estimated Water Use
Zones 1 and 2
Legend
Zone 1 Irrigation
Zone 2 Irrigation
Empirical Spring Model Estimate
Assumed Duties:
Summer = 3.0 AF/acre
Winter = 1.5 AF/acre
Water Use (AF/yr)
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1992
1996
2000
2004
2008
2012
2016
2020
2024
Year

Key Observations

- Most agricultural land is fallowed in any given year
  - Irrigated land in a specific year is a relatively small percentage
- Winter irrigation is significant
  - Empirical model suggested winter pumping
- Water use estimates are consistent with empirical spring model for areas where groundwater pumping affects spring flow (Zone 1 and some of Zone 2)
- No evidence of an “explosion” in “commercial irrigation” in recent years (since 1985)
- Estimated water use of all agricultural land are generally consistent with Existing and Historic Use permitted water use totals (not “inaccurate”, not “outright lies”)
  - Historic period = 1960 to 1991 (~52,000 AF/yr)
  - Existing period = 1992 to 2003 (~36,000 AF/yr)

Planned Documentation

- ARS LLC has prepared a technical memorandum of work completed to date
- This report and subsequent report will be appendices in my planned report that covers:
  - Spring data and empirical model (presented on July 12, 2022)
  - Analysis of monitoring data and documentation of spring flow cross plots to define zones (presented today)
  - Estimates of irrigation pumping from Landsat work (initial work presented today, to be supplemented with second phase)
  - This report will be an appendix to updated management plan

Next Steps

- “Fill in” even years for Landsat Analysis
  - Complete by September 30, 2022
- Extend irrigation analyses prior to 1995
  - Work beginning on October 1, 2022
  - More time consuming and expensive
- Numerical groundwater model will provide more refinement to zone designation
  - This work represents a conceptual starting point for numerical model development and calibration

Appendix A-3

Kinney County GCD Inventory of Cultivated Cropland Areas

Technical Memorandum – October 6, 2022

TECHNICAL MEMORANDOM

TO: Dr. Bill Hutchison, KCGCD Hydrogeologist
Kinney County GCD Board of Directors and General Manager

FROM: Vince Clause, GISP – Hydrogeologist, Allan R. Standen, LLC

SUBJECT: Kinney County GCD Inventory of Cultivated Cropland Areas

DATE: 10/06/2022

INTRODUCTION

A remote sensing analysis was used to identify cultivated cropland areas within Kinney County, Texas. This analysis was performed using Landsat imagery for summer and winter seasons between 1995 and 2022. A summer snapshot was taken during the month of July or early August, while winter snapshots were usually taken late December or early January. Each snapshot was dependent on the available imagery for the associated periods of time.

Landsat imagery was downloaded from the USGS Earth Explorer Tool on August 8th and 9th, and September 20th and 21st, 2022. Appendix I includes the associated tile IDs, flight acquisition date and downloaded bands (red, green, blue and near infrared). This imagery was processed in ArcGIS 10.8.1, where image tiles were merged and clipped to Kinney County using the 'Composite Band', 'Mosaic To New Raster' and 'Clip' tools. The resulting raster files were delivered with this technical memo in an associated zip folder named KinneyCountyLandsatFiles.zip.

Landsat was preferred because it offers monthly historic imagery from the 1970s to present day, provides consistent results and a near infrared band that is useful for vegetation analysis. With this near infrared band, a false color image that highlights areas of healthy vegetation as shades of red can be used to identify cultivated cropland areas (Figure 1).

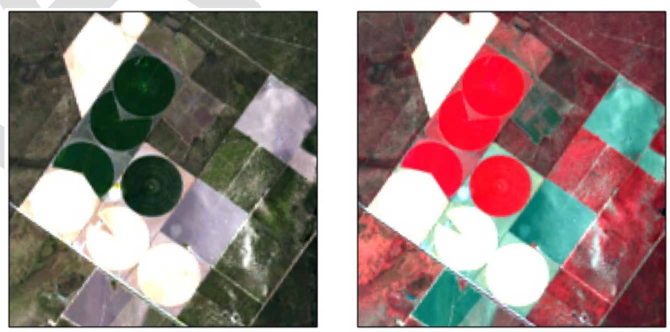


Figure 1 *– Landsat Imagery Natural Color Image (left) and Color Infrared (right). Cultivated croplands appear as bright red in color infrared image. Non-cultivated vegetation appears as dull red and shades of gray with non-defined boundaries.*

Every Landsat image was manually reviewed for the Kinney County study area. Cultivated cropland areas were identified on the false color image as shades of bright and deep reds with well-defined boundaries. Areas that appeared fallow were also documented to better understand Kinney County agricultural land use practices over time.

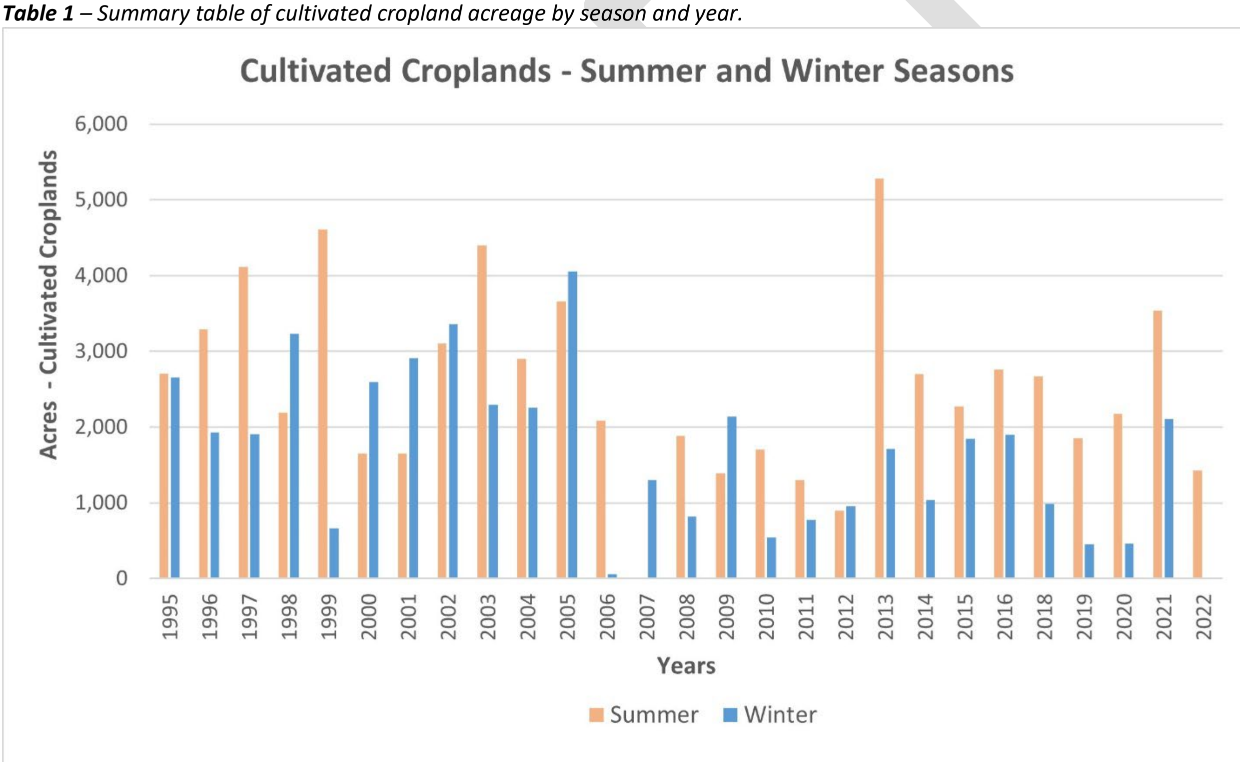
There are several limitations associated with Landsat imagery. Available coverage areas can be limited by cloud cover, airborne particulate matter, and recent rainfalls. These limitations prevented some image tiles from being analyzed (summer of 2007 and 2017 and winter 2017) and can potentially lead to slight over and underestimates (summer 2002, 2005, 2010 and 2013, winter 2015). Landsat imagery also cannot differentiate between crop type, frequency of irrigation, irrigation volumes, source of irrigation, or identify areas where crops have been recently harvested or sowed. Additionally, Landsat imagery has a grid cell resolution of 30 meters, this prevents small acreage tracks (< 5 acres) from being evaluated with this analysis. Cropland production along the Rio Grande and the West Nueces River was occasionally observed but is not included in this analysis.

RESULTS AND DISCUSSION

The results of this analysis are summarized in Table 2. Cultivated cropland and fallow areas were calculated in acres using the Texas Water Development Board Groundwater Availability Model projected coordinate system. Results were also tabulated by Las Moras Spring groundwater production zones, as defined by Dr. Hutchison, the District's Hydrogeologist (Figure 2). Figure 3 provides an overview of all documented cropland areas (cultivated and fallow). Appendix II includes time series figures that illustrate the spatial distribution of cultivated cropland areas for each evaluated year and season.

There is no observable trend for areas with cultivated cropland, these results instead suggest inconsistencies in agriculture practices for the study area (Table 1). There is an overall increase in the total acreage for fallow areas (Table 2). This is a common occurrence in areas with water quality issues and can be observed where crop rotation systems are used to manage soil fertility.

Table 1 *– Summary table of cultivated cropland acreage by season and year.*



RECOMMENDATIONS

Future considerations may also include extending this analysis to 1984, the earliest that this analysis can be performed using the Landsat 5 satellite product. Any analysis prior to this period will use different Landsat satellites with a lower image resolution.

Table 2 - *Summary of Cultivated Croplands and Fallow and/or Abandoned Agricultural Lands (Acres)*

		Cultivated Croplands (Acres)				Fallow (Acres)				Total Acreage				Notes
		Zone 1	Zone 2	Zone 3	Total	Zone 1	Zone 2	Zone 3	Total	Zone 1	Zone 2	Zone 3	Total	
1995	Summer	1,100	1,418	187	2,705	2,394	9,241	2,939	14,574	3,494	10,659	3,126	17,279	
	Winter	1,207	851	596	2,654	2,288	9,808	2,529	14,625					
1996	Summer	1,389	1,903	0	3,292	2,132	8,797	3,308	14,237	3,521	10,700	3,308	17,529	
	Winter	688	597	647	1,932	2,833	10,103	2,661	15,597					
1997	Summer	1,360	2,550	205	4,115	2,161	8,150	3,103	13,414	3,521	10,700	3,308	17,529	
	Winter	1,025	586	299	1,910	2,496	10,113	3,010	15,619					
1998	Summer	940	1,252	0	2,192	2,581	9,668	3,315	15,564	3,521	10,920	3,315	17,756	
	Winter	1,019	1,133	1,076	3,228	2,502	9,787	2,239	14,528					
1999	Summer	869	2,071	1,667	4,607	2,688	8,849	1,648	13,185	3,557	10,920	3,315	17,792	
	Winter	631	33	0	664	2,925	10,887	3,315	17,127					
2000	Summer	1,000	630	23	1,653	2,602	10,290	3,292	16,184	3,602	10,920	3,315	17,837	
	Winter	883	759	957	2,599	2,719	10,161	2,358	15,238					
2001	Summer	692	923	34	1,649	3,173	10,032	3,281	16,486	3,865	10,955	3,315	18,135	
	Winter	730	1,374	804	2,908	3,135	9,581	2,511	15,227					
2002	Summer	1,719	1,175	208	3,102	2,217	9,780	3,107	15,104	3,936	10,955	3,315	18,206	Summer 2002 cloud coverage and moisture in the air. Possible overestimate and missing areas.
	Winter	779	1,723	854	3,356	3,157	9,232	2,461	14,850					
2003	Summer	1,563	2,383	450	4,396	2,461	10,649	2,938	16,048	4,024	13,032	3,388	20,444	
	Winter	632	1,454	207	2,293	3,391	11,578	3,182	18,151					
2004	Summer	1,111	1,566	226	2,903	2,932	11,466	3,221	17,619	4,043	13,032	3,447	20,522	
	Winter	436	1,573	252	2,261	3,607	11,459	3,195	18,261					
2005	Summer	1,983	1,374	298	3,655	2,060	11,658	3,149	16,867	4,043	13,032	3,447	20,522	Summer 2005 possible overestimate because of healthy vegetation area-wide (recent rains).
	Winter	790	1,845	1,419	4,054	3,253	11,187	2,028	16,468					
2006	Summer	1,238	847	0	2,085	2,846	12,397	3,447	18,690	4,084	13,244	3,447	20,775	
	Winter	58	0	0	58	4,026	13,244	3,447	20,717					
2007	Summer	N/A	N/A	N/A	-	N/A	N/A	N/A	-	4,084	13,244	3,447	20,775	Summer 2007 not available because of heavy cloud coverage on available data.
	Winter	342	858	99	1,299	3,742	12,386	3,348	19,476					
2008	Summer	1,005	877	0	1,882	3,079	12,367	3,675	19,121	4,084	13,244	3,675	21,003	
	Winter	79	515	229	823	4,005	12,729	3,446	20,180					
2009	Summer	265	1,122	0	1,387	3,819	12,122	3,675	19,616	4,084	13,244	3,675	21,003	
	Winter	353	942	841	2,136	3,731	12,302	2,834	18,867					
2010	Summer	1,212	493	0	1,705	2,909	12,751	3,675	19,335	4,121	13,244	3,675	21,040	Summer 2010 possible overestimate because of healthy vegetation area-wide (recent rains).
	Winter	201	344	0	545	3,920	12,900	3,675	20,495					
2011	Summer	630	672	0	1,302	3,491	12,572	3,675	19,738	4,122	13,244	3,675	21,041	
	Winter	129	644	0	773	3,993	12,600	3,675	20,268					

		Cultivated Croplands (Acres)				Fallow (Acres)				Total Acreage				Notes
		Zone 1	Zone 2	Zone 3	Total	Zone 1	Zone 2	Zone 3	Total	Zone 1	Zone 2	Zone 3	Total	
2012	Summer	540	359	0	899	3,581	12,885	3,675	20,141	4,121	13,244	3,675	21,040	
	Winter	302	408	247	957	3,819	12,836	3,428	20,083					
2013	Summer	898	2,959	1,428	5,285	3,223	10,285	2,247	15,755	4,122	13,244	3,674	21,040	Summer 2013 likely overestimate because of healthy vegetation area-wide (recent rains).
	Winter	190	1,464	56	1,710	3,932	11,780	3,618	19,330					
2014	Summer	1,378	1,323	0	2,701	2,743	11,921	3,675	18,339	4,121	13,244	3,675	21,040	
	Winter	550	486	0	1,036	3,571	12,758	3,675	20,004					
2015	Summer	1,543	695	38	2,276	2,578	12,549	3,637	18,764	4,122	13,244	3,675	21,041	Winter 2015 possible underestimate because of Landsat imagery issues.
	Winter	196	1,394	260	1,850	3,926	11,850	3,415	19,191					
2016	Summer	1,349	1,283	131	2,763	2,900	12,029	3,544	18,473	4,249	13,312	3,675	21,236	
	Winter	204	1,408	290	1,902	4,045	11,904	3,385	19,334					
2017	Summer	N/A	N/A	N/A	-	N/A	N/A	N/A	-	-	-	-	-	Not able to process Summer or Winter 2017 because of Landsat imagery issues.
	Winter	N/A	N/A	N/A	-	N/A	N/A	N/A	-					
2018	Summer	1,432	1,239	0	2,671	2,817	12,073	3,675	18,565	4,249	13,312	3,675	21,236	
	Winter	70	816	102	988	4,179	12,496	3,573	20,248					
2019	Summer	956	842	56	1,854	3,292	12,471	3,619	19,382	4,249	13,312	3,675	21,236	
	Winter	289	167	0	456	3,960	13,145	3,675	20,780					
2020	Summer	1,002	1,173	0	2,175	3,247	12,229	3,675	19,151	4,249	13,402	3,675	21,326	
	Winter	388	77	0	465	3,861	13,325	3,675	20,861					
2021	Summer	1,083	2,458	0	3,541	3,166	10,944	3,675	17,785	4,249	13,402	3,675	21,326	
	Winter	851	1,258	0	2,109	3,398	12,144	3,675	19,217					
2022	Summer	1,429	2,089	0	3,518	2,820	11,313	3,675	17,808	4,249	13,402	3,675	21,326	

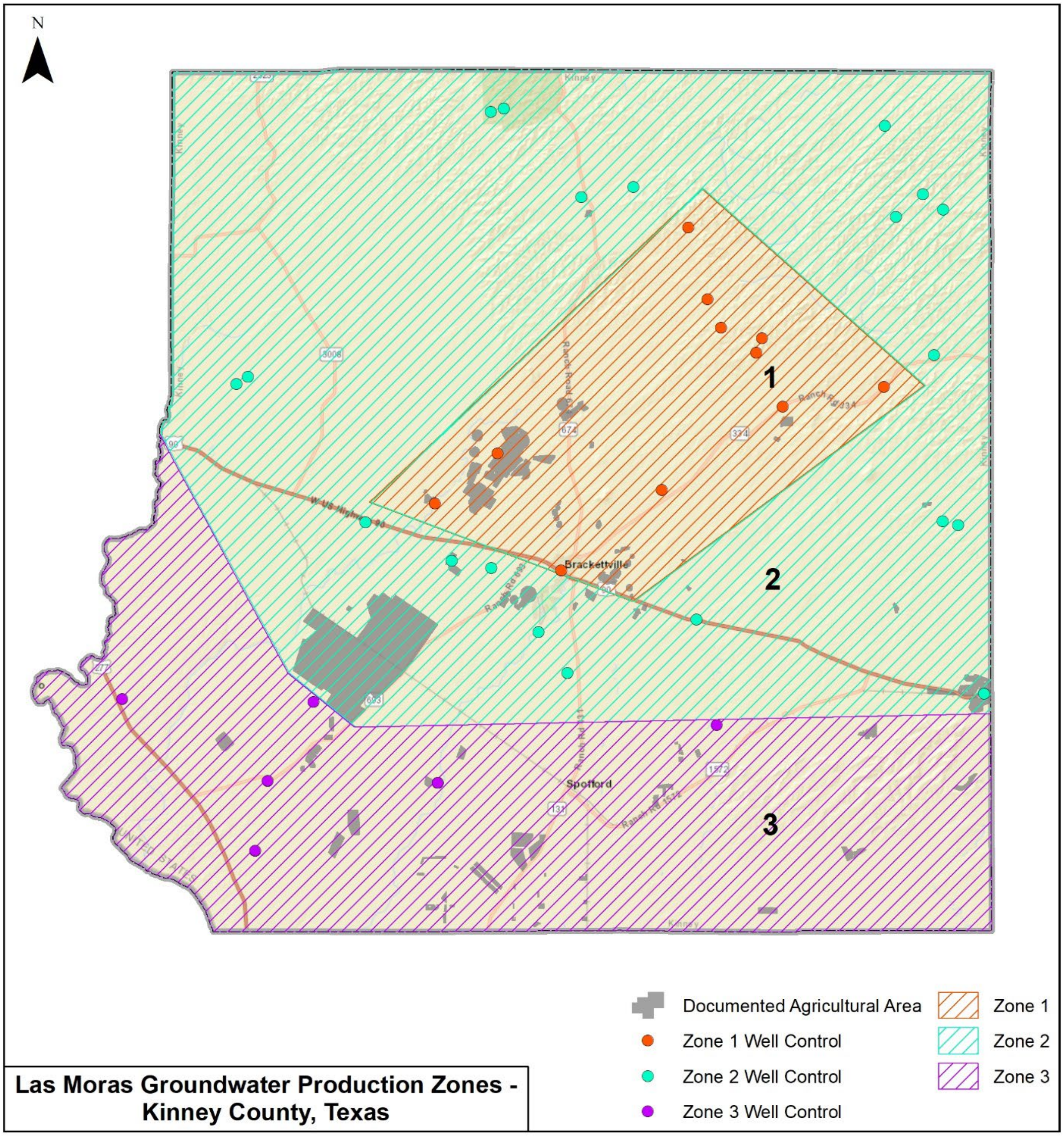


Figure 2 *– Las Moras Spring groundwater production zones and supporting well control points.*

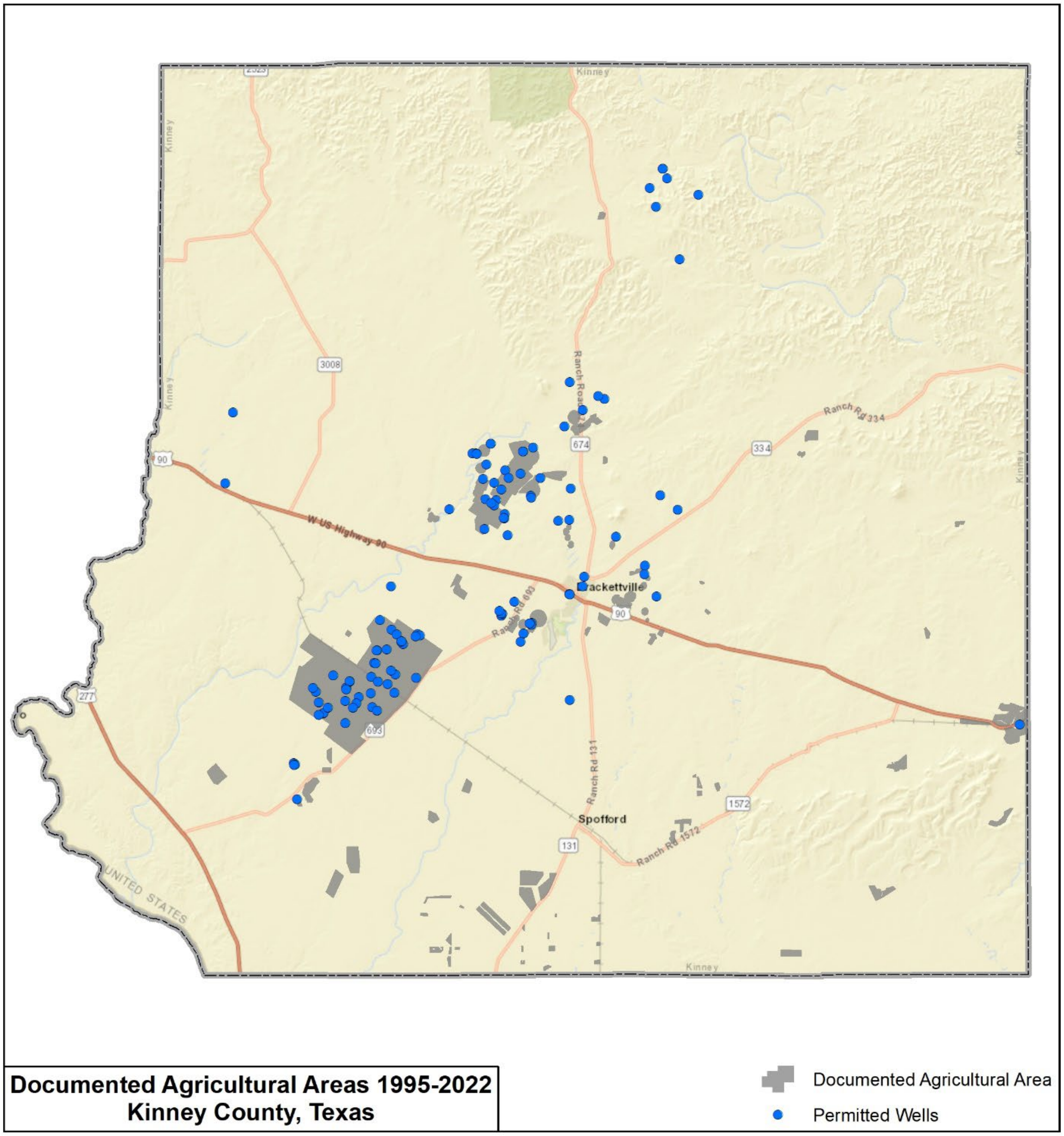


Figure 3 *– Documented Agricultural Areas from 1995-2022.*

APPENDIX I

Landsat Imagery Reference Table

Survey Time Period	Imagery Source	Tile ID	Flight Acquisition Date	Bands	Raster File Name
Summer 1995	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_19950720_20210424_02	7/20/1995	1, 2, 3, 4	S_1995.tif
		LT05_CU_014017_19950727_20210424_02	7/27/1995		
Winter 1995	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_19951125_20210424_02	11/25/1995	1, 2, 3, 4	W_1995.tif
		LT05_CU_014017_19960103_20210424_02	1/3/1996		
Summer 1996	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_19960706_20210424_02	1996-07-06	1, 2, 3, 4	S_1996.tif
		LT05_CU_014017_19960729_20210424_02	1996-07-29		
Winter 1996	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_19961220_20210424_02	1996-12-20	1, 2, 3, 4	W_1996.tif
		LT05_CU_014017_19961229_20210424_02	1996-12-29		
Summer 1997	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_19970709_20210424_02	7/9/1997	1, 2, 3, 4	S_1997.tif
		LT05_CU_014017_19970716_20210424_02	7/16/1997		
Winter 1997	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_19971216_20210424_02	12/16/1997	1, 2, 3, 4	W_1997.tif
		LT05_CU_014017_19980108_20210425_02	1/8/1998		
Summer 1998	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_19980712_20210425_02	1998-07-12	1, 2, 3, 4	S_1998.tif
		LT05_CU_014017_19980719_20210425_02	1998-07-19		
Winter 1998	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_19981219_20210425_02	1998-12-19	1, 2, 3, 4	W_1998.tif
		LT05_CU_014017_19981226_20210425_02	1998-12-26		
Summer 1999	Landsat 5 TM U.S.	LT05_CU_014017_19990731_20210425_02	7/31/1999	1, 2, 3, 4	S_1999.tif

Survey Time Period	Imagery Source	Tile ID	Flight Acquisition Date	Bands	Raster File Name
	Analysis Ready Data	LT05_CU_014017_19990807_20210425_02	8/7/1999		
Winter 1999	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_19991206_20210425_02	12/6/1999	1, 2, 3, 4	W_1999.tif
		LT05_CU_014017_19991213_20210425_02	12/13/1999		
Summer 2000	Landsat 5 TM U.S. Analysis Ready Data	LE07_CU_014017_20000716_20210425_02	2000-07-16	1, 2, 3, 4	S_2000.tif
		LT05_CU_014017_20000717_20210425_02	2000-07-17		
Winter 2000	Landsat 5 TM U.S. Analysis Ready Data	LE07_CU_014017_20001207_20210426_02	2000-12-07	1, 2, 3, 4	W_2000.tif
		LT05_CU_014017_20001208_20210426_02	2000-12-08		
Summer 2001	Landsat 7 TM+ U.S. Analysis Ready Data	LE07_CU_014017_20010712_20210426_02	7/12/2001	1, 2, 3, 4	S_2001.tif
		LE07_CU_014017_20010719_20210426_02	7/19/2001		
Winter 2001	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20011227_20210426_0	12/27/2001	1, 2, 3, 4	W_2003.tif
		LT05_CU_014017_20020103_20210426_02	1/3/2002		
Summer 2002	Landsat 7 TM+ U.S. Analysis Ready Data	LE07_CU_014017_20020731_20210427_02	2002-07-31	1, 2, 3, 4	S_2002.tif
		LE07_CU_014017_20020807_20210427_02	2002-08-07		
Winter 2002	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20021214_20210428_02	2002-12-14	1, 2, 3, 4	W_2002.tif
		LT05_CU_014017_20021221_20210428_02	2002-12-21		
Summer 2003	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20030802_20210428_02	8/2/2003	1, 2, 3, 4	S_2003.tif
		LT05_CU_014017_20030811_20210428_02	8/11/2003		
Winter 2003	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20031217_20210428_02	12/17/2003	1, 2, 3, 4	W_2003.tif
		LT05_CU_014017_20040125_20210428_02	1/25/2004		
Summer 2004	Landsat 5 TM U.S.	LT05_CU_014017_20040728_20210428_0	2004-07-28	1, 2, 3, 4	S_2004.tif

Survey Time Period	Imagery Source	Tile ID	Flight Acquisition Date	Bands	Raster File Name
	Analysis Ready Data	LT05_CU_014017_20040804_20210428_02	2004-08-04		
Winter 2004	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20041219_20210428_02	2004-12-19	1, 2, 3, 4	W_2004.tif
		LT05_CU_014017_20041226_20210428_02	2004-12-26		
Summer 2005	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20050731_20210429_02	7/31/2005	1, 2, 3, 4	S_2005.tif
		LT05_CU_014017_20050807_20210429_02	8/7/2005		
Winter 2005	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20060114_20210429_02	1/14/2006	1, 2, 3, 4	W_2005.tif
		LT05_CU_014017_20060123_20210429_02	1/23/2006		
Summer 2006	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20060718_20210429_02	2006-07-18	1, 2, 3, 4	S_2006.tif
		LT05_CU_014017_20060725_20210429_02	2006-07-25		
Winter 2006	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20061225_20210429_02	2006-12-25	1, 2, 3, 4	W_2006.tif
		LT05_CU_014017_20070101_20210429_02	2007-01-01		
Summer 2007	N/A	N/A	N/A	N/A	N/A
		N/A	N/A		
Winter 2007	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20080120_20210429_02	1/20/2008	1, 2, 3, 4	W_2007.tif
		LT05_CU_014017_20080129_20210429_02	1/29/2008		
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		LT05_CU_014017_20080808_20210430_02	2008-08-08		
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Summer 2009	Landsat 5 TM U.S.	LT05_CU_014017_20090710_20210430_02	7/10/2009	1, 2, 3, 4	S_2009.tif

Survey Time Period	Imagery Source	Tile ID	Flight Acquisition Date	Bands	Raster File Name
	Analysis Ready Data	LT05_CU_014017_20090717_20210430_02	7/17/2009		
Winter 2009	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20091217_20210430_02	12/17/2009	1, 2, 3, 4	W_2009.tif
		LT05_CU_014017_20100109_20210430_02	1/9/2010		
Summer 2010	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20100729_20210430_02	2010-07-29	1, 2, 3, 4	S_2010.tif
		LT05_CU_014017_20100805_20210430_02	2010-08-05		
Winter 2010	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20101211_20210430_02	2010-12-11	1, 2, 3, 4	W_2010.tif
		LT05_CU_014017_20101220_20210430_0	2010-12-20		
Summer 2011	Landsat 5 TM U.S. Analysis Ready Data	LT05_CU_014017_20110614_20210501_02	6/14/2011	1, 2, 3, 4	S_2011.tif
		LT05_CU_014017_20110707_20210501_02	7/7/2011		
Winter 2011	Landsat 7 ETM+ U.S. Analysis Ready Data	LE07_CU_014017_20111222_20210501_02	12/22/2011	1, 2, 3, 4	W_2011
		LE07_CU_014017_20111231_20210501_02	12/31/2011		
Summer 2012	Landsat 7 ETM+ U.S. Analysis Ready Data	LE07_CU_014017_20120802_20210501_02	2012-08-02	1, 2, 3, 4	S_2012.tif
		LE07_CU_014017_20120811_20210501_02	2012-08-11		
Winter 2012	Landsat 7 ETM+ U.S. Analysis Ready Data	LE07_CU_014017_20121217_20210501_02	2012-12-17	1, 2, 3, 4	W_2012.tif
		LE07_CU_014017_20121224_20210501_02	2012-12-24		
Summer 2013	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20130705_20210501_02	7/5/2013	2, 3, 4, 5	S_2013.tif
		LC08_CU_014017_20130712_20210501_02	7/12/2013		
Winter 2013	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20140104_20210501_02	1/4/2014	2, 3, 4, 5	W_2013.tif
		LC08_CU_014017_20140113_20210501_02	1/13/2014		
Summer 2014	Landsat 8 OLI U.S.	LC08_CU_014017_20140708_20210501_02	2014-07-08	2, 3, 4, 5	S_2014.tif

Survey Time Period	Imagery Source	Tile ID	Flight Acquisition Date	Bands	Raster File Name
	Analysis Ready Data	LC08_CU_014017_20140715_20210502_02	2014-07-15		
Winter 2014	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20141206_20210502_02	2014-12-06	2, 3, 4, 5	W_2014.tif
		LC08_CU_014017_20141215_20210502_02	2014-12-15		
Summer 2015	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20150727_20210502_02	7/27/2015	2, 3, 4, 5	S_2015.tif
		LC08_CU_014017_20150803_20210502_02	8/3/2015		
Winter 2015	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20160110_20210502_02	1/10/2016	2, 3, 4, 5	W_2015.tif
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Summer 2016	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20160704_20210502_02	2016-07-04	2, 3, 4, 5	S_2016.tif
		LC08_CU_014017_20160713_20210502_02	2016-07-13		
Winter 2016	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20161220_20210503_02	2016-12-20	2, 3, 4, 5	W_2016.tif
		LC08_CU_014017_20170128_20210503_02	2017-01-28		
Summer 2017	N/A	N/A	N/A	N/A	N/A
		N/A	N/A		
Winter 2017	N/A	N/A	N/A	N/A	N/A
		N/A	N/A		
Summer 2019	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20190729_20210504_02	7/29/2019	2, 3, 4, 5	S_2019.tif
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Winter 2019	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20191229_20210504_02	12/29/2019	2, 3, 4, 5	W_2019.tif
		LC08_CU_014017_20200105_20210505_02	1/5/2020		
Summer 2020	Landsat 8 OLI U.S.	LC08_CU_014017_20200708_20210504_02	2020-07-08	2, 3, 4, 5	S_2020.tif

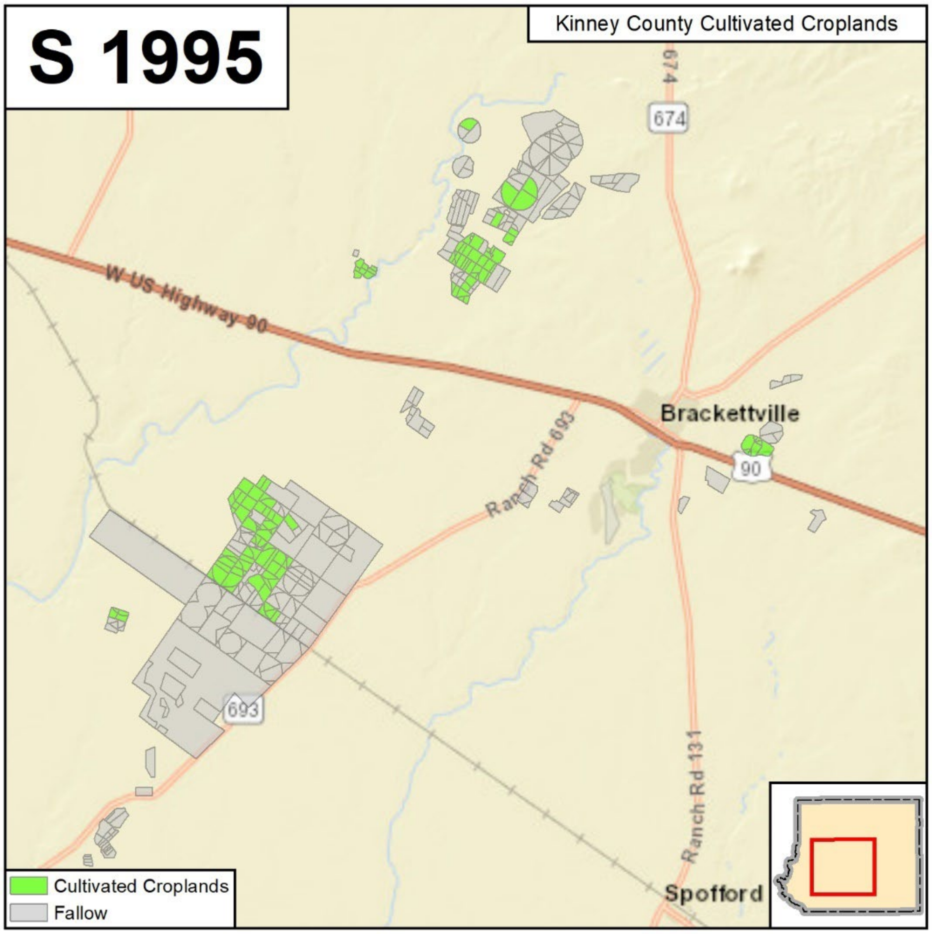
Survey Time Period	Imagery Source	Tile ID	Flight Acquisition Date	Bands	Raster File Name
	Analysis Ready Data	LC08_CU_014017_20200715_20210504_02	2020-07-15		
Winter 2020	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20201215_20210504_02	2020-12-15	2, 3, 4, 5	W_2020.tif
		LC08_CU_014017_20210107_20210504_02	2021-01-07		
Summer 2021	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20210718_20210802_02	7/18/2021	2, 3, 4, 5	S_2021.tif
		LC08_CU_014017_20210803_20210818_0	8/3/2021		
Winter 2021	Landsat 9 OLI U.S. Analysis Ready Data	LC09_CU_014017_20220102_20220214_02	1/2/2022	2, 3, 4, 5	W_2021.tif
		LC08_CU_014017_20220103_20220117_02	1/3/2022		
Summer 2022	Landsat 8 OLI U.S. Analysis Ready Data	LC08_CU_014017_20220714_20220729_02	7/14/2022	2, 3, 4, 5	S_2022.tif

APPENDIX II

Cultivated Cropland Time Series Figures

Summer Time-Series Figures Pages 14-40

Winter Time-Series Figures Pages 40-65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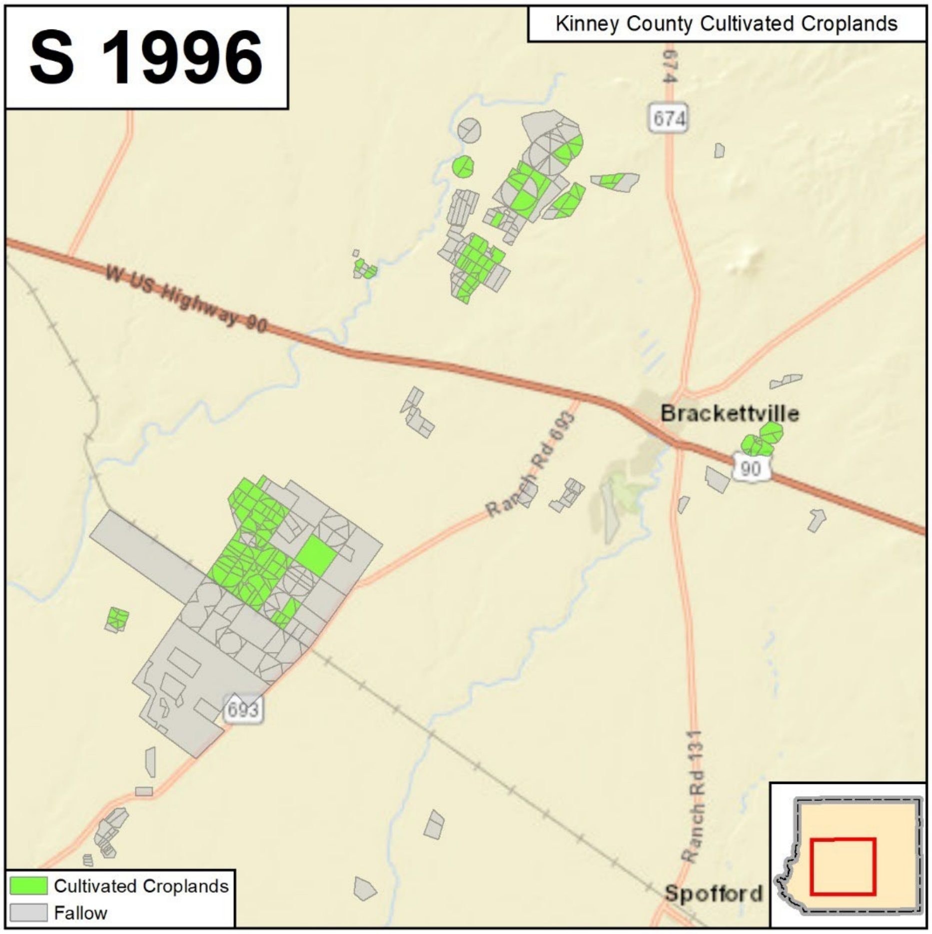
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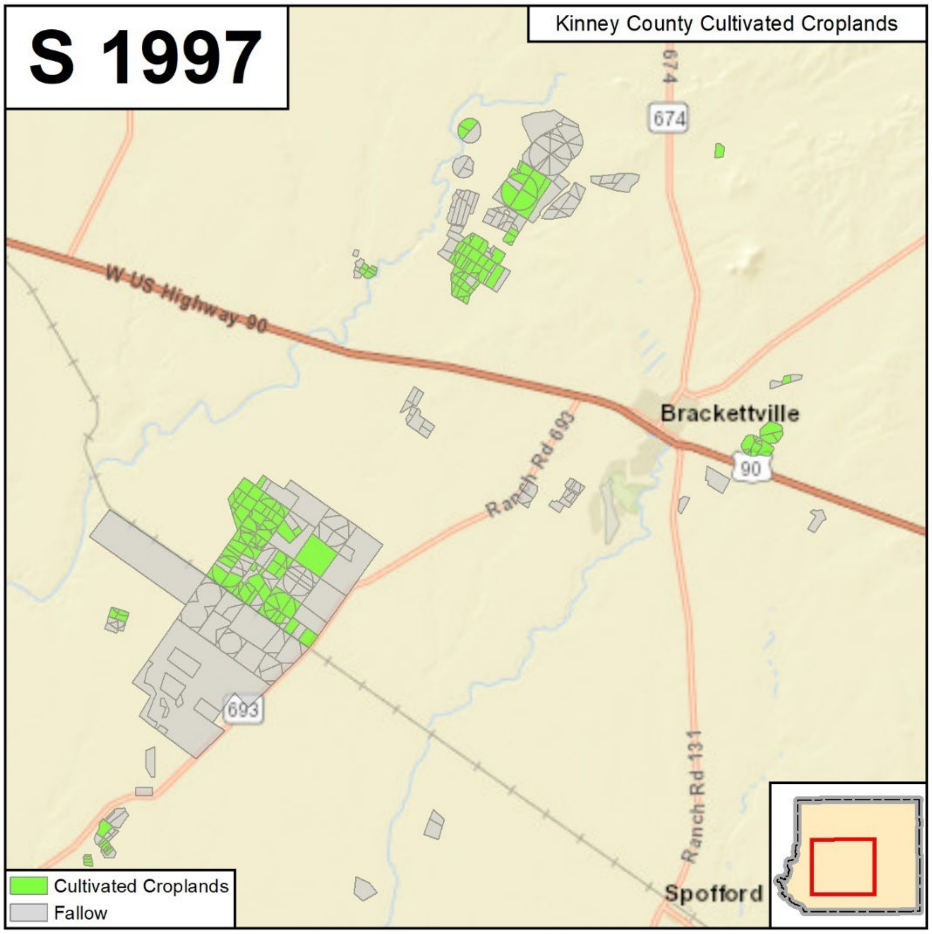
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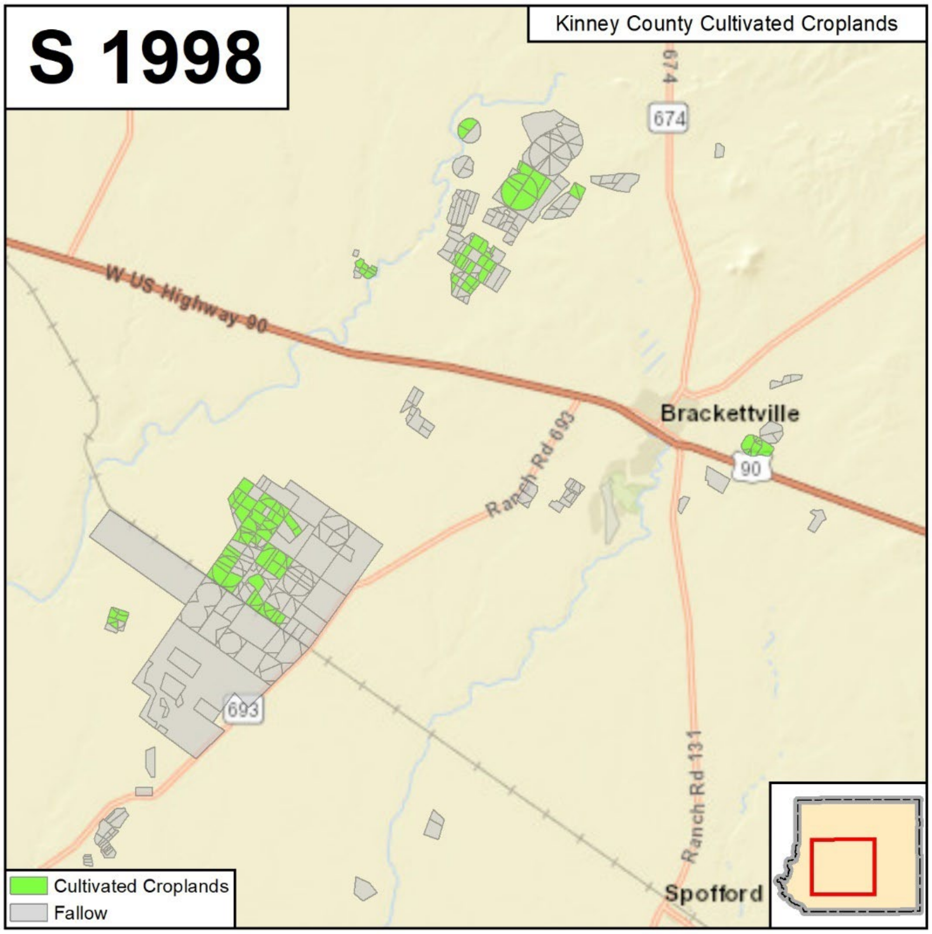
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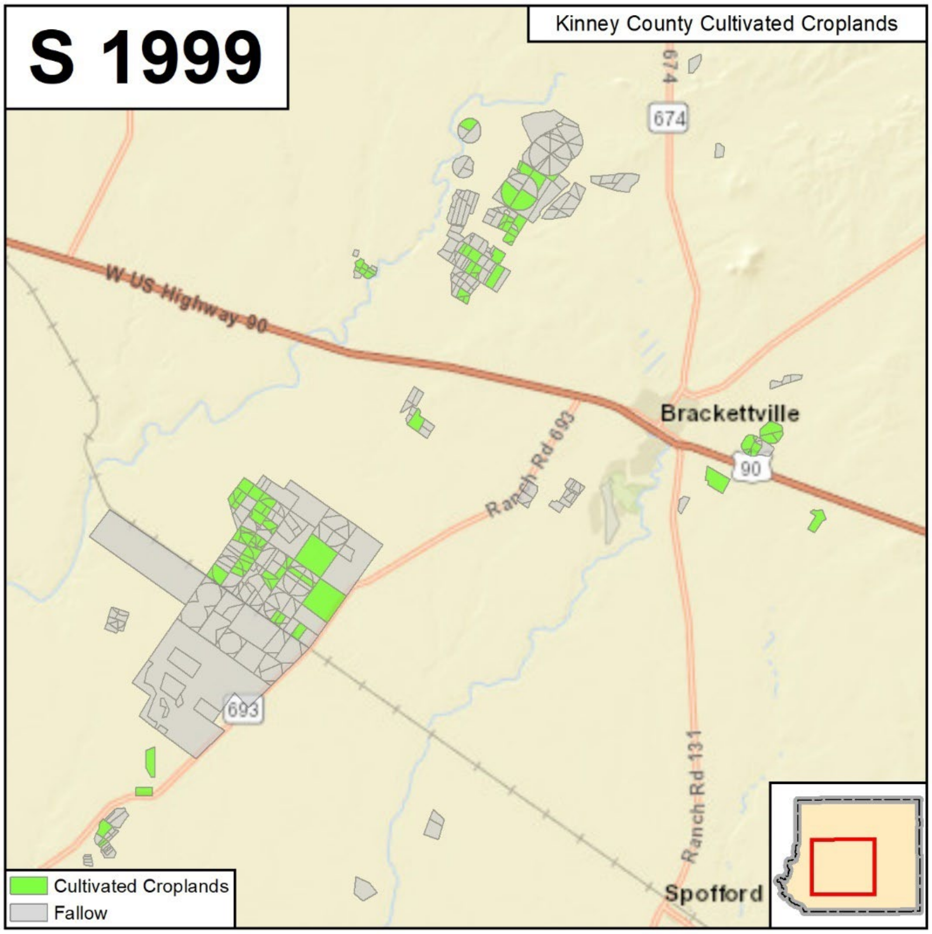
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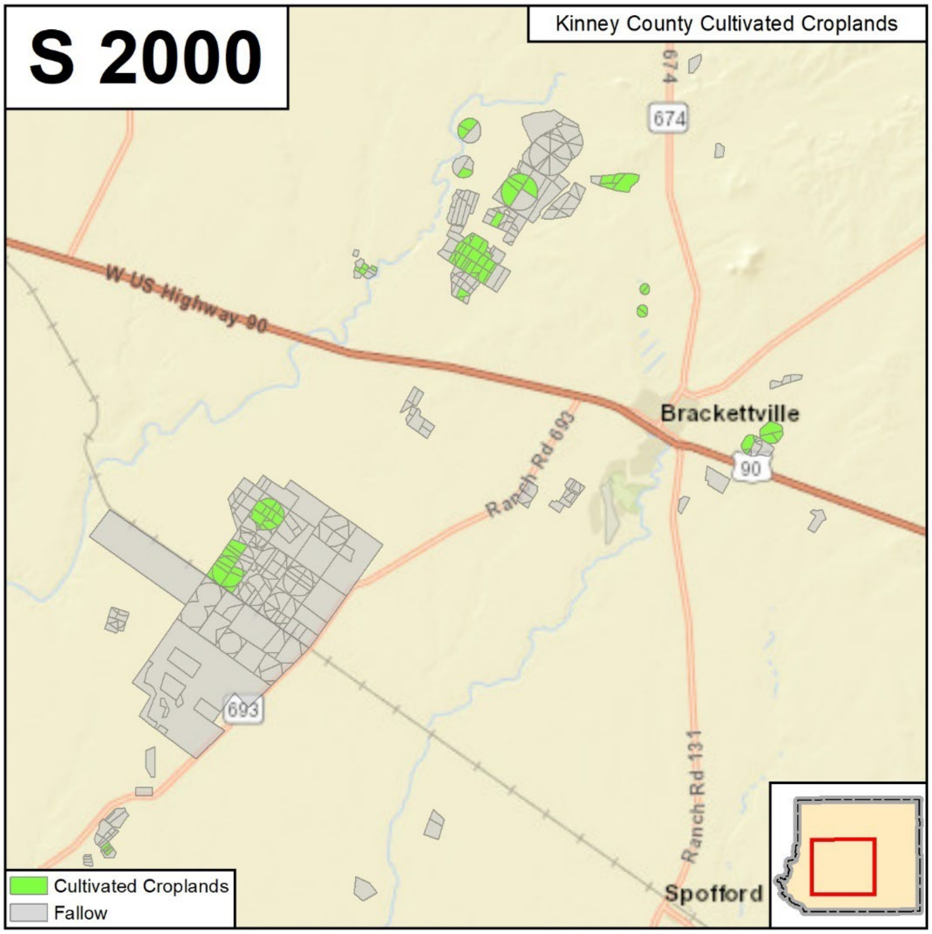
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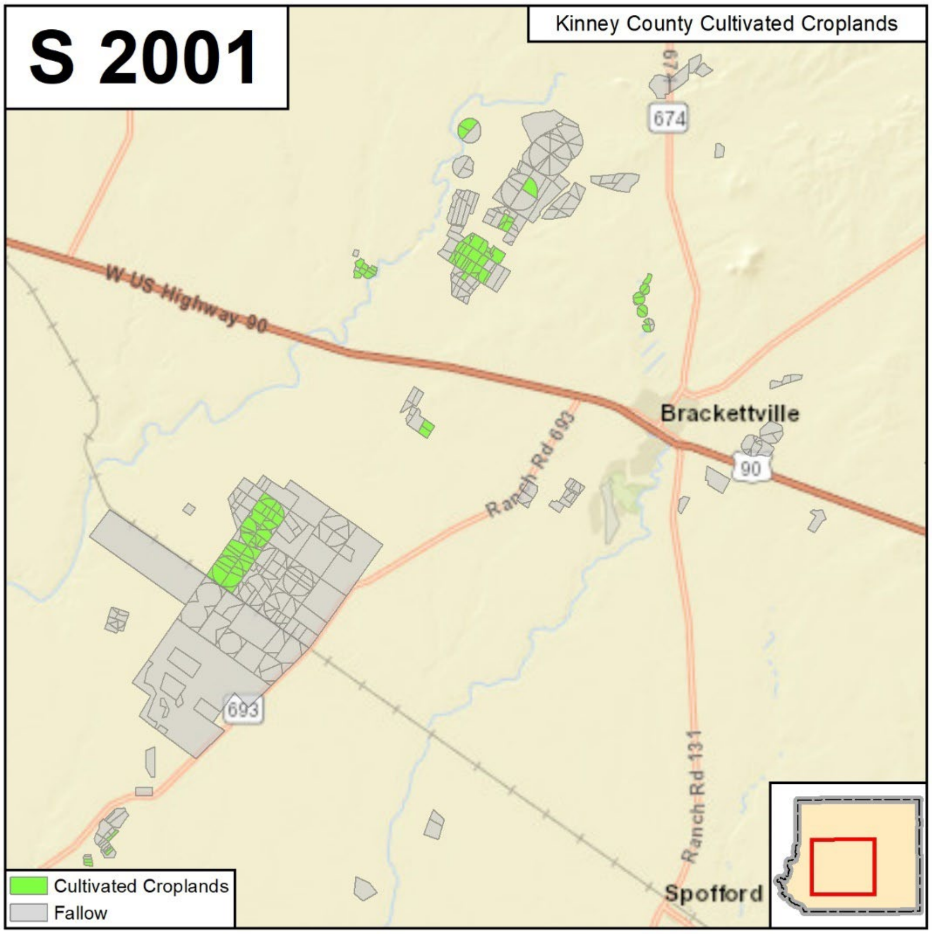
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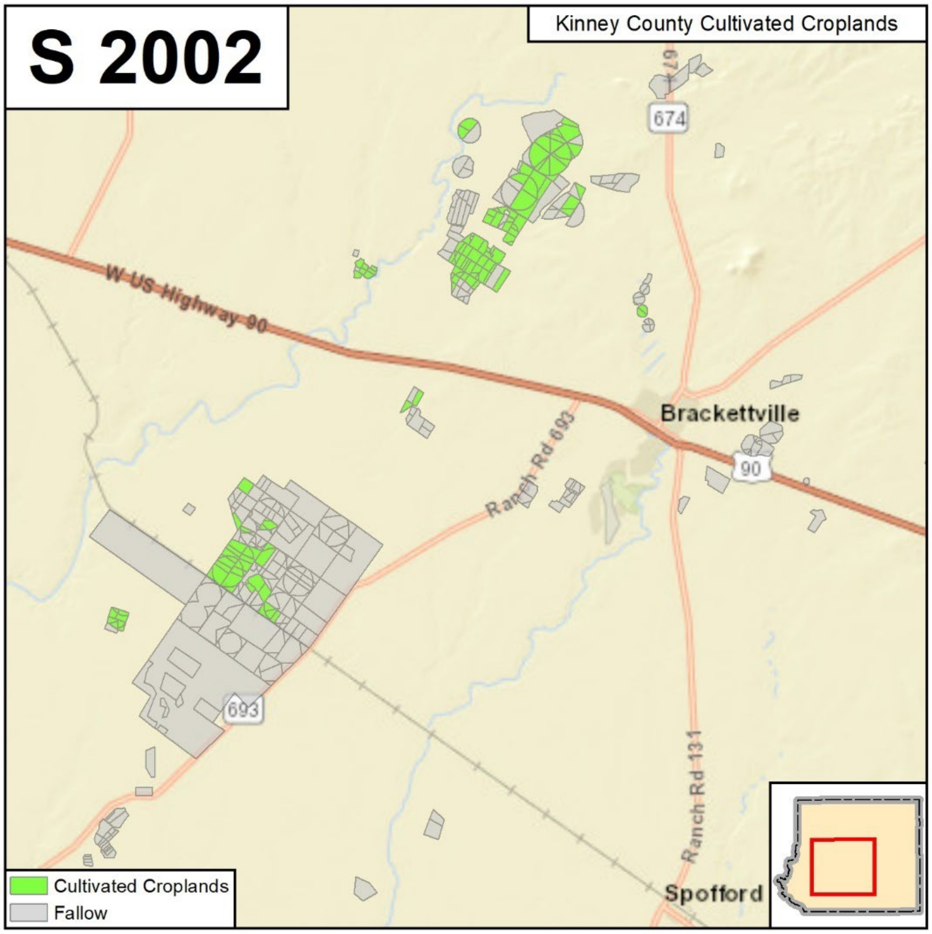
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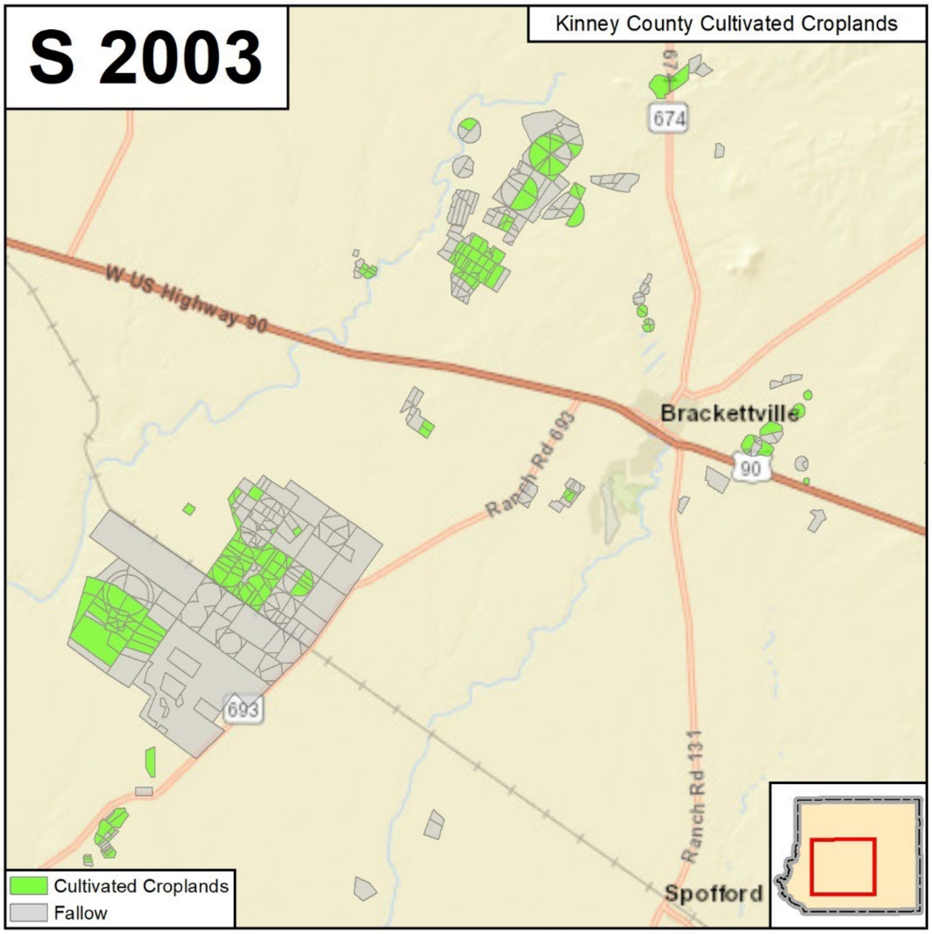
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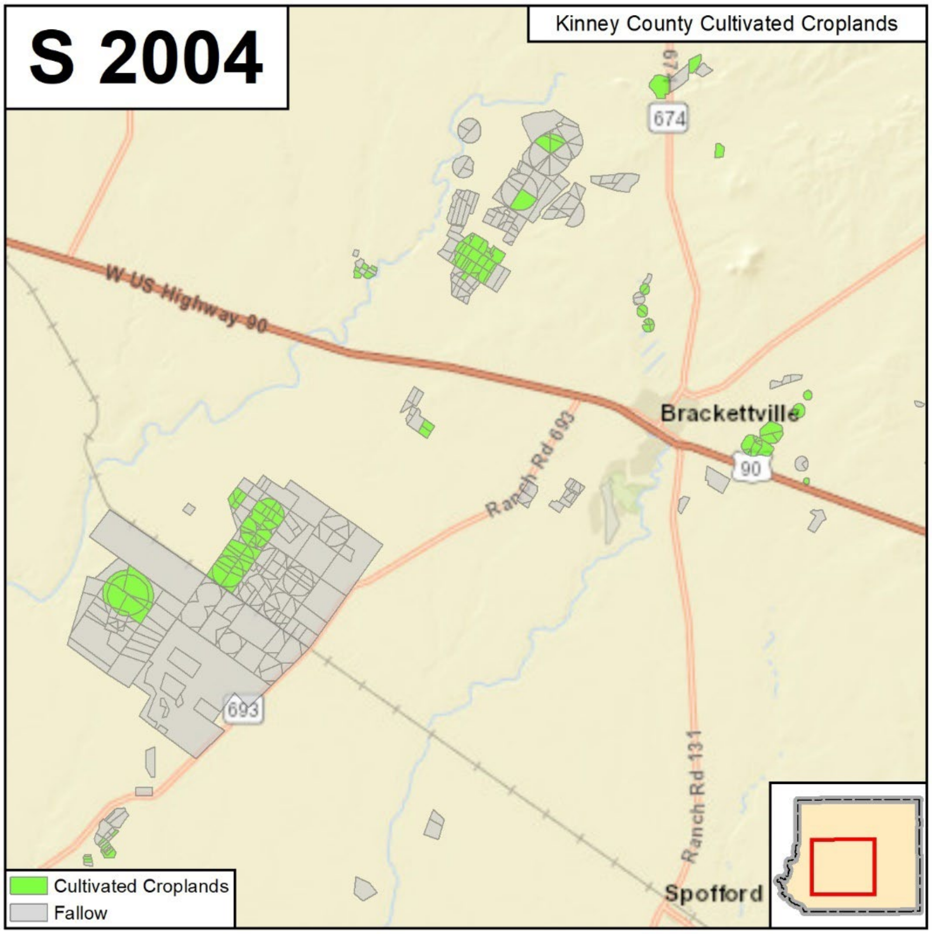
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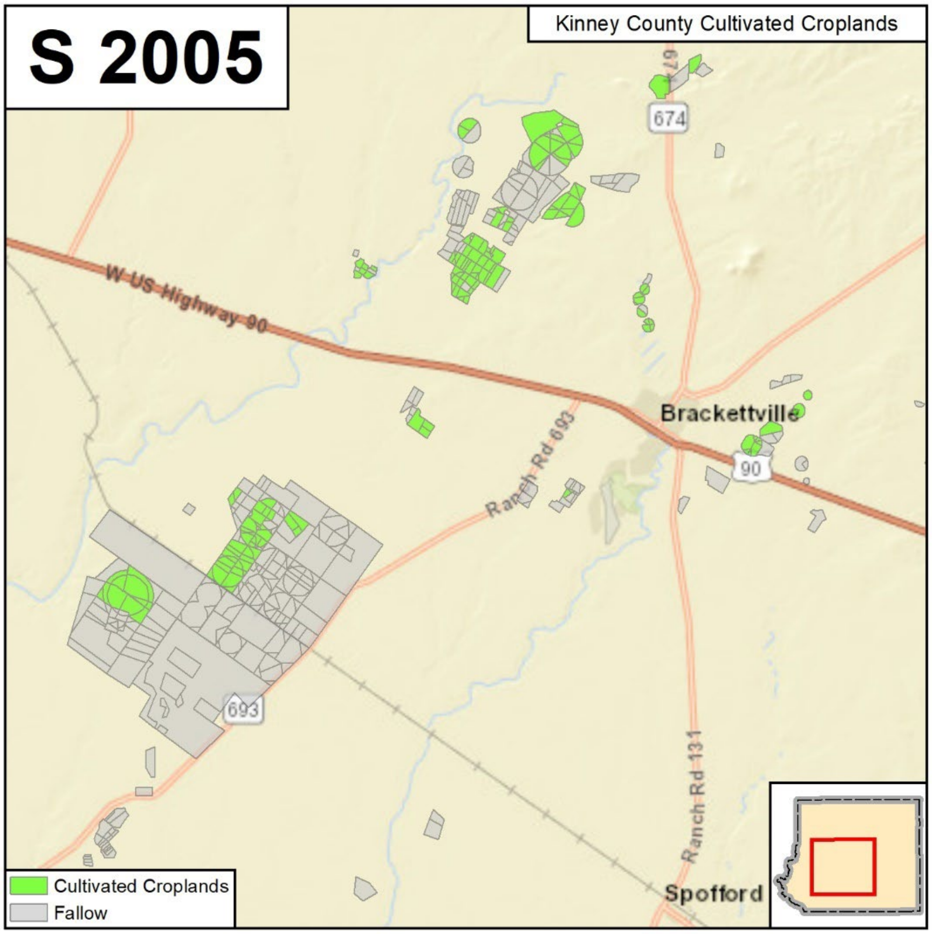
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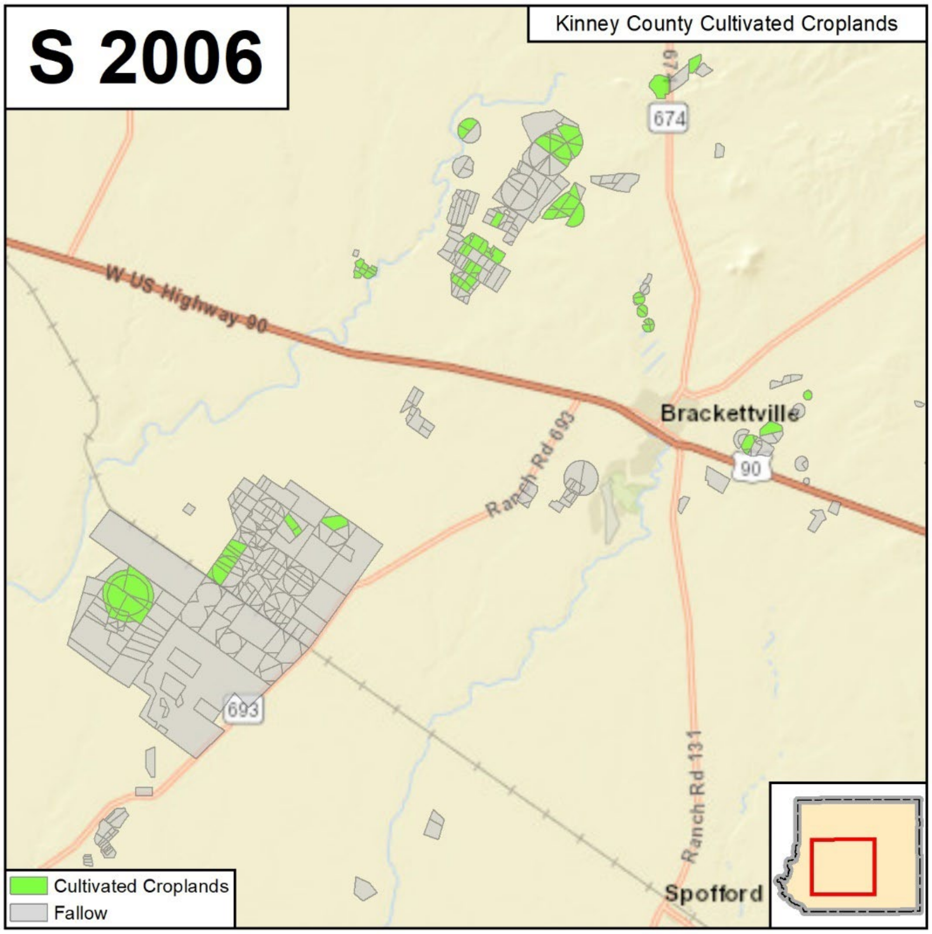

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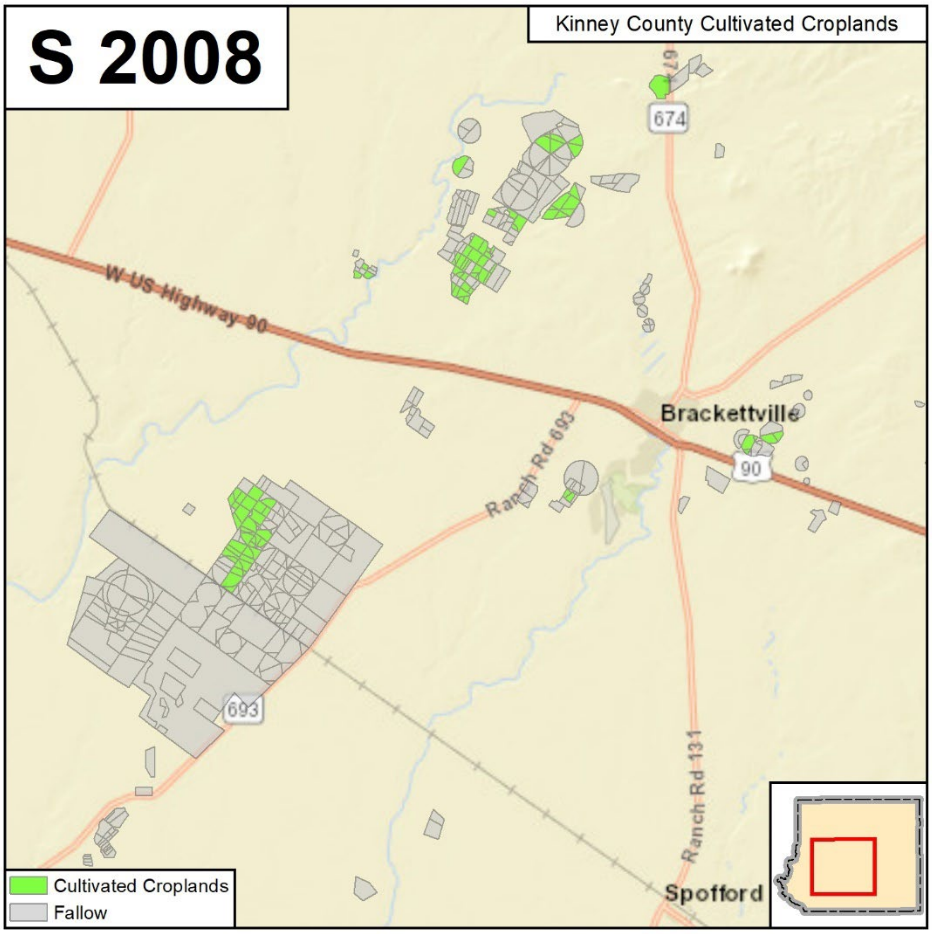
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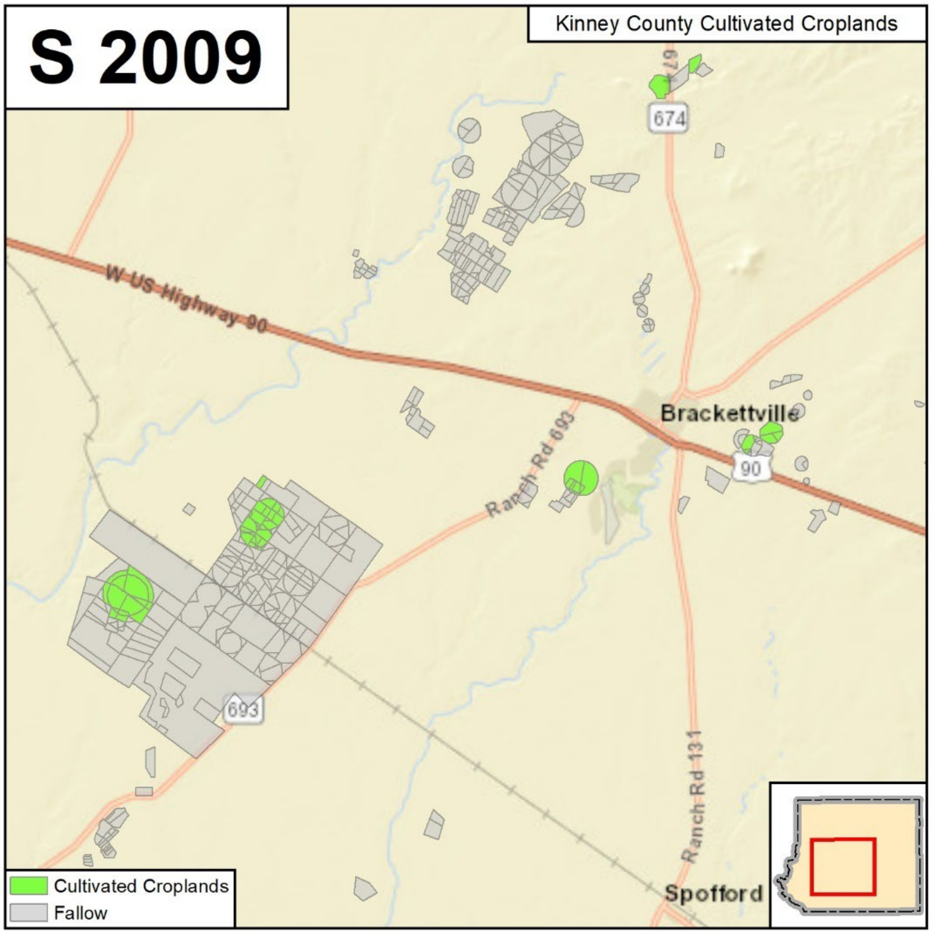
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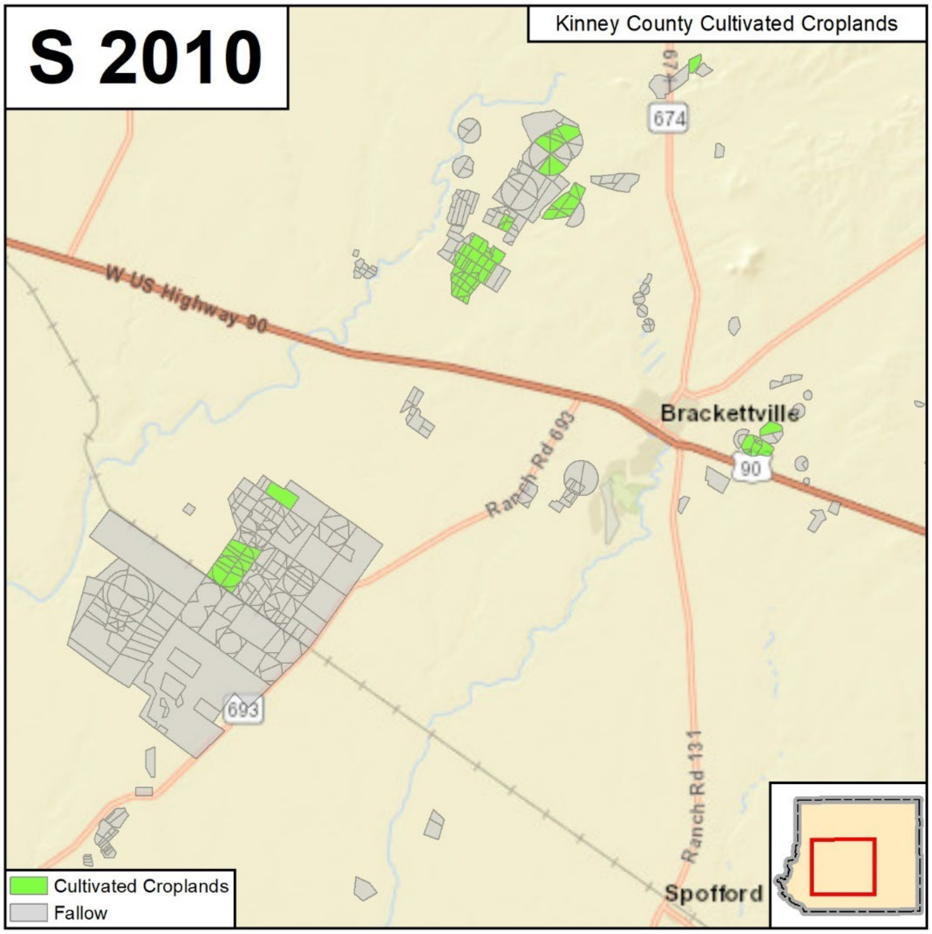
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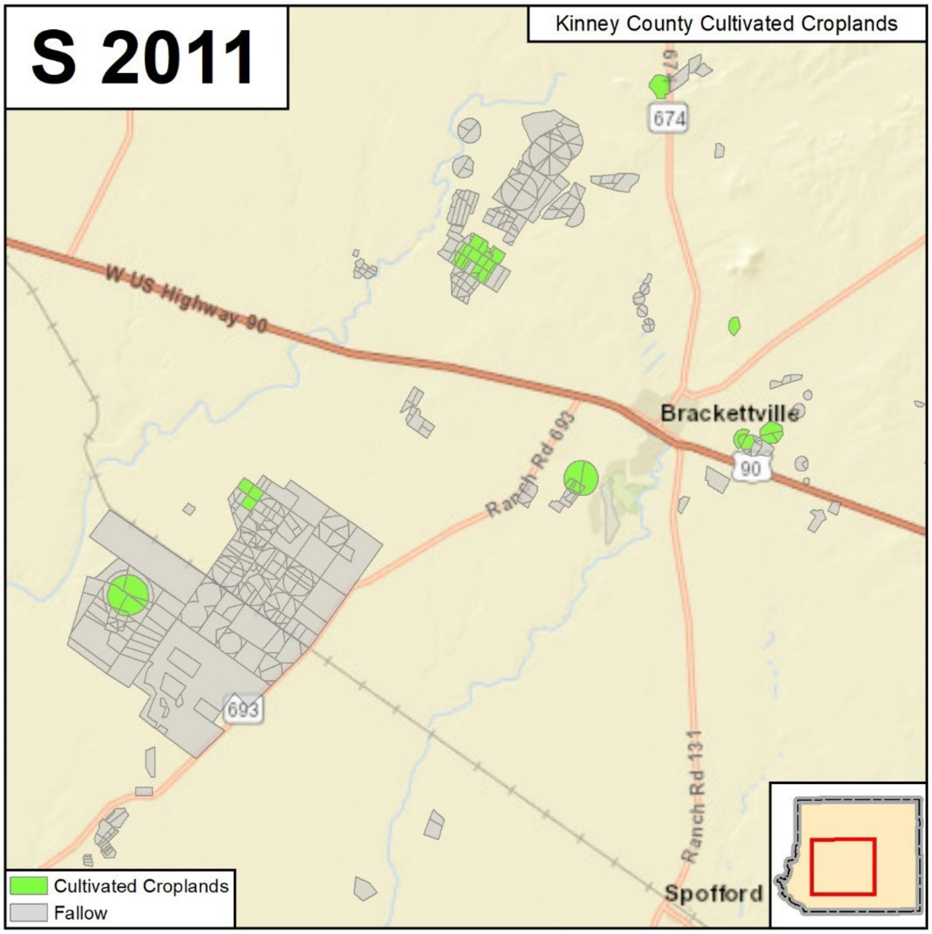
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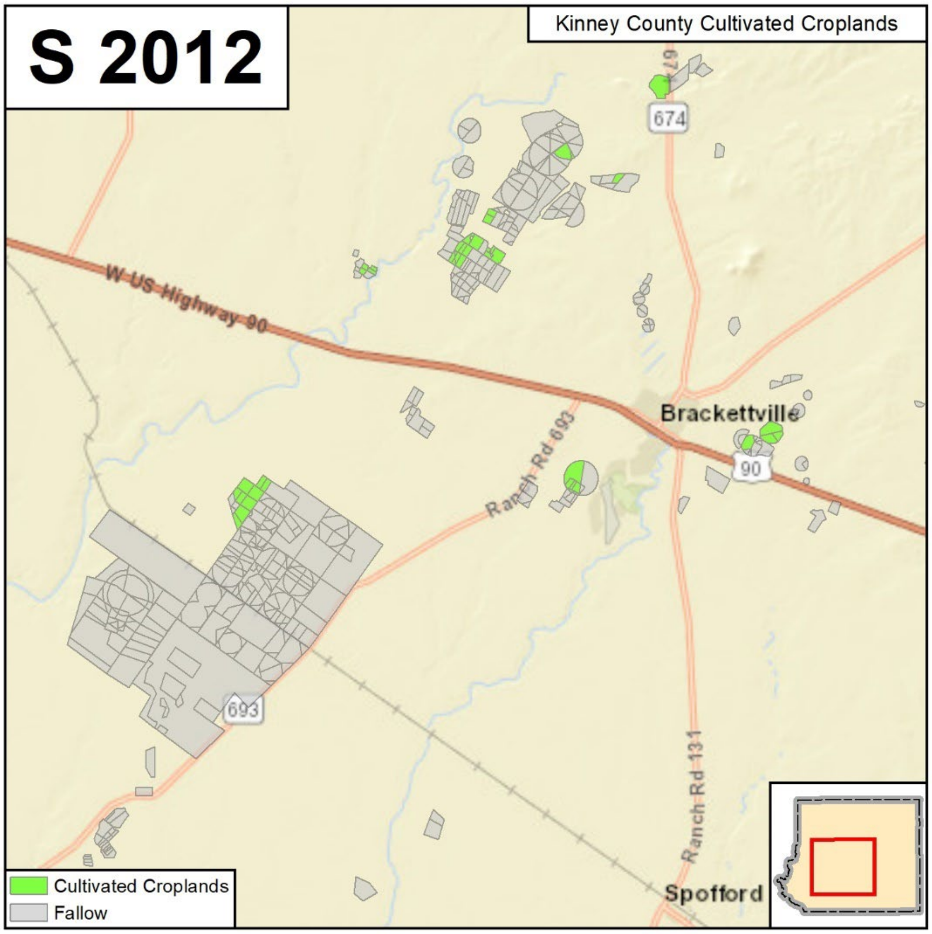
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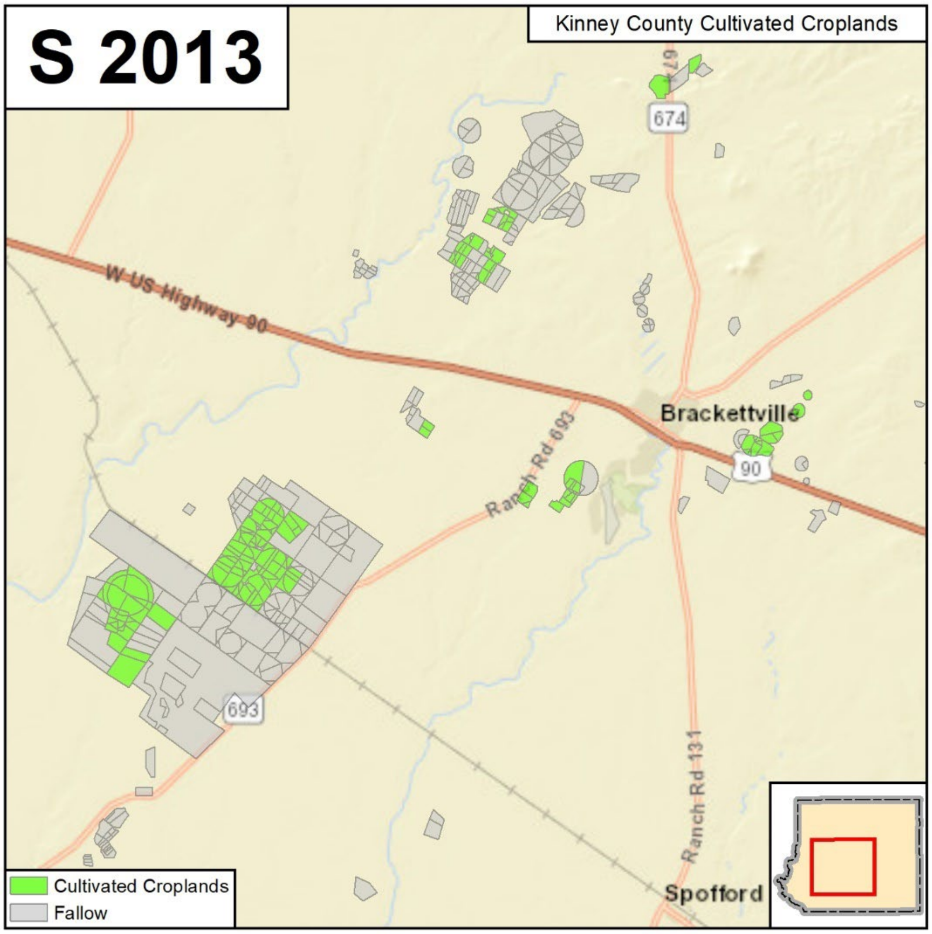
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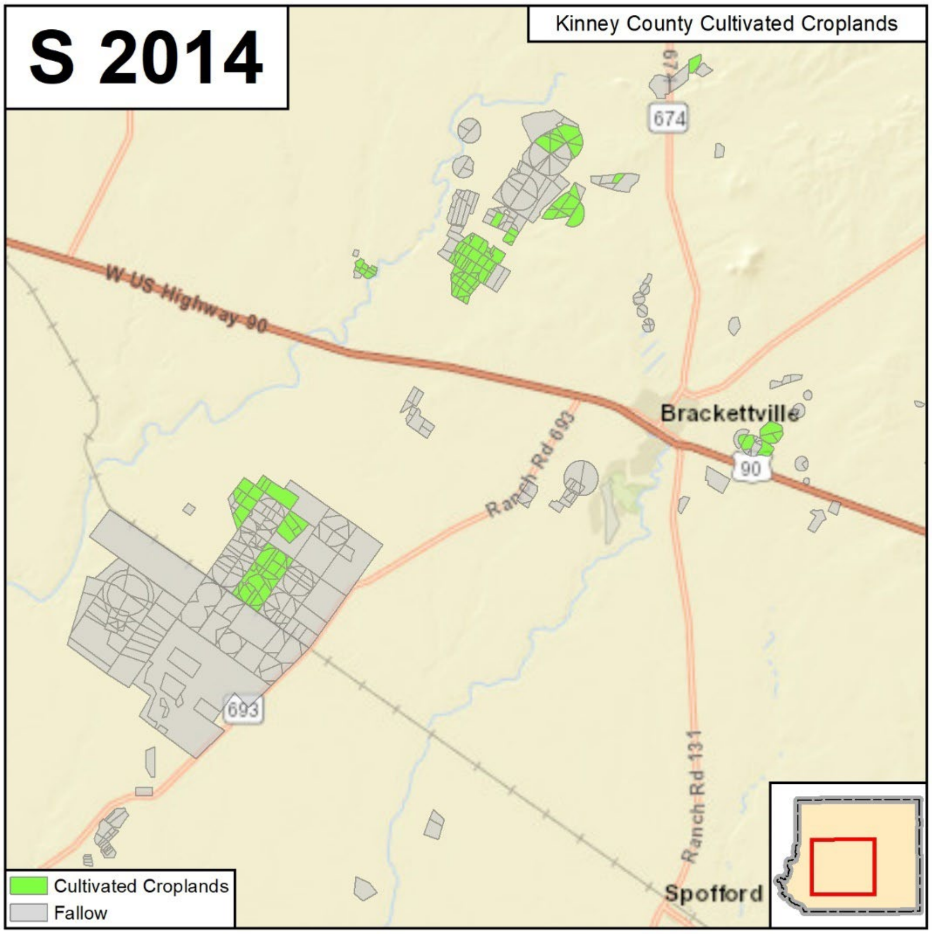
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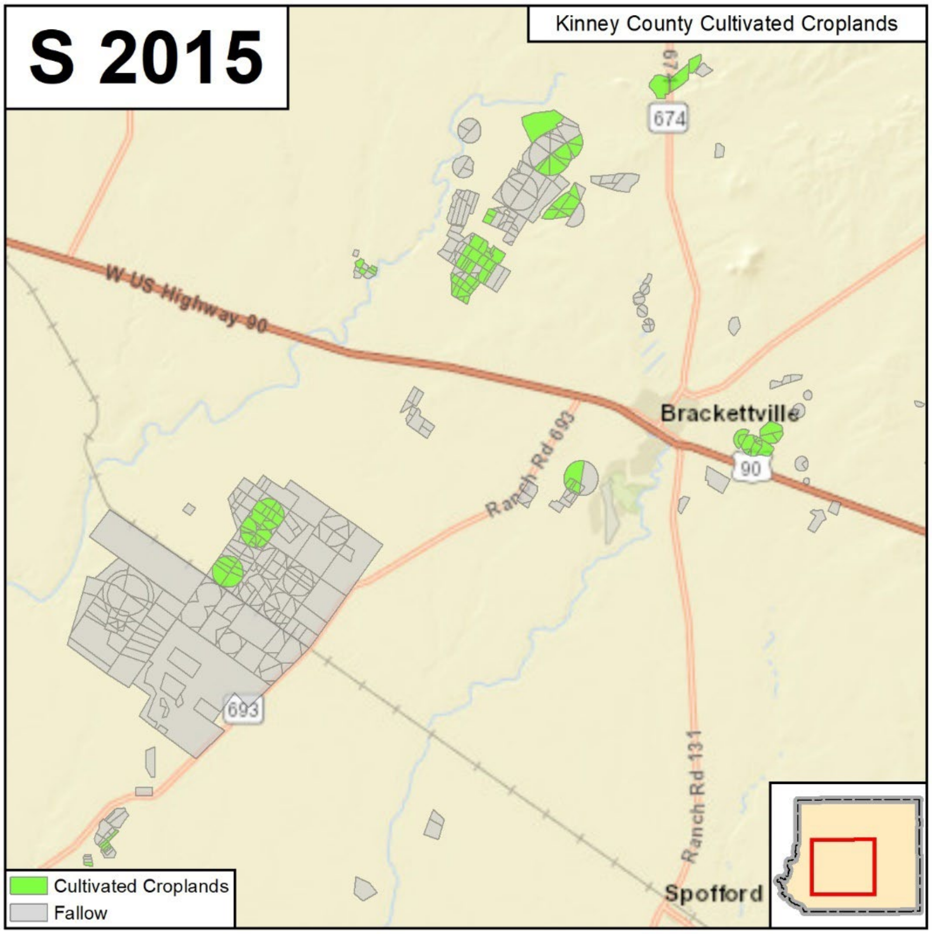
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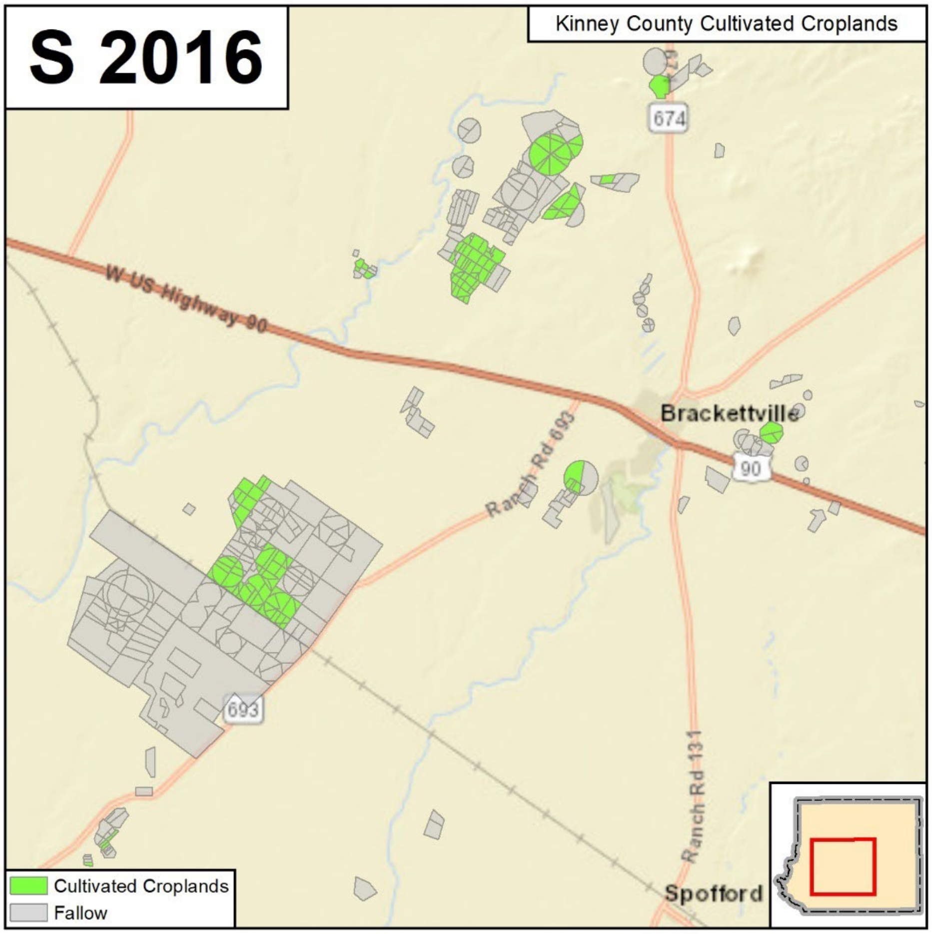
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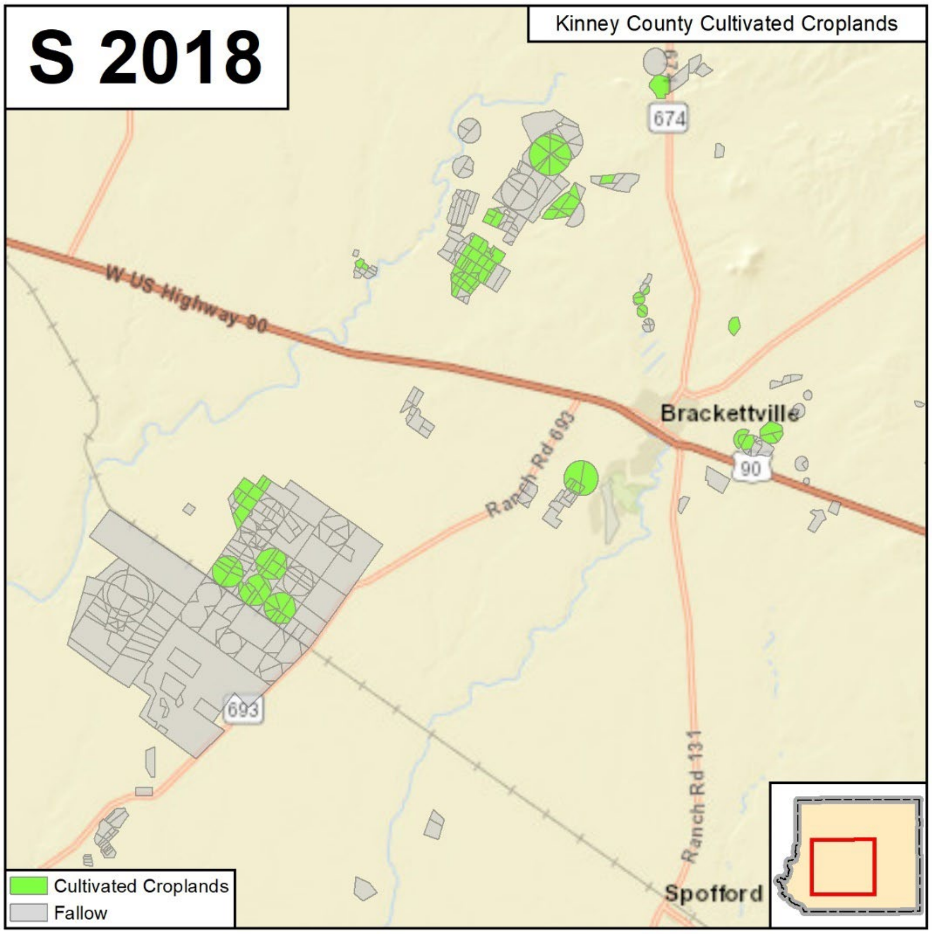
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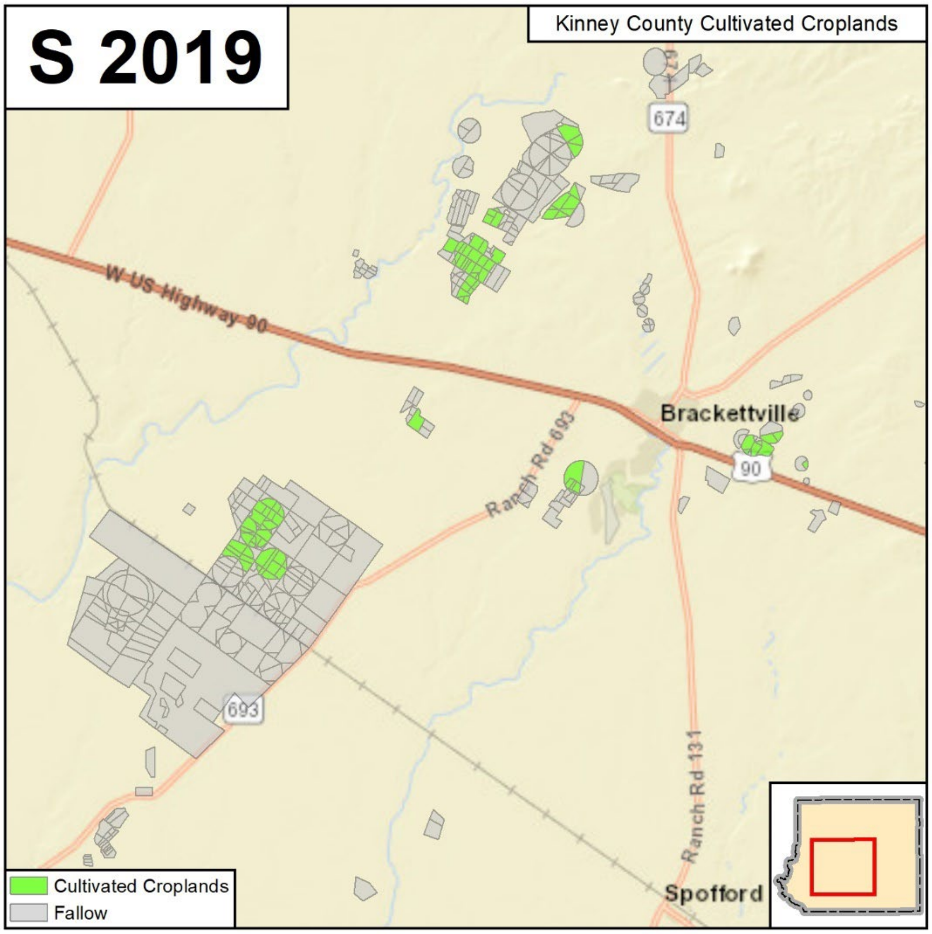
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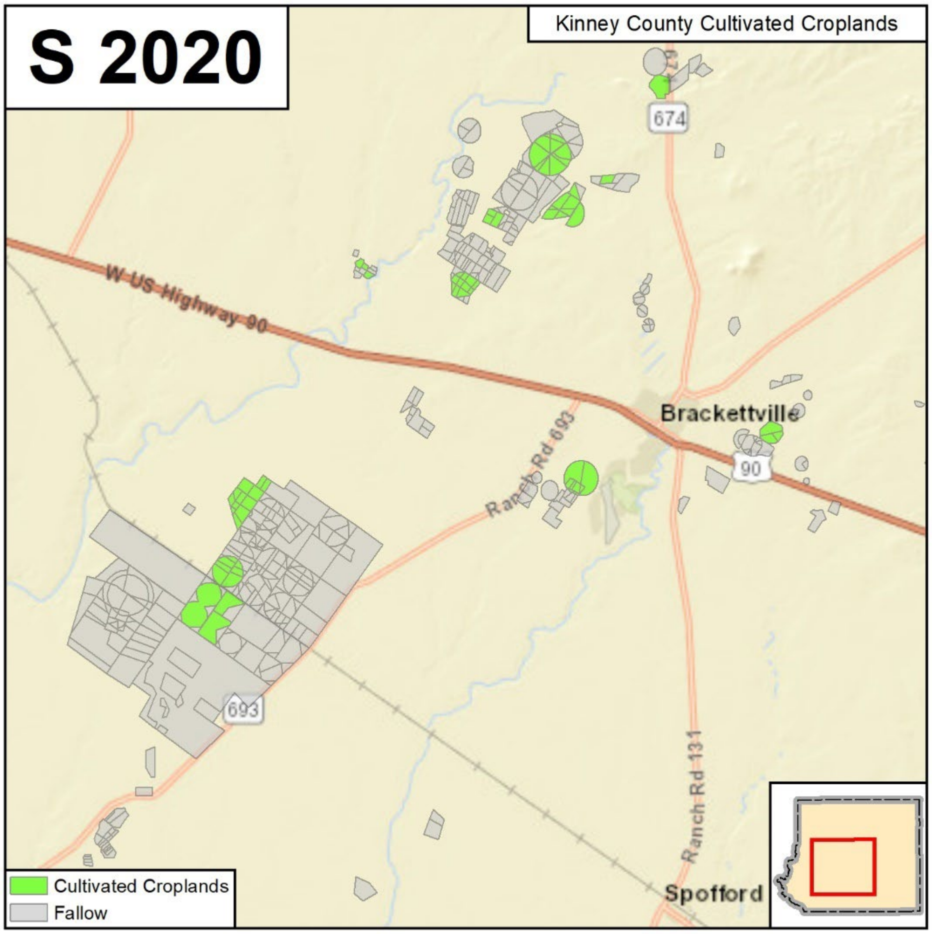
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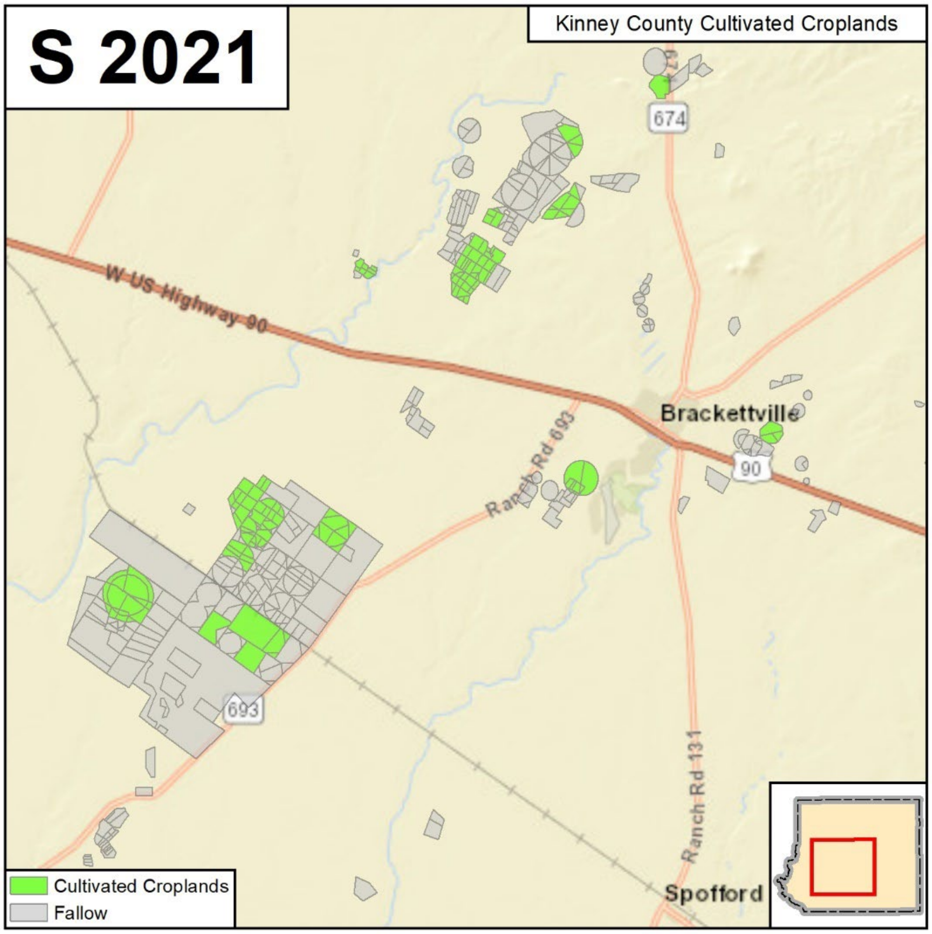
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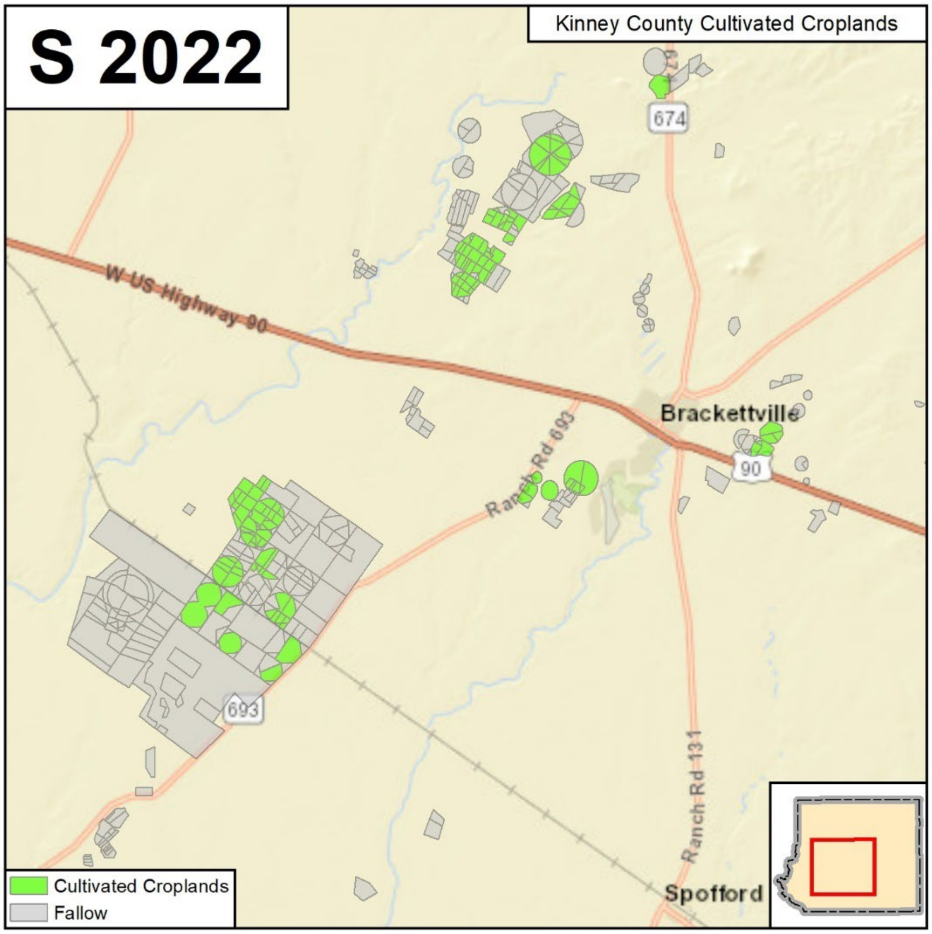

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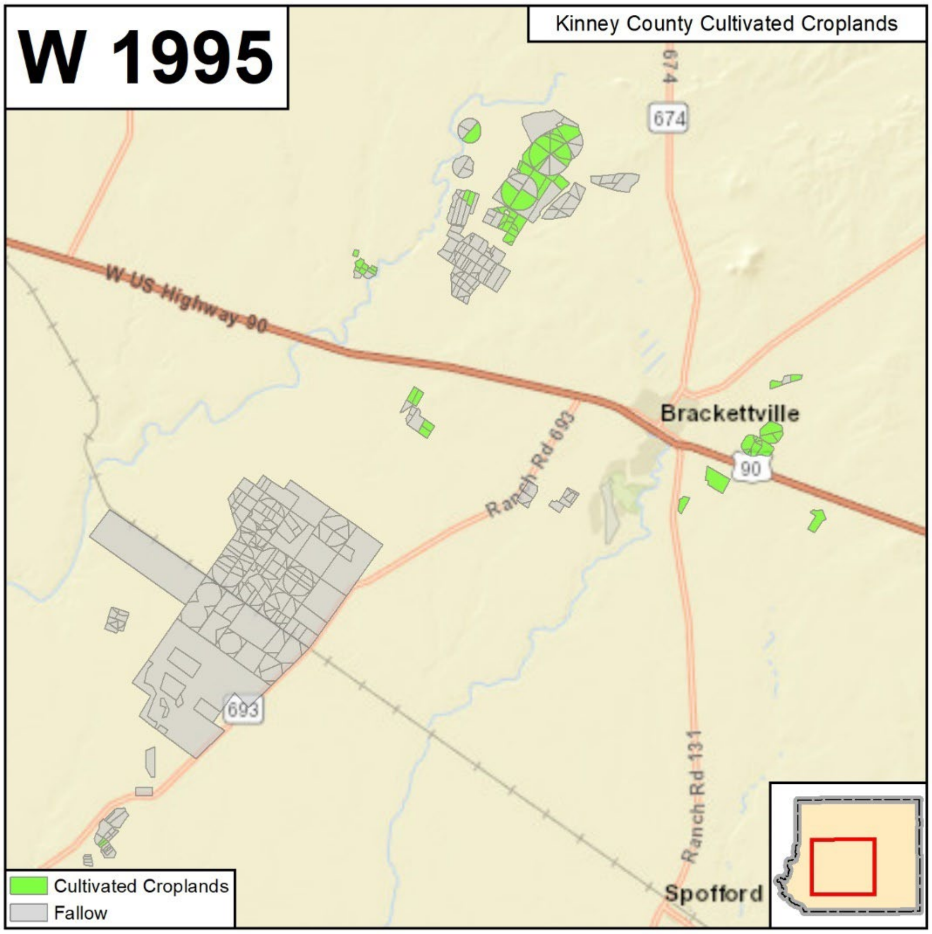
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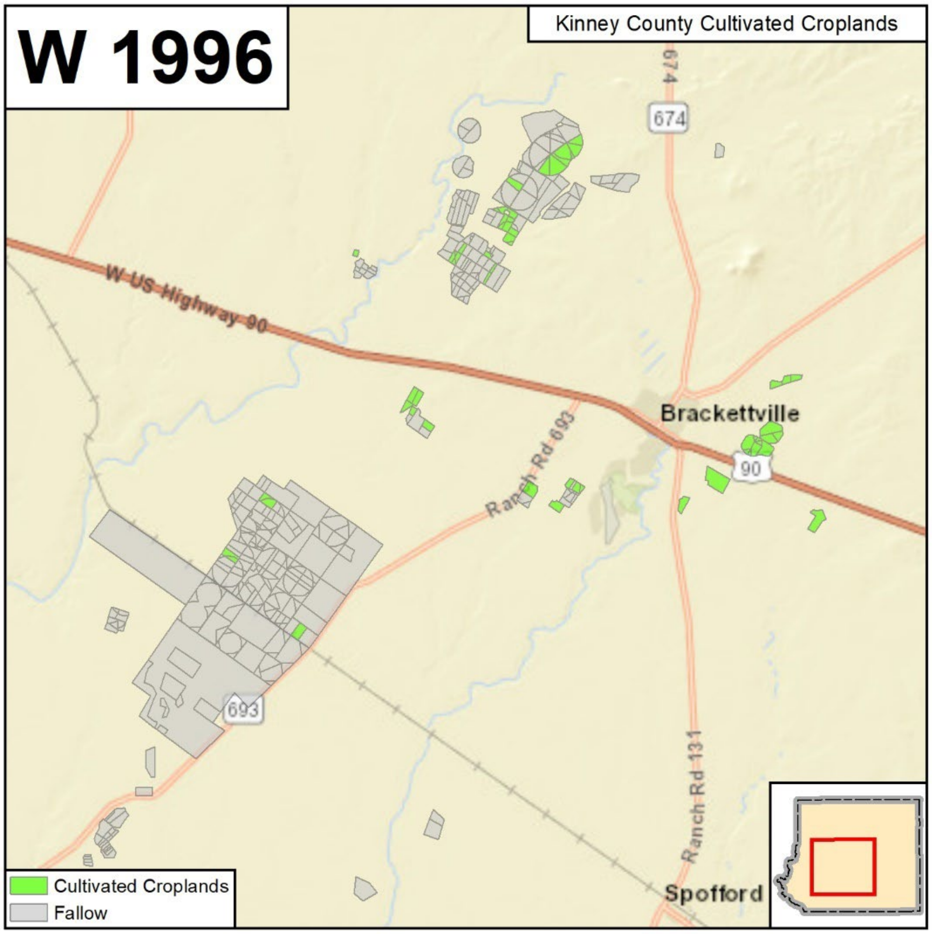
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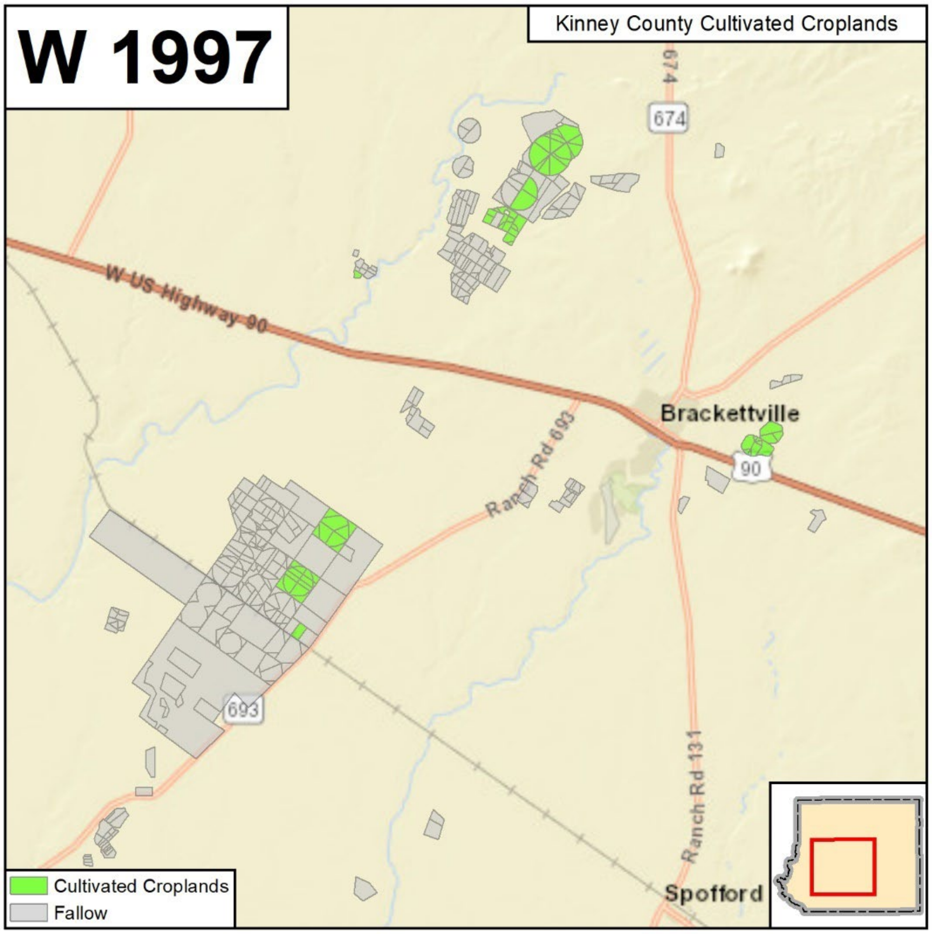
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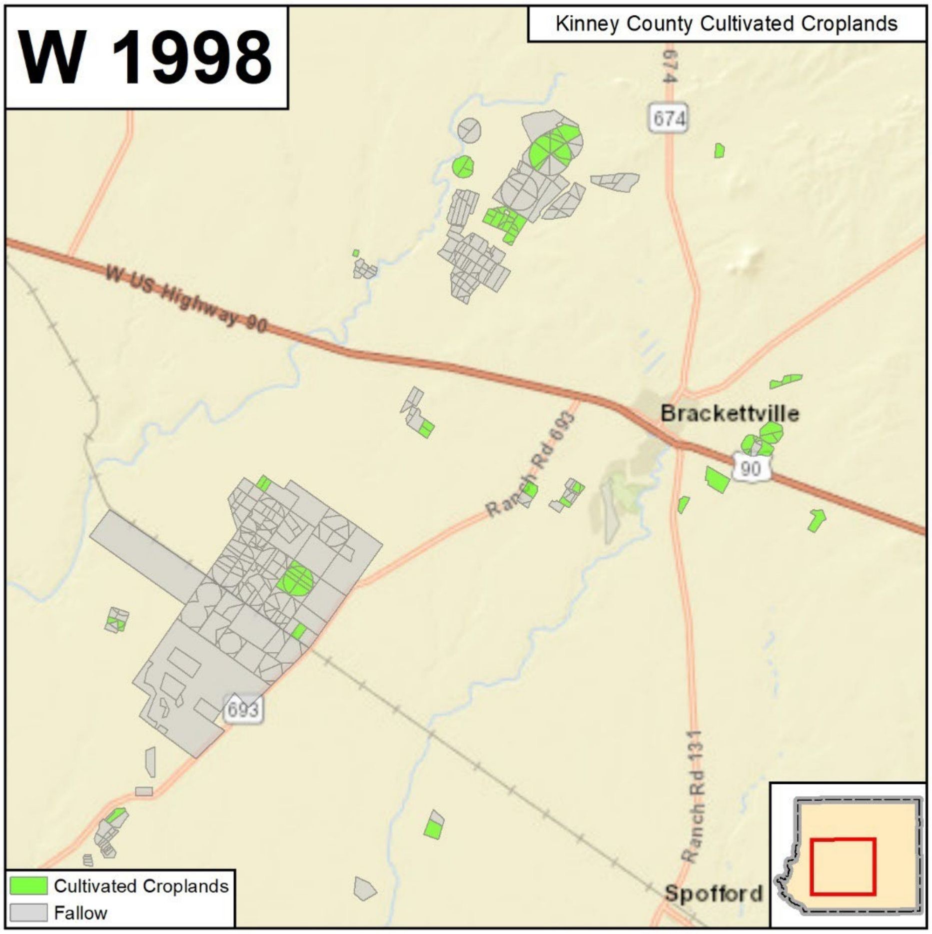
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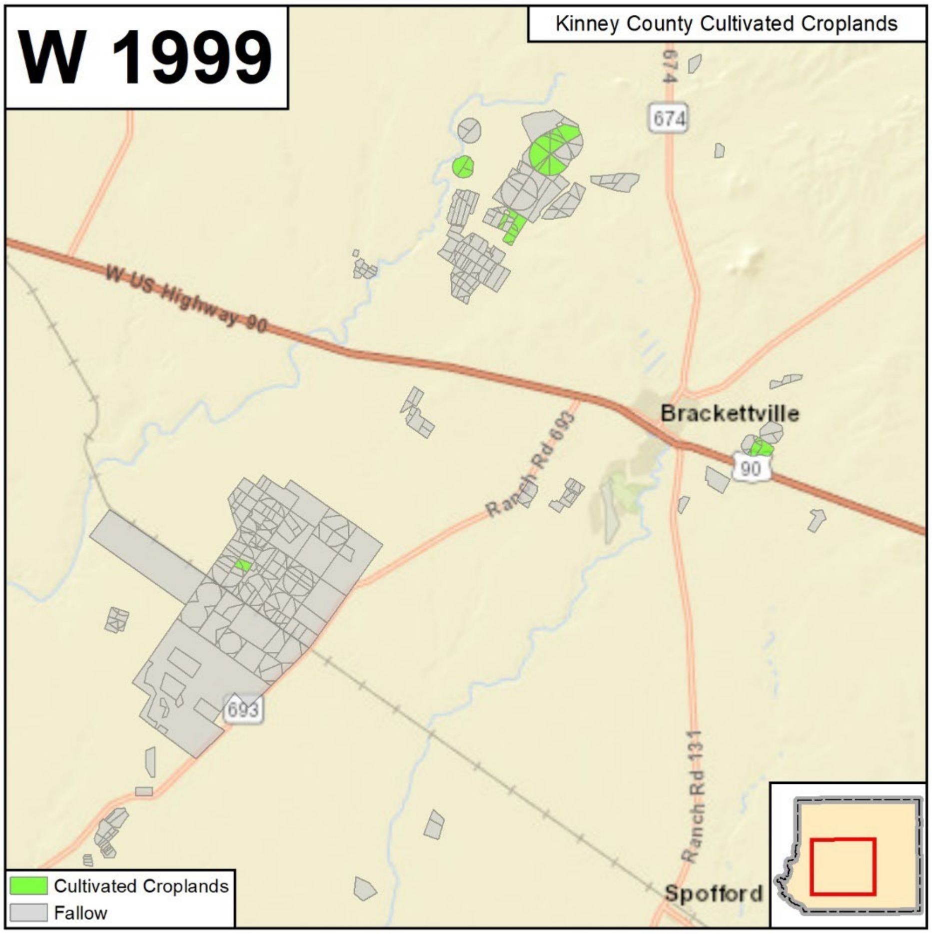
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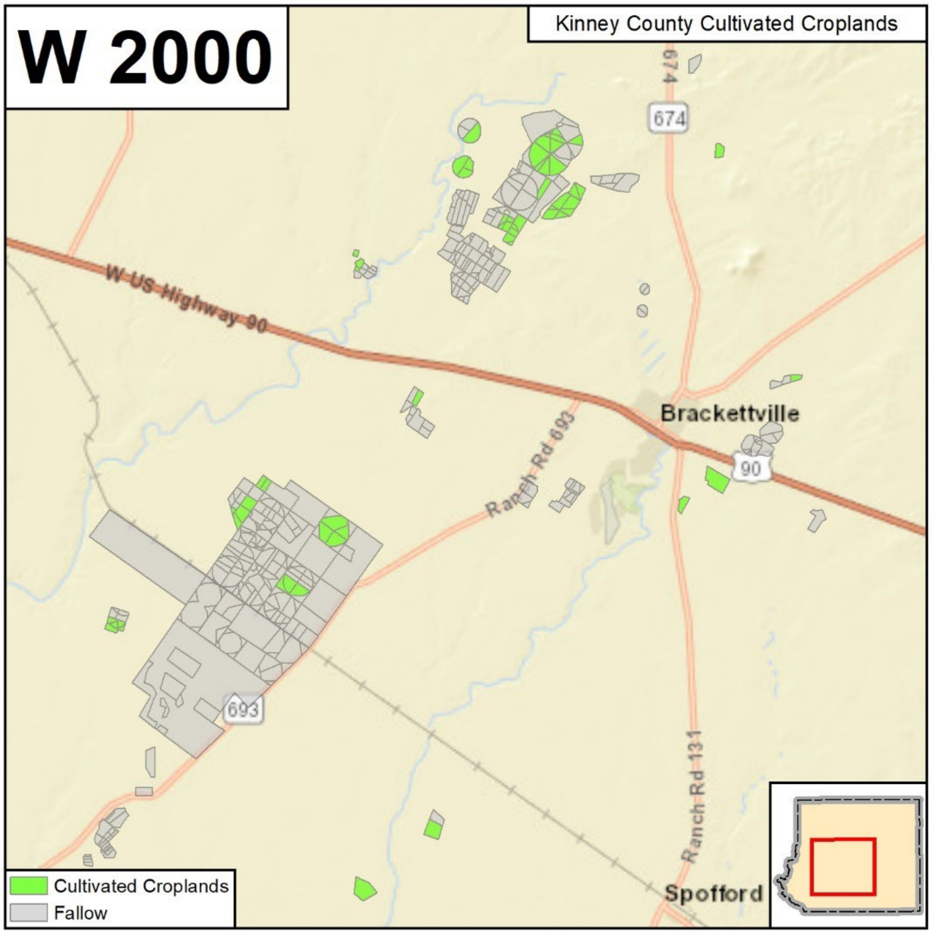
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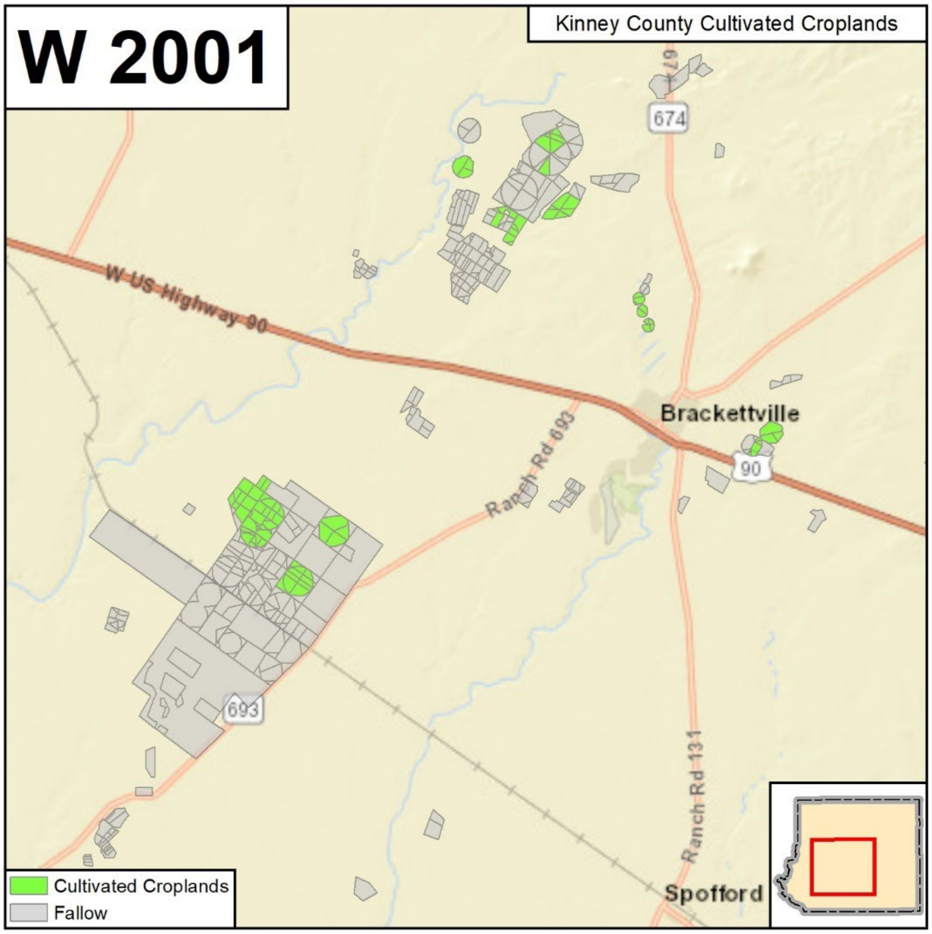

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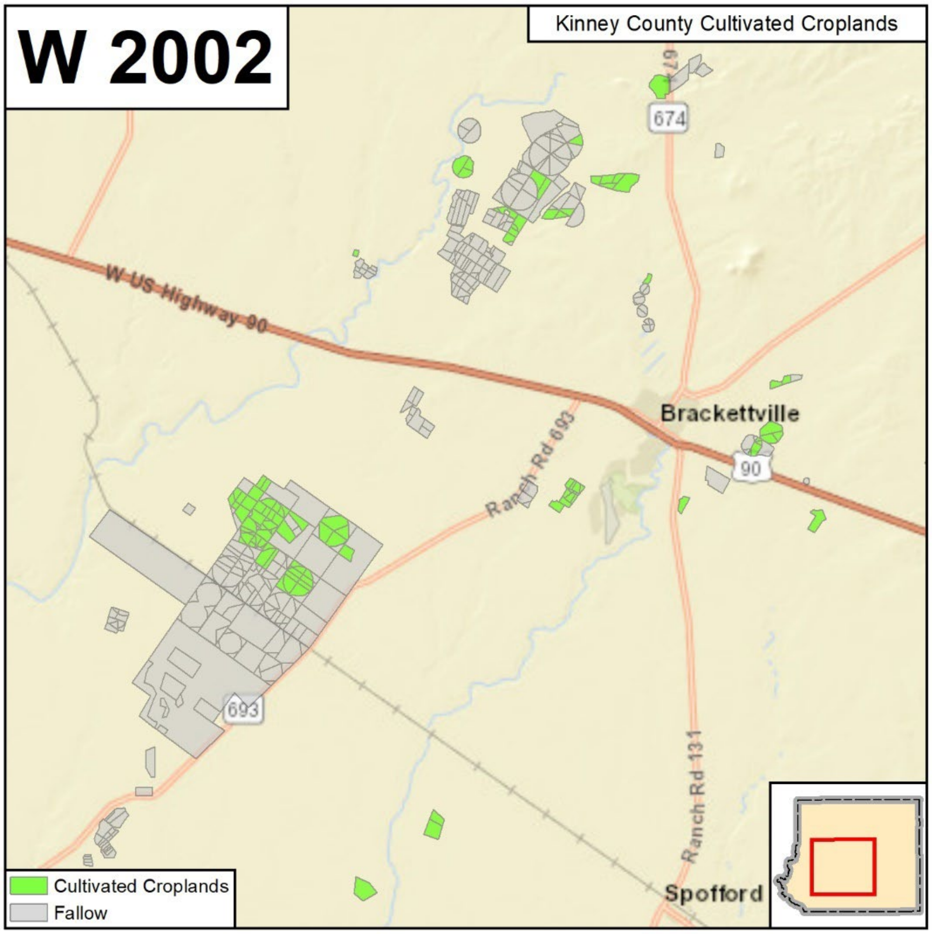
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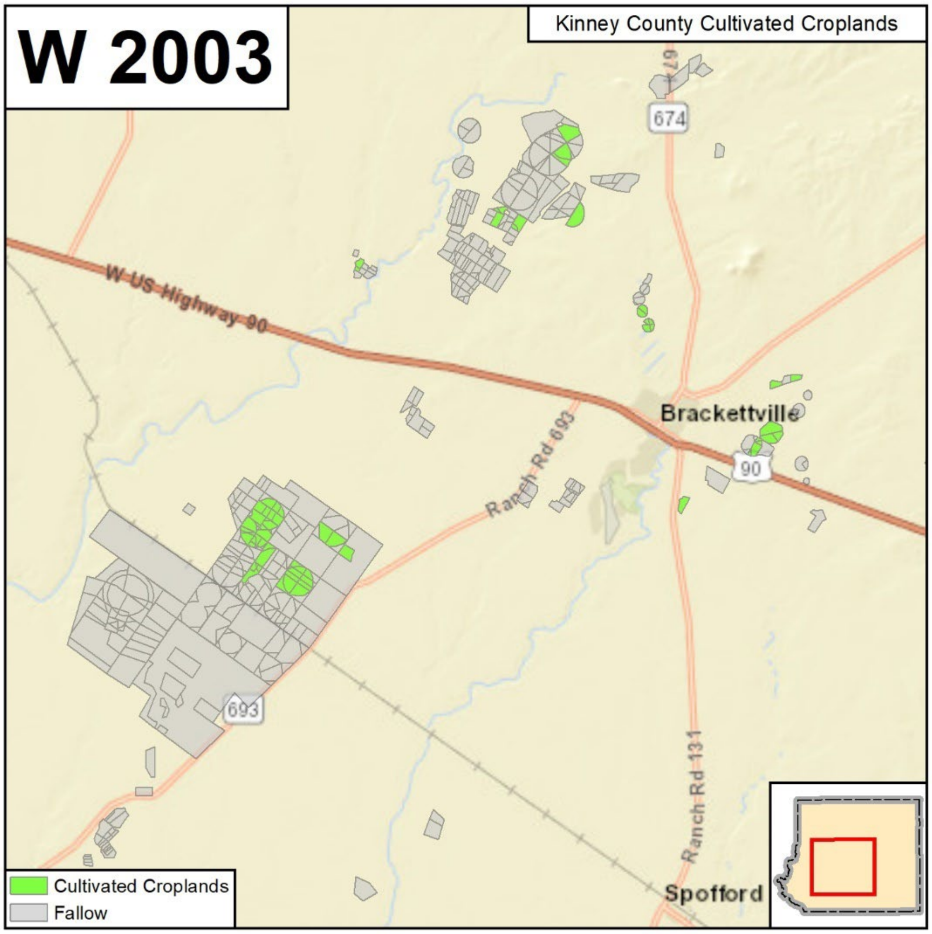
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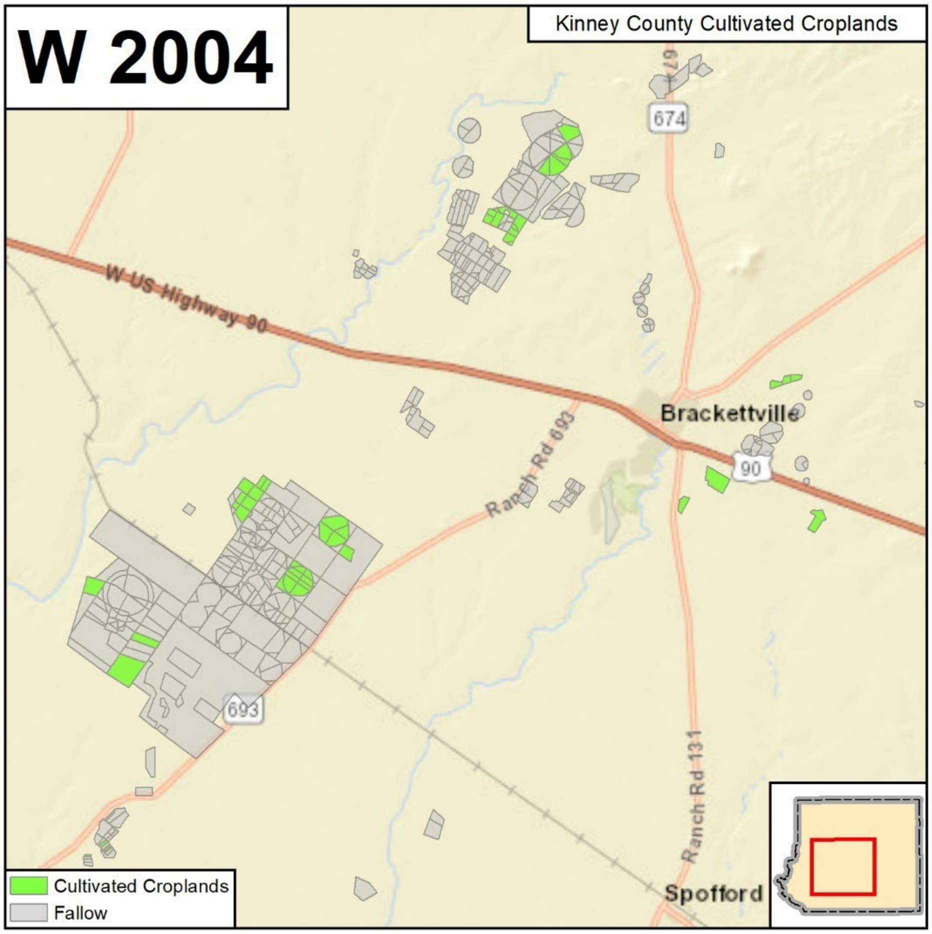
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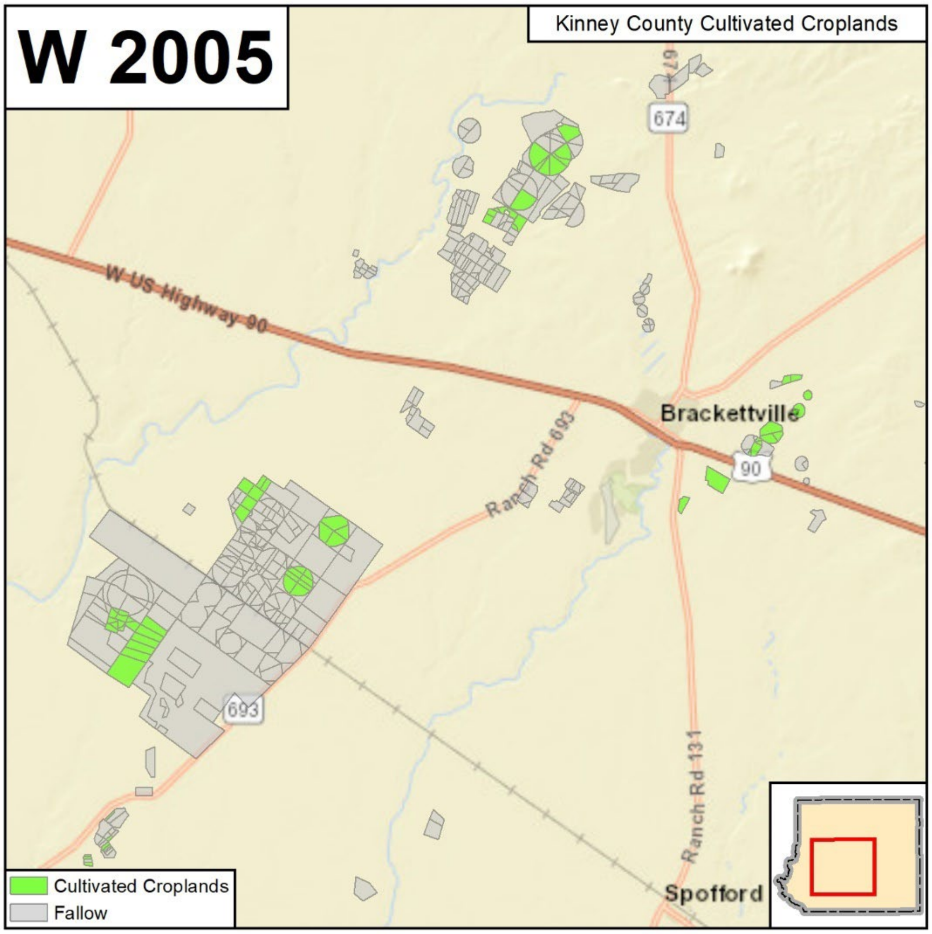
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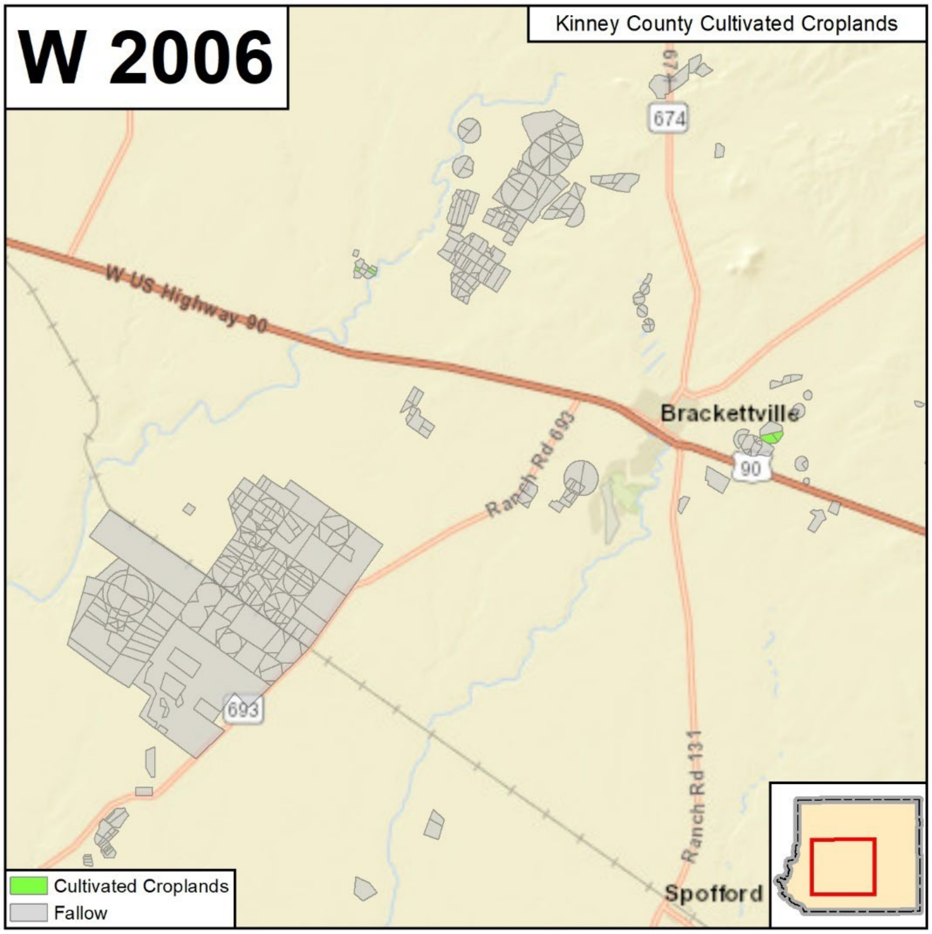
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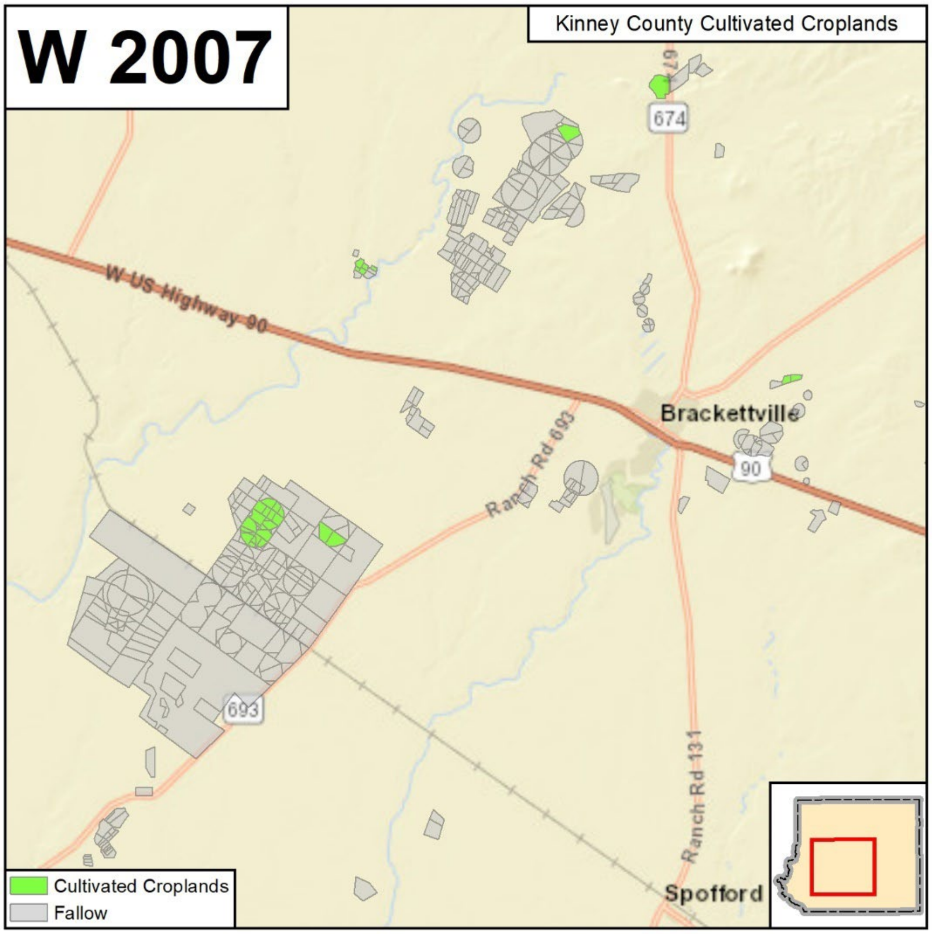
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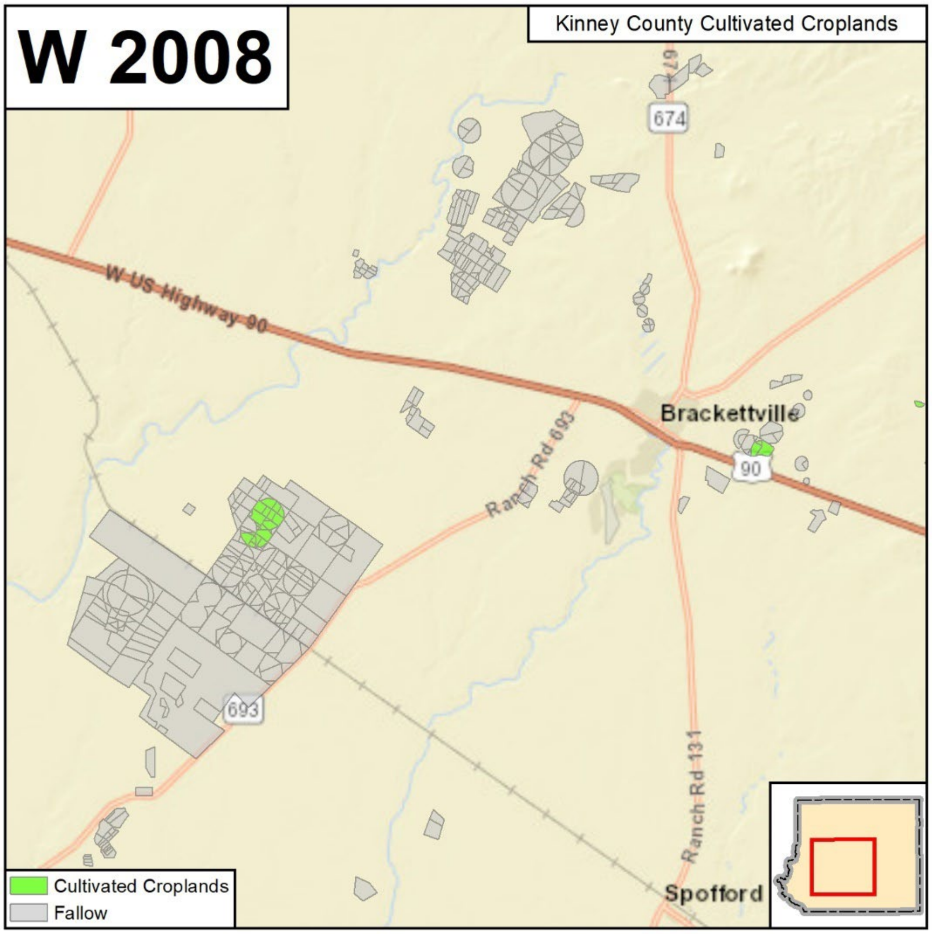
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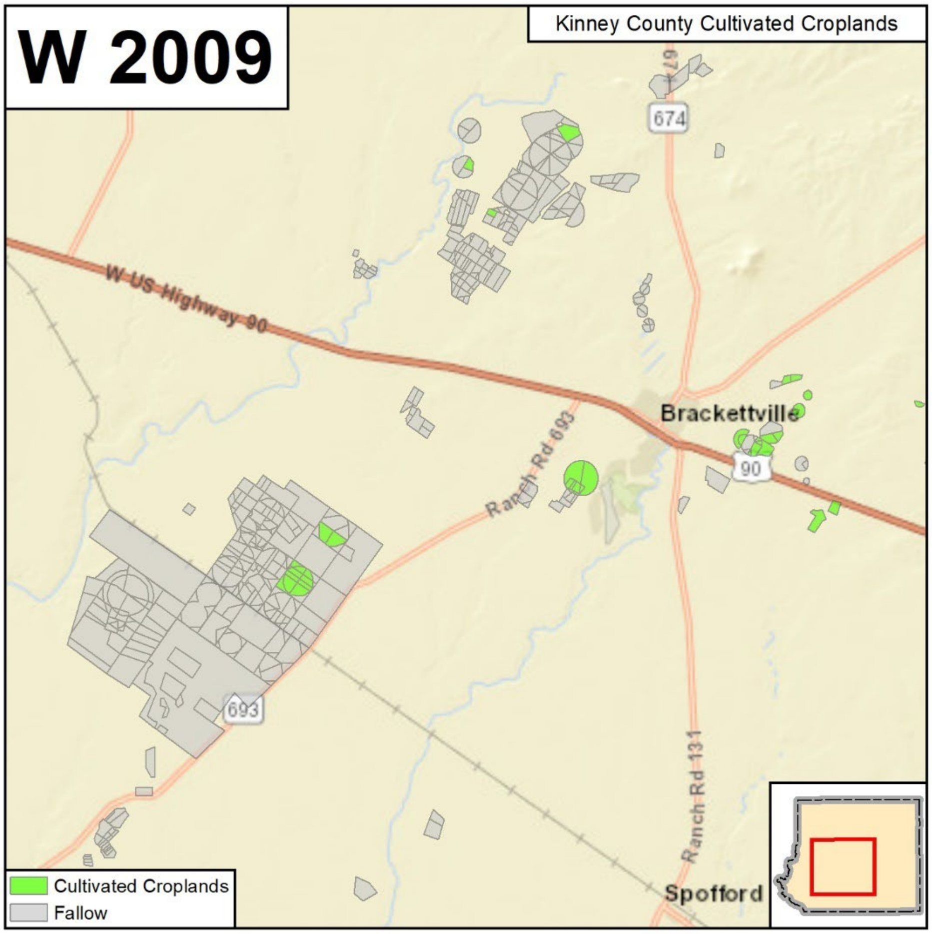

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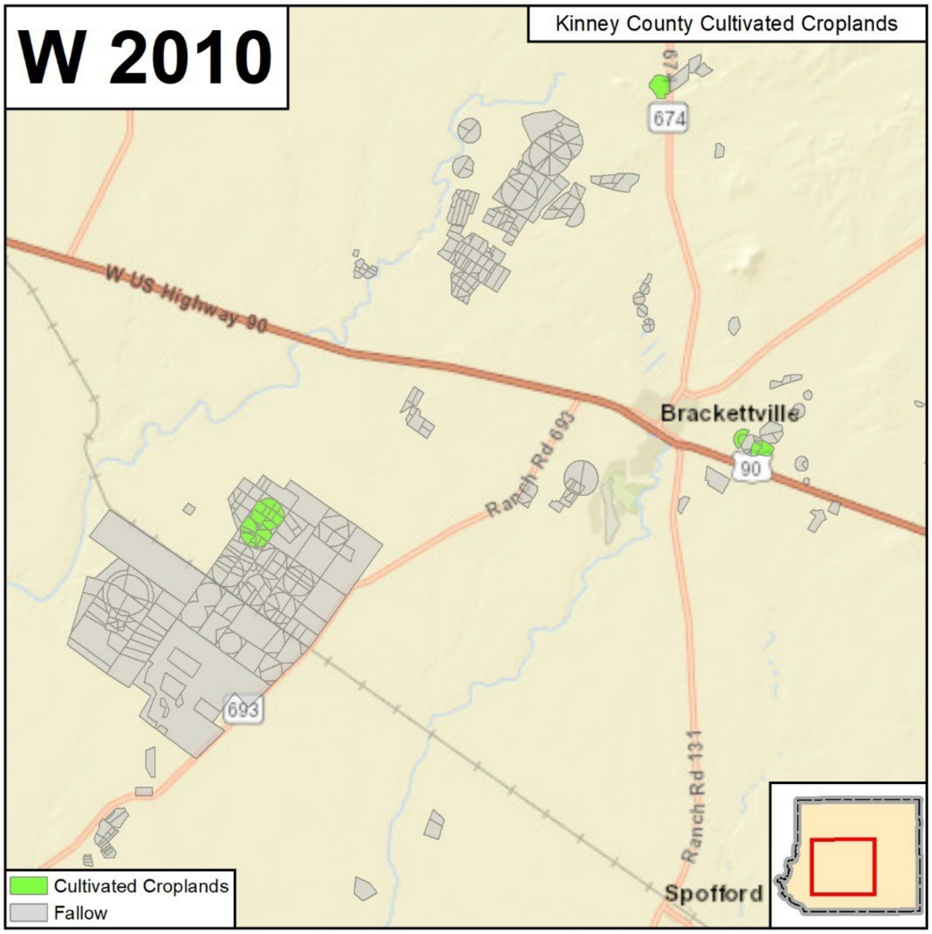

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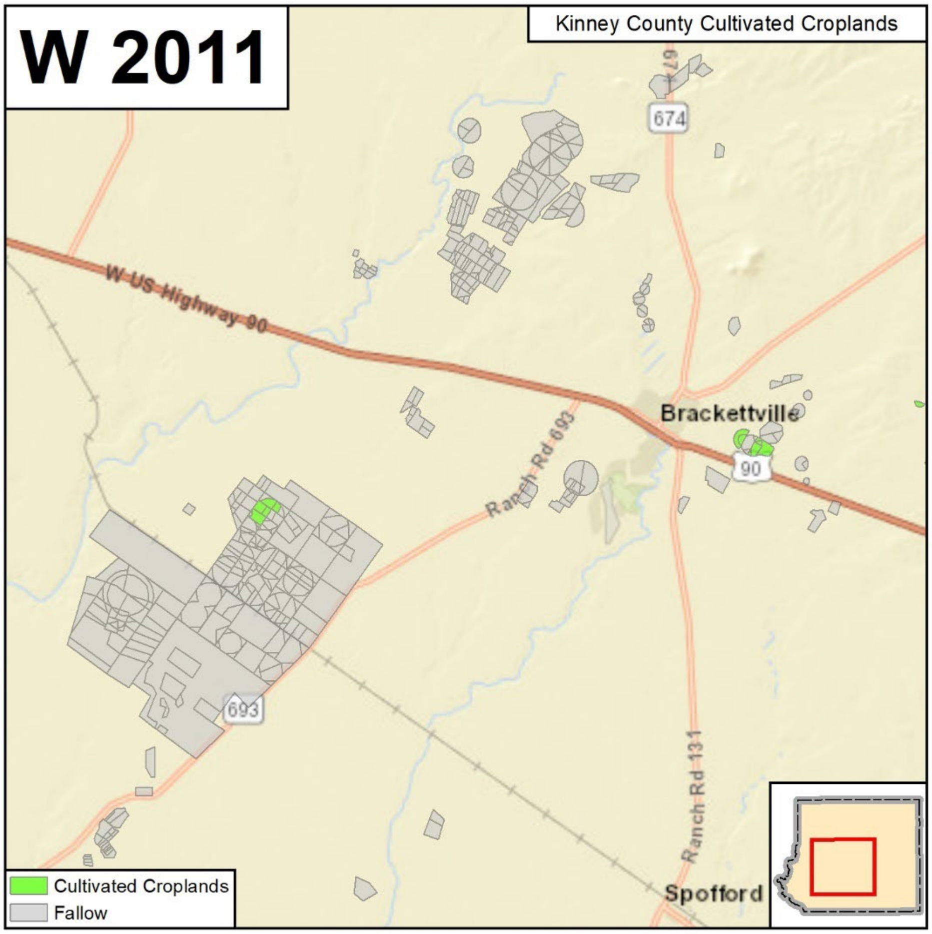
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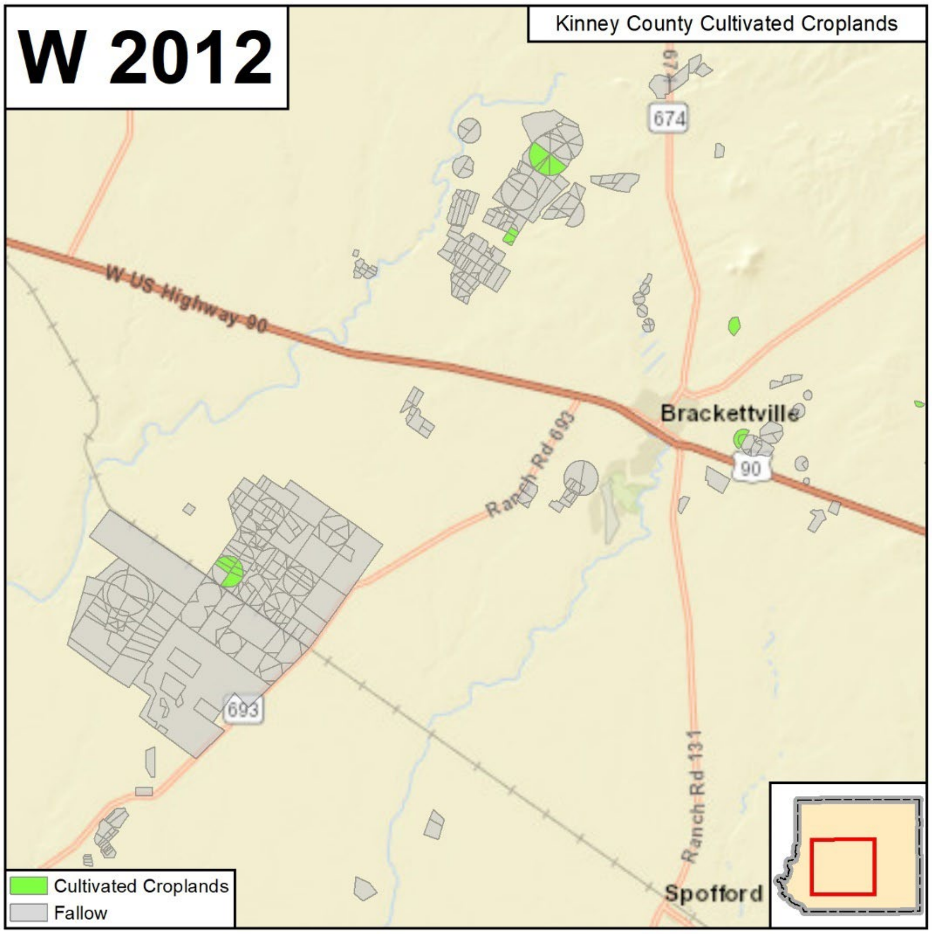
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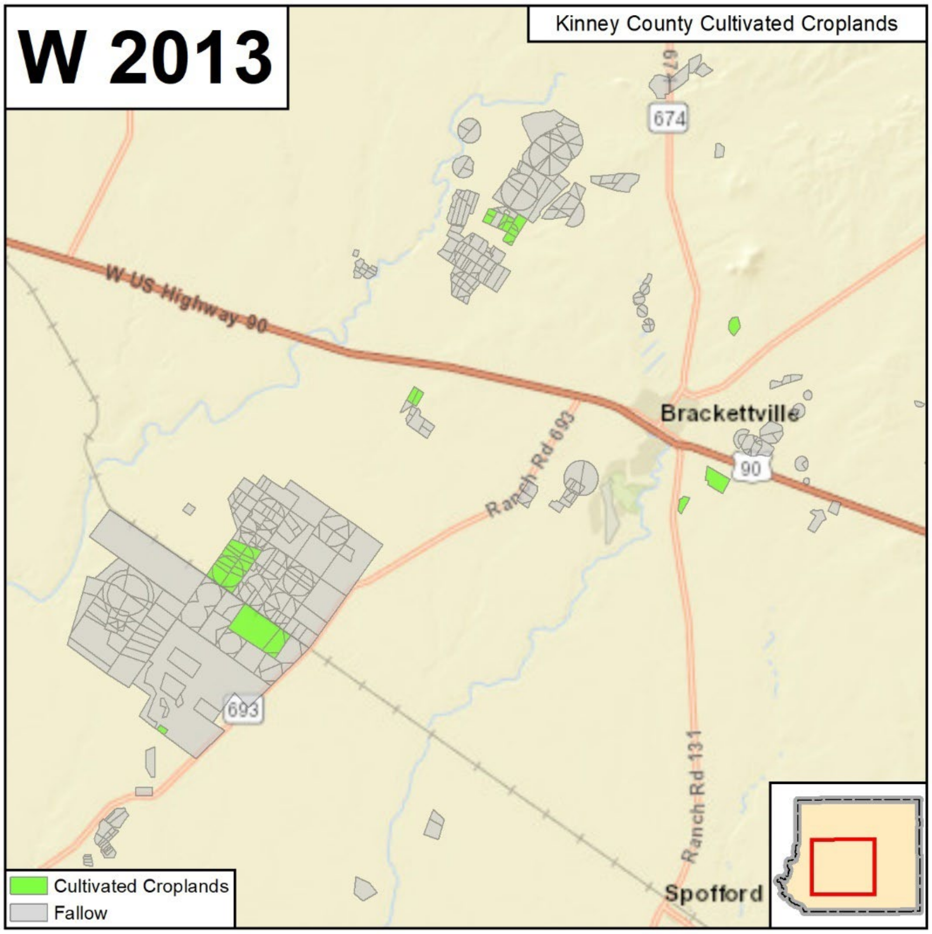
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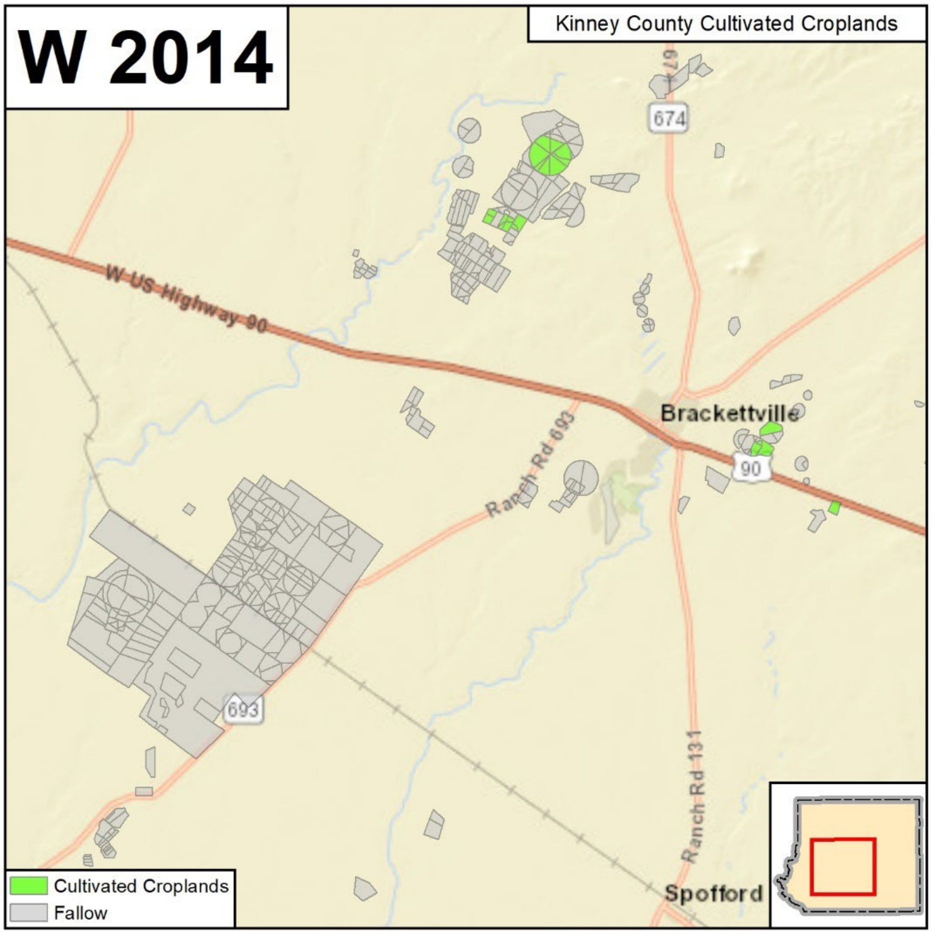
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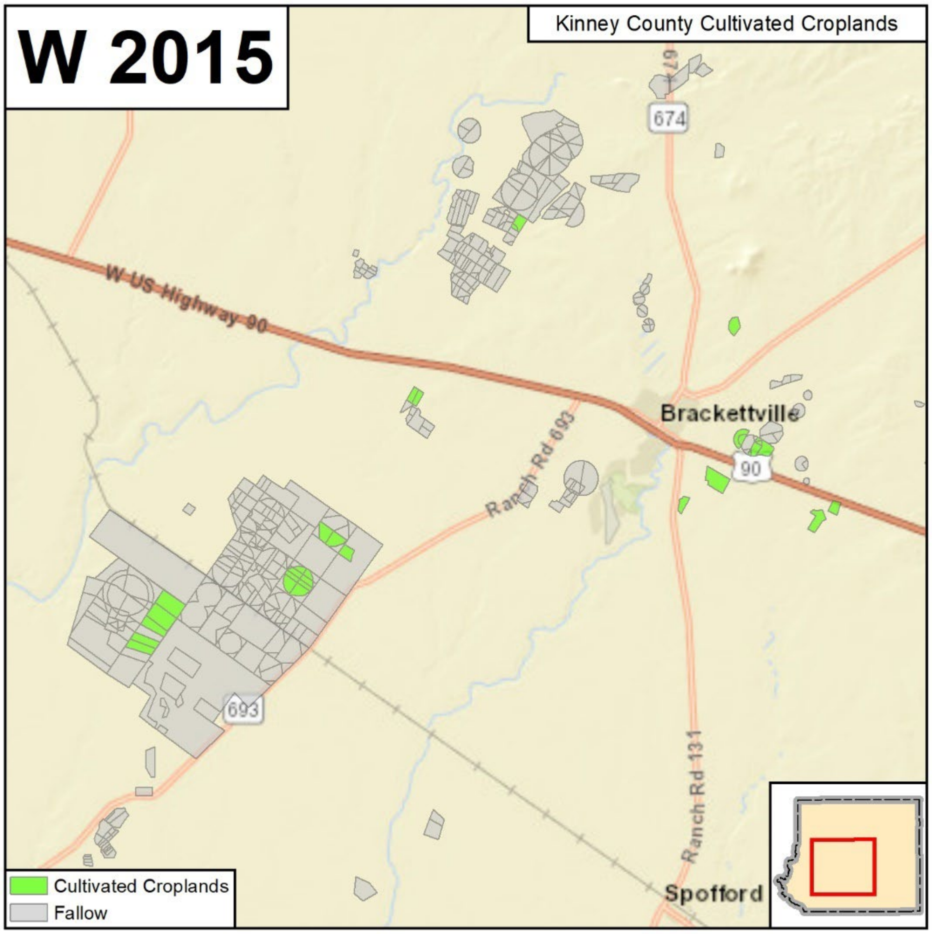
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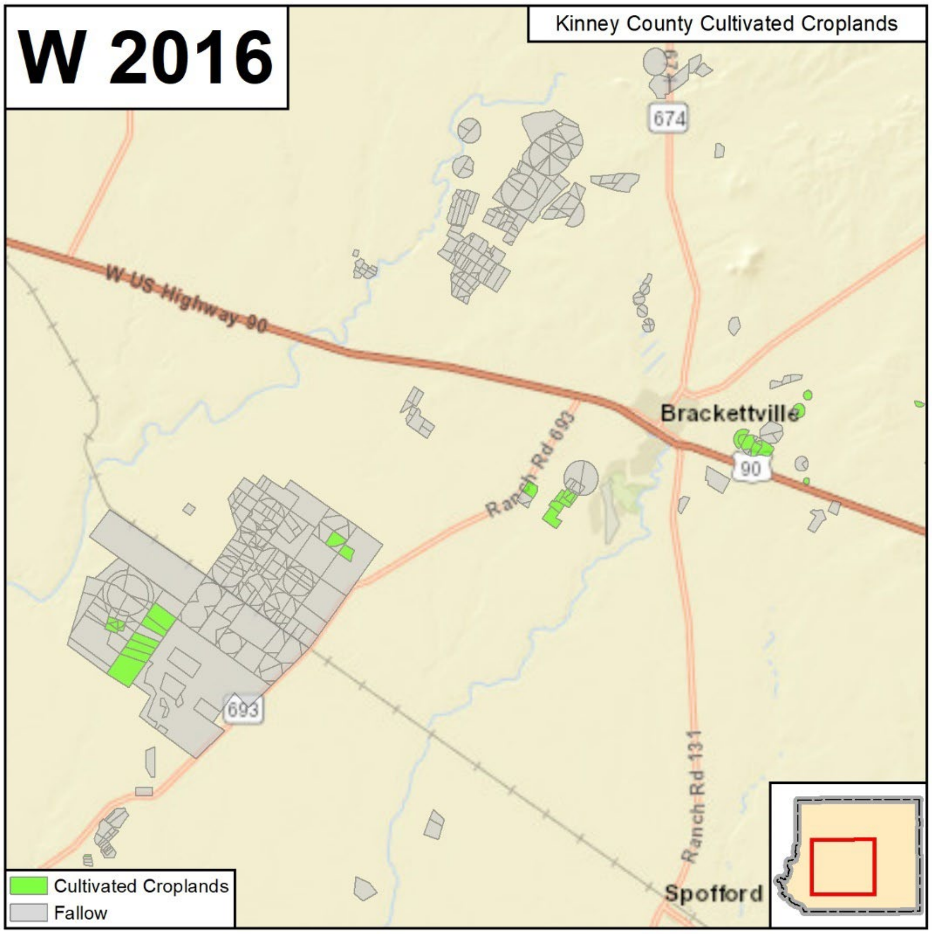

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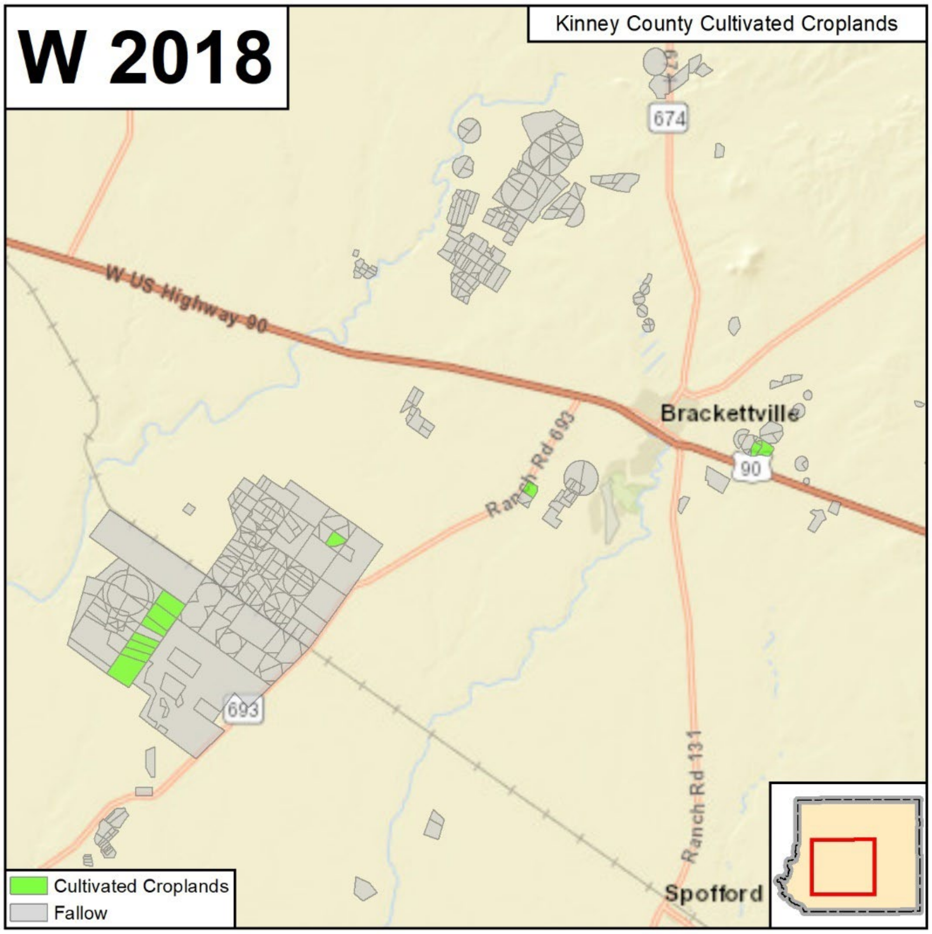
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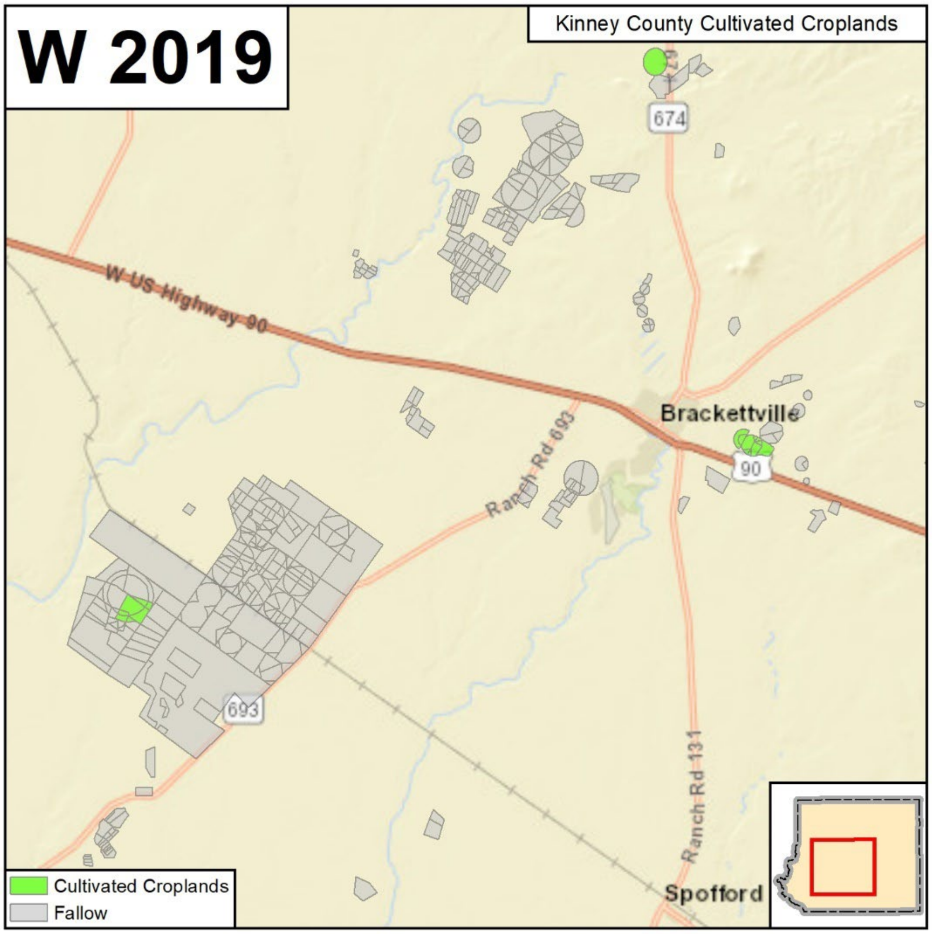
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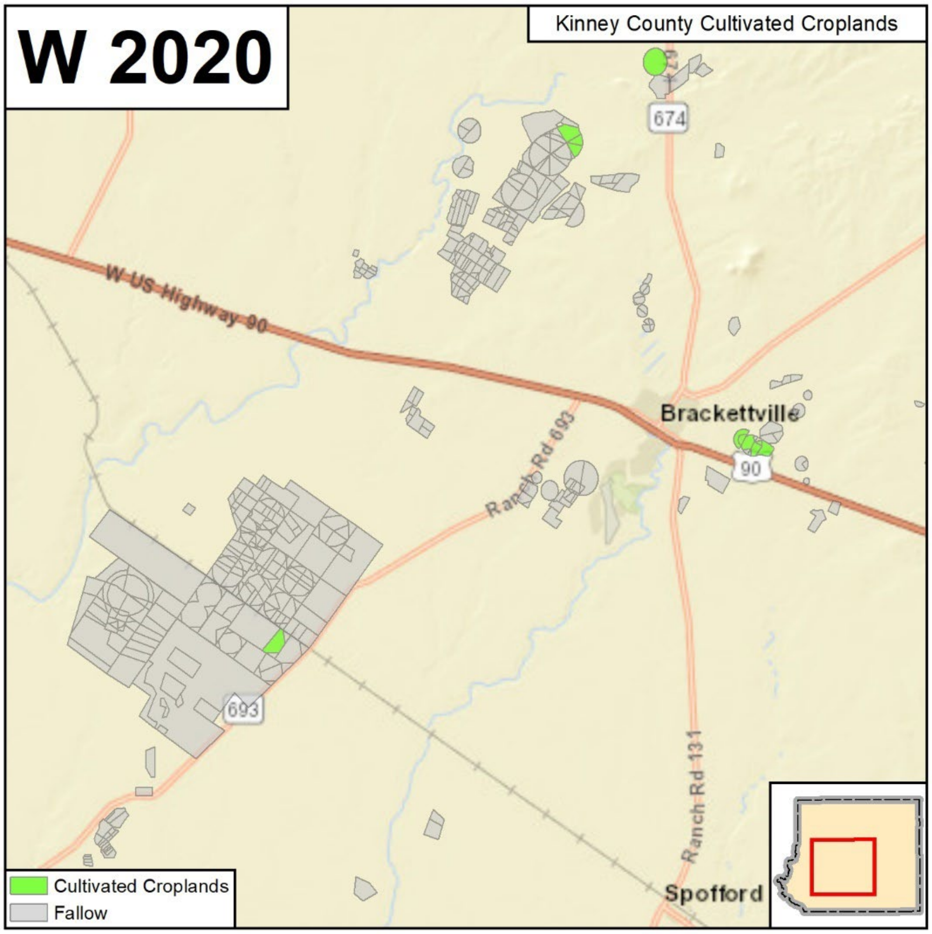

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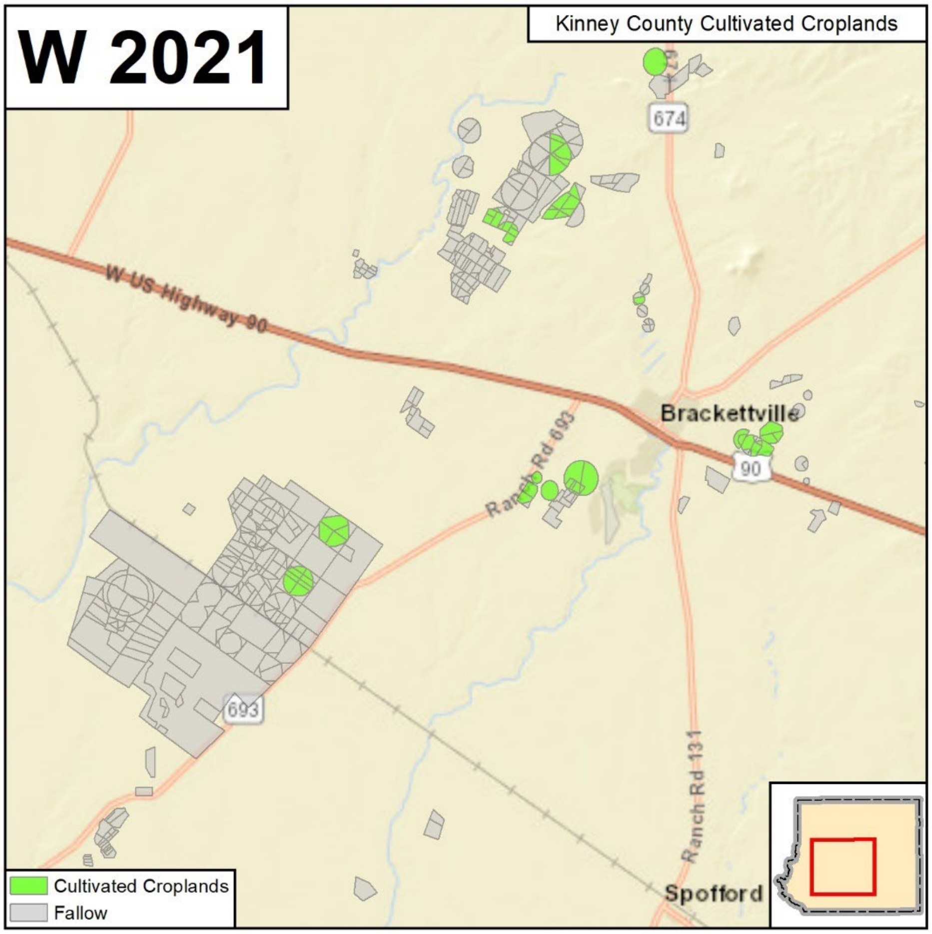
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Appendix B

Draft GAM Task 10-027 (revised)

Draft GAM Task 10-027 (revised)

by William R. Hutchison, Ph.D, P.E., P.G.
Texas Water Development Board
Groundwater Resources Division
(512) 463-5067
February 9, 2011

This document is released for the purpose of interim review under the authority of William R. Hutchison, P.E. 96287, P.G. 286 on February 9, 2011

EXECUTIVE SUMMARY

This GAM Task summarizes the results of seven pumping scenarios using the recently completed groundwater flow model of the Kinney County area. The seven pumping scenarios represent pumping that is higher and lower than historic pumping in order to evaluate changes in spring flow in Las Moras Spring and estimate minimum groundwater elevation in the monitor well that is used by the Kinney County Groundwater Conservation District. The spring flow and minimum groundwater elevation have been adopted by the Kinney County Groundwater Conservation District as their desired future conditions of the aquifer.

Based on this analysis, average spring flow in Las Moras spring will be 23.9 cubic feet per second and median spring flow in Las Moras Spring will be 24.4 cubic feet per second if pumping is about 77,000 acre-feet per year in Kinney County. Minimum groundwater elevation in the monitoring well will be 1,184 feet above mean sea level under this scenario. The minimum groundwater elevation has been revised from an earlier version of the Draft GAM Task report based on input from the Kinney County Groundwater Conservation District regarding the land surface elevation of the monitoring well used in this analysis.

ORIGIN OF TASK:

The Kinney County Groundwater District requested assistance in developing desired future conditions. As a result of this request, TWDB staff developed a groundwater flow model of all the aquifers in Kinney County and surrounding areas. This model is documented in Hutchison and others (2011). This task report summarizes the results of seven scenarios that were presented at the Kinney County Groundwater Conservation District Board meeting of July 27, 2010.

DESCRIPTION OF TASK:

Based on the results of the calibration of the groundwater flow model of Kinney County, historic groundwater pumping from 1950 to 2005 has ranged from about 51,000 acre-feet per year to about 77,000 acre-feet per year (Hutchison and others 2011). In general, pumping increases result in reduced spring flow, and reduced pumping result in increased spring flow. The objective of the simulations run for this task was to quantify the change in spring flow under various scenarios of constant pumping. The information from these simulations has been used by the Kinney County Groundwater Conservation District in establishing the desired future conditions of the aquifer as part of the Joint Planning Process in Groundwater Management Areas 7 and 10. In order to facilitate comparison with historic spring flows, all simulations were run with the recharge and river conditions equivalent to the historic period (1950 to 2005).

METHODS:

Seven pumping scenarios were developed for this task, each with constant pumping. The base case assumed 77,000 acre-feet per year (AF/yr) of pumping, which is equivalent to the highest year of pumping based on the calibrated model for the period 1950 to 2005. Two scenarios included reduced pumping and four scenarios included increased pumping as follows:

Scenario	Kinney County Pumping (AF/yr)
1	38,000
2	57,000
3	77,000
4	96,000
5	115,000
6	134,000
7	153,000

The scenarios consisted of running the model for 56 years, using recharge and river conditions from 1950 to 2005 in order to facilitate comparison with the historic spring flows.

PARAMETERS AND ASSUMPTIONS:

- The recently developed groundwater flow model of the Kinney County area (Hutchison and others, 2011) was used for these simulations.

- The model has four layers: layer 1 represents the Carrizo-Wilcox and associated aquifers, layer 2 represents the upper Cretaceous formations that yield groundwater, layer 3 represents the Edwards (Balcones Fault Zone) Aquifer and the Edwards Group of the Edward-Trinity (Plateau) Aquifer, and layer 4 represents the Trinity Aquifer.

- As further detailed in the model report (Hutchison and others, 2011), model calibration statistics for the entire model domain for groundwater elevation and spring flow are summarized below. Note that groundwater elevation data are expressed in feet above mean sea level (ft MSL), and spring flows are expressed in cubic feet per second (cfs):

Statistic	Groundwater Elevation	Spring Flow
Number of Measurements	1,878	432
Average Residual	4.5 ft	-1.2 cfs
Standard Deviation	58 ft	10 cfs
Range of Measurements	1,581 ft	223 cfs
Standard Deviation divided by Range	0.04	0.04

- Seven different pumping scenarios were used as described above
- Each simulation consisted of 57 stress periods. All model input files were identical to the calibration period in each scenario except for the pumping file, as noted above.
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

RESULTS:

Spring Flow

The results of the simulation include estimating spring flow changes under alternative pumping scenarios. A summary of the results expressed as average spring flow for the three major springs in Kinney County (Las Moras, Mud, and Pinto) as a function of pumping in Kinney County are presented in Figure 1.

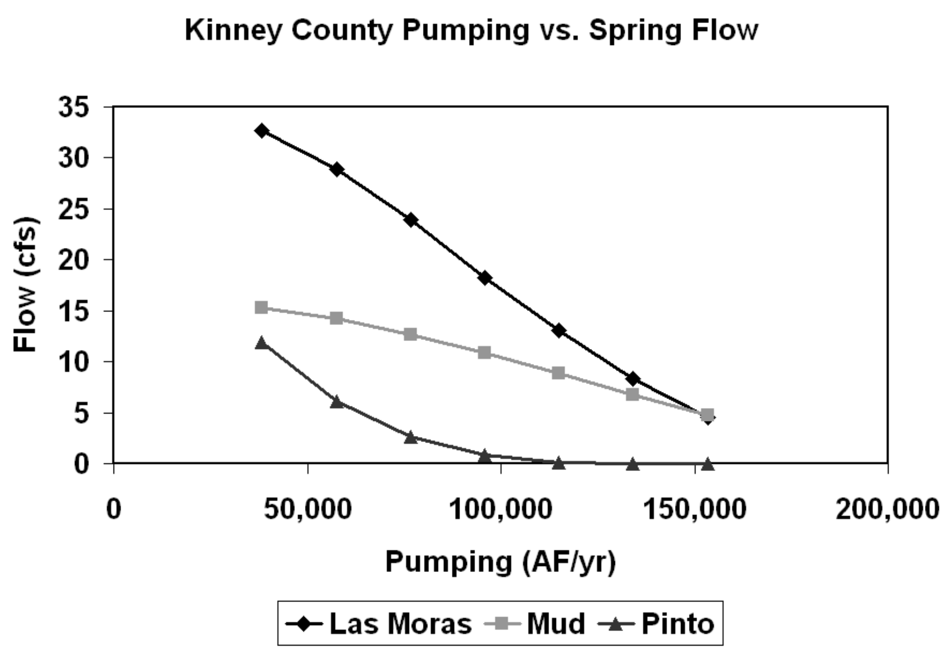


Figure 1. Kinney County Pumping versus Spring Flow for Seven Pumping Scenarios.

Note that as a result of input received from the Kinney County Groundwater Conservation District Board of Directors, Las Moras is the only spring for which a desired future condition will be set due to monitoring constraints. The frequency of various flows in Las Moras spring that are a result of changes in recharge conditions are presented in Table 1.

Table 1. Las Moras Spring Flow Frequency under Seven Alternative Pumping Scenarios
Pumping Totals for Kinney County Only, Frequency Expressed as Percent Occurrence for 56 Year Simulations

Las Moras Spring Flow (cfs)	Scenario 1 (Pumping = 38,000 AF/yr)	Scenario 2 (Pumping = 57,500 AF/yr)	Scenario 3 (Pumping = 77,000 AF/yr)	Scenario 4 (Pumping = 96,000 AF/yr)	Scenario 5 (Pumping = 115,000 AF/yr)	Scenario 6 (Pumping = 134,000 AF/yr)	Scenario 7 (Pumping = 153,000 AF/yr)
0	0	0	0	13	25	45	59
0 to 5	0	0	5	9	14	9	16
5 to 10	0	2	13	9	9	13	5
10 to 15	0	11	7	13	7	9	7
15 to 20	11	9	18	11	18	9	4
20 to 25	13	18	9	14	7	5	2
25 to 30	20	13	16	9	7	4	5
30 to 35	18	20	11	11	5	5	2
35 to 40	16	9	11	7	5	2	0
40 to 45	11	14	7	5	2	0	0
> 50	13	5	4	0	0	0	0

Because the average spring flow and median spring flow of Scenario 3 were adopted as the desired future condition for Kinney County, a graphical summary of Scenario 3 for Las Moras Spring is presented in Figure 2. Note that the average flow and the median flow fall into the group that would occur about 9 percent of the time (20 to 25 cfs). A spring flow between 15 and 20 cfs (slightly below the adopted desired future condition) would occur 18 percent of the time, and flow between 25 and 30 cfs (slightly above the adopted desired future condition) would occur about 16 percent of the time. Thus, Las Moras spring flow would be between 15 and 30 cfs about 43 percent of the time. Note that because the model was run on annual stress periods, these spring flows are representative of end-of-the calendar year conditions. Thus, for comparative purposes, flows collected in December and January should be used to track with the desired future condition.

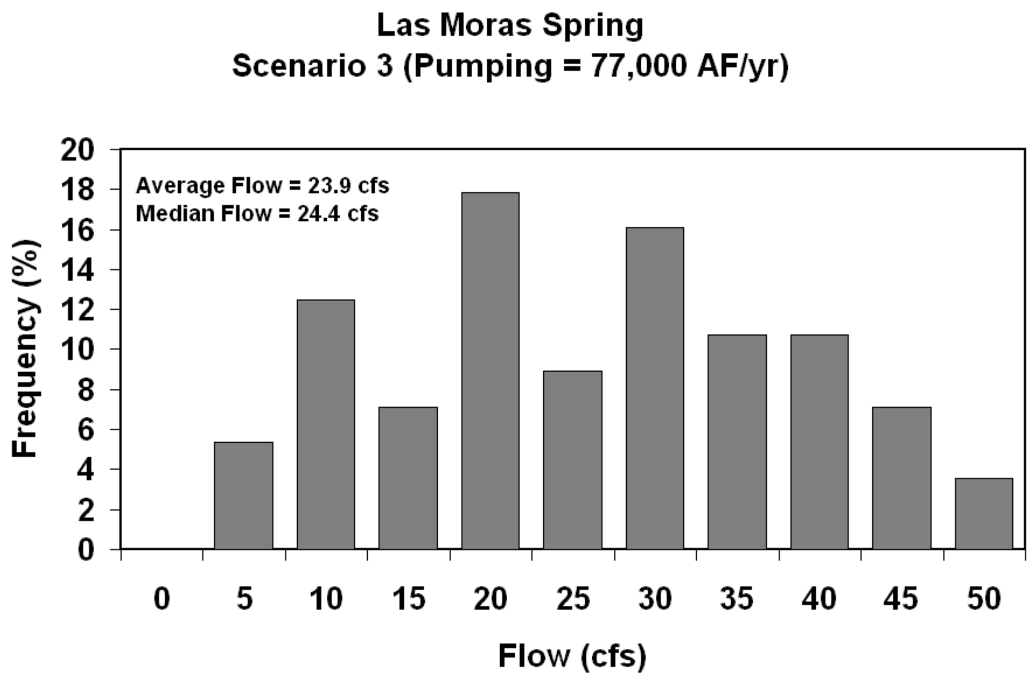


Figure 2. Las Moras Spring Flow Frequency for Scenario 3.

Groundwater Elevations

Groundwater elevation changes due to pumping were evaluated for the monitoring well used by the Kinney County Groundwater Conservation District (Well No. 70-38-902). This well was constructed in 1973 by the Texas Water Development Board. The earlier version of this Draft GAM Task report calculated groundwater elevations using a measuring point elevation of 1,373 ft MSL. However, during review of this document, the Kinney County Groundwater Conservation District informed the Texas Water Development Board in an email dated February 8, 2011, that the measuring point elevation is 1,381.042 ft MSL. Consequently, the hydrograph of measured groundwater elevations presented in Figure 3 have been revised. Note that the minimum groundwater elevation is 1,186, which was measured in January of 1991. The monitoring well has a limited record of data as compared to the calibration period of the model. Moreover, some of the highest levels of groundwater pumping in Kinney County predate the existence of the monitoring well.

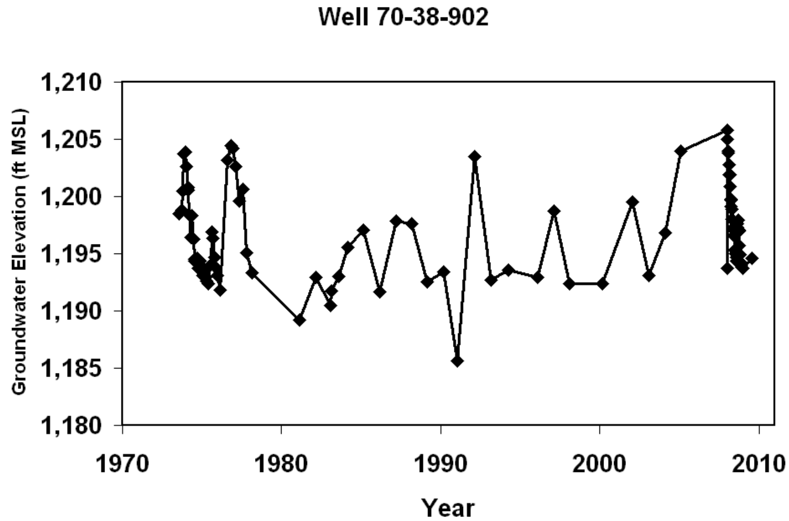


Figure 3. Groundwater elevation measurements in Well 70-38-902.

Because the Kinney County Groundwater Conservation District Board of Directors has adopted a minimum groundwater elevation in this well (1,184 ft MSL) as desired future condition for the Groundwater Management Area 10 portion of Kinney County, an analysis of simulated groundwater levels at the site of this well was completed. Figure 4 presents a comparison of the simulated groundwater elevation estimates with measured groundwater elevations.

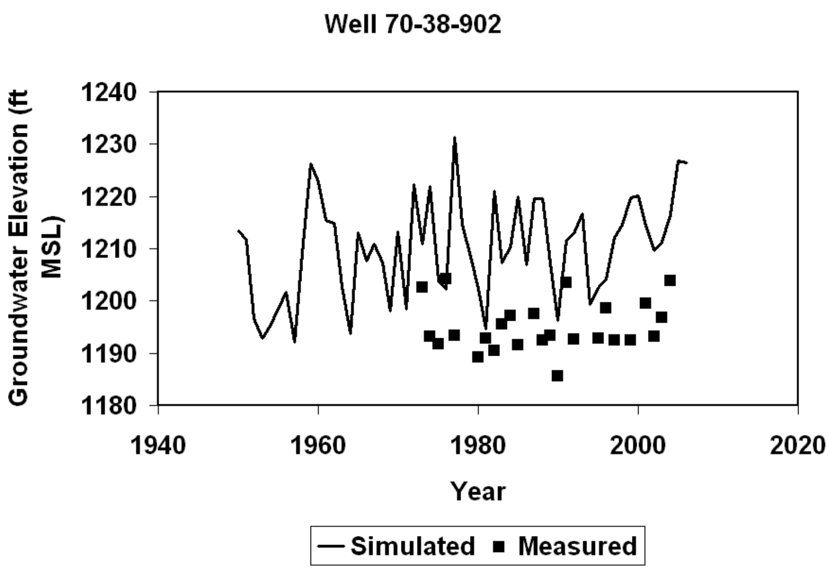


Figure 4. Comparison of simulated groundwater elevations and measured groundwater elevations from winter months.

Note that the general trend is that the simulated groundwater elevations are slightly higher than the measured groundwater elevations. At the end of 1990, the simulated groundwater elevation was estimated to be 1,196 ft MSL, and is comparable to the measured value in January 1991 of 1,186 ft MSL. Note that from 1950 to 2005, there were five years where the simulated groundwater elevation was lower than that simulated in 1990. These estimates are as follows:

- 1957 (4 feet lower than 1990),
- 1953 and 1964 (3 feet lower than 1990),
- 1981 (2 feet lower than 1990), and
- 1954 (1 foot lower than 1990).

The Kinney County Groundwater Conservation District has adopted desired future conditions that are consistent with Scenario 3, and established a minimum groundwater elevation in Well 70-38-902 of 1,184 ft MSL in the Kinney County portion of Groundwater Management Area 10.

Given the nature of the desired future condition, the actual data collected at the well, and the accuracy of the model, it is concluded that the desired future condition expressed by the Kinney County Groundwater Conservation District (minimum groundwater elevation for Well 70-38-902 of 1,184 ft MSL) is consistent with Scenario 3.

REFERENCES:

Harbaugh, A.W., Banta, E.R., Hill, M.C., and McDonald, M.G., 2000, MODFLOW-2000, The U.S. Geological Survey modular ground-water model-user guide to modularization concepts and the ground-water flow process: U.S. Geological Survey Open-File Report 00-92, 121 p.

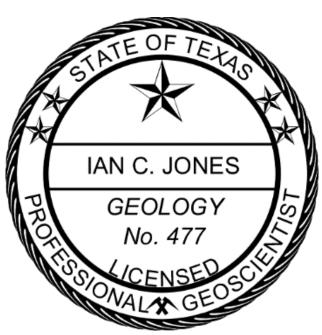
Hutchison, William R., Shi, Jerry, and Jigmond, Marius, 2011. Groundwater Flow Model of the Kinney County Area. Texas Water Development Board Unpublished Report.

Appendix C

GAM Run 21-012 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 7

GAM Run 21-012 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 7

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-463-6641
August 12, 2022



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GAM RUN 21-012 MAG: MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Modeling Department
512-463-6641
August 12, 2022

EXECUTIVE SUMMARY:

The Texas Water Development Board (TWDB) has prepared estimates of the modeled available groundwater for the relevant aquifers of Groundwater Management Area 7—the Capitan Reef Complex, Dockum, Edwards-Trinity (Plateau), Ellenburger-San Saba, Hickory, Ogallala, Pecos Valley, Rustler, and Trinity aquifers. The estimates are based on the desired future conditions for these aquifers adopted by the groundwater conservation districts in Groundwater Management Area 7 on August 19, 2021. The explanatory reports and other materials submitted to the TWDB were determined to be administratively complete on February 23, 2022.

The modeled available groundwater values are summarized by decade for the groundwater conservation districts (Tables 1, 3, 5, 7, 9, 11, 13) and for use in the regional water planning process (Tables 2, 4, 6, 8, 10, 12, 14). The modeled available groundwater estimates for each decade from 2020 through 2070 are:

- 26,164 acre-feet per year in the Capitan Reef Complex Aquifer,
- 2,324 acre-feet per year in the Dockum Aquifer,
- 6,570 to 7,925 acre-feet per year in the Ogallala Aquifer,
- 479,063 acre-feet per year in the undifferentiated Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers,
- 22,616 acre-feet per year in the Ellenburger-San Saba Aquifer,
- 49,936 acre-feet per year in the Hickory Aquifer, and
- 7,040 acre-feet per year in the Rustler Aquifer.

The modeled available groundwater estimates were extracted from results of model runs using the groundwater availability models for the Capitan Reef Complex Aquifer [Version

1.01] (Jones, 2016) for the Capitan Reef Complex Aquifer; the High Plains Aquifer System [Version 1.01] (Deeds and Jigmond, 2015) for the Dockum and Ogallala aquifers; the minor aquifers of the Llano Uplift Area [Version 1.01] (Shi and others, 2016) for the Ellenburger-San Saba and Hickory aquifers, and the Rustler Aquifer [Version 1.01] (Ewing and others, 2012) for the Rustler Aquifer. In addition, the alternative 1-layer model for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers (Hutchison and others, 2011a) was used for the Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers, except for Kinney and Val Verde counties. In these two counties, the alternative Kinney County model (Hutchison and others, 2011b) and the model associated with a hydrogeological study for Val Verde County and the City of Del Rio (EcoKai and Hutchison, 2014), respectively, were used to estimate modeled available groundwater.

REQUESTOR:

Ms. Meredith Allen, coordinator of Groundwater Management Area 7 districts.

DESCRIPTION OF REQUEST:

In an email dated August 28, 2021, Dr. William Hutchison on behalf of Groundwater Management Area 7 provided the TWDB with the desired future conditions for the Capitan, Dockum, Ellenburger-San Saba, Hickory, Ogallala, and Rustler aquifers, as well as for the undifferentiated Edwards-Trinity (Plateau), Pecos Valley and Trinity aquifers, in Groundwater Management Area 7. Groundwater Management Area 7 provided additional clarifications through an email to the TWDB on November 12, 2021, for the assumptions and model files to be used to calculate modeled available groundwater.

The final adopted desired future conditions as stated in signed resolutions for the aquifers in Groundwater Management Area 7 are as follows:

Capitan Reef Complex Aquifer *(Resolution #08-19-2021-2)*

a) Total net drawdown of the Capitan Reef Complex Aquifer not to exceed 56 feet in Pecos County (Middle Pecos GCD) in 2070 as compared with 2006 aquifer levels.
**(Reference: Scenario 4, GMA 7 Technical Memorandum 16-03)*

b) The Capitan Reef Complex Aquifer is not relevant for joint planning purposes in all other areas of GMA 7.

Dockum and Ogallala aquifers *(Resolution #08-19-2021-5)*

Ogallala Aquifer:

a) Total net drawdown of the Ogallala Aquifer not to exceed **6 feet in Glasscock County** in 2070 as compared with 2010 aquifer levels.

Dockum Aquifer:

b) Total net drawdown of the Dockum Aquifer not to exceed **52 feet in Pecos County** in 2070 as compared with 2010 aquifer levels.

c) Total net drawdown of the Dockum Aquifer not to exceed **14 feet in Reagan County** in 2070 as compared with 2010 aquifer levels.

**(Reference items a) through c): Scenario 17, GMA 7 Technical Memorandum 16-01)*

d) The Ogallala and Dockum Aquifers are not relevant for joint planning purposes in all other areas of GMA 7.

Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers *(Resolution #08-19-2021-3)*

a) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **0 feet in Coke County** in 2070 as compared with 2010 aquifer levels.
b) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **10 feet in Crockett County** in 2070 as compared with 2010 aquifer levels.
c) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **4 feet in Ector County** in 2070 as compared with 2010 aquifer levels.
d) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **2 feet in Edwards County** in 2070 as compared with 2010 aquifer levels.
e) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **5 feet in Gillespie County** in 2070 as compared with 2010 aquifer levels.
f) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **42 feet in Glasscock County** in 2070 as compared with 2010 aquifer levels.
g) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **10 feet in Irion County** in 2070 as compared with 2010 aquifer levels.
h) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **1 foot in Kimble County** in 2070 as compared with 2010 aquifer levels.
i) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **1 foot in Menard County** in 2070 as compared with 2010 aquifer levels.
j) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **12 feet in Midland County** in 2070 as compared with 2010 aquifer levels.
k) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **14 feet in Pecos County** in 2070 as compared with 2010 aquifer levels.
l) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **42 feet in Reagan County** in 2070 as compared with 2010 aquifer levels.
m) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **4 feet in Real County** in 2070 as compared with 2010 aquifer levels.
n) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **8 feet in Schleicher County** in 2070 as compared with 2010 aquifer levels.
o) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **7 feet in Sterling County** in 2070 as compared with 2010 aquifer levels.
p) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **6 feet in Sutton County** in 2070 as compared with 2010 aquifer levels.
q) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **0 feet in Taylor County** in 2070 as compared with 2010 aquifer levels.
r) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **2 feet in Terrell County** in 2070 as compared with 2010 aquifer levels.
s) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **20 feet in Upton County** in 2070 as compared with 2010 aquifer levels.
t) Total net drawdown of the Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers not to exceed **2 feet in Uvalde County** in 2070 as compared with 2010 aquifer levels.

*(Reference items *a)* through *t)*: GMA 7 Technical Memorandum 18-01)

Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers *(continued)*

u) Total net drawdown in **Kinney County** in 2070, as compared with 2010 aquifer levels, shall be consistent with maintenance of an annual average flow of 23.9 cfs and an annual median flow of **23.9 cfs at Las Moras Springs.**
**(Reference: Groundwater Flow Model of the Kinney County Area by W.R. Hutchison and others, 2011).*

v) Total net drawdown in **Val Verde County** in 2070, as compared with 2010 aquifer levels, shall be consistent with maintenance of an average annual flow of **73-75 mgd at San Felipe Springs.**
**(Reference: EcoKai, 2014)*

w) The Edwards-Trinity (Plateau), Pecos Valley, and Trinity Aquifers are not relevant for joint planning purposes in all other areas of GMA 7.

Minor Aquifers of the Llano Uplift Area *(Resolution #08-19-2021-4)*

Ellenburger-San Saba Aquifer:

a) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **8 feet in Gillespie County** in 2070 as compared with 2010 aquifer levels.
b) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **18 foot in Kimble County** in 2070 as compared with 2010 aquifer levels.
c) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **14 foot in Mason County** in 2070 as compared with 2010 aquifer levels.
d) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **29 feet in McCulloch County** in 2070 as compared with 2010 aquifer levels.
e) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **46 feet in Menard County** in 2070 as compared with 2010 aquifer levels.
f) Total net drawdown of the Ellenburger-San Saba Aquifer not to exceed **5 feet in San Saba County** in 2070 as compared with 2010 aquifer levels.

Hickory Aquifer:

g) Total net drawdown of the Hickory Aquifer not to exceed **53 feet in Concho County** in 2070 as compared with 2010 aquifer levels.
h) Total net drawdown of the Hickory Aquifer not to exceed **9 feet in Gillespie County** in 2070 as compared with 2010 aquifer levels.
i) Total net drawdown of the Hickory Aquifer not to exceed **18 feet in Kimble County** in 2070 as compared with 2010 aquifer levels.
j) Total net drawdown of the Hickory Aquifer not to exceed **17 feet in Mason County** in 2070 as compared with 2010 aquifer levels.

Minor Aquifers of the Llano Uplift Area *(continued)*

k) Total net drawdown of the Hickory Aquifer not to exceed **29 feet in McColloch County** in 2070 as compared with 2010 aquifer levels.
l) Total net drawdown of the Hickory Aquifer not to exceed **46 feet in Menard County** in 2070 as compared with 2010 aquifer levels.
m) Total net drawdown of the Hickory Aquifer not to exceed **6 feet in San Saba County** in 2070 as compared with 2010 aquifer levels.
**(Reference items a) through m): Scenario 3, GMA 7 Technical Memorandum 16-02)*
n) The Llano Uplift Region (Ellenburger-San Saba, Hickory, Marble Falls) Aquifers are not relevant for joint planning purposes in all other areas of GMA 7.

Rustler Aquifer *(Resolution #08-19-2021-6)*

a) Total net drawdown of the Rustler Aquifer not to exceed **94 feet in Pecos County** in 2070 as compared with 2010 aquifer levels.
**(Reference: Scenario 4, GMA 7 Technical Memorandum 15-05)*
b) The Rustler Aquifer not relevant for joint planning purposes in all other areas of GMA 7.

In addition to the non-relevant statements provided above in the individual resolutions, Groundwater Management Area 7 also provided additional non-relevant documentation dated August 27, 2021 and January 20, 2022 as part of their submittal to TWDB. The following aquifers or parts of aquifers are non-relevant for the purposes of joint planning:

- The entirety of the Blaine, Cross Timbers, Igneous, Lipan, Marble Falls, and Seymour aquifers.
- The Capitan Reef Complex Aquifer outside of the boundaries of the Middle Pecos Groundwater Conservation District.
- The Edwards-Trinity (Plateau) Aquifer in Concho, Mason, McCulloch, Nolan, and Tom Green counties.
- The Ellenburger-San Saba Aquifer in Coleman, Concho, and Mason counties.
- The Hickory Aquifer in Coleman and Llano counties.
- The Dockum Aquifer outside of Reagan and Pecos counties.
- The Ogallala Aquifer outside of Glasscock County.

CLARIFICATIONS:

In response to a request for clarifications from the TWDB in 2021, the Groundwater Management Area 7 Chair, Ms. Meredith Allen, and Groundwater Management Area 7 consultant, Dr. William R. Hutchison, provided the following clarifications regarding the definition of the desired future conditions. These clarifications were necessary for verifying that the desired future conditions of the aquifers were attainable and for confirming approval of the TWDB methodology to calculate modeled available groundwater volumes in Groundwater Management Area 7:

Capitan Reef Complex Aquifer

- The calculated modeled available groundwater values are based on the official TWDB aquifer boundary.
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions are acceptable).
- Drawdown calculations used to define the desired future conditions value take into consideration the occurrence of "dry" cells, where water levels are below the base of the aquifer.

Dockum Aquifer

- The calculated modeled available groundwater values are based on the spatial extent of the Dockum Formation, as represented in the groundwater availability model for the High Plains Aquifer System, rather than the official TWDB aquifer boundary.
- Modeled available groundwater analysis excludes model pass-through cells.
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions are acceptable).

Ogallala Aquifer

- The calculated modeled available groundwater values are based on the official TWDB aquifer boundary and use the same model assumptions used in Groundwater Management Area 7 Technical Memorandum 16-01 (Hutchison, 2016c).
- Drawdown calculations used to define the desired future conditions do not take into consideration the occurrence of "dry" cells, where water levels are below the base of the aquifer.

- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions are acceptable).

Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers

- The calculated modeled available groundwater values are based on the official TWDB aquifer boundaries.
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions value are acceptable).
- Drawdown calculations used to define the desired future conditions include drawdowns for cells with water levels below the base elevation of the cell ("dry" cells).

Kinney County

- The modeled available groundwater values, model assumptions, and simulated springflow are from GAM Run 10-043 MAG Version 2 (Shi, 2012).

Val Verde County

- There is no associated drawdown as a desired future condition. The desired future condition is based solely on simulated spring flow conditions at San Felipe Spring of 73 to 75 million gallons per day. Pumping scenarios—50,000 acre-feet per year—in three well field locations and monthly hydrologic conditions for the historic period 1969 to 2012 meet the desired future conditions set by Groundwater Management Area 7 (EcoKai and Hutchison, 2014; Hutchison 2021).

Minor Aquifers of the Llano Uplift Area

- The calculated modeled available groundwater values are based on the full spatial extent of the Ellenburger-San Saba and Hickory formations in the groundwater availability model for the aquifers of the Llano Uplift Area rather than the official TWDB aquifer boundaries and use the same model assumptions used in Groundwater Management Area 7 Technical Memorandum 16-02 (Hutchison 2016b).
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions value are acceptable).

- The drawdown calculations used to define desired future conditions did not include "dry" cells, where water levels are below the base of the aquifer.

Rustler Aquifer

- The model used to define desired future conditions and calculate modeled available groundwater assumes that the initial model heads represent the heads at the end of 2008 (the baseline for calculating desired future conditions drawdown values).
- Calculated modeled available groundwater values are based on the full spatial extent of the Rustler Formation, as represented in the groundwater availability model for the Rustler Aquifer, rather than the official TWDB aquifer boundary.
- The predictive model used to define desired future conditions and calculate modeled available groundwater uses the same model assumptions used in Groundwater Management Area 7 Technical Memorandum 15-05 (Hutchison, 2016d).
- The modeled available groundwater calculations are based on the desired future conditions with a one-foot tolerance (that is, modeled drawdown verifications within one foot of the desired future conditions value are acceptable).

METHODS:

As defined in Chapter 36 of the Texas Water Code (TWC, 2011), "modeled available groundwater" is the estimated average amount of water that may be produced annually to achieve a desired future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits to manage groundwater production to achieve the desired future condition(s). The other factors districts must consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits.

For relevant aquifers with desired future conditions based on water-level drawdown, water levels simulated at the end of the predictive simulations were compared to the water levels in the baseline year. These baseline years are 2005 in the groundwater availability model for the Capitan Reef Complex Aquifer and the alternative model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers, 2012 in the groundwater availability model for the High Plains Aquifer System, 2010 in the groundwater availability model for the minor aquifers of the Llano Uplift Area, and 2008 in the groundwater availability model for the Rustler Aquifer. The predictive model runs used average pumping rates from the historical period for the respective model except in the aquifer or area of interest. In those areas, pumping rates are varied until they produce drawdowns consistent with the adopted desired future conditions. In most cases, these model runs were supplied by Groundwater Management Area 7 for review by TWDB staff before they were used to calculate the modeled available groundwater. Pumping rates or modeled available groundwater are reported in 10-year intervals.

Water-level drawdown averages were calculated for the relevant portions of each aquifer. Drawdown for model cells that became dry during the simulation—when the water level dropped below the base of the cell—were excluded from the averaging. In Groundwater Management Area 7, dry cells only occur during the predictive period in the Ogallala Aquifer of Glasscock County. Consequently, estimates of modeled available groundwater decrease over time as continued simulated pumping predicts the development of increasing numbers of dry model cells in areas of the Ogallala Aquifer in Glasscock County. The calculated water-level drawdown averages for all aquifers were compared with the desired future conditions to verify that the pumping scenario achieved the desired future conditions.

In Kinney and Val Verde counties, the desired future conditions are based on discharge from selected springs. In these cases, spring discharge was estimated based on simulated average spring discharge over a historical period, maintaining all historical hydrologic conditions—such as recharge and river stage—except pumping. In other words, we assume that past average hydrologic conditions—the range of fluctuation—will continue in the future. In the cases of Kinney and Val Verde counties, simulated spring discharge was based on hydrologic variations that took place over the periods 1950 through 2005 and 1968 through 2013, respectively. The desired future condition for the Edwards-Trinity (Plateau) Aquifer in Kinney County is similar to the one adopted in 2010 and the associated modeled available groundwater is based on a specific model run—GAM Run 10-043 (Shi, 2012).

Modeled available groundwater values for the Ellenburger-San Saba and Hickory aquifers were determined by extracting pumping rates by decade from the model results using ZONBUDUSG Version 1.01 (Panday and others, 2013). For the remaining relevant aquifers in Groundwater Management Area 7 modeled available groundwater values were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Decadal modeled available groundwater for the relevant aquifers is reported by groundwater conservation district and county (Figure 1; Tables 1, 3, 5, 7, 9, 11, 13), and by county, regional water planning area, and river basin (Figures 2 and 3; Tables 2, 4, 6, 8, 10, 12, 14).

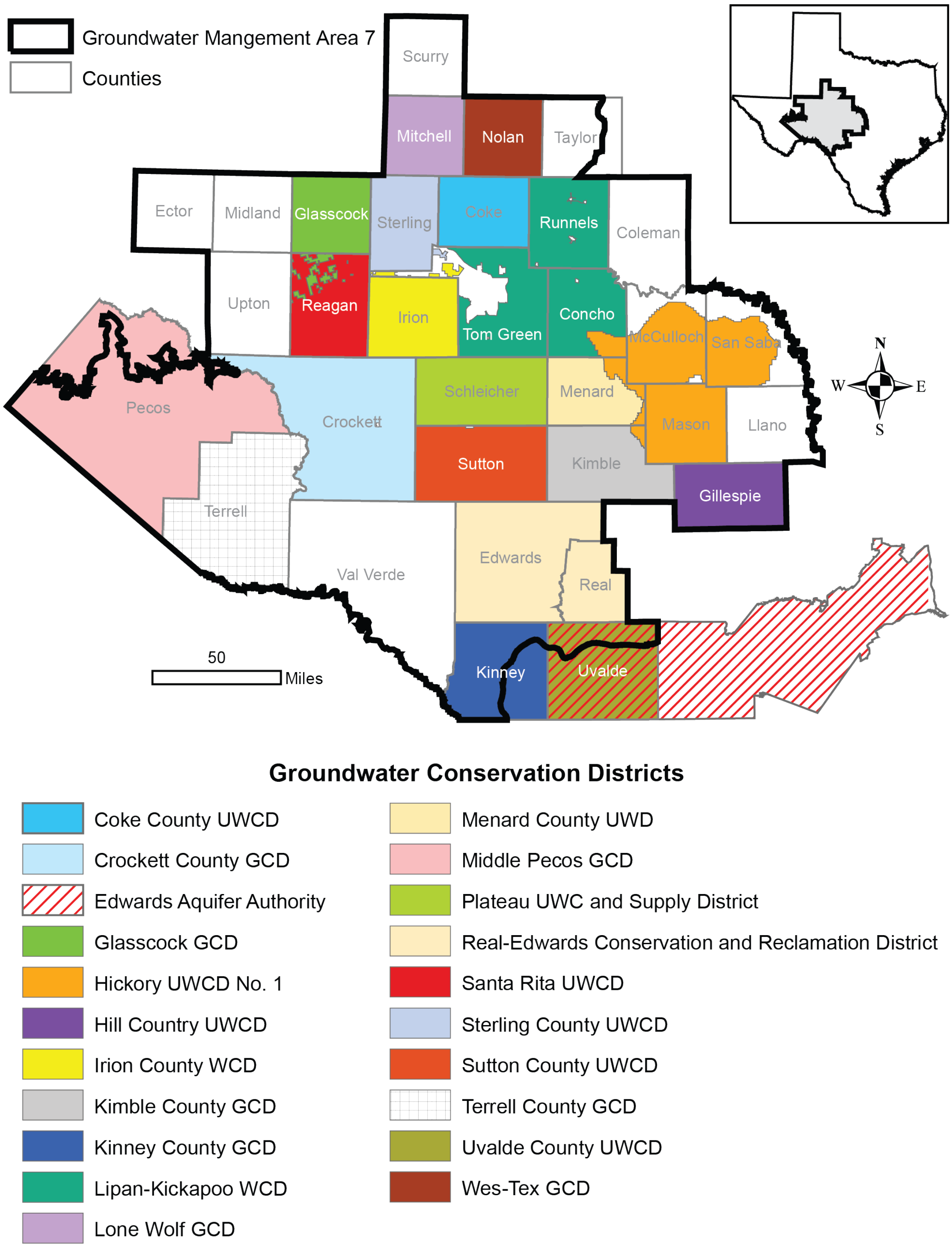

FIGURE 1. **MAP SHOWING THE GROUNDWATER CONSERVATION DISTRICTS (GCD) IN GROUNDWATER MANAGEMENT AREA 7. NOTE: THE BOUNDARIES OF THE EDWARDS AQUIFER AUTHORITY OVERLAP WITH THE UVALDE COUNTY UNDERGROUND WATER CONSERVATION DISTRICT (UWCD).**

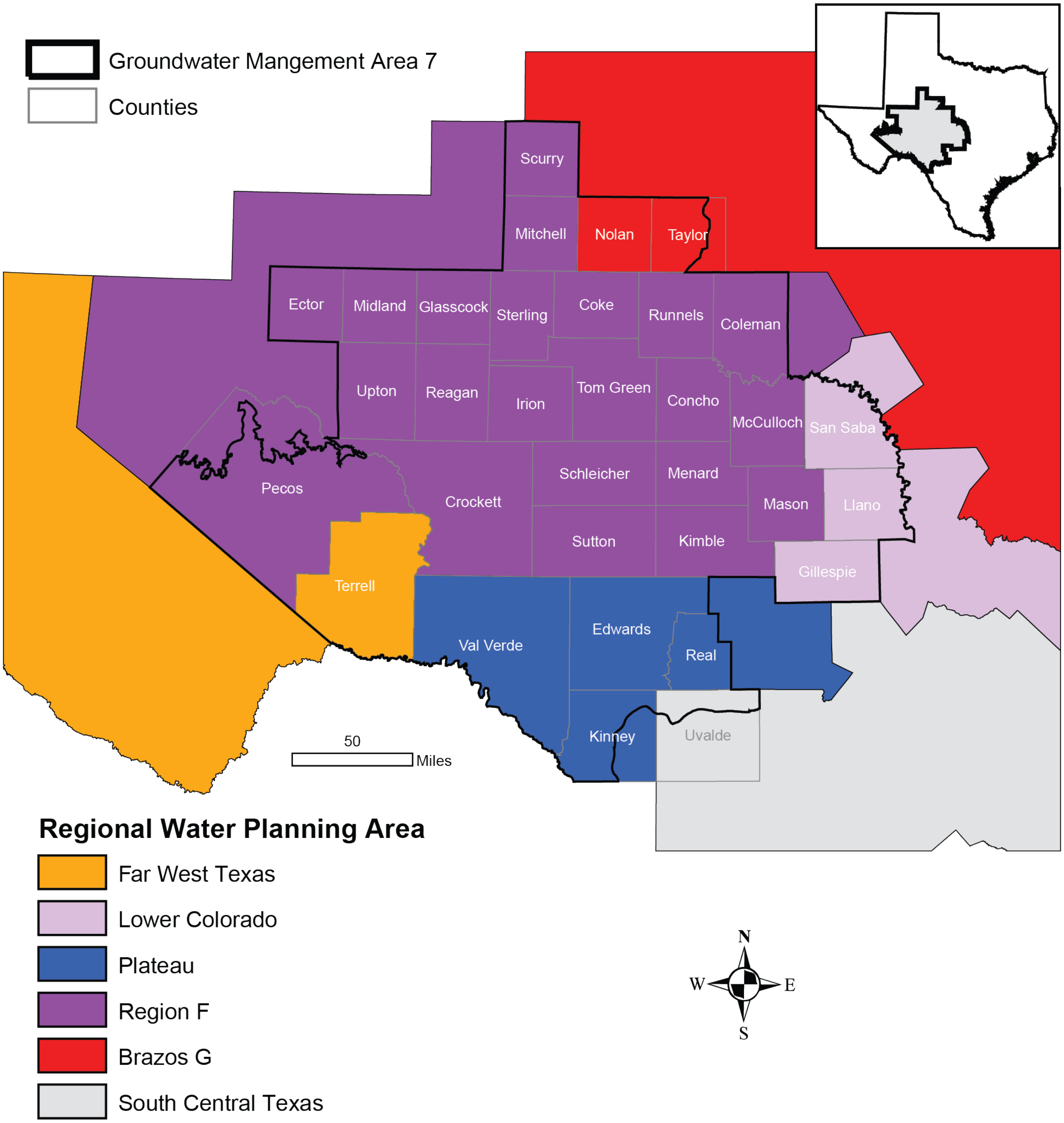

FIGURE 2. MAP SHOWING REGIONAL WATER PLANNING AREAS IN GROUNDWATER MANAGEMENT AREA 7.

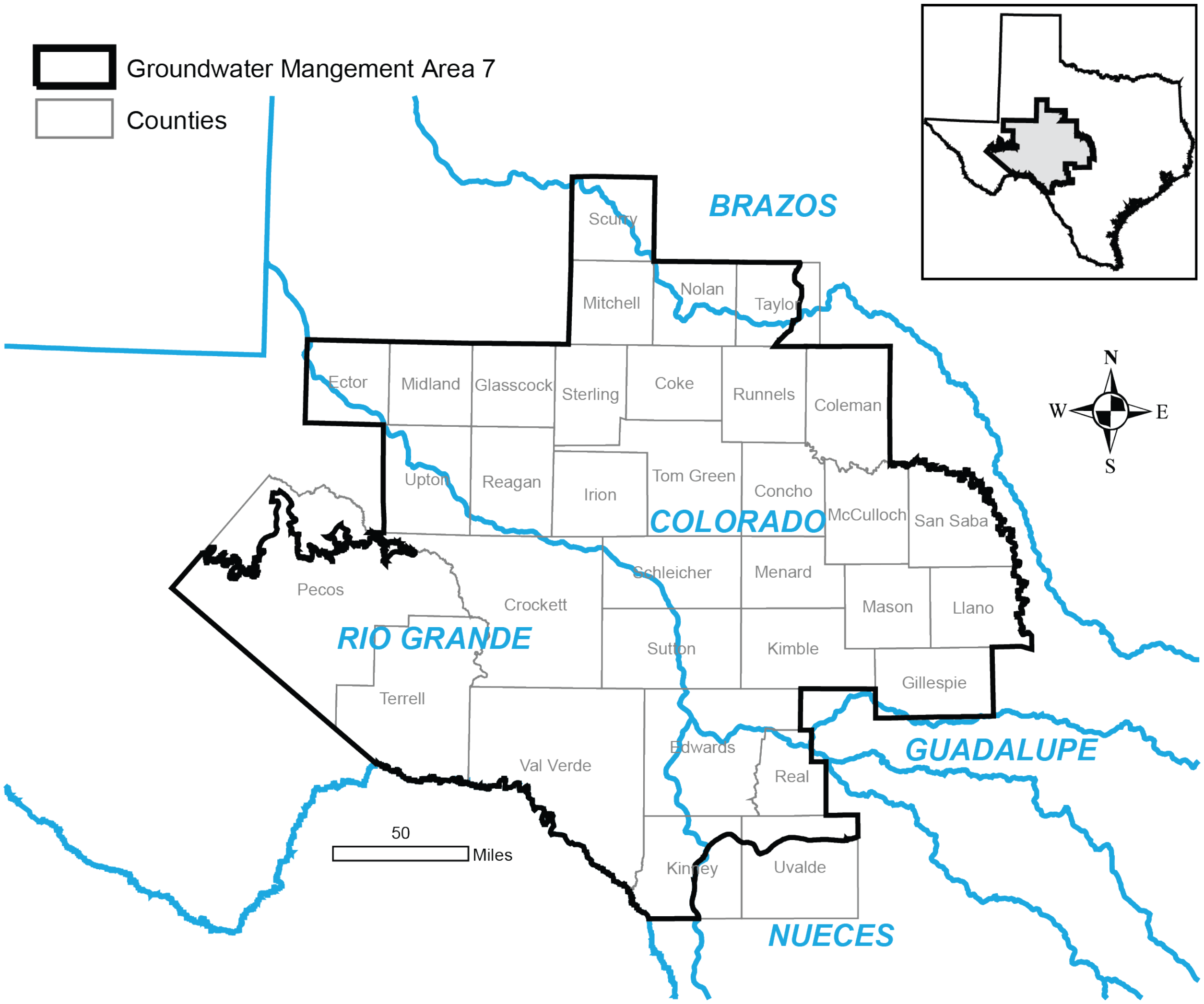

FIGURE 3. **MAP SHOWING RIVER BASINS IN GROUNDWATER MANAGEMENT AREA 7. THESE INCLUDE PARTS OF THE BRAZOS, COLORADO, GUADALUPE, NUECES, AND RIO GRANDE RIVER BASINS.**

PARAMETERS AND ASSUMPTIONS:

Capitan Reef Complex Aquifer

- Version 1.01 of the groundwater availability model of the eastern arm of the Capitan Reef Complex Aquifer was used. See Jones (2016) for assumptions and limitations of the groundwater availability model. See Hutchison (2016a) for details on the assumptions used for predictive simulations.
- The model has five layers: Layer 1, the Edwards-Trinity (Plateau) and Pecos Valley aquifers; Layer 2, the Dockum Aquifer and the Dewey Lake Formation; Layer 3, the Rustler Aquifer; Layer 4, a confining unit made up of the Salado and Castile formations, and the overlying portion of the Artesia Group; and Layer 5, the Capitan Reef Complex Aquifer, part of the Artesia Group, and the Delaware Mountain Group. Layers 1 through 4 are intended to act solely as boundary conditions facilitating groundwater inflow and outflow relative to the Capitan Reef Complex Aquifer (Layer 5).
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).
- The model was run for the interval 2006 through 2070 for a 64-year predictive simulation. Drawdowns were calculated by subtracting 2006 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.
- During predictive simulations, there were no cells where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging.
- Drawdown averages and modeled available groundwater volumes are based on the official TWDB aquifer boundary within Groundwater Management Area 7.

Dockum and Ogallala Aquifers

- Version 1.01 of the groundwater availability model for the High Plains Aquifer System by Deeds and Jigmond (2015) was used to construct the predictive model simulation for this analysis. See Hutchison (2016c) for details of the initial assumptions.
- The model has four layers which represent the Ogallala and Pecos Valley Alluvium aquifers (Layer 1), the Edwards-Trinity (High Plains) and Edwards-Trinity (Plateau) aquifers (Layer 2), the Upper Dockum Aquifer (Layer 3), and the Lower Dockum Aquifer (Layer 4). Pass-through cells exist in layers 2 and 3 to hydraulically connect the Ogallala Aquifer to the Lower Dockum where the Edwards-Trinity (High Plains)

and Upper Dockum aquifers are absent. These pass-through cells were excluded from the calculations of drawdowns and modeled available groundwater.

- The model was run with MODFLOW-NWT (Niswonger and others, 2011). The model uses the Newton formulation and the upstream weighting package, which automatically reduces pumping as heads drop in a particular cell, as defined by the user. This feature may simulate the declining production of a well as saturated thickness decreases. Deeds and Jigmond (2015) modified the MODFLOW-NWT code to use a saturated thickness of 30 feet as the threshold—instead of percent of the saturated thickness—when pumping reductions occur during a simulation. Therefore, the groundwater management area should be aware that the modeled available groundwater values will be less than pumping input values if the modeled saturated thickness drops below that threshold.
- The model was run for the interval 2013 through 2070 for a 58-year predictive simulation. Drawdowns were calculated by subtracting initial water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.
- During predictive simulations, there were no cells in the Dockum Aquifer where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging. However, in the Ogallala Aquifer, dry cells occurred during the predictive simulation. These dry cells were excluded from the modeled available groundwater calculations.
- Drawdown averages and modeled available groundwater volumes are based on the model boundary within Groundwater Management Area 7 for the Dockum Aquifer and the official TWDB aquifer boundary for the Ogallala Aquifer.

Pecos Valley, Edwards-Trinity (Plateau) and Trinity Aquifers

- The single-layer alternative groundwater flow model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers was used for this analysis. This model is an update to the previously developed groundwater availability model documented in Anaya and Jones (2009). See Hutchison and others (2011a) and Anaya and Jones (2009) for assumptions and limitations of the model. See Hutchison (2016e; 2018) for details on the assumptions used for predictive simulations.
- The groundwater model has one layer representing the Pecos Valley Aquifer and the Edwards-Trinity (Plateau) Aquifer. In the relatively narrow area where both aquifers are present, the model is a lumped representation of both aquifers.
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

- The model was run for the interval 2006 through 2070 for a 65-year predictive simulation. Drawdowns were calculated by subtracting 2010 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.
- Because simulated water levels for the baseline year (2010) are not included in the original calibrated historical model, these water levels had to be verified against measured water levels to confirm that the predictive model satisfactorily matched real-world conditions. Comparison of 2010 simulated and measured water levels indicated a root mean squared error of 100 feet or 4 percent of the range in water-level elevations, which is within acceptable limits. Based on these results, we consider the predictive model an appropriate tool for evaluating the attainability of desired future conditions and for calculating modeled available groundwater.
- Drawdowns for cells with water levels below the base elevation of the cell ("dry" cells) were included in the averaging.
- Drawdown averages and modeled available groundwater volumes are based on the official TWDB aquifer boundaries within Groundwater Management Area 7.

Edwards-Trinity (Plateau) Aquifer of Kinney County

- All parameters and assumptions for the Edwards-Trinity (Plateau) Aquifer of Kinney County in Groundwater Management Area 7 are described in GAM Run 10-043 MAG Version 2 (Shi, 2012). This report assumes a planning period from 2010 to 2070.
- The Kinney County Groundwater Conservation District model developed by Hutchison and others (2011b) was used for this analysis. The model was calibrated to water level and spring flux collected from 1950 to 2005.
- The model has four layers representing the following hydrogeologic units (from top to bottom): Carrizo-Wilcox Aquifer (Layer 1), Upper Cretaceous Unit (Layer 2), Edwards (Balcones Fault Zone) Aquifer/Edwards portion of the Edwards-Trinity (Plateau) Aquifer (Layer 3), and Trinity portion of the Edwards-Trinity (Plateau) Aquifer (Layer 4).
- The model was run with MODFLOW-2000 (Harbaugh and others, 2000).
- The model was run for 56 annual stress periods under the conditions set in Scenario 3 in Task 10-027 (Hutchison, 2011).
- Modeled available groundwater volumes are based on the official TWDB aquifer boundary within Groundwater Management Area 7 in Kinney County.

Edwards-Trinity (Plateau) Aquifer of Val Verde County

- The single-layer numerical groundwater flow model for the Edwards-Trinity (Plateau) Aquifer of Val Verde County was used for this analysis. This model is based on the previously developed alternative groundwater model of the Kinney County area documented in Hutchison and others (2011b). See EcoKai and Hutchison (2014) for assumptions and limitations of the model. See Hutchison (2016e; 2021) for details on the assumptions used for predictive simulations, including recharge and pumping assumptions.
- The groundwater model has one layer representing the Edwards-Trinity (Plateau) Aquifer of Val Verde County.
- The model was run with MODFLOW-2005 (Harbaugh, 2005).
- The model was run for a 45-year predictive simulation representing hydrologic conditions of the interval 1968 through 2013. Simulated spring discharge from San Felipe Springs was averaged over duration of the simulation. The resultant pumping rate that met the desired future conditions was applied to the predictive period—2010 through 2070—based on the assumption that average conditions over the predictive period are the same as those over the historic period represented by the model run.
- Modeled available groundwater volumes are based on the official TWDB aquifer boundary within Groundwater Management Area 7 in Val Verde County.

Minor aquifers of the Llano Uplift Area

- We used version 1.01 of the groundwater availability model for the minor aquifers in the Llano Uplift Area. See Shi and others (2016) for assumptions and limitations of the model. See Hutchison (2016b) for details of the initial assumptions.
- The model contains eight layers: Trinity Aquifer, Edwards-Trinity (Plateau) Aquifer, and younger alluvium deposits (Layer 1), confining units (Layer 2), Marble Falls Aquifer and equivalent units (Layer 3), confining units (Layer 4), Ellenburger-San Saba Aquifer and equivalent units (Layer 5), confining units (Layer 6), Hickory Aquifer and equivalent units (Layer 7), and Precambrian units (Layer 8).
- The model was run with MODFLOW-USG beta (development) version (Panday and others, 2013). Perennial rivers and reservoirs were simulated using the MODFLOW-USG river package. Springs were simulated using the MODFLOW-USG drain package.
- The model was run for the interval 2011 through 2070 for a 60-year predictive simulation. Drawdowns were calculated by subtracting initial water levels from 2070 simulated water levels, which were then averaged over the portion of the

aquifer in Groundwater Management Area 7. During predictive simulations, there were no cells where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging.

- Drawdown averages and modeled available groundwater volumes are based on the model boundaries within Groundwater Management Area 7.

Rustler Aquifer

- Version 1.01 of the groundwater availability model for the Rustler Aquifer by Ewing and others (2012) was used to construct the predictive model simulation for this analysis. See Hutchison (2016d) for details of the initial assumptions, including recharge conditions.
- The model has two layers, the top one representing the Rustler Aquifer, and the other representing the Dewey Lake Formation and the Dockum Aquifer.
- The model was run with MODFLOW-NWT (Niswonger and others, 2011).
- The model was run for the interval 2009 through 2070 for a 61-year predictive simulation. Drawdowns were calculated by subtracting 2009 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 7.
- The predictive model used to define desired future conditions uses 2008 recharge conditions throughout the predictive period.
- The predictive model used to define desired future conditions has general-head boundary heads that decline at a rate of 1.5 feet per year.
- During predictive simulations, there were no cells where water levels were below the base elevation of the cell ("dry" cells). Therefore, all drawdowns were included in the averaging.
- Drawdown averages and modeled available groundwater volumes are based on the model boundaries within Groundwater Management Area 7.

RESULTS:

The modeled available groundwater estimates for each decade from 2020 through 2070 are:

- 26,164 acre-feet per year in the Capitan Reef Complex Aquifer,
- 2,324 acre-feet per year in the Dockum Aquifer,
- 6,570 to 7,925 acre-feet per year in the Ogallala Aquifer,

- 479,063 acre-feet per year in the undifferentiated Edwards-Trinity (Plateau), Pecos Valley, and Trinity aquifers,
- 22,616 acre-feet per year in the Ellenburger-San Saba Aquifer,
- 49,936 acre-feet per year in the Hickory Aquifer, and
- 7,040 acre-feet per year in the Rustler Aquifer.

The modeled available groundwater for the respective aquifers has been summarized by aquifer, county, and groundwater conservation district (Tables 1, 3, 5, 7, 9, 11, and 13). The modeled available groundwater is also summarized by county, regional water planning area, river basin, and aquifer for use in the regional water planning process (Tables 2, 4, 6, 8, 10, 12, and 14). The modeled available groundwater for the Ogallala Aquifer that achieves the desired future conditions adopted by districts in Groundwater Management Area 7 decreases from 7,925 to 6,570 acre-feet per year between 2020 and 2070 (Tables 5 and 6). This decline is attributable to the occurrence of increasing numbers of cells where water levels were below the base elevation of the cell ("dry" cells) in parts of Glasscock County. Please note that MODFLOW-NWT automatically reduces pumping as water levels decline.

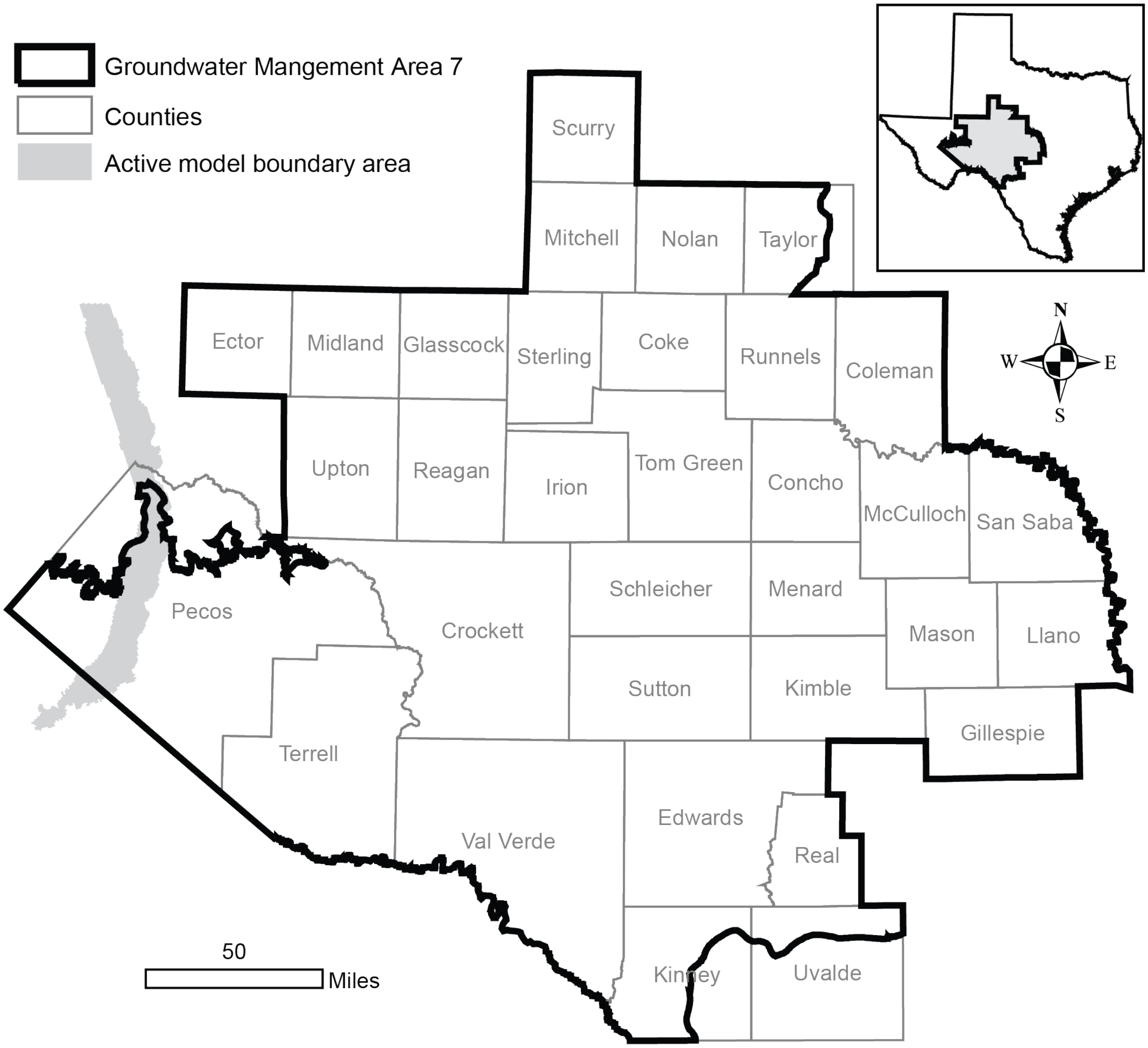

FIGURE 4. **MAP SHOWING THE AREAS COVERED BY THE CAPITAN REEF COMPLEX AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE EASTERN ARM OF THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 7.**

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Middle Pecos GCD	Pecos	26,164	26,164	26,164	26,164	26,164	26,164
	Total	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**
GMA 7		**26,164**	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Pecos	F	Rio Grande	26,164	26,164	26,164	26,164	26,164
		Total	**26,164**	**26,164**	**26,164**	**26,164**	**26,164**
GMA 7			**26,164**	**26,164**	**26,164**	**26,164**	**26,164**

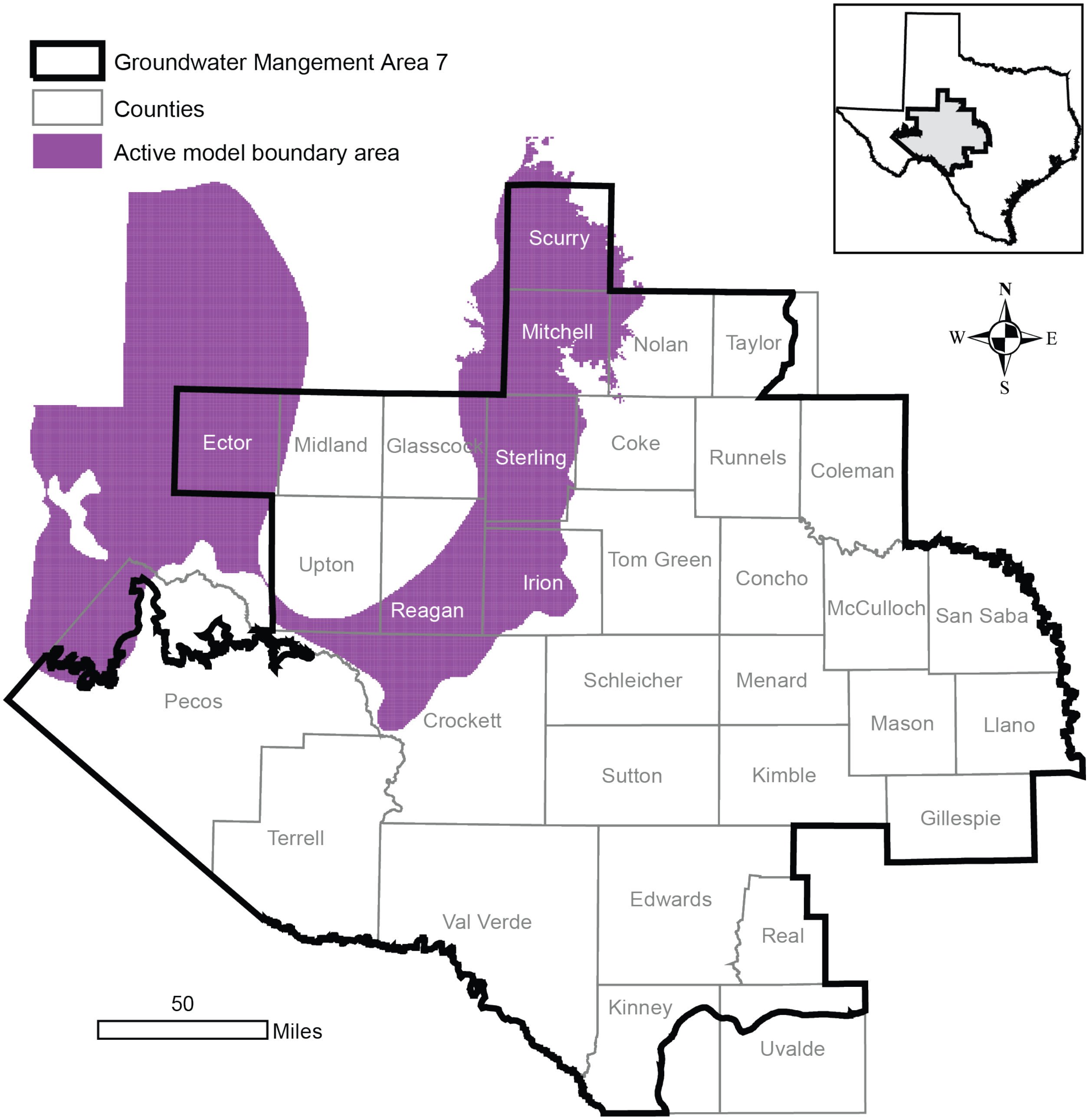

FIGURE 5. **MAP SHOWING AREAS COVERED BY THE DOCKUM AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HIGH PLAINS AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 7.**

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. GCD AND UWCD ARE THE ABBREVIATIONS FOR GROUNDWATER CONSERVATION DISTRICT AND UNDERGROUND WATER CONSERVATION DISTRICT, RESPECTIVELY.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Middle Pecos GCD	Pecos	2,022	2,022	2,022	2,022	2,022	2,022
	Total	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**
Santa Rita UWCD	Reagan	302	302	302	302	302	302
	Total	**302**	**302**	**302**	**302**	**302**	**302**
GMA 7		**2,324**	**2,324**	**2,324**	**2,324**	**2,324**	**2,324**

Note: The modeled available groundwater for Santa Rita Underground Water Conservation District excludes parts of Reagan County that fall within Glasscock Groundwater Conservation District.

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Pecos	F	Rio Grande	2,022	2,022	2,022	2,022	2,022
		Total	**2,022**	**2,022**	**2,022**	**2,022**	**2,022**
Reagan	F	Colorado	302	302	302	302	302
		Rio Grande	0	0	0	0	0
		Total	**302**	**302**	**302**	**302**	**302**
GMA 7			**2,324**	**2,324**	**2,324**	**2,324**	**2,324**

Note: The modeled available groundwater for Reagan County excludes parts of Reagan County that fall outside of Santa Rita Underground Water Conservation District.

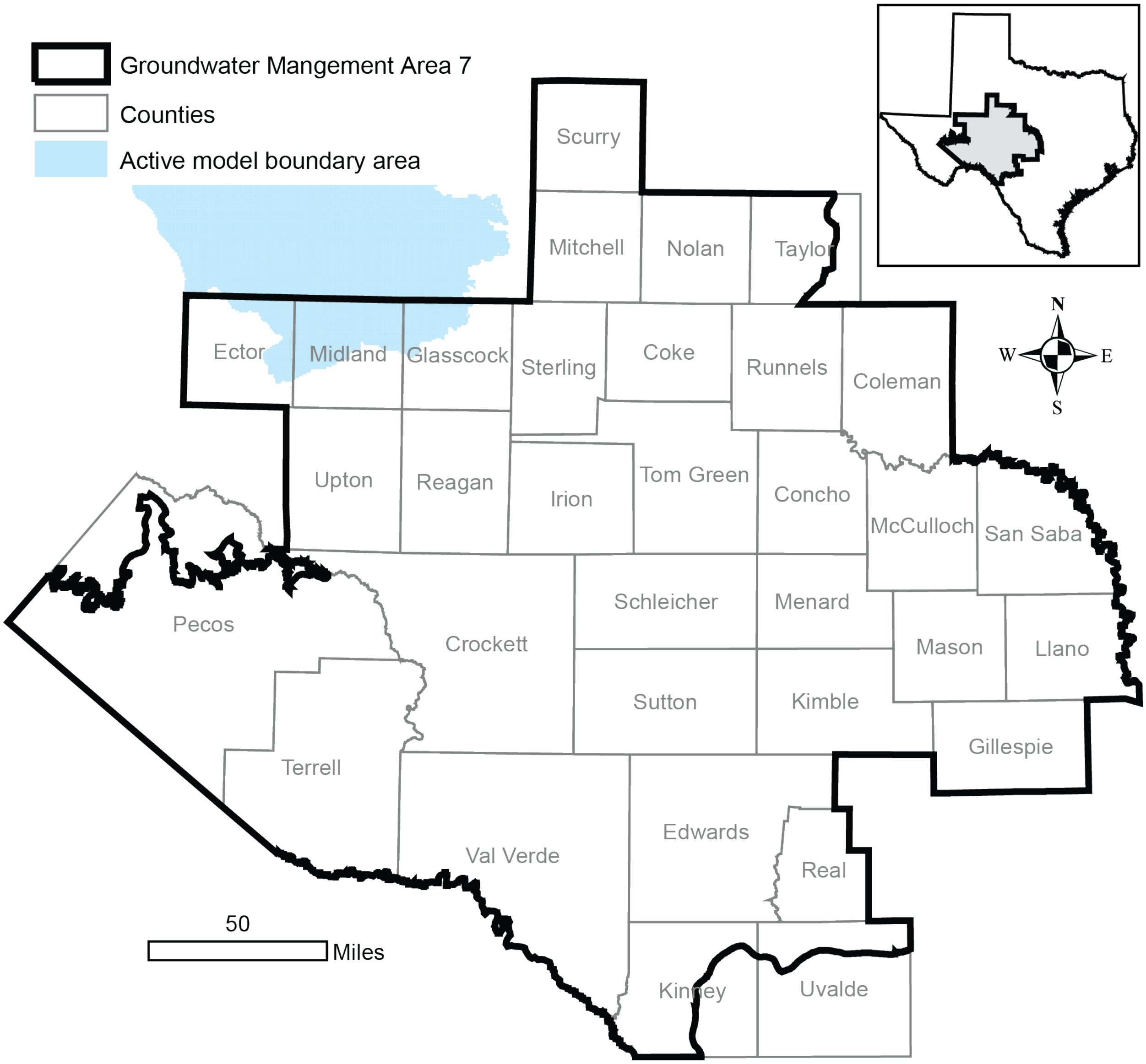

FIGURE 6. **MAP SHOWING THE AREAS COVERED BY THE OGALLALA AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE HIGH PLAINS AQUIFER SYSTEM IN GROUNDWATER MANAGEMENT AREA 7.**

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Glasscock GCD	Glasscock	7,925	7,673	7,372	7,058	6,803	6,570
	Total	**7,925**	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**
GMA 7		**7,925**	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE OGALLALA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Glasscock	F	Colorado	7,673	7,372	7,058	6,803	6,570
		Total	**7,673**	**7,372**	**7,058**	**6,803**	**6,570**
GMA 7			**7,673**	**7,372**	**7,058**	**6,803**	**6,570**

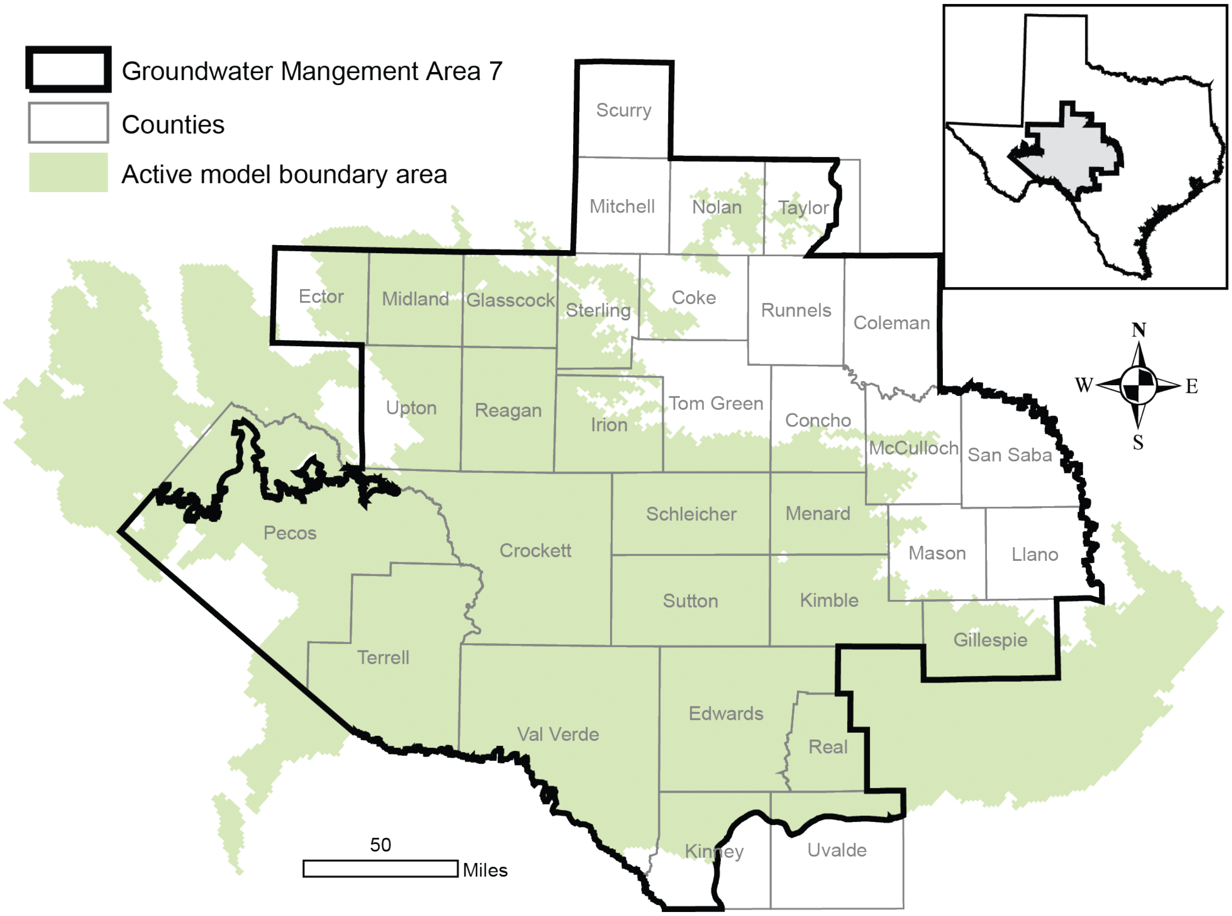

FIGURE 7. **MAP SHOWING THE AREAS COVERED BY THE UNDIFFERENTIATED EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS IN THE GROUNDWATER AVAILABILITY MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AND PECOS VALLEY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7.**

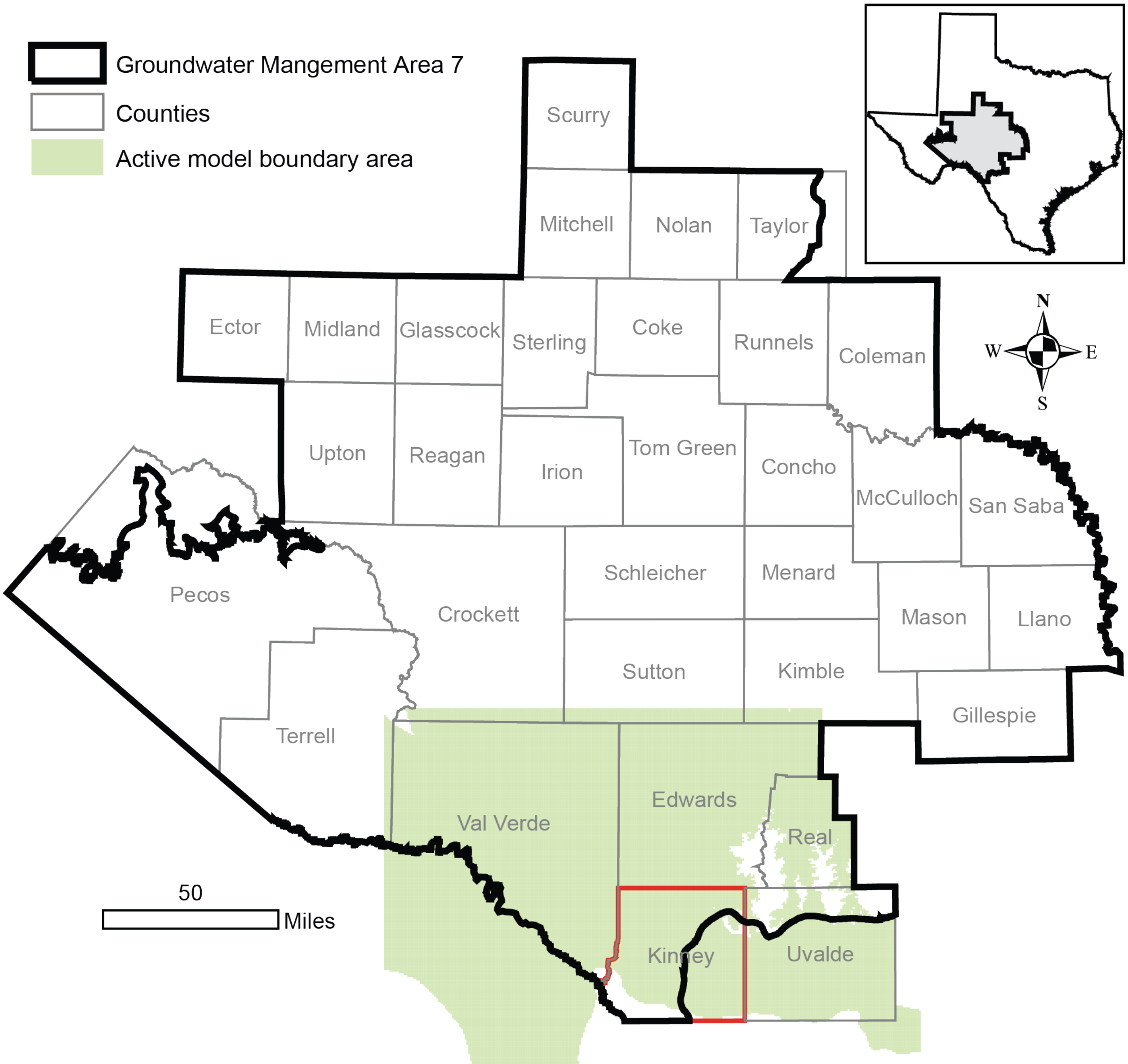

FIGURE 8. **MAP SHOWING THE AREAS COVERED BY THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN THE ALTERNATIVE MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN KINNEY COUNTY [HIGHLIGHTED IN RED].**

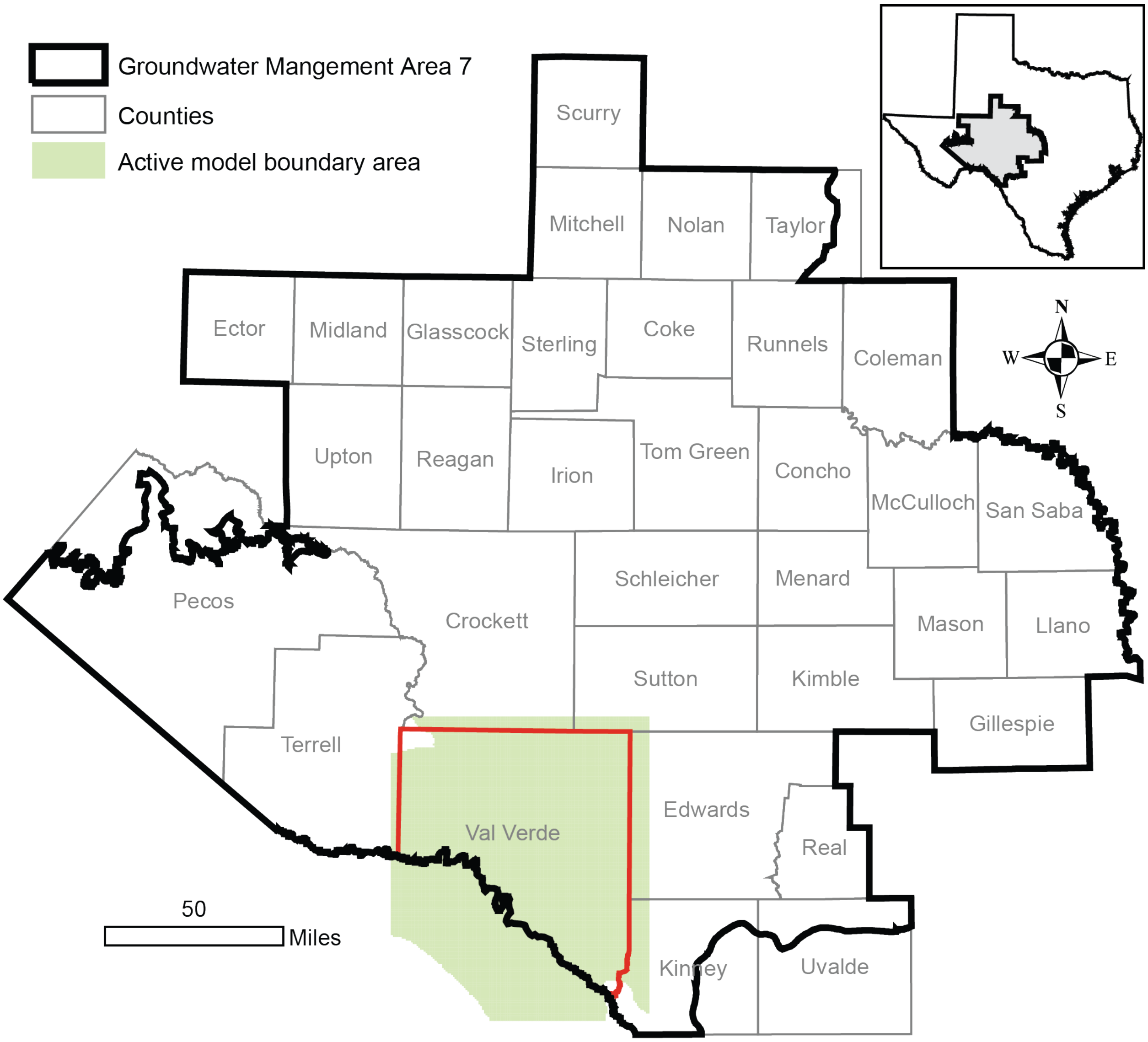

FIGURE 9. **MAP SHOWING THE AREAS COVERED BY THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN THE GROUNDWATER FLOW MODEL FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN VAL VERDE COUNTY [HIGHLIGHTED IN RED].**

TABLE 7. MODELED AVAILABLE GROUNDWATER FOR THE UNDIFFERENTIATED EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY, FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD IS ABBREVIATION FOR UNDERGROUND WATER CONSERVATION DISTRICT, WCD IS WATER CONSERVATION DISTRICT, UWD IS UNDERGROUND WATER DISTRICT, UWC IS UNDERGROUND WATER CONSERVATION, AND C AND R DISTRICT IS CONSERVATION AND RECLAMATION DISTRICT.

District	County	Year					
		2020	**2030**	**2040**	**2050**	**2060**	**2070**
Coke County UWCD	Coke	997	997	997	997	997	997
	Total	**997**	**997**	**997**	**997**	**997**	**997**
Crockett County GCD	Crockett	4,675	4,675	4,675	4,675	4,675	4,675
	Total	**4,675**	**4,675**	**4,675**	**4,675**	**4,675**	**4,675**
Glasscock GCD	Glasscock	65,186	65,186	65,186	65,186	65,186	65,186
	Reagan	40,835	40,835	40,835	40,835	40,835	40,835
	Total	**106,021**	**106,021**	**106,021**	**106,021**	**106,021**	**106,021**
Hickory UWCD No. 1	Kimble	104	104	104	104	104	104
	Menard	380	380	380	380	380	380
	Total	**484**	**484**	**484**	**484**	**484**	**484**
Hill Country UWCD	Gillespie	4,979	4,979	4,979	4,979	4,979	4,979
	Total	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**
Irion County WCD	Irion	3,289	3,289	3,289	3,289	3,289	3,289
	Total	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**
Kimble County GCD	Kimble	1,282	1,282	1,282	1,282	1,282	1,282
	Total	**1,282**	**1,282**	**1,282**	**1,282**	**1,282**	**1,282**

TABLE 7. (CONTINUED).

District	County	Year					
		2020	**2030**	**2040**	**2050**	**2060**	**2070**
Kinney County GCD	Kinney	70,341	70,341	70,341	70,341	70,341	70,341
	Total	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**
Menard County UWD	Menard	2,217	2,217	2,217	2,217	2,217	2,217
	Total	**2,217**	**2,217**	**2,217**	**2,217**	**2,217**	**2,217**
Middle Pecos GCD	Pecos	117,309	117,309	117,309	117,309	117,309	117,309
	Total	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**
Plateau UWC and Supply District	Schleicher	8,034	8,034	8,034	8,034	8,034	8,034
	Total	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**
Real-Edwards C and R District	Edwards	5,676	5,676	5,676	5,676	5,676	5,676
	Real	7,523	7,523	7,523	7,523	7,523	7,523
	Total	**13,199**	**13,199**	**13,199**	**13,199**	**13,199**	**13,199**

TABLE 7. (CONTINUED).

District	County	Year					
		2020	**2030**	**2040**	**2050**	**2060**	**2070**
Santa Rita UWCD	Reagan	27,398	27,398	27,398	27,398	27,398	27,398
	Total	**27,398**	**27,398**	**27,398**	**27,398**	**27,398**	**27,398**
Sterling County UWCD	Sterling	2,495	2,495	2,495	2,495	2,495	2,495
	Total	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**
Sutton County UWCD	Sutton	6,400	6,400	6,400	6,400	6,400	6,400
	Total	**6,400**	**6,400**	**6,400**	**6,400**	**6,400**	**6,400**
Terrell County GCD	Terrell	1,420	1,420	1,420	1,420	1,420	1,420
	Total	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**
Uvalde County UWCD	Uvalde	1,993	1,993	1,993	1,993	1,993	1,993
	Total	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**
No district		102,703	102,703	102,703	102,703	102,703	102,703
GMA 7		**475,236**	**475,236**	**475,236**	**475,236**	**475,236**	**475,236**

TABLE 8. MODELED AVAILABLE GROUNDWATER BY DECADE FOR THE UNDIFFERENTIATED EDWARDS-TRINITY (PLATEAU), PECOS VALLEY, AND TRINITY AQUIFERS IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Coke	F	Colorado	997	997	997	997	997
		Total	**997**	**997**	**997**	**997**	**997**
Crockett	F	Colorado	20	20	20	20	20
		Rio Grande	5,427	5,427	5,427	5,427	5,427
		Total	**5,447**	**5,447**	**5,447**	**5,447**	**5,447**
Ector	F	Colorado	4,925	4,925	4,925	4,925	4,925
		Rio Grande	617	617	617	617	617
		Total	**5,542**	**5,542**	**5,542**	**5,542**	**5,542**
Edwards	J	Colorado	2,305	2,305	2,305	2,305	2,305
		Nueces	1,631	1,631	1,631	1,631	1,631
		Rio Grande	1,740	1,740	1,740	1,740	1,740
		Total	**5,676**	**5,676**	**5,676**	**5,676**	**5,676**
Gillespie	K	Colorado	4,843	4,843	4,843	4,843	4,843
		Guadalupe	136	136	136	136	136
		Total	**4,979**	**4,979**	**4,979**	**4,979**	**4,979**
Glasscock	F	Colorado	65,186	65,186	65,186	65,186	65,186
		Total	**65,186**	**65,186**	**65,186**	**65,186**	**65,186**

TABLE 8. (CONTINUED).

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Irion	F	Colorado	3,289	3,289	3,289	3,289	3,289
		Total	**3,289**	**3,289**	**3,289**	**3,289**	**3,289**
Kimble	F	Colorado	1,386	1,386	1,386	1,386	1,386
		Total	**1,386**	**1,386**	**1,386**	**1,386**	**1,386**
Kinney	J	Nueces	12	12	12	12	12
		Rio Grande	70,329	70,329	70,329	70,329	70,329
		Total	**70,341**	**70,341**	**70,341**	**70,341**	**70,341**
Menard	F	Colorado	2,597	2,597	2,597	2,597	2,597
		Total	**2,597**	**2,597**	**2,597**	**2,597**	**2,597**
Midland	F	Colorado	23,233	23,233	23,233	23,233	23,233
		Total	**23,233**	**23,233**	**23,233**	**23,233**	**23,233**
Pecos	F	Rio Grande	117,309	117,309	117,309	117,309	117,309
		Total	**117,309**	**117,309**	**117,309**	**117,309**	**117,309**

TABLE 8. (CONTINUED).

County	RWPA	River Basin	Year				
			2030	**2040**	**2050**	**2060**	**2070**
Reagan	F	Colorado	68,205	68,205	68,205	68,205	68,205
		Rio Grande	28	28	28	28	28
		Total	**68,233**	**68,233**	**68,233**	**68,233**	**68,233**
Real	J	Colorado	277	277	277	277	277
		Guadalupe	3	3	3	3	3
		Nueces	7,243	7,243	7,243	7,243	7,243
		Total	**7,523**	**7,523**	**7,523**	**7,523**	**7,523**
Schleicher	F	Colorado	6,403	6,403	6,403	6,403	6,403
		Rio Grande	1,631	1,631	1,631	1,631	1,631
		Total	**8,034**	**8,034**	**8,034**	**8,034**	**8,034**
Sterling	F	Colorado	2,495	2,495	2,495	2,495	2,495
		Total	**2,495**	**2,495**	**2,495**	**2,495**	**2,495**
Sutton	F	Colorado	388	388	388	388	388
		Rio Grande	6,022	6,022	6,022	6,022	6,022
		Total	**6,410**	**6,410**	**6,410**	**6,410**	**6,410**
Taylor	G	Brazos	331	331	331	331	331
		Colorado	158	158	158	158	158
		Total	**489**	**489**	**489**	**489**	**489**
Terrell	E	Rio Grande	1,420	1,420	1,420	1,420	1,420
		Total	**1,420**	**1,420**	**1,420**	**1,420**	**1,420**

TABLE 8. (CONTINUED).

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Upton	F	Colorado	21,243	21,243	21,243	21,243	21,243
		Rio Grande	1,126	1,126	1,126	1,126	1,126
		Total	**22,369**	**22,369**	**22,369**	**22,369**	**22,369**
Uvalde	L	Nueces	1,993	1,993	1,993	1,993	1,993
		Total	**1,993**	**1,993**	**1,993**	**1,993**	**1,993**
Val Verde	J	Rio Grande	50,000	50,000	50,000	50,000	50,000
		Total	**50,000**	**50,000**	**50,000**	**50,000**	**50,000**
GMA 7			**479,063**	**479,063**	**479,063**	**479,063**	**479,063**

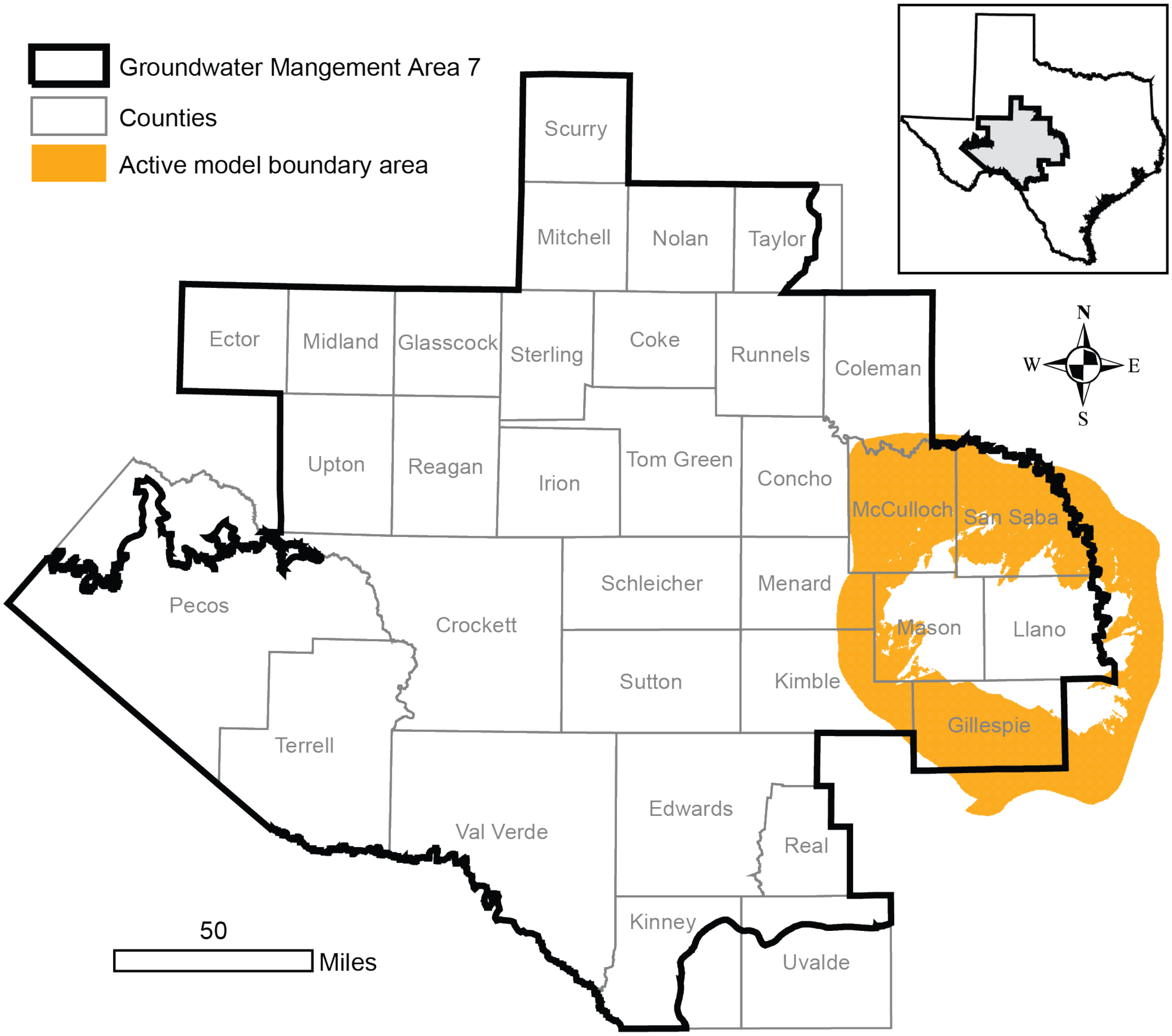

FIGURE 10. MAP SHOWING THE AREAS COVERED BY THE ELLENBURGER-SAN SABA AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS OF THE LLANO UPLIFT AREA IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD IS THE ABBREVIATION FOR UNDERGROUND WATER CONSERVATION DISTRICT AND UWD IS UNDERGROUND WATER DISTRICT.

District	County	Year					
		2020	2030	2030	2050	2060	2070
Hickory UWCD No. 1	Kimble	344	344	344	344	344	344
	Mason	3,237	3,237	3,237	3,237	3,237	3,237
	McCulloch	3,466	3,466	3,466	3,466	3,466	3,466
	Menard	282	282	282	282	282	282
	San Saba	5,559	5,559	5,559	5,559	5,559	5,559
	Total	**12,887**	**12,887**	**12,887**	**12,887**	**12,887**	**12,887**
Hill Country UWCD	Gillespie	6,294	6,294	6,294	6,294	6,294	6,294
	Total	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**
Kimble County GCD	Kimble	178	178	178	178	178	178
	Total	**178**	**178**	**178**	**178**	**178**	**178**
Menard County UWD	Menard	27	27	27	27	27	27
	Total	**27**	**27**	**27**	**27**	**27**	**27**
No District	McCulloch	898	898	898	898	898	898
	San Saba	2,331	2,331	2,331	2,331	2,331	2,331
	Total	**3,229**	**3,229**	**3,229**	**3,229**	**3,229**	**3,229**
GMA 7		**22,615**	**22,615**	**22,615**	**22,615**	**22,615**	**22,615**

TABLE 10. MODELED AVAILABLE GROUNDWATER FOR THE ELLENBURGER-SAN SABA AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Gillespie	K	Colorado	6,294	6,294	6,294	6,294	6,294
		Total	**6,294**	**6,294**	**6,294**	**6,294**	**6,294**
Kimble	F	Colorado	521	521	521	521	521
		Total	**521**	**521**	**521**	**521**	**521**
Mason	F	Colorado	3,237	3,237	3,237	3,237	3,237
		Total	**3,237**	**3,237**	**3,237**	**3,237**	**3,237**
McCulloch	F	Colorado	4,364	4,364	4,364	4,364	4,364
		Total	**4,364**	**4,364**	**4,364**	**4,364**	**4,364**
Menard	F	Colorado	309	309	309	309	309
		Total	**309**	**309**	**309**	**309**	**309**
San Saba	K	Colorado	7,890	7,890	7,890	7,890	7,890
		Total	**7,890**	**7,890**	**7,890**	**7,890**	**7,890**
GMA 7			**22,615**	**22,615**	**22,615**	**22,615**	**22,615**

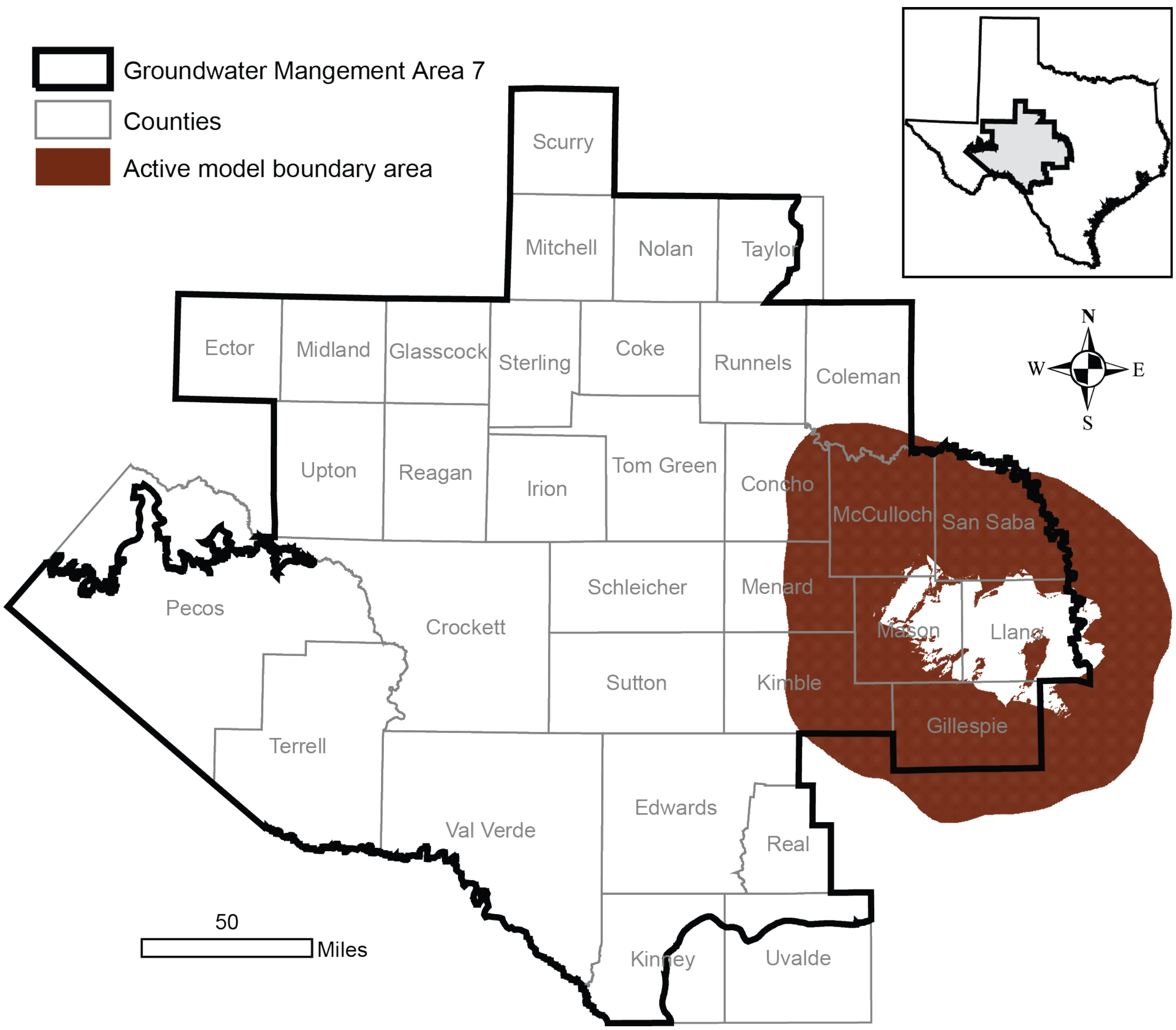

FIGURE 11. **MAP SHOWING AREAS COVERED BY THE HICKORY AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE MINOR AQUIFERS OF THE LLANO UPLIFT AREA IN GROUNDWATER MANAGEMENT AREA 7.**

TABLE 11. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR. UWCD IS THE ABBREVIATION FOR UNDERGROUND WATER CONSERVATION DISTRICT AND UWD IS UNDERGROUND WATER DISTRICT.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Hickory UWCD No. 1	Concho	13	13	13	13	13	13
	Kimble	42	42	42	42	42	42
	Mason	13,212	13,212	13,212	13,212	13,212	13,212
	McCulloch	21,950	21,950	21,950	21,950	21,950	21,950
	Menard	2,600	2,600	2,600	2,600	2,600	2,600
	San Saba	7,027	7,027	7,027	7,027	7,027	7,027
	Total	**44,843**	**44,843**	**44,843**	**44,843**	**44,843**	**44,843**
Hill Country UWCD	Gillespie	1,751	1,751	1,751	1,751	1,751	1,751
	Total	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**
Kimble County GCD	Kimble	123	123	123	123	123	123
	Total	**123**	**123**	**123**	**123**	**123**	**123**
Lipan-Kickapoo WCD	Concho	13	13	13	13	13	13
	Total	**13**	**13**	**13**	**13**	**13**	**13**
Menard County UWD	Menard	126	126	126	126	126	126
	Total	**126**	**126**	**126**	**126**	**126**	**126**
No District	McCulloch	2,427	2,427	2,427	2,427	2,427	2,427
	San Saba	652	652	652	652	652	652
	Total	**3,080**	**3,080**	**3,080**	**3,080**	**3,080**	**3,080**
GMA 7		**49,937**	**49,937**	**49,937**	**49,937**	**49,937**	**49,937**

TABLE 12. MODELED AVAILABLE GROUNDWATER FOR THE HICKORY AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Concho	F	Colorado	27	27	27	27	27
		Total	**27**	**27**	**27**	**27**	**27**
Gillespie	K	Colorado	1,751	1,751	1,751	1,751	1,751
		Total	**1,751**	**1,751**	**1,751**	**1,751**	**1,751**
Kimble	F	Colorado	165	165	165	165	165
		Total	**165**	**165**	**165**	**165**	**165**
Mason	F	Colorado	13,212	13,212	13,212	13,212	13,212
		Total	**13,212**	**13,212**	**13,212**	**13,212**	**13,212**
McCulloch	F	Colorado	24,377	24,377	24,377	24,377	24,377
		Total	**24,377**	**24,377**	**24,377**	**24,377**	**24,377**
Menard	F	Colorado	2,725	2,725	2,725	2,725	2,725
		Total	**2,725**	**2,725**	**2,725**	**2,725**	**2,725**
San Saba	K	Colorado	7,680	7,680	7,680	7,680	7,680
		Total	**7,680**	**7,680**	**7,680**	**7,680**	**7,680**
GMA 7			**49,937**	**49,937**	**49,937**	**49,937**	**49,937**

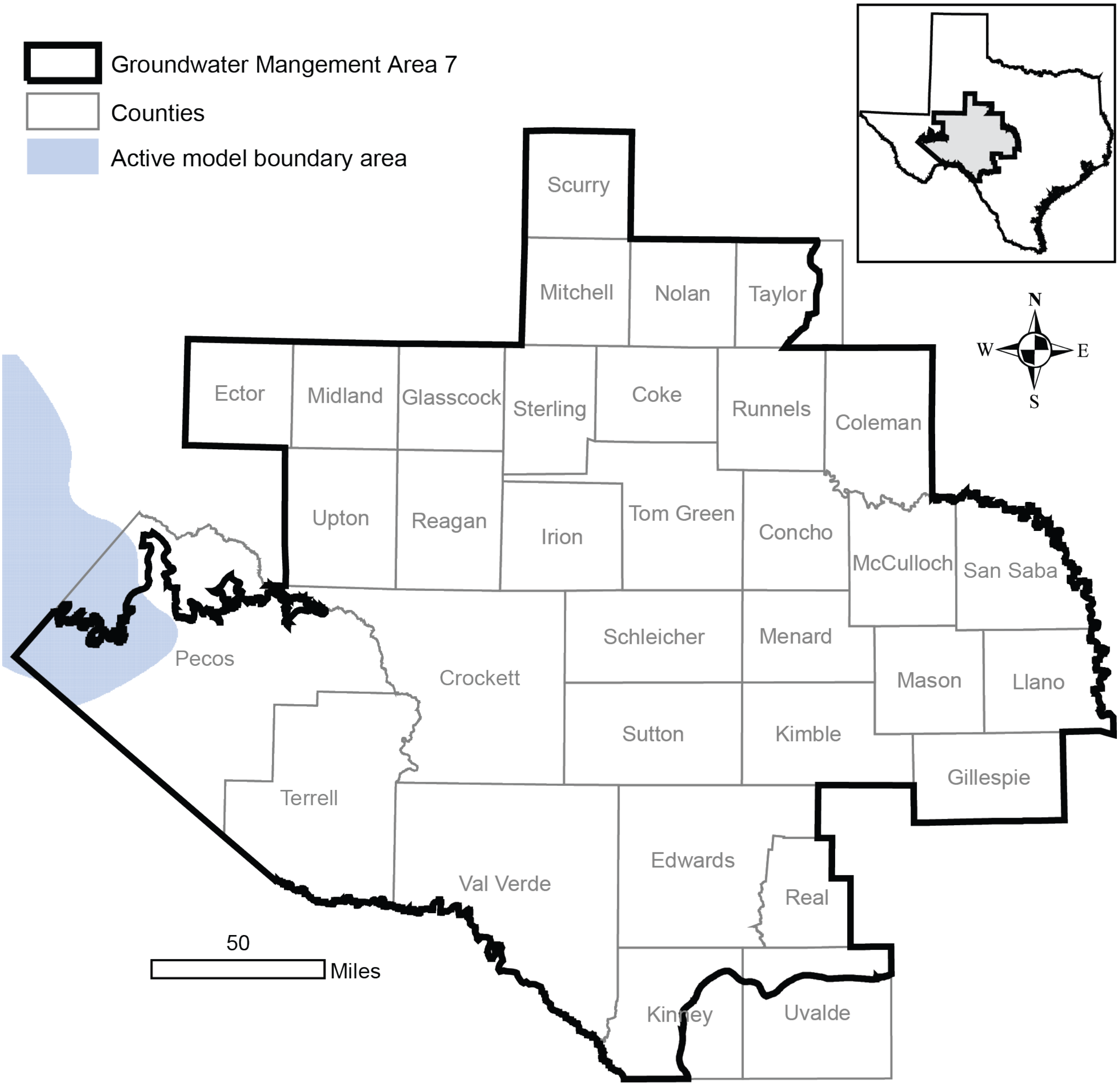

FIGURE 13. MAP SHOWING AREAS COVERED BY THE RUSTLER AQUIFER IN THE GROUNDWATER AVAILABILITY MODEL FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 7.

TABLE 13. MODELED AVAILABLE GROUNDWATER FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY DISTRICT AND COUNTY FOR EACH DECADE BETWEEN 2020 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

District	County	Year					
		2020	2030	2040	2050	2060	2070
Middle Pecos GCD	Pecos	7,040	7,040	7,040	7,040	7,040	7,040
	Total	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**

TABLE 14. MODELED AVAILABLE GROUNDWATER FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 7 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2030 AND 2070. RESULTS ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Year				
			2030	2040	2050	2060	2070
Pecos	F	Rio Grande	7,040	7,040	7,040	7,040	7,040
		Rio Grande	**7,040**	**7,040**	**7,040**	**7,040**	**7,040**

LIMITATIONS:

The groundwater model used in completing this analysis is the best available scientific tool that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> *"Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."*

A key aspect of using the groundwater model to evaluate historical groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historical pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and streamflow are specific to a particular historical time period.

Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and groundwater levels in the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

Model "Dry" Cells

In some cases, the predictive model run for this analysis could result in water levels in some model cells dropping below the base elevation of the cell during the simulation. In terms of water level, the cells have gone dry. However, as noted in the model assumptions the transmissivity of the cell remains constant and will produce water. This would mean that the modeled available groundwater would include imaginary "pumping" values that are coming from cells that are actually dry.

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Appendix D

GAM Run 16-033 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 10

GAM Run 16-033 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 10

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GAM RUN 16-033 MAG: MODELED AVAILABLE GROUNDWATER AQUIFERS IN GROUNDWATER MANAGEMENT AREA 10

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(512) 463-5808
July 20, 2018

EXECUTIVE SUMMARY:

The modeled available groundwater for the relevant aquifers of Groundwater Management Area 10—the Austin Chalk-Buda Limestone (relevant in Uvalde County), Barton Springs segment of the Edwards (Balcones Fault Zone), saline portion of the Barton Springs segment of the Edwards (Balcones Fault Zone), western portion of the San Antonio segment of the Edwards (Balcones Fault Zone) in Kinney County, Leona Gravel (relevant in Uvalde County), and Trinity—are summarized for the groundwater conservation districts (Tables 1, 3, 5, and 8) and by decade for use in the regional water planning process (Tables 2, 4, 6, and 9) . The modeled available groundwater estimates are 2,935 acre-feet per year in the Austin Chalk Aquifer (Uvalde County); 758 acre-feet per year in the Buda Limestone Aquifer (Uvalde County); 11,557 acre-feet per year in the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer during average recharge conditions (3,765 acre-feet per year during drought conditions); 8,564 acre-feet per year in the saline portion of the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer; 6,321 acre-feet per year in the freshwater portion of the western part of the San Antonio segment of the Edwards (Balcones Fault Zone) Aquifer; 9,385 acre-feet per year in the Leona Gravel Aquifer (Uvalde County); and 46,481 acre-feet per year in the Trinity Aquifer. Appropriate groundwater availability models were used to determine the modeled available groundwater for the Kinney County area of the Edwards (Balcones Fault Zone) Aquifer and to determine average recharge conditions for the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer. Water budget methods were used to calculate the modeled available groundwater for the rest of the relevant aquifers in Groundwater Management Area 10. The Texas Water Development Board (TWDB) determined that the explanatory report and other materials were administratively complete on February 12, 2018.

REQUESTOR:

Mr. John Dupnik, Chair of Groundwater Management Area 10.

DESCRIPTION OF REQUEST:

In a letter dated November 3, 2017, Mr. John Dupnik provided the TWDB with the desired future conditions of the relevant aquifers in Groundwater Management Area 10. The desired future conditions, adopted June 26, 2017, by the groundwater conservation districts within Groundwater Management Area 10, are reproduced below:

Austin [Chalk-]Buda Limestone Aquifer(s), relevant in Uvalde County only:

- Buda Limestone: no drawdown (including exempt and non-exempt use); and
- Austin Chalk: no drawdown (including exempt and non-exempt use).

Freshwater Edwards Aquifer in the Northern [Groundwater Management Area 10] Subdivision

- Springflow at Barton Springs during average recharge conditions shall be no less than 49.7 [cubic feet per second] averaged over an 84-month (7-year) period; and,
- Springflow of Barton Springs during extreme drought conditions, including those as severe as a recurrence of the 1950s drought of record, shall be no less than 6.5 [cubic feet per second] average on a monthly basis.

Saline Edwards Aquifer in the Northern [Groundwater Management Area 10] Subdivision

- No more than 75 feet of regional average potentiometric surface drawdown due to pumping when compared to pre-development.

Freshwater Edwards Aquifer in the Western [Groundwater Management Area 10] Subdivision

- The water level in well 70-38-902 shall not fall below 1,184 [feet above] mean sea level.

Leona Gravel Aquifer, relevant in Uvalde County only:

- No drawdown (including exempt and non-exempt use).

Trinity Aquifer, in hydrologically confined zone downdip of the Trinity outcrop:

- Outside of Uvalde and Bexar counties: average regional well drawdown not exceeding 25 feet during average recharge conditions (including exempt and non-exempt use);
- In Uvalde County: no (zero) regional well drawdown (including exempt and non-exempt use); [and]
- In Bexar County: non-relevant for joint planning purpose.

In response to a request for clarifications from the TWDB on December 14, 2017, and January 29, 2018 Mr. John Dupnik indicated the following preferences for calculating modeled available groundwater volumes in Groundwater Management Area 10:

Austin Chalk-Buda Limestone aquifers (only in Uvalde County)

The TWDB will use the methods and assumptions from AA 10-26 MAG and AA 10-27 MAG, with a planning period from 2010 to 2060.

Freshwater Edwards, Northern Subdivision

The TWDB will use the methods and assumptions from GAM Run 10-059 MAG Version 2, with a planning period from 2010 to 2060. Groundwater Management Area 10 specified two desired future conditions for this aquifer. We will provide only the drought conditions modeled available groundwater for regional water planning purposes because this corresponds to the methods used in regional water planning (planning for water in times of drought). We will provide both the average recharge conditions and the drought conditions modeled available groundwater in the final report. The modeled available groundwater values will be unchanged from the previous planning cycle.

Saline Edwards, Northern Subdivision

The TWDB will use aquifer parameters from AA 10-35 MAG, with a planning period from 2010 to 2060, but we will recalculate with a simple water budget as outlined in Table 1 of the Saline Edwards explanatory report, instead of the method used in AA 10-35 MAG. On January 29, 2018, we received Technical Memo 2017-1221 from the Barton Springs/ Edwards Aquifer Conservation District, which outlines the technical clarification on the method to use for this aquifer.

Freshwater Edwards, Western Subdivision (only in Kinney County)

The TWDB will use the methods and assumptions from GAM Run 12-002 MAG, with a planning period from 2010 to 2060. The modeled available groundwater values will be unchanged from the previous planning cycle.

Leona Gravel (only in Uvalde County)

The TWDB will use the methods and assumptions from AA 10-28 MAG, with a planning period from 2010 to 2060.

Trinity (downdip of recharge zone)

The TWDB will use the methods and assumptions from AA 10-06 with a planning period from 2010 to 2060. The changes in groundwater district boundaries since AA 10-06 will require reapportionment of the modeled available groundwater.

METHODS:

The desired future conditions for the Austin Chalk-Buda Limestone aquifers (relevant in Uvalde County), Leona Gravel Aquifer (relevant in Uvalde County), Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer, saline portion of the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer, Trinity Aquifer, and western portion of the San Antonio segment of the Edwards (Balcones Fault Zone) Aquifer in Kinney County are identical to the ones adopted in 2010. The applicable water budget methodologies to calculate modeled available groundwater are unchanged except for the saline Edwards (Balcones Fault Zone) and Trinity aquifers.

Therefore, the modeled available groundwater volumes presented for most of the aquifers are the same as those shown in the previous water budget assessments and model runs. These reports are AA 10-26 MAG (Thorkildsen and Backhouse, 2011a), AA 10-27 MAG (Thorkildsen and Backhouse, 2011b), GAM Run 10-059 MAG Version 2 (Hutchison and Oliver, 2011), GAM Run 12-002 MAG (Shi, 2012), and AA 10-28 MAG (Bradley, 2013).

The modeled available groundwater numbers were recalculated for the Trinity Aquifer to incorporate changes in the Groundwater Management Area 10 and groundwater conservation district boundaries. Additionally, a change in methodology required the recalculation of the Saline Edwards (Balcones Fault Zone) Aquifer modeled available groundwater, however, aquifer parameters from AA 10-35 MAG (Bradley, 2011) were incorporated into this assessment.

For the water budget approaches, modeled available groundwater volumes were determined by summing estimates of effective recharge and the change in aquifer storage. The water budget for these analyses were a simplified version of one found in Freeze and Cherry (1979, p.365).

This was the best method to calculate a modeled available groundwater estimate at this time; however, this method has limitations and should be replaced with better tools, including groundwater models and additional data as they become available. These analyses assume homogeneous and isotropic aquifers; however, real aquifer conditions do not satisfy these assumptions. These analyses further assume that precipitation is the only source of aquifer recharge, that lateral inflow to the aquifer is equal to lateral outflow from the aquifer, and that future pumping will not alter this balance. In addition, certain assumptions have been made regarding future precipitation, recharge, and streamflow in developing these estimates. Those assumptions also need to be considered and compared to actual future data when evaluating achievement of the desired future condition.

Estimates of modeled available groundwater volumes from the numerical flow models were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Annual pumping rates were divided by county, river basin, regional water planning area, and groundwater conservation district within Groundwater Management Area 10 (Figures 1 through 7 and Tables 1 through 9).

Modeled Available Groundwater and Permitting

Chapter 36 of the Texas Water Code defines "modeled available groundwater" to be the estimated average amount of water that may be produced annually to achieve a desired future condition. Groundwater conservation districts are required to consider modeled available groundwater, along with several other factors, when issuing permits to manage groundwater production to achieve the desired future condition(s). Districts must also consider include annual precipitation and production patterns, the estimated amount of pumping exempt from permitting, existing permits, and a reasonable estimate of actual groundwater production under existing permits.

PARAMETERS AND ASSUMPTIONS:

Austin Chalk-Buda Limestone Aquifers

- All parameters and assumptions for the Austin Chalk Aquifer are described in AA 10-26 MAG (Thorkildsen and Backhouse, 2011a) and for the Buda Limestone in AA 10-27 MAG (Thorkildsen and Backhouse, 2011b). Both reports assumed a planning period from 2010 to 2060.
- The Austin Chalk Aquifer in Uvalde County is in a state of dynamic equilibrium and the 2008 estimated pumpage of 2,935 acre-feet (Green and others, 2009) achieves the adopted desired future condition.

- The Buda Limestone Aquifer in Uvalde County is in a state of dynamic equilibrium and the 2008 estimated pumpage of 758 acre-feet (Green and others, 2009) achieves the adopted desired future condition.
- Conditions are physically possible across the management area and a water-level decline of 0 feet is uniform across the aquifer(s).

Freshwater Edwards (Balcones Fault Zone) Aquifer

NORTHERN SUBDIVISION OF GROUNDWATER MANAGEMENT AREA 10

- All parameters and assumptions for the freshwater portion of the Edwards (Balcones Fault Zone) Aquifer in the northern subdivision of Groundwater Management Area 10 are described in GAM Run 10-059 MAG Version 2 (Hutchison and Oliver, 2011). Both approaches discussed below assumed a 50-year planning period. From clarifications we received from Mr. John Dupnik, we assume a 50-year planning period from 2010 to 2060.
- A water balance approach was used to estimate modeled available groundwater during extreme drought conditions[1] based on information provided by Barton Springs/Edwards Aquifer Conservation District. See Hunt and others (2011) for additional details on the methods and assumptions for this approach.
- The total amount of water available for discharge by both springs and pumping during extreme drought conditions (11.7 cubic feet per second or 8,470 acre-feet per year) was estimated using information from the 1950's drought of record as described in Hunt and (2011).
- The water balance approach does not contain information about the spatial distribution of pumping. For the purposes of regional water planning, the estimated total pumping available during extreme drought conditions was divided by county, regional water planning area, river basin, and groundwater conservation district based on the distribution of pumping in the modeled approach under average recharge conditions (Hutchison and Oliver, 2011).
- For average recharge conditions, we used the numerical groundwater flow model that was recalibrated to include the 1950s drought for the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer. See Hutchison and Hill (2011a) for assumptions and limitations of the numerical flow model.

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[1] The desired future conditions statement adopted by the district representatives in GMA 10 uses the term "extreme drought conditions" to include the drought of record.

- The model does not cover the Edwards Aquifer (Balcones Fault Zone) in the southernmost Barton Springs/Edwards Aquifer Conservation District jurisdiction (see Figure 4). However, given that, during average recharge conditions, the contributing zone for the flow at Barton Springs does not extend this far south, we deemed the use of the model appropriate for this purpose.
- Similar to GAM Run 09-019 (Hutchison and Hill, 2011b), the simulations consisted of 342 7-year simulations extending from 1648 through 1995 based on a tree-ring dataset from Cleaveland (2006). Each 7-year simulation consisted of 84 monthly stress periods.
- Model simulations indicated that, during average recharge conditions, an average springflow of 49.7 cubic feet per second could be maintained by allowing 11,557 acre-feet per year pumping.

KINNEY COUNTY

- All parameters and assumptions for the freshwater portion of the Edwards (Balcones Fault Zone) Aquifer in the western subdivision of Groundwater Management Area 10 (Kinney County) are described in GAM Run 12-002 MAG (Shi, 2012). We used a 50-year planning period from 2010 to 2060.
- We used version 1.01 of the numerical groundwater flow model of the Kinney County Area. See Hutchison and others (2011) for assumptions and limitations of the numerical groundwater flow model. The model was run with MODFLOW-2000 (Harbaugh and others, 2000).
- The model has four layers: layer 1 represents the Carrizo-Wilcox and associated aquifers, layer 2 represents the upper Cretaceous formations that yield groundwater, layer 3 represents the Edwards (Balcones Fault Zone) Aquifer and the Edwards Group of the Edward-Trinity (Plateau) Aquifer, and layer 4 represents the Trinity Aquifer.

Saline Edwards (Balcones Fault Zone) Aquifer

- A detailed description of all parameters is available for the saline portion of the Edwards (Balcones Fault Zone) Aquifer in the northern subdivision of Groundwater Management Area 10 in AA 10-35 MAG (Bradley, 2011). Table 1 from Barton Springs/Edwards Aquifer Conservation District Technical Memo 2017-1221 (Hunt, 2017) outlines the approach used to estimate modeled available groundwater. We used a 50-year planning period from 2010 to 2060.

- Map areas (Figure 5) from AA 10-35 MAG (Bradley, 2011) were used to calculate volumes based on a storage coefficient of 7.0×10^{-4} (Hunt and others, 2010) and a desired future condition of 75 feet of drawdown. Map areas are designated as Plum Creek Conservation District only where their jurisdiction does not overlap with the Barton Springs/Edwards Aquifer Conservation District.
- A water-level decline of 75 feet is uniform across the aquifer for the 50-year planning period.
- The aquifer is homogeneous and isotropic, lateral inflow to the aquifer is equal to lateral outflow from the aquifer, and future pumping will not alter this balance.

Leona Gravel Aquifer

- A detailed description of all parameters and assumptions is available for the Leona Gravel Aquifer in Uvalde County in AA 10-28 MAG (Bradley, 2013). We used a 50-year planning period from 2010 to 2060.
- See George (2010) for assumptions and parameters used to estimate effective recharge. Recharge is received mainly from inflow from the Edwards Aquifer (Green and others, 2008) with additional recharge from direct precipitation. The period 1996 to 2011 was selected for analysis of J-27 water levels due to the start of mandated management of the Edwards Aquifer in 1996.

Trinity Aquifer

- A detailed description of all parameters and assumptions is available in AA 10-06 (Thorkildsen and Backhouse, 2010b). We used a 50-year planning period from 2010 to 2060.
- The methods and assumptions used to estimate modeled available groundwater for the Trinity Aquifer remain unchanged from AA 10-06 (Thorkildsen and Backhouse, 2010b). Because the Groundwater Management Area 10 boundary was adjusted since the last round of joint planning, this required a reapportionment of the modeled available groundwater as estimated in the original aquifer assessment. First, changes were made to the Groundwater Management Area 10 boundary to exclude the Guadalupe County, Hays Trinity, and Trinity Glen Rose groundwater conservation districts. There were also changes in to the Barton Springs/Edwards Aquifer Conservation District boundary to include a portion of the Trinity Aquifer in Hays County.

- Bexar County is excluded from the modeled available groundwater calculations because the groundwater management area designated the Trinity Aquifer in Bexar County not relevant for joint planning.
- Outcrop areas are calculated as unconfined areas of the aquifer and subcrop areas are calculated as confined areas of the aquifer. Map areas 1-10 represent outcrop areas, and map areas 11-31 are subcrop areas (see Figure 8 and Table 7).
- Recharge is assigned only to the outcrop areas. The average annual precipitation for outcrop map areas was determined from the Texas Climatic Atlas (Narasimhan and others, 2008), which is the average for years 1971 to 2000; the values range from 29 to 36 inches per year. The effective recharge rate is estimated to be 4 percent. The effective recharge calculation is the map area, in acres, multiplied by the estimated average annual precipitation, in feet, and the effective recharge rate, in percent.
- Lateral inflow to the Trinity Aquifer in Groundwater Management Area 10 is estimated to be 46,018 acre-feet per year based on the average outflow across the Balcones Fault Zone results (Scenario 6) from GAM Task 10-005 (Hutchison, 2010). This volume was apportioned across each county by aquifer map areas. GAM Task 10-005 does not include inflows to Uvalde County, so a proportional amount based on inflow to Medina County was used to estimate the inflow to Uvalde County.
- The storage coefficient for the Trinity Aquifer subcrop is assumed to be 1×10^{-5} derived from aquifer tests of the Trinity Aquifer subcrop in Travis and Hays counties (Hunt and others, 2010). The storage coefficient for the Trinity Aquifer subcrop in the remaining counties is assumed to be 5×10^{-5} as derived from the calibrated groundwater availability model for the Hill Country portion of the Trinity Aquifer system in Texas (Jones and others, 2009). The average specific yield of the Trinity Aquifer outcrop is estimated to be 5×10^{-2} (Ashworth, 1983).
- Water-level drawdowns are uniform across the aquifer. Annual volumes from drawdowns are calculated by dividing the total volume by 50 years.
- Modeled available groundwater estimates are the sum of the effective recharge, lateral inflow, and volume from water-level decline.

RESULTS:

Tables 1 through 6 and 8 through 9 show the combination of modeled available groundwater summarized (1) by groundwater conservation district and county; and (2) by county, river basin, and regional water planning area for use in the regional water planning process. The modeled available groundwater results for the groundwater conservation districts (Tables 1, 3, 5, and 8), reflect the ending year discussed in the Parameters and Assumption Section of this report. For purposes of planning (Tables 2, 4, 6, and 9), the values may have been populated past the dates noted in Parameters and Assumption Section using the trend of results.

The modeled available groundwater estimates are 2,935 acre-feet per year in the Austin Chalk Aquifer (Uvalde County); 758 acre-feet per year in the Buda Limestone Aquifer (Uvalde County); 11,557 acre-feet per year in the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer during average recharge conditions (3,765 acre-feet per year during drought conditions); 8,564 acre-feet per year in the saline portion of the Barton Springs segment of the Edwards (Balcones Fault Zone) Aquifer; 6,321 acre-feet per year in the freshwater portion of the western part of the San Antonio segment of the Edwards (Balcones Fault Zone) Aquifer; 9,385 acre-feet per year in the Leona Gravel Aquifer (Uvalde County); and 46,481 acre-feet per year in the Trinity Aquifer.

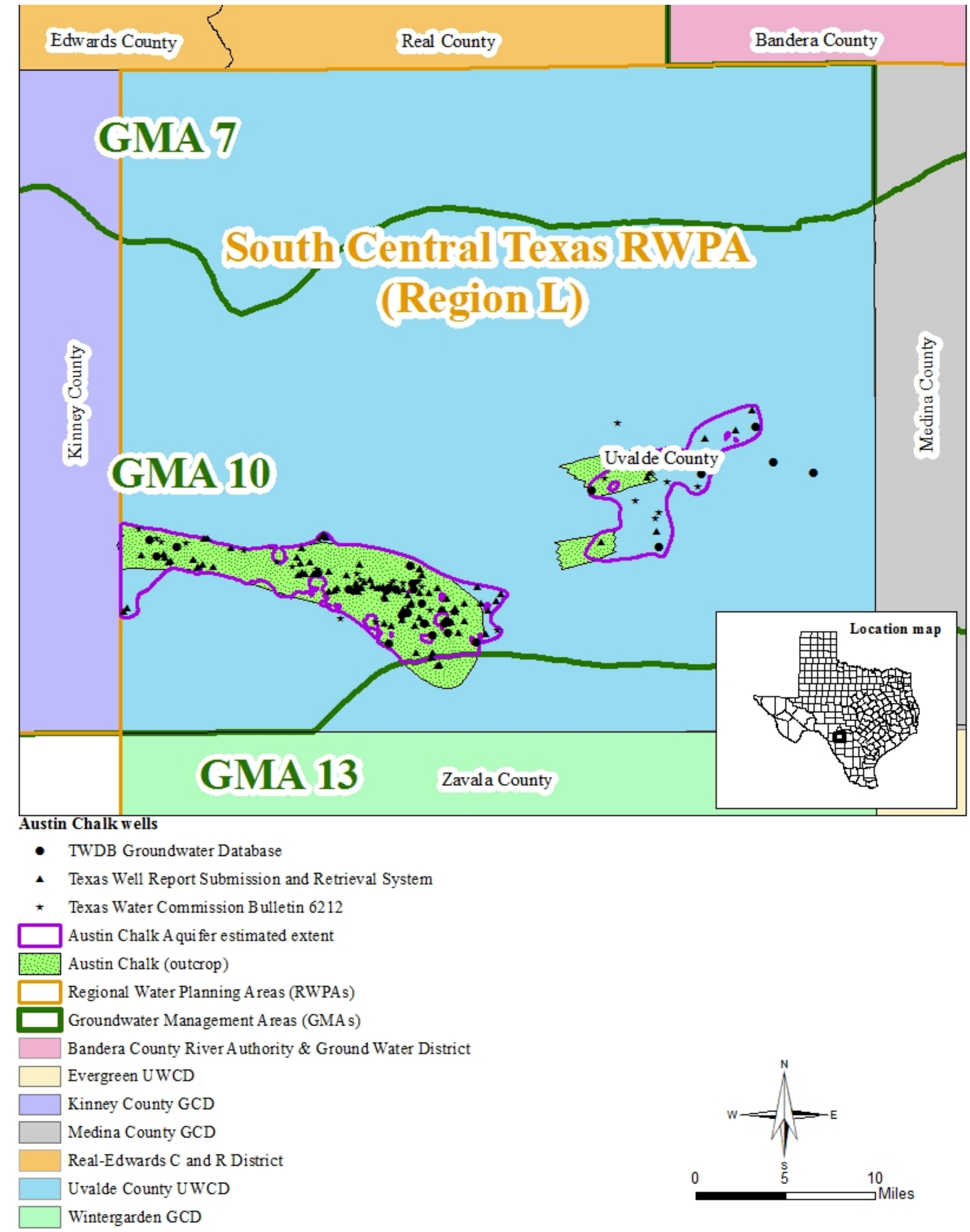

FIGURE 1. MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES IN THE VICINITY OF THE AUSTIN CHALK AQUIFER IN UVALDE COUNTY.

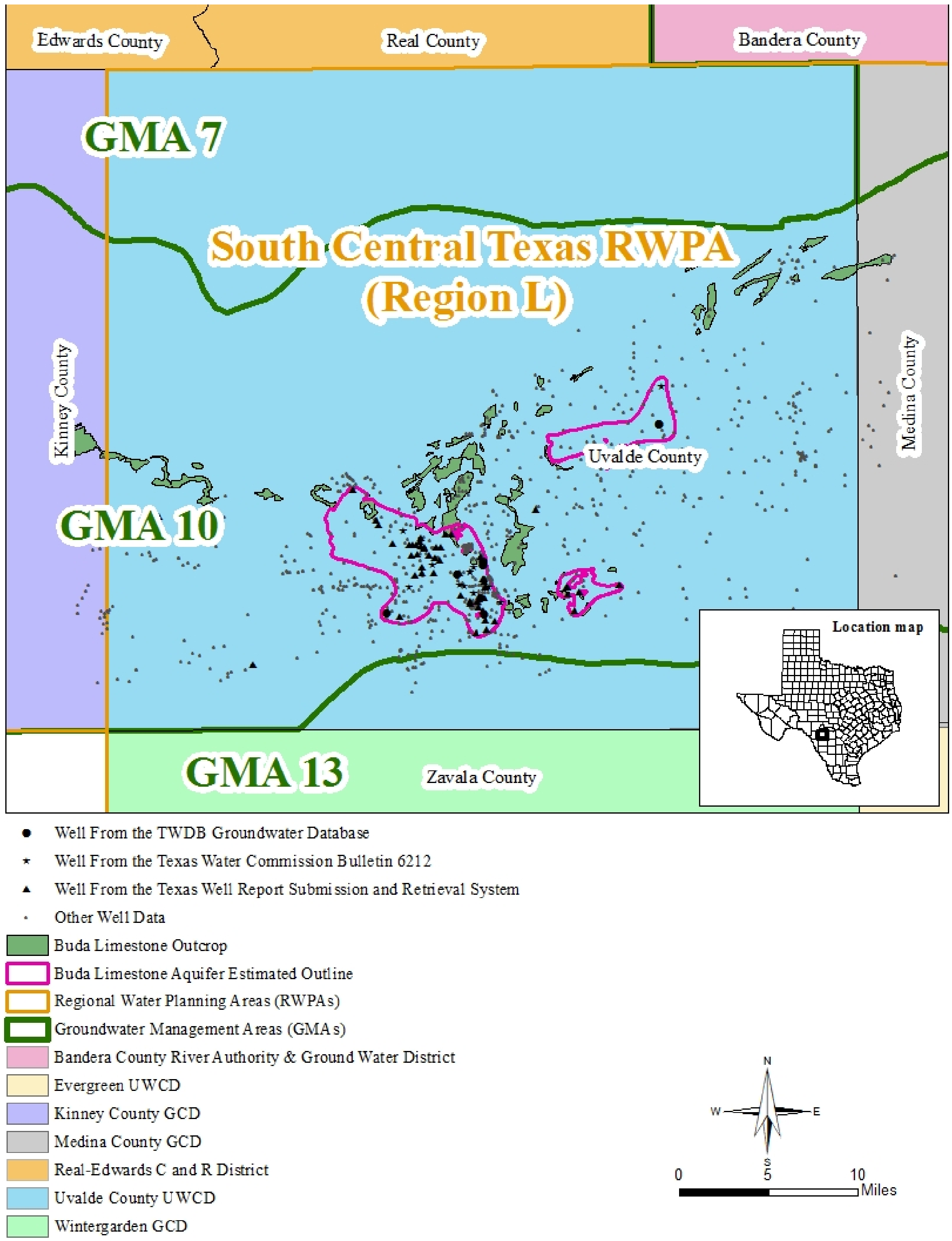

FIGURE 2. MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES IN THE VICINITY OF THE BUDA LIMESTONE AQUIFER IN UVALDE COUNTY.

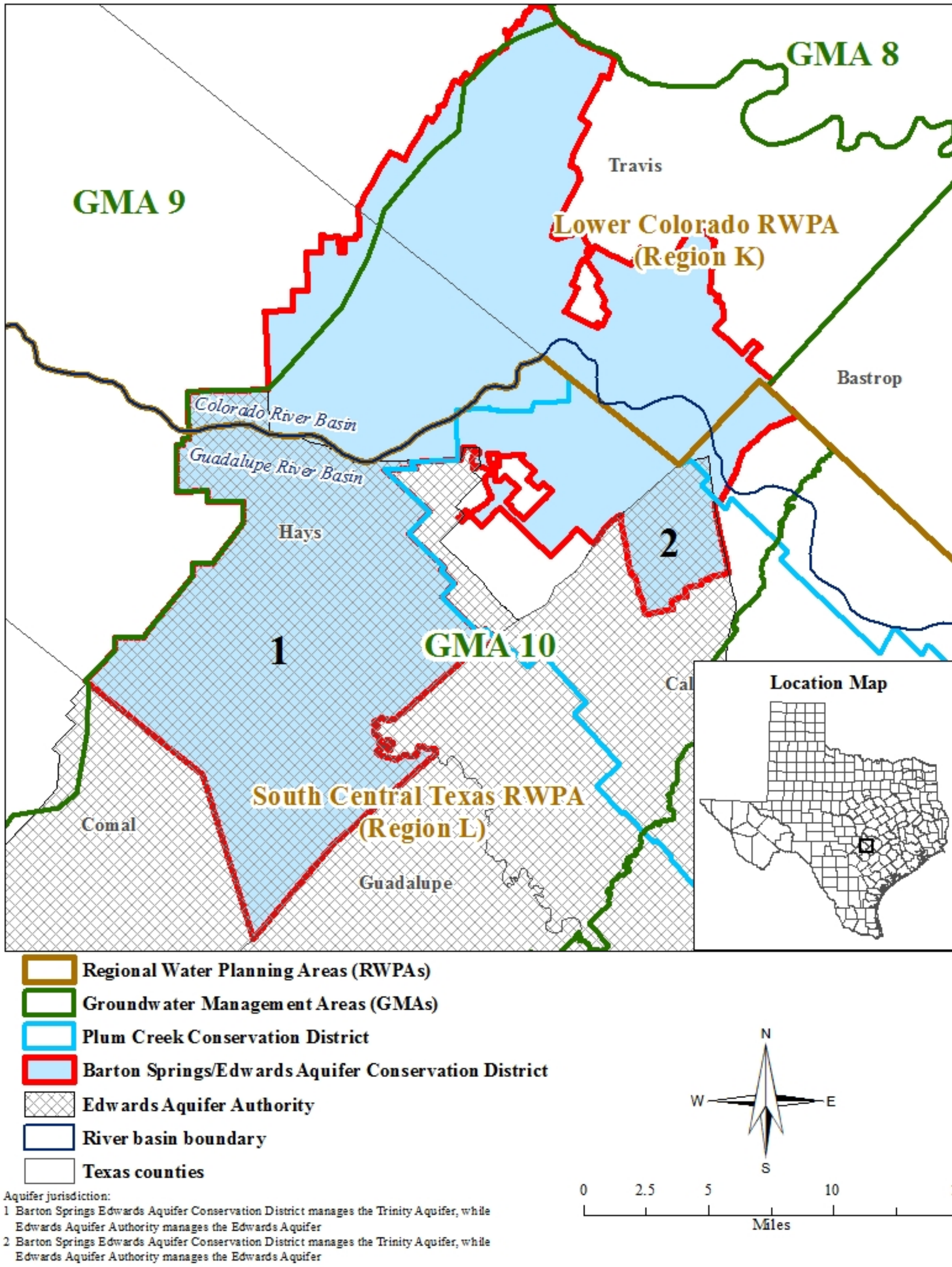

FIGURE 3. **MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES IN THE VICINITY OF THE FRESHWATER AND SALINE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN THE NORTHERN SUBDIVISION OF GROUNDWATER MANAGEMENT AREA 10.**

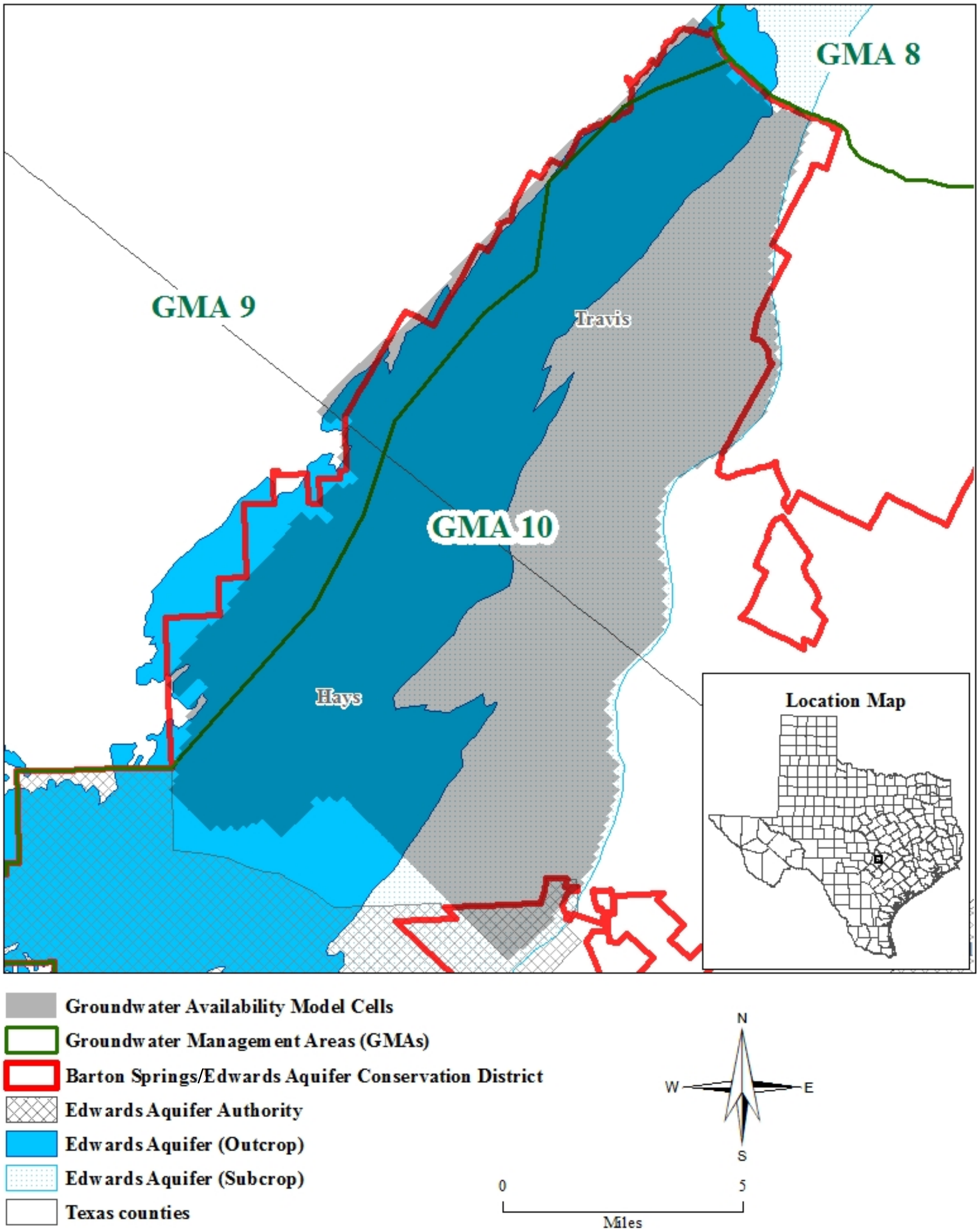

FIGURE 4. MAP SHOWING GROUNDWATER AVAILABILITY MODEL EXTENT, EDWARDS (BALCONES FAULT ZONE) AQUIFER, AND ADMINISTRATIVE BOUNDARIES IN THE NORTHERN PART OF THE BARTON SPRINGS/EDWARDS AQUIFER CONSERVATION DISTRICT IN THE NORTHERN SUBDIVISION OF GROUNDWATER MANAGEMENT AREA 10.

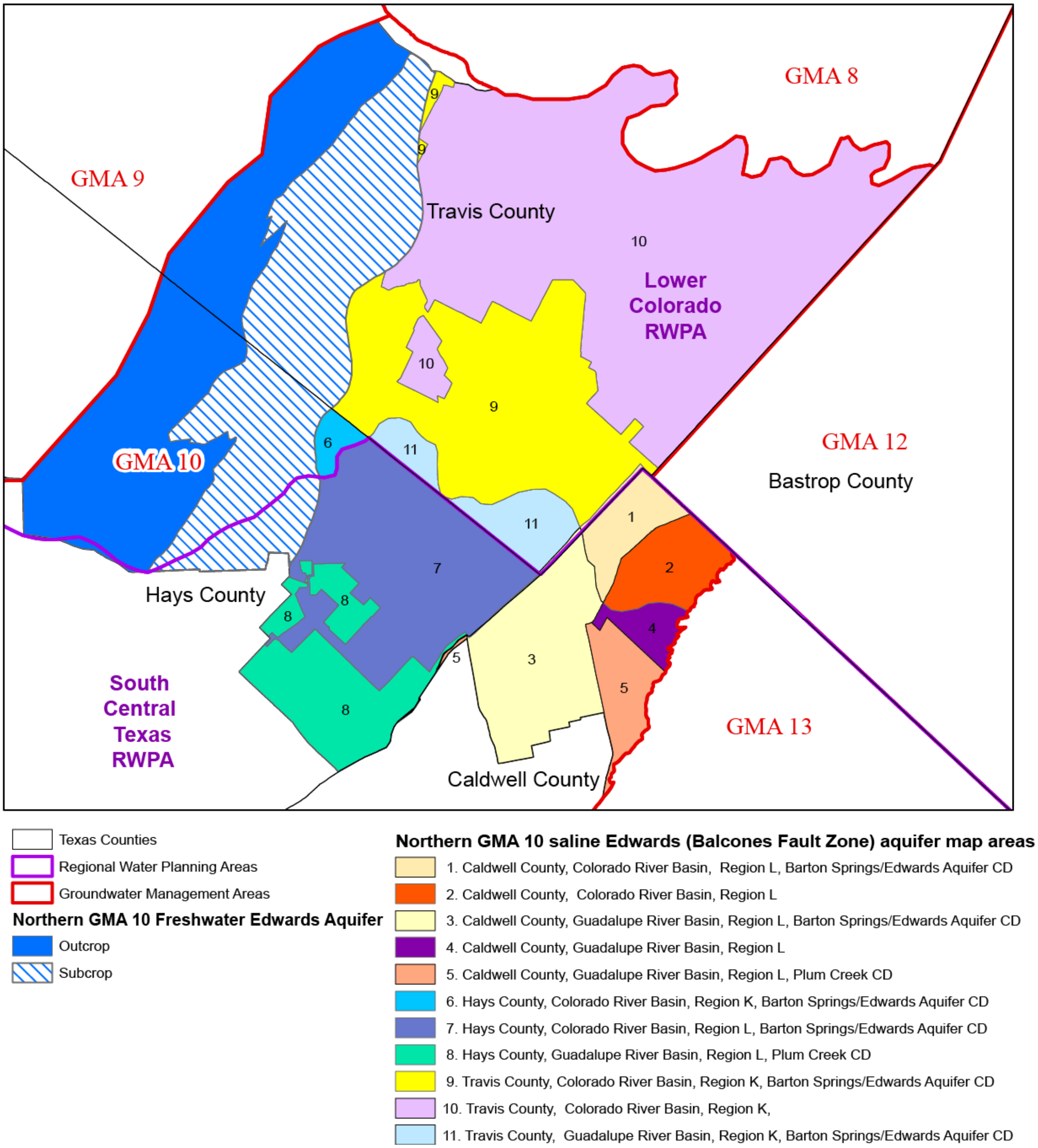

FIGURE 5. MAP SHOWING AREAS USED FOR ESTIMATING THE SALINE, EDWARDS (BALCONES FAULT ZONE) AQUIFER, MODELED AVAILABLE GROUNDWATER IN THE NORTHERN SUBDIVISION OF GROUNDWATER MANAGEMENT AREA 10, (MODIFIED FROM BRADLEY,2011) .

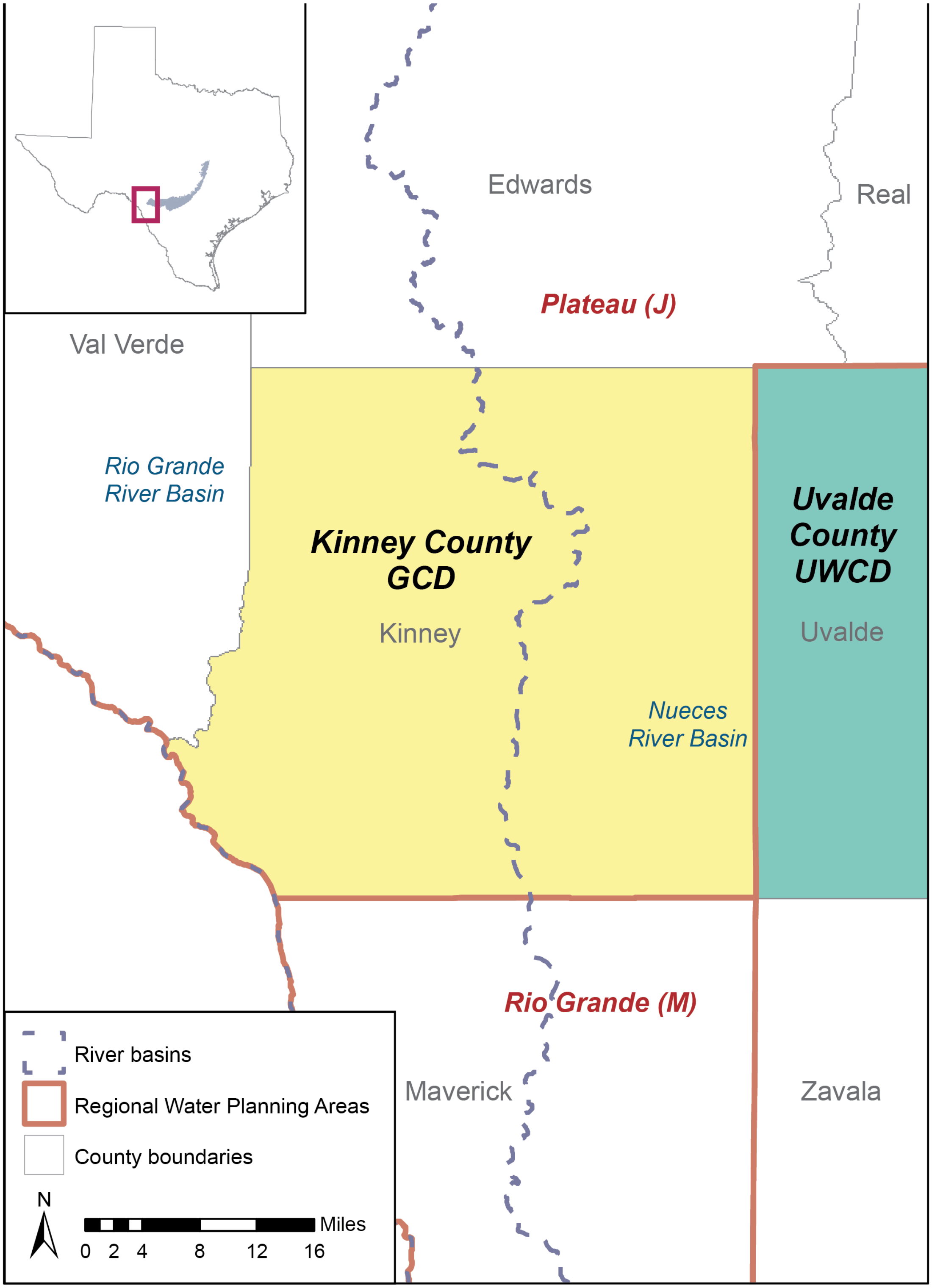

FIGURE 6. MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES IN THE VICINITY OF THE FRESHWATER EDWARDS (BALCONES FAULT ZONE) AQUIFER IN THE WESTERN SUBDIVISION OF GROUNDWATER MANAGEMENT AREA 10 (KINNEY COUNTY).

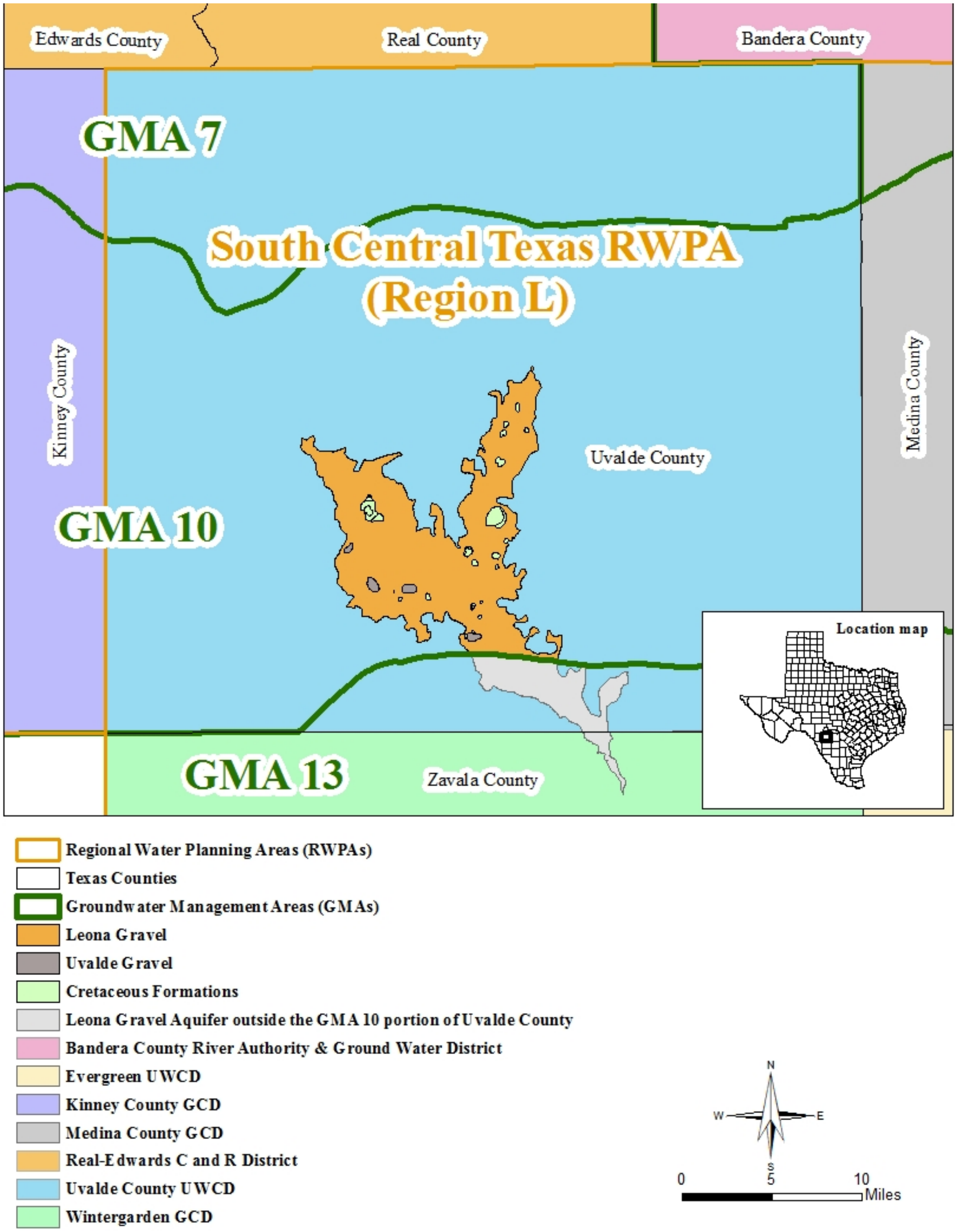

FIGURE 7. MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS, UWCDS), AND COUNTIES IN THE VICINITY OF THE LEONA GRAVEL AQUIFER IN GROUNDWATER MANAGEMENT AREA 10 (UVALDE COUNTY).

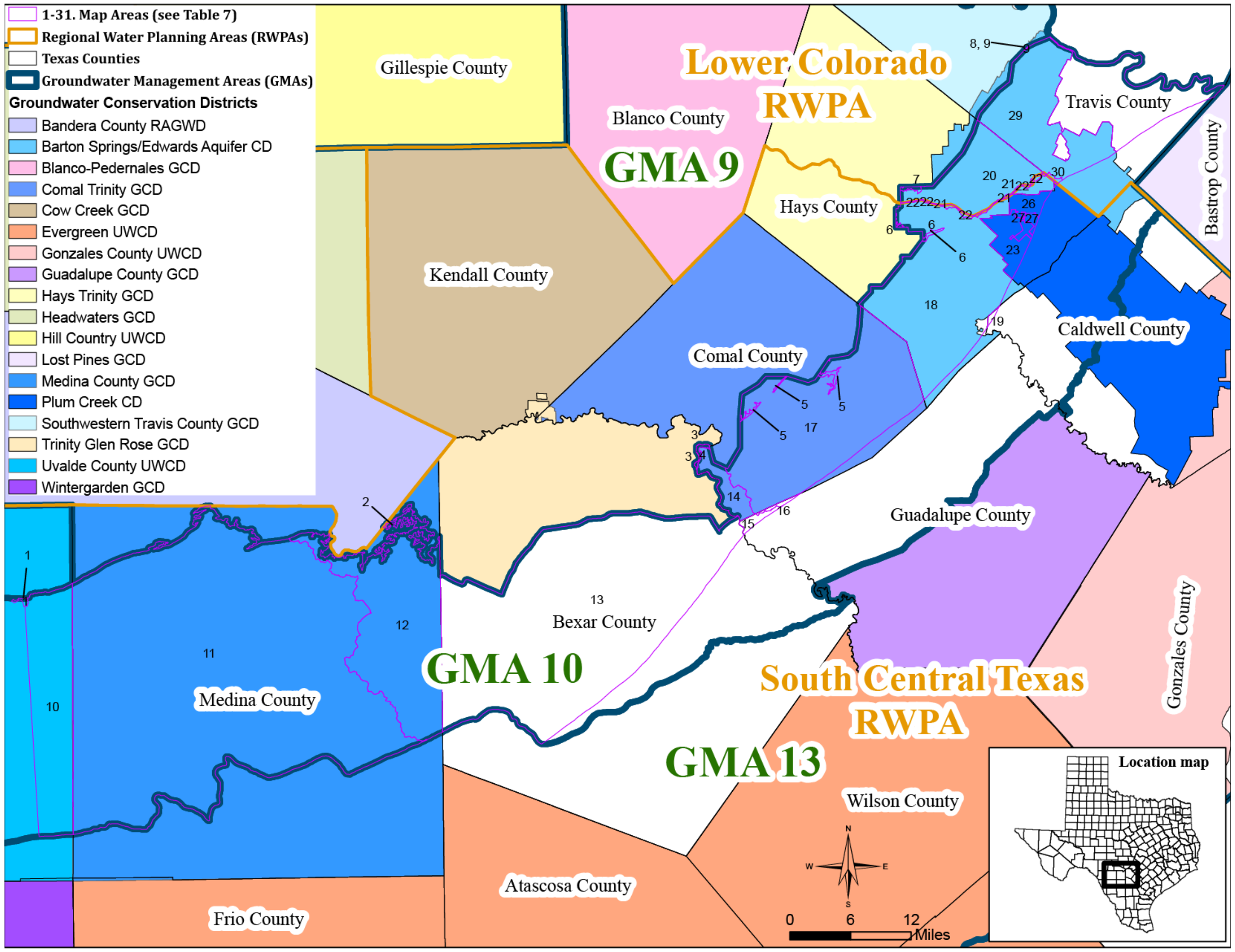

FIGURE 8 MAP SHOWING REGIONAL WATER PLANNING AREAS (RWPAS), GROUNDWATER CONSERVATION DISTRICTS (GCDS), AND COUNTIES IN THE VICINITY OF THE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 10.

TABLE 1. MODELED AVAILABLE GROUNDWATER FOR THE AUSTIN CHALK, BUDA LIMESTONE, AND LEONA GRAVEL AQUIFERS IN UVALDE COUNTY IN GROUNDWATER MANAGEMENT AREA 10 FOR EACH DECADE BETWEEN 2010 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	Aquifer	2010	2020	2030	2040	2050	2060
Uvalde County Underground Water Conservation District	Uvalde	Austin Chalk	2,935	2,935	2,935	2,935	2,935	2,935
		Buda Limestone	758	758	758	758	758	758
		Leona Gravel	9,385	9,385	9,385	9,385	9,385	9,385
Total			**16,013**	**16,013**	**16,013**	**16,013**	**16,013**	**16,013**

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE AUSTIN CHALK, BUDA LIMESTONE, AND LEONA GRAVEL AQUIFERS IN UVALDE COUNTY IN GROUNDWATER MANAGEMENT AREA 10 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	Aquifer	2020	2030	2040	2050	2060	2070
Uvalde	L	Nueces	Austin Chalk	2,935	2,935	2,935	2,935	2,935	2,935
			Buda Limestone	758	758	758	758	758	758
			Leona Gravel	9,385	9,385	9,385	9,385	9,385	9,385
Total				**16,013**	**16,013**	**16,013**	**16,013**	**16,013**	**16,013**

TABLE 3. MODELED AVAILABLE GROUNDWATER FOR THE FRESHWATER PORTION OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 10 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Recharge Condition	Groundwater Conservation District	County	2010	2020	2030	2040	2050	2060
Average	Barton Springs/Edwards Aquifer Conservation District	Hays	7,950	7,950	7,950	7,950	7,950	7,950
		Travis	3,578	3,578	3,578	3,578	3,578	3,578
	Non-District Areas	Hays	29	29	29	29	29	29
Total for average recharge conditions			**11,557**	**11,557**	**11,557**	**11,557**	**11,557**	**11,557**
Drought	Barton Springs/Edwards Aquifer Conservation District	Hays	2,590	2,590	2,590	2,590	2,590	2,590
		Travis	1,166	1,166	1,166	1,166	1,166	1,166
	Non-District Areas	Hays	9	9	9	9	9	9
Total for drought recharge conditions			**3,765**	**3,765**	**3,765**	**3,765**	**3,765**	**3,765**
Kinney County Groundwater Conservation District		Kinney	6,321	6,321	6,321	6,321	6,321	6,321

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE FRESHWATER PORTION OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 10 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR.

Recharge Condition	County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Average	Hays	K	Colorado	7,037	7,037	7,037	7,037	7,037	7,037
	Hays	L	Guadalupe	942	942	942	942	942	942
	Travis	K	Colorado	3,578	3,578	3,578	3,578	3,578	3,578
	Total for average recharge conditions			**11,557**	**11,557**	**11,557**	**11,557**	**11,557**	**11,557**
Drought	Hays	K	Colorado	2,292	2,292	2,292	2,292	2,292	2,292
	Hays	L	Guadalupe	307	307	307	307	307	307
	Travis	K	Colorado	1,166	1,166	1,166	1,166	1,166	1,166
	Total for drought recharge conditions			**3,765**	**3,765**	**3,765**	**3,765**	**3,765**	**3,765**
Not applicable	Kinney	J	Nueces	6,319	6,319	6,319	6,319	6,319	6,319
			Rio Grande	2	2	2	2	2	2

TABLE 5. MODELED AVAILABLE GROUNDWATER FOR THE SALINE PORTION OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 10 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	2010	2020	2030	2040	2050	2060
Barton Springs/Edwards Aquifer Conservation	Caldwell	858	858	858	858	858	858
	Hays	1,171	1,171	1,171	1,171	1,171	1,171
	Travis	1,770	1,770	1,770	1,770	1,770	1,770
Non-District Areas	Caldwell	369	369	369	369	369	369
	Travis	3,583	3,583	3,583	3,583	3,583	3,583
Plum Creek Conservation District	Caldwell	210	210	210	210	210	210
	Hays	602	602	602	602	602	602
Total		**8,563**	**8,563**	**8,563**	**8,563**	**8,563**	**8,563**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE SALINE PORTION OF THE EDWARDS (BALCONES FAULT ZONE) AQUIFER IN GROUNDWATER MANAGEMENT AREA 10 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Caldwell	L	Colorado	469	469	469	469	469	469
		Guadalupe	968	968	968	968	968	968
Hays	K	Colorado	66	66	66	66	66	66
	L	Guadalupe	1,707	1,707	1,707	1,707	1,707	1,707
Travis	K	Colorado	5,073	5,073	5,073	5,073	5,073	5,073
		Guadalupe	280	280	280	280	280	280
Total			**8,563**	**8,563**	**8,563**	**8,563**	**8,563**	**8,563**

TABLE 7. INPUTS TO CALULATE MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 10, SUMMARIZED BY MAP AREA REPRESENTING EACH GROUNDWATER CONSERVATION DISTRICT (GCD), COUNTY, RIVER BASIN, AND REGIONAL WATER PLANNING AREA (RWPA) COMBINATIONS. AREA VALUES ARE IN ACRES, AND OTHER VALUES ARE IN ACRE-FEET PER YEAR.

Map area[1,2,3]	GCD	County	River Basin	RWPG	Areal extent	Estimated annual effective recharge	Estimated annual lateral inflow	Estimated annual volume from water-level decline	Modeled available groundwater
1	Uvalde County UWCD	Uvalde	Nueces	L	372	36	4	0	40
2	Medina GCD	Medina	San Antonio	L	1	0	0	0	0
3	No GCD	Bexar	San Antonio	L	N/A	N/A	N/A	N/A	N/A
4	Comal Trinity GCD	Comal	San Antonio	L	594	67	147	15	229
5	Comal Trinity GCD	Comal	Guadalupe	L	1,282	149	318	32	499
6	Barton Springs/ Edwards Aquifer Conservation District	Hays	Guadalupe	L	505	61	13	13	87
7	Barton Springs/ Edwards Aquifer Conservation District	Hays	Colorado	K	494	57	12	12	81
8	Barton Springs/ Edwards Aquifer Conservation District	Travis	Colorado	K	3	0	0	0	0
9	Southwestern Travis County GCD	Travis	Colorado	K	11	1	0	0	1
10	Uvalde County UWCD	Uvalde	Nueces	L	63,464	N/A	755	0	755
11	Medina GCD	Medina	Nueces	L	459,975	N/A	5,470	12	5,482
12	Medina GCD	Medina	San Antonio	L	98,983	N/A	1,177	2	1,179

1. Map areas 1-10 represent outcrop areas and were assumed to be under unconfined aquifer conditions.

2. Map areas 11-31 represent subcrop areas and were assumed to be under confined aquifer conditions.

3. Map areas 24-26 cover the Barton Springs/Edwards Aquifer Conservation District and Plum Creek Conservation District where the two districts overlap. These values are assigned to the Barton Springs/Edwards Aquifer Conservation District.

Table 7 (Continued)

Map area[1,2,3]	GCD	County	River basin	RWPG	Areal extent	Estimated annual effective recharge	Estimated annual lateral inflow	Estimated annual volume from water-level decline	Modeled available groundwater
13	No GCD	Bexar	San Antonio	L	N/A	N/A	N/A	N/A	N/A
14	Comal Trinity GCD	Comal	San Antonio	L	9,243	N/A	2,290	0	2,290
15	No GCD	Guadalupe	San Antonio	L	1,907	N/A	472	0	472
16	No GCD	Guadalupe	Guadalupe	L	757	N/A	188	0	188
17	Comal Trinity GCD	Comal	Guadalupe	L	123,232	N/A	30,533	3	30,536
18	Barton Springs/ Edwards Aquifer Conservation District	Hays	Guadalupe	L	104,045	N/A	2,597	3	2,600
19	No GCD	Caldwell	Guadalupe	L	420	N/A	10	0	10
20	Barton Springs/ Edwards Aquifer Conservation District	Hays	Colorado	K	36,033	N/A	899	0	899
21	Barton Springs/ Edwards Aquifer Conservation District	Hays	Guadalupe	K	354	N/A	9	0	9
22	Barton Springs/ Edwards Aquifer Conservation District	Hays	Colorado	L	1,286	N/A	32	0	32
23	Plum Creek CD	Hays	Guadalupe	L	9,934	N/A	248	0	248

1. Map areas 1-10 represent outcrop areas and were assumed to be under unconfined aquifer conditions.

2. Map areas 11-31 represent subcrop areas and were assumed to be under confined aquifer conditions.

3. Map areas 24-26 cover the Barton Springs/Edwards Aquifer Conservation District and Plum Creek Conservation District where the two districts overlap. These values are assigned to the Barton Springs/Edwards Aquifer Conservation District.

Table 7 (Continued)

Map area[1,2,3]	GCD	County	River basin	RWPG	Areal extent	Estimated annual effective recharge	Estimated annual lateral inflow	Estimated annual volume from water-level decline	Modeled available groundwater
24	Barton Springs/ Edwards Aquifer Conservation District[3]	Hays	Guadalupe	K	17	N/A	0	0	0
25	Barton Springs/ Edwards Aquifer Conservation District[3]	Hays	Colorado	K	1	N/A	0	0	0
26	Barton Springs/ Edwards Aquifer Conservation District[3]	Hays	Guadalupe	L	5,864	N/A	146	0	146
27	Plum Creek CD	Hays	Guadalupe	L	1,108	N/A	28	0	28
28	Southwestern Travis County GCD	Travis	Colorado	K	18	N/A	0	0	0
29	Barton Springs/ Edwards Aquifer Conservation District	Travis	Colorado	K	55,223	N/A	339	0	339
30	Barton Springs/ Edwards Aquifer Conservation District	Travis	Guadalupe	K	396	N/A	2	0	2
31	No GCD	Travis	Colorado	K	53,547	N/A	329	0	329

1. Map areas 1-10 represent outcrop areas and were assumed to be under unconfined aquifer conditions.

2. Map areas 11-31 represent subcrop areas and were assumed to be under confined aquifer conditions.

3. Map areas 24-26 cover the Barton Springs/Edwards Aquifer Conservation District and Plum Creek Conservation District where the two districts overlap. These values are assigned to the Barton Springs/Edwards Aquifer Conservation District.

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 10 SUMMARIZED BY GROUNDWATER CONSERVATION DISTRICT (GCD) AND COUNTY FOR EACH DECADE BETWEEN 2010 AND 2060. VALUES ARE IN ACRE-FEET PER YEAR.

Groundwater Conservation District	County	2010	2020	2030	2040	2050	2060
Barton Springs/ Edwards Aquifer Conservation District	Hays	3,854	3,854	3,854	3,854	3,854	3,854
	Travis	341	341	341	341	341	341
Comal Trinity GCD	Comal	33,554	33,554	33,554	33,554	33,554	33,554
Medina County GCD	Medina	6,661	6,661	6,661	6,661	6,661	6,661
Non-District Areas	Caldwell	10	10	10	10	10	10
	Guadalupe	660	660	660	660	660	660
	Travis	329	329	329	329	329	329
Plum Creek Conservation District	Hays	276	276	276	276	276	276
Southwestern Travis County GCD	Travis	1	1	1	1	1	1
Uvalde County UWCD	Uvalde	795	795	795	795	795	795
Total		**46,481**	**46,481**	**46,481**	**46,481**	**46,481**	**46,481**

TABLE 9. MODELED AVAILABLE GROUNDWATER FOR THE TRINITY AQUIFER IN GROUNDWATER MANAGEMENT AREA 10 SUMMARIZED BY COUNTY, REGIONAL WATER PLANNING AREA (RWPA), AND RIVER BASIN FOR EACH DECADE BETWEEN 2020 AND 2070. VALUES ARE IN ACRE-FEET PER YEAR.

County	RWPA	River Basin	2020	2030	2040	2050	2060	2070
Caldwell	L	Guadalupe	10	10	10	10	10	10
Comal	L	Guadalupe	31,035	31,035	31,035	31,035	31,035	31,035
		San Antonio	2,519	2,519	2,519	2,519	2,519	2,519
Guadalupe	L	Guadalupe	188	188	188	188	188	188
		San Antonio	472	472	472	472	472	472
Hays	K	Colorado	980	980	980	980	980	980
		Guadalupe	9	9	9	9	9	9
	L	Colorado	32	32	32	32	32	32
		Guadalupe	3,109	3,109	3,109	3,109	3,109	3,109
Medina	L	Nueces	5,482	5,482	5,482	5,482	5,482	5,482
		San Antonio	1,179	1,179	1,179	1,179	1,179	1,179
Travis	K	Colorado	669	669	669	669	669	669
		Guadalupe	2	2	2	2	2	2
Uvalde	L	Nueces	795	795	795	795	795	795

LIMITATIONS:

The groundwater model used in completing this analysis is the best available scientific tool that can be used to meet the stated objectives. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> *"Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."*

A key aspect of using the groundwater model to evaluate historical groundwater flow conditions includes the assumptions about the location in the aquifer where historical pumping was placed. Understanding the amount and location of historical pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and streamflow are specific to a particular historical time period.

Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and groundwater levels in the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historical precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

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Appendix E

Estimated Historical Use and 2022 State Water Plan Datasets: Kinney County Groundwater Conservation District

Estimated Historical Groundwater Use And 2022 State Water Plan Datasets:

Kinney County Groundwater Conservation District

Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
November 3, 2022

GROUNDWATER MANAGEMENT PLAN DATA:

This package of water data reports (part 1 of a 2-part package of information) is being provided to groundwater conservation districts to help them meet the requirements for approval of their five-year groundwater management plan. Each report in the package addresses a specific numbered requirement in the Texas Water Development Board's groundwater management plan checklist. The checklist can be viewed and downloaded from this web address:

http://www.twdb.texas.gov/groundwater/docs/GCD/GMPChecklist0113.pdf

The five reports included in this part are:

1. Estimated Historical Groundwater Use (checklist item 2)

   from the TWDB Historical Water Use Survey (WUS)

2. Projected Surface Water Supplies (checklist item 6)
3. Projected Water Demands (checklist item 7)
4. Projected Water Supply Needs (checklist item 8)
5. Projected Water Management Strategies (checklist item 9)

   from the 2022 Texas State Water Plan (SWP)

Part 2 of the 2-part package is the groundwater availability model (GAM) report for the District (checklist items 3 through 5). The District should have received, or will receive, this report from the Groundwater Availability Modeling Section. Questions about the GAM can be directed to Grayson Dowlearn, grayson.dowlearn@twdb.texas.gov, (512) 475-1552.

DISCLAIMER:

The data presented in this report represents the most up-to-date WUS and 2022 SWP data available as of 11/3/2022. Although it does not happen frequently, either of these datasets are subject to change pending the availability of more accurate WUS data or an amendment to the 2022 SWP. District personnel must review these datasets and correct any discrepancies in order to ensure approval of their groundwater management plan.

The WUS dataset can be verified at this web address:

http://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/

The 2022 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

The values presented in the data tables of this report are county-based. In cases where groundwater conservation districts cover only a portion of one or more counties the data values are modified with an apportioning multiplier to create new values that more accurately represent conditions within district boundaries. The multiplier used in the following formula is a land area ratio: (data value * (land area of district in county / land area of county)). For two of the four SWP tables (Projected Surface Water Supplies and Projected Water Demands) only the county-wide water user group (WUG) data values (county other, manufacturing, steam electric power, irrigation, mining and livestock) are modified using the multiplier. WUG values for municipalities, water supply corporations, and utility districts are not apportioned; instead, their full values are retained when they are located within the district, and eliminated when they are located outside (we ask each district to identify these entity locations).

The remaining SWP tables (Projected Water Supply Needs and Projected Water Management Strategies) are not modified because district-specific values are not statutorily required. Each district needs only "consider" the county values in these tables.

In the WUS table every category of water use (including municipal) is apportioned. Staff determined that breaking down the annual municipal values into individual WUGs was too complex.

TWDB recognizes that the apportioning formula used is not perfect but it is the best available process with respect to time and staffing constraints. If a district believes it has data that is more accurate it can add those data to the plan with an explanation of how the data were derived. Apportioning percentages that the TWDB used are listed above each applicable table.

For additional questions regarding this data, please contact Stephen Allen (stephen.allen@twdb.texas.gov or 512-463-7317).

Estimated Historical Water Use
TWDB Historical Water Use Survey (WUS) Data

Groundwater and surface water historical use estimates are currently unavailable for calendar year 2020. TWDB staff anticipates the calculation and posting of these estimates at a later date.

KINNEY COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2019	GW	1,114	0	0	0	4,269	192	5,575
	SW	0	0	0	0	0	48	48
2018	GW	1,289	0	0	0	3,883	193	5,365
	SW	0	0	0	0	0	48	48
2017	GW	923	0	0	0	3,789	182	4,894
	SW	0	0	0	0	0	45	45
2016	GW	978	0	0	0	3,195	182	4,355
	SW	0	0	0	0	0	45	45
2015	GW	950	0	0	0	3,169	181	4,300
	SW	0	0	0	0	0	45	45
2014	GW	1,059	0	0	0	3,611	193	4,863
	SW	0	0	0	0	0	49	49
2013	GW	1,157	0	0	0	3,692	166	5,015
	SW	0	0	0	0	0	42	42
2012	GW	1,202	0	0	0	3,269	169	4,640
	SW	0	0	0	0	0	42	42
2011	GW	1,258	0	0	0	6,734	185	8,177
	SW	0	0	0	0	0	46	46
2010	GW	1,026	0	0	0	1,258	184	2,468
	SW	0	0	0	0	0	46	46
2009	GW	1,164	0	0	0	895	338	2,397
	SW	0	0	0	0	0	84	84
2008	GW	1,101	0	0	0	2,043	294	3,438
	SW	0	0	0	0	0	72	72
2007	GW	926	0	0	0	1,641	217	2,784
	SW	0	0	0	0	0	55	55
2006	GW	1,150	0	0	0	4,776	238	6,164
	SW	0	0	0	0	0	60	60
2005	GW	1,025	0	0	0	3,980	265	5,270
	SW	0	0	0	0	0	66	66
2004	GW	892	0	0	0	4,513	127	5,532
	SW	0	0	0	0	0	182	182

Projected Surface Water Supplies
TWDB 2022 State Water Plan Data

KINNEY COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
J	Brackettville	Rio Grande	Rio Grande Run-of-River	0	0	0	0	0	0
J	Irrigation, Kinney	Rio Grande	Rio Grande Run-of-River	3,616	3,616	3,616	3,616	3,616	3,616
	Sum of Projected Surface Water Supplies (acre-feet)			**3,616**	**3,616**	**3,616**	**3,616**	**3,616**	**3,616**

Projected Water Demands
TWDB 2022 State Water Plan Data

Please note that the demand numbers presented here include the plumbing code savings found in the Regional and State Water Plans.

KINNEY COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
J	Brackettville	Rio Grande	608	602	594	593	592	592
J	County-Other, Kinney	Nueces	11	11	11	11	10	10
J	County-Other, Kinney	Rio Grande	53	52	51	51	51	51
J	Fort Clark Springs MUD	Rio Grande	618	616	612	610	609	609
J	Irrigation, Kinney	Nueces	1,300	1,300	1,300	1,300	1,300	1,300
J	Irrigation, Kinney	Rio Grande	2,413	2,413	2,413	2,413	2,413	2,413
J	Livestock, Kinney	Nueces	100	100	100	100	100	100
J	Livestock, Kinney	Rio Grande	124	124	124	124	124	124
		Sum of Projected Water Demands (acre-feet)	**5,227**	**5,218**	**5,205**	**5,202**	**5,199**	**5,199**

Projected Water Supply Needs
TWDB 2022 State Water Plan Data

Negative values (in red) reflect a projected water supply need, positive values a surplus.

KINNEY COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
J	Brackettville	Rio Grande	37	43	51	52	53	53
J	County-Other, Kinney	Nueces	23	23	23	23	24	24
J	County-Other, Kinney	Rio Grande	112	113	114	114	114	114
J	Fort Clark Springs MUD	Rio Grande	753	755	759	761	762	762
J	Irrigation, Kinney	Nueces	1,057	1,057	1,057	1,057	1,057	1,057
J	Irrigation, Kinney	Rio Grande	5,580	5,580	5,580	5,580	5,580	5,580
J	Livestock, Kinney	Nueces	-27	-27	-27	-27	-27	-27
J	Livestock, Kinney	Rio Grande	197	197	197	197	197	197
	Sum of Projected Water Supply Needs (acre-feet)		**-27**	**-27**	**-27**	**-27**	**-27**	**-27**

Projected Water Management Strategies
TWDB 2022 State Water Plan Data

KINNEY COUNTY

WUG, Basin (RWPG)

All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
Brackettville, Rio Grande (J)							
City of Brackettville - Increase Supply to Spofford with New Water Line and Storage	Edwards-Trinity-Plateau, Pecos Valley, and Trinity Aquifers [Kinney]	0	6	6	6	6	6
		0	**6**	**6**	**6**	**6**	**6**
Fort Clark Springs MUD, Rio Grande (J)							
Fort Clark Springs MUD - Increase Storage Facility	Edwards-Trinity-Plateau, Pecos Valley, and Trinity Aquifers [Kinney]	0	620	620	620	620	620
Fort Clark Springs MUD - Water Loss Audit and Main-Line Repair	DEMAND REDUCTION [Kinney]	79	79	79	79	79	79
		79	**699**	**699**	**699**	**699**	**699**
Sum of Projected Water Management Strategies (acre-feet)		**79**	**705**	**705**	**705**	**705**	**705**

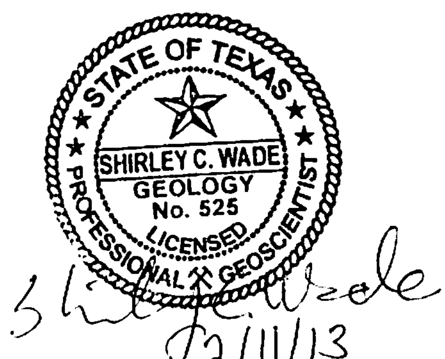
Appendix F

GMA Run 12-014: Kinney County Groundwater Conservation District Management Plan

GAM RUN 12-014: KINNEY COUNTY GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by Jerry Shi, Ph.D., P.G. and Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
Jerry Shi (512) 436-5076
Shirley Wade (512) 936-0883

February 11, 2013



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GAM RUN 12-014: KINNEY COUNTY GROUNDWATER CONSERVATION DISTRICT MANAGEMENT PLAN

by Jerry Shi, Ph.D., P.G. and Shirley Wade, Ph.D., P.G.
Texas Water Development Board
Groundwater Resources Division
Groundwater Availability Modeling Section
Jerry Shi (512) 436-5076
Shirley Wade (512) 936-0883

February 11, 2013

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h), states that, in developing its groundwater management plan, groundwater conservation districts shall use groundwater availability modeling information provided by the executive administrator of the Texas Water Development Board in conjunction with any available site-specific information provided by the district to the executive administrator for review and comment. Information derived from groundwater availability models that shall be used in the groundwater management plan includes:

- the annual amount of recharge from precipitation to the groundwater resources within the district, if any;
- for each aquifer within the district, the annual volume of water that discharges from the aquifer to springs and any surface water bodies, including lakes, streams, and rivers; and
- the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The purpose of this report is to provide Part 2 of a two-part package of information to Kinney County Groundwater Conservation District for its groundwater management plan. This groundwater management plan is due for approval by the executive administrator of the Texas Water Development Board (TWDB) before June 19, 2013.

This report discusses the method, assumptions, and results from GAM run 12-014 using the Kinney County Groundwater Conservation District model developed by Hutchison

and others (2011). The model has four layers representing the following hydrogeologic units (from top to bottom): Carrizo-Wilcox Aquifer (layer 1), Upper Cretaceous Unit (layer 2), Edwards (Balcones Fault Zone) Aquifer/Edwards portion of the Edwards-Trinity (Plateau) Aquifer (layer 3), and Trinity portion of the Edwards-Trinity (Plateau) Aquifer (layer 4). Tables 1 and 2 summarize the groundwater availability model data for the official aquifers required by the statute. Figures 1 and 2 show the area of the model from which the values in the tables were extracted using different combination of model layers (as referenced below).

METHODS:

The Kinney County Groundwater Conservation District model (Hutchison and others, 2011) was used for this analysis. Water budgets for selected years—1980 through 2005—of the transient model period were extracted using ZONEBUDGET Version 3.01 (Harbaugh, 2009) and the average annual water budget values for recharge, surface water outflow, lateral inflow to the district, lateral outflow from the district, and flow between aquifers/geologic units located within the district are summarized in this report. Please note that the Edwards (Balcones Fault Zone) Aquifer was simulated in model layer 3, while the Edwards-Trinity (Plateau) Aquifer was simulated in model layers 3 and 4.

PARAMETERS AND ASSUMPTIONS:

Edwards (Balcones Fault Zone) and Edwards-Trinity (Plateau) Aquifers

- The Kinney County Groundwater Conservation District model developed by Hutchison and others (2011) was used for this management plan data analysis. The model was calibrated to water level and spring flux collected from 1950 to 2005; however, data were extracted only for the period from 1980 to 2005 for the management plan. These dates were used to avoid skewing the data as a result of the drought of the 1950s. The period from 1980 to 2005 includes both drought and wet climatic conditions.

- The model has four layers representing the following hydrogeologic units (from top to bottom): Carrizo-Wilcox Aquifer (layer 1), Upper Cretaceous Unit (layer 2), Edwards (Balcones Fault Zone) Aquifer/Edwards portion of the Edwards-Trinity (Plateau) Aquifer (layer 3), and Trinity portion of the Edwards-Trinity (Plateau) Aquifer (layer 4). The model was run with MODFLOW-2000 (Harbaugh and others, 2000).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifer according to the groundwater availability model. Selected components were extracted from the groundwater budget for the Edwards (Balcones Fault Zone) Aquifer and the Edwards-Trinity (Plateau) Aquifer and averaged over the 1980 to 2005 portion of the model runs in the district (Tables 1 and 2). These selected components are:

- Precipitation recharge—The spatially-distributed recharge due to precipitation within the district.
- Surface water outflow—The total water discharging from the aquifers to surface water features such as streams, reservoirs, and springs.
- Flow into and out of district—The lateral flow within the aquifers between the district and adjacent counties and other areas.
- Flow between aquifers—The flow between aquifers or confining units. This flow is controlled by the relative water levels in each aquifer or confining unit and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

The information needed for the District's management plan is summarized in Tables 1 and 2. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as district or county boundaries, is assigned to one side of the boundary based on the location of the centroid of the model cell. For example, if a cell contains two counties, the cell is assigned to the county where the centroid of the cell is located (Figures 1 and 2).

LIMITATIONS

The groundwater model used for this analysis is the best available scientific tool to meet the stated objective. To the extent that this analysis will be used for planning purposes and/or regulatory purposes related to pumping in the past and into the future, it is important to recognize the assumptions and limitations associated with the use of the results. In reviewing the use of models in environmental regulatory decision making, the National Research Council (2007) noted:

> "Models will always be constrained by computational limitations, assumptions, and knowledge gaps. They can best be viewed as tools to help inform decisions

> rather than as machines to generate truth or make decisions. Scientific advances will never make it possible to build a perfect model that accounts for every aspect of reality or to prove that a given model is correct in all respects for a particular regulatory application. These characteristics make evaluation of a regulatory model more complex than solely a comparison of measurement data with model results."

A key aspect of using the groundwater model to evaluate historic groundwater flow conditions includes the assumptions about the location in the aquifer where historic pumping was placed. Understanding the amount and location of historic pumping is as important as evaluating the volume of groundwater flow into and out of the district, between aquifers within the district (as applicable), interactions with surface water (as applicable), recharge to the aquifer system (as applicable), and other metrics that describe the impacts of that pumping. In addition, assumptions regarding precipitation, recharge, and streamflow are specific to a particular historic time period.

Because the application of the groundwater model was designed to address regional scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations relating to the actual conditions of any aquifer at a particular location or at a particular time.

It is important for groundwater conservation districts to monitor groundwater pumping and overall conditions of the aquifer. Because of the limitations of the groundwater model and the assumptions in this analysis, it is important that the groundwater conservation districts work with the TWDB to refine this analysis in the future given the reality of how the aquifer responds to the actual amount and location of pumping now and in the future. Historic precipitation patterns also need to be placed in context as future climatic conditions, such as dry and wet year precipitation patterns, may differ and affect groundwater flow conditions.

REFERENCES:

Harbaugh, A. W., 2009, Zonebudget Version 3.01, A computer program for computing subregional water budgets for MODFLOW ground-water flow models, U.S. Geological Survey Groundwater Software.

Harbaugh, A.W., Banta, E.R., Hill, M.C., and McDonald, M.G., 2000, MODFLOW-2000, The U.S. Geological Survey modular ground-water model-user guide to modularization concepts and the ground-water flow process: U.S. Geological Survey Open-File Report 00-92, 121 p.

Hutchison, William R., Shi, Jerry, and Jigmond, Marius, 2011, Groundwater Flow Model of the Kinney County Area, Texas Water Development Board, 138 p.

National Research Council, 2007. Models in Environmental Regulatory Decision Making: Committee on Models in the Regulatory Decision Process, National Academies Press, Washington D.C., 287 p., http://www.nap.edu/catalog.php?record_id=11972.

TABLE 1: SUMMARIZED INFORMATION FOR THE EDWARDS (BALCONES FAULT ZONE) AQUIFER THAT IS NEEDED FOR KINNEY COUNTY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE APPROXIMATE AND REPORTED IN ACRE-FEET PER YEAR.

Management Plan requirement	Aquifer and other units	TWDB Kinney GCD Model (1980 – 2005)
Estimated annual amount of recharge from precipitation to the district	Edwards (Balcones Fault Zone) Aquifer	17,674
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards (Balcones Fault Zone) Aquifer	514
Estimated annual volume of flow into the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	268
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards (Balcones Fault Zone) Aquifer	12,346
Estimated net annual volume of flow between each aquifer in the district	From Upper Cretaceous Units to Edwards (Balcones Fault Zone) Aquifer	15,597
	From Edwards-Trinity (Plateau) Aquifer to Edwards (Balcones Fault Zone) Aquifer	11,514
	From Edwards (Balcones Fault Zone) to Edwards-Trinity Units	33,598

TABLE 2: SUMMARIZED INFORMATION FOR THE EDWARDS-TRINITY (PLATEAU) AQUIFER THAT IS NEEDED FOR KINNEY COUNTY GROUNDWATER CONSERVATION DISTRICT'S GROUNDWATER MANAGEMENT PLAN. ALL VALUES ARE APPROXIMATE AND REPORTED IN ACRE-FEET PER YEAR.

Management Plan requirement	Aquifer and other units	TWDB Kinney GCD Model (1980 – 2005)
Estimated annual amount of recharge from precipitation to the district	Edwards-Trinity (Plateau) Aquifer	48,216
Estimated annual volume of water that discharges from the aquifer to springs and any surface water body including lakes, streams, and rivers	Edwards-Trinity (Plateau) Aquifer	33,439
Estimated annual volume of flow into the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	148,792
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	74,709
Estimated net annual volume of flow between each aquifer in the district	From Upper Cretaceous Units to Edwards-Trinity (Plateau) Aquifer	40,848
	From Edwards-Trinity (Plateau) Aquifer to Edwards (Balcones Fault Zone) Aquifer	11,514
	From Edwards-Trinity (Plateau) Aquifer to Edwards-Trinity Units	105,311

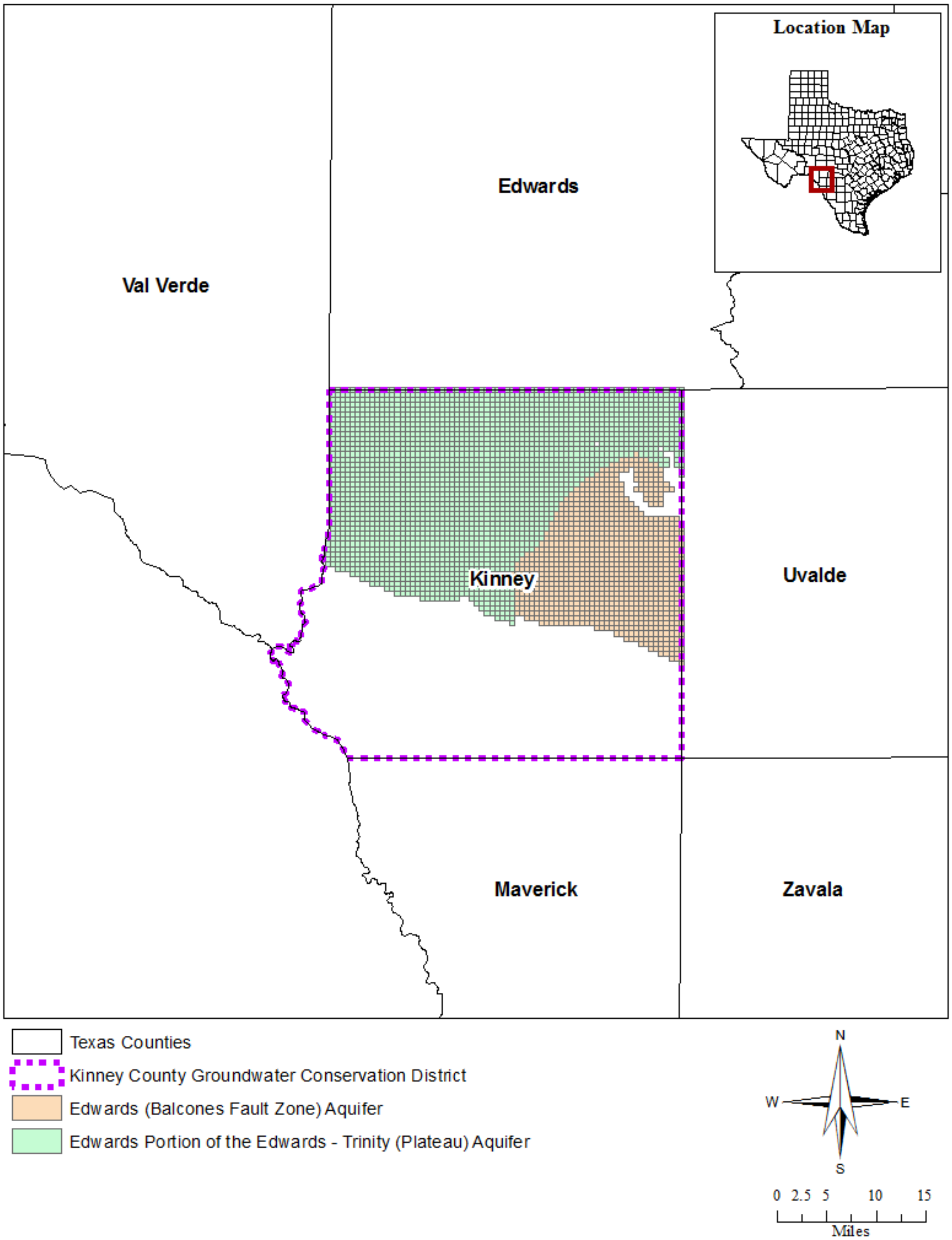

FIGURE 1: THE EDWARDS (BALCONES FAULT ZONE) AQUIFER AND EDWARDS PORTION OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN MODEL LAYER 3 FROM WHICH THE INFORMATION IN TABLES 1 AND 2 WAS EXTRACTED FOR THE KINNEY COUNTY GROUNDWATER CONSERVATION DISTRICT.

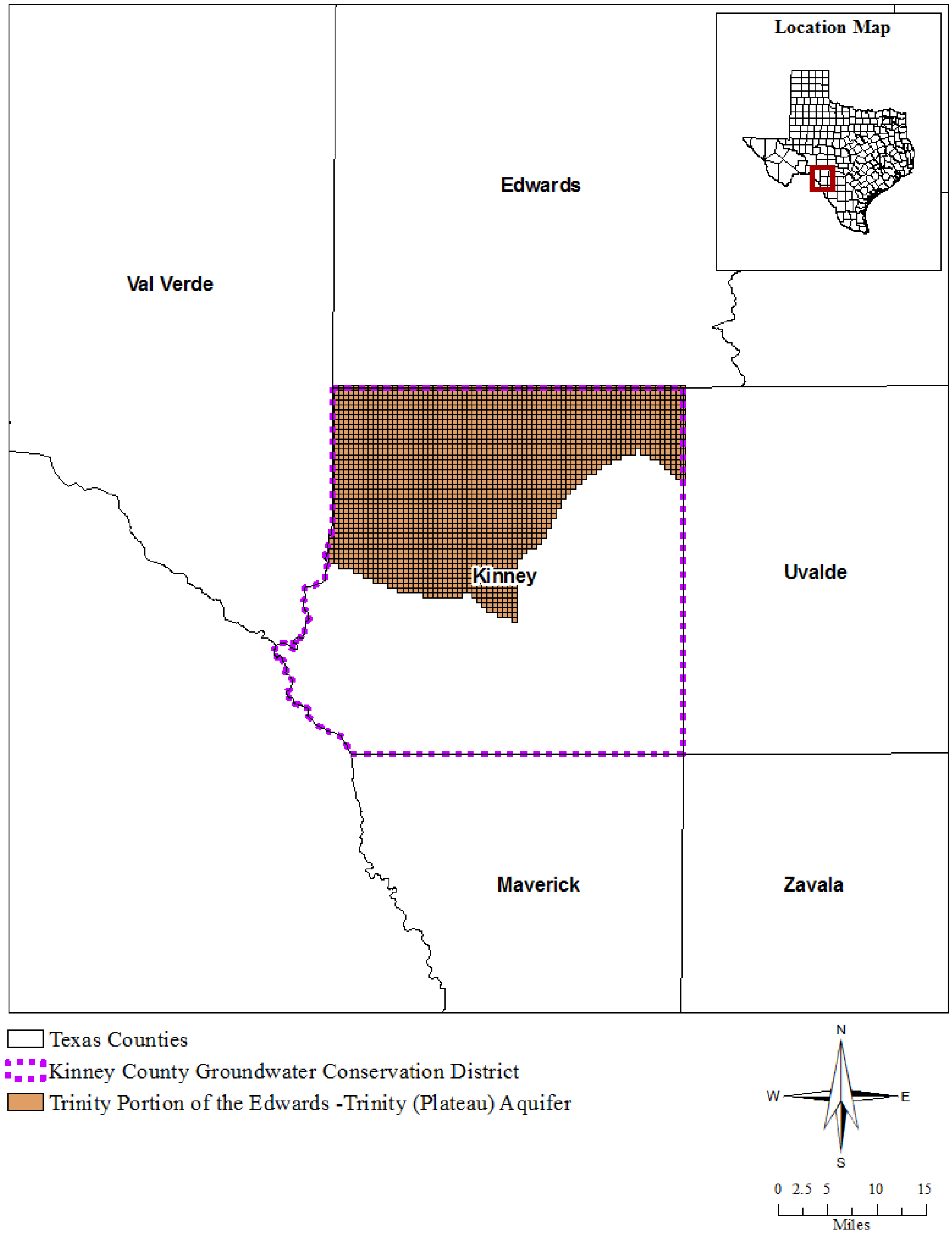

FIGURE 2: THE TRINITY PORTION OF THE EDWARDS-TRINITY (PLATEAU) AQUIFER IN MODEL LAYER 4 FROM WHICH THE INFORMATION IN TABLES 1 AND 2 WAS EXTRACTED FOR THE KINNEY COUNTY GROUNDWATER CONSERVATION DISTRICT.

Appendix G

Rules of Kinney County Groundwater Conservation District

RULES OF THE

KINNEY COUNTY GROUNDWATER

CONSERVATION DISTRICT

Adopted October 13, 2022

DISTRICT MISSION

The mission of the Kinney County Groundwater Conservation District is to develop, promote, and implement water conservation and management strategies to conserve, preserve, and protect the groundwater supplies of the District, to protect and enhance recharge, prevent waste and pollution, and to promote efficient and beneficial use of groundwater within the District.

The District seeks to protect the rights of owners of water rights as defined in Chapter 36 (Section 36.002), Water Code, within the District from impairment of their groundwater quality and quantity from within the District and to guard against the same from outside the District by all means available, pursuant to the power and duties granted under Subchapter D, Chapter 36, Water Code.

The District desires to manage the production and quality of groundwater within the District on a sustainable basis that allows the capture of water flowing through the county without jeopardizing the viability of water in the county during extended periods of low rainfall or unduly increasing the frequency of the natural cycles for springs and intermittent streams going dry.

TABLE OF CONTENTS

SECTION 1 -- GENERAL PROVISIONS

RULE 1.01 PURPOSE OF RULES AND APPLICABILITY

These Rules are adopted to achieve the purposes of the District Act and accomplish its objectives and requirements as set out in the District's Groundwater Management Plan. These rules are adopted to protect property rights, balance the conservation and development of groundwater to meet the needs of this State, and use the best available science in the conservation and development of groundwater. With respect to any permit or permit application, these Rules govern the permitting process for any well that is not the subject of a pending permit application filed prior to the effective date of these Rules. Any permit application pending on the effective date of these Rules is governed by the Rules in effect at the time such application was filed with the District.

RULE 1.02 DISTRICT ADDRESS

The District's mailing address is Post Office Box 369, Brackettville, Texas 78832. The office is located in Brackettville, Texas.

RULE 1.03 COMPUTING TIME

In computing any period of time specified by these Rules, by a presiding officer, by board orders, or by law, the period shall begin on the day after the act, event, or default in question, and shall conclude on the last day of that designated period, unless the last day is a Saturday, Sunday, or legal holiday on which the District office is closed, in which case the period runs until the end of the next day which is neither a Saturday, Sunday, nor legal holiday on which the District office is closed.

RULE 1.04 METHODS OF SERVICE UNDER THE RULES

Except as otherwise provided for in these Rules, any notice or document required by these Rules to be served or delivered may be delivered to the recipient, or the recipient's authorized representative, in person, by agent, by courier-receipted delivery, by certified or registered mail, return receipt requested, sent to recipient's last known address, by e-mail to the recipient's e-mail address on file with the District if written consent is granted by the recipient, or by facsimile document transfer to the recipient's current facsimile number and shall be accomplished by 5:00 o'clock p.m. of the date on which it is due.

Service by mail is complete upon deposit in a post office or other official depository of the United States Postal Service. If service or delivery is by mail, and the recipient has the right to perform some act or is required to perform some act within a prescribed period of time after service, three (3) days will be added to the prescribed period.

Service by telephonic document transfer is complete upon transfer, except that any transfer commencing after 5:00 o'clock p.m. shall be deemed complete the following business day. Where service by other methods has proved unsuccessful, the service shall be complete upon publication of the notice in a newspaper of general circulation in the district.

RULE 1.05 USE OF FORMS

The District will furnish forms and instructions for the preparation of any application, declaration, registration or other document that is required to be filed with the District on a form prepared by the District. The use of such forms is mandatory. Supplements may be attached if there is insufficient space on the form. Supplements must identify the sections of the form to which the information contained in the supplement pertains.

RULE 1.06 Procedure, Conduct, and Decorum at Meetings of the Board of Directors

A) All Regular, Special, and Emergency Board Meetings will be called and conducted in accordance with the provisions of the Texas Open Meetings Act, Chapter 551, Government Code.

B) Regular, Special, and Emergency Board Meetings are open to the public and to representatives of the press and media. Closed Board meetings ("Executive Sessions") are not open to the public or the press, and only those individuals expressly requested or ordered to be present are allowed to attend Executive Sessions.

C) Public participation at Board meetings is limited to that of observers unless the Board requests that a member of the public address the Board or unless the person who wishes to address the Board submits a completed Public Participation Form prior to the beginning of the meeting. The Public Participation Form must list each agenda item the person wishes to address or any item the person would like the Board to consider adding to a future agenda. Public comment will occur at the beginning of the meeting prior to consideration of any other agenda item. A sample of the Public Participation Form is attached hereto.

1) The Presiding Officer of the meeting may limit the total amount of time each member of the public has to address the Board. The time limit, if any, must be announced at the beginning of the meeting.

2) Offensive, insulting, or threatening language directed toward any person or racial, ethnic, or gender slurs or epithets will not be tolerated during public comments. These Rules do not prohibit public criticism of the District, including criticism of any act, omission, policy, procedure, program, or service. Violation of these rules may result in the following sanctions:

a) cancellation of a speaker's remaining time;
b) removal from the Board meeting;

c) such other civil or criminal sanctions as may be authorized under the Constitution, Statutes, and Codes of the State of Texas.

D) E. From time to time, the Board of Directors may conduct public hearings. These rules of procedure, conduct, and decorum shall also apply to public hearings.

SECTION 2 -- REGISTRATION OF WELLS OR NEW WELLS

RULE 2.01 REGISTRATION

A) **Exempt Use Wells.** As used in these Rules, the phrase "exempt use wells" means any use exempted by Section 36.117, Water Code.

B) **Registration.** The District requires that all exempt use wells be registered with the District on the approved District form for purpose of information gathering in the furtherance of groundwater management and groundwater planning. No person owning or operating an exempt use well may appear before the District in any permit hearing or other adjudication unless such well is first registered with the District. Exempt use wells that have not been registered with the District cannot be included in any long-term water planning or aquifer management and this could result in negative water table conditions in the future.

C) **Review by Office Staff.** The Office Staff will review the completed form and determine if the well is for exempt use or non-exempt use and whether a permit is required. If exempt from the permit requirements, the Office Staff will issue a Registration Certificate with a well number.

E) **Forfeiture of Exemption.** A well for exempt use under this section will lose its exempt status if the well is subsequently used for a purpose or in a manner that is not exempt or illegal under these Rules or Chapter 36, Water Code. Forfeiture of exempt status will occur upon notice to the well owner, following a hearing before the Board.

RULE 2.02 REGISTRATION OF EXISTING WELLS

No person may operate an existing well, other than a well used solely for exempt uses, without first obtaining a permit. The District does not require a permit or a permit application or a permit amendment for maintenance or repair of a well if the maintenance or repair does not increase the production capabilities of the well.

RULE 2.03 PROCEDURE FOR DRILLING A WELL OR REWORKING AN EXISTING WELL

A) Application. An application must be filed with the District to drill, equip, substantially alter or increase the output of an existing well by more than 5%. A violation of this Rule occurs on the first day of the drilling, equipping, completion, or alteration without the appropriate registration or permit. Fines may begin and continue each day thereafter until the appropriate registration or permit is issued.

B) Preparation of Application. An application for a well registration, permit, or permit amendment shall be made on forms provided by the District.

C) District Review. At the District President's direction, either the Designated District Employee or District President will review the application and make a preliminary determination of whether the well meets the exemption from permitting provided in these Rules and whether the well is in compliance with these Rules. The Applicant will be informed of the determination within five (5) business days from the date of receipt of the completed application.

1) **Exempt Use Well.** If the District President's or Designated District Employee's preliminary determination is that the well is for exempt uses and in compliance with these Rules, and all applicable fees have been paid, the Applicant may begin construction or other activity immediately upon receiving the approved registration.

2) **Non-Exempt Use Well.** If the District President's or Designated District Employee's preliminary determination is that the exemption does not apply, the Applicant must complete the process for a Test Permit under Rule 3.03.

RULE 2.04 TERM OF DRILLING PERMIT

A Permit issued in accordance with this rule will expire and be null and void with no further action of the Board if drilling of the well is not completed within 365 calendar days of the date the Permit is issued. Thereafter, the Applicant must file a new Permit Application.

RULE 2.05 SPACING

A) An Exempt use well must not be within fifty (50) feet of a neighboring property line. The District President or the Designated District Employee may grant the Landowner a variance.

B) A Non-Exempt use well must not be within three hundred (300) yards of a neighboring property line.

C) A written statement filed with the District from the neighbor stating that there is no objection to a well closer to the property line can override the yard spacing requirement in 2.05.B. This variance must be filed with the Kinney County Clerk and become a part of the County Record.

D) An Applicant may bring a request for an exception to subsection B) to the Board.

RULE 2.06 LOCATION OF WELLS AFTER EFFECTIVE DATE OF THESE RULES

A) **Drilling Range.** After an Application for a well permit has been granted, the well, if drilled must be drilled within thirty (30) feet of the location specified in the permit but not closer than fifty (50) feet from the property line if the well is for exempt use and three hundred (300) yards if the well is for Non-Exempt use.

B) **Location Restrictions.** A well shall be located at a minimum distance of:

1) **five hundred** (500) feet from any sewage, wastewater, or other liquid-waste collection facility;

2) **one hundred** (100) feet from any concentrated source of contamination, including, but not limited to, a septic tank, septic drain field, or OSST spray field; and

3) **five hundred** (500) feet from a cemetery.

C) **Flood Plains.** If a new well is to be located within a one hundred (100)-year flood plain as defined by the Federal Emergency Management Agency, the well must comply with TDLR Rules,16 TAC Chapter 76.

RULE 2.07 MINIMUM STANDARDS OF NEW WELL COMPLETION

A) **TDLR Rules.** The minimum requirements for well drilling shall be the TDLR Rules, 16 TAC Chapter 76. The District may, by Resolution, impose additional requirements for well drilling, as circumstances may require. To the extent that any Rule or Resolution adopted by the District is more restrictive than those imposed by the TDLR Rules, the District's Rule or Resolution shall be controlling.

B) **Annular Space.** The annular space between the borehole and the casing shall be filled from ground level to a minimum depth of twenty (20) feet with API Class A neat cement.

C) **Sealing.** A steel reinforced concrete slab or sealing block shall be placed above the cement around the casing at the ground surface.

1) **Slab Block.** The slab or block shall extend at least two (2) feet from the well in all directions, have a minimum thickness of four (4) inches to include three-eighths (3/8th) rebar at twelve (12) inch o. c. or 6 x 6 x 10 mesh reinforcing wire.

2) **Slab Surface Slope.** The surface of the slab shall be sloped to drain away from the well.

D) **Casing Top.** The top of the casing shall extend a minimum of one (1) foot above the ground surface.

E) **PVC Casing Instead of Concrete.** If a well is to be completed with polyvinyl chloride (PVC) casing, in lieu of placing a concrete slab around the casing at the ground surface as provided for in section C) of this Rule, a steel sleeve may be used to protect the casing from breakage. The steel sleeve shall be a minimum of three-sixteenth (3/16) inches in thickness and eighteen (18) inches in length, shall extend six (6) inches in to neat cement, and shall be two (2) inches larger in diameter that the PVC casing being used.

F) **Prohibition on Commingling of Aquifers.** All wells that are to be completed in the artesian or confined portion of an aquifer shall be completed so that waters from other strata or zones are not allowed to commingle through the borehole-casing annulus. With respect to such wells, one of the following shall apply:

1) **Steel Casing.** If the well is to be completed with steel casing, the annular space between the borehole and the casing shall be filled with neat cement from the top of the water-bearing formation of production to the land surface.

2) **PVC Casing.** If the well is to be completed with PVC casing, the borehole-casing annulus shall be filled with cement, pelletized bentonite, grout, or other suitable material if specifically approved by the Board, from the top of the water-bearing formation of production to the land surface provided that if cement is not used, a cement plug will be installed as required by the TDLR Rules.

G) **Gravel Packed Wells.** If a well is to be gravel packed the full length of the casing, or string of casing must be set to the top of the desired aquifer formation and extend one foot above land surface. The second string of casing may then be set at the desired depth in the aquifer, and the annulus.

H) **Gravel Packed Wells in Unconfined Portion of Aquifer.** If a gravel-packed well is to be drilled in the unconfined portion of an aquifer, it shall be completed with a double string of casing. The outside string of casing shall be set at a depth of twenty (20) feet below land surface, extend one foot above land surface, and shall be completed according to the TDLR Rules. The second string of casing may then be set inside of the first string of casing at the desired depth in the aquifer, and the annulus between the two casings shall contain bentonite grout.

I) **Undesirable Water.** If a well penetrates any undesirable water in a zone or zones that contained water that differs in "chemical quality," the undesirable water shall be sealed off and confined to its zone of origin. When undesirable water is encountered in a zone overlying fresh water, the well shall be cased from the top of the fresh water zone to the land surface and the annular space between the casing and the borehole shall be cemented to the land surface. When undesirable water is encountered in a zone underlying a fresh water zone, the portion of the well bore opposite the undesirable water zone shall be filled with cement to a height that will prevent the entrance of the undesirable water into the well.

J) **Capping Well.** The well casing shall be capped or completed in a manner that will prevent pollutants from entering the well.

RULE 2.08 PERSONS AUTHORIZED TO CONSTRUCT

Only licensed water well drillers in good standing with TDLR and not known to have any unresolved violations of any of the District's Rules may construct water wells within the District.

RULE 2.09 DRILLING LOGS

A) **Driller's Logs Required.** The driller of any water well within the District shall keep an accurate driller's log for each well. The driller shall file a copy of each log and a report detailing the drilling, equipping, and completing of the well with the District within sixty (60) days after the date the well is completed. The report shall include all information requested on the form that is relevant to that well regardless of whether the information is required by the TDLR. In the event that the driller's log and report required under this section are not filed within sixty (60) days after the date the well is completed, the driller shall be subject to enforcement by the District for violation of this Rule.

B) **Uncompleted Wells.** In the event the landowner prevents the driller from completing the well to state specifications, the driller shall report any uncompleted wells to the District. The landowner must cure the discrepancy within thirty (30) days or be subject to enforcement by the District for violation of these Rules.

C) **Review of Drilling Logs.** Within sixty (60) days of completion of the well, the Driller will submit completed well logs to the District. The Office Staff will review the logs and if satisfactory, issue a registration certificate with well number to the Applicant. Within thirty (30) calendar days following the next regular Board meeting, the Office Staff shall return the drilling deposit by District check. If the well log is not filed with the District within the sixty (60) days of completion of the well, the drilling deposit is forfeited to the District and the District will file a complaint with TDLR.

SECTION 3 – PERMITS

RULE 3.01 TYPES OF PERMITS

A) **Existing Use Permit.** A permit on an existing, non-exempt well that was completed and operational on or before January 7, 2003, and that produced and used groundwater at any time during the Existing Use Period. The Existing Use Period is the period from January 1, 1992, through January 7, 2003.

B) **Historic Use Permit.** A permit on an existing, non-exempt well that was completed and operational on or before December 31, 1991, and that produced and used groundwater at any time during the Historic Use Period. The Historic Use Period is the period from January 1, 1960, through December 31, 1991.

C) **Testing Permit.** A permit for an existing or new well that has not had a hearing by the Board or has not been through a contested case hearing. All well production is on a temporary basis.

D) **Regular Permit:** A Permit issued after a hearing by the Board or a contested case hearing for a specified amount.

E) **Export Permit:** Permit issued for water to be exported outside the District.

RULE 3.02 EVALUATION OF PERMIT APPLICATION

An application shall be limited to only one well.

Applicant: For applications for a groundwater withdrawal permit, if the well or proposed well has one owner, that owner shall file the application. If there is more than one owner, a joint application shall be filed by those owners. In the case of more than one owner, the owners shall select one among them to act for and represent them before the District. Written documentation satisfactory to the District, must accompany the application. Unless the ownership of the well by the lessee, assignee, or easement holder is clearly established in the documentation defining the relationship between parties, a lessee or designee of the surface estate or an easement holder, will not be considered the owner of the well. If the Applicant is a lessee or owns groundwater rights severed from the surface estate, the Applicant shall provide written notice of the application to each groundwater rights owner and surface estate owner by certified mail, return receipt requested. Groundwater rights must be evidenced by a certified copy of a recorded deed. The application is not administratively complete until evidence of the notice provided, including the signed returned receipts or the refused or undelivered certified letters are provided to the District.

In deciding whether to issue a permit, and in setting the terms of the permit, the Board will consider the purpose of the District Act and all other relevant factors, including, but not limited to:

1) the application conforms to the requirements of Chapter 36, Water Code, and is accompanied by the prescribed fees;

2) the quantity of groundwater proposed to be withdrawn unreasonably affects existing groundwater and surface water resources, existing permit holders or other groundwater users within the District;

3) the proposed use of water is dedicated to any beneficial use;

4) the proposed use of the water is consistent with the District's certified water management plan;

5) the Applicant has agreed to avoid waste and achieve water conservation; and

6) the Applicant has agreed that reasonable diligence will be used to protect groundwater quality and that the Applicant will follow well plugging guidelines at the time of well closure.

RULE 3.03 REQUIREMENTS FOR A TESTING PERMIT

A) Application. An Application must be filed with the District on a form provided by the district. A separate application is required for each well.

B) Minimum Requirements for Application. An application must contain the following information in sufficient detail to be considered administratively complete by the District:

1) Applicant's Information. The application must contain the following information:

a) the name, mailing address, physical address, 911 emergency address and phone number of the Applicant and the owner of the land on which the well is or will be located, supported by a run sheet from a title company duly licensed in the State of Texas;

b) shows or provides the documentation establishing the applicable authority to construct and operate a well for the proposed use, if the Applicant is other than the owner of the property;

c) a statement of the nature and purpose of the proposed use and the approximate amount of water in acre feet to be used for each purpose; and

d) a declaration that the Applicant will comply with:

i) the District's Rules;
ii) the District's Groundwater Management Plan;
iii) TDLR Rules (16 TAC §76);
iv) Chapter 36, Water Code; and
v) the District's drought contingency plan.

2) Technical Information. The application must be accompanied by a map that adequately details the proposed project, showing:

a) the project's location on the map;

b) the project's GPS location (Latitude and Longitude Coordinates);

c) the project's surface elevation in feet above mean sea level (msl); and

d) all monitoring well locations.

3) Other Information. The application must also contain the following information:

a) the proposed pumping volume, in gallons per minute;

b) the pump horsepower;

c) the casing size in inches;

d) the depth of well (in feet) and producing formations;

e) a description of the use of the water to be pumped;

f) meter information from a District approved vendor; and

g) mitigation plan – a water conservation plan or a declaration that the Applicant will comply with the district's management plan.

C) Completeness of Application. The Designated District Employee will review the application for completeness. An application shall be considered administratively complete if it (a) includes all information required, (b) is properly completed, signed, and notarized, (c) is accompanied by payment of all applicable fees; and (d) includes any maps, documents, or supplementary information requested by the Board or Staff. At the District President's direction, either the Designated District Employee or District President will make a determination of administrative completeness.

D) Action on Incompleteness. If the Designated District Employee or District President's preliminary determination is that the application is not in compliance with all District Rules, the Designated District Employee shall notify the Applicant of the provisions that are not in compliance and the changes needed to bring the proposed well application into compliance. The Applicant may resubmit the application to the District after correcting the appropriate provisions. The District will not take action on an application that is not administratively complete. An application may be rejected as not administratively complete if the District finds that substantive information required by the application or District staff is missing, false, or incorrect. The District will notify Applicants submitting incomplete applications in writing. An Applicant shall have sixty (60) days from the date of the District's notification to correct the application before the application expires.

E) Action on Administrative Completeness. If the Designated District Employee or District President determines that the application is administratively complete, the following shall occur:

1) The Applicant will place notice of the proposed permit in each local newspaper of general circulation in Kinney County on a form approved by the District and proof of publication filed with the District.

2) Following publication in a local newspaper, the proposed Testing Permit will be considered at the next available meeting of the Board.

3) If the Board approves the application, the Applicant will pump the well for a minimum of one (1) year or, within one year, perform a pump test acceptable to the District. The Applicant must submit the actual amount pumped by providing monthly pumping reports. The District will reserve the right to observe, monitor, and inspect all phases of construction, and the pumping test. If the pumping rate causes detrimental impacts to any land owner's wells, base spring flow or the aquifer, the District shall have the authority to cause a decrease in pumping or stoppage of pumping until recharge has occurred. The pumping may be resumed at a reduced rate once conditions have normalized for the surrounding wells and springs. This process shall continue until a pumping rate is established that is not detrimental to any entity protected by the District's Management Plan, and shall establish sustainable yield. The District must approve the meter and the meter installation. The Applicant will be responsible for notifying the District seven (7) days in advance for commencement of the above-named activities. The Applicant shall bear all costs associated with the pump test and monitoring of wells of landowners who have registered as interested persons, spring flows or aquifer levels required by the approved pump test.

4) All monitoring wells must be registered with the District.

5) Within sixty (60) days from the date the notice is published, a person may request in writing to be an interested person with respect to the testing permit concerned. If the person seeking interested person status has one or more existing wells, that person must allow the District to monitor his or her well or wells during the one-year process to obtain interested person status. Such a request and offer to monitor is a prerequisite to becoming a protestant in any subsequent application for a non-temporary permit by the Applicant. The purpose of the requirement to allow the District to monitor the person's wells is to assess the impact that the Applicant's future pumping may have on the person seeking interested person status. All permitted owners of surface water rights in the Groundwater Management Zone may request interested person status.

F) Compliance with Groundwater Management Plan. In issuing permits, the District shall manage total groundwater production on a long-term basis to achieve an applicable desired future condition and consider:

1) the modeled available groundwater determined by the executive administrator;

2) the executive administrator's estimate of the current and projected amount of groundwater produced under exemptions granted by District rules and Section 36.117, Water Code;

3) the amount of groundwater authorized under permits previously issued by the District;

4) a reasonable estimate of the amount of groundwater that is actually produced under permits issued by the District; and

5) yearly precipitation and production patterns.

RULE 3.04 REQUIREMENTS FOR A REGULAR PERMIT

After granting a test permit by the District and the well has been pumped for a minimum of one (1) year, or an acceptable pumping test has been completed, the Applicant must submit an application for a Regular Permit on a form approved by the District, which must state the quantity pumped or requested in acre feet. The amount granted for a Regular Permit may not exceed the maximum amount requested and tested for under the test permit. The Applicant's submission must contain a written request for a public hearing on a form approved by the District.

RULE 3.05 REQUIREMENTS FOR AN EXPORT PERMIT

An Applicant wanting an Export Permit must be a party to the water supply contract with the end user or be the end user.

The procedure for export permit applications is described in more detail in Section 6.

RULE 3.06 PERMIT ACTIONS BY THE BOARD NOT REQUIRING A HEARING

A) **Applications for Permits or Permit Amendments other than Test Permits.** Within sixty (60) days from the date on which the District determines that an application is administratively complete, the application shall be set on the agenda for Board action at a Board meeting. Such setting shall be no later than the next available Board meeting.

B) **Required Notice**. The Applicant shall publish notice of the application no less than fourteen (14) days before the Board meeting at which the application will be considered. The notice shall include the name of the Applicant and the address or location of the well and other information deemed relevant by the District.

C) **Notice to Applicant.** Notice of the Board meeting at which the Application will be considered shall be mailed to the Applicant at least seven (7) days prior to the scheduled meeting date. Such notice may be waived by the Applicant.

D) **Public Comment.** Anyone interested in the application may attend the meeting and make oral comments at the time designated for comments. The presiding officer shall administer the oath to the Applicant and anyone who makes oral comments on the application.

E) **Board Action if No Request for Contested Case Hearing.** If no request for a contested case hearing is made, the Board shall issue a written order or resolution reflecting its decision. If the Board approves the Application, the permit shall be an attachment to that written order or resolution. The Board's decision shall be made within sixty (60) days after the final hearing at which the Application was considered. If the Board votes to issue the permit at an amount less than the amount requested on the application, or votes to issue the permit with conditions that were not part of the original proposal, or denies the permit, the applicant may demand a contested case hearing by submitting a written demand to the District office no later than the close of business on the tenth (10^{th}) business day after the Board's vote.

F) **Effective Date if No Contested Case Hearing.** The effective date of the written order shall be ten (10) days after the date on which the District President or the Presiding Officer, signs the order or resolution, if no request for a contested case hearing is received by the District. The order or resolution shall include a statement that the order or resolution and its attachment become effective and final within ten (10) days of that date. An order or resolution of an application that was not considered in a contested case hearing may not be appealed.

G) **Effective Date if Request for Contested Case Hearing Denied.** If there is a timely filed request for a contested case hearing and, the Board determines that there will be no contested case hearing, the effective date of the written order shall be the date on which the Board denies the contested case hearing.

RULE 3.07 PERMIT ACTIONS REQUIRING A CONTESTED CASE HEARING

A) Application. This Rule applies only to applications for which the District has received a timely filed request for a contested case hearing.

B) Request for Contested Case Hearing and Party Status must be in writing. A person who is an owner of a permitted or registered well in the same management zone as the well application and who is willing to allow the District to monitor wells on his or her property may request Party Status in a contested case hearing. All requests for Party Status in a contested case hearing must be in writing and filed with the District. If a person allows the District to monitor his or her wells but the District does not monitor the well the person may provide well data from a credible source.

C) Deadline to Request a Contested Case Hearing. A request for a contested case hearing must be physically delivered to the District office no later than 5:00 p.m. the last business day before the date of the Board meeting at which the application is first scheduled to be considered. Failure to file a request for contested case hearing waives any right to appear as a party in a contested case hearing or to appeal any decision on the application.

D) Preliminary Hearing. If the District receives a written request for a contested case hearing, the District shall schedule a preliminary hearing. The preliminary hearing may be held to consider any matter which may expedite the hearing or otherwise facilitate the hearing process, including, but not limited to:

1) whether a valid contested case hearing request has been submitted and if so, the designation of parties;

2) the Contested Case Hearing Fee deposit amount required to be paid by each designated party;

3) formulation and simplification of issues; and

4) the hearing schedule, including any necessary discovery.

E) Open Meetings Notice. Notice required by the Open Meetings Act shall be provided for the hearing if conducted by a quorum of the Board.

F) Required Notices. In addition to the notice required by the Open Meeting Act, not later than the tenth (10th) day before the date of the hearing notice may be provided as follows:

1) post notice in a place readily accessible to the public at the District office;

2) provide notice to the County Clerk of Kinney County;

3) mail notice to the Applicant by regular mail;

4) mail notice to the individual requesting a contested case hearing by regular mail;

5) mail notice to the record owner, according to the Appraisal District Records of Kinney County, Texas, of all tracts of land overlying the groundwater rights if severed from the surface, all tracts of land adjoining the tract of land upon which the well is located or proposed to be located, and all Permitted owners of surface water rights within the Management Zone; and

6) provide notice by mail, fax, or e-mail to any person who has requested notice under Rule 3.07.G.

G) Requirements of Notice. Notice of the hearing on the application shall include the following:

1) the name of the Applicant;

2) the address or location of the well;

3) a brief explanation of the proposed permit or permit amendment, including the requested amount of groundwater, the purpose of the proposed use, and any change in use;

4) the time, date and location of the hearing; and

5) any other information the District considers relevant and appropriate.

H) Third Party Requests for Notice. Any person may submit to the District a written request for notice of a hearing on a permit or permit amendment. A request is effective for the remainder of the calendar year in which the request is received by the District. To receive notice of a hearing in a later year, a person must submit a new request. Failure to provide notice does not invalidate an action taken by the District at a contested case hearing.

I) Selection of Presiding Officer.

1) The hearing may be conducted by a quorum of the Board or the Board may appoint a Hearing Examiner to preside at and conduct the hearing on the application. If the District President is not present, the Board shall select one of the Directors who is present to preside. By order, the Board may delegate to SOAH the authority to conduct hearings designated by the Board.

2) If the Board refers a contested case hearing to SOAH, then the applicable rules of practice and procedure of SOAH (1 TAC Ch. 155) govern any contested case hearing of the District, as supplemented by this subchapter.

3) If the Board refers a contested case hearing to SOAH, the administrative law judge who conducts the contested case hearing shall serve as the hearings examiner and consider applicable District rules and policies in conducting the hearing. However, the District may not supervise the administrative law judge.

4) If the Board refers a contested case hearing to SOAH, the District may not attempt to influence the findings of facts or the administrative law judge's application of the law in a contested case hearing except by proper evidence and legal argument.

5) If requested by the Applicant or other party to a contested case, a district shall contract with the SOAH to conduct the hearing. The party must file such a request not later than the fourteenth (14th) day before the date the evidentiary hearing is scheduled to begin. The Board order granting the contested case hearing may designate a location for the hearing inside the boundaries of the District or in Travis County at a location designated by SOAH. The party requesting the hearing before SOAH shall pay all costs associated with the contract for the hearing and shall, before the hearing begins, deposit with the district an amount sufficient to pay the contract amount. At the conclusion of the hearing, the district shall refund any excess money to the paying party.

6) When an application is referred to contested case hearing by the Board, the District will file all applicable documents to have the matter referred to SOAH.

7) In referring the case to contested case hearing, the District will:

a) notify the administrative law judge of the applicable burden of proof for the Applicant to establish all of the prima facie elements;

b) identify for the administrative law judge any additional issues that have been raised in the request(s) for contested case hearing; and

c) provide the administrative law judge with a written statement of applicable rules and policies of the District.

J) **Duties of Presiding Officer.** The presiding officer has the following authority and obligations:

1) May convene the hearing at the time and place specified in the notice;

2) May set any necessary additional hearing dates;

3) May designate the parties regarding a contested application who qualify under Section 3.03 (E) (5);

4) May establish the order for presentation of evidence;

5) May administer oaths to all persons presenting testimony;

6) May examine persons presenting testimony;

7) May ensure that information and testimony are introduced as conveniently and expeditiously as possible without prejudicing the rights of any party;

8) Shall admit relevant evidence and may exclude evidence that is irrelevant, immaterial, or unduly repetitious;

9) May prescribe reasonable time limits for testimony and the presentation of evidence;

10) May allow testimony to be submitted in writing and sworn to. On the motion of a party to the hearing, the presiding officer may exclude written testimony if the person who submits the testimony is not available for cross-examination by phone, a deposition before the hearing, or other reasonable means;

11) May continue a hearing from time to time and from place to place without providing notice under Rule 3.07.E. If the continuance is not announced on the record at the hearing, the presiding officer shall provide notice of the continued hearing by regular mail to the parities. In any event, if the hearing is being conducted by a quorum of the Board, Open Meetings notice under Rule 3.09.D shall be provided.

K) **Recordings.** Under Section 36.408, Water Code, the presiding officer shall prepare and keep a record of each hearing in the form of an audio or video recording or a court reporter transcription. On the request of a party to a contested hearing, the presiding officer shall have the hearing transcribed by a court reporter. The presiding officer may assess any court reporter transcriptions cost against the party that requested the transcription or among the parties to the hearing. Except as provided by this subsection, the presiding office may exclude a party from further participation in a hearing for failure to pay in a timely manner costs assessed against that party under this subsection if the parties have agreed that the costs assessed against that party will be paid by another party. If a hearing is uncontested, the presiding officer may substitute minutes or the report required under Section 36.410, Water Code.

L) Service of Documents

1) For any document filed with the District or the hearings examiner in a contested case, the person filing that document must serve a copy on all parties at or before the time that the request is filed.

2) A document presented for filing must contain a certificate of service indicating the date and manner of service and the name and address of each person served. The District may authorize a document to be filed without a certificate of service but will require the certificate be served within three (3) days thereafter.

M) Continuances

1) The Board may continue a hearing related to a contested case under the jurisdiction of the Board from time to time and from place to place.

2) The notice of the hearing must indicate the times and places at which the hearing may be continued.

3) If a hearing is not concluded on the day it begins, the Board shall, to the extent possible, proceed with the hearing on each subsequent working day until the hearing is concluded.

N) Discovery. Discovery in contested case proceedings will be governed by Chapter 2001, Subchapter D, Tex. Gov't Code and Title 1, Section 155.31, Tex. Admin. Code, as supplemented by this subchapter. Depositions in a contested case shall be governed by Tex. Gov't Code §§ 2001.096-2001.102.

O) Expenses of Witness or Deponent

1) A witness or deponent in a contested case who is not a party and who is subpoenaed or otherwise compelled to attend a hearing or a proceeding to give a deposition or to produce books, records, papers, or other objects that may be necessary or proper for the purposes of the contested case, is entitled to receive:

a) Ten (0.10) cents for each mile for going to and returning from the place of the hearing or deposition if the place is more than twenty-five (25) miles from the person's place of residence and the person uses the person's personally owned or leased motor vehicle for the travel;

b) Reimbursement of the transportation expenses of the witness or deponent for going to and returning from the place where the hearing is held or the deposition is taken, if the place is more than twenty-five (25) miles from the person's place of residence and the person does not use the person's personally owned or leased motor vehicle for the travel;

c) Reimbursement of the meal and lodging expenses of the witness or deponent while going to and returning from the place where the hearing is held or deposition is taken, if the place is more than twenty-five (25) miles from the person's place of residence; and

d) Ten dollars ($10) for each day or part of a day that the person is necessarily present.

2) Amounts required to be reimbursed or paid shall be reimbursed or paid by the party at whose request the witness appears or the deposition is taken.

3) The District may directly pay a commercial transportation company for the transportation expenses or a commercial lodging establishment for the lodging expenses of a witness or deponent if this section otherwise requires the District to reimburse the witness or deponent for those expenses.

4) The District may not pay a commercial transportation company or commercial lodging establishment or reimburse a witness or deponent for transportation, meal, or lodging expenses at a rate that exceeds the maximum rates provided by law for state employees. The District may not adopt rules that provide for payment or reimbursement rates that exceed those maximum rates.

5) In this section:

a) "Commercial lodging establishment" means a motel, hotel, inn, apartment, or similar entity that offers lodging to the public in exchange for compensation.

b) "Commercial transportation company" means an entity that offers transportation of people or goods to the public in exchange for compensation.

P) Evidentiary Matters

1) Evidence that is irrelevant, immaterial, or unduly repetitious shall be excluded.

2) The rules of privilege recognized by law shall be given effect.

3) An objection to an evidentiary offer may be made and shall be noted in the record.

4) Evidence may be received in writing if:

a) it will expedite the hearing; and

b) the interests of the parties will not be substantially prejudiced.

5) A copy or excerpt of documentary evidence may be received if an original document is not readily available. On request, a party shall be given an opportunity to compare the copy or excerpt with the original document.

6) A party may conduct cross-examination required for a full and true disclosure of the facts.

7) Witnesses may be sworn and their testimony taken under oath.

8) Official notice may be taken of:

a) all facts that are judicially cognizable; and

b) generally recognized facts within the area of the District's specialized knowledge. Each party shall be notified either before or during the hearing, or by reference in a preliminary report or otherwise, of the material officially noticed, including staff memoranda or information. Each party is entitled to an opportunity to contest material that is officially noticed. The special skills or knowledge of District staff may be used in evaluating the evidence.

Q) Depositions and Subpoenas

1) On its own motion, or on the written request of a party, and on deposit of an amount that will reasonably ensure payment of the estimated total amount, the Board will issue a commission, addressed to the officers authorized by statute to take a deposition, requiring that the deposition of a witness be taken for a contested matter pending before it. Requests for issuance of commissions requiring deposition or subpoenas in a contested case will be in writing and directed to the Board.

2) A party requesting the issuance of a commission requiring deposition or a subpoena will file an original of the request with the District. District staff will arrange for the request to be presented to the Board at the next available meeting.

3) In the case of a deposition, the Board will issue a commission addressed to the officer authorized by statute to take a deposition, requiring that the deposition of a witness be taken. The commission shall authorize the issuance of any subpoena necessary to require that the witness appear and produce, at the time the deposition is taken, books, records, papers or other objects that may be necessary and proper for the purpose of the proceeding. Additionally, the commission will require the officer to whom it is addressed to examine the witness before the officer on the date and at the place named in the commission; and take answers under oath to questions asked the witness by a party to the proceeding, the District, or an attorney for a party or the District. The commission will require the witness to remain in attendance from day to day until the deposition is begun and completed.

4) In the case of a hearing, if good cause is shown for the issuance of a subpoena, and if an amount is deposited that will reasonably ensure payment of the amounts estimated to accrue, the District will issue a subpoena addressed to the sheriff or to a constable to require the attendance of a witness or the production of books, records, papers or other objects that may be necessary or proper for the purpose of the proceeding.

R) Ex Parte Communications

1) For applications for which there is a right to a contested case hearing, a member of the Board may not, at any time after the application has been filed and before the Board has taken final action, communicate, directly or indirectly, about any issue of fact or law with any representative of the District or other designated party to the application, except on notice and opportunity for all parties to participate.

2) Subsection (1) does not apply if:

a) the Board member abstains from voting on a matter in which he or she engaged in ex parte communications;

b) the communications are by and between members of the Board consistent with the Open Meetings Act;

c) the communications are with District staff who have not participated in any hearing in the contested case for the purpose of using the special skills or knowledge of the staff in evaluating the evidence; or

d) the communications are with legal counsel representing the Board of Directors.

S) Remand to Board

1) A hearings examiner may remand an application to the Board as follows:

a) all timely hearing requests have been withdrawn;

b) all parties to a contested case reach a settlement so that no facts or issues remain controverted; or

c) the party or parties requesting the hearing defaults.

2) After remand, the application will be uncontested, and the Applicant will either be deemed to have agreed to the action proposed by the general manager or, if the parties have reached a settlement agreement, the agreement will be presented to the Board for its consideration. District staff will set the application for consideration at a Board meeting.

T) Informal Dispositions and Alternative Dispute Resolution

1) An informal disposition of a contested case may be made by:

a) stipulation;
b) agreed settlement;
c) consent order; or
d) default.

2) The hearings examiner may require the parties enter into mediation or other alternative dispute resolution process. The hearings examiner may also determine how the costs of the alternative dispute procedure shall be apportioned among the parties, appoint an impartial third party as provided by Section 2009.053, Government Code, to facilitate that procedure.

U) Certified Questions

1) At any time during a contested case proceeding, on a motion by a party or on the hearings examiner's own motion, the hearings examiner may certify a question to the Board.

2) Issues regarding District policy, jurisdiction, or the imposition of any sanction by the hearings examiner that would substantially impair a party's ability to present its case are appropriate for certification. Policy questions for certification purposes include, but are not limited to:

a) the District's interpretation of its rules and applicable statutes;

b) the portion of the Act, the District rules, or other statutes that are applicable to a proceeding; and

c) whether District policy should be established or clarified as to a substantive or procedural issue of significance to the proceeding.

3) If a question is certified, the hearings examiner shall submit the certified issue to the District. District staff will place the certified issue on the agenda of a meeting of the Board. The District will give the hearings examiner and parties thirty (30) day notice of the meeting at which the certified question will be considered. Within ten (10) days after the certified question is filed with the District, parties to the proceeding may file briefs. Within ten (10) days of the filing of such briefs, parties may file responses. Briefs and responses shall be filed with the District with copies served on the hearings examiner. The District will provide copies of the certified questions and any briefs and responses to the Board. The hearings examiner may abate the hearing until the District answers the certified question, or continue with the hearing if the hearings examiner determines that no party will be substantially harmed.

4) The Board will take action and issue a written decision on the certified issue and provide copies to the parties and the hearings examiner. A decision on a certified issue is not subject to a motion for rehearing, appeal or judicial review prior to the issuance of the District's final decision in the proceeding.

V) Scheduling of a Meeting of the Board

1) After receiving the proposal for decision or other disposition from the hearings examiner, District staff shall schedule the presentation of the proposal to the Board. The District shall provide ten (10) day notice to the parties of the date of the final hearing before the Board at which the proposal will be presented and considered. The Board may reschedule the presentation of the proposal. The District will send notice of the rescheduled meeting date to the parties no later than ten (10) days before the rescheduled meeting.

2) Any party to the contested case hearing may make an oral presentation at the Board meeting in which the proposal for decision in that case is presented to the Board.

3) On the written request of a party to a contested case, the oral proceedings before the Board at which the proposal for decision is presented and oral presentations are made, may be transcribed by a court reporter. A party that desires a transcript of the proceedings shall bear the cost, or the costs will be equally divided between all parties requesting a transcript. If the District desires a transcript it will bear the costs.

W) Reopening the Record. The Board, on the motion of any party to a contested case or on its own motion, may order the hearings examiner to reopen the record for further proceedings on specific issues in dispute. The order shall include instructions as to the subject matter of further proceedings and the hearings examiner's duties in preparing supplemental materials or revised proposals based upon those proceedings for the Board's adoption.

X) Hearing Examiner's Report. If a Hearing Examiner is to be the presiding officer at the hearing, the Hearing Examiner shall submit a report to the Board not later than thirty (30) days after the date the evidentiary hearing is concluded. A copy shall be provided to the Applicant and each party to the hearing. The Applicant and other parties to the evidentiary hearing may submit to the Board written exceptions to the report within ten (10) days of issuance of the report. The report shall include:

1) a summary of the subject matter of the hearing;

2) a summary of the evidence received; and

3) the Hearing Examiner's recommendations for Board action on the subject matter of the hearing.

Y) Board Action.

(a) The Board will evaluate the hearing request at a scheduled Board meeting and may determine that the person requesting the hearing:

(1) does not have a personal justiciable interest not common to the general public affected by the application and deny the hearing request; or

(2) has a personal justiciable interest not common to the general public affected by the application and schedule the application for a contested case hearing.

(b) If the Board grants the request for a contested case hearing, the Board shall assign a Hearings examiner or delegate the matter to SOAH. The Hearings examiner shall:

(1) schedule a preliminary hearing;

(2) at least 21 days after the preliminary hearing, schedule an evidentiary hearing; and

(3) following the evidentiary hearing, prepare a proposal for decision including proposed findings of fact and conclusions of law, and transmit that proposal to the Board.

(c) The Board shall schedule a final hearing where it will consider the evidence and testimony presented during the evidentiary hearing and the hearings examiner's proposal for decision.

(d) Following the final hearing, the Board may:

(1) grant the application;

(2) grant the application with conditions; or

(3) deny the application.

(e) The Board shall act on a permit or permit amendment application not later than the 60th day after the date the final hearing on the application is concluded. If the Board votes to issue the permit with conditions or denies the permit as an uncontested application, the applicant may contest the Board's action by submitting a formal contested case letter to the District office within ten (10) days after the Board's vote. The application shall go before the Board as a contested case at the next available Board hearing.

Z) Request for Rehearing or Findings and Conclusions. Requests for rehearing or for findings and conclusions shall be considered in the manner provided below.

1) Time for Filing. Not later than twenty (20) days after the date the Board issues its written order or resolution, an Applicant or a party to a contested case hearing may administratively appeal a decision of the Board on an application by requesting written findings and conclusions of the Board.

2) **Board Action.** On receipt of a timely written request, the Board shall make written findings and conclusions regarding a decision of the Board on an application. The Board shall provide certified copies of the findings and conclusions to the person who requested them, and to each designated party, not later than thirty-five (35) days after the date the Board received the request. The Applicant or a party to the contested case hearing may request a rehearing before the Board not later than twenty (20) days after the date the Board issues the findings and conclusions.

3) **Place of Filing; Required Information; Copies.** A request for rehearing must be filed in the District office and must state the grounds for the request. The person requesting a rehearing must provide copies of the request to each of the other parties to the contested case hearing.

4) **If Rehearing Granted.** If the Board grants a request for rehearing, the Board shall schedule the rehearing not later than forty-five (45) days after the date the request is granted. Any action by the Board on a request for rehearing shall be made at a Board meeting conducted in accordance with the Open Meetings Act.

AA) Final Decision. A decision by the Board on an application is final if:

1) a request for rehearing is not filed on time, on the expiration of the period for filing a request for rehearing;

2) a request for rehearing is filed on time, on the date:

a) the Board denies the request for rehearing; or

b) the Board renders a written decision after granting the rehearing; or

c) a request for rehearing is filed on time and the Board does not issue a written decision granting or denying the request for rehearing within ninety (90) days from the date of the Board's initial written order or resolution, on the ninety-first (91st) day after the Board issued its initial order or resolution.

BB) Appeal to District Court. A party to a contested case hearing may appeal the District's final decision under Section 36.251, Water Code, not later than the sixtieth (60th) day after the date on which the decision becomes final. A timely filed request for rehearing is a prerequisite to any such suit. No person may file a request for rehearing unless that person participated as an Applicant, protestant, or other party in the hearing that resulted in the decision challenged.

RULE 3.08 NEW REGULAR OR EXPORT PERMITS ISSUED BY THE DISTRICT

A) Invoice for Fees. Upon the Board's granting of a permit application, and prior to the issuance of the permit, the Designated District Employee shall promptly provide an invoice to the Applicant for all water use fees and hearing fees due and owing to the District.

B) Payment of Fees Condition for Permit. The District will not issue a permit until all applicable fees have been paid.

C) Change of Ownership. Within ninety (90) days after the date of a change in ownership of the right to produce water under a permit or registration, the existing permit or registration holder must notify the District. Notification must be in writing and provide legal proof of ownership in the form of a recorded deed or other instrument of title.

D) Standard Permit Provisions. All permits issued by the District shall state the following:

1) the name of the person to whom the permit is issued and the owner of the groundwater estate;

2) the date the permit is issued;

3) the date the permit expires;

4) the amount of water permitted;

5) the type of permit;

6) any conditions and restrictions placed on the rate or amount of groundwater withdrawal;

7) any other conditions or restrictions the District prescribes;

8) the purpose of use for the groundwater withdrawn; and

9) any other information the District determines necessary.

SECTION 4 -- PERMIT REQUIREMENTS

RULE 4.01 PROHIBITION OF WASTE AND POLLUTION

A) **Prohibition of Waste.** No person shall intentionally or negligently commit waste. Groundwater produced from within the District shall not be used in such a manner or under such conditions as to constitute waste as defined in Chapter 36, Water Code.

B) **Prohibition of Pollution**. No person shall pollute or harmfully alter the character of the groundwater within the District by causing or allowing the introduction of pollutants or other deleterious matter from another stratum, from the surface, or from the operation of a well.

RULE 4.02 REQUIRED EQUIPMENT ON WELLS

A) **Equipment Required for the Protection of Groundwater.** Equipment must be installed on all wells having a chemical injection, chemigation or foreign substance unit in the water delivery system: an in-line, automatic quick-closing check valve capable of preventing pollution or harmful alteration of the groundwater. Such equipment must be installed on all new wells at the time of completion.

B) **Equipment Required for Establishing Quantity of Groundwater Produced.** All non-exempt use wells must have installed meters and monitoring equipment approved by the District from a list of approved vendors. Monitoring equipment may include real-time monitoring equipment installed at the District's office at the well owner's expense. The meter and monitoring equipment installation must be inspected by the District and schematic drawing of installation provided to the District. Metering Device failure must be reported to the District and the District must approve an appropriate measuring alternative. The purpose of the approved meter and monitoring equipment is to ensure that the District has the capability to promptly and accurately measure the amount of groundwater being produced or transported out of the District.

RULE 4.03 LIMITATION ON PRODUCTION

A) **Limit Specified in Permit.** The maximum annual quantity of groundwater that may be withdrawn under an Existing Use Permit, Historic Use Permit or Regular Permit issued by the District shall be no greater than the amount specified in the permit.

B) **Aquifer-Based Production Limits.** Using the best available hydrogeologic and geographic data, the District will continue to study and accumulate data on the various aquifers located within the boundaries of the District and their subdivisions, and may amend from time to time the limit on total annual production either throughout the District or for a particular aquifer or its subdivision, as set forth under these Rules.

RULE 4.04 ANNUAL GROUNDWATER PUMPAGE REPORT

Before January 15th of each year, each permit holder must submit to the District a report on a form provided by the District, stating the following:

1) the name of the permit holder;

2) the well number(s);

3) the total amount of groundwater produced by the well or aggregate system during the immediately preceding calendar year (January through December);

4) the purpose for which the groundwater was used;

5) any other information requested by the District pursuant to the provisions of the District Act and Chapter 36, Water Code.

The District requires an annual pumping report that includes the amount of groundwater withdrawn each calendar month during that reporting period.

RULE 4.05 REPLACEMENT WELLS

A) **Application.** A well owner may apply to re-equip, re-drill, or replace a currently permitted or registered well by filing an application to amend such permit or registration and providing such information as may be required by the District under the following conditions:

1) the replacement well must be drilled within fifty (50) feet of the location of the well being replaced, unless otherwise determined by the District;

2) the replacement well shall remain subject to the same permit provisions and requirements as the well being replaced, including the amount of maximum authorized withdrawal;

3) the replacement well or pump shall not be larger in size or capacity than the well being replaced so as to substantially alter the size or capacity of the well; and

4) if a replacement well is drilled, the well owner ceases production from the well being replaced and begins pursuit of compliance with the well closure requirements of the District for the well being replaced.

B) **No-Hearing Required.** Applications for replacement wells may be granted without notice or hearing.

SECTION 5 -- PERMIT RENEWALS AND AMENDMENTS

RULE 5.01 PERMIT RENEWALS

A) Any permit, other than an export permit, will renew March 1 of each year if all requirements of the Rules in effect at the time the permit was issued have been met and there are no outstanding fees owed. A permit subject to automatic renewal under subsection (c) remains in effect until the final settlement or adjudication on the matter of the substantive violation.

B) Permit renewals under this section shall be approved by the General Manager without notice or hearing if the permit holder is not requesting a change related to the renewal that would require a permit amendment under the District rules.

C) The General Manager may not renew a permit under this section if the applicant:

1) is delinquent in paying a fee required by the District;

2) is subject to a pending enforcement action for a substantive violation of a District permit, order, or rule that has not been settled by agreement with the District or a final adjudication; or

3) has not paid a civil penalty or has otherwise failed to comply with an order resulting from a final adjudication of a violation of a District permit, order, or rule.

D) If the well owner or well operator seeks, as part of the renewal application, to increase the amount of authorized withdrawal, or otherwise change any of the permit terms or conditions that would require a permit amendment, a permit application form must be filed and will be scheduled for a hearing and consideration by the Board. If the requested changes or amendments are denied, the permit shall be renewed under the original permit conditions as it existed before the permit amendment process, unless the District proposes an amendment under subsection (e). During consideration of the permit renewal process, the permit, as it existed before the permit amendment process, remains in effect until the later of:

1) the conclusion of the permit amendment or renewal process, as applicable; or

2) final settlement or adjudication on the matter of whether the change to the permit requires a permit amendment.

E) The District may initiate an amendment to a permit under this section, in connection with the renewal of a permit or otherwise, in accordance with these rules, in order to achieve the groundwater management goals and objectives set forth in these rules and the District's Management Plan. If the District initiates an amendment to a permit, the permit as it existed before the permit amendment process shall remain in effect until the conclusion of the permit amendment or renewal process, as applicable. If aquifer conditions at or near the well or well field indicate excessive drawdown or subsidence, or if aquifer conditions indicate the need for groundwater withdrawal rate reduction, the Board may renew the permit at a lower authorized withdrawal amount or with additional special provisions either limiting the rate of withdrawal or requiring other adjustments to mitigate the impact of the groundwater withdrawals. The Board may consider waivers signed by landowners affected by the aquifer drawdown in setting the special permit provisions.

RULE 5.02 PERMIT AMENDMENTS

A) **Permit Amendment:** A permit owner is required to obtain a permit amendment prior to (i) any change in the maximum amount of groundwater to be produced from a well, (ii) the location of a proposed well, (iii) the purpose of use of the groundwater allowed to be pumped under the permit, (iv) the location of use of the groundwater allowed to be pumped under the permit, or (v) the drilling and operation of additional wells even if aggregate withdrawals remain the same. The Board will consider applications for permit amendments in the manner prescribed for Test Well Permit applications. The fee to be assessed for any additional withdrawal granted shall be the fee rate in effect at the time of issuance of the amended permit multiplied by the additional withdrawal granted. Only a permit owner may seek a permit amendment.

B) **Administrative Permit Amendment.**

1) **Transfer of Wells.** Absent an express reservation of rights of the transferor, the transfer of ownership of the well(s) designated by a permit is presumed to transfer ownership of the permit.

2) **Administrative Permit Amendment.** To bring about an Administrative Permit Amendment, the permit holder must file notice of the contemplated amendment with the District within ninety (90) days from the date of the change in ownership, along with any legal documents establishing the change in ownership. Upon receipt of the requisite notice, the District President or Office Staff, at the District President's direction, shall, upon determination that the proposed amendment is, in fact, a Ministerial Permit Amendment, grant the permit amendment and issue a revised permit. The District's issuance of a permit amendment shall be made within thirty (30) calendar days after receipt of the requisite notice and the documentation required.

C) **Change in Purpose of Use or Place of Use.** The scope of any review or hearing on an amendment to change the purpose of use or place of use authorized in the permit is limited to those elements that would have been different if the original permit application had included the provisions in the amendments related to the contemplated new purpose of use or place of use and may subject the permit holder to additional permitting hearings, including contested case hearings, as the Board may deem appropriate and as required by Chapter 36, Water Code.

D) Application Fee and Other Fees. Each application for a permit amendment must be accompanied by the appropriate fees, as established by the Board.

SECTION 6 -- WATER EXPORT AND ENHANCEMENT OF GROUNDWATER FOR THE DISTRICT

RULE 6.01 GENERAL PROVISIONS FOR EXPORT

A) General Requirements for Exportation of Water. A person who produces or wishes to produce groundwater from a permitted well or aggregate wells located or to be located within the District and export such groundwater for use outside of the District must possess or obtain a Regular Permit. Any person or entity wishing to export groundwater outside of the District boundaries must first file an application for and obtain an export permit, pay all related fees, and cooperate with the District in establishing User/Purchaser fees and collection procedures to effect collection of the required charges imposed on water exported.

B) Exceptions to Export Permit Requirement. An export permit is not required if the groundwater is:

1) a part of a manufactured product (such as bottled water or any other final product) that is manufactured in Kinney County and exported outside the District as a final product; or

2) used on property that (i) straddles the District boundary line and (ii) is owned by the owner or operator of the well(s) that produce the groundwater.

C) Processing Fee. The District shall impose a fee for processing an application for an export permit. The fee will be charged according to the current fee schedule as applicable to the required services or professional and legal fees that may be required to process the application. An application filed under this Rule shall be considered and processed under the same or similar procedures as other applications for other permits as the circumstances of a particular application may require.

D) Use of Certain Revenues. The District is prohibited from using revenues obtained under subsection C) to prohibit the export of groundwater outside of the District. The District is authorized to use revenues obtained under subsection C) to pay any expenses related to enforcement of the Rules or for any other authorized purpose of the District.

E) Conditions for Issuance of Export Permit. The District shall not issue an export permit unless the following conditions are satisfied.

1) The Applicant must be the end user or be a party to a contract with the end user. The Applicant must have (a) secured via lease or purchase the right to a Regular Permit that authorizes the Applicant to produce the groundwater that is desired to be exported, and (b) the Applicant must prove, in aggregate, the amount of water available for export via the pump test as approved by the Board.

2) The Applicant must submit a written agreement with the end user of the exported water for the District's review and approval to ensure proof of beneficial use and that the contract contains:

a) all the provisions of the District's Management Plan and Rules; and

b) a binding agreement on all parties to pay any and all taxes**,** fees**,** and assessments due and owing to the District.

3) The Applicant must submit a mitigation plan, previously approved by the District's Board, and specific to the Management Zone or Zones from which groundwater will be withdrawn under the export permit. A certified copy of the approved mitigation plan must be filed with the District before issuance of the export permit.

F) Factors to be Considered. In reviewing an application for an export permit, the District shall consider:

1) the availability of water in the District and in the proposed receiving area during the period for which the water supply is requested, including any planned use;

2) the projected effect of the proposed export on the aquifer conditions, depletion, and effects on existing permit holders or other groundwater users within the District;

3) the approved regional water plan and the District's Groundwater Management Plan;

4) if the Applicant has a Regular Permit issued or being considered by the District, or a contract for the purchase of water from a person that has a Regular Permit**.**

G) Limitation of Volume of Groundwater Exported. The District may restrict an export permit by limiting the volume of groundwater for export depending on the pump test prescribed in these Rules. Each export permit shall specify the amount of water that may be exported and the period of time for which the water may be exported.

H) Term of Export Permit. The term of duration of an export permit shall be:

1) at least three (3) years if construction of a conveyance system has not been initiated prior to the issuance of the export permit; or

2) at least thirty (30) years if construction of a conveyance system has been initiated prior to the issuance of the export permit; and

3) notwithstanding the period specified in subsections 1) and 2) above, during which water may be transferred under a permit, the District shall continuously monitor the amount of water that may be transferred under the permit and may limit that amount if additional factors considered in Section 36.122(f), Water Code, warrant the limitation, or if Production Limit Triggers established by the District's Drought Contingency Plan have been reached. The amount of water that may be transferred under the permit shall be subject to continuous review and adjustment based on the Drought Contingency Plan, the Desired Future Conditions, and available groundwater factors.

I) REPEALED.

J) Limitations on District Discretion. The District may not impose more restrictive permit conditions on the owner of an export permit than the District imposes on existing in-district users of water; provided, however, the District may establish provisions for direct payments of certain water user fees from destination users and remittance of those fees by destination users directly to the District. Subject to other applicable provisions of these Rules, the District shall not deny a permit under this Rule based on the fact that the Applicant seeks to export groundwater out of the District.

K) Construction of Rule. In applying this Rule, the District must be fair, impartial, and non-discriminatory.

RULE 6.02 APPLICATION FOR EXPORT PERMIT

A) Use of District Form. An export permit application must be filed with the District on a form prescribed by the District.

B) Requisites of Administratively Complete Application. An application for an export permit must:

1) be in writing and sworn to before a person authorized to administer oaths in the State of Texas;

2) contain the name, mailing address, and place of residence or principal office of the Applicant, contain the name and mailing address of any lessee of the Applicant, and the name and mailing address of all landowners whose property interests in groundwater have been leased to the permittee;

3) contain the name and mailing address of the current fee simple owner or owners of the groundwater estate on the land on which the well or wells is to be located, supported by a run sheet from a title company duly licensed in the State of Texas;

4) identify the actual or anticipated location of the well from which the groundwater to be exported is produced or is proposed to be produced;

5) identify the pump size and production capacity of the well from which the groundwater to be exported is produced or is proposed to be produced;

6) describe the proposed export facilities;

7) state the nature and purposes of the proposed use and the anticipated amount of groundwater to be used for each purpose, including any proposed conjunctive use of surface and groundwater;

8) state the anticipated time within which any proposed construction or alteration of the export facilities is to begin;

9) state the presently anticipated duration for the proposed export of groundwater;

10) provide information showing what water conservation measures the Applicant has adopted, what water conservation goals the Applicant has established, and what measures and time frames are necessary to achieve the Applicant's established water conservation goals;

11) if the water is to be resold to others, provide a description of the Applicant's service area, metering, leak detection and repair program for its water storage, delivery and distribution system, drought or emergency water management plan, and information on each subsequent customer's water demands, including population and customer data, water use data, water supply system data, alternative water supply, water conservation measures and goals, conjunctive use of surface and groundwater, and the means for implementation and enforcement of all applicable Rules, plans, and goals; and

12) contain an independent title opinion from an attorney duly licensed in the State of Texas that the proposed location of the wells and proposed use of the wells are not prohibited as a matter of restrictive covenants, easements, encumbrances, or other real covenants from withdrawing groundwater from the locations identified in the application.

C) Review for Administrative Completeness.

1) **Review by District President or Office Staff.** At the District President's direction, the President or the Office Staff shall determine whether the application complies with the requirements of this Rule and may require amendment of the application to achieve necessary compliance.

2) **Title Opinion from Independent Counsel.** The provision of a satisfactory title opinion described in 6.02.B.12 is conclusive evidence in any contested case hearing that the Applicant is not prohibited as a matter of restrictive covenants, easements, encumbrances, or other real covenants from withdrawing groundwater from the

locations identified in the application, subject to an order declaring otherwise from the Kinney County District Court.

D) **Payment of Fees.** An application must be accompanied by the required application fee established by the Board.

RULE 6.03 HEARINGS FOR EXPORT PERMITS

A) **Declaration of Administratively Complete Application and Scheduling of Hearing.** Within thirty (30) days after receiving and declaring an application administratively complete, the District will schedule a public hearing on the application.

B) **Granting or Denying Permit.** On approval of the Applicant's export permit application, the District shall issue an export permit to the Applicant. The Applicant's right to export groundwater shall be limited to the terms of the permit.

RULE 6.04 PERMIT INFORMATION FOR EXPORT PERMITS

Elements of Export Permit. An export permit issued by the District shall contain substantially the following information:

1) the name and mailing address of (a) the permittee, (b) any lessee of the permit, and (c) all landowners whose property interests in groundwater have been leased to the permittee;

2) the name and mailing address of the owner of the land from which the groundwater will be taken;

3) the date the permit is issued;

4) the period for which the groundwater may be exported;

5) the date the permit is to expire if no groundwater is exported;

6) the date the original application was filed;

7) a requirement that the groundwater withdrawn under the permit be put to beneficial use at all times;

8) the location of use of the exported groundwater;

9) the conditions and restrictions, if any, placed on the rate and amount of withdrawal;

10) the use or purpose for which the water is to be exported;

11) the maximum quantity of water to be exported annually;

12) any other information the District finds reasonably useful and beneficial;

13) standard terms and conditions for payment of the District's export fee and other fees authorized by the District;

14) terms of water use fees, collection, conditions, and fees to be paid if development or delay in actual use is sought and approved.

RULE 6.05 EXEMPT USE WELLS REQUIRING PERMIT; FEES AND DISCHARGES UNDER STATE PERMITS

A) **Exempt Use Wells Not Excused from Requirement to Obtain Export Permit.** The owner of an exempt use well is not excused from the requirements to obtain an export permit and paying groundwater export fees if the groundwater produced from the exempt use well is exported outside of the District.

B) **State Water Discharge.** Groundwater that is discharged within the District pursuant to a permit issued by the Texas Railroad Commission or the Texas Commission on Environmental Quality is not considered to have been exported from the District unless the discharge is part of an overall water transfer for use outside the District. The owner of an exempt use well is not excused from the requirements to obtain an export permit and paying groundwater export fees if the groundwater produced from the exempt use well is exported outside of the District.

RULE 6.06 REPORTING

On or before February 15th of each year, the owner of an export permit shall file an annual report with the District describing the amount of water exported under the permit. The report shall be filed on a form provided by the District and will include the following:

1) the name and mailing address of (a) the permittee, (b) any lessee of the permit, and (c) all landowners whose property interests in groundwater have been leased to the permittee;

2) the well numbers of each well for which the permittee holds an export permit;

3) the total amount of groundwater exported from each well and total well system during the immediately preceding calendar year;

4) the total amount of groundwater exported from each well or well system during each month of the immediately preceding calendar year;

5) the purposes for which the water was exported;

6) fees paid through the report period; and

7) any other information requested by the District.

RULE 6.07 EXTENSION OF EXPORT PERMIT

A permittee may apply for an extension of the term of an export permit granted under this Section. The District shall consider and grant or deny each application for extension of an export permit in the same manner as is provided herein for the application for an initial permit.

RULE 6.08 REVOCATION OR MODIFICATION OF EXPORT PERMIT

A permit granted under this Section will be subject to review and modification as provided in these Rules. The permit shall also be subject to revocation for nonuse or waste by the permittee or for deviation from the purposes or other terms stated in the permit unless non-use has been specifically approved by the District and fees paid for such purpose. To revoke a permit for nonuse, the District must, at a public meeting, duly noticed under the Open Meetings Act and conducted not sooner than ten (10) days after the District has sent notice to the export permit holder by certified mail, return receipt requested, determine that construction of a conveyance system has not been initiated within three (3) years after issuance of the export permit or that other conditions of the permit have not been met and form adequate grounds for revocation or non-renewal. A revoked permit may be reinstated if the well owner submits an application for reinstatement. An application for reinstatement will be processed the same as an application to amend a permit.

SECTION 7 -- FEES AND DEPOSITS

RULE 7.01 WATER USE AND OTHER DISTRICT FEES AND CHARGES

A) **Water Use Fee Exemption.** Except as otherwise provided in these Rules, exempt use wells are exempt from payment of water use fees.

B) **Schedule of Fees.** The water use, permitted production, export, permits, administrative functions including legal fees incurred by the District pertaining to an Applicant's permit, and other fees heretofore adopted by the Board are hereby ratified, confirmed and readopted by the Board and shall be enumerated. The Board shall, from time to time, adopt a schedule of fees for water use, non-use, production, export, permits and administrative functions including professional fees to be paid by Applicants, and any other lawful purpose or business of the District. The fees, rates and charges will be established in a schedule of fees and charges adopted by the Board, and each such schedule of fees and charges shall thereafter be and remain in effect until amended by the Board.

C) Authorized Production. The water use fee rate schedule established by the Board shall be applied to the total authorized annual production for each historic use, existing use, and regular permit. As used in this Section, when applied to the holder of a permit issued by the District, the term "water used" shall mean the total annual production authorized in the permit whether pumped or not pumped.

D) Water Use Fees. Water use fees shall be paid to the District for water that is authorized to be pumped from wells that are not exempted by these Rules or state laws from the payment of such fees. The water use fees and rates shall be established by the Board. Except as otherwise provided by these Rules or state law, the rate will be initially applied to total volume authorized to be pumped for a period designated by the Board. Following issuance of permits, the rate shall be applied to the total authorized annual production for each permit, including permits and amendments issued during the fiscal year the rate is in effect. Such annualized fees shall be pro-rated for the remainder of the calendar year in which the permit is issued, and one-twelfth of the annualized fee will be paid by the permittee at the end of each month remaining in that calendar year after the issuance of the permit.

E) Limit on Water Use Fees. Pursuant to the District Act, the water use fee may not exceed:

1) $1.00 per acre-foot for water used for agricultural use; or

2) $10.00 per acre foot for water permitted for any other purpose.

F) Export Fees. The District may establish a reasonable fee for the export of groundwater, using one of the following methods:

1) a fee negotiated between the District and the export permit holder; or

2) a fee rate not to exceed the equivalent of the district's tax rate per hundred dollars ($100) of valuation for each thousand gallons of water transferred out of the district**,** or ten cents ($0.10) per thousand gallons of groundwater if the district assesses a tax rate of $0.10 per hundred dollars of valuation.

The District is prohibited from using revenues obtained from export fees to prohibit the transfer of groundwater outside the District, but may use export fees for paying expenses related to any enforcement provisions of Chapter 36, Water Code, or the Rules, or for any other lawful purpose of the District.

All export permits shall contain a condition that requires, as a condition to exporting water to a destination user, that the permit holder's contract with a destination user require the destination user to assume responsibility for payment to the District of all due and owing resource impact fees in the event (a) the permit holder refuses to pay all due and owing water fees, (b) the permit holder is unable, for financial reasons, to pay all due and owing resource impact fees, or (c) the permit holder files for protection under any chapter of the United States Bankruptcy Code.

RULE 7.02 APPLICATION FEES, REGISTRATION FEES, AND OTHER FEES

All fees, rates and charges provided for in these Rules shall be charged and collected pursuant to a schedule of fees, rates and charges adopted by the Board.

The Board shall establish a schedule of fees, rates and charges for permit applications and administrative functions that generally relate to the costs incurred by the District in performing the administrative functions for which the fees are charged.
Payment of the water use fees allows the permit holder to use the water or reserve that amount of water in the aquifer.

The District's monitor wells are exempt from all fees. At the District President's direction, the District President or Designated District Employee shall exempt monitoring wells from any other fees if the District President or Designated District Employee determines that the assessment of the fee would result in the District charging itself a fee.

RULE 7.03 PAYMENT OF FEES

All permit fees are due at the time of application or registration or other time designated by the District. The annual water use and export fee for each permit shall be paid as directed by the District from time-to-time and as determined necessary and suitable to assure proper accounting and un-interrupted receipt of such funds. An amendment application must be accompanied by the appropriate annual water use fee for the amount of groundwater withdrawal authorized by the amendment.

RULE 7.04 EXPORT PERMIT PROCESSING

The Board may adopt an application processing fee schedule for export permits to cover all reasonable and necessary costs to the District of processing the application. The permit processing fee for an application to export groundwater out of the District may not exceed the fees that the District imposes for processing applications for the use of groundwater within the District.

RULE 7.05 INSPECTION AND PLAN REVIEW FEES

The Board may establish fees for the inspection of wells, all measuring, water control, delivery and containment facilities, meters, or other inspection activities, plan reviews, special inspection services requested by other entities, or other similar services that require involvement of District personnel or its agents. Fees may be based on the amount of the District's time and involvement, out-of-pocket costs, number of wells, well production, well bore, casing size, size of exporting facilities, or amounts of water exported.

RULE 7.06 EXCEPTIONS

If a regulated water utility or other entity is unable to pass through production fees due to delay in obtaining regulatory approval, or in other unusual instances of hardship, the Board may grant exceptions and establish a delay payment schedule. Such exceptions shall be applied consistently but shall consider the delay value of late receipt and the limited resources available to the District for use in accomplishing conservation and preservation activities of the District.

RULE 7.07 RECHARGE PROJECT

The District may undertake development of water resource conservation and recharge projects such as authorized by Public Law 83-566 for construction of recharge dams to impound less than two-hundred (200) acre-feet of water or cause water to be channeled into sink holes or openings that will ~~we~~ replenish or confine water by storage for future use within the Aquifer. The Board, if such projects are undertaken, shall consider the costs and benefits and establish a project budget and directions and enter into necessary contracts for accomplishment of such public purposes. The Board shall solicit advice, and permits if needed from the Texas Water Development Board, Texas Commission on Environmental Quality, the Soil and Water Conservation District, and the United States Department of Agriculture concerning the effectiveness of such measures and develop a cost and project fee or assessment program for such improvements to compare to the resources available to the District.

SECTION 8 -- MANAGEMENT ZONES

RULE 8.01 MANAGEMENT ZONES

Using the best available scientific, hydrogeologic and geographic data, the Board shall divide the District into zones for the administration of groundwater management and regulation in the District. These management zones shall serve as areas for which the District shall determine separate and distinct water availability, which will be part of the aggregate water availability of the aquifer in which the management zone lies. In establishing a management zone, the District will, in each case, authorize total production, special drought management tools, and apportion available water among competing permit Applicants, if applicable. The District shall attempt in defining management zones to utilize boundaries that, to the extent practicable, will promote fairness and efficiency by the District in its management of groundwater, but with emphasis given to scientific, hydrogeologic and geographic data.

RULE 8.02 ESTABLISHING AVAILABILITY OF GROUNDWATER IN MANAGEMENT ZONE.

Every five (5) years, or more frequently if the District is presented with significant new and credible information that justifies an earlier revision, the District shall use the best available scientific, hydrogeologic, and geographic information to determine or reevaluate the annual amount of groundwater available for withdrawal in each management zone, based upon the District Management Plan and the information available to the District. To aid in this determination the District may conduct studies and tests, alone or jointly with other persons, or governmental entities; review and accept third party studies; and establish a series of index or monitoring wells.

RULE 8.03 PROPORTIONAL ADJUSTMENT

The Board may establish proportional adjustment regulations to alter the amount of production allowed in a management zone, as set forth under these Rules, when available groundwater is less than known production. The Board must adhere to the following requirements when establishing proportional adjustment regulations:

1) The Board shall first set aside an amount of groundwater equal to an estimate of production from exempt use wells located in the management zone. After setting aside the amount above, to the extent of remaining groundwater availability, the Board shall allocate groundwater to issued Existing Use Permits, Historic Use Permits, and Regular Permits in that order of priority.

2) If there is insufficient groundwater availability to satisfy any class of permits during such allocation, then the lower priority permits will be curtailed completely and within the higher priority class of permits the District will allocate the groundwater availability among the classes by reducing the amount authorized under each permit pro rata, based on the percentage each permit's maximum permitted amount bears to the total permitted amount of all permits in that class. The priority of permits is established in the Groundwater Management Plan, Section 5.

3) If there is sufficient groundwater to satisfy all classes of permits in a management zone, the District will then allocate remaining groundwater availability to new or amended Regular Permits, if any, in accordance with these Rules.

4) If remaining available groundwater is less that the aggregate amounts of all new and amended Regular Permits in process at the District at the time of such determination, then the District will allocate such amount among the new and amended Regular Permits pro rata, based on the percentage each new or amended Regular Permit's maximum permitted amount bears to the total permitted amount of all new and amended Regular Permits. With respect to new or amended Regular Permits involved in this allocation, to the extent the intended beneficial use is municipal or industrial and the amount of intended withdrawal is greater than two-hundred fifty (250) acre feet, the District will require documentary evidence from the end user of the ability and present intent to use the intended amount for the use stated and within the five (5) year management zone adjustment cycle.

SECTION 9 -- ENFORCEMENT AND VARIANCES

RULE 9.01 COMPLAINT AND INVESTIGATION

A) **Complaint Form.** All complaints shall be reflected on a District Complaint Form. These forms are available at the District office. If a complaint is made verbally, by telephone, or in person, District personnel will ensure that the information is memorialized on a District Complaint Form, but no action will be taken until the complainant signs the District Complaint Form. The complainant must inform the District if the complainant wants to qualify as an aggrieved party under the citizen suit provision of Section 36.119, Water Code.

B) **Aggrieved Party.** For purposes of this Rule and Section 36.119, Water Code, an aggrieved party is a landowner or other person who has a right to produce groundwater from the land that is adjacent to the land on which the well subject to the complaint is located, or who owns or otherwise has a right to produce groundwater from land that lies within the same Groundwater Management Zone.

C) **Investigation.** One or more District representatives will investigate the complaint promptly and will memorialize his or her findings in a written investigation report.

D) **Resolution of Complaint.**

1) **Informal Resolution.** Upon filing of a complaint, the District President or Office Staff, at the District President's direction, shall contact the alleged violator and attempt to resolve the complaint informally.

2) **Formal Investigation.** If the complaint cannot be resolved informally, the District may enter onto any public or private property, pursuant to Section 36.123, Water Code, and inspect and investigate the circumstances surrounding the complaint, as they relate to water quality, well conditions, or compliance with these Rules, permit conditions, or other orders issued by the District.

a) **Minimal Intrusion.** The District respects private property rights and shall endeavor to minimize any inconvenience to property owners while conducting District business. Whenever possible, the District shall notify, coordinate, and schedule well and property access in advance with the property owner, his agent, tenant, or other local contact. Notice is not required if prior permission to enter land or access wells has been granted by the property owner, his agent, tenant, or other local contact.

b) **Exhibit Credentials.** District employees or agents accessing public or private wells or property shall exhibit proper credentials upon request.

c) **Observe Rules and Regulations.** District employees or agents acting under this authority shall observe all posted Rules and regulation concerning safety, internal security, and fire protection.

d) **Immediate Inspections.** If unexpected, emergency, or critical conditions require the District to access public or private wells or property without prior access arrangements, the District shall, at the first reasonable opportunity, contact the property owner, his agent, tenant, or other local contact. The District shall inform him that the District accessed the well or property, the reasons for the District's access, and any pertinent information or action resulting from the District's access.

3) **Investigation Report.** The District shall memorialize its investigation in an Investigation Report. A copy of the Investigation Report will be sent to the person about whom the complaint was made and to the complainant.

4) **Board Consideration of Investigation Reports.**

a) **Time for Presenting Investigation Report.** The investigation reports for all complaints must be presented to the Board for consideration not later than ninety (90) days from the date of the receipt of the complaint.

b) **Notice of Consideration of Investigation Report.** Notice of the date, time and location of the Board meeting at which the Investigation Report will be considered and a copy of the Investigation Report shall be mailed to the person about whom the complaint was made and to the aggrieved party by certified mail, return receipt requested, at least ten (10) days prior to the scheduled Board meeting.

c) **Action on Investigation Report.** At the Board meeting, the Board may decide that there was no violation and close the complainant file. If the Board decides that there has been a violation, it may direct the District staff to issue a Notice of Violation or initiate a civil enforcement under these Rules.

RULE 9.02 ENFORCEMENT

A) **Administrative Enforcement**. As authorized by Section 36.102(b), Water Code, the Board may adopt a schedule of penalties against any person for breach of any rule of the district not to exceed ten thousand dollars ($10,000) per day per violation, and each day of a continuing violation constitutes a separate violation. Following notice and subject to the hearing provisions of Rule 9.04, the Board may suspend a permit until such time as all violations are cured and penalties paid.

B) **Civil Enforcement.** As authorized by Section 36.102, Water Code, the violation of any District Rule shall be subject to a civil penalty not to exceed ten thousand dollars ($10,000) per day per violation, and each day of a continuing violation constitutes a separate violation. The Board may seek enforcement of such civil penalties by injunction, mandatory injunction, or other appropriate remedy through a complaint filed in a court of competent jurisdiction. In addition, the District may seek and the court shall grant, recovery of attorney's fees, costs for expert witnesses, and any other costs incurred by the District before the court.

C) **Notice of Violation.** The District shall send a notice of violation to a person who is believed to be in violation of the law, including violation of a District Rule, Order, or permit. The notice shall include a copy of the investigation report. The notice may require remedial action and may assess a penalty. The notice must advise the person who is believed to be in violation that he or she has an opportunity for public hearing.

D) **Penalty Schedule.** The District may assess penalties for noncompliance with District Rules including failure to comply with conditions of a permit issued by the District. Penalties will be assessed in accordance with the District's Schedule of Fees and Fines. Penalties may be assessed per day per violation, with each day of a continuing violation constituting a separate violation.

E) **Enforcement Costs.** In addition to any penalty authorized by the District's Schedule of Penalties, the District is entitled to recover expenses, including attorney's fees, costs for expert witnesses, court costs and other costs incurred by the District to enforce District Rules.

RULE 9.03 VARIANCES

Any exceptions or variance to the requirements imposed by the District Rules shall be considered on a case-by-case basis. A request for variance shall be submitted in writing and include the reasons for the request. All requests will be considered fairly and without prejudice.

RULE 9.04 HEARINGS ON ENFORCEMENT ACTIONS

A) **Request for Hearing.** If the District receives a filed written request for hearing from a Respondent who has received a notice of violation from the District within thirty (30) days, the District shall decide at which Board meeting the enforcement action will be considered. The Board meeting which the enforcement action is considered under this Rule shall be considered the public hearing on the matter and fulfills the requirement, if any, for a public hearing.

B) **Open Meetings Notice.** Notice required by the Open Meetings Act shall be provided for the meeting.

C) **Notice of Hearing.** Notice of the hearing on the enforcement action shall be mailed to the Respondent by certified mail, return receipt requested, at least ten (10) days prior to the scheduled hearing date.

D) Oath. The Board will administer the oath to the staff, the Respondent, the Aggrieved Party, and anyone who makes oral comment on behalf of any Aggrieved Party in the enforcement action.

E) Appointment of Hearings Officer or Committee. The Board, in its sole discretion, may appoint a Hearings Officer or committee of the Board to conduct the hearing on the enforcement action. In this Rule, either procedure is referred to as a Hearing Body. Any hearing conducted by a Hearing Body shall be conducted in the same manner as provided under a Contested Case Hearing. At the close of the hearing, the Hearing Body, through the Hearings Officer or Presiding Officer, shall make a written recommendation to the Board. The recommendation shall become part of the record. The Board is not required to approve the recommendation of the Hearing Body.

F) Board Action. The Board shall issue a written order or resolution reflecting its decision.

G) Order or Resolution. The effective date of the written order shall be the date on which the District President signs the order or resolution. The order or resolution shall include a statement that the order or resolution becomes effective and final on that date. Any appeal authorized by Chapter 36,Water Code, shall run from the effective date, because it is the date on which all administrative appeals to the District are final.

H) Costs of Hearing. If the Respondent is proven to not be in compliance with the Rules of the District under which his permit was issued, the District and the Respondent will bear the costs of the hearing. If the Respondent is not proven to be in violation of the Rules of the District under which the permit was issued, the District and the Complainant will bear the costs of the hearing.

RULE 9.05 SEALING OF WELLS

Following public notice, the Board may order the sealing of a well that is in violation of District Rules or that has been prohibited from producing groundwater. The reasons for ordering the sealing of a well include, but are not limited to:

1) failure to apply for a test permit prior to drilling;

2) operating a well without the required permit; or

3) operating a well when the Board has denied, cancelled, or revoked a permit.

Once the Board has ordered a well sealed, the District, following the procedures in 9.01.D, shall seal the well by physical means, tag it to indicate that the well has been sealed by the District, or take any other appropriate action necessary to clearly indicate that the well has been sealed. The seal is intended to preclude operation of the well or identify unauthorized operation of the well.

Tampering with, altering, damaging, removing, or violating the seal of a sealed well in any way, or pumping groundwater from a well that has been sealed constitutes a violation of District Rules and subjects the person who performs that action, as well as the well owner, to enforcement and penalties pursuant to all applicable District Rules under which the permit was issued.

RULE 9.06 CAPPING OF WELLS AND CREATION OF LIENS

The District shall require an open uncovered well that is in a non-deteriorated condition to be capped to prevent waste, pollution, or prevent deterioration. The well shall remain capped until conditions that led to the capping are eliminated. The cap shall provide a sanitary seal to prevent the introduction of potential contaminants and shall be capable of sustaining a weight of at least four hundred (400) pounds. If the owner fails to close or cap the well in compliance with the District Rules, the District, following the procedures 9.01.D, shall cap the well. Reasonable expenses incurred by the District in capping a well shall constitute a lien on the land on which the well is located pursuant to Section 36.118, Water Code.

RULE 9.07 PLUGGING OF WELLS

The quality of our groundwater is important to the District. As such, it may be necessary to plug wells to protect the quality of our groundwater. If the condition of a well or the construction of a well causes contamination, the well shall be plugged or reconstructed to seal off the contaminating zone. All cost are the responsibility of the well owner.
The well owner may have up to one-hundred eighty (180) days to plug the well in accordance with TDLR, 16 TAC, Chapter 76, and seal off the contaminating zone within the well.

However, if the level of contamination is such that it becomes perilous to human or animal consumption, immediate action will be taken to seal off the contamination and if necessary, plug the well. Any costs incurred by the District in taking immediate action, if the well owner fails to take such action, shall create a lien upon and be assessed against the owner's land in accordance with Section 36.118, Water Code.

RULE 9.08 ARTESIAN WELLS

Artesian wells which are free flowing at the well head will be maintained in as good a condition as is practicably possible to limit leakage.

SECTION 10 -- REPEALED

SECTION 11 -- REPEALED

SECTION 12 -- RULES WITH PROCEDURES FOR RULEMAKING

RULE 12.01 CONSTRUCTION

Unless otherwise expressly provided for in these Rules, the past, present and future tense shall each include the other; the masculine, feminine and neutral gender shall each include the other; and the singular and plural number shall include the other.

RULE 12.02 USE AND EFFECT OF RULES

These Rules are used by the District as legal requirements in the exercise of the powers conferred by law and in the accomplishment of the purposes of the District Act and Chapter 36, Water Code. They shall not be construed as a limitation or restriction on the exercise of any discretion, where it exists, nor shall they be construed to deprive the District or Board of the exercise of any powers, duties or jurisdiction conferred by law; nor shall they be construed to limit or restrict the amount and character of data or information that may be required to be collected for the proper administration of the District Act or Chapter 36, Water Code.

RULE 12.03 HEADINGS AND CAPTIONS

The section and other headings and captions contained in these Rules are for reference purposes only and do not affect in any way the meaning or interpretation of these Rules.

RULE 12.04 SEVERABILITY

In case any one or more of the provisions contained in these Rules shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other Rules or provisions hereof, and these Rules shall be construed as if such invalid, illegal, or unenforceable Rule or provision had never been contained herein.

RULE 12.05 DEFINITION OF TERMS AND PHRASES

Unless expressly stated otherwise in any Rule, all terms and phrases shall be given the meaning assigned to them in the Glossary contained in the Appendix to these Rules, and if not defined therein, the meaning given to them by Chapter 36, Water Code, and if not contained therein, according to their plain and ordinary meaning.

RULE 12.06 AMENDING OF RULES

The Board may, following notice and hearing, amend or repeal these Rules or adopt new Rules from time to time.

RULE 12.07 RULEMAKING HEARING

A) Rulemaking Hearing. Not later than the twentieth (20th) day before the date of a rulemaking hearing, the Board shall:

1) post notice in a place readily accessible to the public at the District office;

2) provide notice to the county clerk of each County in the District;

3) publish notice in one or more newspapers of general circulation in the county or counties in which the District is located;

4) provide notice by mail, fax, or e-mail to any person who has requested notice under subsection E) below; and

5) make available a copy of all proposed Rules at a place accessible to the public during normal business hours.

B) Notice. The notice provided under subsection A) must include:

1) the time, date, and location of the rulemaking hearing;

2) a brief explanation of the subject of the rulemaking hearing; and

3) a location at which a copy of the proposed Rules may be reviewed or copied.

C) Conduct of Rulemaking Hearing. The District President or presiding officer shall conduct a rulemaking hearing in the manner the presiding officer determines to be most appropriate to obtain information and comments relating to the proposed rule as conveniently and expeditiously as possible. Comments may be submitted orally at the hearing or in writing. The presiding officer may hold the record open for a specified period after the conclusion of the hearing to receive additional written comments.

D) Hearing Registration Form. Each person who participates in a rulemaking hearing must submit a hearing registration form stating:

1) the person's name;

2) the person's address; and

3) whom the person represents, if the person is not at the hearing in the person's individual capacity.

E) Record of Hearing. The District President or presiding officer shall prepare and keep a record of each rulemaking hearing in the form of an audio or video recording or a court reporter transcription.

F) **Request to Receive Notice.** Any person may submit to the District a written request for notice of a rulemaking hearing. A request is effective for the remainder of the calendar year in which the request is received by the District. To receive notice of a rulemaking hearing in a later year, a person must submit a new request. An affidavit of an officer or employee of the District establishing attempted service by first class mail, facsimile, or e-mail to the person in accordance with the information provided by the person is proof that notice was provided by the District. Failure to provide notice under this subsection does not invalidate an action taken by the District at a rulemaking hearing.

G) **Consideration of Proposed Rules.** The District may use an informal conference or consultation to obtain the opinion and advice of interested persons about contemplated Rules and may appoint advisory committees of experts, interested person, or public representatives to advise the District about contemplated Rules.

RULE 12.08 EMERGENCY RULES

A) **Conditions for Adoption of Emergency Rules.** The Board may adopt an emergency Rule without prior notice or hearing, or with an abbreviated notice and hearing, if the Board:

1) finds a substantial likelihood of imminent peril to the public health, safety, or welfare, or a requirement of state or federal law, requires adoption of a Rule or less than twenty (20) days' notice; and

2) prepares a written statement of the reasons for its finding under subsection A)1), above.

B) **Duration of Emergency Rules.** Except as provided by subsection C), a Rule adopted under this section may not be effective for longer than ninety (90) days, unless notice of a hearing on the final Rule is given not later than the ninetieth (90th) day after the date the emergency Rule is adopted, in which case the emergency Rule will be effective for an additional ninety (90) days.

C) **Open Meetings Act Compliance.** A Rule adopted under this section must be adopted at an open and public meeting, held in accordance with Texas Government Code, Chapter 551.

END OF RULES

APPENDIX: GLOSSARY

DEFINITIONS OF TERMS

In the administration of its duties the District defines terms as set forth in Chapter 36, Water Code, unless otherwise modified or defined herein as necessary to apply to unique attributes of the District. The specific terms hereinafter defined shall have the following meaning in these Rules:

"Abandoned Well" shall mean a well that has not been used for six (6) consecutive months. A well is considered to be "in use" if it is a non-deteriorated well (as per the requirements of 16 TAC 76, TDLR Rules) in the following cases:

1) a well that contains the casing, pump, and pump column in good condition; or
2) a well that has been capped; or
3) an artesian flowing well with casing and a flow control device in good condition.

"Acre-foot" shall mean the amount of groundwater necessary to cover one acre of land to a depth of one foot (approximately 325,851 gallons).

"Agent" shall mean the person authorized to act on behalf of the landowner with respect to transactions involving the District or someone who acts on behalf of the District in the conduct of its business.

"Aggregate Wells" shall mean a well system comprised of two or more wells that are owned and operated by the same person or entity.

"Aggregate Withdrawal" shall mean the amount of groundwater withdrawn from two (2) or more registered wells in a water system which is permitted under a single permit for a total pumpage volume of all wells in the aggregate.

"Aquifer" or **"Groundwater Reservoir"** shall mean a hydrogeologic unit or a group of saturated hydrogeologic units capable of storing and yielding groundwater in usable quantities or a geologic formation or a group of saturated geologic formations capable of storing and yielding groundwater in usable quantities.

"Annular Space" shall mean the space between two (2) concentric cylindrical objects, one of which surrounds the other, such as the space between the walls of a drilled hole and the installed casing.

"Artesian Well" shall mean a groundwater well completed in the confined portion of an aquifer such that, groundwater will rise in the well, by natural pressure, above an overlying impermeable stratum.

"Authorized Well Site" shall mean the location of a proposed well on a valid permit (an authorized well site is not a permit to drill).

“Bentonite” shall mean a sodium hydrous aluminum silicate clay mineral (montmorillonite) commercially available in powdered, granular, or pellet form which may be mixed with potable water and used to provide a seal in the annular space between the well casing and borehole wall or used in the plugging of wells.

“Board” shall mean the Board of Directors of the Kinney County Groundwater Conservation District.

“Capped Well” shall mean a well that is closed or capped with a covering capable of preventing surface pollutants from entering the well and sustaining a weight of at least four-hundred (400) pounds and constructed in such a way that the covering cannot be easily removed by hand.

“Casing” shall mean a tubular watertight structure installed in the excavated or drilled hole, temporarily or permanently, to maintain the hole sidewalls against caving, and, along with cementing or bentonite grouting, to confine groundwater to its zone of origin and prevent surface contaminant infiltration. Casing diameter is the inside diameter of a well casing.

“Cement” shall mean a neat Portland construction cement mixture of not more than seven (7) gallons of water per ninety-four (94)-pound sack of dry cement, or a cement slurry which contains cement along with bentonite, gypsum, or other additives. All manufacturer’s recommendations regarding water content for the mix must be strictly adhered to.

“Chemigation” shall mean a process whereby pesticides, fertilizers or other chemicals, or effluent from animal or human wastes are added to irrigation water applied to land or crops, or both, through an irrigation system.

“Completion” shall mean sealing off the access of undesirable water to the well bore by proper casing or cementing procedures and adherence to State standards for completion.

“Discharge” shall mean the amount of water that leaves an aquifer by natural or artificial means.

“Director” shall mean an elected or appointed member of the Board of Directors of the District.

“District” shall mean the Kinney County Groundwater Conservation District, with its principal office in Brackettville, Texas. Where applications, reports, and other papers are required to be filed with or sent to “the District,” this shall mean the District’s Office, the mailing address of which is Post Office Box 369, Brackettville, Texas 78832.

“District Act” shall mean Chapter 8846, Special District Local Laws Code, and the non-conflicting provisions of Chapter 36, Water Code.

“Domestic Use” shall mean use of groundwater to supply the needs of a typical household, such as for drinking, washing, cooking, landscape watering, family gardening and watering of domestic animals, for which no monetary consideration is given or received. This includes the use of groundwater for home landscapes and home gardening on no more than two (2) acres of land.

“Drought Contingency Plan” has the meaning set forth under 30 TAC, Section 288.1.

“Evidence of historic or existing use” shall mean evidence that is material and relevant to a determination of the amount of groundwater beneficially used without waste by an Applicant during the relevant time period set by District Rule that regulates groundwater based on historic use. Evidence in the form of oral or written testimony shall be subject to cross-examination. The Texas Rules of Evidence govern the admissibility and introduction of evidence of historic or existing use, except that evidence not admissible under the Texas Rule of Evidence may be admitted if is of the type commonly relied upon by reasonably prudent persons in the conduct of their affairs.

“Existing Use Period” shall mean the time period from January 1, 1992, through January 7, 2003.

“**Existing and Historic Use Period**” shall mean the time period that includes the Existing Use Period from January 1, 1992, through January 7, 2003, and the Historic Use Period from January 1, 1960, through December 31, 1991.

“Existing Use” shall mean production and beneficial, non-wasteful use of groundwater from an aquifer located within the District during the Existing Use Period.

“Export of Groundwater” shall mean pumping, transferring, or moving groundwater out of the District, unless clearly indicated otherwise when read in context.

“Federal Conservation Program” the Conservation Reserve Program of the United States Department of Agriculture”

“Fees” shall mean charges imposed by the District pursuant to District Rule, order, resolution, or the District Act.

“Fiscal Year” shall mean the business year of the District which shall be established by Resolution of the Board.

“Groundwater or Underground Water” shall mean water percolating beneath the earth’s surface but does not include water produced with oil and gas production.

“Groundwater Right” shall mean a legally-definable right to produce groundwater from a certain tract of land evidenced by a written agreement or agreements with the landowner(s) such as a lease agreement, contract for sale, deed, or non-compete agreement.

"Historic Use" shall mean production and beneficial, non-wasteful use of groundwater from an aquifer located within the District during the Historic Use Period.

"Historic Use Period" shall mean the time period from January 1, 1960, through December 31, 1991.

"Industrial Use" shall mean the use of water in processes designed to convert materials of a lower order of value into forms having greater usability and commercial value, including commercial fish and shellfish production and the development of power by means other than hydroelectric, but does not include agricultural use.

"Irrigation" shall mean the application of water to plants or land in order to promote growth of plants, turf, or trees, excluding water used for domestic use.

"Irrigation Distribution System" shall mean a device or combination of devices having a hose, pipe or other conduit which connects directly to any groundwater well through which groundwater or a mixture of groundwater and chemicals which is drawn and applied to land. The term also includes a canal system. The term does not include any hand held hose sprayer or other similar device which is constructed so that an interruption in water flow automatically prevents any backflow to the water source.

"Modeled Available Groundwater"(MAG) shall mean the amount of water that may be withdrawn within the District for beneficial use in accordance with the desired future condition of the aquifer as determined under Section 36.108, Water Code.

"Management Plan" shall mean a comprehensive groundwater conservation plan adopted by the District pursuant to Section 36.1071, Water Code.

"Maximum Historic Use" shall mean the amount of groundwater that a permittee for an Existing Use Permit or a Historic Use Permit is authorized to withdraw from a well or aggregate wells located within the District, subject to the District's Rules and conditions imposed upon the Permit issued by the District. A permittee's Maximum Historic Use will be determined by the District upon demonstration of beneficial use during the Existing Use Period or Historic Use Period by the Applicant, and is equal to the following, unless proportionately adjusted:

1) for an Applicant who demonstrates beneficial use during the Existing and Historic Use Period and does not qualify under Subsection (2) of this definition, the Applicant's actual maximum beneficial use of groundwater from an aquifer excluding waste during any one (1) full calendar year of the Existing and Historic Use Period; or

2) for an Applicant who demonstrates beneficial use during the Existing Use Period, but, due to the Applicant's groundwater production activities not having been commenced before January 7, 2002, and thus not in operation for the full three hundred and sixty-five (365) days of the final calendar year of the Existing Use Period, the Applicant does not have beneficial use for one (1) full calendar year, the Applicant's extrapolated maximum beneficial use calculated as follows: the amount of groundwater that would normally have been placed to the same beneficial use without waste by the Applicant for the last full calendar year during the Existing Use Period for the applied-for purpose had the Applicant's activities been commenced and in operation for the full final calendar year during the Existing Use Period.

"Meter" shall mean a water flow measurement device which meets American Water Works Association standards for the line size, pressures, and flows, and which is properly installed according to the manufacturer's specifications, or other, alternative measuring method approved by the District capable of accurately measuring the actual volume of groundwater pumped and maintaining a cumulative record of measured flows. If the District approves an alternative measuring method, then the term "meter," when used in these Rules, shall also apply to the alternative measuring method.

"Meter Reading" shall mean a written report of the readings taken from the meter installed on a permitted well, as required by the District.

"Ministerial Permit Amendment" shall mean solely an amendment to a permit to reflect a change in ownership of a well, permit, or land directly overlying a well.

"Open Meetings Act" shall mean Chapter 551, Texas Government Code.

"Operator" shall mean and includes any individual, firm, partnership, or corporation or other legal entity that has the right to produce groundwater from the land either by ownership, contract, lease, easement or any other estate in the land.

"Overpumpage" shall mean the withdrawal or aggregate withdrawal of groundwater from a well or aggregate wells in excess of the amount authorized to be withdrawn in accordance with these Rules or a permit issued by the District.

"Person" shall mean any individual, partnership, firm, state governmental agency, political subdivision, corporation or other legal entity.

"Permit" shall mean an authorization issued by the District allowing the drilling, equipping, completion, or alteration of a specific, designated non-exempt use well or aggregate wells and withdrawal or aggregate withdrawal of a specific amount of groundwater from a non-exempt use well or aggregate wells for a designated purpose and period of time, subject to District Rules and conditions that may be necessary to prevent waste and achieve water conservation, minimize as far as practicable the drawdown of the water table or the reduction of artesian pressure, lessen interference between wells, or control and prevent subsidence.

"Plugging" shall mean the permanent closure of a well in accordance with approved District standards.

"Plugging Authorization" shall mean an authorization issued by the District which defines the methods for the permanent closure of a well.

“Pollution” shall mean the alteration of the physical, thermal, chemical, or biological quality of, or the contamination of, any water in the District that renders the water harmful, detrimental, or injurious to humans, animal life, vegetation, or property or to public health, safety, or welfare, or impairs the usefulness or the public enjoyment of the water for any lawful or reasonable purpose.

“Presiding Officer” shall mean the District President, Vice-President, Secretary, or other Board Member presiding at any hearing or other proceeding or a hearing examiner conducting any hearing or other proceeding.

“Public Information Act” shall mean Chapter 552, Texas Government Code.

“Pump, Pumpage, Produce, or Production” shall mean groundwater withdrawn, measured at the wellhead.

“Pump Installation” shall mean the procedures employed in the placement, and preparation for operation, of equipment and materials used to obtain groundwater from a well, including construction involved in establishing seals and safeguards as necessary to protect the groundwater from contamination. The term includes repairs to an existing pump.

“Recharge” shall mean the amount of water that infiltrates to the water table of the aquifer.”

“Recharge Zone” shall mean the area of an aquifer in which water infiltrates the surface and enters permeable rock layers.

“Re-equip” shall mean to replace any portion of the water producing equipment in a well.

“Registration” shall mean a certificate issued by the District for wells.

“Rework” shall mean to accomplish by any mechanical or chemical means the alteration of a well.

“Rules” shall mean the Rules of the District compiled herein, as may be repealed, or amended from time to time.

“SOAH” shall mean the State Office of Administrative Hearings.

“Spring” shall mean a point of natural discharge from an aquifer.

“Substantially alter” with respect to the size or capacity of a well means to increase the inside diameter of the pump discharge column pipe size of the well in any way or to otherwise increase the capacity of the well to produce groundwater in an amount more than five (5) percent greater than the well had the capacity to produce before the alterations.

“Sustainable Yield” the amount of water that can be produced from a well or well field production unit without jeopardizing the water supply to base spring flow, urban center wells, exempt use wells, historic permit users or existing permit users. Reduced artesian well flow is not considered detrimental to aquifer.

Types of Wells:

1) **"Deteriorated Well"** shall mean a well, the condition of which will cause, or is likely to cause, pollution of groundwater.

2) **"Dewatering Well"** shall mean a well used to remove groundwater from a construction site or excavation, or to relieve hydrostatic uplift on permanent structures.

3) **"Exempt Use Well"** shall mean a new or an existing well that is exempt from permitting under the laws of this State or these Rules and is not required to have a Regular, Existing Use, or Historic Use Permit to withdraw groundwater from an aquifer within the District.

4) **"Existing Well"** shall mean a well that was in existence or for which drilling commenced on or prior to January 7, 2003.

5) **"Leachate Well"** shall mean a well used to remove contamination from soil or groundwater.

6) **"Monitoring Well"** shall mean a well installed to measure some property of the groundwater or an aquifer that it penetrates, that does not produce more than five-thousand (5,000) gallons per year.

7) **"New Well"** shall mean a proposed well or a well for which drilling has commenced on or after January 8, 2003.

8) **"Non-exempt Use Well"** shall mean any well that does not fall within the exclusions or exemptions set forth in these Rules.

9) **"Public Water Supply Well"** shall mean a well that produces the majority of its water for use by a public water system or a well that produces water primarily for residential use, but may have incidental commercial, industrial or other use, and from which the water is sold or distributed to the users by the well owner or operator (may include non-profit public corporations or municipalities).

"Undesirable Water" shall mean water that is injurious to human health, to vegetation, to land, or to fresh water, or water that can cause pollution.

"Waste" shall have the meaning assigned by Chapter 36, Water Code, and in these Rules.
"Well" or **"Water Well"** shall mean and includes any artificial excavation constructed for the purpose of exploring for or producing or withdrawing groundwater, together with any device employed for such withdrawal.

“Well Operator” shall mean the person who operates a well or well system.

“Well Owner” shall mean the person who owns a possessory interest in: (1) the land upon which a well or well system is located; or (2) the well or well system.

“Well Log” or **“Well Report”** shall mean a record, made at the time of drilling, showing the depth, thickness, character of the different strata penetrated, location of any water-bearing strata, depth, size and character of casing installed, together with any other data or information required by the State or this Board and recorded on forms prescribed either by the State regulatory agency with jurisdiction thereof or by this Board.

“Well System” shall mean a group of wells connected or tied together by a pipeline or storage facilities.

“Withdraw” shall mean an act that results in taking groundwater from an aquifer by or through manmade facilities or conduits, including pumping or diverting groundwater from beneath the land surface by pumping or some other method or allowing groundwater to escape through a hole or other conduit that was created or altered by a person.

Appendix H

Evidence of Notice and Hearing

Laredo Field
Resume Norm
Amistad Dam

DEL RIO, TEXAS — U.S. Customs and Border Protection (CBP) Office of Field Operations (OFO) Laredo Field Office will reopen the Amistad Dam International Bridge after a closure due to maintenance issues.

On Wednesday, December 28, 2022, the Amistad Dam Port of Entry, located on Texas Spur 349 in Del Rio, Texas will reopen and resume their normal operating hours of 10:00 a.m. to 6:00 p.m., seven days a week.

Hours at the Del Rio Port of Entry as well as cargo operations remain unaffected.

CBP reminds the traveling public that effective on Nov. 8, foreign nationals who have been fully vaccinated for COVID-19 and have appropriate documentation will be permitted to enter the United States via land ports of entry (POEs) and

Public Notice

PUBLIC HEARING

Notice is hereby given that the Board of Directors of the Kinney County Groundwater Conservation District will hold a **PUBLIC HEARING** on Thursday, January 12, 2023 @ 9:00 a.m. at the Kinney County Groundwater Conservation District office located at 503 S. Ann, Brackettville, Texas. The hearing will be to take public comments on the proposed revised Groundwater Management Plan of the Kinney County Groundwater Conservation District and act thereon or schedule a further meeting of the Board of Directors to consider amendment (s) and / or approval and make subsequent submission for review by the Texas Water Development Board. A copy of the proposed revised management can be obtained by contacting the District Office by phoning (830) 563-9699, emailing kinneyh2o@att.net. , or by mailing P.O. Box 369, Brackettville, Texas. A copy of the proposed plan may be picked up at the District Office during regular business hours of operation Monday-Friday, 8a.m. to 4:00 p.m. A courtesy copy will be available for public viewing at the Kinney County Library.

This hearing will be scheduled in conjunction with the Districts Regular meeting on January 12, 2023, in accordance with the District's by-laws, Section 2.3.

It's the Most Wonderful Time

Chuck Hall

Christmas Eve is always a special event. At our house, it's when we unwrap gifts that we've exchanged. Giving and receiving is fun. This year was especially exciting. Cold as the north pole. Lots of broken pipes. Even though I took the usual precautions. Lots of work for m grandson who's in the pluming profession.

Said grandson and I were traveling to the ranch when a local DPS officer stopped us and told us to get off of the road. He told us to pull over because a high speed chase was coming about a mile away. We quickly obeyed. I immediately told Tanner this was something we needed to film with phones.

The police began to put out spike strips. I'm thinking I'm not in an enviable position. I mentally began to list all of the things that could happen to us. None of them were pleasant. As expected, here they came. Fugitive in front, several police cars following. In hot pursuit. I'm thinking I'll just let Tanner film. I'll get under the dash. Suddenly the bad guy swerves off of the road. Then I hear three pops. I instinctively know it's not fireworks. I also know it is certainly time to seek cover. But then it's over just that quick. Just roundup the criminals. I'll just mosey on my way and let the officers do their work.

Things can't get any more exciting. But they did. Later in the evening as we were taking family photos of every branch, my granddaughter's boyfriend steps up, drops to a knee and proposes. Tears flowed from every eye. Now that's exciting.

If you had a better Christmas Eve, I'd really like to hear about it. Mine was great.

But I could be wrong.

NOTICE OF
PUBLC HEARING AND REGULAR MEETING OF THE GOVERNING BOARD OF THE KINNEY COUNTY GROUNDWATER CONSERVATION DISTRICT

Notice is hereby given that a meeting of the Kinney County Groundwater Conservation District will be held **Thursday, January 12, 2023 at 9:00 a.m. at the district office, 503 S. Ann Street, Brackettville, Texas,** at which the following subjects will be discussed, to wit:

MEETING AGENDA

1. Call to order.
2. Establish a quorum.
3. Pledge of Allegiance.
4. Director/Public Comments.
5. Discussion/Possible Action: Approval of minutes from November 17 regular meeting.
6. Certification of Election: Issuance of Certificate of Election to each candidate elected to the board.
7. Oath of Office: Newly elected Directors will take oath of office.
8. Board will elect new officers.

Recess for Public Hearing: Permit Amendment (Randy Schott).

A. Open Public Hearing for testimony.
B. Comments from the Public.
C. Close the Public Hearing.

Recess for Public Hearing: Final Approval of 2023 Management Plan.

A. Open Public Hearing for testimony.
B. Comments from the Public.
C. Close Public Hearing.

Reconvene to Regular Session.

9. Discussion/Possible Action: Amend permit/Convert 70- acre feet from Ag. to Commercial use.
10. Discussion/Possible Action: Final Approval of 2023 Management Plan.

11. Financial statements for November 2022 and December 2022.

12. Review Monthly Investment Officer's Reports.

13. Discussion/Possible Action: Invoices received, and invoices paid.

14. Review Palmer Drought Index, TWDB monitor well, USGS streamflow, City of Brackettville water data, and MUD well data.

15. Discussion/Possible Action: Greg Ellis Engagement Letter.

16. Discussion/Possible Action: Adoption of the GMA 10 Desired Future Conditions and Relevant Aquifer Destinations.

17. Discussion/Possible Acton: Tire Disposal

18. Discussion/Possible Action: COLA/ or End of Year Bonus for employees.

19. General Manager's report on daily activities and upcoming events.

20. Adjourn.

I, the undersigned authority, do hereby certify that the above NOTICE OF MEETING of the Board of Directors of the Kinney County Groundwater Conservation District is a true and correct copy of said Notice. I have posted a true and correct copy of said Notice at the District's office, located in Brackettville, Texas, and said Notice was posted at __________ am/pm on Jan. 6 __________, 2023; a true and correct copy of said Notice was furnished to the Kinney County Clerk, in which the above named political subdivision is located.

Kinney County Groundwater Conservation District

By: Genell Hobbs
Genell Hobbs, General Manager

Appendix I

Coordination with Surface Water Entities

Bill Hutchison

From:	Genell Hobbs <kinneyh2o@att.net>
Sent:	Tuesday, January 17, 2023 1:31 PM
To:	pablo.garza@ibwc.gov; Nueces River Authority
Cc:	Bill Hutchison; Greg Ellis
Subject:	KCGCD management plan
Attachments:	KCGCD2023 Final Draft v2 NoApp.pdf

Dear Sirs,
By way of this email and the attached copy of the Kinney County Groundwater Conservation District Management Plan, we are advising you of our updated plan approved on January 12, 2023.

Sincerely,
Bonnie Brotherton
Administrative Assistant

Genell Hobbs
General Manager
Kinney County GCD
PO Box 369/503 S. Ann St.
Brackettville, TX 78832
PH: 830-563-9699
Fax: 830-563-9606