APPENDIX A

RESOLUTION ADOPTING THE MANAGEMENT PLAN

RESOLUTION OF THE BOARD OF DIRECTORS OF THE REEVES COUNTY GROUNDWATER CONSERVATION DISTRICT ADOPTING A DISTRICT MANAGEMENT PLAN

THE STATE OF TEXAS §
§
COUNTY OF REEVES §

WHEREAS, Reeves County Groundwater Conservation District (District) is a duly created and existing groundwater conservation district created and operating under Chapter 8876 of the Texas Special District Laws Code and Chapter 36 of the Texas Water Code, as amended;

WHEREAS, the Management Plan of the District has been developed for the purpose of conserving, preserving, protecting, and recharging the aquifers in the District, and this action is taken under the District's statutory authority to prevent waste and protect rights of owners of interest in groundwater;

WHEREAS, after notice and hearing the Board of Directors ("Board") of the District adopted a Management Plan on July 31, 2018; and

WHEREAS, the Management Plan meets the requirements of Texas Water Code § 36.1071 and § 36.1072 and 31 TAC § 356. 52.

NOW THEREFORE, BE IT RESOLVED AND ORDERED BY THE BOARD OF DIRECTORS OF REEVES COUNTY GROUNDWATER CONSERVATION DISTRICT THAT:

1. The facts and recitations found in the preamble of this Resolution are hereby found and declared to be true and correct, and are incorporated by reference herein and expressly made a part hereof, as if copied verbatim.

2. The Board of Directors of the District hereby adopts the Management Plan for the District, subject to those amendments necessary based on comments received from the public at the public hearing or Board meeting, recommendations from the District Board, General Manager, or legal counsel, or to incorporate information received from the Texas Water Development Board (TWDB) and/or District consultants.

3. The General Manager of the District is hereby authorized to take all steps necessary to implement this resolution and submit the Management Plan to TWDB for its approval.

4. The General Manager of the District is further authorized to take any and all action necessary to coordinate with the TWDB as may be required in furtherance of TWDB's approval pursuant to the provisions of Section 36.1072 of the Texas Water Code.

PASSED AND APPROVED this the 31st day of July, 2018.

President, Board of Directors

ATTEST:

Secretary, Board of Directors

APPENDIX B

EVIDENCE THAT THE MANAGEMENT PLAN WAS ADOPTED

NOTICE OF PUBLIC HEARING AND MEETING
REEVES COUNTY GROUNDWATER CONSERVATION DISTRICT
119 South Cedar St.
Pecos, Texas 79772
Tuesday, July 31, 2018 at 5:00 p.m.
Public Hearing and Meeting Agenda

1. Call to order and declare a quorum.
2. Public Comment.
3. Discussion and action on appointment of director, completion of sworn statement, administration of oath of office and approval of bond.
4. Discussion and action to approve minutes of the June 21, 2018 Board Meeting.
5. Discussion and action on financial statements/bank statements.
6. Discussion and action on payment of current bills.
7. Public hearing on proposed District Management Plan
8. Discussion and action on District Management Plan including adoption of resolution.
9. Discussion and action on proposed draft rules.
10. Discussion and action on FY 2019 Budget.
11. Discussion and action on amending Investment Policy including adoption of resolution.
12. Discussion and action on District website.
13. Discussion and action on method to pay Texas Workforce Commission for unemployment benefits.
14. Discussion and action on Annual Financial Audit engagement letter for year 2018.
15. General Manager's Report:
    a. Texas Alliance of Groundwater Districts Symposium update
    b. Current stakeholder meetings & correspondence
    c. Office and vehicle update
16. Discussion and action on correspondence received.
17. Discussion and action on date and time of next Board Meeting.
18. Discussion and action on items to consider at next Board meeting.

01109381;1

19. Adjourn.

DATED this 27th day of July, 2018, and posted this 27th day of July, 2018 at 1:20 p. m.

Reeves County Groundwater Conservation District

By: _____
Greg Perrin, General Manager

POSTED
1:21 o'clock p M
JUL 27 2018
DANICE O. FLORES
REEVES COUNTY CLERK, REEVES COUNTY, TEXAS
BY Mytta Miranda

01109381;1

Affidavit of Publication

STATE OF TEXAS

COUNTY OF REEVES

Before me, the undersigned authority, on this day personally appeared

CHRISTINA BITOLAS (Name), the ADVERTISING MANAGER (Title) of the

PECOS ENTERPRISE (Name of Newspaper), a newspaper having general circulation in

REEVES County, Texas, who being by me duly sworn, deposes and

says that the foregoing attached notice was published in said newspaper on the following

date(s), to wit: July 12, 2018.

Christina Bitolas
Signature

Subscribed and sworn to before me this the 26 day of

July, 2018, to certify which witness my hand and seal of office.

LAURA A. RODRIGUEZ
My Commission Expires
January 31, 2019

Laura Rodriguez
Notary Public in and for

REEVES County, Texas

The Idle American

Rain on Priceline Parade...

Commentary by Dr. Don Newbury

The fingers of one hand are more than enough to count the disparaging columns I've written about online purchases that I feel warrant "red alert" warnings.

There's a current issue, however--intended to be a "let-the-buyer-beware" suggestion-- that could save travelers both money and grief.

It concerns a respected company, Priceline©, best known for allowing us to bid on hotel rooms. It also dabbles in other ventures....

*****

For the hotel side of Priceline©, I say "amen," having booked rooms more than 100 times during the company's first two decades of operation. I likely will continue to do so, having faced minimal problems while saving considerable cash.

Priceline© also rents automobiles, and it's my hope that this practice becomes an aborted dabble, like several others in its history.

While I am certain Priceline© demands that participating hotels meet certain standards for each "star level" claimed, such indices don't seem to apply to its car rental companies....

*****

I know. All that glitters isn't gold, and sometimes doesn't even save the couple of dollars expected when one falls for the allure in ads and ignores the fine print.

More than three months ago, I sought a Priceline© car rental at the Denver Airport. I was notified by Ace Rent A Car that my vehicle awaited. However, I learned the day before the scheduled pick-up that Ace was "no longer in business." However, I was assured that "my contract would be honored by Fox Rent A Car."

I should have checked Yelp ratings first. Renters rated Ace #107 among car rental locations in Denver, and Fox wasn't even to be found....

*****

Fox Renters are "yelping on Yelp," however, 767 times so far.

The "Yelpers" cite numerous common shortcomings, and 599 offer just one "star," many indicating they would have cited "no star" if the provision were offered. ("Yelpers" suggest the fleet may resemble the one my late "Uncle Cecil" accumulated. He was an undertaker who often accepted used cars as partial payment for funerals. "Usually, the cars 'jumped naked' on me," he used to say.)

I would be a "no star" respondent, too, had there been a place to check "ZERO."...

*****

I spoke with a Priceline© customer relations guy. He was cordial and understanding--or seemed to be--but couldn't understand why I felt my multiple issues with Fox involved his company. He urged me to take it up with Fox.

Unhappy "renters" cite many shortcomings. Many are repetitious, so surely Priceline© is aware of them. And if they're not, they should be. Shame on William Shatner, the company's ad guy said to earn millions annually for his ad endorsements.

Fox Rent A Car "hit" my Sam's MasterCard bill for a third straight month, assessing a charge of $111.90 for "tolls and fines." No doubt, the Fox folks didn't expect my wife to give the bill (and all of our bills) the "fine-toothed-comb" treatment....

*****

I would rent a camel before giving Fox Rent A Car another chance.

Priceline© for hotels remains "at the top" in my book. It will remain there if the "tolls and fines" are cleared. Ten weeks ago, I wrote with tongue in cheek about the misadventures involved in trying to return the rental car. We arose at the Priceline©-booked Aurora, CO, Radisson Hotel, at 2:30 a.m. to make the 6 a.m. flight, 19 miles away (mostly freeway). Unable to find the Fox rental car return, we missed our flight. For this writing, my tongue is retracted, and my teeth are gritted over this ongoing miserable experience.

This gloom is overshadowed, however, by the loss of our rescue dog, Sadie, who had to be put away last week. We'd had her 11 of her estimated 13-15 years, and are saddened that she had too many health issues to overcome. We still have one rescue canine, a dachshund named Sailor. He scrunches beside me in my lounger every day at naptime....

*****

Dr. Newbury is a former educator who "commits speeches" round about. Comments/inquiries to: newbury@speakerdoc.com. Phone: 817-447-3872. Web site: www.speakerdoc.com Twitter: @donnewbury. Facebook: don newbury.

Capital Highlights

Paxton sends letters to cities that passed bag ban ordinances

By ED STERLING

AUSTIN — Texas Attorney General Ken Paxton on July 2 notified 11 Texas cities that their ordinances against plastic shopping bags had been knocked down by the Texas Supreme Court.

Paxton said he issued letters to the cities of Austin, Sunset Valley, Port Aransas, Laguna Vista, Fort Stockton, Eagle Pass, Corpus Christi, Brownsville, Kermit, Freer and South Padre Island "to ensure awareness of the recent ruling and waste management responsibilities Texas law places on municipalities."

In January, the state Supreme Court heard arguments in the City of Laredo v. Laredo Merchants Association and on June 22 the court struck down the bag ordinance. The city maintained it was not a bag ban but "an incremental implementation plan towards a cleaner city."

However, the Supreme Court upheld an appeals court ruling siding with the merchants association in finding that the state's Solid Waste Disposal Act preempts the city's ordinance, and no city ordinance may conflict with a state law.

Request for aid granted

Gov. Greg Abbott's federal disaster request for individual assistance for Cameron and Hidalgo counties following recent severe weather and flooding has been granted, the governor's office announced July 6.

Abbott made the request to the Federal Emergency Management Agency on June 26 after visiting Edinburg, where local officials briefed him on the flooding and response and recovery efforts following a storm that hit South Texas June 18-22. The weather event and its aftermath are being referred to as "The Great June 2018 Flood." The National Weather Service has estimated that the event's breadth and impact could turn out to be greater than that of Hurricane Dolly in 2008.

"I thank the president and his administration for their swift response to aid Texans in the Rio Grande Valley as they continue to recover from these devastating floods. Going forward, the state of Texas will continue to work with local leaders to ensure the needs of those affected by the floods are being met," Abbott said.

Illnesses tied to parasite

The Texas Department of State Health Services on July 2 announced some 56 cases of illness caused by the microscopic parasite Cyclospora had been identified since the beginning of May.

Cyclosporiasis is an intestinal illness caused by the consumption of food or water contaminated with Cyclospora. The main symptom of the illness is watery diarrhea lasting from a few days to a few months.

State and local health agencies are working to determine if there is a common source for the infections. They recommend thorough washing of all fresh produce.

Revenue total increases

Texas Comptroller Glenn Hegar on July 3 announced state sales tax revenue totaled $2.77 billion in June, an amount 13.7 percent more than reported for the month of June 2017.

Sales tax revenue increased for almost all major economic sectors, Hegar said. "The strong revenue growth was led by collections from the mining and manufacturing sectors. The construction, wholesale and retail trade sectors also saw strong gains," he added.

Also, total sales tax revenue for the three months ending in June 2018 was up 12.4 percent compared to the same period a year ago.

Sales tax revenue is the largest source of state funding for the state budget, accounting for 58 percent of all tax collections. Revenue from other major taxes on motor vehicle sales and rentals, motor fuel and oil and natural gas production also rose in June 2018, Hegar said.

More details are available online via the Comptroller's Monthly State Revenue Watch at comptroller.texas.gov.

Inspection totals released

The Texas Department of Public Safety announced some 7,980 commercial motor vehicles were inspected in Roadcheck 2018, a national commercial motor vehicle safety effort conducted June 5-7.

Commercial vehicle enforcement troopers, specially trained highway patrol troopers, civilian inspectors, compliance review investigators and local partner agencies participated in the effort, in which 1,975 of the 18-wheelers, buses and other commercial vehicles inspected were placed out of service for a variety of safety violations until appropriate repairs could be made. Issues with brakes and defective tires were among the most common infractions that led to out-of-service violations.

Drivers also were checked for compliance with state and federal laws, and 301 drivers were placed out of service. Among the violations were failing to have the proper type of driver license for the vehicle being driven and violation of hours-of-service limits.

In all, 1,258 citations and 18,178 warnings were issued, the DPS said.

Legal

NOTICE OF DRAWING FOR PLACE ON BALLOT

Notice is hereby given of a drawing to determine the order in which the names of candidates are to be printed on the ballot for the election to be held on JULY 5 (date), 20 18 in REEVES (name of political subdivision), Texas. The drawing will be held at 5 PM (~~AM~~) (p.m.) (hour) on JULY 5 (date) 20 18 at 100 S 4th ST, ROOM 100 (address, including room number, if applicable), PECOS (city), Texas.

DIANNE O. FLOREZ
Officer Conducting Drawing

AVISO DEL SORTEO PARA UN LUGAR EN LA BOLETA

Por la presente se da aviso que habrá un sorteo para determinar la orden en que aparecerán los nombres de los candidatos en la boleta para la elección que se celebrará el 3 DE JULIO (fecha) 20 18 *en* REEVES (nombre de la subdivisión política), *Texas. El sorteo tendrá lugar a las* 5 PM (~~AM~~) (p.m.) (hora) *el* 3 DE JULIO (fecha) 20 18 *a* 100 S 4TH ST, CUARTO 100 (dirección, incluyendo el número del cuarto, si aplicable), PECOS (ciudad), *Texas.*

DIANNE O. FLOREZ
Oficial Municipal del Sorteo

Legal

NOTICE OF PUBLIC HEARING

Notice is given that the Reeves County Groundwater Conservation District Board of Directors will hold a public hearing on the adoption of a Management Plan at its regularly scheduled public meeting on Tuesday, July 31, 2018, at 119 South Cedar Street, Pecos, Texas 79772. The public meeting will begin at 5:00 p.m. and the public hearing will take place during the public meeting and will begin about, but no earlier than 5:15 p.m.

A copy of the proposed Management Plan is available for inspection at the District office 119 South Cedar Street, Pecos, Texas 79772.

Legal

NOTICE OF APPLICATION AND PUBLIC AUCTION

This notice is published by authority of the Texas Natural Resources Code 52.186(b)(2) All owners of the soil, known and unknown, are on notice that entities are attempting to enter into an oil and gas lease on the property mentioned herein. An undivided 20% of 30/1968 S Mineral Interest in Sections 6,8, and 10, Block 143, T&ST L RY Co survey, Pecos County, Texas executed as appears in Volume 583, Page 457 of the county deed records, Pecos County, Texas

An application has been submitted to the Texas General Land Office to deem the owner of said soil unavailable for purposes of entering into a mineral lease

If the owner of the soil has not contacted the Texas General Land Office within 30 days after the completion of this notice, then the owner of the soil will be deemed unavailable to act as the state's leasing agent and the School Land Board may lease the state's mineral interest

Individuals who believe they have title to the soil and / or minerals should contact

Texas General Land Office,
Mineral Leasing Division,
1700 N. Congress Ave., Ste. 840,
Austin, Texas 78701-1495
(800) 998-4GLO (4456)

This posting serves as notice to all heirs, known and unknown, that all mineral rights in the property will be put up for lease by the Texas General Land Office at public auction on October 2nd at 9:00 a.m.

Date: June 11, 2018

Scott Phillips

Scott Phillips
Corporate Legal Counsel
Optima Land Services, LLC
415 W. Wall Street, Suite 105
Midland, Texas 79701
Office: 432-555-3117

APPENDIX C

EVIDENCE THAT THE

DISTRICT COORDINATED DEVELOPMENT OF THE MANAGEMENT

PLAN WITH SURFACE WATER ENTITIES

From: Greg <gjp1953@hotmail.com>
Sent: Wednesday, August 1, 2018 11:15 AM
To: manager@rcwid1.net; redbluff@windstream.net; lynn.wright@tpwd.texas.gov
Cc: stephen.allen@twdb.texas.gov; Bill Dugat; Laughlin, Kristie
Subject: Reeves County Groundwater Conservation District
Attachments: Reeves County GCD Management Plan August 1 2018_Optimized.pdf

To Whom It May Concern:

This email is to notify you of the recent adoption of the Reeves County Groundwater Conservation District ("District") Management Plan, developed and adopted in accordance with Chapter 36 of the Texas Water Code and Title 31 Texas Administrative Code Chapter 356. The District's boundaries are coextensive with the boundaries of Reeves County, Texas. The purpose of the District Management Plan is to identify the water supplies and demands within the District and to define the goals that the District will use to manage the groundwater resources in the District. The District Management Plan is the product of a public planning process that culminated in the adoption of the plan by the District's board of directors after a public hearing held on July 31,2018, following appropriate public notice. The District submits the Management Plan to you in accordance with Section 36.1071(a) of the Texas Water Code to coordinate with you on the District's management goals.

Please feel free to contact me if you have any questions or comments regarding the District Management Plan or other District activities.

Greg Perrin

General Manager

cc:

Stephen Allen, Texas Water Development Board

Bill Dugat, Bickerstaff Heath Delgado Acosta LLP

Kristie Laughlin, WSP

APPENDIX D

REEVES COUNTY GCD DRAFT RULES

For a current copy of the Draft Rules go to the REGULATIONS drop down tab which is just to the right of the ORGANIZATIONS drop down tab.

APPENDIX E

GAM RUNS

GAM Run 16-027 MAG: Modeled Available Groundwater for the Aquifers in Groundwater Management Area 3

Radu Boghici, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5808
March 14, 2018

3/14/2018

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MODELED AVAILABLE GROUNDWATER FOR THE AQUIFERS IN GROUNDWATER MANAGEMENT AREA 3

Radu Boghici, P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
(512) 463-5808
March 14, 2018

EXECUTIVE SUMMARY:

The modeled available groundwater for the relevant aquifers of Groundwater Management Area 3—the Capitan Reef Complex, Dockum, Edwards-Trinity (Plateau), Pecos Valley, and Rustler aquifers—are summarized by decade for use by the groundwater conservation districts (Tables 1, 3, 5, and 7) and by the regional water planning process (Tables 2, 4, 6, and 8). The modeled available groundwater estimates are: 381 acre-feet per year in the Capitan Reef Complex Aquifer; 17,378 acre-feet per year in the Dockum Aquifer; 420,541 acre-feet per year in the Edwards-Trinity (Plateau) and Pecos Valley aquifers; and 2,590 acre-feet per year in the Rustler Aquifer. The modeled available groundwater estimates were extracted from results of model runs using the following groundwater availability models: Eastern Arm of the Capitan Reef Complex, the alternative model for the Edwards-Trinity (Plateau) and Pecos Valley, High Plains Aquifer System, and Rustler aquifers. The explanatory report and other materials submitted to the Texas Water Development Board (TWDB) were determined to be administratively complete on December 8, 2017.

REQUESTOR:

Mr. Ty Edwards, coordinator of Groundwater Management Area 3.

DESCRIPTION OF REQUEST:

In a letter dated February 15, 2017, Dr. William R. Hutchison, on behalf of Groundwater Management Area 3, provided the TWDB with the desired future conditions of the Capitan Reef Complex, Dockum, Edwards-Trinity (Plateau), Pecos Valley, and Rustler aquifers adopted by the groundwater conservation districts in Groundwater Management Area 3. The groundwater conservation districts in Groundwater Management Area 3 proposed to adopt desired future conditions for these aquifers on April 26, 2016. The groundwater conservation districts in Groundwater Management Area 3 adopted the desired future conditions, described in Resolutions No. 16-01, 16-02, 16-03, 16-04, and 16-05, on October 20, 2016. On December 13, 2017, the groundwater conservation districts revised the desired future conditions for the Edwards-Trinity (Plateau) and Pecos Valley aquifers, described in Resolution No. 17-01. The final desired future conditions for the relevant aquifers in Groundwater Management Area 3 are listed below:

Capitan Reef Complex Aquifer

- Total net drawdown not to exceed 4 feet in Pecos County (Middle Pecos GCD) in 2070 as compared with aquifer levels in 2006 [...];
- Total net drawdown in Ward and Winkler Counties no (sic) to exceed 2 feet in 2070 as compared with in 2006 aquifer levels [...];
- The Capitan Reef Aquifer is not relevant for joint planning purposes in all other areas of Groundwater Management Area 3.

Dockum Aquifer

Total net drawdown in the following counties not to exceed drawdowns in 2070, as compared with aquifer levels in 2012 [...]:

County (GCD)	No. Feet of Drawdown 2070
Crane	0
Loving	5
Pecos (Middle Pecos GCD)	52
Reeves (Reeves County GCD)	20
Ward	30
Winkler	22

Edwards-Trinity (Plateau) and Pecos Valley aquifers

Average drawdown in the following counties not to exceed drawdowns from 2010 to 2070 [...]:

County (GCD)	Average Drawdown 2010 to 2070
Crane	58
Loving	5
Pecos (Middle Pecos GCD)	14
Reeves (Reeves County GCD)	8
Ward	63
Winkler	161

Rustler Aquifer

Total net drawdowns in the following counties not to exceed drawdowns in 2070, as compared with 2009 aquifer levels [...]:

County (GCD)	No. of Feet of Drawdown 2070
Loving	28
Pecos (Middle Pecos GCD)	69
Reeves (Reeves County GCD)	40
Ward	30
Winkler	31
The Rustler Aquifer is not relevant for joint planning purposes in Crane County	

In Resolution 16-05, Groundwater Management Area 3 declared the Igneous and Ogallala aquifers non-relevant for joint planning purposes.

TWDB staff reviewed the model files associated with the desired future conditions and received clarification on procedures and assumptions from the Groundwater Management Area 3 Technical Coordinator on March 13 and 15, 2017. Clarification requests included drawdown calculation methodologies, whether drawdown averages and modeled available groundwater values should be based on official aquifer extent or model extent, and whether to include pass-through layers in drawdown averaging for Dockum Aquifer.

On December 13, 2017, groundwater conservation districts changed the desired future conditions for the Edwards-Trinity (Plateau) and Pecos Valley aquifers from the values

adopted on February 15, 2017 to the values listed in the desired future conditions summary listed above. These changes were based on the analysis done by Dr. Hutchison in Technical Memorandum 17-01 (2017). In a response on November 6, 2017 to a request for clarifications from the TWDB, the consultant for Groundwater Management Area 3, Dr. Hutchison, explained how he had developed model files that computed average drawdowns and modeled available groundwater volumes for the Dockum Aquifer. To be consistent with this approach, the TWDB excluded the pass-through cells from drawdown averaging thereby reducing the modeled available groundwater volumes.

In another response on November 20, 2017 to a request for clarifications from the TWDB, Dr. Hutchison revised the model files to support the update of the desired future condition for the Edwards-Trinity (Plateau) and Pecos V alley aquifers by Groundwater Management Area 3. On December 14, 2017, Dr. Hutchison submitted an update to the Technical Memorandum 17-01 for the Edwards-Trinity (Plateau) and Pecos Valley aquifers reflecting the revised desired future conditions and associated pumping volumes.

METHODS:

The TWDB attempted to replicate the predictive modeling scenarios submitted by Groundwater Management Area 3 that achieved the adopted desired future conditions. As part of this investigation, the TWDB used the same models used by Dr. Hutchison to extract simulated water levels for the baseline year (2006, 2009, 2010, and 2012 depending on each aquifer's desired future condition statement) and for year 2070, and drawdown was calculated as the difference between water levels in the start year and water levels in 2070.

The individual drawdowns in all active model cells were averaged by aquifer for each county and groundwater conservation district. Any dry model cells (that is, cells where simulated water levels dropped below the base of the cells) were included in the averaging. The calculated drawdown averages were compared with the desired future conditions to verify that the pumping scenario achieved the desired future conditions within one foot. The calculated drawdown averages compared well with the desired future conditions and verified that the desired future conditions adopted by the districts can be achieved within the assumptions and limitations associated with each groundwater availability model. Modeled available groundwater volumes were determined by extracting pumping rates by decade from the model results using ZONEBUDGET Version 3.01 (Harbaugh, 2009). Annual pumping rates by aquifer are presented by county and groundwater conservation district, subtotaled by groundwater conservation district, and then summed for Groundwater Management Area 3 (Tables 1, 3, 5, and 7). Annual pumping rates by aquifer are also

presented by county, river basin, and regional water planning area within Groundwater Management Area 3 (Tables 2, 4, 6, and 8).

Modeled Available Groundwater and Permitting

As defined in Chapter 36 of the Texas Water Code, "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 in order 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.

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 3.
- 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.

Dockum Aquifer

- 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 (2016b) 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 where the Dockum Aquifer was absent but provided pathway for flow between the Lower Dockum and the Ogallala or Edwards-Trinity (High Plains) aquifers vertically. 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.
- The model was run for the interval 2012 through 2070 for a 58-year predictive simulation. Drawdowns were calculated by subtracting 2012 simulated water levels from 2070 simulated water levels, which were then averaged over the portion of the aquifer in Groundwater Management Area 3.
- 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 3.

Edwards-Trinity (Plateau) and Pecos Valley Alluvium Aquifers

- The single-layer numerical groundwater flow model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers 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 (2011) and Anaya and Jones (2009) for assumptions and limitations of the model. See Hutchison (2016c) 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 2005 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 3. We are unable to verify that water levels in the model for 2010 were compared to measured water levels.
- Drawdowns for cells with water levels below the base elevation of the cell ("dry" cells) were included in the averaging.

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.
- 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 3. 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.

RESULTS:

Tables 1 through 8 show the combination of modeled available groundwater for relevant aquifers in Groundwater Management Area 3 summarized (1) by county, river basin, and

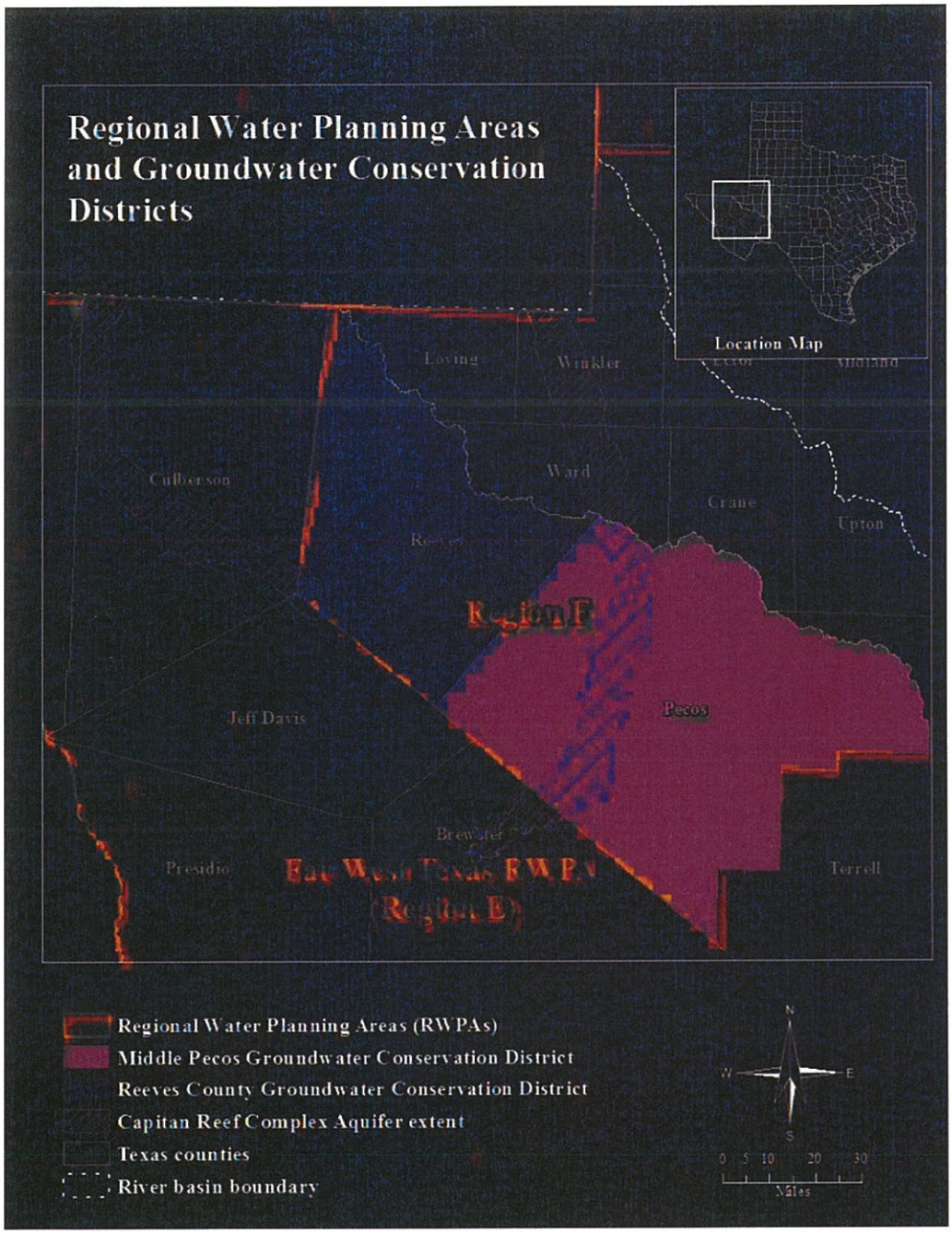
regional water planning area for use in the regional water planning process; and (2) by groundwater conservation district and county.

The modeled available groundwater for the Capitan Reef Complex Aquifer that achieves the adopted desired future conditions is 381 acre-feet per year between 2020 and 2070 (Tables 1 and 2).

The modeled available groundwater for the Dockum Aquifer that achieves the adopted desired future conditions is 17,378 acre-feet per year between 2020 and 2070 (Tables 3 and 4).

The modeled available groundwater for the Edwards-Trinity (Plateau) and Pecos Valley Alluvium aquifers that achieves the adopted desired future conditions is 420,541 acre-feet per year between 2020 and 2070 (Tables 5 and 6).

The modeled available groundwater for the Rustler Aquifer that achieves the adopted desired future conditions is 2,590 acre-feet per year between 2020 and 2070 (Tables 7 and 8).


Regional Water Planning Areas and Groundwater Conservation Districts
Location Map
Loving
Winkler
Culberson
Ward
Crane
Upton
Reeves
Region F
Pecos
Jeff Davis
Brewster
Presidio
Terrell
Regional Water Planning Areas (RWPAs)
Middle Pecos Groundwater Conservation District
Reeves County Groundwater Conservation District
Capitan Reef Complex Aquifer extent
Texas counties
River basin boundary
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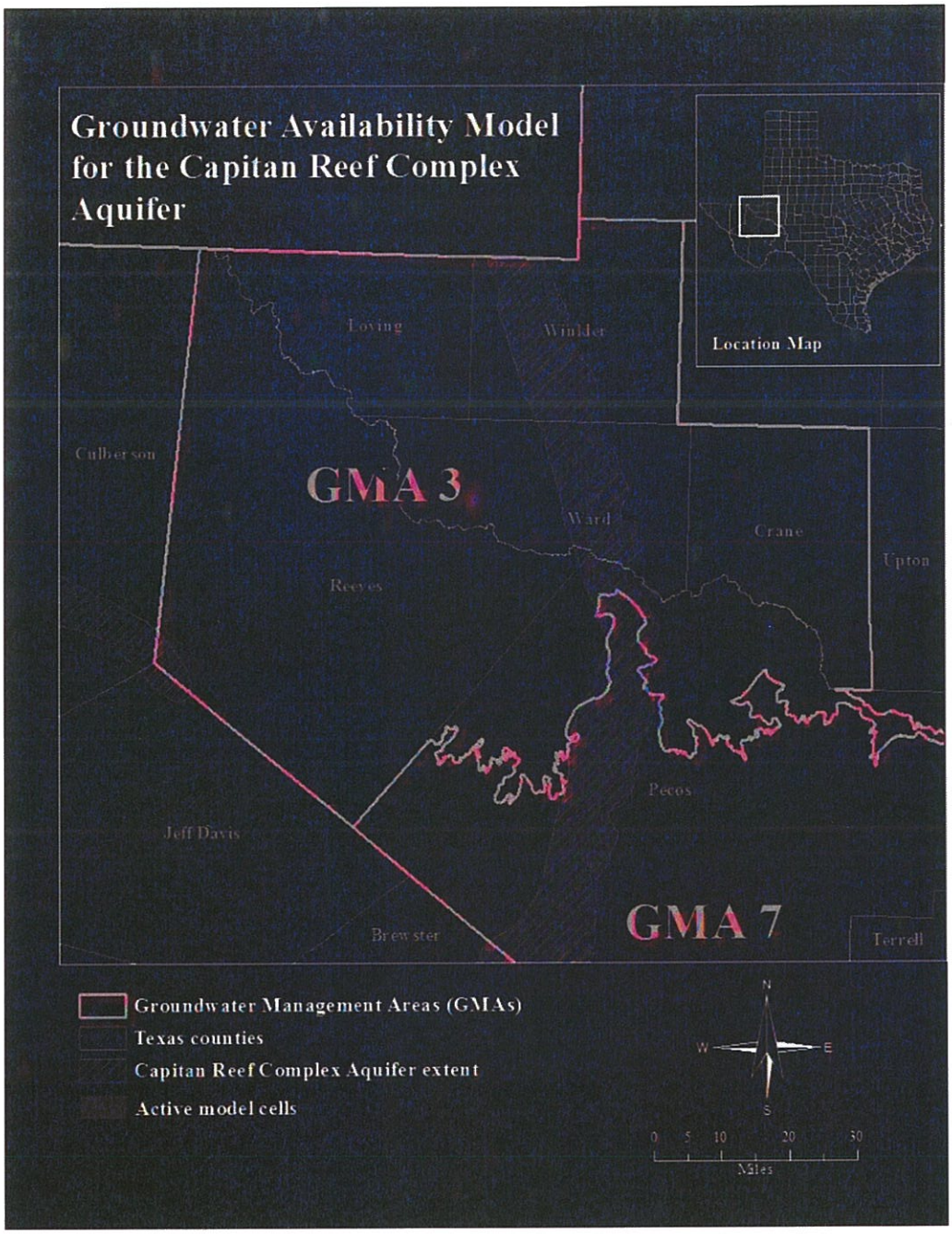
Miles


Groundwater Availability Model for the Capitan Reef Complex Aquifer
Location Map
Loving
Winkler
Culberson
GMA 3
Ward
Crane
Upton
Reeves
Pecos
Jeff Davis
Brewster
GMA 7
Terrell
Groundwater Management Areas (GMAs)
Texas counties
Capitan Reef Complex Aquifer extent
Active model cells
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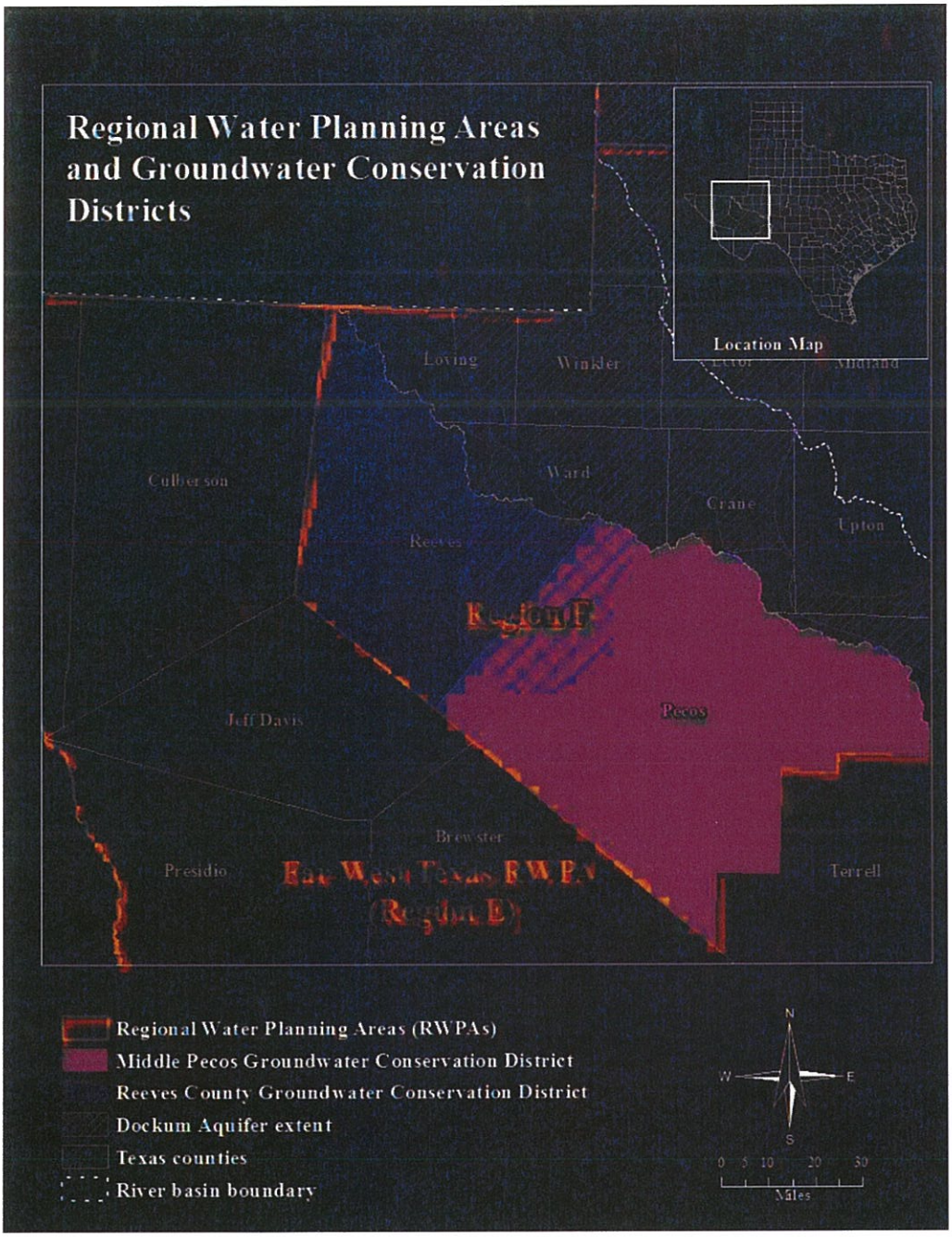
Regional Water Planning Areas and Groundwater Conservation Districts
Location Map
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Region F
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Jeff Davis
Brewster
Presidio
Terrell
Far West Texas RWPA (Region E)
Regional Water Planning Areas (RWPAs)
Middle Pecos Groundwater Conservation District
Reeves County Groundwater Conservation District
Dockum Aquifer extent
Texas counties
River basin boundary
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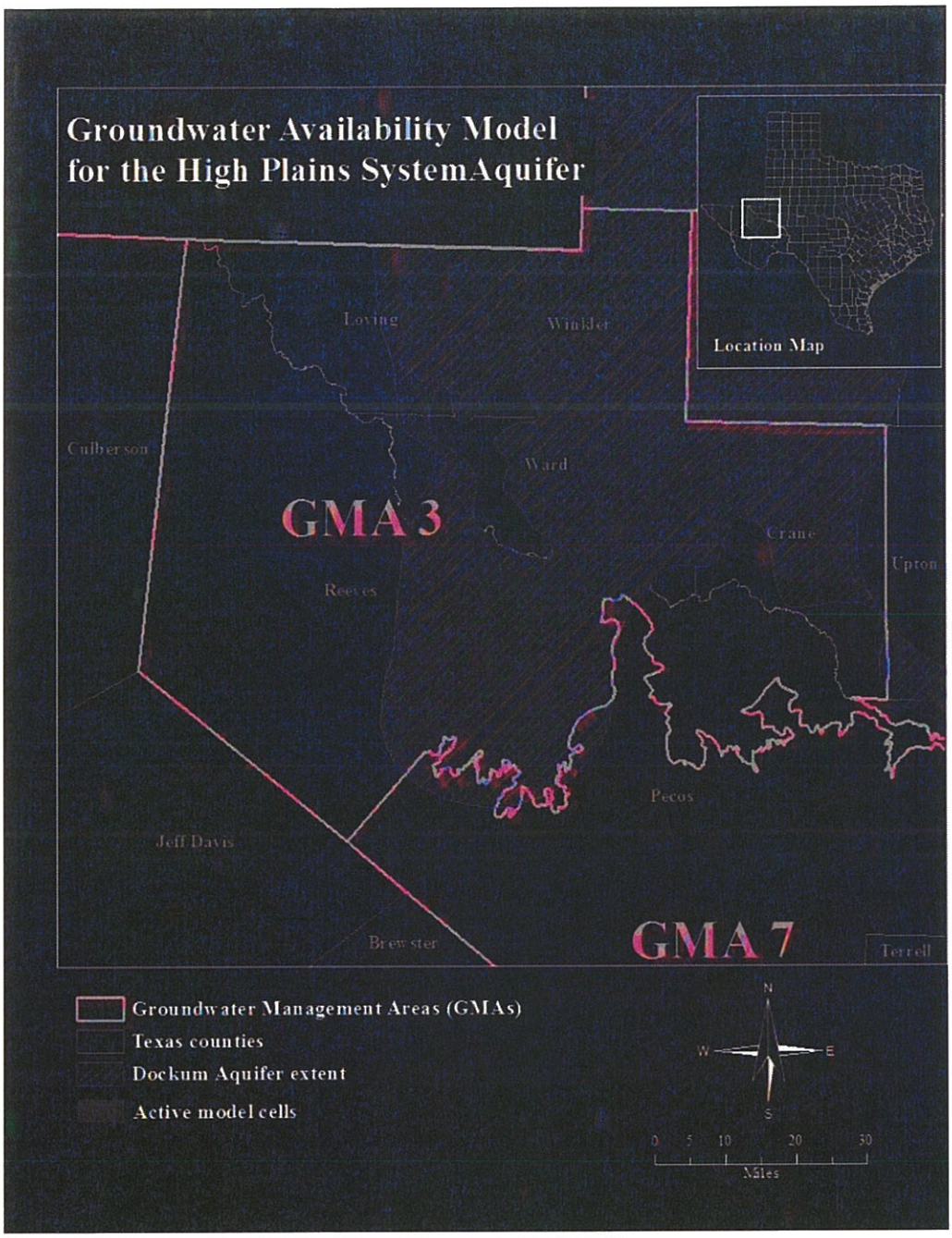
Groundwater Availability Model
for the High Plains SystemAquifer
Location Map
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Winkler
Culberson
Ward
GMA 3
Crane
Upton
Reeves
Pecos
Jeff Davis
Brewster
GMA 7
Terrell
Groundwater Management Areas (GMAs)
Texas counties
Dockum Aquifer extent
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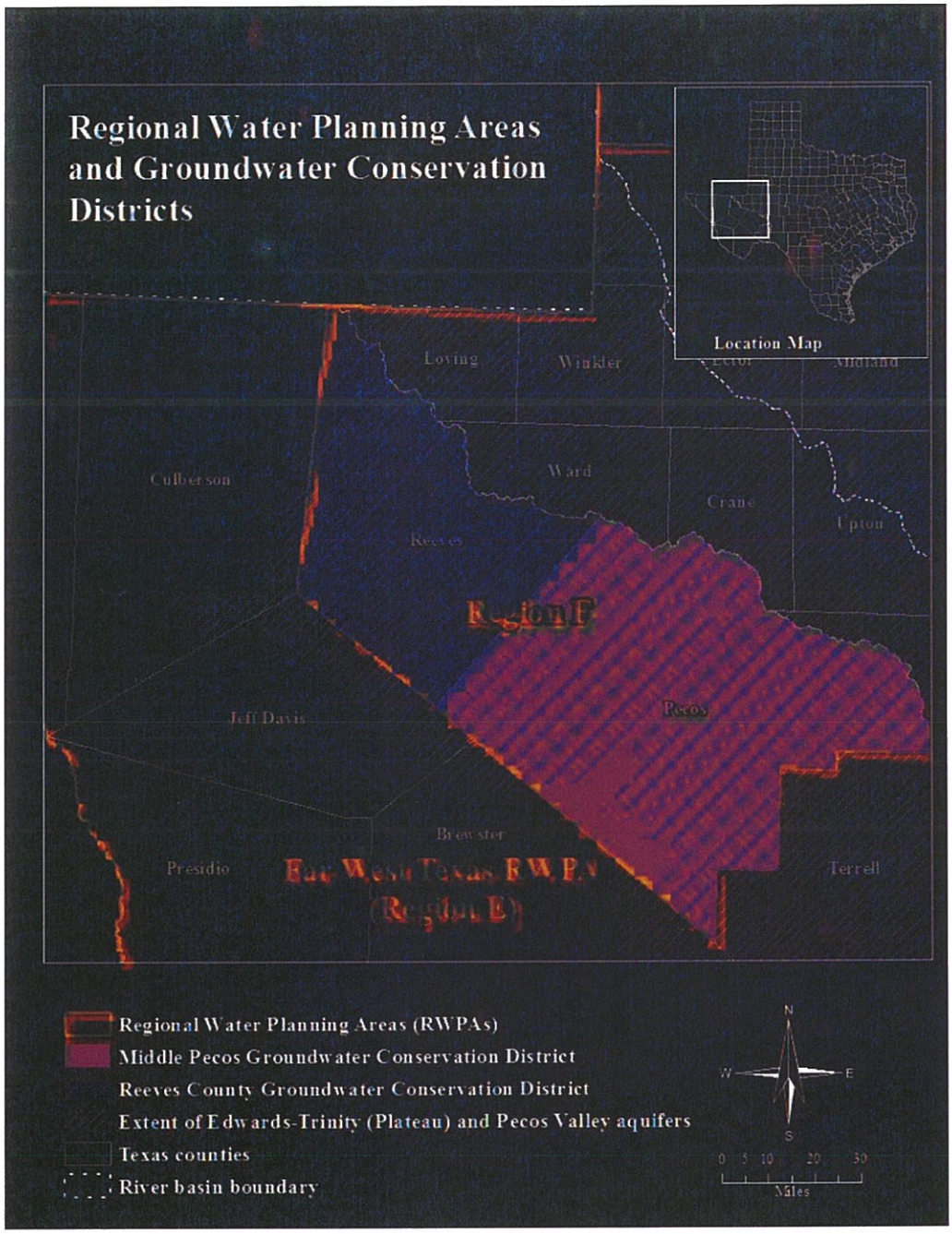
Regional Water Planning Areas and Groundwater Conservation Districts
Location Map
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Crane
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Culberson
Reeves
Region F
Pecos
Jeff Davis
Brewster
Presidio
Terrell
Far West Texas R.W.P.A.
(Region E)
Regional Water Planning Areas (RWPAs)
Middle Pecos Groundwater Conservation District
Reeves County Groundwater Conservation District
Extent of Edwards-Trinity (Plateau) and Pecos Valley aquifers
Texas counties
River basin boundary
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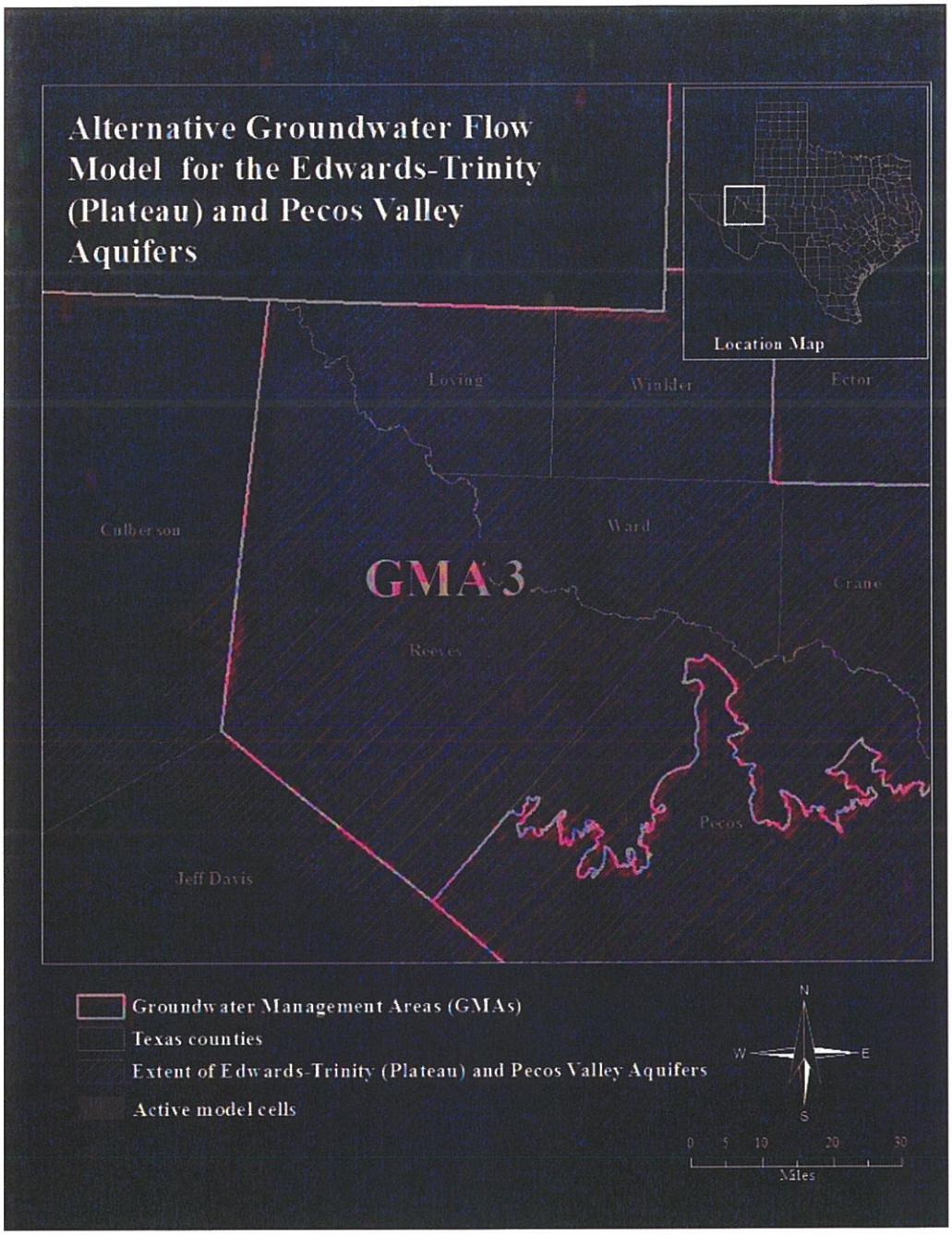
Alternative Groundwater Flow Model for the Edwards-Trinity (Plateau) and Pecos Valley Aquifers
Location Map
Loving
Winkler
Ector
Culberson
Ward
GMA 3
Crane
Reeves
Pecos
Jeff Davis
Groundwater Management Areas (GMAs)
Texas counties
Extent of Edwards-Trinity (Plateau) and Pecos Valley Aquifers
Active model cells
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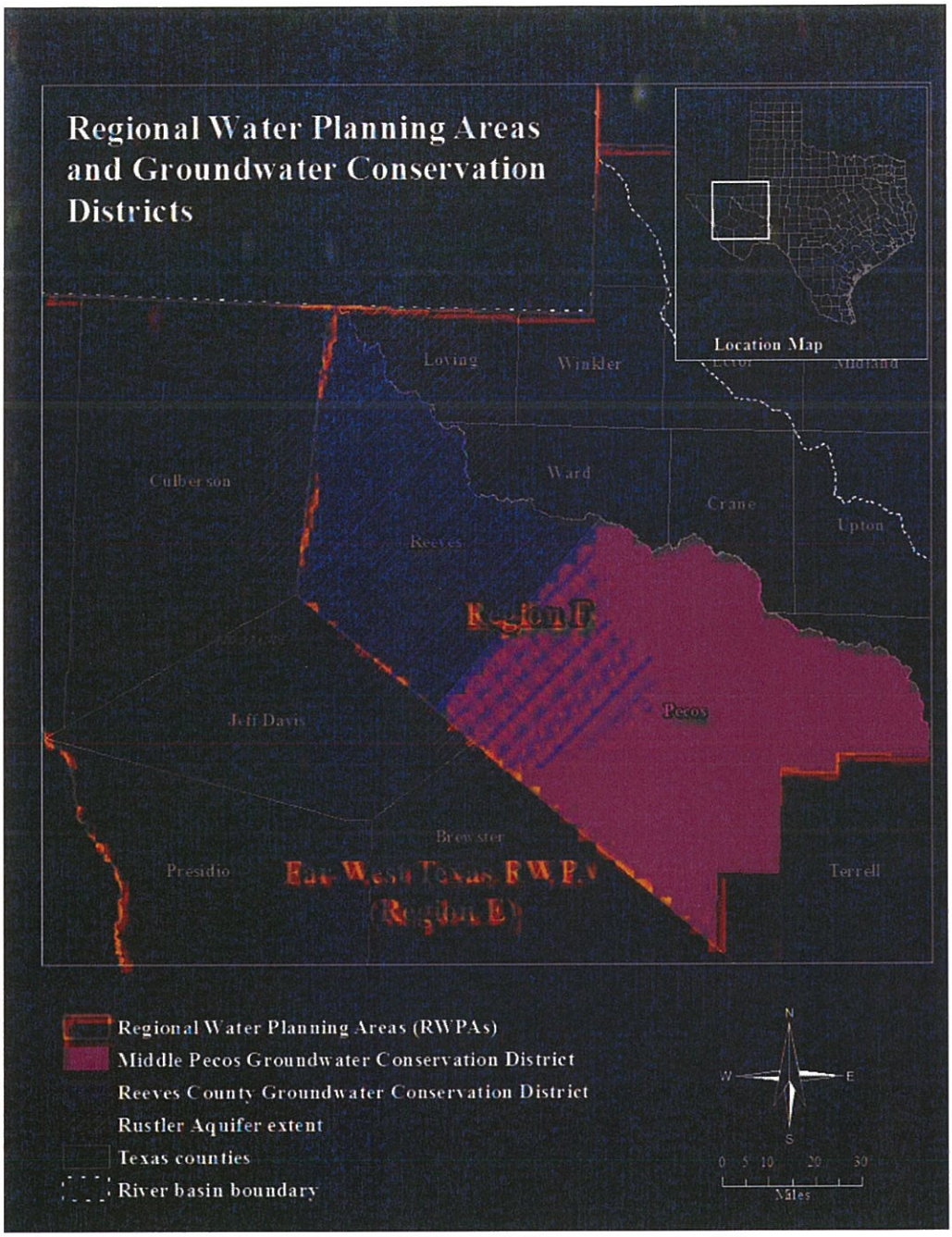
Regional Water Planning Areas and Groundwater Conservation Districts
Location Map
Loving
Winkler
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Reeves
Region E
Pecos
Jeff Davis
Brewster
Presidio
Terrell
Far West Texas RWPA (Region E)
Regional Water Planning Areas (RWPAs)
Middle Pecos Groundwater Conservation District
Reeves County Groundwater Conservation District
Rustler Aquifer extent
Texas counties
River basin boundary
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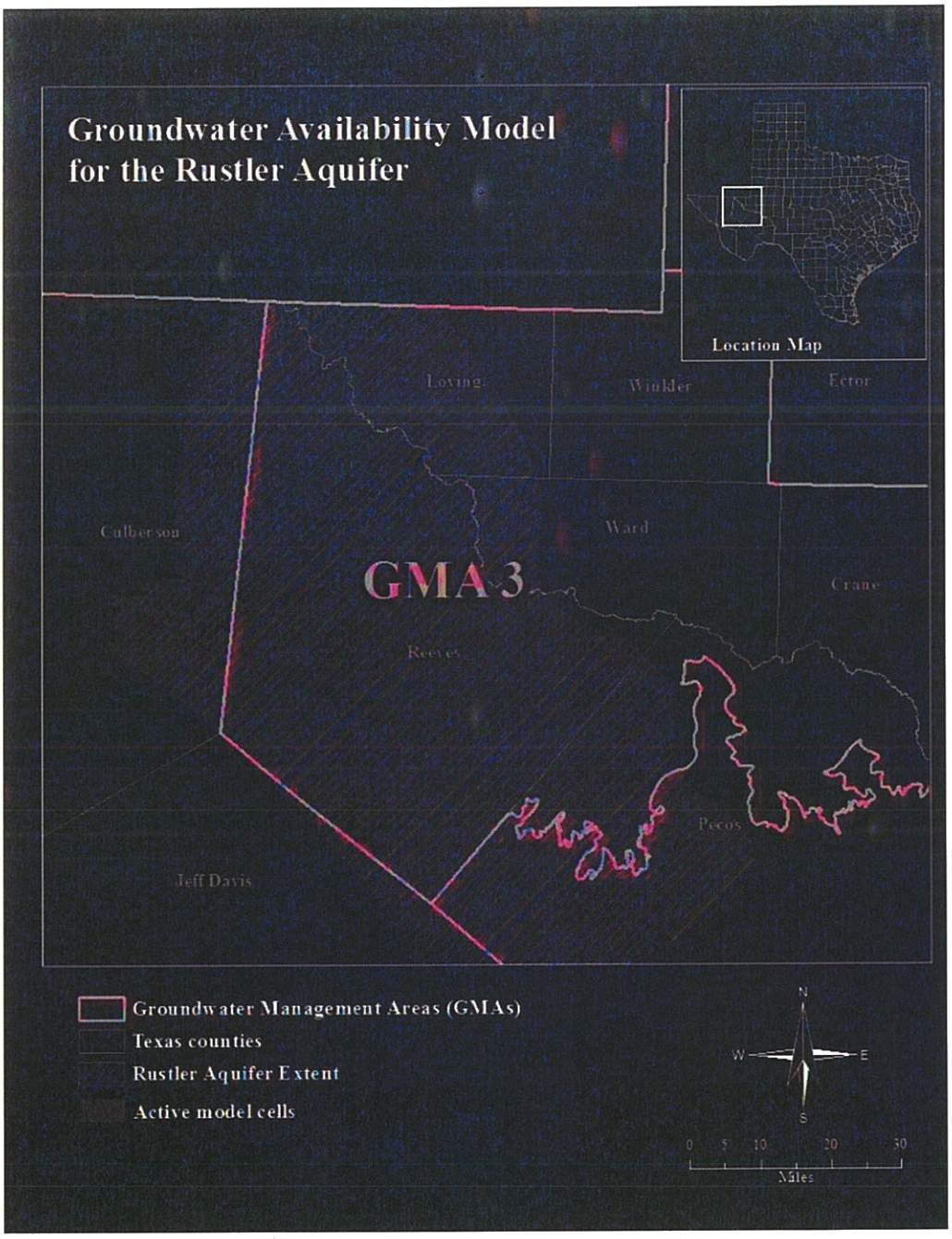
Groundwater Availability Model
for the Rustler Aquifer
Location Map
Loving
Winkler
Ector
Culberson
Ward
Crane
GMA 3
Reeves
Pecos
Jeff Davis
Groundwater Management Areas (GMAs)
Texas counties
Rustler Aquifer Extent
Active model cells
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Miles

Middle Pecos GCD	Pecos	4	4	4	4	4	4
-	Ward	103	103	103	103	103	103
-	Winkler	274	274	274	274	274	274
Total		**381**	**381**	**381**	**381**	**381**	**381**

Ward and Winkler counties are not in a groundwater conservation district.

TABLE 2. MODELED AVAILABLE GROUNDWATER FOR THE CAPITAN REEF COMPLEX AQUIFER IN GROUNDWATER MANAGEMENT AREA 3 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.

Pecos	F	Rio Grande	4	4	4	4	4	4
Ward	F	Rio Grande	103	103	103	103	103	103
Winkler	F	Rio Grande	274	274	274	274	274	274
Total			**381**	**381**	**381**	**381**	**381**	**381**

-	Crane	94	94	94	94	94	94
-	Loving	453	453	453	453	453	453
Middle Pecos GCD	Pecos	6,142	6,142	6,142	6,142	6,142	6,142
Reeves County GCD	Reeves	2,539	2,539	2,539	2,539	2,539	2,539
-	Ward	2,150	2,150	2,150	2,150	2,150	2,150
-	Winkler	6,000	6,000	6,000	6,000	6,000	6,000
Total		**17,378**	**17,378**	**17,378**	**17,378**	**17,378**	**17,378**

[1]**Crane, Loving, Ward, and Winkler counties are not in a groundwater conservation district.**

TABLE 4. MODELED AVAILABLE GROUNDWATER FOR THE DOCKUM AQUIFER IN GROUNDWATER MANAGEMENT AREA 3 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.

Crane	F	Rio Grande	94	94	94	94	94	94
Loving	F	Rio Grande	453	453	453	453	453	453
Pecos	F	Rio Grande	6,142	6,142	6,142	6,142	6,142	6,142
Reeves	F	Rio Grande	2,539	2,539	2,539	2,539	2,539	2,539
Ward	F	Rio Grande	2,150	2,150	2,150	2,150	2,150	2,150
Winkler	F	Rio Grande	5,987	5,987	5,987	5,987	5,987	5,987
Winkler	F	Colorado	13	13	13	13	13	13
Total			**17,378**	**17,378**	**17,378**	**17,378**	**17,378**	**17,378**

-	Crane	4,991	4,991	4,991	4,991	4,991	4,991
-	Loving	2,982	2,982	2,982	2,982	2,982	2,982
Middle Pecos GCD	Pecos	122,899	122,899	122,899	122,899	122,899	122,899
Reeves County GCD	Reeves	189,744	189,744	189,744	189,744	189,744	189,744
-	Ward	49,976	49,976	49,976	49,976	49,976	49,976
-	Winkler	49,949	49,949	49,949	49,949	49,949	49,949
Total		**420,541**	**420,541**	**420,541**	**420,541**	**420,541**	**420,541**

[1]**Crane, Loving, Ward, and Winkler counties are not in a groundwater conservation district.**

TABLE 6. MODELED AVAILABLE GROUNDWATER FOR THE EDWARDS-TRINITY (PLATEAU) AND PECOS VALLEY AQUIFES IN GROUNDWATER MANAGEMENT AREA 3 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.

Crane	F	Rio Grande	4,991	4,991	4,991	4,991	4,991	4,991
Loving	F	Rio Grande	2,982	2,982	2,982	2,982	2,982	2,982
Pecos	F	Rio Grande	122,899	122,899	122,899	122,899	122,899	122,899
Reeves	F	Rio Grande	189,744	189,744	189,744	189,744	189,744	189,744
Ward	F	Rio Grande	49,976	49,976	49,976	49,976	49,976	49,976
Winkler	F	Rio Grande	49,949	49,949	49,949	49,949	49,949	49,949
Total			**420,541**	**420,541**	**420,541**	**420,541**	**420,541**	**420,541**

-	Loving	200	200	200	200	200	200
Middle Pecos GCD	Pecos	3	3	3	3	3	3
Reeves County GCD	Reeves	2,387	2,387	2,387	2,387	2,387	2,387
-	Ward	0	0	0	0	0	0
Total		**2,590**	**2,590**	**2,590**	**2,590**	**2,590**	**2,590**

[1]Loving and Ward counties are not in a groundwater conservation district.

TABLE 8. MODELED AVAILABLE GROUNDWATER FOR THE RUSTLER AQUIFER IN GROUNDWATER MANAGEMENT AREA 3 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.

Loving	F	Rio Grande	200	200	200	200	200	200
Pecos	F	Rio Grande	3	3	3	3	3	3
Reeves	F	Rio Grande	2,387	2,387	2,387	2,387	2,387	2,387
Ward	F	Rio Grande	0	0	0	0	0	0
Total			**2,590**	**2,590**	**2,590**	**2,590**	**2,590**	**2,590**

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 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 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.

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Hutchison, W.R., 2016b, GMA 3 Technical Memorandum 16-05 Final, Dockum Aquifer: Initial Predictive Simulations with HPAS, 16p.

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Hutchison, W.R., 2017, GMA 3 Technical Memorandum 17-01 Final, Edwards-Trinity (Plateau) and Pecos Valley Aquifers: Update of Average Drawdown Calculations, 6p.

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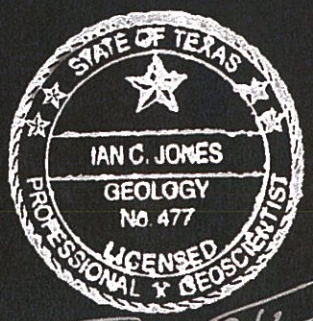
Texas Water Code, 2011, http://www.statutes.legis.state.tx.us/docs/WA/pdf/WA.36.pdf.

GAM Run 18-001: Reeves County Groundwater Conservation District Groundwater Management Plan

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
512-463-6641
May 11, 2018



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GROUNDWATER CONSERVATION DISTRICT GROUNDWATER MANAGEMENT PLAN

Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Division
Groundwater Availability Modeling Department
512-463-6641
April 30, 2018

EXECUTIVE SUMMARY:

Texas State Water Code, Section 36.1071, Subsection (h) (Texas Water Code, 2015), states that, in developing its groundwater management plan, a groundwater conservation district shall use groundwater availability modeling information provided by the Executive Administrator of the Texas Water Development Board (TWDB) in conjunction with any available site-specific information provided by the district for review and comment to the Executive Administrator.

The TWDB provides data and information to the Reeves County Groundwater Conservation District in two parts. Part 1 is the Estimated Historical Water Use/State Water Plan dataset report, which will be provided to you separately by the TWDB Groundwater Technical Assistance Department. Please direct questions about the water data report to Mr. Stephen Allen at 512-463-7317 or stephen.allen@twdb.texas.gov. Part 2 is the required groundwater availability modeling information and this information includes:

1. the annual amount of recharge from precipitation, if any, to the groundwater resources within the district;
2. 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
3. the annual volume of flow into and out of the district within each aquifer and between aquifers in the district.

The groundwater management plan for the Reeves County Groundwater Conservation District should be adopted by the district on or before August 5, 2018, and submitted to the Executive Administrator of the TWDB on or before September 4, 2018. The management

stephen.allen@twdb.texas.gov.

Tables 1 through 5 summarize the groundwater availability model data required by statute and Figures 1 through 4 show the area of the models from which the values in the tables were extracted. If, after review of the figures, the Reeves County Groundwater Conservation District determines that the district boundaries used in the assessment do not reflect current conditions, please notify the TWDB at your earliest convenience.

METHODS:

In accordance with the provisions of the Texas State Water Code, Section 36.1071, Subsection (h), the groundwater availability models for the aquifer mentioned above were used to estimate information for the Reeves County Groundwater Conservation District management plan. Water budgets were extracted for the historical model period using ZONEBUDGET Version 3.01 (Harbaugh, 2009). The historical model periods used were 1981 through 2000 for the Edwards-Trinity (Plateau) and Pecos Valley aquifers, 1980 through 2012 for the Dockum Aquifer, 1980 through 2008 for the Rustler Aquifer, and 1980 through 2005 for the Capitan Reef Complex Aquifer. The average annual water budget values for recharge, surface-water outflow, inflow to the district, and outflow from the district for the aquifers within the district are summarized in this report.

PARAMETERS AND ASSUMPTIONS:

Edwards-Trinity (Plateau) and Pecos Valley Aquifers

- We used version 1.01 of the groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers. See Anaya and Jones (2009) for assumptions and limitations of the groundwater availability model for the Edwards-Trinity (Plateau) and Pecos Valley aquifers.
- The Edwards-Trinity (Plateau) and Pecos Valley aquifers model includes two active layers; however, in the area underlying the district, Layer 1 represents the Pecos Valley alluvium, the Edwards Group and equivalent limestone hydrostratigraphic units, and the undifferentiated Trinity Group hydrostratigraphic units. We assumed certain model cells are assigned to the Pecos Valley Aquifer and the remaining cells are assigned to the Edwards-Trinity (Plateau) Aquifer.
- The model was run with MODFLOW-96 (Harbaugh and McDonald, 1996).

Dockum Aquifer

- We used version 1.01 of the groundwater availability model for the High Plains Aquifer System. See Deeds and Jigmond (2015) for assumptions and limitations of the model.
- The groundwater availability model for the High Plains Aquifer System contains four layers:
    - Layer 1—the Ogallala Aquifer and the Pecos Valley Alluvium Aquifer.
    - Layer 2—the Rita Blanca Aquifer, the Edwards-Trinity (High Plains) Aquifer, the Edwards-Trinity (Plateau) Aquifer.
    - Layer 3—the upper Dockum Group.
    - Layer 4—the lower Dockum Group.
- While the model for the High Plains Aquifer System includes the Pecos Valley Alluvium and Edwards-Trinity (Plateau) aquifers, the focus of the model run was to extract information for the Dockum Aquifer.
- The model was run with MODFLOW-NWT (Niswonger and others, 2011).

Rustler Aquifer

- We used version 1.01 of the groundwater availability model for the Rustler Aquifer Groundwater Availability Model (Ewing and Others, 2012). See Ewing and others (2012) for assumptions and limitations of the groundwater availability model.
- The model has two active layers representing the Dewey Lake Formation and Dockum Aquifer (Layer 1) and the Rustler Aquifer (Layer 2). While the model for the Rustler Aquifer includes the Dockum Aquifer, the focus of the model run was to extract information for the Rustler Aquifer. Thus, Model Layer 2 was used for the management plan analysis.
- The model was run with MODFLOW-2000 (Harbaugh and Others, 2000).

Capitan Reef Complex Aquifer

- We used version 1.01 of the groundwater availability model for the Capitan Reef Complex Aquifer Groundwater Availability Model (Jones, 2016). See Jones (2016) for assumptions and limitations of the groundwater availability model.
- The model has five active layers representing the Edwards-Trinity (Plateau) and Pecos Valley aquifers (Layer 1); Dockum Aquifer (Layer 2); Rustler Aquifer (Layer 3); Artesia Group, Salado Formation, and Castile Formation (Layer 4), and Capitan Reef Complex Aquifer, Delaware Basin, and San Andres Formation (Layer 5). While the model for the Capitan Reef Complex Aquifer includes the Pecos Valley Alluvium, Edwards-Trinity (Plateau), Dockum, and Rustler aquifers, the focus of the model run was to extract information for the Capitan Reef Complex Aquifer. Thus, Model Layer 5 was used for the management plan analysis. It should be noted that the model for the Capitan Reef Complex Aquifer only includes the eastern "arm" of the aquifer and does not include the small aquifer extent at the end of the western "arm" located within the district boundary.
- The model was run with MODFLOW-2005 (Harbaugh, 2005).

RESULTS:

A groundwater budget summarizes the amount of water entering and leaving the aquifers according to the groundwater availability model. Selected groundwater budget components listed below were extracted from the groundwater availability model results for the Pecos Valley, Edwards-Trinity (Plateau), Dockum, Rustler, and Capitan Reef

Complex aquifers located within Reeves County Groundwater Conservation District and averaged over the historical calibration periods, as shown in Tables 1 through 5.

1. Precipitation recharge—the areally distributed recharge sourced from precipitation falling on the outcrop areas of the aquifers (where the aquifer is exposed at land surface) within the district.

2. Surface-water outflow—the total water discharging from the aquifer (outflow) to surface-water features such as streams, reservoirs, and springs.

3. Flow into and out of district—the lateral flow within the aquifer between the district and adjacent counties.

4. Flow between aquifers—the net vertical flow between the aquifer and adjacent aquifers or confining units. This flow is controlled by the relative water levels in each aquifer and aquifer properties of each aquifer or confining unit that define the amount of leakage that occurs.

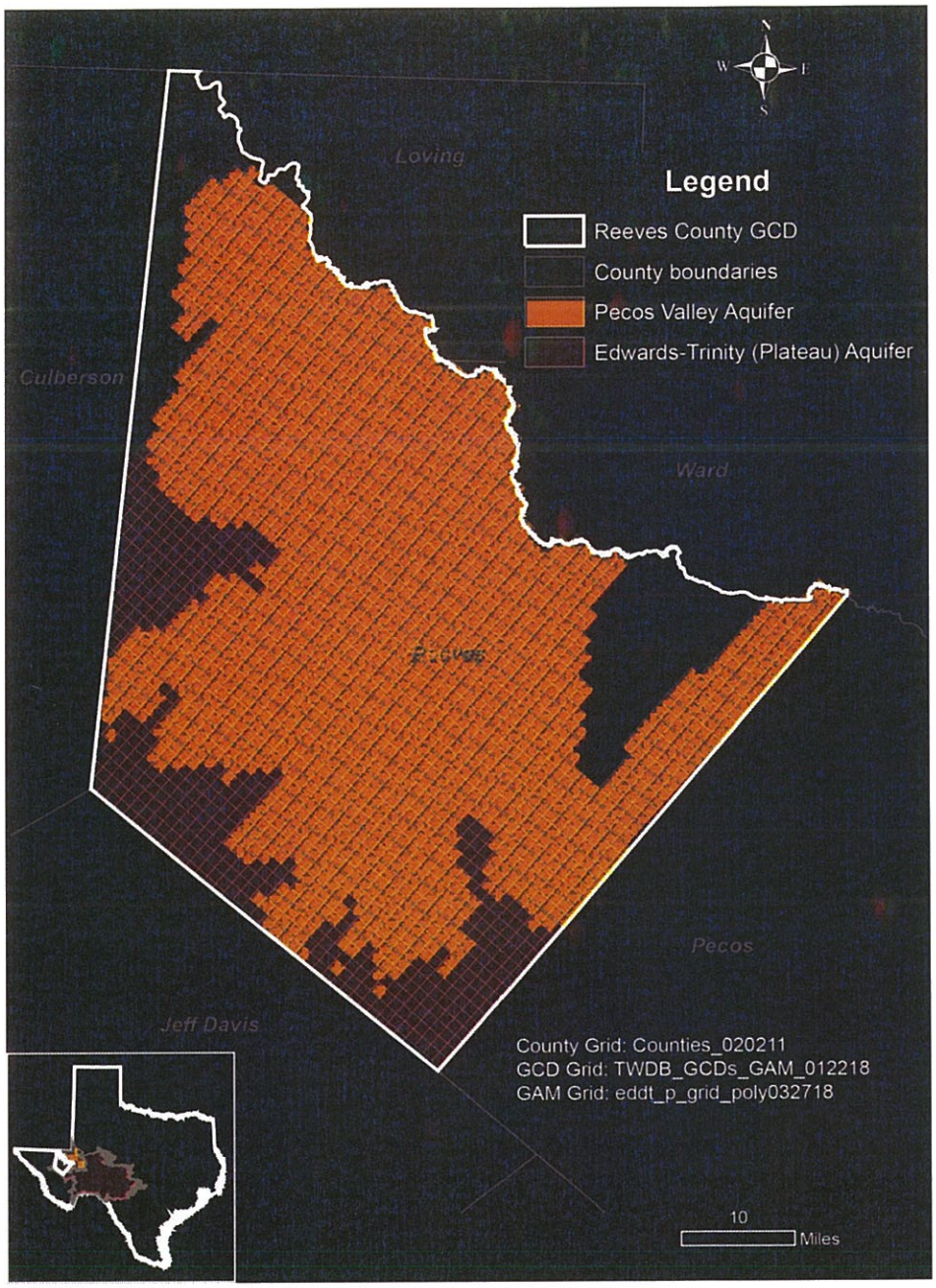
The information needed for the district's management plan is summarized in Tables 1 through 5. It is important to note that sub-regional water budgets are not exact. This is due to the size of the model cells and the approach used to extract data from the model. To avoid double accounting, a model cell that straddles a political boundary, such as a district or county boundary, 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.

Estimated annual amount of recharge from precipitation to the district	Pecos Valley Aquifer	65,380
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Pecos Valley Aquifer	51,531
Estimated annual volume of flow into the district within each aquifer in the district	Pecos Valley Aquifer	12,033
Estimated annual volume of flow out of the district within each aquifer in the district	Pecos Valley Aquifer	18,111
Estimated net annual volume of flow between each aquifer in the district	Flow from Edwards-Trinity (Plateau) Aquifer to the Pecos Valley Aquifer	44,055
	Flow from the Rustler Aquifer to the Pecos Valley Aquifer	979*

* - From the groundwater availability model for the Rustler Aquifer.

Estimated annual amount of recharge from precipitation to the district	Edwards-Trinity (Plateau) Aquifer	16,343
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	0
Estimated annual volume of flow into the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	29,335
Estimated annual volume of flow out of the district within each aquifer in the district	Edwards-Trinity (Plateau) Aquifer	6
Estimated net annual volume of flow between each aquifer in the district	Flow from Edwards-Trinity (Plateau) Aquifer to the Pecos Valley Aquifer	44,055
	Flow from the Rustler Aquifer to the Edwards-Trinity (Plateau) Aquifer	522*

* - From the groundwater availability model for the Rustler Aquifer.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Edwards-Trinity (Plateau) Aquifer
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County Grid: Counties_020211
GCD Grid: TWDB_GCDs_GAM_012218
GAM Grid: eddt_p_grid_poly032718
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Estimated annual amount of recharge from precipitation to the district	Dockum Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Dockum Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Dockum Aquifer	648
Estimated annual volume of flow out of the district within each aquifer in the district	Dockum Aquifer	490
Estimated net annual volume of flow between each aquifer in the district	Flow from Edwards-Trinity (Plateau) and Pecos Valley aquifers to underlying Dockum Aquifer	72
	Flow from Rustler Aquifer to Dockum Aquifer	1,446*

* - From the groundwater availability model for the Rustler Aquifer.


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GCD Grid: TWDB_GCDs_GAM_012218
GAM Grid: hpas_grid_poly082615
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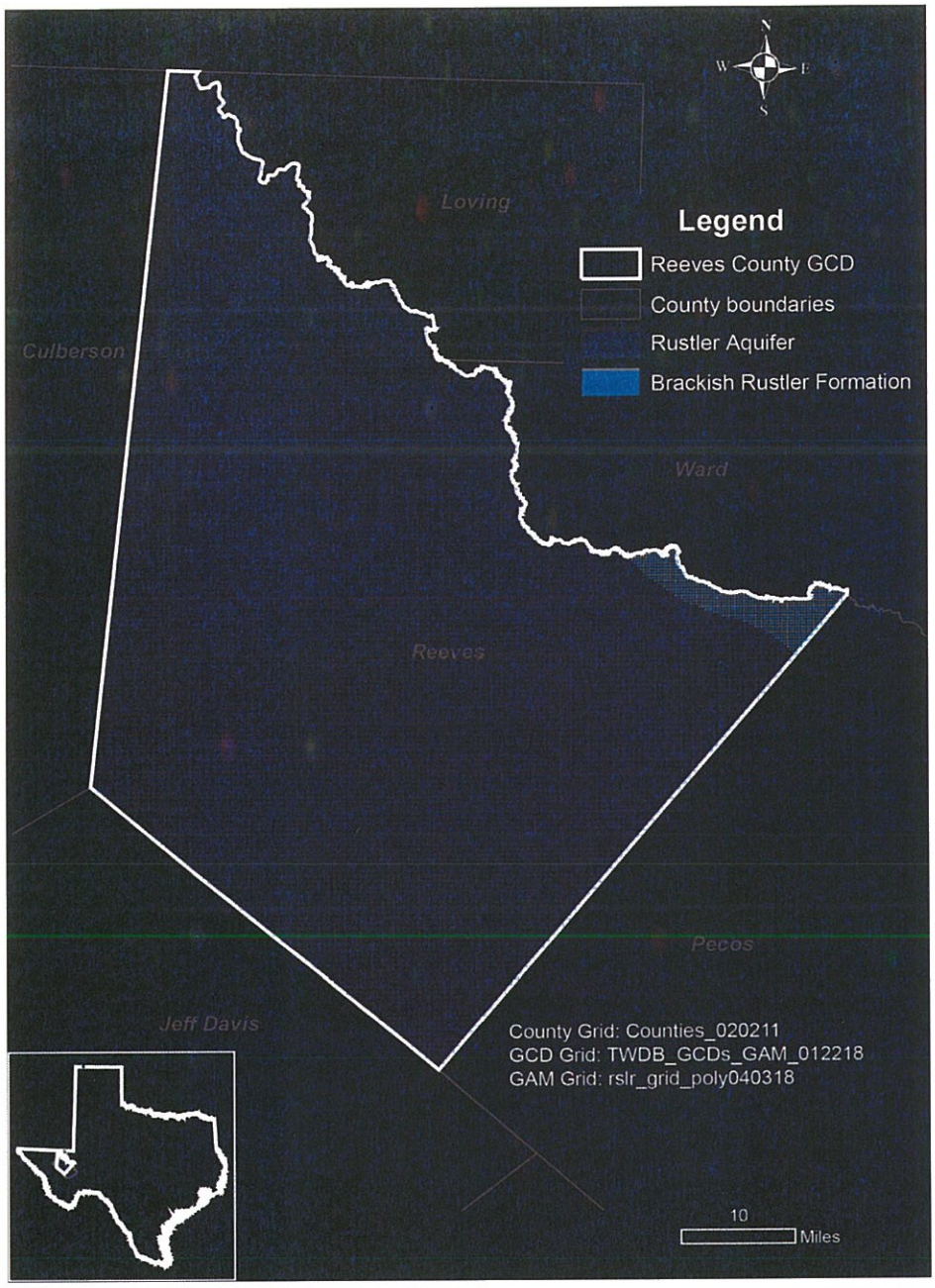
Estimated annual amount of recharge from precipitation to the district	Rustler Aquifer	146
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Rustler Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Rustler Aquifer	1,498
Estimated annual volume of flow out of the district within each aquifer in the district	Rustler Aquifer	281
Estimated net annual volume of flow between each aquifer in the district	Flow from Rustler Aquifer to Dockum Aquifer	1,446
	Flow from Rustler Aquifer to Edwards-Trinity (Plateau) Aquifer	522
	Flow from Rustler Aquifer to Pecos Valley Aquifer	979
	Flow from overlying stratigraphic units to Rustler Aquifer	163
	From Rustler Aquifer to saline Rustler Formation	38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Reeves County GCD
County boundaries
Rustler Aquifer
Brackish Rustler Formation
Culberson
Ward
Reeves
Pecos
Jeff Davis
County Grid: Counties_020211
GCD Grid: TWDB_GCDs_GAM_012218
GAM Grid: rslr_grid_poly040318
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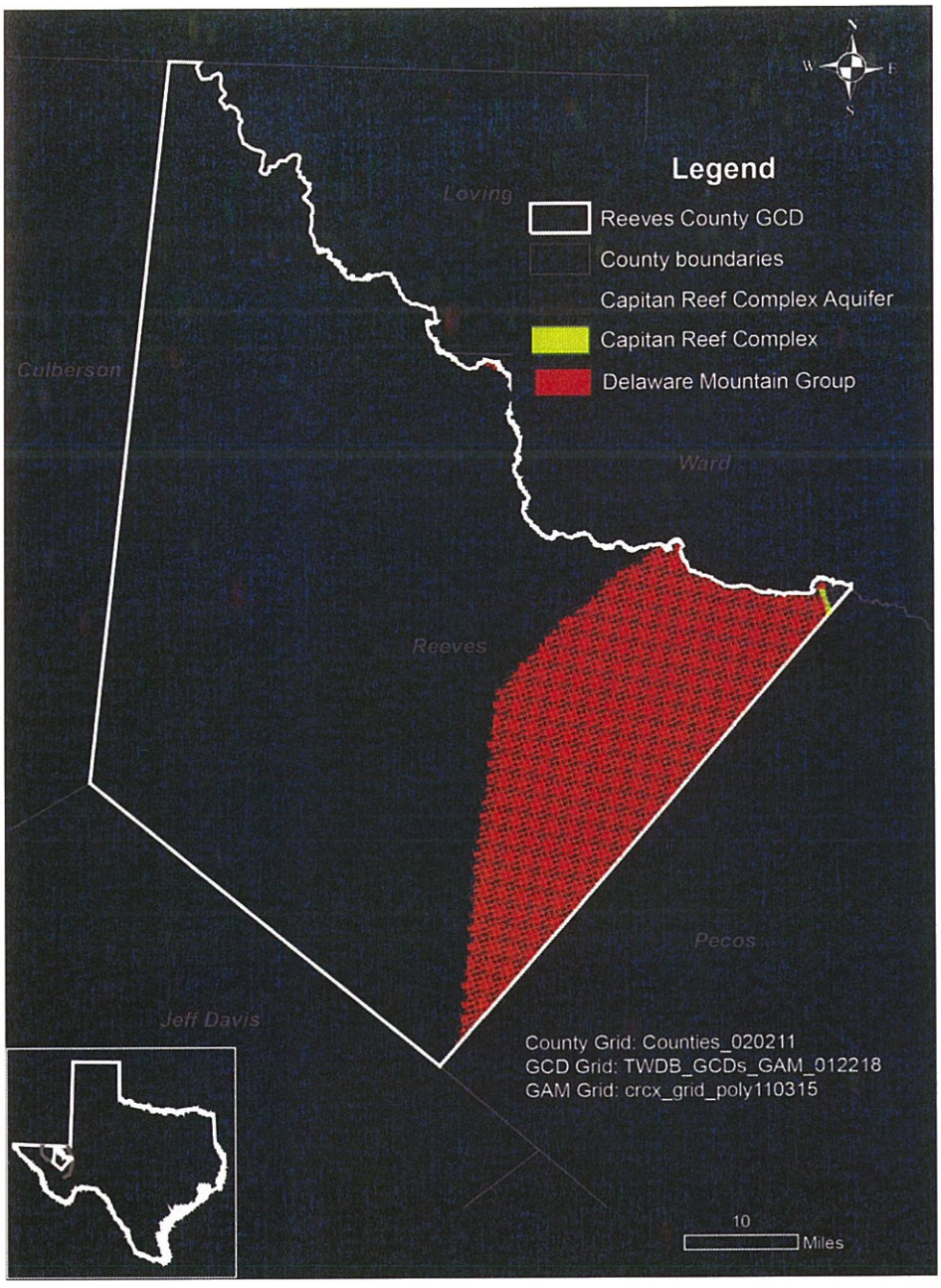
Miles

Estimated annual amount of recharge from precipitation to the district	Capitan Reef Complex Aquifer	0
Estimated annual volume of water that discharges from the aquifer to springs and any surface-water body including lakes, streams, and rivers	Capitan Reef Complex Aquifer	0
Estimated annual volume of flow into the district within each aquifer in the district	Capitan Reef Complex Aquifer	859
Estimated annual volume of flow out of the district within each aquifer in the district	Capitan Reef Complex Aquifer	755
Estimated net annual volume of flow between each aquifer in the district	Flow from Capitan Reef Complex Aquifer to overlying stratigraphic units	114
	From Capitan Reef Complex Aquifer to Delaware Mountain Group	1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Capitan Reef Complex Aquifer
Capitan Reef Complex
Delaware Mountain Group
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Reeves
Pecos
Jeff Davis
County Grid: Counties_020211
GCD Grid: TWDB_GCDs_GAM_012218
GAM Grid: crcx_grid_poly110315
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LIMITATIONS:

The groundwater models used in completing this analysis are the best available scientific tools 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 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 interaction with streams are specific to particular historic time periods.

Because the application of the groundwater models was designed to address regional-scale questions, the results are most effective on a regional scale. The TWDB makes no warranties or representations related 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.

http://www.twdb.texas.gov/groundwater/models/gam/eddt_p/ET-Plateau_Full.pdf

Deeds, N. E. and Jigmond, M., 2015, Numerical Model Report for the High Plains Aquifer System Groundwater Availability Model, Prepared for the Texas Water Development Board by Intera Inc., 640 p. http://www.twdb.texas.gov/groundwater/models/gam/hpas/HPAS_GAM_Numerical_Report.pdf

Ewing, J. E., Kelley, V. A., Jones, T. L., Yan, T., Singh, A., Powers, D. W., Holt, R. M., and Sharp, J. M., 2012, Groundwater availability model report for the Rustler Aquifer: Prepared for the Texas Water Development Board by Intera Inc., 460 p. http://www.twdb.texas.gov/groundwater/models/gam/rslr/RSLR_GAM_Report.pdf

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., and McDonald, M. G., 1996, User's documentation for MODFLOW-96, an update to the U.S. Geological Survey modular finite-difference ground-water flow model: U.S. Geological Survey Open-File Report 96–485, 56 p.

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: United States Geological Survey, Open-file Report 00-92, 121 p.

Harbaugh, A. W., 2005, MODFLOW-2005, the U.S. Geological Survey modular ground-water model -- the Ground-Water Flow Process: U.S. Geological Survey Techniques and Methods 6-A16.

Jones, I., 2016, Groundwater Availability Model: Eastern Arm of the Capitan Reef Complex Aquifer of Texas: Texas Water Development Board, unpublished report, 494 p. http://www.twdb.texas.gov/groundwater/models/gam/crcx/CapitanModelReportFinal.pdf

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.

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APPENDIX F

ESTIMATED HISTORICAL WATER USE

AND 2017 STATE WATER PLANS

Estimated Historical Water Use And 2017 State Water Plan Datasets:

Reeves County Groundwater Conservation District

by Stephen Allen
Texas Water Development Board
Groundwater Division
Groundwater Technical Assistance Section
stephen.allen@twdb.texas.gov
(512) 463-7317
July 19, 2018

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 Water 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 2017 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 Dr. Shirley Wade, shirley.wade@twdb.texas.gov, (512) 936-0883.

The data presented in this report represents the most up-to-date WUS and 2017 SWP data available as of 7/19/2018. 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 2017 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 2017 SWP dataset can be verified by contacting Sabrina Anderson (sabrina.anderson@twdb.texas.gov or 512-936-0886).

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 2017. TWDB staff anticipates the calculation and posting of these estimates at a later date.

REEVES COUNTY

All values are in acre-feet

Year	Source	Municipal	Manufacturing	Mining	Steam Electric	Irrigation	Livestock	Total
2016	GW	5,145	6	1,558	0	54,206	476	61,391
	SW	0	0	0	0	11,217	0	11,217
2015	GW	4,741	41	1,371	0	37,049	467	43,669
	SW	0	0	0	0	12,201	0	12,201
2014	GW	4,515	52	1,065	0	40,633	445	46,710
	SW	0	0	0	0	13,712	0	13,712
2013	GW	4,372	96	401	0	33,318	486	38,673
	SW	0	0	0	0	42,382	0	42,382
2012	GW	3,980	114	1,381	0	39,811	285	45,571
	SW	0	0	0	0	13,797	0	13,797
2011	GW	4,227	121	464	0	47,161	319	52,292
	SW	0	0	192	0	5,500	0	5,692
2010	GW	4,331	286	429	0	40,894	303	46,243
	SW	0	0	178	0	17,475	0	17,653
2009	GW	3,592	286	875	0	44,465	633	49,851
	SW	0	0	114	0	13,484	0	13,598
2008	GW	3,366	286	383	0	0	482	4,517
	SW	0	0	50	0	26,968	0	27,018
2007	GW	3,348	409	972	0	12,521	545	17,795
	SW	27	571	0	0	65,673	0	66,271
2006	GW	3,295	289	1,144	0	18,925	862	24,515
	SW	33	0	0	0	70,000	0	70,033
2005	GW	3,352	291	1,054	0	18,837	693	24,227
	SW	32	0	0	0	73,300	0	73,332
2004	GW	3,313	298	495	0	36,928	601	41,635
	SW	33	0	0	0	52,131	32	52,196
2003	GW	3,347	291	595	0	22,038	492	26,763
	SW	276	0	0	0	11,913	26	12,215
2002	GW	3,426	289	449	0	53,458	713	58,335
	SW	226	0	0	0	10,182	38	10,446
2001	GW	3,309	306	449	0	56,867	723	61,654
	SW	233	0	0	0	19,695	38	19,966

Projected Surface Water Supplies
TWDB 2017 State Water Plan Data

REEVES COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	Source Name	2020	2030	2040	2050	2060	2070
F	COUNTY-OTHER, REEVES	RIO GRANDE	RIO GRANDE OTHER LOCAL SUPPLY	0	0	0	0	0	0
F	IRRIGATION, REEVES	RIO GRANDE	BALMORHEA LAKE/RESERVOIR	21,844	21,844	21,844	21,844	21,844	21,844
F	IRRIGATION, REEVES	RIO GRANDE	RED BLUFF LAKE/RESERVOIR	9,110	9,110	9,110	9,110	9,110	9,110
F	LIVESTOCK, REEVES	RIO GRANDE	RIO GRANDE LIVESTOCK LOCAL SUPPLY	66	66	66	66	66	66
	Sum of Projected Surface Water Supplies (acre-feet)			**31,020**	**31,020**	**31,020**	**31,020**	**31,020**	**31,020**

Projected Water Demands
TWDB 2017 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.

REEVES COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
F	COUNTY-OTHER, REEVES	RIO GRANDE	503	530	553	570	583	594
F	IRRIGATION, REEVES	RIO GRANDE	91,357	90,577	89,795	89,015	88,242	87,475
F	LIVESTOCK, REEVES	RIO GRANDE	862	862	862	862	862	862
F	MADERA VALLEY WSC	RIO GRANDE	586	616	644	665	682	694
F	MANUFACTURING, REEVES	RIO GRANDE	197	201	205	208	220	233
F	MINING, REEVES	RIO GRANDE	1,531	2,632	2,537	2,068	1,632	1,288
F	PECOS	RIO GRANDE	2,990	3,143	3,296	3,407	3,491	3,556
	Sum of Projected Water Demands (acre-feet)		**98,026**	**98,561**	**97,892**	**96,795**	**95,712**	**94,702**

Projected Water Supply Needs
TWDB 2017 State Water Plan Data

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

REEVES COUNTY

All values are in acre-feet

RWPG	WUG	WUG Basin	2020	2030	2040	2050	2060	2070
F	COUNTY-OTHER, REEVES	RIO GRANDE	0	0	0	0	0	0
F	IRRIGATION, REEVES	RIO GRANDE	0	0	0	0	0	0
F	LIVESTOCK, REEVES	RIO GRANDE	1	1	1	1	1	1
F	MADERA VALLEY WSC	RIO GRANDE	0	0	0	0	0	0
F	MANUFACTURING, REEVES	RIO GRANDE	0	0	0	0	0	0
F	MINING, REEVES	RIO GRANDE	0	0	0	0	0	0
F	PECOS	RIO GRANDE	0	0	0	0	0	0
	Sum of Projected Water Supply Needs (acre-feet)		**0**	**0**	**0**	**0**	**0**	**0**

Projected Water Management Strategies
TWDB 2017 State Water Plan Data

REEVES COUNTY

WUG, Basin (RWPG) All values are in acre-feet

Water Management Strategy	Source Name [Origin]	2020	2030	2040	2050	2060	2070
COUNTY-OTHER, REEVES, RIO GRANDE (F)							
MUNICIPAL CONSERVATION - REEVES COUNTY OTHER	DEMAND REDUCTION [REEVES]	19	20	22	23	24	25
		19	**20**	**22**	**23**	**24**	**25**
IRRIGATION, REEVES, RIO GRANDE (F)							
IRRIGATION CONSERVATION - REEVES COUNTY	DEMAND REDUCTION [REEVES]	4,568	9,058	13,469	13,469	13,469	13,469
WEATHER MODIFICATION	WEATHER MODIFICATION [ATMOSPHERE]	240	240	240	240	240	240
		4,808	**9,298**	**13,709**	**13,709**	**13,709**	**13,709**
MADERA VALLEY WSC, RIO GRANDE (F)							
MUNICIPAL CONSERVATION - MADERA VALLEY WSC	DEMAND REDUCTION [REEVES]	11	12	12	13	13	14
WATER AUDITS AND LEAK - MADERA VALLEY WSC	DEMAND REDUCTION [REEVES]	69	73	76	78	80	82
		80	**85**	**88**	**91**	**93**	**96**
MINING, REEVES, RIO GRANDE (F)							
MINING CONSERVATION - REEVES COUNTY	DEMAND REDUCTION [REEVES]	107	184	178	145	114	90
		107	**184**	**178**	**145**	**114**	**90**
PECOS, RIO GRANDE (F)							
MUNICIPAL CONSERVATION - PECOS	DEMAND REDUCTION [REEVES]	53	56	59	62	63	64
WATER AUDITS AND LEAK - PECOS	DEMAND REDUCTION [REEVES]	157	165	173	178	183	186
		210	**221**	**232**	**240**	**246**	**250**
Sum of Projected Water Management Strategies (acre-feet)		**5,224**	**9,808**	**14,229**	**14,208**	**14,186**	**14,170**