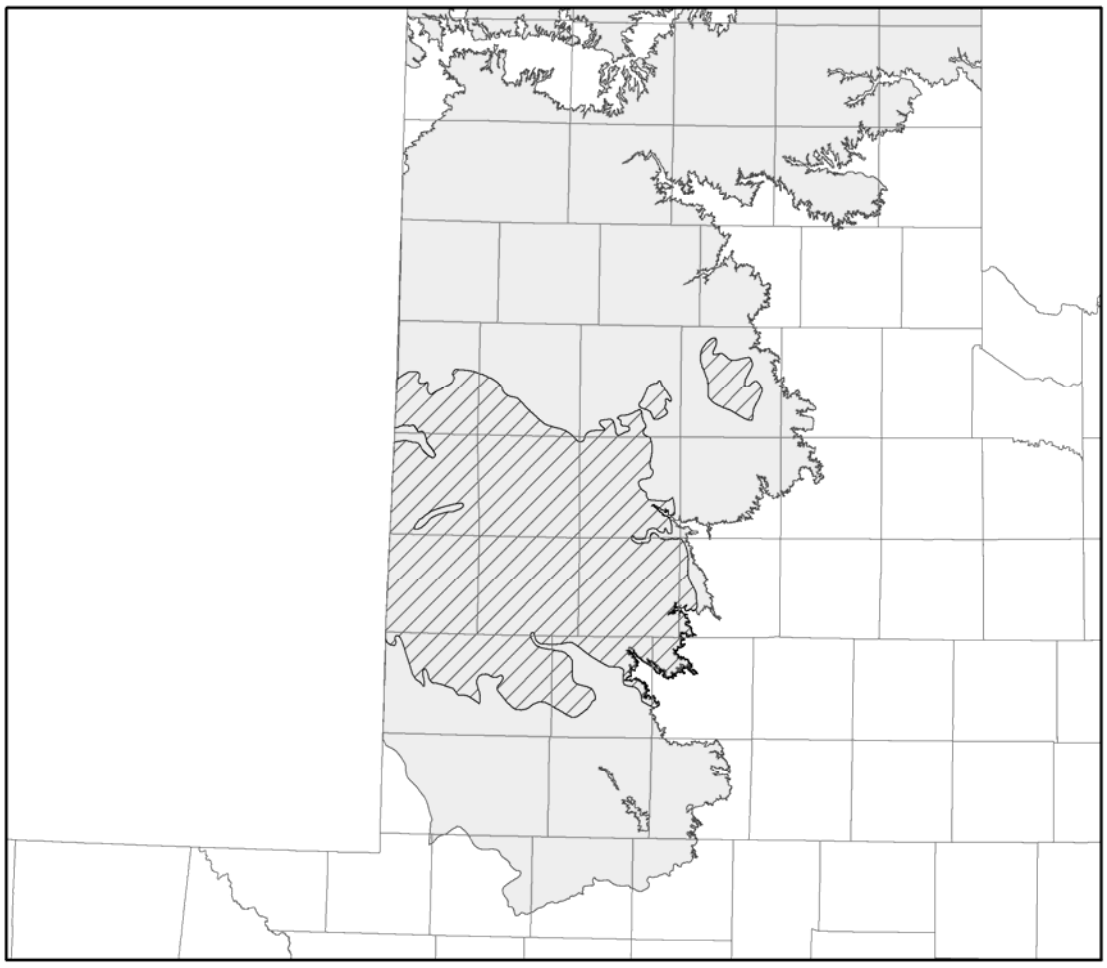

Quick Reference
for the Groundwater Availability Model
for the Southern Portion of the Ogallala and
Edwards-Trinity (High Plains) Aquifers

Quick Reference for the Groundwater Availability Model for the Southern Portion of the Ogallala and Edwards-Trinity (High Plains) Aquifers

November 4, 2009

Purpose: This reference guide is intended to assist individuals with using the groundwater availability model (GAM). It is primarily intended for individuals with experience in hydrogeology, groundwater modeling, MODFLOW, the TWDB GAM program, and the Dockum Aquifer. For more information on these subjects, please refer to the appropriate groundwater textbook or modeling reference.

This GAM is appropriate for regional evaluations of groundwater conditions in the Ogallala (southern portion) and Edwards-Trinity (High Plains) aquifers. It is not intended for site-specific use, such as small well fields or individual wells. For details on how the GAM was developed and calibrated, and for limitations of this model, please refer to the reports below (Blandford and others, 2003; Blandford and others, 2008).

Unique or noteworthy aspects of this GAM are marked in bold and highlighted in red in this document.

Groundwater Availability Model report reference:

Blandford, T.N., Blazer, D.J., Calhoun, K.C., Dutton, A.R., Naing, T., Reedy, R.C., and Scanlon, B.R., 2003, Groundwater availability of the southern Ogallala aquifer in Texas and New Mexico—Numerical simulations through 2050: Final report prepared for the Texas Water Development Board by Daniel B. Stephens & Associates, Inc., 158 p.

Blandford, T.N., Kuchanur, M., Standen, A., Ruggiero, R., Calhoun, K.C., Kirby, P., and Shah, G., 2008, Groundwater availability model of the Edwards-Trinity (High Plains) Aquifer in Texas and New Mexico: Final report prepared for the Texas Water Development Board by Daniel B. Stephens & Associates, Inc., 176 p.

Please forward any comments, corrections, or suggestions to Wade Oliver at the Texas Water Development Board (Wade.Oliver@twdb.state.tx.us).

Table of Contents

Table of Figures

Table of Tables

1. Updates to this Quick Reference Guide

August 17, 2009 – Original version of this Quick Reference guide.

November 4, 2009 – Corrected text and Figure 21 related to the application of the MODFLOW Multi-Node Well package. The correction was to clarify that the Multi-Node Well package was only used to simulate wells completed into both the Ogallala and Edwards-Trinity (Plateau) Aquifers in Gaines and Dawson counties.

2. Versions of the Model

February 2003 – Version 1.01 – Initial GAM constructed by Daniel B. Stephens and Associates in coordination with the Bureau of Economic Geology (Blandford and others, 2003). This model only contained the southern extent of the Ogallala Aquifer and some parts of the Edwards-Trinity (High Plains) Aquifer that could not be differentiated. Many of the files associated with the GAM for the southern portion of the Ogallala Aquifer are referred to using the abbreviation "OGLL_s."

December 2008 – Version 2.01 –GAM updated to include the Edwards-Trinity (High Plains) Aquifer constructed by Daniel B. Stephens and Associates in coordination with the Bureau of Economic Geology (Blandford and others, 2008). Changes also include adjustments to agricultural pumping and adjustments to historical pumping and recharge in the vicinity of Lubbock. Many of the files associated with this version of the GAM for the southern portion of the Ogallala and the Edwards-Trinity (High Plains) aquifers are referred to using the abbreviation "ETHP." A location map of the aquifers is shown in Figure 1.

3. Notes on Running the Model

- There are no problems with running the model (version 2.01). Both the steady-state and historic models take less than three minutes to run on a Dell PWS490 with a 3 GHz processor and 3.25 GB of RAM with Microsoft XP.

- **The boundary of the Edwards-Trinity (High Plains) Aquifer on which the model is based is a revision to the boundary described in the TWDB 2007 State Water Plan. The aquifer boundary presented in the figures below is this revised aquifer boundary.**

- **The hydrostratigraphic unit represented by each model layer varies spatially across the model area. Refer to Figure 2 below (a reproduction of Figure 45 in Blandford and others, 2008) for the vertical construction of the model in space.**

- **The MODFLOW multi-node well (MNW) package is used to represent pumping in wells that are dual-completed into both the Ogallala and Edwards-Trinity (High Plains) aquifers in Gaines and Dawson counties. See Figure 21 for the location of the multi-node wells included in the model. The MNW package determines the volume of water pumped from each layer of the model based on the hydraulic properties and saturated thickness of each layer as well as the screened intervals (Blandford and others, 2008).**

- **Injection wells in the vicinity of Lubbock are included to simulate recharge from individual playas as shown in Figure 20. Be careful to consider these when extracting results from the model.**

- **In order to account for irrigation return flow, the amount of agricultural pumping in the Ogallala Aquifer each year was reduced by a fraction corresponding to the efficiency of irrigation shown in Table 2 (Blandford and others, 2003).**

- **A buffer of 1 to 2 active cells outside the boundary of the Edwards-Trinity (High Plains) Aquifer is included in layers 2 and 3 to facilitate the transition from four active model layers to one (Blandford and others, 2003). It may be necessary to consider and account for this when extracting results from the model.**

4. Model Summary

270 Rows – Grid-spacing = 5,280 feet or 1 mile

290 Columns – Grid-spacing = 5,280 feet or 1 mile

4 Layers – (See Figure 2)

- Layer 1: Southern portion of the Ogallala Aquifer
- **Layer 2: Primarily Cretaceous shale (Duck Creek and Kiamichi Formations) but also includes portions representing Ogallala and limestone**
- **Layer 3: Primarily limestone (Edwards and Comanche Peak Formations) but also includes portions representing Ogallala and Cretaceous shale**
- **Layer 4: Primarily Antler's Sand but also includes small portions representing the Ogallala Aquifer.**

Units – Feet and days

Coordinate System or Projection – The GAM projection below was used during model development:

Projection: Albers Equal-Area
Horizontal Datum: North American Datum 1983
Vertical Datum: North American Vertical Datum 1988
Speroid: GRS 80
Longitude of Origin: -100.0
Latitude of Origin: 31.25
Standard Parallel 1: 27.5
Standard parallel 2: 35
False Easting: 4,921,250 (US Survey Feet)
False Northing: 19,685,000 (US Survey Feet)

Model Grid Origin (above coordinates) – X = 3,290,868; Y = 19,854,789 to lower left of model grid (i.e. Row 270, Column 1)

Model Grid Rotation – No rotation

Steady-State Model – The steady-state GAM is included as the first stress period of the transient calibration model. The steady state model represents predevelopment conditions.

Transient Calibration-Verification Model – Consists of 72 stress periods, the first of which is steady-state. The subsequent 71 annual stress periods represent 1930 to 2000 (Table 1). Each of the transient stress periods (i.e. all but the steady-state) are divided into 4 time steps. The water levels, including dry cells, at the end of the transient period are shown in figures 3, 4, 5, and 6 for layers 1, 2, 3, and 4 respectively.

MODFLOW Version – MODFLOW 2000. This model was developed and delivered in Groundwater Vistas format (version 5.17).

Aquifer Parameters – Active cells and boundary conditions used in the model are shown in figures 7, 8, 9, and 10 for 1ayers 1, 2, 3, and 4, respectively. Values for horizontal hydraulic conductivities are shown in figures 11, 12, 13, and 14 for the same layers. The value for vertical hydraulic conductivity is one-tenth of the value of horizontal hydraulic conductivity where the model represents the Ogallala aquifer, limestone, or Antler's Sand and one-hundredth of the horizontal value where the aquifer represents shale. Storage properties were also identified for each cell in the model. The specific yield values for each cell are shown in Figure 15. Storativity values for each model layer are shown in figures 16, 17, 18, and 19.

Table 1. Historic (transient calibration-verification) model stress periods

Stress Period	Length (days)	Time Period	Stress Period	Length (days)	Time Period
1	N/A	Steady-State	37	365	1965
2	365	1930	38	365	1966
3	365	1931	39	365	1967
4	366	1932	40	366	1968
5	365	1933	41	365	1969
6	365	1934	42	365	1970
7	365	1935	43	365	1971
8	366	1936	44	366	1972
9	365	1937	45	365	1973
10	365	1938	46	365	1974
11	365	1939	47	365	1975
12	366	1940	48	366	1976
13	365	1941	49	365	1977
14	365	1942	50	365	1978
15	365	1943	51	365	1979
16	366	1944	52	366	1980
17	365	1945	53	365	1981
18	365	1946	54	365	1982
19	365	1947	55	365	1983
20	366	1948	56	366	1984
21	365	1949	57	365	1985
22	365	1950	58	365	1986
23	365	1951	59	365	1987
24	366	1952	60	366	1988
25	365	1953	61	365	1989
26	365	1954	62	365	1990
27	365	1955	63	365	1991
28	366	1956	64	366	1992
29	365	1957	65	365	1993
30	365	1958	66	365	1994
31	365	1959	67	365	1995
32	366	1960	68	366	1996
33	365	1961	69	365	1997
34	365	1962	70	365	1998
35	365	1963	71	365	1999
36	366	1964	72	366	2000

5. MODFLOW Packages used in this GAM

- **Basic (BAS) Package** – Standard MODFLOW package required in all models. In order to simulate communication between the southern and northern portions of the Ogallala Aquifer, cells along the boundary of the model in north-central Randall and south-central Potter counties were assigned as constant head cells (Figure 7).

- **Block-Centered Flow (BCF) Package** – Standard MODFLOW package required in all models

- **Output Control (OC) Package** – Standard MODFLOW package required in all models

- **Well (WEL) Package** – The GAM uses the MODFLOW well package to represent pumping for agriculture, municipal, livestock, manufacturing and other uses. **In order to account for irrigation return flow, the amount of agricultural pumping in the Ogallala Aquifer each year was reduced by a fraction corresponding to the efficiency of irrigation (Table 2, Blandford and others, 2003).** Pumpage included in the GAM in each county and aquifer for each transient calibration-verification time period is summarized in Appendix A. The distribution of pumping at the end of the transient-calibration period for Layer 1 is shown in Figure 20.

- **Multi-Node Well (MNW) Package – The MODFLOW multi-node well (MNW) package is used to represent pumping in wells that are completed into both the Ogallala and Edwards-Trinity (High Plains) aquifers in Gaines and Dawson counties. See Figure 21 for the location of the multi-node wells included in the model. The MNW package determines the volume of water pumped from each layer of the model based on the hydraulic properties and saturated thickness of each layer as well as the screened intervals (Blandford and others, 2008).**

- **Recharge (RCH) Package –** This GAM uses the MODFLOW recharge package to represent inflow to the Ogallala Aquifer sourced from precipitation, primarily from playas. The model does not include any recharge directly to the Edwards-Trinity (High Plains) Aquifer because it is overlain by the Ogallala Aquifer. **Recharge to the model using the MODFLOW recharge package does not include irrigation return flow, which was accounted for in the model by a direct reduction in agricultural pumping as described above (Blandford and others, 2003). The recharge package also does not account for recharge from playas in the vicinity of Lubbock as they are modeled as injection wells using the MODFLOW well package (described above).** Recharge values for each model cell were determined during calibration and distributed as a function of soil type.

- **Preconditioned Conjugate Gradient Package 2 (PCG2) Solver** – This GAM uses the PCG2 solver with a 5 ft head change criterion and a 43,560 ft^3/day (1 acre-ft per day) residual convergence criterion.

- **Drain (DRN) Package –** The MODFLOW Drain package was used to simulate springs and seeps originating from the Ogallala and Edwards-Trinity (High Plains) aquifers, especially along the eastern escarpment (the eastern boundary of the model). **Note that this also includes discharge to a number of large salt lakes in the central portion of the model area (e.g. Lamb, Hickley, and Lynn counties; Figure 8).**

Table 2. Irrigation return flow estimates for Texas and New Mexico (also found on pg. 44; Blandford and others, 2003). These irrigation return flow percentages were incorporated into the model by a direct reduction in agricultural pumpage as described above and in Blandford and others (2003).

Period	Return Flow (%)	
	Texas	New Mexico
1940-1960	55	55
1961-1965	50	50
1966-1970	45	50
1971-1975	40	50
1976-1980	35	40
1981-1985	25	40
1986-1990	20	35
1991-1995	15	25
1996-2000	10	20

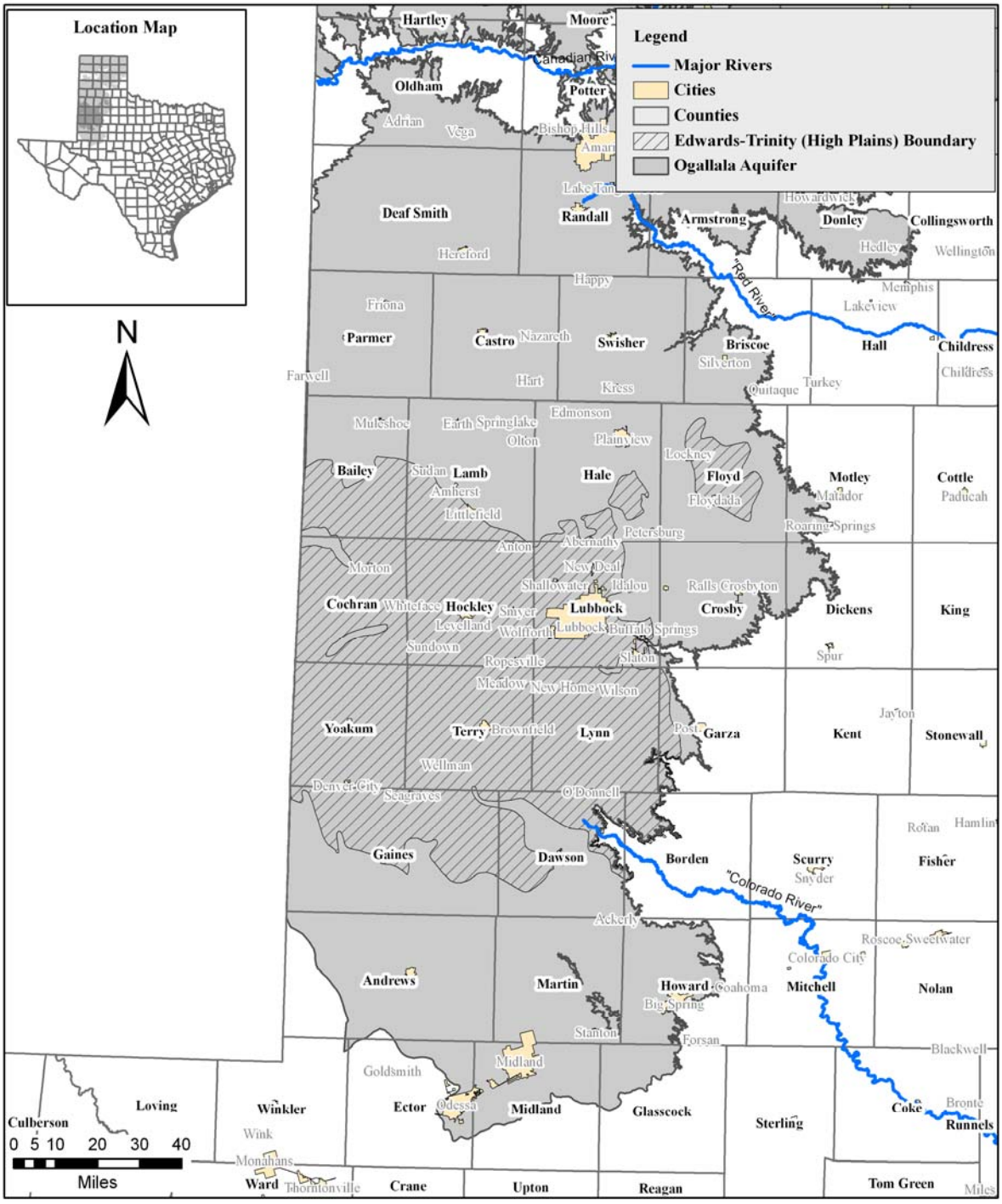

Figure 1. Location map. Note that the boundary of the Edwards-Trinity (High Plains) Aquifer presented above is the revised boundary on which the model was based.

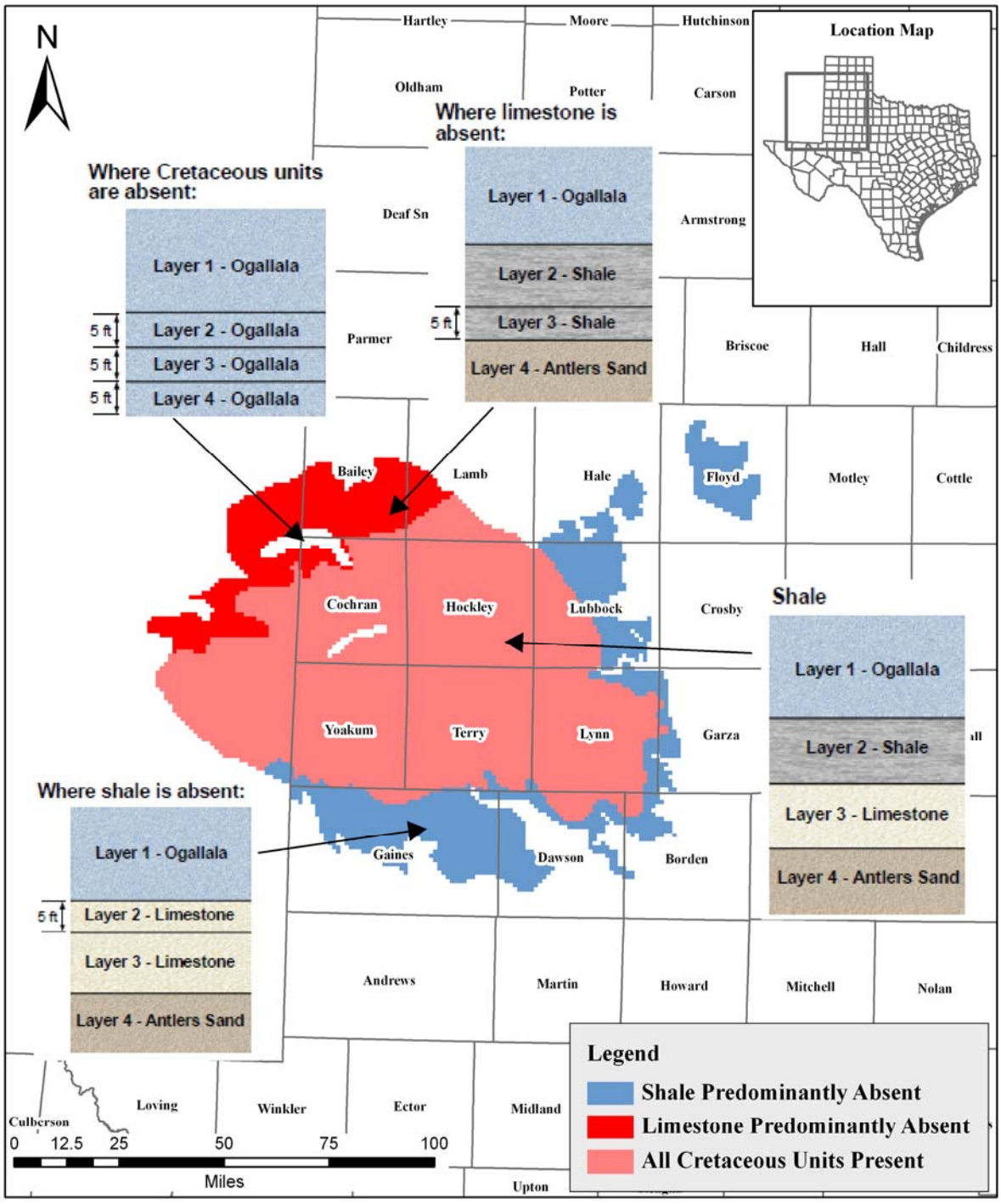

Figure 2. Vertical construction of the model grid for the Edwards-Trinity (High Plains) Aquifer (reproduced from Figure 45 of Blandford and others, 2008)

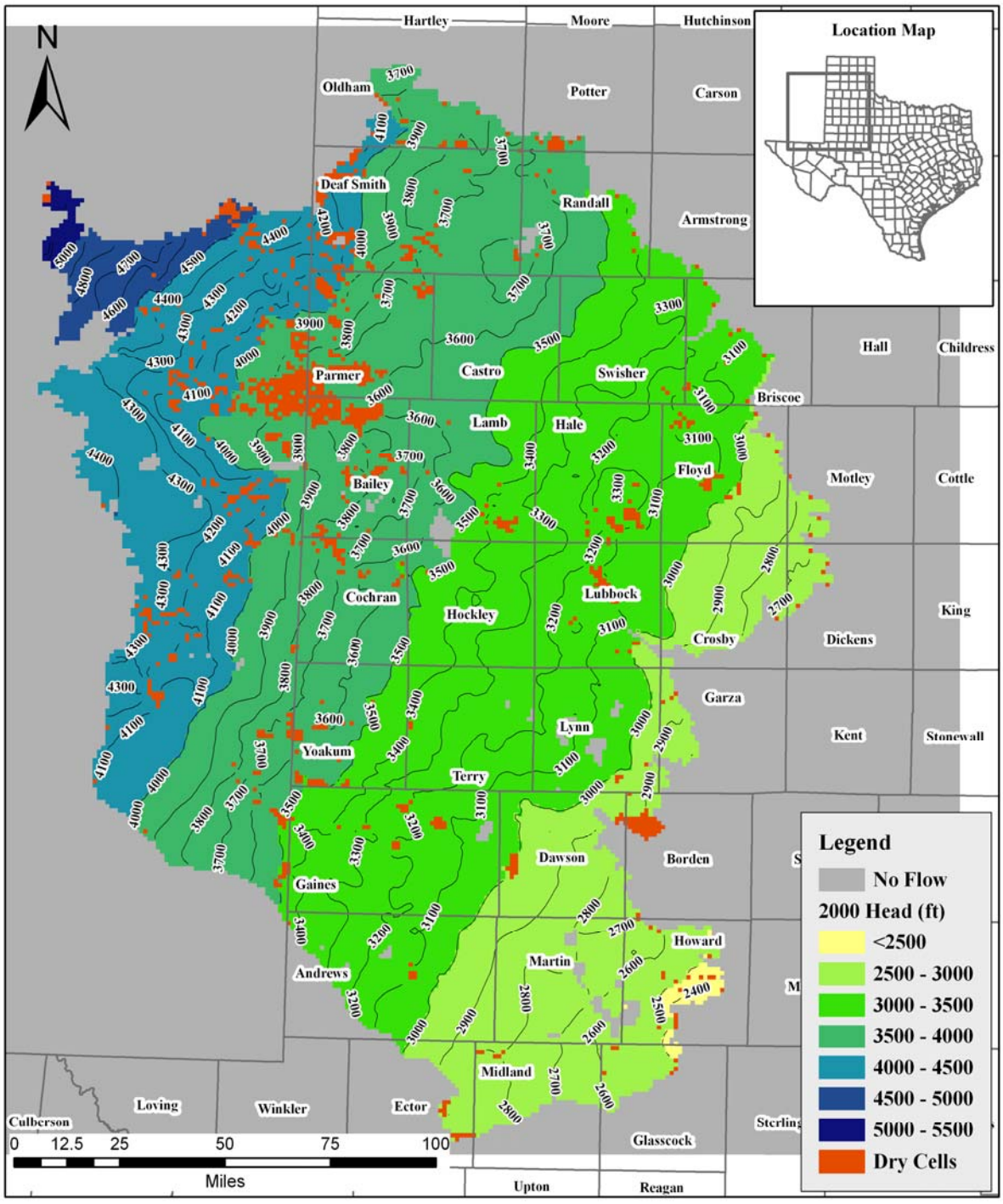

Figure 3. Water levels in Layer 1 at the end of the transient-calibration portion of the model (2000). There are 1,186 dry cells represented in the above figure.

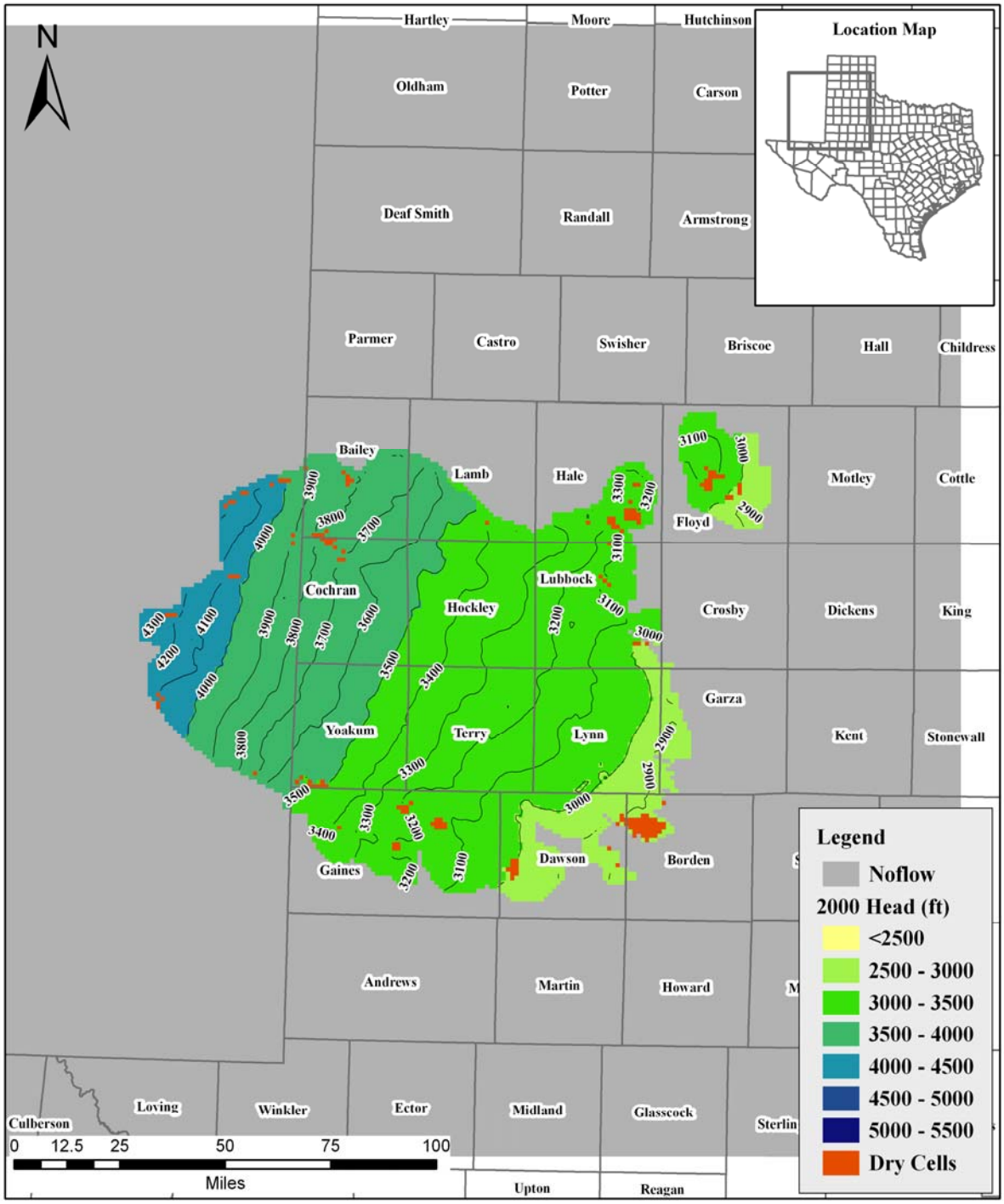

Figure 4. Water levels in Layer 2 at the end of the transient-calibration portion of the model (2000). There are 183 dry cells represented in the above figure.

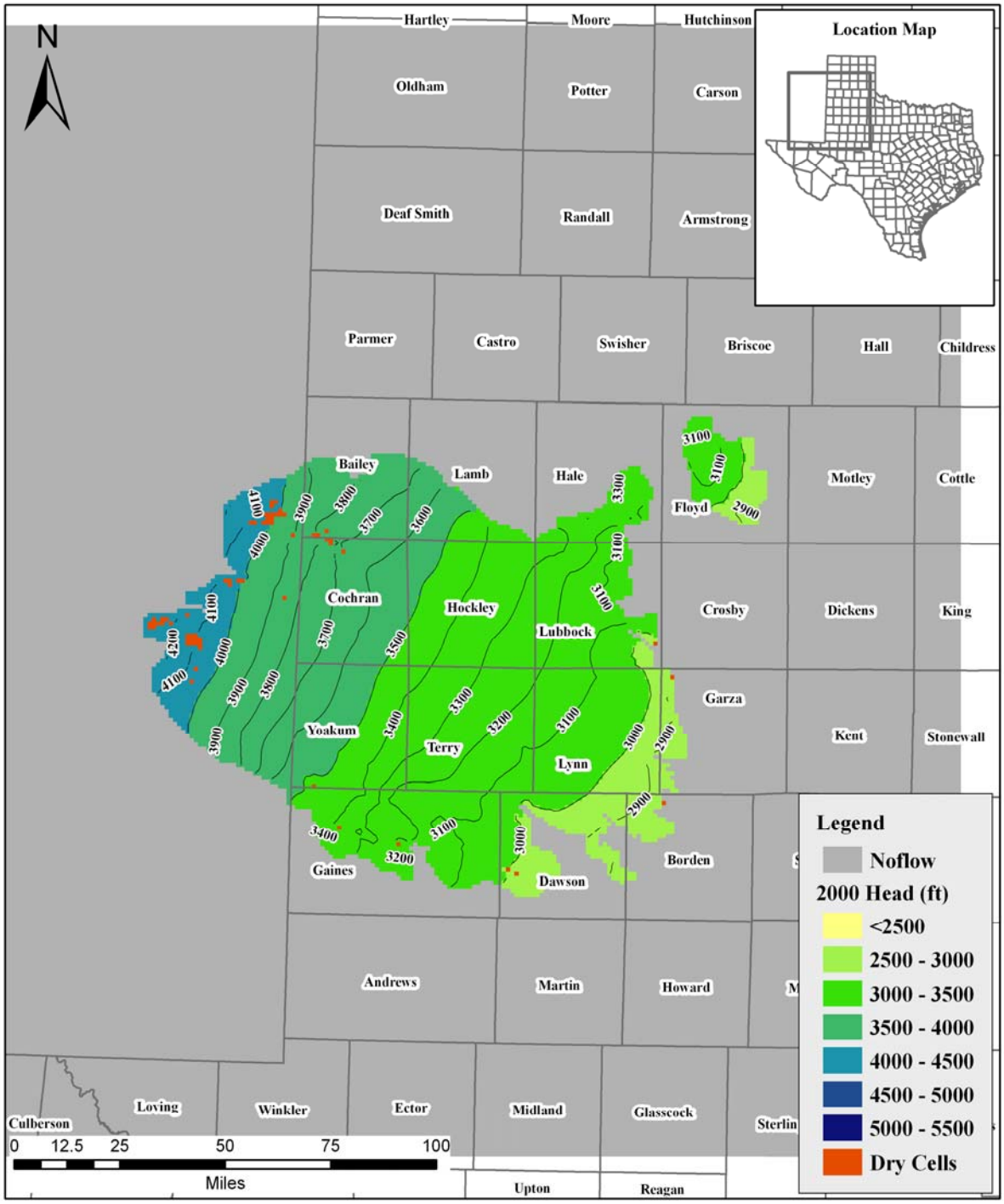

Figure 5. Water levels in Layer 3 at the end of the transient-calibration portion of the model (2000). There are 64 dry cells represented in the above figure.

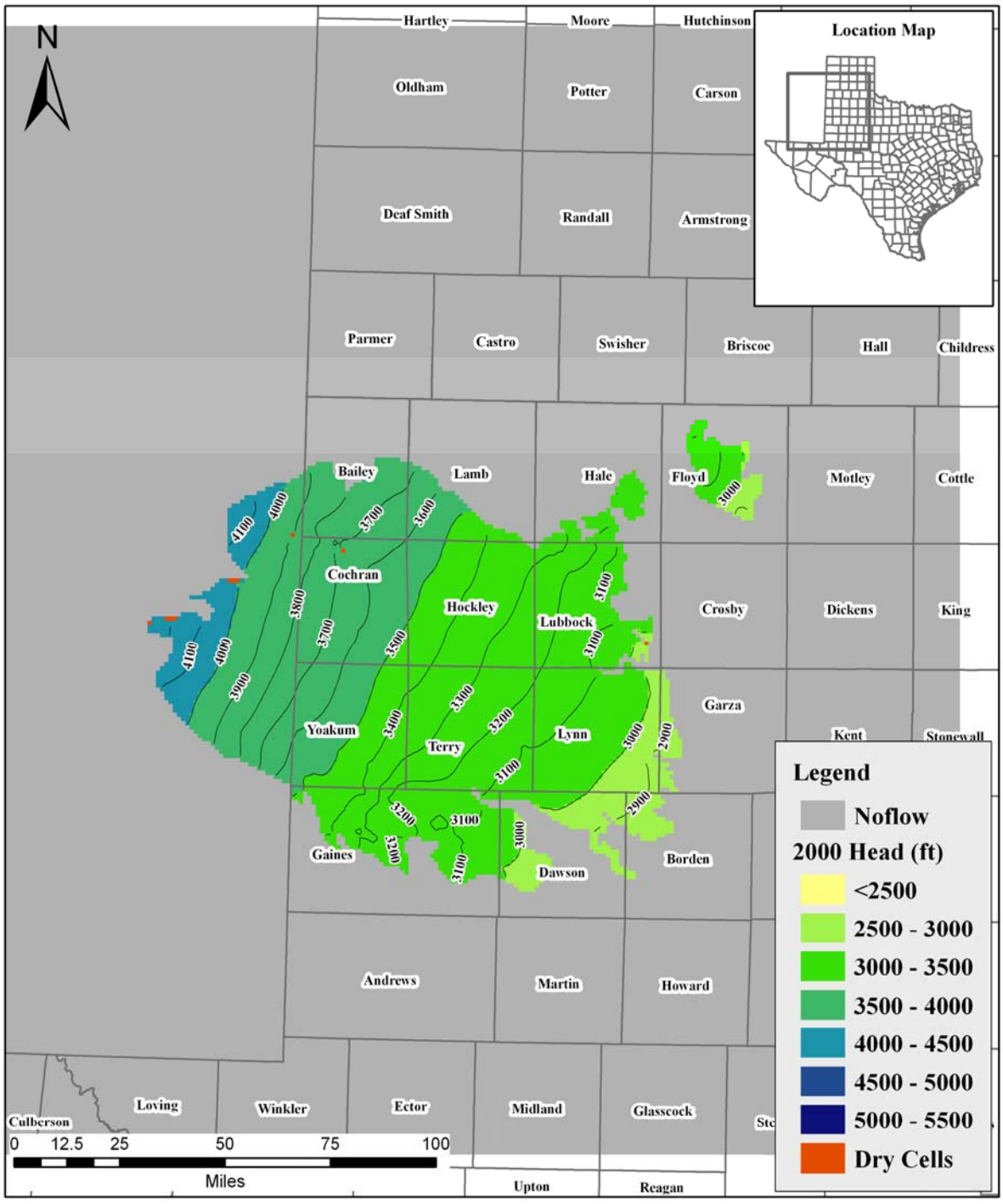

Figure 6. Water levels in Layer 4 at the end of the transient-calibration portion of the model (2000). There are 10 dry cells represented in the above figure.

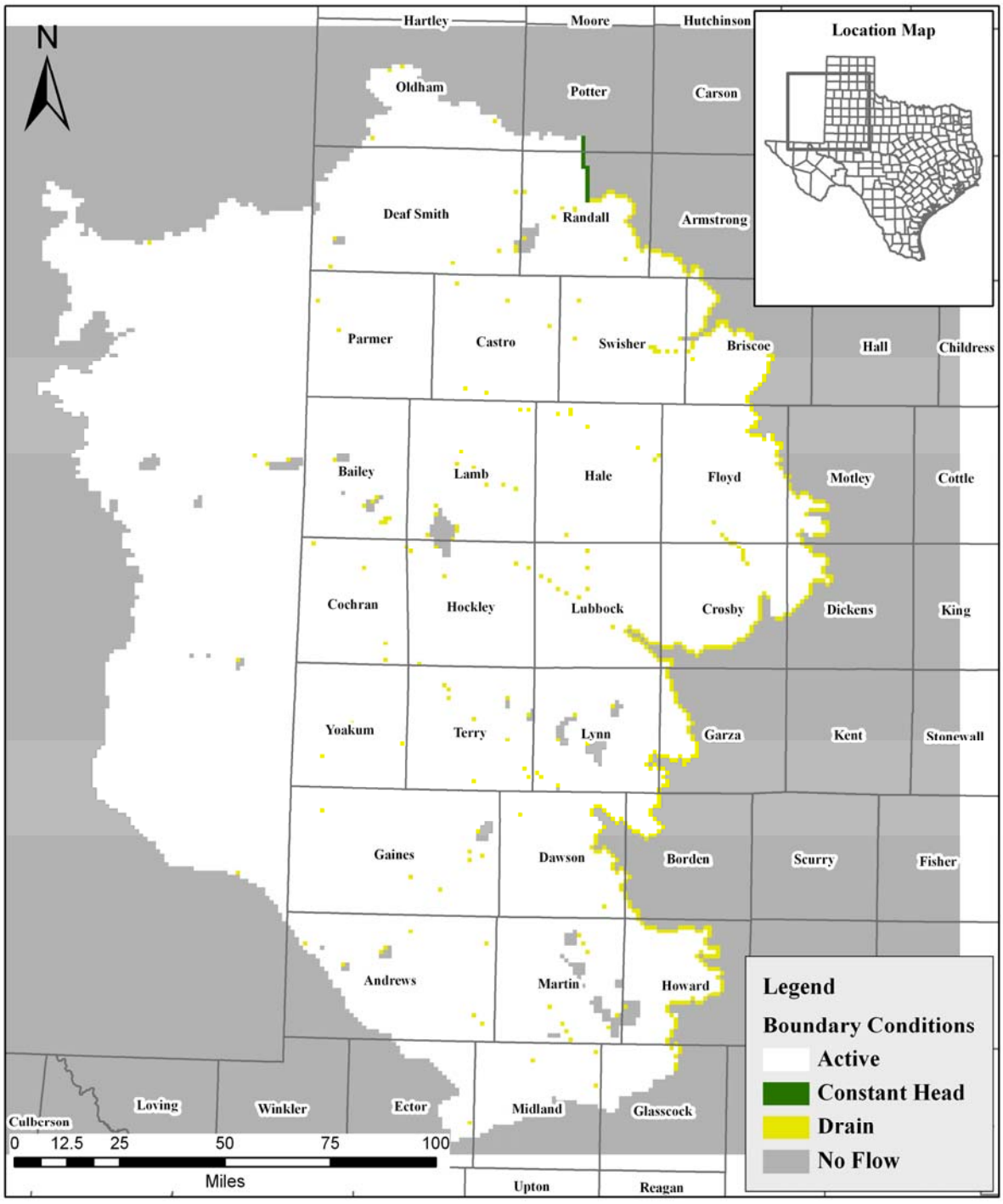

Figure 7. Active cells and boundary conditions in Layer 1.

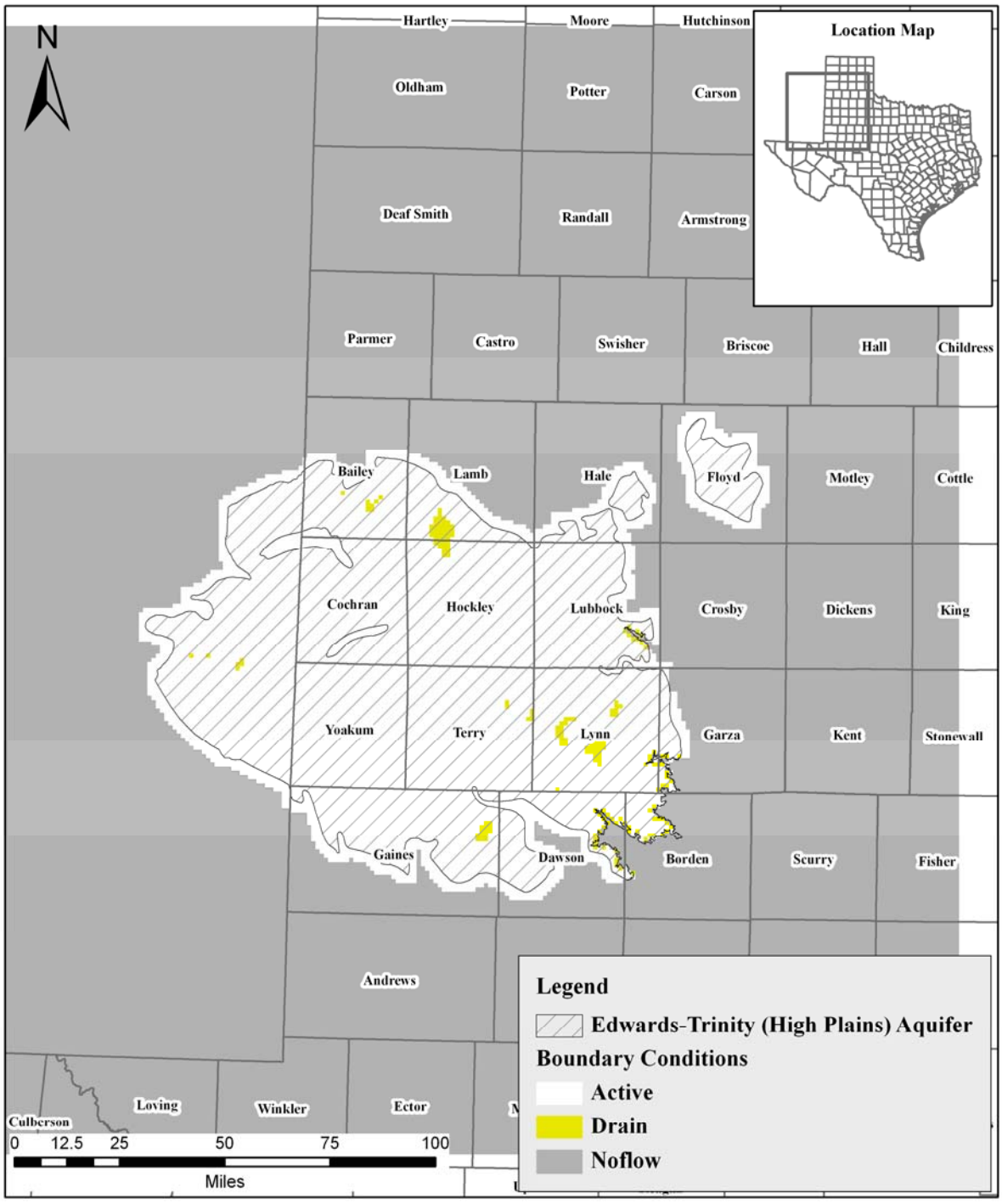

Figure 8. Active cells and boundary conditions in Layer 2. Note that drains in the Edwards-Trinity (High Plains) Aquifer portion of the groundwater availability model are used to simulate outflow to springs and seeps along the eastern escarpment and discharge to large salt lakes.

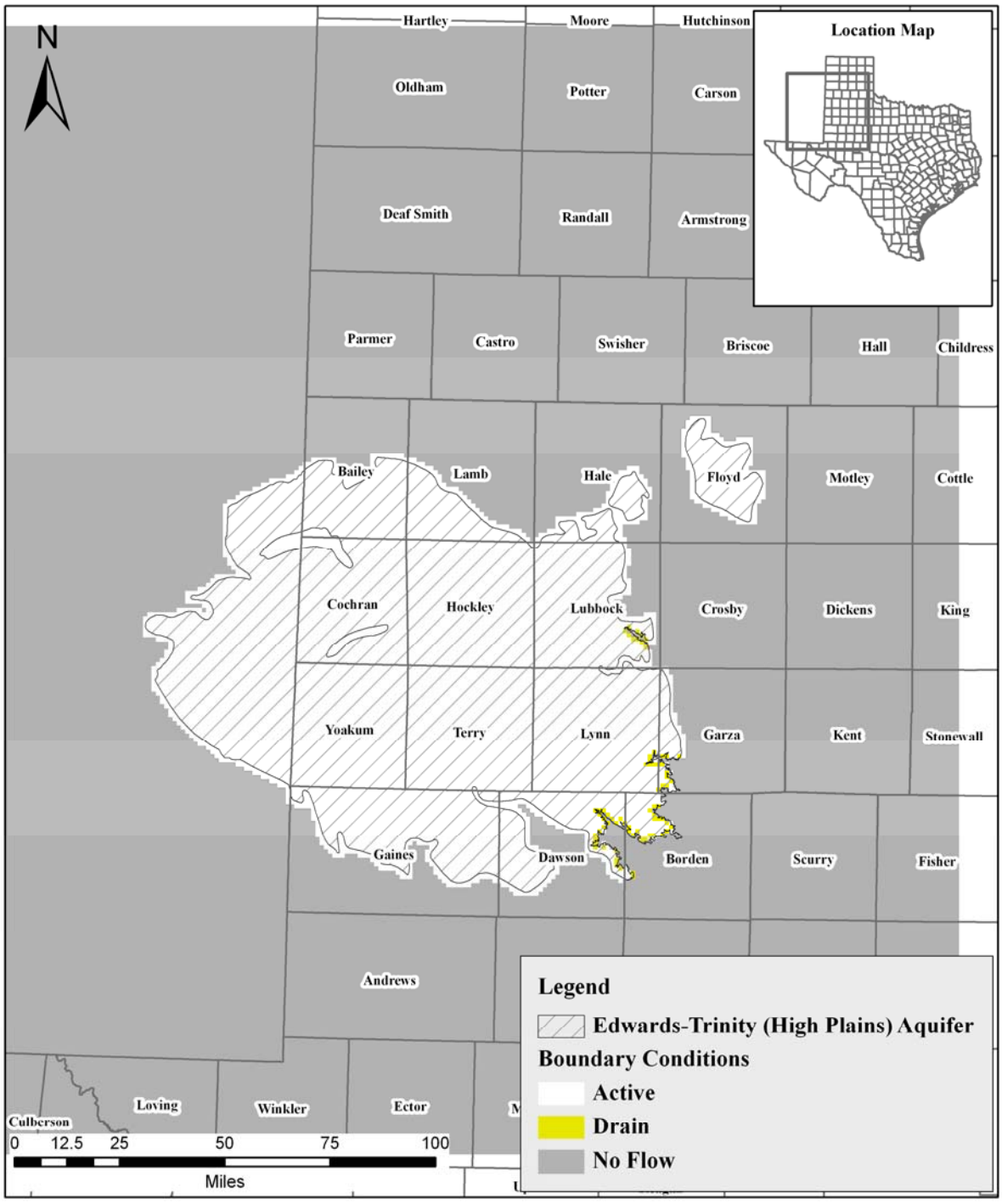

Figure 9. Active cells and boundary conditions in Layer 3

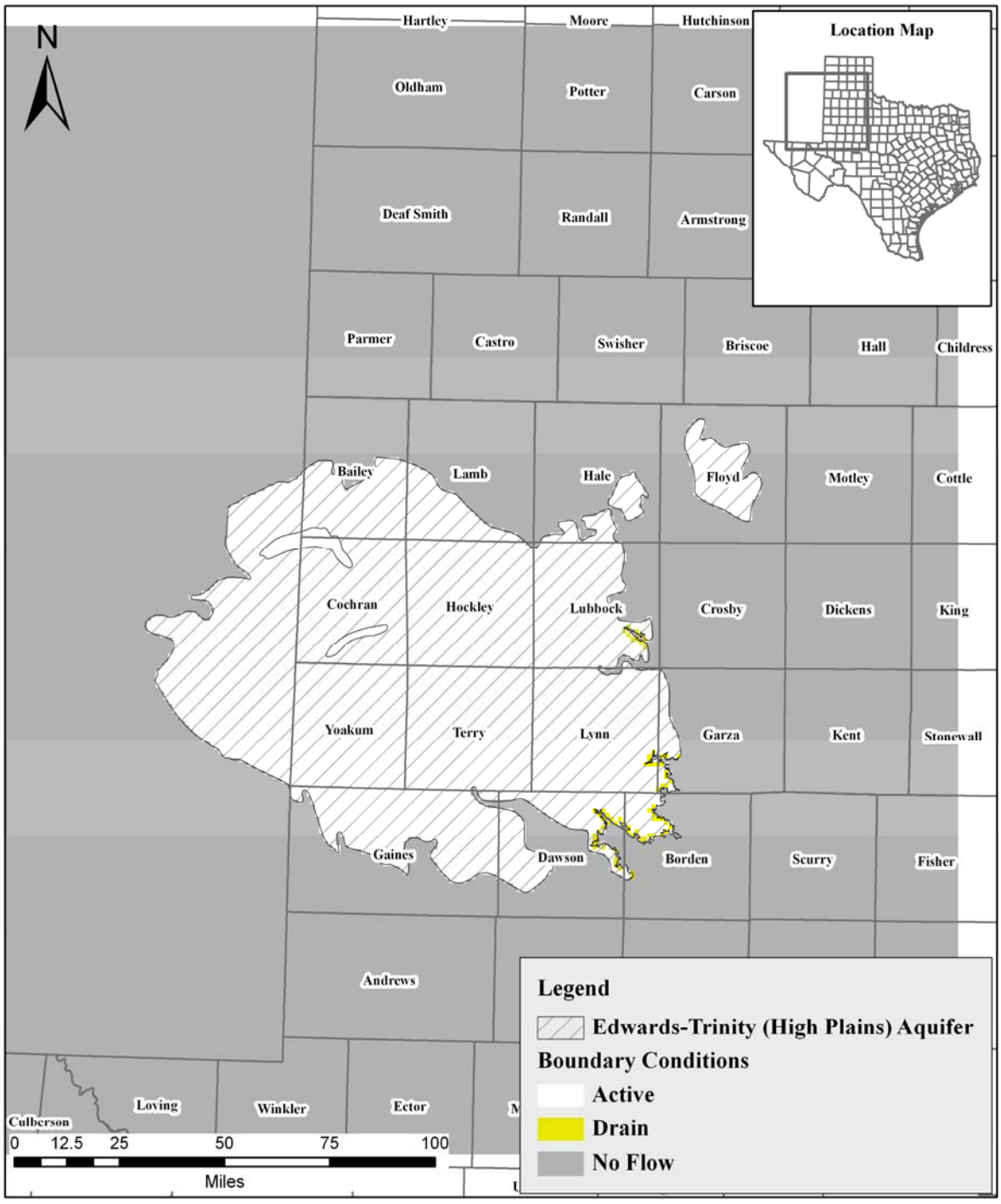

Figure 10. Active cells and boundary conditions in Layer 4

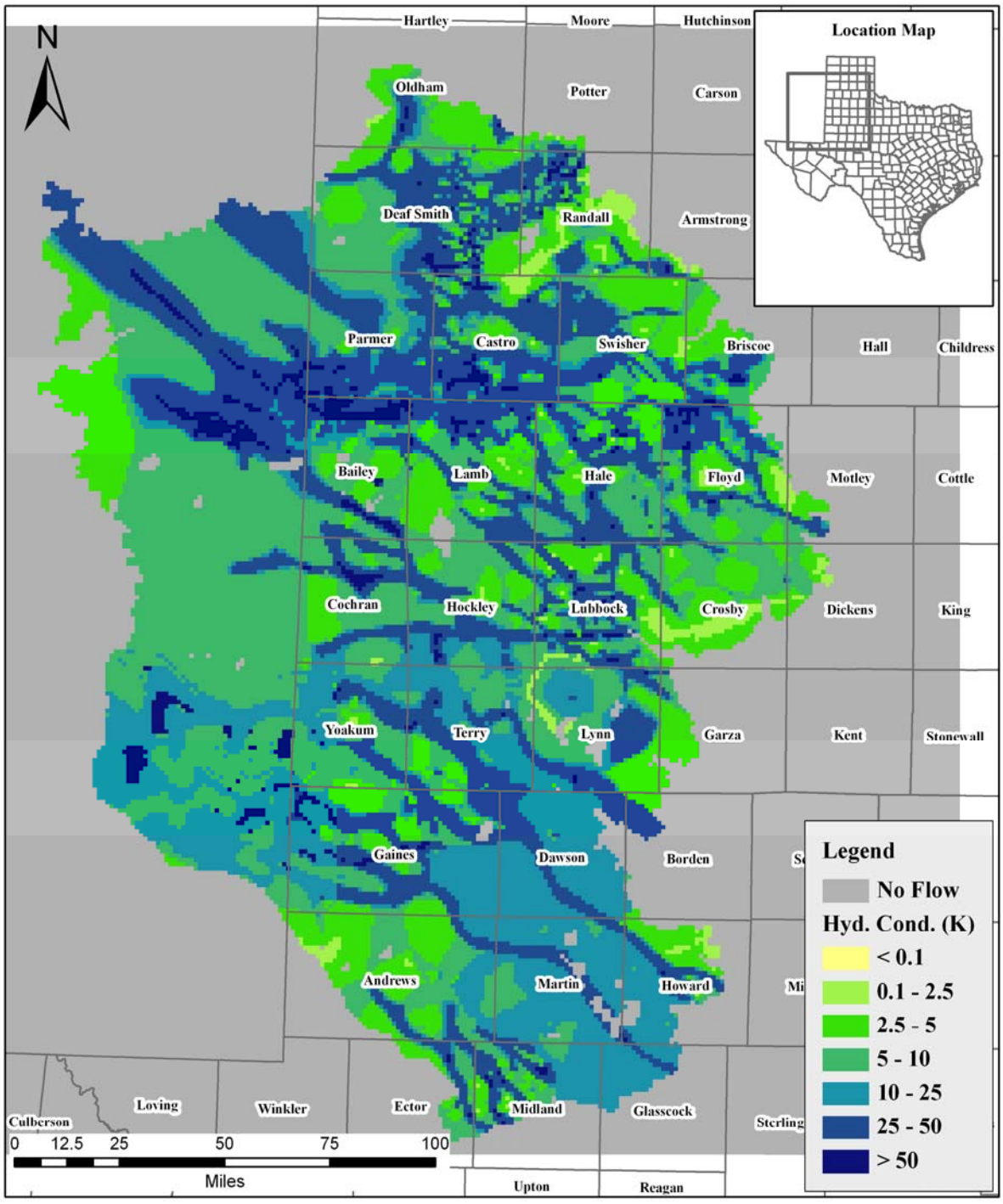

Figure 11. Hydraulic Conductivity (K) in Layer 1

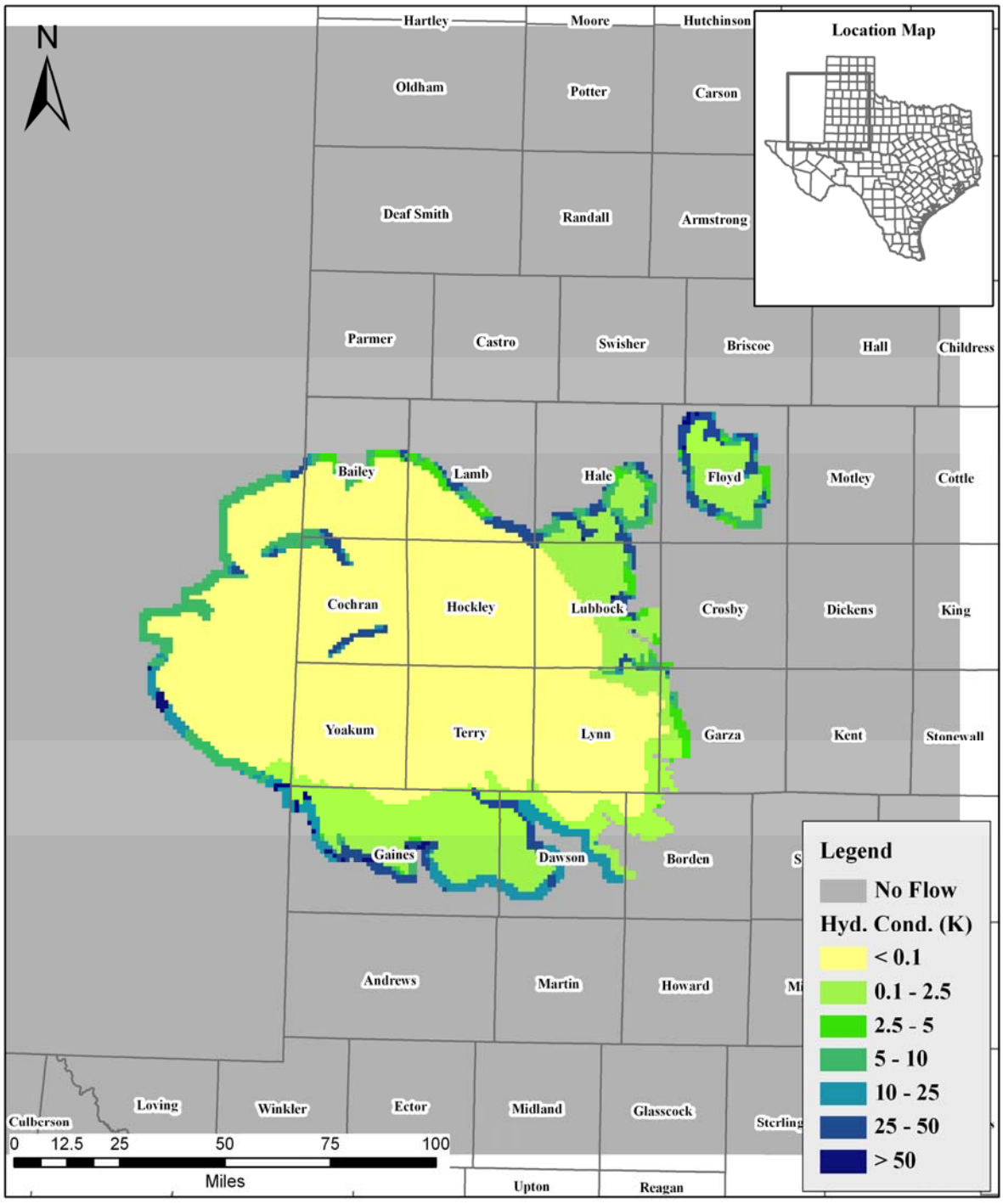

Figure 12. Hydraulic Conductivity (K) in Layer 2

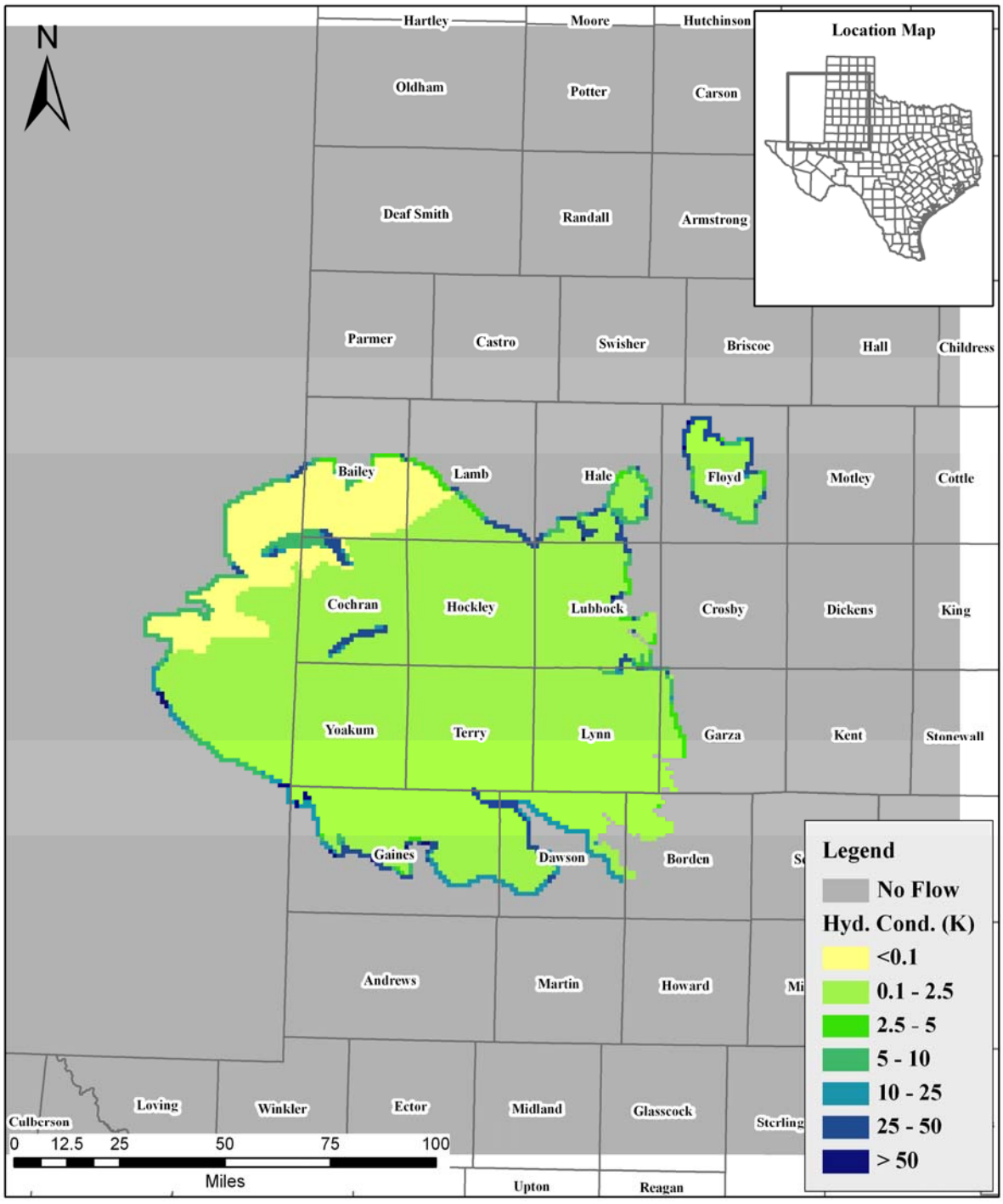

Figure 13. Hydraulic Conductivity (K) in Layer 3

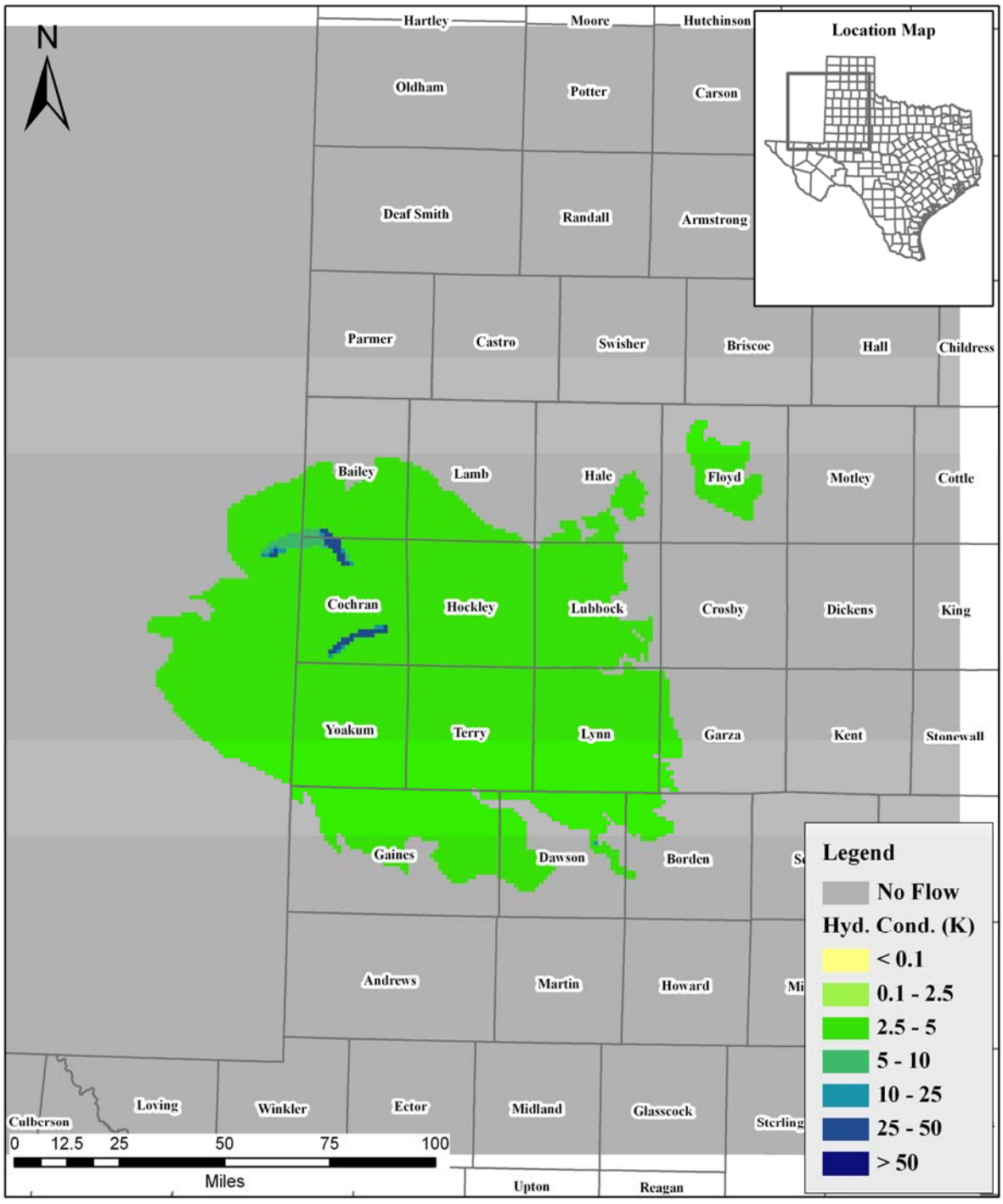

Figure 14. Hydraulic Conductivity (K) in Layer 4

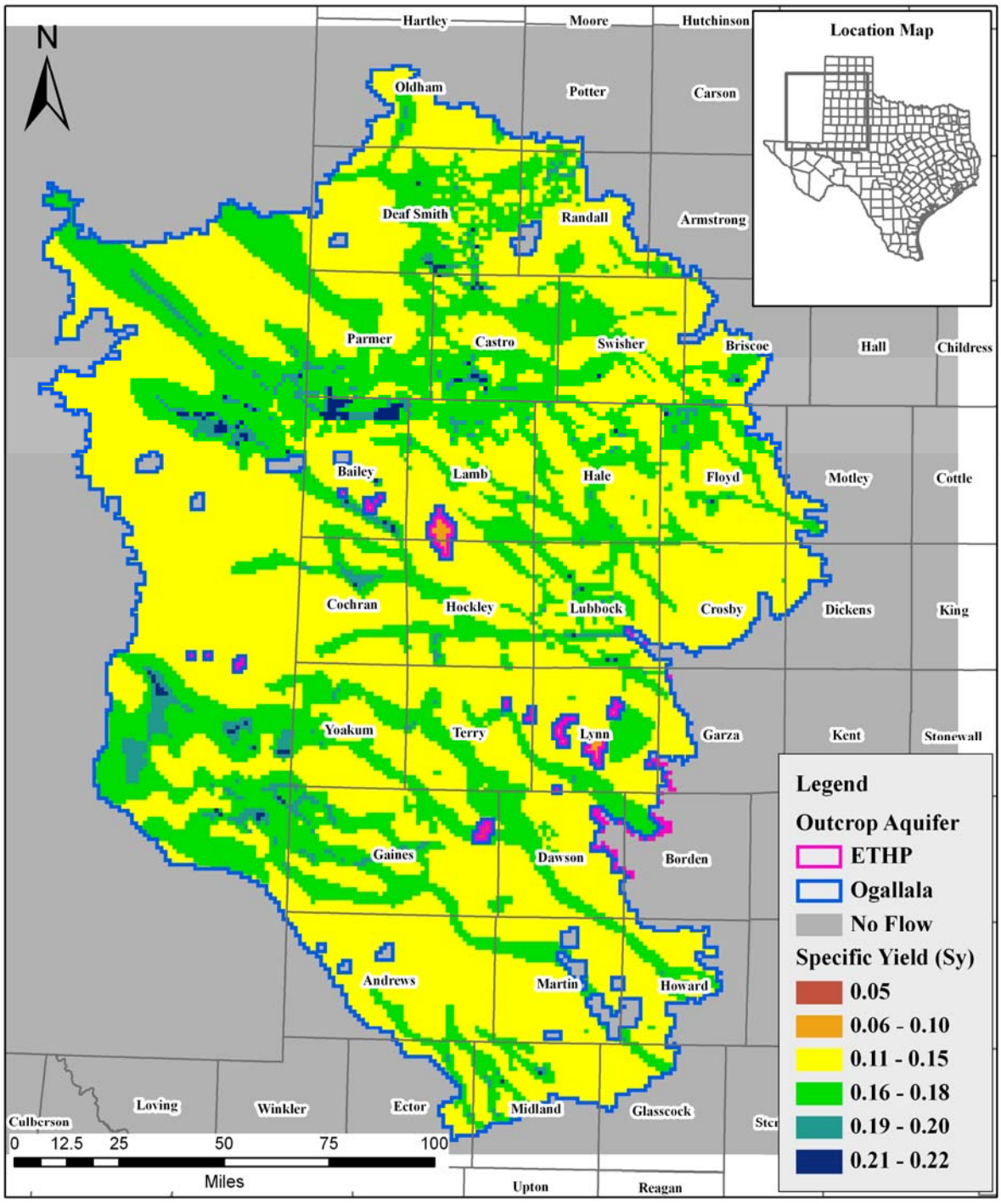

Figure 15. Specific Yield (Sy) for each layer in the model

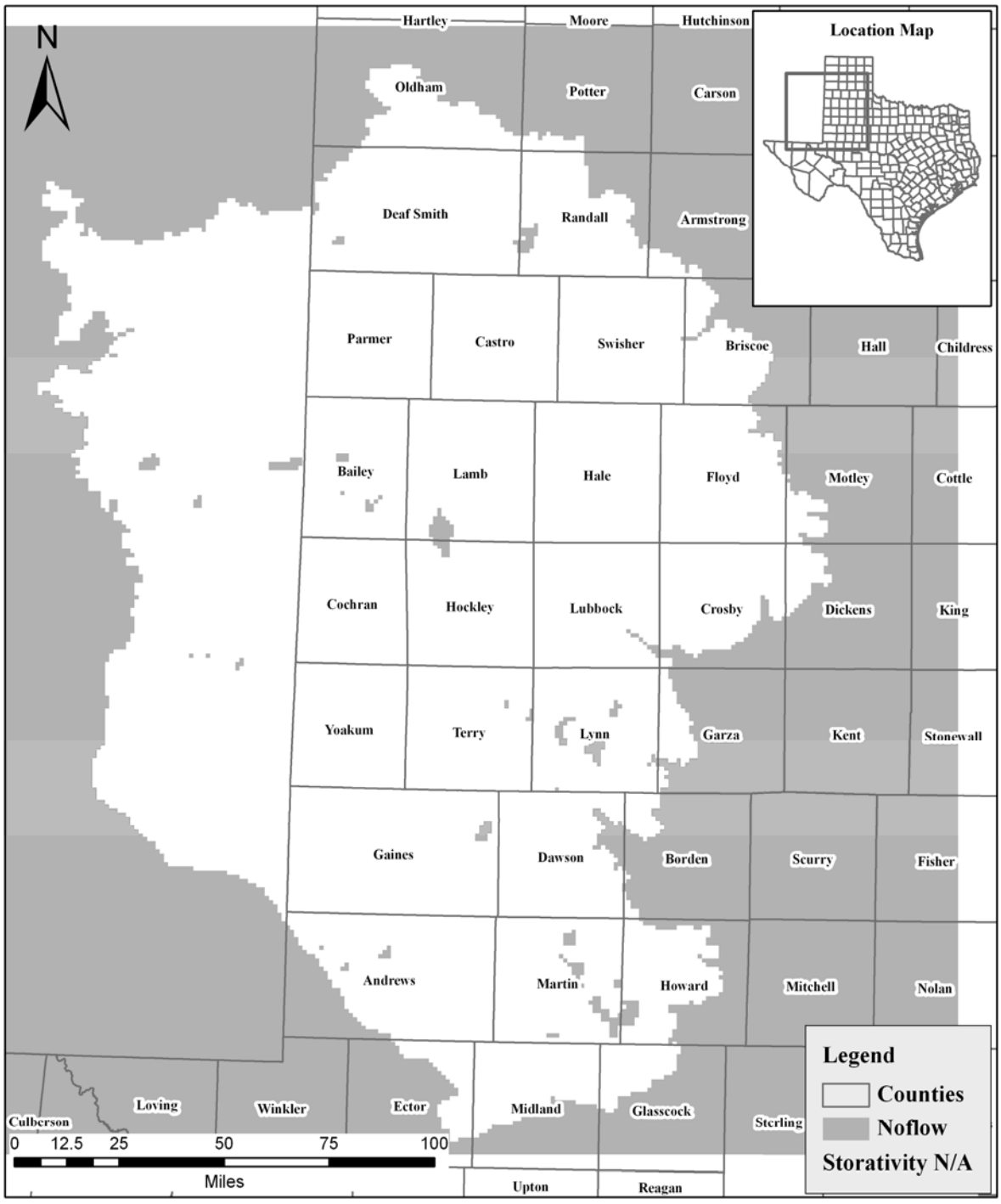

Figure 16. Storativity in Layer 1. Note that storativity is not applicable in the Ogallala Aquifer (Layer 1) because it is unconfined.

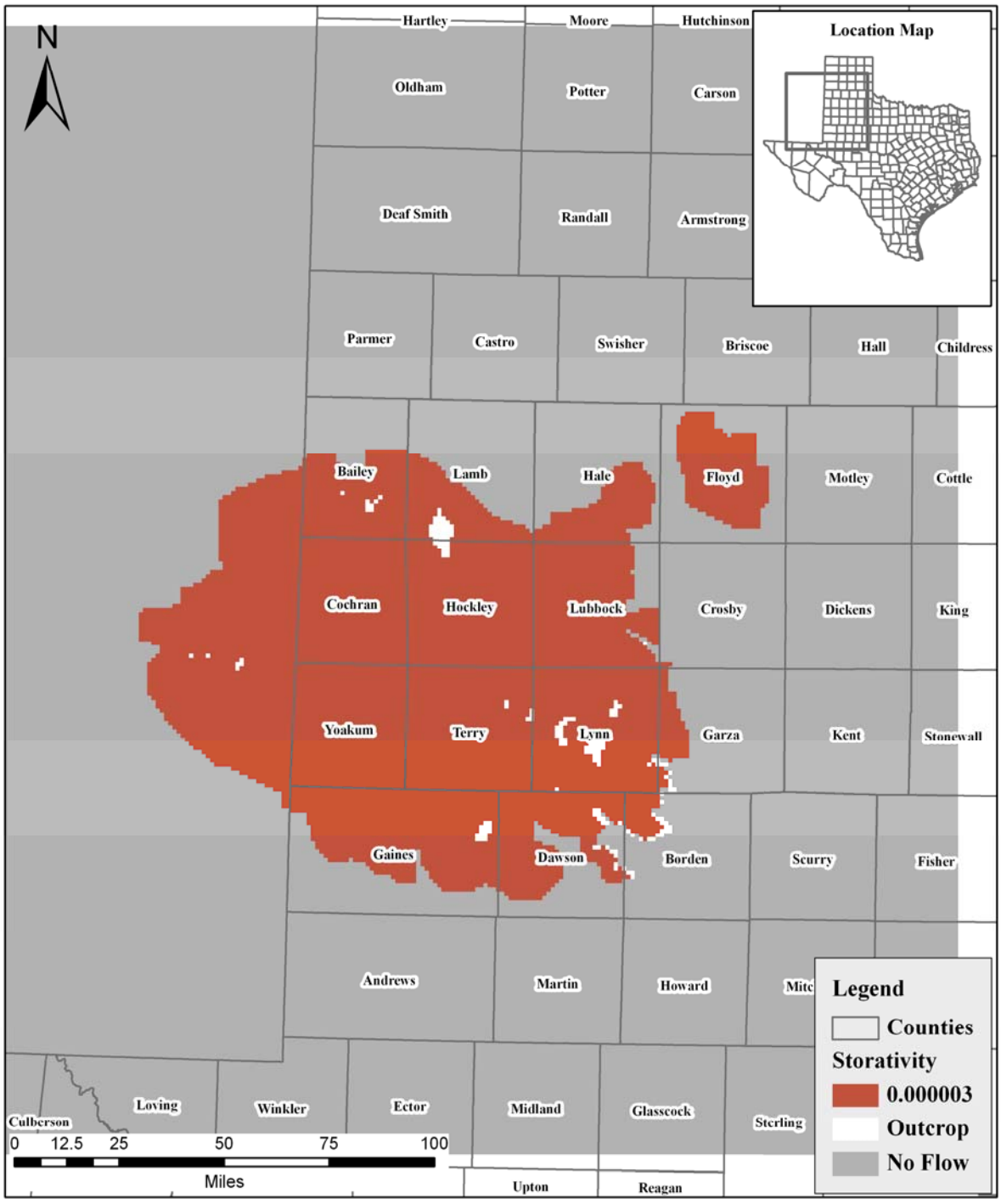

Figure 17. Storativity in Layer 2

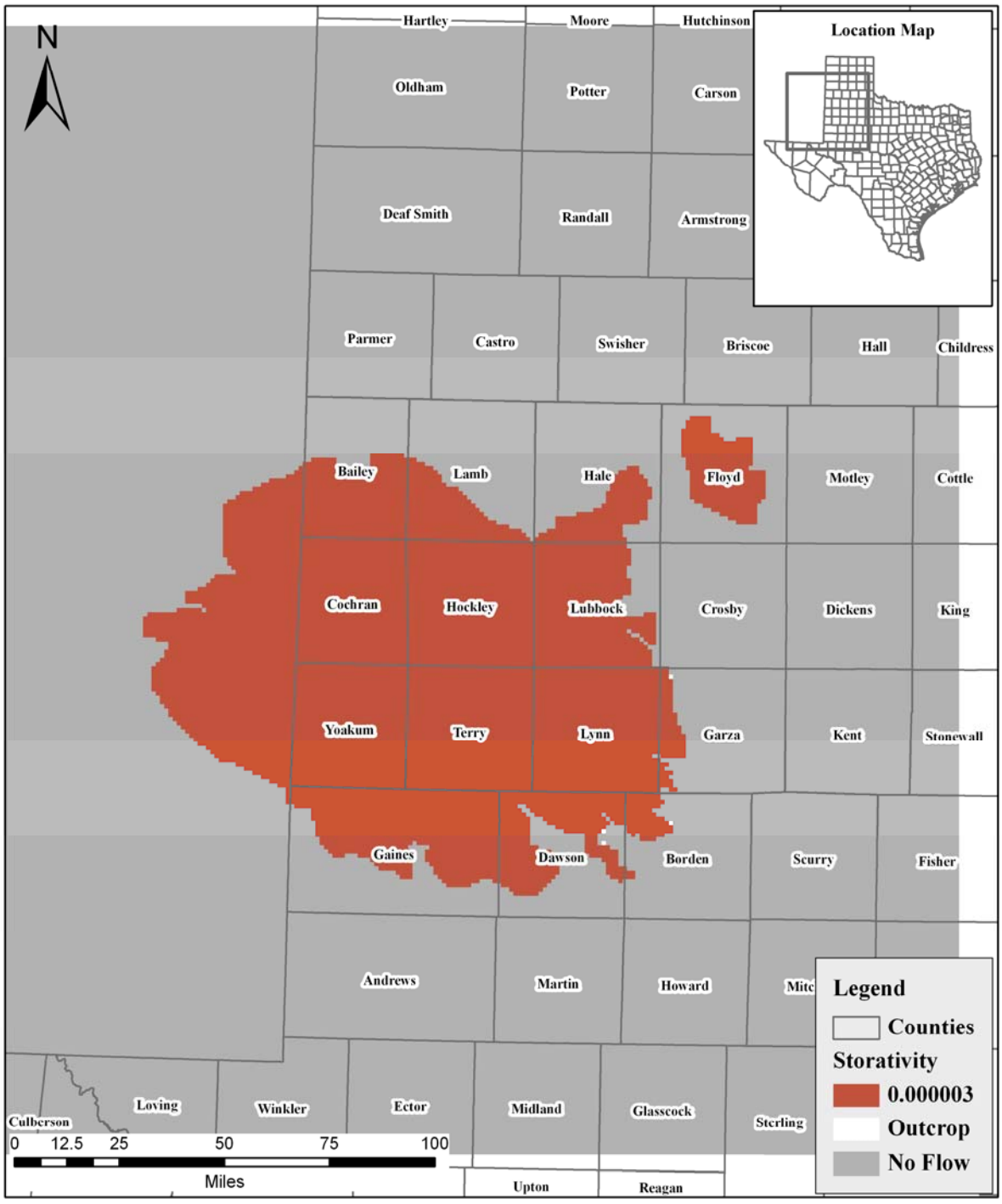

Figure 18. Storativity in Layer 3

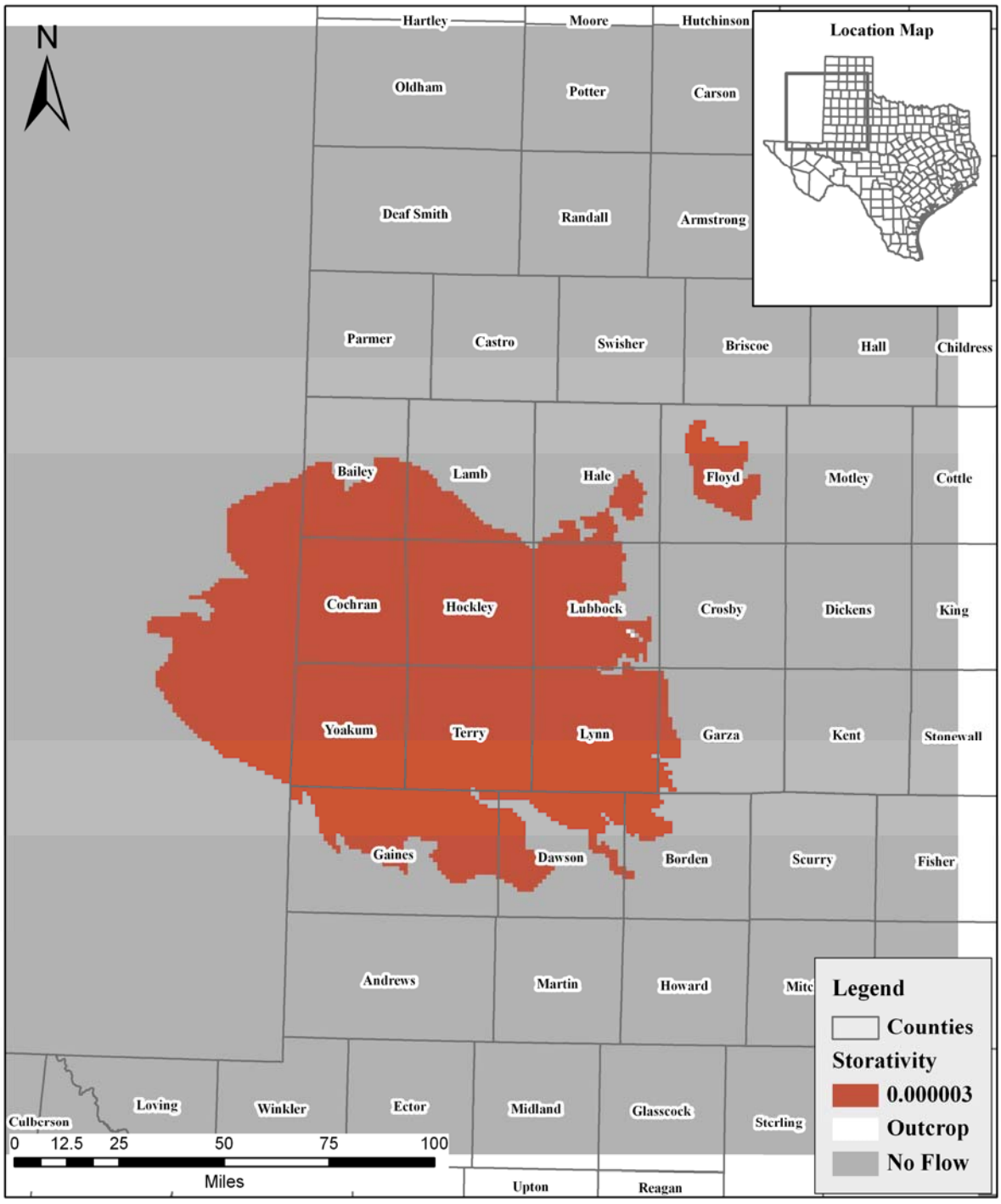

Figure 19. Storativity in Layer 4

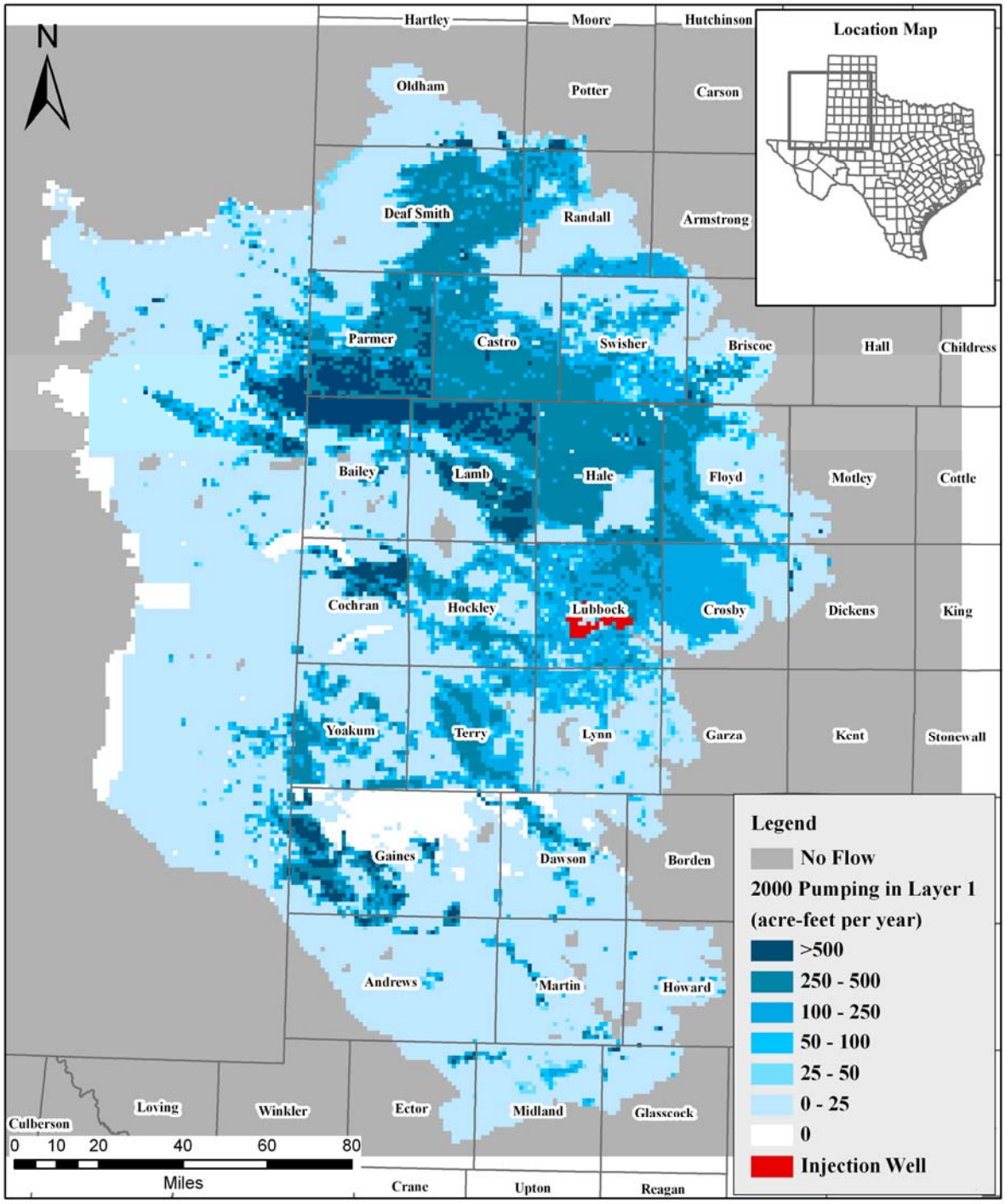

Figure 20. Pumpage distribution in Layer 1 for the last stress period of the transient-calibration portion of the model (2000). Pumping is in acre-feet per year (AFY). Note: as described in Blandford and others (2008), injection wells in the vicinity of Lubbock are included to simulate recharge from individual playas.

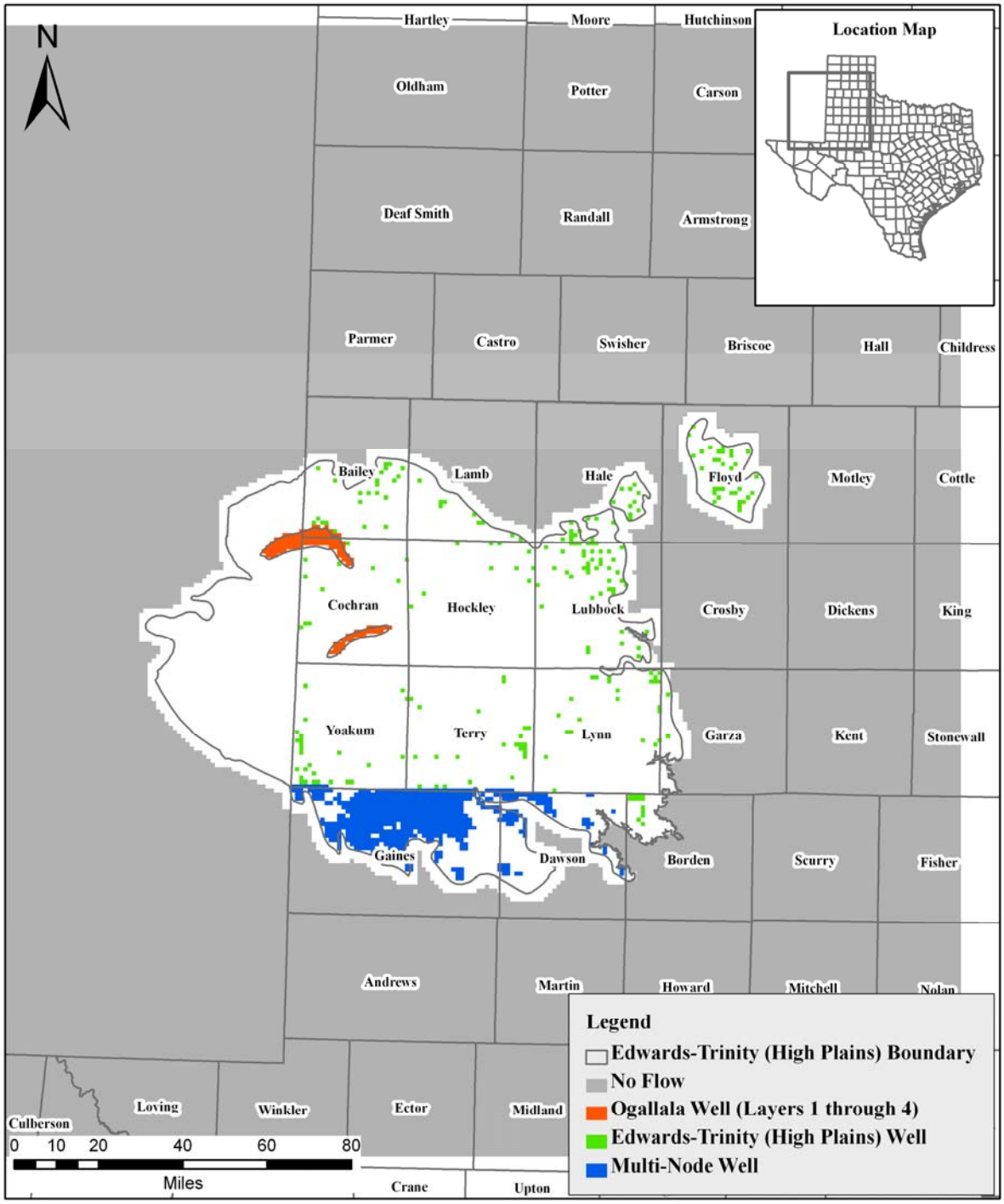

Figure 21. Pumping in layers 2 through 4 in the transient-calibration portion of the model.
Note: Pumping in multi-node wells is distributed among layers 1 through 4 and represents wells which are dual completed into both the Ogallala and Edwards-Trinity (High Plains) aquifers. Pumping in non-multi-node wells above was applied in the model using the MODFLOW well package.

Appendix A

Summary of Historic Pumpage out of the GAM

Table A-1. Historic pumpage included in the GAM well file (WEL) in the Ogallala Aquifer by county (in acre-feet per year).

Period	Andrews		Armstrong		Bailey		Borden		Briscoe	
	In	Out	In	Out	In	Out	In	Out	In	Out
Steady-State	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0
1940	0	556	0	568	0	1,464	0	68	0	472
1941	0	594	0	570	0	4,631	0	75	0	806
1942	0	636	0	573	0	7,753	0	81	0	1,080
1943	0	685	0	575	0	10,891	0	88	0	1,353
1944	0	756	0	580	0	16,643	0	100	0	1,872
1945	0	838	0	585	0	22,462	0	112	0	2,391
1946	0	931	0	590	0	28,256	0	124	0	2,911
1947	0	1,042	0	595	0	34,064	0	136	0	3,430
1948	0	1,179	0	600	0	39,843	0	148	0	3,950
1949	0	1,375	0	607	0	49,104	0	167	0	4,784
1950	0	1,622	0	615	0	58,396	0	187	0	5,618
1951	0	1,812	0	623	0	67,718	0	206	0	6,457
1952	0	2,025	0	631	0	76,976	0	225	0	7,296
1953	0	2,272	0	638	0	86,273	0	245	0	8,135
1954	0	2,064	0	644	0	92,562	0	258	0	8,701
1955	0	2,357	0	649	0	98,796	0	271	0	9,268
1956	0	2,787	0	654	0	107,014	0	284	0	9,846
1957	0	3,196	0	659	0	112,027	0	297	0	10,419
1958	0	3,582	0	664	0	117,890	0	310	0	10,966
1959	0	4,745	0	681	0	125,025	0	305	0	14,287
1960	0	6,438	0	698	0	132,277	0	300	0	17,505
1961	0	7,981	0	731	0	156,602	0	320	0	23,009
1962	0	9,342	0	750	0	166,072	0	315	0	26,606
1963	0	10,303	0	768	0	174,003	0	309	0	30,274
1964	0	12,038	0	787	0	185,049	0	304	0	33,957

Table A-1. Continued.

Period	Andrews		Armstrong		Bailey		Borden		Briscoe	
	In	Out	In	Out	In	Out	In	Out	In	Out
1965	0	9,924	0	777	0	169,990	0	303	0	33,017
1966	0	8,804	0	787	0	166,765	0	326	0	35,187
1967	0	7,665	0	776	0	147,857	0	325	0	34,133
1968	0	5,214	0	765	0	124,775	0	325	0	33,068
1969	0	3,648	0	755	0	103,429	0	324	0	32,039
1970	0	4,095	0	751	0	123,969	0	317	0	32,466
1971	0	4,830	0	763	0	153,720	0	333	0	35,818
1972	0	5,244	0	758	0	175,525	0	326	0	36,278
1973	0	5,273	0	754	0	193,212	0	318	0	36,709
1974	0	6,102	0	750	0	212,538	0	311	0	37,172
1975	0	6,035	0	720	0	188,187	0	272	0	36,797
1976	0	7,184	0	703	0	183,375	0	249	0	39,391
1977	0	8,095	0	671	0	165,245	0	208	0	38,983
1978	0	8,588	0	704	0	149,980	0	190	0	38,472
1979	0	8,923	0	738	0	135,360	0	171	0	37,883
1980	0	11,090	0	767	0	124,023	0	294	0	30,693
1981	0	14,279	0	691	0	132,327	0	464	0	26,902
1982	0	16,477	0	706	0	125,058	0	598	0	30,404
1983	0	29,532	0	626	0	93,505	0	55	0	26,278
1984	0	12,530	0	594	0	76,604	0	138	0	21,675
1985	0	12,372	0	603	0	66,214	0	263	0	20,164
1986	0	11,479	0	644	0	63,232	0	415	0	20,000
1987	0	9,554	0	640	0	55,701	0	551	0	18,393
1988	0	9,725	0	626	0	57,629	0	776	0	19,762
1989	0	10,772	0	644	0	60,088	0	999	0	21,000
1990	0	10,496	0	658	0	63,119	0	1,228	0	22,316
1991	0	11,424	0	699	0	65,386	0	1,555	0	24,850
1992	0	11,238	0	1,009	0	67,684	0	1,803	0	26,275
1993	0	9,486	0	1,056	0	74,926	0	55	0	30,980
1994	0	10,696	0	831	0	69,558	0	1,643	0	28,138
1995	0	12,564	0	659	0	65,785	0	2,217	0	22,876
1996	0	17,101	0	641	0	61,719	0	2,946	0	18,589
1997	0	19,777	0	630	0	51,633	0	2,813	0	12,889
1998	0	20,235	0	2,635	0	71,866	0	2,021	0	16,957
1999	0	19,890	0	4,641	0	74,213	0	1,228	0	20,625
2000	0	19,631	0	6,646	0	81,311	0	436	0	24,614

Table A-1. Continued.

Period	Castro		Cochran		Crosby		Dawson		Deaf Smith	
	In	Out	In	Out	In	Out	In	Out	In	Out
Steady-State	0	0	0	0	0	0	20	1	0	0
1930	0	0	0	0	0	0	15	1	0	0
1931	0	0	0	0	0	0	15	1	0	1,125
1932	0	0	0	0	0	0	14	1	0	2,253
1933	0	0	0	0	0	0	14	1	0	3,381
1934	0	0	0	0	0	0	14	1	0	4,508
1935	0	0	0	0	0	0	14	1	0	5,637
1936	0	0	0	0	0	0	14	1	0	6,764
1937	0	0	0	0	0	0	14	1	0	7,892
1938	0	0	0	0	0	0	14	1	0	9,020
1939	0	0	0	0	0	0	14	1	0	10,147
1940	0	2,773	0	1,226	0	913	4	1,782	0	16,721
1941	0	7,029	0	2,293	0	2,617	4	3,440	0	17,949
1942	0	11,288	0	3,366	0	4,284	4	4,710	0	19,179
1943	0	15,547	0	4,436	0	5,952	3	5,982	0	20,422
1944	0	23,528	0	6,421	0	9,080	3	8,326	0	29,699
1945	0	31,508	0	8,408	0	12,207	3	10,669	0	38,979
1946	0	39,490	0	10,397	0	15,335	3	13,015	0	48,265
1947	0	47,470	0	12,387	0	18,464	3	15,360	0	57,560
1948	0	55,452	0	14,380	0	21,593	3	17,705	0	66,872
1949	0	68,218	0	17,553	0	26,600	3	21,427	0	81,692
1950	0	80,985	0	20,725	0	31,607	2	25,148	0	96,520
1951	0	93,771	0	23,862	0	36,621	2	28,808	0	111,337
1952	0	106,558	0	26,999	0	41,634	2	32,467	0	126,160
1953	0	119,346	0	30,136	0	46,650	2	36,116	0	140,990
1954	0	127,989	0	32,256	0	50,035	2	38,579	0	151,065
1955	0	136,635	0	34,376	0	53,421	2	41,038	0	161,147
1956	0	145,158	0	36,455	0	56,733	2	43,496	0	171,472
1957	0	153,895	0	38,587	0	60,139	2	45,664	0	181,007
1958	0	162,606	0	40,906	0	63,615	2	48,320	0	190,795
1959	0	183,832	0	42,196	0	67,240	2	51,570	0	196,002
1960	0	204,795	0	42,902	0	70,922	2	54,775	0	200,372
1961	0	250,299	0	48,531	0	82,836	2	64,031	0	227,296
1962	0	273,773	0	49,652	0	86,904	2	67,699	0	232,549
1963	0	297,142	0	50,784	0	90,988	2	71,079	0	238,472
1964	0	320,867	0	51,995	0	95,234	2	74,604	0	244,610

Table A-1. Continued.

Period	Castro		Cochran		Crosby		Dawson		Deaf Smith	
	In	Out	In	Out	In	Out	In	Out	In	Out
1965	0	312,129	0	48,667	0	97,798	1	64,160	0	245,779
1966	0	333,589	0	49,441	0	110,292	1	58,687	0	270,860
1967	0	324,149	0	45,531	0	113,118	1	47,431	0	272,665
1968	0	314,946	0	41,526	0	115,920	1	35,237	0	272,646
1969	0	305,390	0	37,680	0	118,722	1	23,326	0	272,537
1970	0	305,042	0	39,985	0	120,572	1	23,496	0	279,090
1971	0	332,674	0	45,876	0	133,452	1	22,921	0	308,479
1972	0	332,799	0	48,213	0	135,453	1	21,488	0	312,723
1973	0	332,817	0	50,223	0	137,507	1	20,267	0	316,621
1974	0	332,542	0	52,720	0	139,491	1	19,027	0	321,523
1975	0	316,654	0	45,758	0	73,951	1	16,678	0	296,858
1976	0	325,926	0	41,547	0	80,014	1	15,547	0	297,001
1977	0	309,221	0	34,599	0	80,008	0	13,395	0	271,621
1978	0	291,028	0	26,707	0	79,988	1	10,362	0	245,333
1979	0	273,776	0	19,650	0	2,623	1	7,097	0	219,634
1980	0	287,584	0	25,551	0	79,996	1	13,815	0	217,169
1981	0	346,699	0	36,051	0	92,085	1	24,051	0	244,548
1982	0	362,537	0	42,737	0	94,200	1	32,221	0	240,629
1983	0	308,300	0	49,322	0	119,902	1	31,021	0	213,521
1984	0	319,818	0	55,850	0	123,349	1	28,504	0	185,730
1985	0	280,186	0	21,817	0	100,495	1	24,803	0	173,036
1986	0	254,826	0	22,995	0	82,578	1	22,537	0	166,681
1987	0	211,676	0	22,799	0	58,127	1	18,664	0	151,973
1988	0	217,493	0	22,560	0	71,310	1	20,211	0	153,294
1989	0	225,576	0	22,677	0	84,424	1	21,315	0	158,330
1990	0	234,465	0	27,440	0	97,535	1	22,699	0	164,953
1991	0	256,464	0	34,148	0	117,554	1	25,044	0	180,142
1992	0	267,580	0	39,090	0	131,262	1	26,589	0	190,651
1993	0	323,437	0	44,156	0	164,780	1	44,988	0	224,919
1994	0	147,208	0	48,978	0	131,883	1	45,464	0	207,073
1995	0	181,882	0	57,499	0	119,182	1	56,355	0	194,149
1996	0	227,941	0	68,935	0	112,536	1	71,902	0	190,703
1997	0	264,617	0	77,154	0	98,838	1	83,945	0	176,119
1998	0	257,692	0	84,668	0	92,231	1	66,952	0	196,052
1999	0	250,394	0	91,127	0	85,539	1	49,897	0	218,457
2000	0	243,154	0	89,011	0	78,882	1	32,936	0	238,585

Table A-1. Continued.

Period	Dickens		Ector		Floyd		Gaines		Garza	
	In	Out	In	Out	In	Out	In	Out	In	Out
Steady-State	0	0	0	0	0	0	134	48	0	0
1930	0	0	0	0	0	0	68	33	0	0
1931	0	0	0	0	0	504	68	34	0	0
1932	0	0	0	0	0	1,011	67	34	0	0
1933	0	0	0	0	0	1,517	67	34	0	0
1934	0	0	0	0	0	2,024	66	34	0	0
1935	0	0	0	0	0	2,531	66	34	0	0
1936	0	0	0	0	0	3,037	66	34	0	0
1937	0	0	0	0	0	3,543	66	34	0	0
1938	0	0	0	0	0	4,051	65	34	0	0
1939	0	0	0	0	0	4,557	65	34	0	0
1940	0	168	0	878	0	6,794	6	3,154	0	105
1941	0	229	0	1,049	0	7,338	2	5,042	0	285
1942	0	290	0	1,259	0	7,842	1	6,741	0	465
1943	0	351	0	1,514	0	8,348	1	8,446	0	645
1944	0	466	0	1,825	0	12,462	1	11,568	0	982
1945	0	580	0	2,204	0	16,577	1	14,732	0	1,320
1946	0	695	0	1,198	0	20,691	1	17,850	0	1,657
1947	0	809	0	1,440	0	24,805	0	21,108	0	1,995
1948	0	924	0	1,735	0	28,920	0	24,398	0	2,332
1949	0	1,107	0	1,183	0	35,503	0	29,572	0	2,872
1950	0	1,291	0	1,421	0	42,088	0	34,853	0	3,412
1951	0	1,474	0	1,596	0	48,695	0	40,400	0	3,952
1952	0	1,657	0	1,793	0	55,302	0	45,604	0	4,492
1953	0	1,840	0	2,016	0	61,910	0	50,715	0	5,032
1954	0	1,964	0	2,269	0	66,378	0	54,213	0	5,397
1955	0	2,088	0	2,554	0	70,846	0	57,782	0	5,761
1956	0	2,212	0	2,673	0	75,330	0	61,183	0	6,126
1957	0	2,335	0	3,009	0	79,918	0	64,220	0	6,490
1958	0	2,459	0	2,997	0	84,201	0	67,631	0	6,855
1959	0	2,513	0	3,658	0	89,142	0	76,073	0	7,081
1960	0	2,567	0	4,026	0	94,095	0	84,492	0	7,307
1961	0	2,894	0	5,121	0	109,712	0	103,195	0	8,358
1962	0	2,954	0	5,507	0	115,231	0	112,065	0	8,609
1963	0	3,014	0	6,154	0	120,766	0	121,807	0	8,860
1964	0	3,075	0	6,862	0	126,460	0	132,629	0	9,111

Table A-1. Continued.

Period	Dickens		Ector		Floyd		Gaines		Garza	
	In	Out	In	Out	In	Out	In	Out	In	Out
1965	0	3,282	0	6,790	0	132,459	0	119,983	0	8,949
1966	0	3,822	0	6,967	0	151,950	0	117,359	0	9,655
1967	0	4,051	0	6,700	0	158,461	0	104,288	0	9,476
1968	0	4,280	0	6,076	0	164,872	0	90,402	0	9,298
1969	0	4,508	0	5,723	0	171,567	0	76,898	0	9,119
1970	0	4,441	0	5,899	0	168,446	0	93,125	0	9,039
1971	0	4,756	0	6,997	0	179,944	0	118,996	0	9,765
1972	0	4,683	0	6,067	0	176,351	0	136,843	0	9,678
1973	0	4,610	0	5,909	0	172,740	0	154,025	0	8,921
1974	0	4,536	0	6,034	0	169,358	0	171,775	0	8,841
1975	0	3,816	0	6,309	0	156,489	0	181,738	0	8,409
1976	0	3,344	0	6,478	0	155,590	0	207,851	0	8,630
1977	0	2,565	0	6,475	0	141,765	0	219,121	0	8,160
1978	0	1,847	0	6,217	0	127,903	0	230,586	0	7,737
1979	0	1,130	0	6,617	0	113,834	0	241,827	0	6,934
1980	0	1,526	0	3,205	0	144,711	0	235,058	0	5,846
1981	0	2,149	0	3,566	0	202,037	0	263,423	0	5,436
1982	0	4,991	0	3,347	0	244,877	0	254,622	0	4,149
1983	0	2,722	0	1,100	0	177,217	0	194,068	0	4,525
1984	0	3,707	0	1,194	0	192,709	0	153,895	0	5,037
1985	0	2,801	0	2,159	0	166,884	0	149,311	0	4,160
1986	0	2,007	0	2,792	0	150,017	0	152,881	0	3,502
1987	0	1,043	0	3,299	0	122,319	0	146,974	0	2,581
1988	0	1,172	0	3,144	0	132,014	0	157,970	0	2,696
1989	0	1,306	0	3,073	0	141,940	0	169,130	0	2,828
1990	0	1,432	0	2,277	0	151,942	0	180,075	0	2,946
1991	0	1,647	0	3,640	0	171,974	0	202,013	0	3,261
1992	0	1,779	0	2,598	0	183,203	0	213,001	0	3,382
1993	0	1,186	0	2,716	0	197,390	0	201,720	0	4,210
1994	0	1,784	0	2,210	0	184,129	0	212,809	0	6,919
1995	0	3,005	0	4,060	0	161,708	0	207,499	0	8,343
1996	0	4,469	0	4,628	0	148,792	0	214,189	0	10,341
1997	0	5,761	0	3,899	0	125,419	0	209,153	0	11,790
1998	0	4,966	0	4,530	0	115,443	0	240,944	0	8,334
1999	0	4,172	0	5,162	0	104,955	0	250,067	0	4,877
2000	0	3,377	0	5,793	0	95,671	0	257,662	0	1,420

Table A-1. Continued.

Period	Glasscock		Hale		Hockley		Howard		Lamb	
	In	Out	In	Out	In	Out	In	Out	In	Out
Steady-State	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	1,590	0	0	0	0	0	0
1932	0	0	0	3,186	0	0	0	0	0	0
1933	0	0	0	4,779	0	0	0	0	0	0
1934	0	0	0	6,375	0	0	0	0	0	0
1935	0	0	0	7,968	0	0	0	0	0	0
1936	0	0	0	9,562	0	0	0	0	0	0
1937	0	0	0	11,157	0	0	0	0	0	0
1938	0	0	0	12,751	0	0	0	0	0	0
1939	0	0	0	14,346	0	0	0	0	0	0
1940	0	358	0	19,982	0	863	0	195	0	3,183
1941	0	369	0	21,862	0	2,869	0	214	0	7,962
1942	0	380	0	23,595	0	4,876	0	233	0	12,744
1943	0	391	0	25,336	0	6,887	0	251	0	17,525
1944	0	412	0	38,442	0	10,634	0	286	0	26,465
1945	0	433	0	51,556	0	14,383	0	321	0	35,405
1946	0	454	0	64,678	0	18,134	0	356	0	44,346
1947	0	474	0	77,811	0	21,888	0	391	0	53,288
1948	0	495	0	90,952	0	25,944	0	425	0	62,229
1949	0	529	0	111,875	0	31,953	0	481	0	76,517
1950	0	562	0	132,810	0	37,966	0	536	0	90,805
1951	0	595	0	153,666	0	43,929	0	592	0	105,085
1952	0	629	0	174,527	0	49,892	0	633	0	119,364
1953	0	662	0	195,383	0	55,814	0	687	0	133,643
1954	0	685	0	209,517	0	59,843	0	724	0	143,289
1955	0	707	0	223,720	0	64,367	0	761	0	155,108
1956	0	730	0	238,605	0	68,824	0	801	0	167,727
1957	0	752	0	251,826	0	72,920	0	837	0	179,540
1958	0	775	0	266,116	0	78,054	0	869	0	191,180
1959	0	853	0	306,070	0	95,463	0	911	0	215,344
1960	0	931	0	346,225	0	112,918	0	953	0	238,136
1961	0	1,081	0	423,989	0	144,636	0	1,085	0	285,591
1962	0	1,169	0	472,243	0	164,366	0	1,132	0	311,224
1963	0	1,256	0	516,905	0	184,127	0	1,183	0	336,973
1964	0	1,341	0	561,342	0	204,081	0	1,234	0	361,075

Table A-1. Continued.

Period	Glasscock		Hale		Hockley		Howard		Lamb	
	In	Out	In	Out	In	Out	In	Out	In	Out
1965	0	1,418	0	519,636	0	185,567	0	1,146	0	330,776
1966	0	1,608	0	523,093	0	183,225	0	1,145	0	329,284
1967	0	1,693	0	475,173	0	162,457	0	995	0	296,402
1968	0	1,777	0	428,182	0	141,241	0	904	0	259,114
1969	0	1,862	0	381,735	0	120,916	0	813	0	224,151
1970	0	2,046	0	397,219	0	91,944	0	923	0	227,779
1971	0	2,400	0	450,893	0	99,399	0	1,076	0	249,981
1972	0	2,601	0	468,682	0	99,543	0	1,192	0	253,261
1973	0	2,802	0	486,771	0	99,272	0	1,308	0	255,392
1974	0	3,002	0	504,095	0	209,742	0	1,424	0	259,861
1975	0	2,818	0	447,580	0	99,189	0	1,312	0	245,425
1976	0	2,827	0	423,607	0	107,643	0	1,217	0	253,073
1977	0	2,628	0	361,977	0	107,538	0	1,048	0	240,897
1978	0	2,496	0	301,389	0	108,026	0	1,232	0	229,721
1979	0	2,363	0	239,790	0	31,441	0	1,580	0	216,570
1980	0	1,811	0	264,252	0	39,233	0	3,620	0	237,420
1981	0	1,372	0	330,165	0	53,358	0	6,309	0	294,104
1982	0	4,268	0	358,593	0	55,702	0	8,548	0	320,561
1983	0	4,554	0	316,023	0	63,324	0	3,544	0	265,061
1984	0	4,309	0	327,543	0	70,634	0	4,031	0	230,327
1985	0	3,741	0	283,934	0	66,071	0	3,065	0	210,946
1986	0	3,329	0	258,010	0	64,769	0	2,786	0	204,872
1987	0	2,825	0	213,539	0	59,808	0	2,132	0	187,878
1988	0	3,021	0	231,653	0	72,839	0	2,837	0	194,362
1989	0	3,229	0	251,184	0	86,291	0	3,561	0	201,191
1990	0	3,413	0	270,505	0	99,721	0	4,213	0	209,625
1991	0	3,817	0	306,225	0	119,935	0	5,196	0	226,128
1992	0	3,958	0	326,163	0	134,115	0	4,713	0	232,936
1993	0	3,777	0	346,101	0	137,034	0	3,142	0	254,639
1994	0	4,835	0	332,149	0	145,123	0	2,461	0	240,807
1995	0	5,136	0	291,554	0	135,725	0	2,638	0	223,443
1996	0	4,321	0	261,498	0	133,161	0	2,784	0	215,890
1997	0	2,963	0	215,433	0	122,629	0	3,017	0	195,178
1998	0	2,524	0	237,971	0	116,892	0	3,180	0	232,823
1999	0	2,187	0	262,241	0	96,873	0	3,349	0	245,599
2000	0	1,542	0	285,156	0	77,680	0	3,369	0	258,918

Table A-1. Continued.

Period	Lubbock		Lynn		Martin		Midland		Motley	
	In	Out	In	Out	In	Out	In	Out	In	Out
Steady-State	0	0	0	0	0	0	0	0	0	0
1930	1,315	2,092	0	0	0	0	0	0	0	0
1931	1,368	9,101	0	0	0	0	0	0	0	0
1932	1,439	16,129	0	0	0	0	0	0	0	0
1933	1,510	23,157	0	0	0	0	0	0	0	0
1934	1,580	30,155	0	0	0	0	0	0	0	0
1935	1,651	37,175	0	0	0	0	0	0	0	0
1936	1,722	44,197	0	0	0	0	0	0	0	0
1937	1,792	51,217	0	0	0	0	0	0	0	0
1938	1,863	58,648	0	0	0	0	0	0	0	0
1939	1,949	66,095	0	0	0	0	0	0	0	0
1940	2,202	75,985	0	1,368	0	2,866	0	1,410	0	585
1941	2,295	83,535	0	2,519	0	3,510	0	1,617	0	581
1942	2,391	91,077	0	3,464	0	3,998	0	1,842	0	583
1943	2,492	98,655	0	4,409	0	4,485	0	2,084	0	585
1944	2,593	106,245	0	6,189	0	5,399	0	2,426	0	588
1945	2,936	113,695	0	7,966	0	6,314	0	2,791	0	592
1946	3,025	121,304	0	9,746	0	7,228	0	3,183	0	596
1947	3,115	128,931	0	11,526	0	8,143	0	3,606	0	600
1948	3,204	136,576	0	13,306	0	9,057	0	4,064	0	604
1949	4,252	154,605	0	16,159	0	10,521	0	4,661	0	610
1950	4,370	162,200	0	19,013	0	11,984	0	5,304	0	616
1951	4,467	186,480	0	21,873	0	13,426	0	6,178	0	622
1952	4,524	239,166	0	24,735	0	14,865	0	7,170	0	628
1953	4,578	240,403	0	27,596	0	16,307	0	8,302	0	634
1954	4,708	241,726	0	29,527	0	17,273	0	9,514	0	638
1955	4,869	242,559	0	31,458	0	18,239	0	10,927	0	642
1956	4,998	245,013	0	33,201	0	18,573	0	11,788	0	646
1957	5,882	184,107	0	35,100	0	19,937	0	11,260	0	650
1958	6,009	184,629	0	37,061	0	20,852	0	11,759	0	654
1959	6,148	177,461	0	36,979	0	22,266	0	12,041	0	663
1960	8,602	169,381	0	37,069	0	23,453	0	11,029	0	671
1961	8,772	160,492	0	40,980	0	26,035	0	9,633	0	691
1962	8,910	153,832	0	41,045	0	26,892	0	8,802	0	701
1963	9,059	146,242	0	40,967	0	27,739	0	8,752	0	710
1964	9,215	138,192	0	40,904	0	29,267	0	8,604	0	720

Table A-1. Continued.

Period	Lubbock		Lynn		Martin		Midland		Motley	
	In	Out	In	Out	In	Out	In	Out	In	Out
1965	10,157	134,015	0	35,356	0	27,322	0	8,929	0	742
1966	10,364	138,999	0	32,566	0	26,994	0	8,671	0	782
1967	10,531	127,788	0	26,325	0	26,101	0	9,454	0	805
1968	10,651	120,922	0	19,972	0	24,319	0	9,044	0	829
1969	10,838	116,996	0	13,959	0	21,751	0	9,285	0	853
1970	10,956	126,632	0	19,063	0	18,141	0	7,536	0	848
1971	10,932	136,115	0	26,549	0	19,997	0	8,354	0	867
1972	10,910	145,673	0	32,244	0	19,003	0	7,719	0	862
1973	10,888	155,479	0	37,928	0	19,263	0	7,896	0	857
1974	10,862	164,816	0	43,792	0	19,740	0	8,194	0	852
1975	10,594	72,343	0	39,589	0	17,464	0	7,263	0	651
1976	10,633	77,170	0	38,450	0	17,073	0	7,190	0	467
1977	10,620	76,528	0	33,942	0	16,221	0	7,074	0	262
1978	10,195	77,771	0	29,652	0	14,628	0	7,245	0	258
1979	10,412	10,491	0	25,053	0	12,285	0	7,044	0	255
1980	10,489	78,314	0	25,309	0	9,781	0	5,450	0	248
1981	10,400	89,660	0	29,052	0	12,807	0	6,197	0	226
1982	10,435	90,214	0	29,100	0	13,237	0	9,763	0	606
1983	10,429	90,567	0	37,398	0	16,312	0	7,251	0	487
1984	10,424	90,921	0	41,233	0	13,562	0	7,734	0	582
1985	11,438	95,866	0	34,295	0	11,177	0	7,190	0	571
1986	11,365	107,926	0	30,119	0	8,889	0	6,521	0	542
1987	11,329	113,948	0	23,454	0	6,727	0	6,058	0	481
1988	11,278	125,286	0	29,875	0	8,360	0	6,847	0	480
1989	11,130	137,686	0	36,301	0	10,534	0	7,824	0	438
1990	11,276	149,901	0	42,629	0	11,168	0	7,597	0	426
1991	10,930	171,254	0	52,073	0	13,249	0	8,039	0	454
1992	10,863	184,117	0	58,725	0	14,616	0	8,538	0	451
1993	10,780	206,304	0	46,585	0	16,039	0	6,757	0	334
1994	11,008	176,514	0	46,507	0	15,182	0	7,792	0	498
1995	11,029	168,917	0	44,476	0	11,477	0	7,523	0	483
1996	10,884	171,256	0	44,873	0	11,767	0	8,686	0	497
1997	10,443	161,965	0	42,549	0	10,393	0	9,287	0	476
1998	11,345	151,170	0	37,151	0	12,668	0	8,997	0	840
1999	11,408	140,268	0	31,445	0	13,749	0	8,126	0	1,204
2000	11,459	129,622	0	25,889	0	14,863	0	7,362	0	1,569

Table A-1. Continued.

Period	Oldham		Parmer		Potter		Randall		Swisher	
	In	Out	In	Out	In	Out	In	Out	In	Out
Steady-State	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	731
1932	0	0	0	0	0	0	0	0	0	1,465
1933	0	0	0	0	0	0	0	0	0	2,199
1934	0	0	0	0	0	0	0	0	0	2,933
1935	0	0	0	0	0	0	0	0	0	3,667
1936	0	0	0	0	0	0	0	0	0	4,401
1937	0	0	0	0	0	0	0	0	0	5,135
1938	0	0	0	0	0	0	0	0	0	5,869
1939	0	0	0	0	0	0	0	0	0	6,603
1940	0	601	0	2,371	0	133	0	3,270	0	10,136
1941	0	893	0	11,744	0	255	0	4,390	0	11,055
1942	0	1,185	0	21,017	0	377	0	5,540	0	11,813
1943	0	1,476	0	30,305	0	500	0	6,722	0	12,571
1944	0	2,022	0	47,718	0	727	0	8,669	0	18,560
1945	0	2,568	0	65,132	0	955	0	10,655	0	24,549
1946	0	3,114	0	82,546	0	1,183	0	12,683	0	30,541
1947	0	3,660	0	99,959	0	1,410	0	14,758	0	36,531
1948	0	4,206	0	117,366	0	1,638	0	16,884	0	42,522
1949	0	5,081	0	145,228	0	2,001	0	20,006	0	52,092
1950	0	5,953	0	173,091	0	2,365	0	23,191	0	61,662
1951	0	6,824	0	201,000	0	2,730	0	26,964	0	71,237
1952	0	7,695	0	228,914	0	3,096	0	30,955	0	80,814
1953	0	8,566	0	256,834	0	3,462	0	35,200	0	90,390
1954	0	9,156	0	275,704	0	3,712	0	38,929	0	96,866
1955	0	9,744	0	294,575	0	3,962	0	43,007	0	103,344
1956	0	10,334	0	313,500	0	4,243	0	47,812	0	110,023
1957	0	10,996	0	332,356	0	4,514	0	45,979	0	116,379
1958	0	11,592	0	351,148	0	4,786	0	48,358	0	122,885
1959	0	12,698	0	336,235	0	5,736	0	55,098	0	138,471
1960	0	13,788	0	321,214	0	6,737	0	57,323	0	153,947
1961	0	16,449	0	339,873	0	8,518	0	67,083	0	187,971
1962	0	17,678	0	323,169	0	9,563	0	71,632	0	205,308
1963	0	18,900	0	306,618	0	10,650	0	78,574	0	222,654
1964	0	18,147	0	290,127	0	11,757	0	85,423	0	240,115

Table A-1. Continued.

Period	Oldham		Parmer		Potter		Randall		Swisher	
	In	Out	In	Out	In	Out	In	Out	In	Out
1965	0	17,375	0	282,035	0	11,554	0	77,839	0	230,014
1966	0	18,236	0	300,922	0	12,498	0	79,090	0	241,376
1967	0	15,872	0	291,719	0	12,332	0	72,858	0	230,113
1968	0	14,005	0	282,873	0	12,254	0	56,771	0	218,511
1969	0	12,320	0	273,786	0	12,138	0	42,689	0	207,280
1970	0	10,723	0	286,337	0	12,486	0	46,933	0	219,153
1971	0	11,705	0	325,624	0	13,975	0	51,999	0	251,184
1972	0	11,954	0	338,533	0	14,331	0	50,726	0	263,619
1973	0	12,061	0	352,606	0	14,808	0	56,394	0	276,280
1974	0	11,345	0	365,629	0	14,394	0	56,440	0	289,109
1975	0	11,513	0	363,252	0	13,584	0	56,129	0	250,957
1976	0	12,245	0	391,392	0	12,260	0	61,032	0	230,392
1977	0	12,325	0	389,529	0	11,378	0	61,869	0	189,123
1978	0	10,174	0	387,717	0	9,615	0	59,597	0	148,032
1979	0	8,093	0	385,825	0	9,120	0	59,511	0	106,878
1980	0	8,624	0	354,809	0	8,599	0	48,604	0	140,302
1981	0	12,485	0	372,049	0	8,256	0	36,213	0	199,655
1982	0	13,637	0	336,628	0	7,325	0	22,390	0	238,180
1983	0	13,306	0	276,797	0	15,155	0	49,161	0	207,427
1984	0	12,975	0	259,471	0	18,771	0	58,385	0	235,090
1985	0	12,634	0	226,682	0	13,692	0	53,796	0	191,975
1986	0	10,409	0	204,923	0	10,830	0	52,938	0	157,642
1987	0	10,389	0	167,766	0	7,494	0	48,654	0	110,976
1988	0	9,680	0	170,726	0	6,316	0	46,612	0	113,950
1989	0	9,651	0	177,743	0	6,337	0	45,669	0	118,514
1990	0	9,592	0	185,126	0	6,268	0	48,344	0	123,358
1991	0	9,704	0	201,087	0	5,620	0	51,727	0	135,736
1992	0	8,212	0	209,500	0	5,090	0	49,042	0	142,220
1993	0	5,663	0	258,880	0	4,862	0	51,200	0	162,344
1994	0	8,077	0	235,517	0	4,722	0	52,955	0	163,342
1995	0	9,266	0	211,035	0	5,087	0	52,606	0	140,616
1996	0	8,778	0	197,966	0	5,520	0	53,711	0	123,756
1997	0	9,712	0	174,750	0	5,464	0	52,345	0	98,903
1998	0	9,565	0	193,334	0	5,587	0	45,146	0	98,610
1999	0	9,415	0	209,310	0	5,330	0	49,424	0	98,421
2000	0	9,265	0	222,992	0	5,422	0	53,558	0	98,111

Table A-1. Continued.

Period	Terry		Yoakum		New Mexico	
	In	Out	In	Out	In	Out
Steady-State	17	1	0	0	0	0
1930	8	1	0	0	0	0
1931	8	1	0	0	0	0
1932	8	1	0	0	0	0
1933	8	1	0	0	0	0
1934	8	1	0	0	0	0
1935	8	1	0	0	0	0
1936	8	1	0	0	0	0
1937	8	1	0	0	0	0
1938	8	1	0	0	0	0
1939	8	1	0	0	0	0
1940	5	2,364	0	4,350	0	15,954
1941	0	4,062	0	1,503	0	7,635
1942	0	5,725	0	2,298	0	15,214
1943	0	7,390	0	3,093	0	25,946
1944	0	10,476	0	4,592	0	15,003
1945	0	13,562	0	6,093	0	22,745
1946	0	16,650	0	7,592	0	21,365
1947	0	19,738	0	9,094	0	31,605
1948	0	22,826	0	10,597	0	36,289
1949	0	27,743	0	13,006	0	45,302
1950	0	32,662	0	15,417	0	67,768
1951	0	37,599	0	17,888	0	107,412
1952	0	42,536	0	20,357	0	114,716
1953	0	47,476	0	22,451	0	137,633
1954	0	50,836	0	24,108	0	170,884
1955	0	54,196	0	25,768	0	183,127
1956	0	57,410	0	27,426	0	186,817
1957	0	60,413	0	29,052	0	164,759
1958	0	63,744	0	30,931	0	127,289
1959	0	66,671	0	30,548	0	146,908
1960	0	68,656	0	30,088	0	112,127
1961	0	79,590	0	32,870	0	140,817
1962	0	82,902	0	32,477	0	158,628
1963	0	84,684	0	32,011	0	176,416
1964	0	88,528	0	31,605	0	193,313

Table A-1. Continued.

Period	Terry		Yoakum		New Mexico	
	In	Out	In	Out	In	Out
1965	0	76,686	0	32,861	0	210,646
1966	0	71,434	0	37,542	0	227,818
1967	0	58,810	0	39,205	0	242,750
1968	0	45,832	0	39,975	0	257,843
1969	0	33,152	0	41,202	0	218,851
1970	0	33,169	0	41,328	0	223,663
1971	0	35,831	0	44,976	0	226,154
1972	0	35,356	0	44,937	0	228,652
1973	0	35,145	0	45,010	0	228,555
1974	0	34,812	0	83,163	0	230,113
1975	0	34,806	0	45,011	0	231,445
1976	0	38,078	0	48,677	0	262,507
1977	0	38,036	0	48,647	0	240,847
1978	0	38,849	0	48,660	0	225,300
1979	0	39,114	0	79,720	0	209,041
1980	0	50,755	0	75,726	0	183,548
1981	0	71,216	0	81,696	0	177,683
1982	0	84,250	0	76,896	0	125,336
1983	0	125,895	0	53,321	0	74,321
1984	0	103,699	0	47,516	0	74,652
1985	0	87,577	0	35,035	0	73,966
1986	0	76,088	0	23,891	0	80,967
1987	0	59,226	0	10,698	0	81,107
1988	0	69,310	0	22,443	0	87,639
1989	0	79,527	0	34,167	0	93,486
1990	0	89,799	0	45,950	0	98,990
1991	0	106,207	0	60,720	0	118,020
1992	0	117,027	0	72,584	0	120,825
1993	0	128,798	0	57,466	0	105,656
1994	0	121,697	0	74,163	0	113,192
1995	0	125,078	0	81,531	0	110,409
1996	0	135,888	0	92,509	0	109,983
1997	0	139,132	0	99,673	0	106,094
1998	0	134,762	0	95,293	0	111,157
1999	0	114,943	0	82,050	0	109,090
2000	0	95,406	0	67,406	0	106,691

Table A-2. Historic pumpage included in the GAM well file (WEL) in the Edwards-Trinity (High Plains) Aquifer by county (in acre-feet per year).

Period	Bailey		Borden		Cochran		Dawson		Floyd	
	In	Out	In	Out	In	Out	In	Out	In	Out
Steady-State	0	0	0	0	0	0	1	20	0	0
1930	0	0	0	0	0	0	1	15	0	0
1931	0	0	0	0	0	0	1	15	0	0
1932	0	0	0	0	0	0	1	14	0	0
1933	0	0	0	0	0	0	1	14	0	0
1934	0	0	0	0	0	0	1	14	0	0
1935	0	0	0	0	0	0	1	14	0	0
1936	0	0	0	0	0	0	1	14	0	0
1937	0	0	0	0	0	0	1	14	0	0
1938	0	0	0	0	0	0	1	14	0	0
1939	0	0	0	0	0	0	1	14	0	0
1940	0	5	0	0	0	4	1	33	0	43
1941	0	11	0	0	0	9	1	65	0	86
1942	0	17	0	0	0	13	0	97	0	130
1943	0	23	0	1	0	17	0	130	0	173
1944	0	30	0	1	0	22	0	191	0	216
1945	0	38	0	1	0	27	0	253	0	259
1946	0	45	0	1	0	31	0	316	0	302
1947	0	52	0	1	0	36	0	379	0	346
1948	0	60	0	1	0	41	0	444	0	389
1949	0	69	0	1	0	46	0	546	0	432
1950	0	78	0	1	0	51	0	651	0	475
1951	0	87	0	2	0	56	0	759	0	518
1952	0	96	0	2	0	62	0	870	0	562
1953	0	105	0	2	0	67	0	988	0	605
1954	0	112	0	2	0	72	1	1,070	0	648
1955	0	120	0	2	0	77	1	1,156	0	691
1956	0	127	0	2	0	81	2	1,245	0	734
1957	0	135	0	2	0	86	2	1,340	0	778
1958	0	143	0	2	0	91	3	1,440	0	821
1959	0	151	0	2	0	95	3	1,556	0	864
1960	0	159	0	3	0	99	4	1,679	0	907
1961	0	174	0	3	0	106	4	2,008	0	950
1962	0	183	0	3	0	110	5	2,153	0	994
1963	0	191	0	3	0	114	6	2,326	0	1,037
1964	0	199	0	3	0	119	6	2,502	0	1,080

Table A-2. Continued.

Period	Bailey		Borden		Cochran		Dawson		Floyd	
	In	Out	In	Out	In	Out	In	Out	In	Out
1965	0	196	0	3	0	121	7	2,169	0	1,123
1966	0	199	0	3	0	125	7	2,010	0	1,166
1967	0	195	0	3	0	127	8	1,616	0	1,210
1968	0	191	0	4	0	129	8	1,206	0	1,253
1969	0	187	0	4	0	131	8	795	0	1,296
1970	0	201	0	4	0	136	8	745	0	1,339
1971	0	222	0	4	0	143	8	760	0	1,382
1972	0	238	0	4	0	148	8	712	0	1,426
1973	0	253	0	4	0	152	8	662	0	1,469
1974	0	268	0	4	0	157	8	615	0	1,512
1975	0	266	0	4	0	158	8	528	0	1,555
1976	0	271	0	5	0	160	9	479	0	1,598
1977	0	268	0	5	0	160	9	389	0	1,642
1978	0	265	0	5	0	161	11	298	0	1,685
1979	0	262	0	5	0	161	11	207	0	1,728
1980	0	264	0	5	0	168	9	422	0	1,771
1981	0	377	0	8	0	165	8	743	0	1,597
1982	0	327	0	7	0	161	8	1,008	0	1,408
1983	0	265	0	7	0	157	8	968	0	1,234
1984	0	212	0	6	0	153	8	892	0	1,062
1985	0	222	0	7	0	123	9	772	0	593
1986	0	230	0	12	0	125	9	700	0	505
1987	0	177	0	9	0	114	10	574	0	662
1988	0	153	0	9	0	94	10	611	0	689
1989	0	233	0	5	0	62	11	649	0	632
1990	0	257	0	5	0	75	11	687	0	776
1991	0	249	0	8	0	81	14	774	0	831
1992	0	264	0	8	0	106	15	817	0	913
1993	0	319	0	11	0	128	16	1,413	0	1,742
1994	0	275	0	15	0	125	17	1,448	0	1,464
1995	0	301	0	20	0	216	17	1,846	0	1,422
1996	0	325	0	57	0	287	18	2,435	0	1,342
1997	0	244	0	106	0	251	19	2,931	0	1,216
1998	0	259	0	106	0	255	20	2,406	0	1,216
1999	0	269	0	106	0	259	21	1,792	0	1,216
2000	0	279	0	106	0	263	22	1,160	0	1,216

Table A-2. Continued.

Period	Gaines		Garza		Hale		Hockley		Lamb	
	In	Out	In	Out	In	Out	In	Out	In	Out
Steady-State	48	134	0	0	0	0	0	0	0	0
1930	33	68	0	0	0	0	0	0	0	0
1931	34	68	0	0	0	0	0	0	0	0
1932	34	67	0	0	0	0	0	0	0	0
1933	34	67	0	0	0	0	0	0	0	0
1934	34	66	0	0	0	0	0	0	0	0
1935	34	66	0	0	0	0	0	0	0	0
1936	34	66	0	0	0	0	0	0	0	0
1937	34	66	0	0	0	0	0	0	0	0
1938	34	65	0	0	0	0	0	0	0	0
1939	34	65	0	0	0	0	0	0	0	0
1940	50	288	0	0	0	151	0	2	0	7
1941	47	497	0	1	0	303	0	4	0	15
1942	44	680	0	1	0	454	0	6	0	22
1943	43	863	0	2	0	606	0	8	0	29
1944	39	1,200	0	2	0	757	0	10	0	37
1945	37	1,538	0	2	0	908	0	12	0	44
1946	35	1,878	0	3	0	1,060	0	14	0	51
1947	35	2,219	0	3	0	1,211	0	16	0	58
1948	34	2,562	0	3	0	1,362	0	18	0	66
1949	34	3,100	0	4	0	1,514	0	20	0	73
1950	37	3,641	0	4	0	1,665	0	22	0	80
1951	40	4,191	0	4	0	1,816	0	23	0	88
1952	41	4,752	0	5	0	1,968	0	25	0	95
1953	48	5,308	0	5	0	2,119	0	27	0	102
1954	51	5,677	0	6	0	2,271	0	29	0	110
1955	55	6,049	0	6	0	2,422	0	31	0	117
1956	58	6,422	0	6	0	2,573	0	33	0	124
1957	59	6,765	0	7	0	2,725	0	35	0	131
1958	60	7,073	0	7	0	2,876	0	37	0	139
1959	64	8,008	0	7	0	3,027	0	39	0	146
1960	66	8,959	0	8	0	3,179	0	41	0	153
1961	78	11,041	0	8	0	3,330	0	43	0	161
1962	84	12,145	0	8	0	3,481	0	45	0	168
1963	91	13,307	0	9	0	3,633	0	47	0	175
1964	98	14,545	0	9	0	3,784	0	49	0	182

Table A-2. Continued.

Period	Gaines		Garza		Hale		Hockley		Lamb	
	In	Out	In	Out	In	Out	In	Out	In	Out
1965	91	13,226	0	10	0	3,936	0	51	0	190
1966	92	13,055	0	10	0	4,087	0	53	0	197
1967	92	11,667	0	10	0	4,238	0	55	0	204
1968	87	10,132	0	11	0	4,390	0	57	0	212
1969	83	8,569	0	11	0	4,541	0	59	0	219
1970	91	10,438	0	11	0	4,692	0	61	0	226
1971	110	13,402	0	12	0	4,844	0	63	0	234
1972	120	15,528	0	12	0	4,995	0	64	0	241
1973	127	17,694	0	12	0	5,147	0	66	0	248
1974	141	19,913	0	13	0	5,298	0	68	0	255
1975	148	21,481	0	13	0	5,449	0	70	0	263
1976	167	25,025	0	14	0	5,601	0	72	0	270
1977	180	26,896	0	14	0	5,752	0	74	0	277
1978	191	28,935	0	14	0	5,903	0	76	0	285
1979	200	30,978	0	15	0	6,055	0	78	0	292
1980	206	31,082	0	15	0	6,206	0	80	0	299
1981	227	35,951	0	14	0	5,895	0	75	0	289
1982	222	36,179	0	13	0	5,658	0	69	0	278
1983	194	27,942	0	12	0	5,296	0	65	0	268
1984	173	22,111	0	11	0	4,924	0	59	0	258
1985	175	21,747	0	6	0	4,115	0	52	0	182
1986	175	22,518	0	4	0	3,054	0	40	0	178
1987	170	21,931	0	4	0	2,515	0	34	0	117
1988	175	23,994	0	9	0	2,268	0	32	0	111
1989	186	26,024	0	13	0	4,021	0	52	0	102
1990	194	28,413	0	9	0	4,112	0	53	0	168
1991	210	32,831	0	7	0	2,731	0	53	0	136
1992	205	35,833	0	3	0	2,408	0	72	0	53
1993	212	35,109	0	8	0	3,848	0	85	0	179
1994	214	38,482	0	10	0	3,445	0	98	0	144
1995	212	38,811	0	13	0	3,778	0	99	0	180
1996	211	42,394	0	22	0	3,846	0	98	0	182
1997	210	42,822	0	18	0	3,523	0	96	0	164
1998	207	53,463	0	18	0	3,523	0	96	0	164
1999	212	58,720	0	18	0	3,523	0	96	0	164
2000	216	65,848	0	18	0	3,523	0	96	0	164

Table A-2. Continued.

Period	Lubbock		Lynn		Terry		Yoakum	
	In	Out	In	Out	In	Out	In	Out
Steady-State	0	0	0	0	1	17	0	0
1930	0	0	0	0	1	8	0	0
1931	0	0	0	0	1	8	0	0
1932	0	0	0	0	1	8	0	0
1933	0	0	0	0	1	8	0	0
1934	0	0	0	0	1	8	0	0
1935	0	0	0	0	1	8	0	0
1936	0	0	0	0	1	8	0	0
1937	0	0	0	0	1	8	0	0
1938	0	0	0	0	1	8	0	0
1939	0	0	0	0	1	8	0	0
1940	0	9	0	10	1	18	0	43
1941	0	18	0	19	0	32	0	95
1942	0	27	0	29	0	47	0	147
1943	0	36	0	39	0	62	0	198
1944	0	45	0	48	0	82	0	258
1945	0	54	0	58	0	102	0	318
1946	0	62	0	68	0	121	0	378
1947	0	71	0	78	0	141	0	438
1948	0	80	0	87	0	161	0	498
1949	0	89	0	97	0	186	0	568
1950	0	98	0	107	0	212	0	638
1951	0	107	0	116	0	237	0	708
1952	0	116	0	126	0	264	0	779
1953	0	125	0	136	0	289	0	850
1954	0	134	0	145	0	309	0	911
1955	0	143	0	155	0	329	0	973
1956	0	151	0	165	0	349	0	1,035
1957	0	160	0	174	0	370	0	1,097
1958	0	169	0	184	0	391	0	1,159
1959	0	178	0	194	0	409	0	1,197
1960	0	187	0	204	0	428	0	1,235
1961	0	196	0	213	0	472	0	1,310
1962	0	205	0	223	0	491	0	1,348
1963	0	214	0	233	0	511	0	1,386
1964	0	223	0	242	0	531	0	1,423

Table A-2. Continued.

Period	Lubbock		Lynn		Terry		Yoakum	
	In	Out	In	Out	In	Out	In	Out
1965	0	232	0	252	0	503	0	1,481
1966	0	241	0	262	0	496	0	1,580
1967	0	249	0	271	0	463	0	1,642
1968	0	258	0	281	0	431	0	1,704
1969	0	267	0	291	1	399	0	1,767
1970	0	276	0	300	2	408	0	1,813
1971	0	285	0	310	3	425	0	1,906
1972	0	294	0	320	3	434	0	1,952
1973	0	303	0	329	5	443	0	2,002
1974	0	312	0	339	6	452	0	2,546
1975	0	321	0	349	8	462	0	2,110
1976	0	330	0	359	10	482	0	2,209
1977	0	339	0	368	12	492	0	2,260
1978	0	347	0	378	14	503	0	2,313
1979	0	356	0	388	17	515	0	2,808
1980	0	365	0	397	13	555	0	2,837
1981	0	361	0	377	8	569	0	2,684
1982	0	382	0	357	7	561	0	2,380
1983	0	375	0	336	0	645	0	1,734
1984	0	371	0	316	0	523	0	1,370
1985	0	310	0	294	1	535	0	981
1986	0	255	0	174	2	390	0	712
1987	0	236	0	112	4	301	0	438
1988	0	399	0	117	3	353	0	783
1989	0	591	0	142	3	715	0	1,849
1990	0	717	0	216	2	692	0	1,884
1991	0	541	0	185	1	741	0	2,274
1992	0	225	0	308	0	660	0	2,039
1993	0	687	0	202	0	971	0	1,855
1994	0	669	0	288	0	909	0	2,349
1995	0	850	0	350	0	887	0	2,599
1996	0	744	0	299	0	1,021	0	3,194
1997	0	690	0	230	0	1,062	0	3,395
1998	0	690	0	230	0	1,059	0	3,413
1999	0	690	0	230	3	991	0	3,145
2000	0	690	0	230	7	926	0	2,878