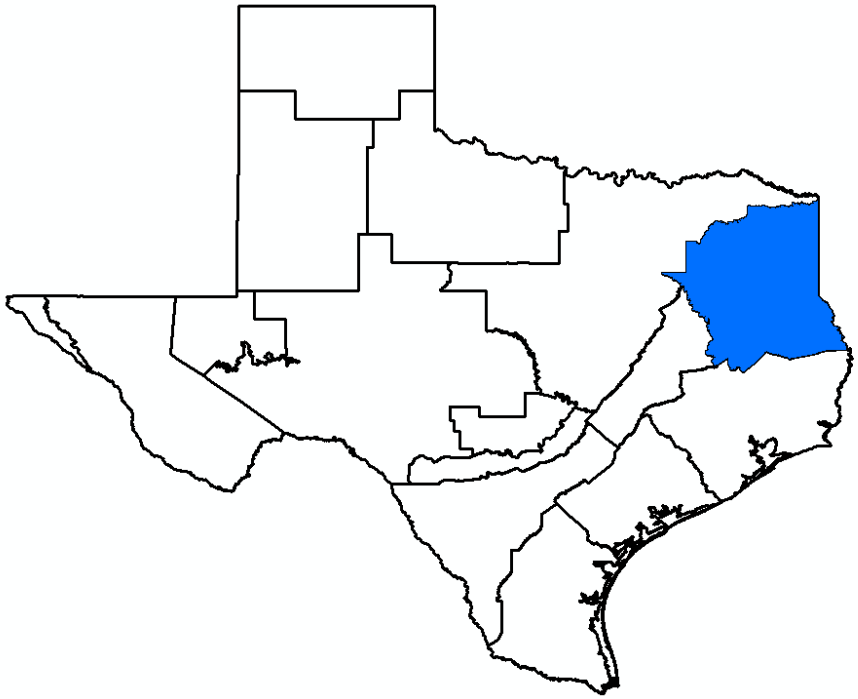
GMA 11 Technical Memorandum 26-03 (Draft 1)

Documentation of GMA 11 Pumping Scenarios 26.2 to 26.6



Prepared for:
Groundwater Management Area 11

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1.0 Introduction and Background

1.1 GMA 11 Meeting of April 28, 2026

At the GMA 11 meeting of April 28, 2026, I was directed to complete five additional GAM simulations in response to comments by Neches & Trinity Valley GCD (NTVGCD) regarding Scenario 26.1 pumping assumptions in the three counties that comprise NTVGCD. In summary, NTVGCD requested that pumping in its three counties equal the current Modeled Available Groundwater values (also known as Scenario 33 from the 2021 round of joint planning).

1.2 Summary of Scenarios 26.2 to 26.6

Scenarios 26.2 to 26.6 pumping in all counties was set equal to pumping in Scenario 26.1 as documented in Hutchison (2026) except the three counties that comprise NTVGCD. In the NTVGCD counties, pumping was set as summarized in Table 1.

Table 1. Summary of NTVGCD Pumping in Scenarios 26.2 to 26.6

Scenario	Queen City Pumping	Carrizo-Wilcox Pumping
26.2	Scenario 33	Scenario 33
26.3	Scenario 26.1	Scenario 33
26.4	Scenario 33	Sceanrio 26.1
26.5	Scenario 26.1	Scenario 33 * 1.25
26.6	Scenario 26.1	Scenario 33 * 1.50

Please note that Scenario 26.2 represents Scenario 33 pumping in both the Queen City Aquifer and Carrizo-Wilcox Aquifer in NTVGCD counties. Scenario 26.3 represents Scenario 33 pumping in the Carrizo-Wilcox Aquifer and Scenario 26.1 pumping in the Queen City Aquifer in NTVGCD counties. Because the comments from NTVGCD were focused on the Carrizo-Wilcox Aquifer, it seemed reasonable to complete both scenarios for review.

Scenario 26.4 represents Scenario 33 pumping in the Queen City Aquifer and Scenario 26.1 pumping in the Carrizo-Wilcox Aquifer. This scenario is a bookend to Scenarios 26.2 and 26.3 and is useful to understand the relative impacts of changed pumping in each aquifer.

Scenarios 26.5 and 26.6 represents increased pumping (more than Scenario 33 amounts) in the Carrizo-Wilcox Aquifer in NTVGCD counties to provide information related to balancing increased pumping with avoiding impacts of increased groundwater pumping.

1.3 Organization of Report

This report is organized as follows:

- Section 2: Documentation of pumping input files for scenarios
- Section 3: Pumping output results for all scenarios
- Section 4: Average drawdown results for all scenarios
- Section 5: Dry well analysis for all scenarios
- Section 6: Groundwater budget analysis for all scenarios
- Section 7: References

All files associated with Scenarios 26.2 to 26.6 and this report can be accessed from a Google Drive folder:

https://drive.google.com/drive/folders/1Aq9XijsHklgBJuUdw7Tl1Lc2JiCHkIlm?usp=sharing

2.0 Pumping Input Files for All Scenarios

The Fortran program *ScenWel.exe* was written to develop the pumping input files for Scenarios 26.2 to 26.6.

The program:

- Reads the GAM grid file (specifies the county of each grid cell)
- Reads the Scenario 33 pumping file
- Reads the Scenario 26.1 pumping file
- Assigns the pumping according to the specifications previously presented in Table 1
- Writes the five scenario pumping files:
    - *Scen26.2.wel*
    - *Scen26.3.wel*
    - *Scen26.4.wel*
    - *Scen26.5.wel*
    - *Scen26.6.wel*

3.0 Pumping Results

3.1 Documentation of *getpump.exe*

The output of each scenario was processed with the Fortran program *getpump.exe*, which extracts the output pumping from the cell-by-cell file of each scenario (i.e. the cbb file). This program:

- Reads the county list file
- Reads the GAM grid file
- Reads the cbb file
- Sums GMA 11 pumping by county and model layer
- Writes the results

The results include annual pumping (from 2014 to 2080) for each county and model layer, and a sum of the four Carrizo-Wilcox layers to calculate a Carrizo-Wilcox Aquifer total pumping. In addition, a summary of 2080 pumping for each aquifer is written:

- *Scen26.22080pump.dat*
- *Scen26.32080pump.dat*
- *Scen26.42080pump.dat*
- *Scen26.52080pump.dat*
- *Scen26.62080pump.dat*

These 2080 pumping summaries were gathered for all scenarios and saved in an Excel spreadsheet named *PumpSummary.xlsx*.

3.2 Summaries of 2080 Pumping in Each GMA 11 County

Output pumping for the year 2080 for each county in GMA 11 is summarized in the following tables:

- Table 2: Sparta Aquifer
- Table 3: Queen City Aquifer
- Table 4: Carrizo-Wilcox Aquifer

Each table presents the pumping of the following scenarios:

- Baseline (estimated 2013 pumping as documented Hutchison, 2026)
- Scenario 33 (documented in Hutchison, 2026)
- Scenario 26.1 (documented in Hutchison, 2026)
- Scenario 26.2
- Scenario 26.3
- Scenario 26.5
- Scenario 26.6

Table 2. Simulated Pumping in the Year 2080 (Sparta Aquifer)

County	Baseline	Scen 33	Scen 26.1	Scen 26.2	Scen 26.3	Scen 26.4	Scen 26.5	Scen 26.6
Anderson	39	307	307	307	307	307	307	307
Angelina	292	390	390	390	390	390	390	390
Cherokee	192	351	351	351	351	351	351	351
Houston	683	1,481	1,481	1,481	1,481	1,481	1,481	1,481
Nacogdoches	228	362	362	362	362	362	362	362
Sabine	47	49	49	49	49	49	49	49
SanAugustine	20	166	166	166	166	166	166	166
Trinity	15	152	152	152	152	152	152	152

Table 3. Simulated Pumping in the Year 2080 (Queen City Aquifer)

County	Baseline	Scen 33	Scen 26.1	Scen 26.2	Scen 26.3	Scen 26.4	Scen 26.5	Scen 26.6
Anderson	626	16,580	1,727	16,580	1,726	16,580	1,726	1,725
Angelina	83	1,094	109	109	109	109	109	109
Camp	64	1,593	191	191	191	191	191	191
Cass	504	16,468	1,818	1,818	1,818	1,818	1,818	1,818
Cherokee	944	8,806	1,425	8,806	1,424	8,806	1,423	1,423
Gregg	204	2,510	328	328	328	328	328	328
Harrison	342	3,535	501	501	501	501	501	501
Henderson	652	10,663	1,220	10,663	1,220	10,663	1,220	1,220
Houston	188	2,294	340	340	340	340	340	340
Marion	147	7,384	781	781	781	781	781	781
Morris	116	3,276	355	355	355	355	355	355
Nacogdoches	282	2,944	298	298	298	298	298	298
Rusk	25	59	26	26	26	26	26	26
Sabine	0	0	0	0	0	0	0	0
Smith	1,048	32,556	3,393	3,393	3,393	3,393	3,393	3,392
Trinity	1	0	1	1	1	1	1	1
Upshur	1,238	12,156	1,673	1,673	1,673	1,673	1,673	1,673
VanZandt	228	2,341	308	308	308	308	308	308
Wood	1,537	6,505	1,545	1,545	1,545	1,545	1,545	1,545

Table 4. Simulated Pumping in the Year 2080 (Carrizo-Wilcox Aquifer)

County	Baseline	Scen 33	Scen 26.1	Scen 26.2	Scen 26.3	Scen 26.4	Scen 26.5	Scen 26.6
Anderson	4,689	27,006	7,500	27,006	27,006	7,500	33,240	35,850
Angelina	21,628	27,592	27,592	27,592	27,592	27,592	27,592	27,592
Bowie	2,712	9,638	9,638	9,638	9,638	9,638	9,638	9,638
Camp	1,142	3,859	3,859	3,859	3,859	3,859	3,859	3,859
Cass	2,306	13,633	8,500	8,500	8,500	8,500	8,500	8,500
Cherokee	8,231	15,231	9,500	15,231	15,231	9,500	19,015	21,219
Franklin	592	5,728	1,500	1,500	1,500	1,500	1,500	1,500
Gregg	2,789	6,068	6,068	6,068	6,068	6,068	6,068	6,068
Harrison	3,395	9,090	9,090	9,090	9,090	9,090	9,090	9,090
Henderson	6,579	7,217	7,217	7,217	7,217	7,217	9,022	10,756
Hopkins	2,605	4,749	3,500	3,500	3,500	3,500	3,500	3,500
Houston	831	2,354	2,354	2,354	2,354	2,354	2,354	2,354
Marion	1,133	1,965	1,965	1,965	1,965	1,965	1,965	1,965
Morris	1,106	2,569	1,500	1,500	1,500	1,500	1,500	1,500
Nacogdoches	13,661	20,845	20,845	20,845	20,845	20,845	20,845	20,837
Panola	2,645	4,996	4,996	4,996	4,996	4,996	4,996	4,996
Rains	682	1,410	682	682	682	682	682	682
Rusk	6,364	14,009	14,009	14,009	14,009	14,009	14,009	14,008
Sabine	721	1,387	1,387	1,387	1,387	1,387	1,387	1,387
SanAugustine	700	587	587	587	587	587	587	587
Shelby	2,502	6,315	5,500	5,500	5,500	5,500	5,500	5,500
Smith	13,886	25,529	18,000	18,000	18,000	18,000	18,000	18,000
Titus	1,719	7,531	1,900	1,900	1,900	1,900	1,900	1,900
Trinity	28	267	100	100	100	100	100	100
Upshur	4,877	6,653	6,653	6,653	6,653	6,653	6,653	6,653
VanZandt	4,458	6,927	5,000	5,000	5,000	5,000	5,000	5,000
Wood	5,071	17,890	10,000	10,000	10,000	10,000	10,000	10,000

4.0 Average Drawdown Results

4.1 Documentation of *getdd.exe*

The output of each scenario was processed with the Fortran program *getdd.exe*, which extracts the groundwater elevation output from the heads file (i.e. the hds file). This program:

- Reads the county list file
- Reads the GAM grid file
- Reads the hds file
- Reads the acreage in each county and model layer
- Calculates an area-weighted average for each county and model layer
- Writes the results

The results include annual average drawdown (from 2014 to 2080) for each county and model layer, including an average drawdown for the four Carrizo-Wilcox layers to calculate a Carrizo-Wilcox Aquifer average drawdown.

In addition, a decadal average drawdown by aquifer for each county is written (where ***x*** is the scenario number (i.e. 2 to 6):

- *AvgDecadalDDSP2080S26.**x**.dat* (Sparta Aquifer)
- *AvgDecadalDDQC2080S26.**x**.dat* (Queen City Aquifer)
- *AvgDecadalDDCW2080S26.**x**.dat* (Carrizo-Wilcox Aquifer)

The 2080 pumping summaries were gathered for all scenarios and saved in three Excel spreadsheets (one for each aquifer):

- *Avg DD Summary – Sparta.xlsx*
- *Avg DD Summary – QC.xlsx*
- *Avg DD Summary – CW.xlsx*

4.2 Comparison of Annual Average Drawdown in Each GMA 11 County

Appendix A presents hydrographs that plot annual average drawdown in the Carrizo-Wilcox Aquifer from 2014 to 2080 for each scenario for each county (total of 27 hydrographs). For comparison purposes, the hydrographs include results from the baseline simulation, Scenario 33, and Scenario 26.1 documented in Hutchison (2026).

4.3 Comparison of Average Drawdown in 2080 for Each GMA 11 County

Average drawdown in 2080 for all scenarios for each aquifer are presented in:

- Table 5 – Sparta Aquifer

- Table 6 – Queen City Aquifer
- Table 7 – Carrizo-Wilcox Aquifer

Please note that the comparison includes the 2080 drawdown from the baseline simulation, Scenario 33, and Scenario 26.1 documented in Hutchison (2026).

Table 5. Comparison of Average Drawdown in 2080 in GMA 11 Counties (Sparta Aquifer)

County	Baseline	Scen 33	Scen 26.1	Scen 26.2	Scen 26.3	Scen 26.4	Scen 26.5	Scen 26.6
Anderson	3	23	6	26	7	21	8	9
Angelina	0	6	3	4	4	3	4	4
Cass	4	97	9	9	9	9	9	9
Cherokee	2	7	3	7	4	6	4	4
Houston	0	3	2	2	2	2	2	2
Marion	3	117	5	5	5	5	5	5
Nacogdoches	2	7	5	5	5	5	5	5
Rusk	0	22	23	31	30	24	36	41
Sabine	0	1	1	1	1	1	1	1
SanAugustine	0	2	2	2	2	2	2	2
Shelby	0	9	10	12	11	10	13	14
Smith	2	40	3	3	3	3	3	4
Trinity	0	5	3	4	4	3	5	5
Upshur	2	11	2	3	3	2	3	3
Wood	2	11	2	2	2	2	2	2

Table 6. Comparison of Average Drawdown in 2080 in GMA 11 Counties (Queen City Aquifer)

County	Baseline	Scen 33	Scen 26.1	Scen 26.2	Scen 26.3	Scen 26.4	Scen 26.5	Scen 26.6
Anderson	1	60	4	56	7	44	9	9
Angelina	0	27	11	17	14	13	16	17
Camp	0	16	2	2	2	2	2	2
Cass	1	67	3	3	3	3	3	3
Cherokee	0	42	3	30	6	25	8	9
Gregg	1	61	8	9	9	8	10	10
Harrison	1	50	2	2	2	2	2	2
Henderson	1	40	3	29	5	25	6	7
Houston	0	14	3	9	6	6	7	8
Marion	1	69	4	4	4	4	4	4
Morris	1	77	5	5	5	5	5	5
Nacogdoches	2	27	8	10	10	9	10	11
Rusk	0	18	10	14	13	10	17	20
Sabine	0	3	3	3	3	3	3	3
SanAugustine	0	7	5	6	6	5	7	7
Shelby	0	10	7	8	8	7	9	10
Smith	0	141	5	7	6	5	7	7
Titus	0	7	1	1	1	1	1	1
Trinity	0	18	7	13	12	9	14	15
Upshur	0	53	5	6	6	5	6	6
VanZandt	1	55	2	5	3	4	4	5
Wood	1	24	2	2	2	2	2	2

Table 7. Comparison of Average Drawdown in 2080 in GMA 11 Counties (Carrizo-Wilcox Aquifer)

County	Baseline	Scen 33	Scen 26.1	Scen 26.2	Scen 26.3	Scen 26.4	Scen 26.5	Scen 26.6
Anderson	1	180	38	154	146	43	197	225
Angelina	-3	65	43	59	58	44	66	71
Bowie	0	18	13	13	13	13	13	13
Camp	-1	100	37	38	38	37	39	40
Cass	0	92	42	42	42	42	42	42
Cherokee	-1	177	50	136	126	55	174	203
Franklin	-1	120	18	19	19	18	19	20
Gregg	-1	116	52	60	59	53	64	68
Harrison	0	36	22	23	23	22	23	24
Henderson	0	155	39	98	91	43	132	161
Hopkins	-1	80	15	16	16	15	16	17
Houston	-2	83	30	75	71	32	91	102
Marion	0	53	24	24	24	24	25	25
Morris	-1	95	26	27	27	26	27	27
Nacogdoches	-3	80	50	70	68	52	80	88
Panola	-1	26	21	23	23	22	24	25
Rains	0	25	3	3	3	3	4	4
Rusk	-2	96	54	71	69	55	81	90
Sabine	-1	10	8	10	9	8	10	11
SanAugustine	-2	24	17	22	21	18	24	25
Shelby	-1	25	18	20	20	18	21	22
Smith	-2	263	77	120	115	81	142	161
Titus	-1	87	10	10	10	10	10	10
Trinity	-2	54	27	49	47	29	57	63
Upshur	-1	144	52	58	58	53	61	64
VanZandt	-1	89	24	39	37	25	49	58
Wood	-1	161	41	47	46	41	51	54

4.4 Average Drawdown in 2080 for Each Scenario

Because GMA 11 has historically expressed desired future conditions (DFCs) as average drawdown by county and aquifer, and because the proposed DFCs (approved at the GMA 11 meeting of April 28, 2026) were expressed as average drawdown by county and aquifer, Appendix B presents tables of each scenario with all average drawdowns for the Sparta, Queen City, and Carrizo-Wilcox Aquifers. If GMA 11 agrees on a particular scenario, the DFC statement in terms of average drawdown by county and aquifer is available for use in Appendix B.

5.0 Dry Well Analysis

The dry well analysis documented in Hutchison (2026) was used to process the results of Scenarios 26.2 to 26.6.

5.1 Documentation of *getpredhed.exe*

The Fortran program *getpreded.exe:*

- Reads the groundwater elevation from the hds file of a scenario
- Reads the list of GMA 11 wells downloaded from the TWDB groundwater database (as documented in Hutchison, 2026)
- Writes the data for each GMA 11 well from the input file and the 2080 groundwater elevation for the cell in which the well is located

The output file from this post-processor is named *hdsScen26.**x**.dat*, where ***x*** is the scenario number (2 to 6).

5.2 Documentation of *Dry Well Summary.xlsx*

The Excel spreadsheet *Dry Well Summary.xlsx* includes the results of Hutchison (2026) for the baseline scenario, Scenario 33, and Scenario 26.1 and adds the results of Scenarios 26.2 to 26.6. The output from *getpredhed.exe* for each scenario is imported into the appropriate sheet of *Dry Well Summary.xlsx*. Results in columns M to R are summarized by layer for all of GMA 11, and the results in columns T to AB are summarized for each county in GMA 11.

The overall results by county for all scenarios are in the tab named *Compare Overall* (presented in Table 8) and the results for the Carrizo-Wilcox Aquifer are in the tab named *Compare CW* (presented in Table 9).

Table 8. Summary of Dry Well Analysis - Overall

County	Number of Wells	Number of Dry Wells							
		Baseline	Scenario 33	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Anderson	237	2	22	6	20	10	11	18	22
Angelina	118	0	0	0	0	0	0	0	0
Bowie	50	1	3	3	3	3	3	3	3
Camp	80	0	4	0	0	0	0	0	0
Cass	162	0	28	2	2	2	2	2	2
Cherokee	255	1	84	16	61	43	29	78	98
Franklin	40	0	10	0	0	0	0	0	0
Gregg	107	1	12	2	2	2	2	2	2
Harrison	188	1	11	4	4	4	4	4	5
Henderson	370	2	44	7	25	16	15	26	37
Hopkins	25	0	1	1	1	1	1	1	1
Houston	155	0	1	0	1	1	1	1	1
Marion	61	0	3	0	0	0	0	0	0
Morris	98	2	21	5	5	5	5	5	5
Nacogdoches	315	2	25	12	16	16	12	18	19
Panola	136	1	2	1	1	1	1	1	2
Rains	31	0	3	1	1	1	1	2	2
Rusk	428	0	39	13	19	19	14	29	37
Sabine	55	1	1	1	1	1	1	1	1
SanAugustine	65	0	0	0	0	0	0	0	0
Shelby	105	0	3	2	3	3	2	3	3
Smith	375	0	105	6	12	12	6	16	19
Titus	190	0	41	0	0	0	0	0	0
Trinity	3	0	0	0	0	0	0	0	0
Upshur	150	0	17	3	3	3	3	3	4
VanZandt	218	1	16	2	3	2	3	5	7
Wood	200	0	19	0	0	0	0	0	0
All	4217	15	515	87	183	145	116	218	270

County	Number of Wells	Percentage of Dry Wells							
		Baseline	Scenario 33	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Anderson	237	1	9	3	8	4	5	8	9
Angelina	118	0	0	0	0	0	0	0	0
Bowie	50	2	6	6	6	6	6	6	6
Camp	80	0	5	0	0	0	0	0	0
Cass	162	0	17	1	1	1	1	1	1
Cherokee	255	0	33	6	24	17	11	31	38
Franklin	40	0	25	0	0	0	0	0	0
Gregg	107	1	11	2	2	2	2	2	2
Harrison	188	1	6	2	2	2	2	2	3
Henderson	370	1	12	2	7	4	4	7	10
Hopkins	25	0	4	4	4	4	4	4	4
Houston	155	0	1	0	1	1	1	1	1
Marion	61	0	5	0	0	0	0	0	0
Morris	98	2	21	5	5	5	5	5	5
Nacogdoches	315	1	8	4	5	5	4	6	6
Panola	136	1	1	1	1	1	1	1	1
Rains	31	0	10	3	3	3	3	6	6
Rusk	428	0	9	3	4	4	3	7	9
Sabine	55	2	2	2	2	2	2	2	2
SanAugustine	65	0	0	0	0	0	0	0	0
Shelby	105	0	3	2	3	3	2	3	3
Smith	375	0	28	2	3	3	2	4	5
Titus	190	0	22	0	0	0	0	0	0
Trinity	3	0	0	0	0	0	0	0	0
Upshur	150	0	11	2	2	2	2	2	3
VanZandt	218	0	7	1	1	1	1	2	3
Wood	200	0	10	0	0	0	0	0	0
All	4217	0	12	2	4	3	3	5	6

Table 9. Summary of Dry Well Analysis – Carrizo-Wilcox Aquifer

County	Number of Wells	Number of Dry Wells							
		Baseline	Scenario 33	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Anderson	237	0	9	1	7	5	1	13	17
Angelina	118	0	0	0	0	0	0	0	0
Bowie	50	1	2	2	2	2	2	2	2
Camp	80	0	3	0	0	0	0	0	0
Cass	162	0	1	0	0	0	0	0	0
Cherokee	255	0	54	11	37	33	13	62	77
Franklin	40	0	10	0	0	0	0	0	0
Gregg	107	0	5	0	0	0	0	0	0
Harrison	188	1	5	4	4	4	4	4	4
Henderson	370	0	30	4	11	10	5	17	28
Hopkins	25	0	1	1	1	1	1	1	1
Houston	155	0	0	0	0	0	0	0	0
Marion	61	0	0	0	0	0	0	0	0
Morris	98	0	7	2	2	2	2	2	2
Nacogdoches	315	0	11	7	11	11	7	13	14
Panola	136	1	2	1	1	1	1	1	2
Rains	31	0	3	1	1	1	1	2	2
Rusk	428	0	38	12	18	18	13	28	36
Sabine	55	1	1	1	1	1	1	1	1
SanAugustine	65	0	0	0	0	0	0	0	0
Shelby	105	0	3	2	3	3	2	3	3
Smith	375	0	36	3	8	8	3	11	12
Titus	190	0	39	0	0	0	0	0	0
Trinity	3	0	0	0	0	0	0	0	0
Upshur	150	0	9	2	2	2	2	2	3
VanZandt	218	1	11	2	2	2	2	5	6
Wood	200	0	17	0	0	0	0	0	0
All	4217	5	297	56	111	104	60	167	210

County	Number of Wells	Percentage of Dry Wells							
		Baseline	Scenario 33	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Anderson	237	0	5	1	4	3	1	7	9
Angelina	118	0	0	0	0	0	0	0	0
Bowie	50	2	4	4	4	4	4	4	4
Camp	80	0	4	0	0	0	0	0	0
Cass	162	0	1	0	0	0	0	0	0
Cherokee	255	0	35	7	24	21	8	40	50
Franklin	40	0	25	0	0	0	0	0	0
Gregg	107	0	5	0	0	0	0	0	0
Harrison	188	1	3	2	2	2	2	2	2
Henderson	370	0	10	1	4	3	2	5	9
Hopkins	25	0	4	4	4	4	4	4	4
Houston	155	0	0	0	0	0	0	0	0
Marion	61	0	0	0	0	0	0	0	0
Morris	98	0	10	3	3	3	3	3	3
Nacogdoches	315	0	5	3	5	5	3	6	6
Panola	136	1	2	1	1	1	1	1	2
Rains	31	0	10	3	3	3	3	7	7
Rusk	428	0	9	3	4	4	3	7	9
Sabine	55	3	3	3	3	3	3	3	3
SanAugustine	65	0	0	0	0	0	0	0	0
Shelby	105	0	3	2	3	3	2	3	3
Smith	375	0	13	1	3	3	1	4	4
Titus	190	0	21	0	0	0	0	0	0
Trinity	3	0	0	0	0	0	0	0	0
Upshur	150	0	7	2	2	2	2	2	2
VanZandt	218	0	5	1	1	1	1	2	3
Wood	200	0	10	0	0	0	0	0	0
All	4217	0	7	1	3	2	1	4	5

6.0 Groundwater Budget Analysis

Groundwater budgets quantify the inflows to, outflows from, and storage change within a specified geographic area. Groundwater budgets for Scenarios 26.2 to 26.6 were developed based on GAM output using the same approach and zone file (river basin) as Hutchison (2026).

All groundwater budgets that express inflows, outflows and storage changes within each river basin for Scenarios 26.2 to 26.6 are presented in Appendix C. Maps of the extent of each river basin are included in Appendix C. Included in each basin groundwater budget are the groundwater budgets for the baseline scenario, Scenario 33 (the basis for the current DFC), and Scenario 26.1 all of which were documented in Hutchison (2026).

6.1 Summary of Pumping and Inflow from Alluvium

The upper part of Table 10 presents a summary of groundwater pumping in each basin for each scenario. The lower part of Table 10 presents a summary of inflow from (positive numbers) or outflow to (negative numbers) the alluvium.

Table 10. Summary of Pumping and Inflow from Alluvium

Basin	Groundwater Pumping (AF/yr)							
	Scenario							
	Baseline	Scenario 33	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Cypress Basin	14,611	81,967	33,612	33,612	33,612	33,612	33,612	33,612
Neches Basin	69,405	183,651	102,959	151,665	124,538	130,085	134,597	140,681
Sabine Basin	28,411	87,048	51,554	51,554	51,554	51,554	51,554	51,554
Sulphur Basin	5,478	15,806	12,598	12,598	12,598	12,598	12,598	12,598
Trinity Basin	8,888	16,593	8,016	16,223	11,672	12,566	13,733	15,673
Total GMA 11	126,794	385,065	208,739	265,652	233,974	240,415	246,094	254,117

Basin	Alluvium (AF/yr) (+ = Inflow from Alluvium, - = Outflow to Alluvium)							
	Scenario							
	Baseline	Scenario 33	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Cypress Basin	-15,897	32,812	-2,582	-2,402	-2,420	-2,569	-2,306	-2,214
Neches Basin	-10,590	58,852	6,933	37,397	14,310	30,160	17,430	19,239
Sabine Basin	-16,327	34,464	1,759	3,257	3,101	1,873	4,055	4,820
Sulphur Basin	513	11,293	7,962	7,968	7,967	7,963	7,970	7,973
Trinity Basin	-5,770	5,386	-4,212	4,357	1,503	-1,499	4,067	5,814
Total GMA 11	-48,071	142,808	9,860	50,577	24,461	35,928	31,216	35,632

6.2 Interbasin Flow of Groundwater

6.2.1 Cypress Basin

Table 11 presents the pumping and interbasin flow of groundwater for the Cypress Basin.

Table 11. Pumping and Interbasin Flow - Cypress Basin

Scenario	Cypress Basin		
	Pumping (AF/yr)	Outflow to Sabine (AF/yr)	Inflow from Sulphur (AF/yr)
Baseline	14,611	-258	1,518
Scenario 33	81,967	1,373	6,022
Scenario 26.1	33,612	780	3,957
Scenario 26.2	33,612	1,008	3,962
Scenario 26.3	33,612	985	3,962
Scenario 26.4	33,612	797	3,957
Scenario 26.5	33,612	1,130	3,965
Scenario 26.6	33,612	1,247	3,968

6.2.2 Neches Basin

Table 12 presents the pumping and interbasin flow of groundwater for the Neches Basin.

Table 12. Pumping and Interbasin Flow - Neches Basin

Scenario	Neches Basin		
	Pumping (AF/yr)	Inflow from Sabine (AF/yr)	Inflow from Trinity (AF/yr)
Baseline	69,405	4,156	4,731
Scenario 33	183,651	8,435	23,671
Scenario 26.1	102,959	5,638	11,765
Scenario 26.2	151,665	7,780	21,753
Scenario 26.3	124,538	7,558	20,973
Scenario 26.4	130,085	5,798	12,537
Scenario 26.5	134,597	8,900	24,507
Scenario 26.6	140,681	9,975	26,230

6.2.3 Sabine Basin

Table 13 presents the pumping and interbasin flow of groundwater for the Sabine Basin.

Table 13. Pumping and Interbasin Flow - Sabine Basin

Scenario	Sabine Basin				
	Pumping (AF/yr)	Inflow from Cypress (AF/yr)	Outflow to Neches (AF/yr)	Outflow to Sulphur (AF/yr)	Inflow from Trinity (AF/yr)
Baseline	28,411	-258	4,156	109	147
Scenario 33	87,048	1,373	8,435	227	264
Scenario 26.1	51,554	780	5,638	11	256
Scenario 26.2	51,554	1,008	7,780	9	264
Scenario 26.3	51,554	985	7,558	9	263
Scenario 26.4	51,554	797	5,798	11	257
Scenario 26.5	51,554	1,130	8,900	7	269
Scenario 26.6	51,554	1,247	9,975	6	274

6.2.4 Sulphur Basin

Table 14 presents the pumping and interbasin flow of groundwater for the Sulphur Basin.

Table 14. Pumping and Interbasin Flow - Sulphur Basin

Scenario	Sulphur Basin		
	Pumping (AF/yr)	Outflow to Cypress (AF/yr)	Inflow from Sabine (AF/yr)
Baseline	5,478	1,518	109
Scenario 33	15,806	6,022	227
Scenario 26.1	12,598	3,957	11
Scenario 26.2	12,598	3,962	9
Scenario 26.3	12,598	3,962	9
Scenario 26.4	12,598	3,957	11
Scenario 26.5	12,598	3,965	7
Scenario 26.6	12,598	3,968	6

6.2.5 Trinity Basin

Table 15 presents the pumping and interbasin flow of groundwater for the Trinity Basin.

Table 15. Pumping and Interbasin Flow - Trinity Basin

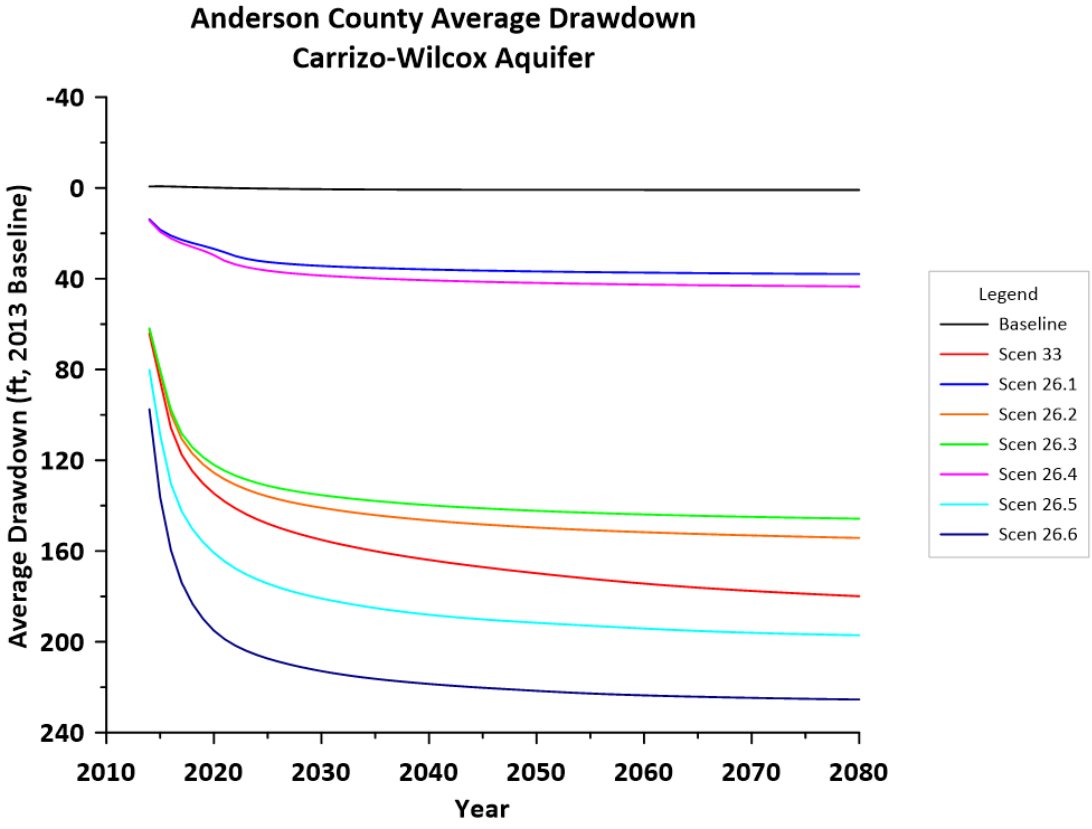
Scenario	Trinity Basin		
	Pumping (AF/yr)	Outflow to Neches (AF/yr)	Outflow to Sabine (AF/yr)
Baseline	8,888	4,731	147
Scenario 33	16,593	23,671	264
Scenario 26.1	8,016	11,765	256
Scenario 26.2	16,223	21,753	264
Scenario 26.3	11,672	20,973	263
Scenario 26.4	12,566	12,537	257
Scenario 26.5	13,733	24,507	269
Scenario 26.6	15,673	26,230	274

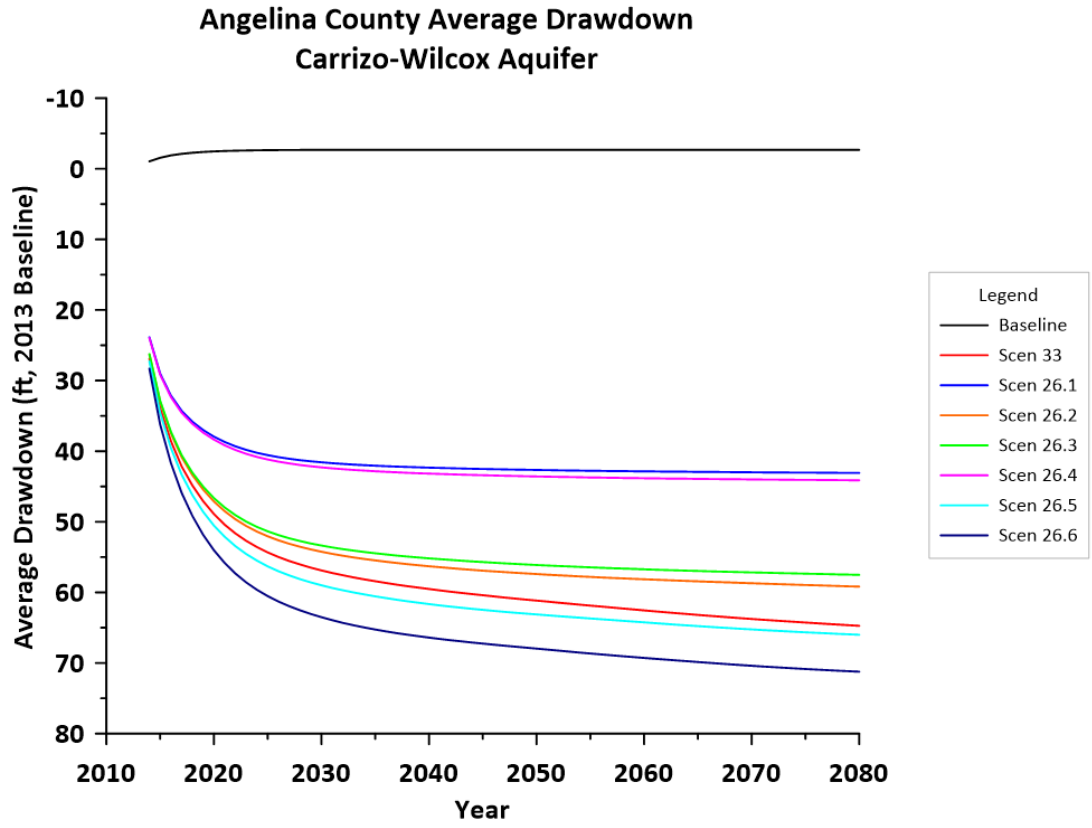
7.0 References

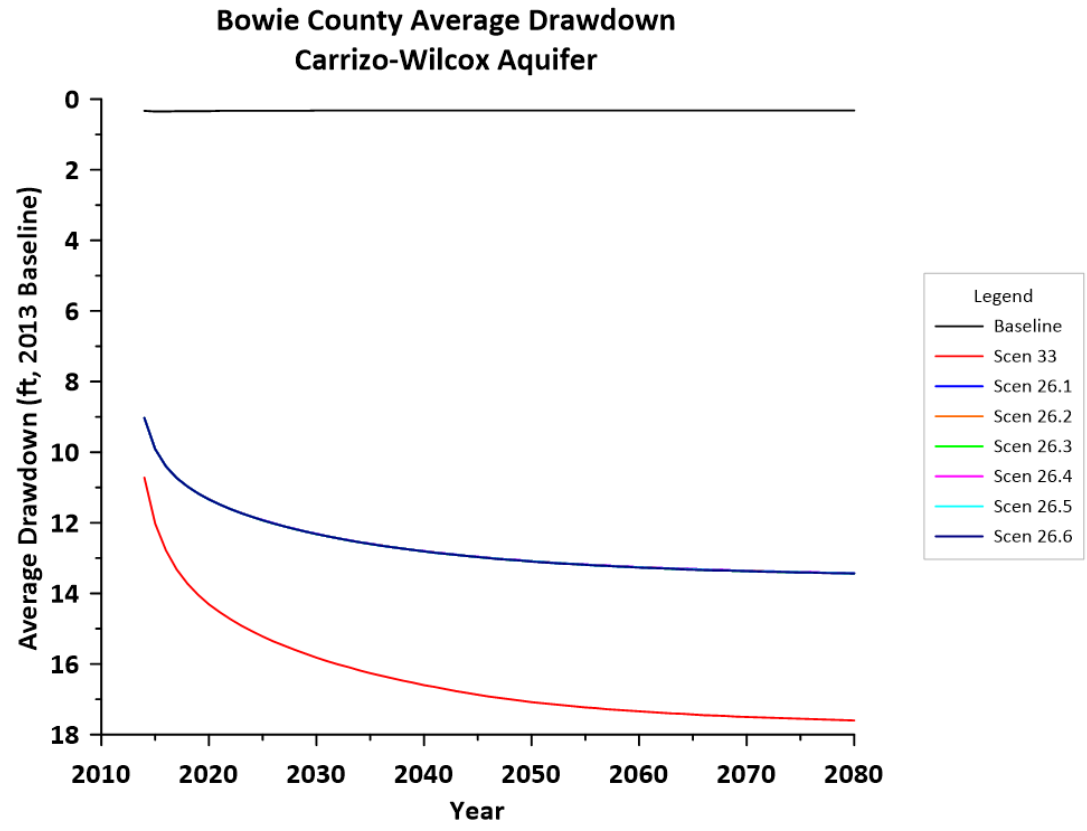
Hutchison, W.R., 2026. Documentation of GMA 11 Pumping Scenarios to Simulate Reduction in Queen City and Carrizo-Wilcox Pumping Relative to Scenario 33 Pumping. GMA 11 Technical Memorandum 26-02 (draft), February 26, 2026, 38p.

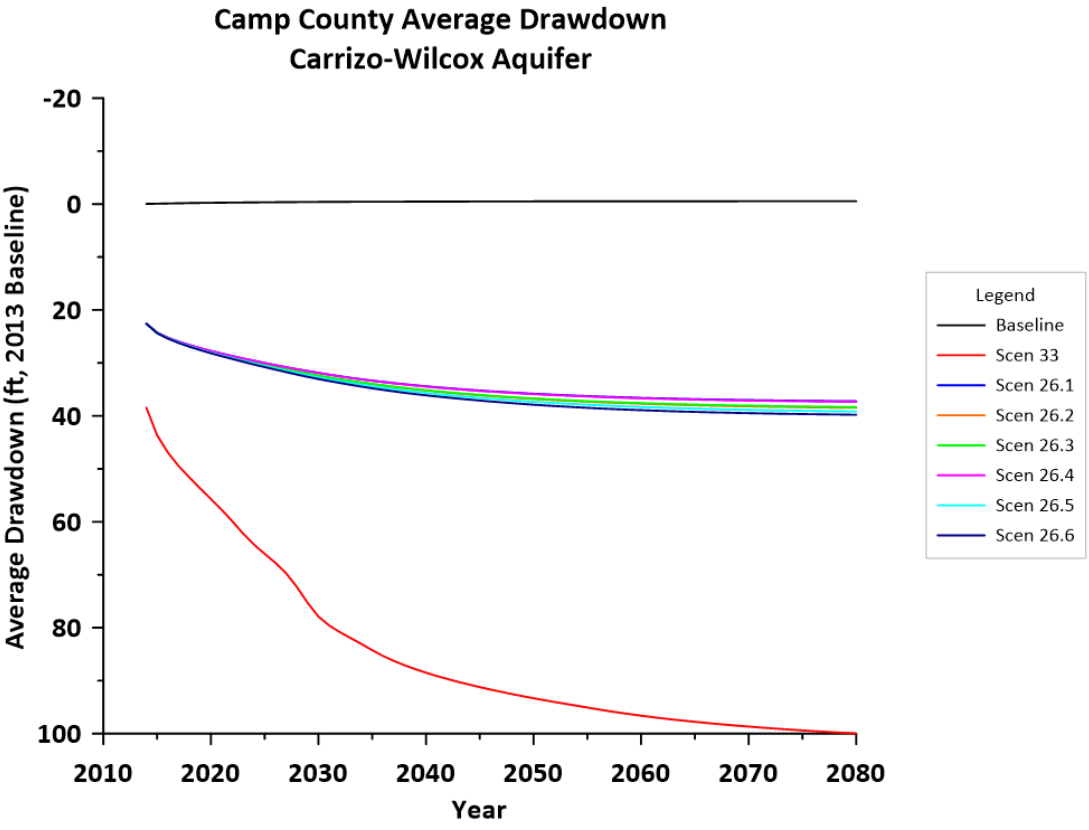
Appendix A

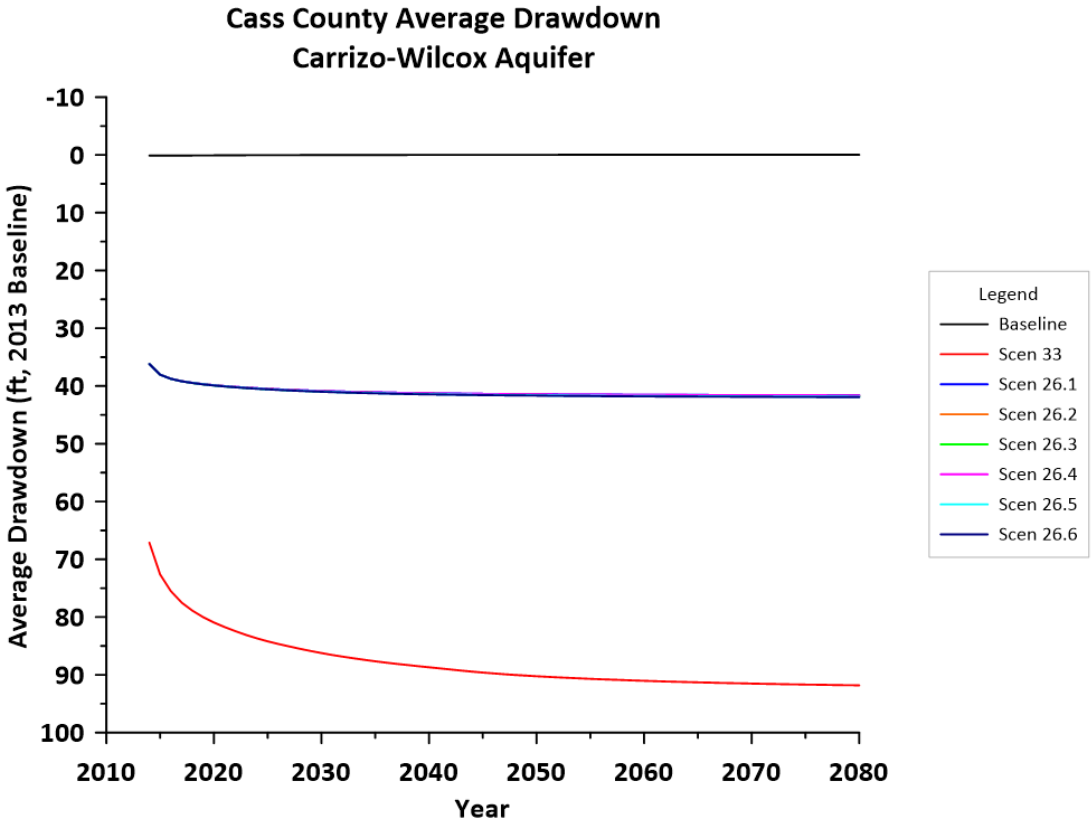
Average Drawdown Comparison Hydrographs for Each County in the Carrizo-Wilcox Aquifer All Scenarios

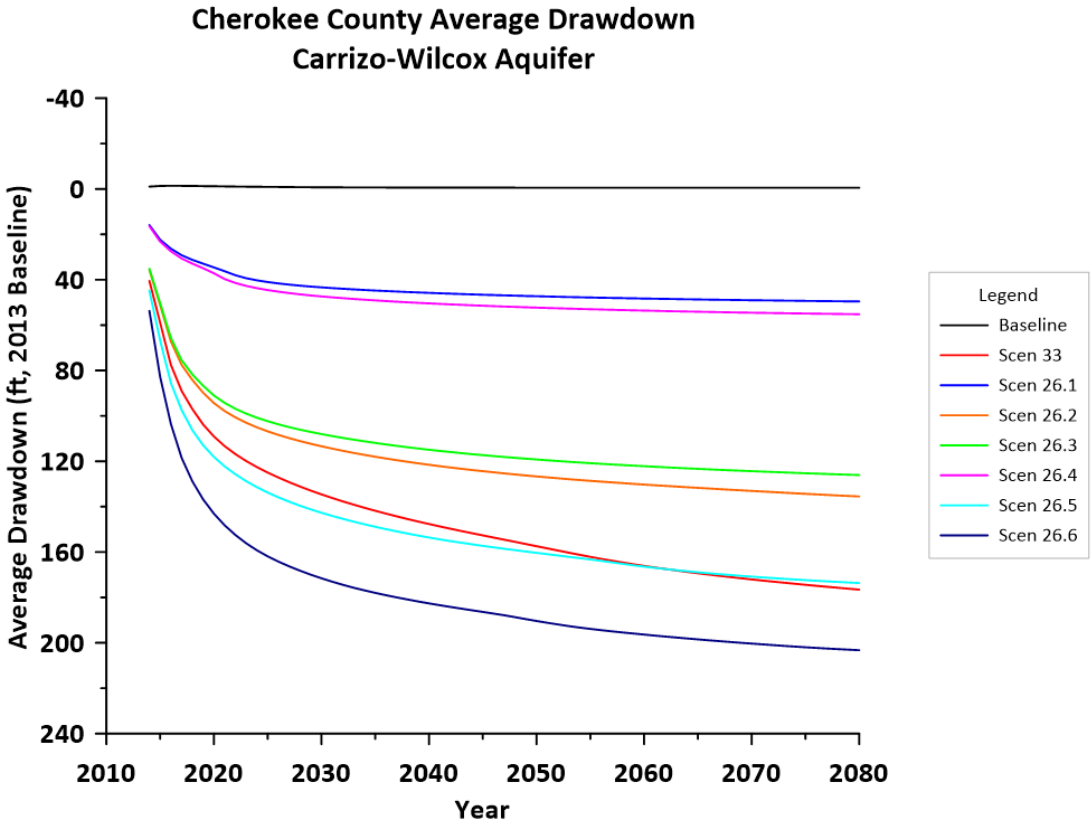

Anderson County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-40
0
40
80
120
160
200
240
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

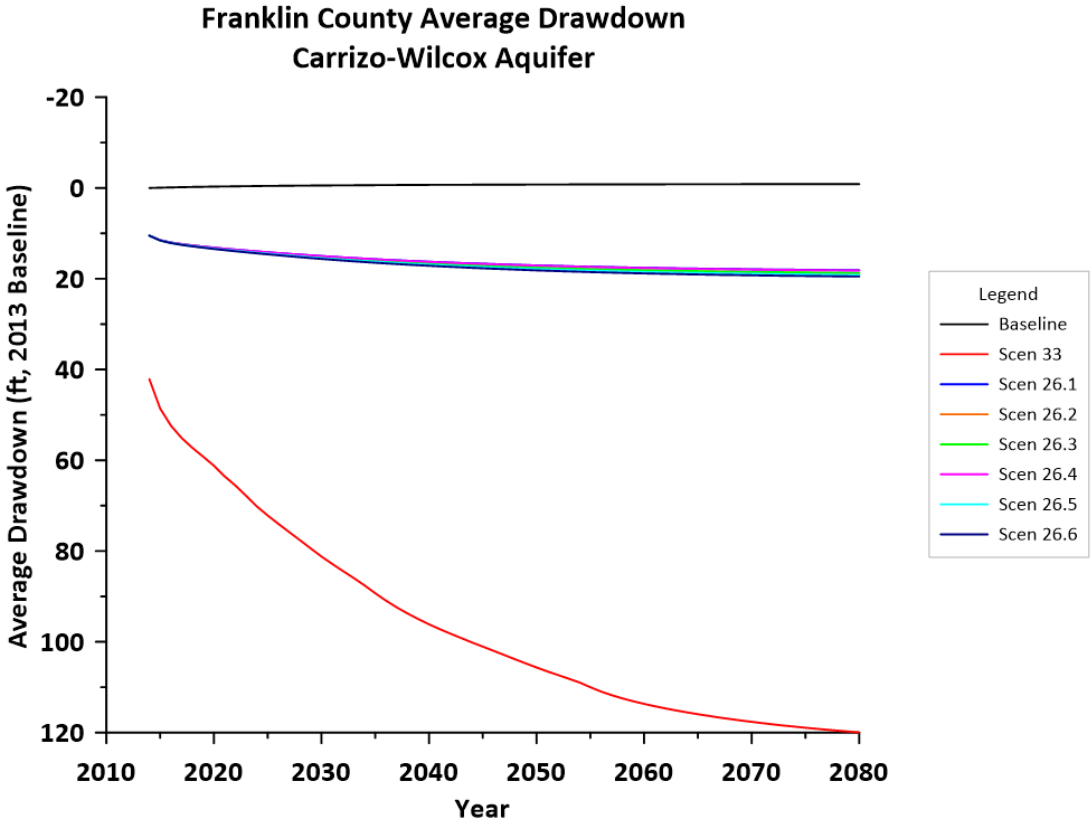

Angelina County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-10
0
10
20
30
40
50
60
70
80
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

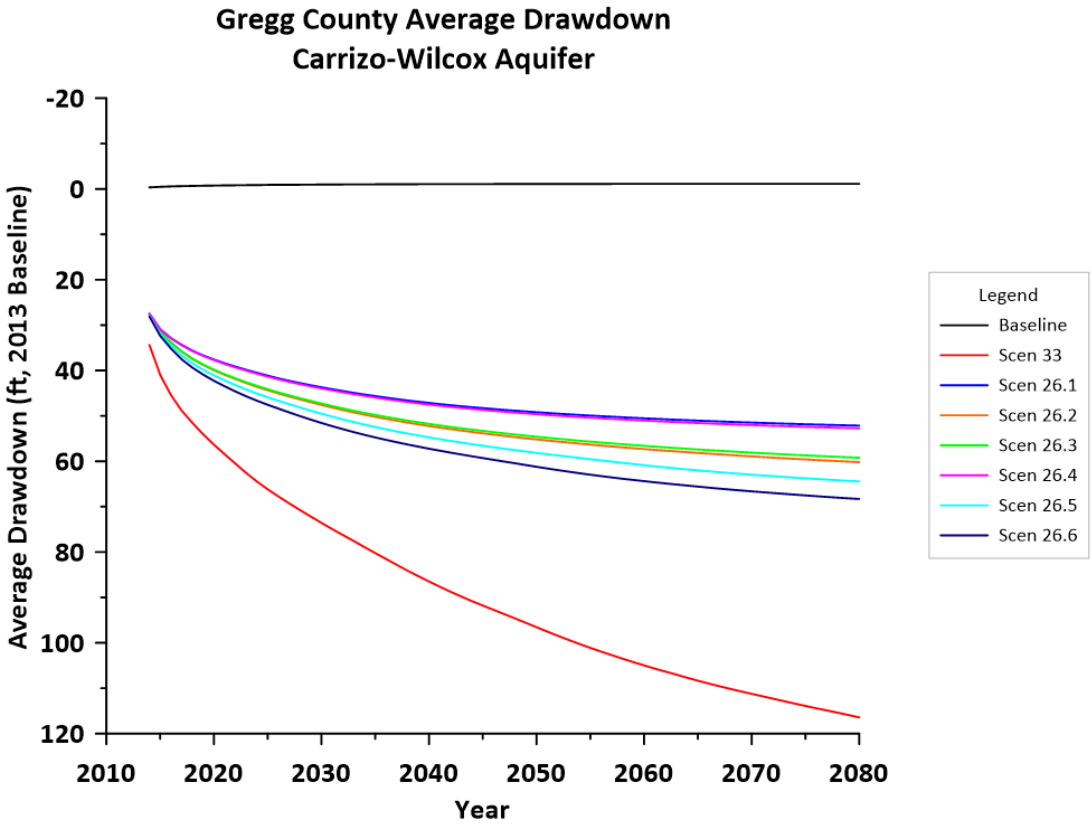

Bowie County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
0
2
4
6
8
10
12
14
16
18
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

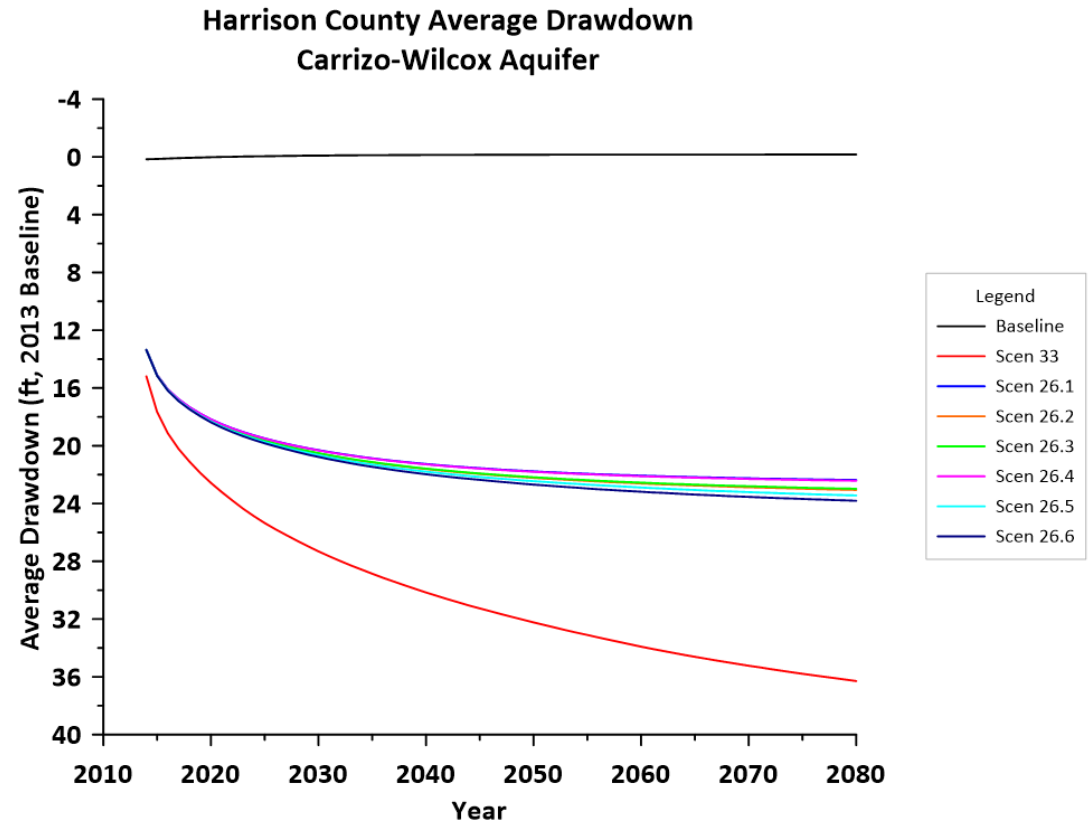

Camp County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-20
0
20
40
60
80
100
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

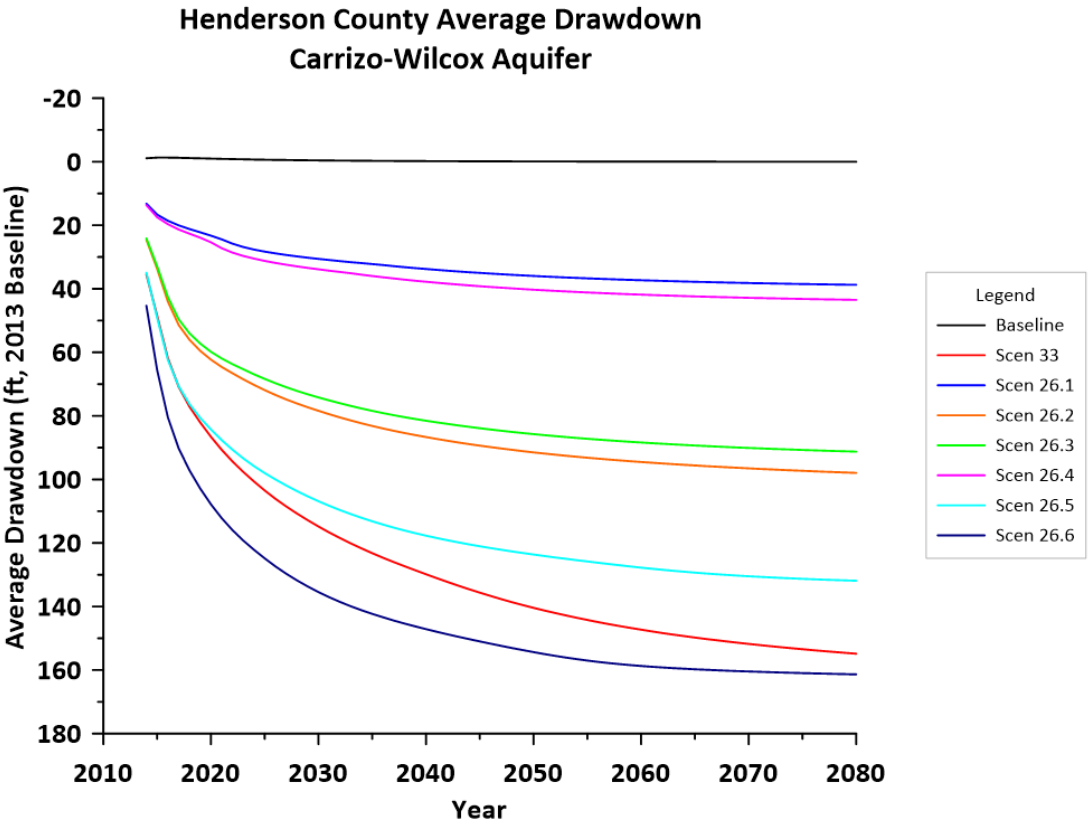

Cass County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-10
0
10
20
30
40
50
60
70
80
90
100
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

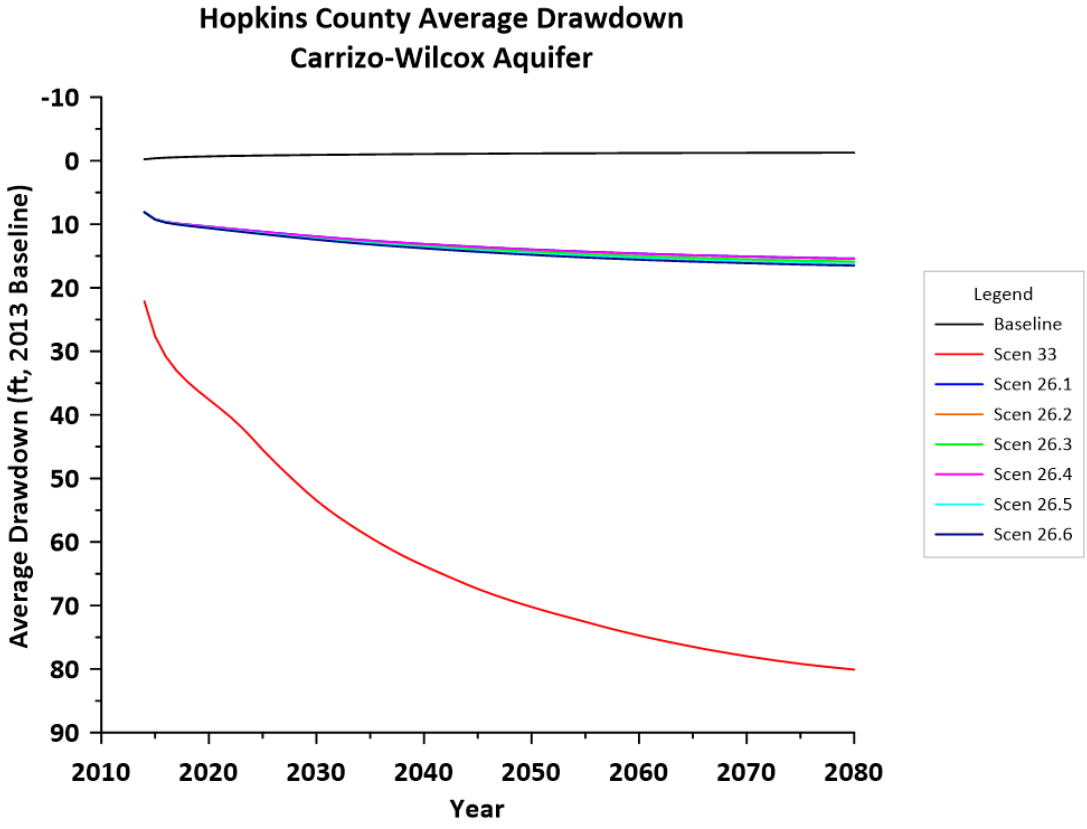

Cherokee County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-40
0
40
80
120
160
200
240
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

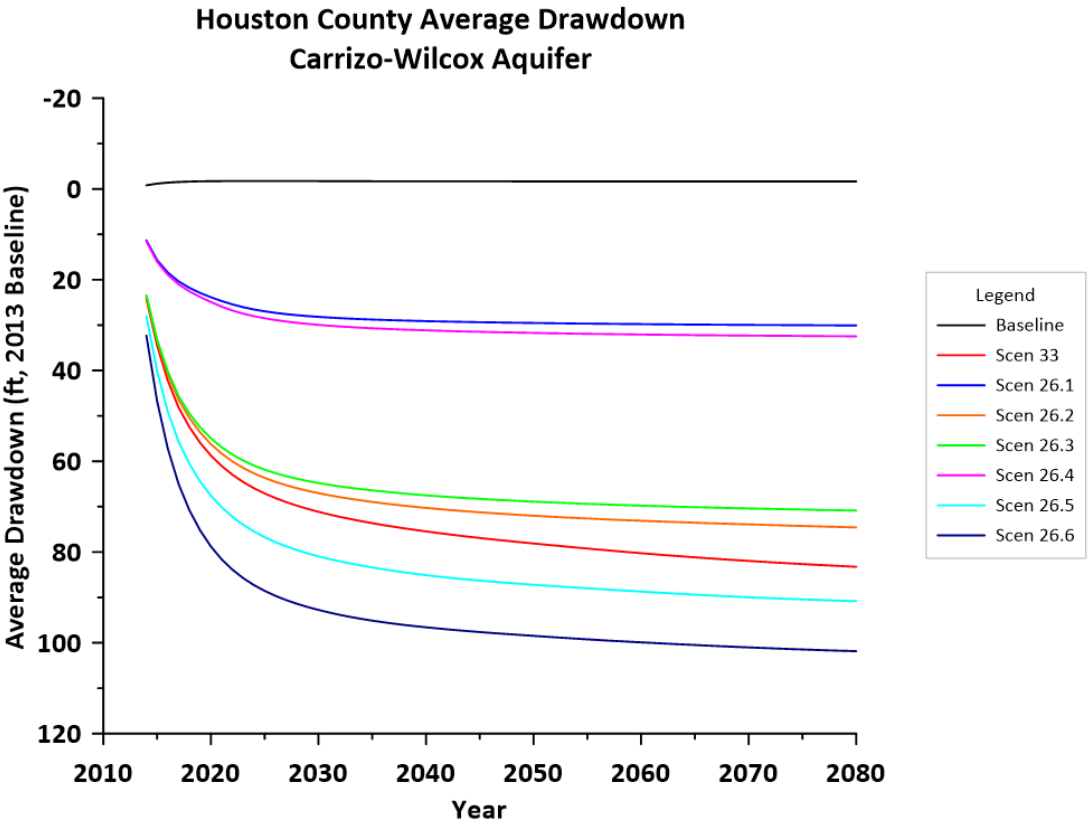

Franklin County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-20
0
20
40
60
80
100
120
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

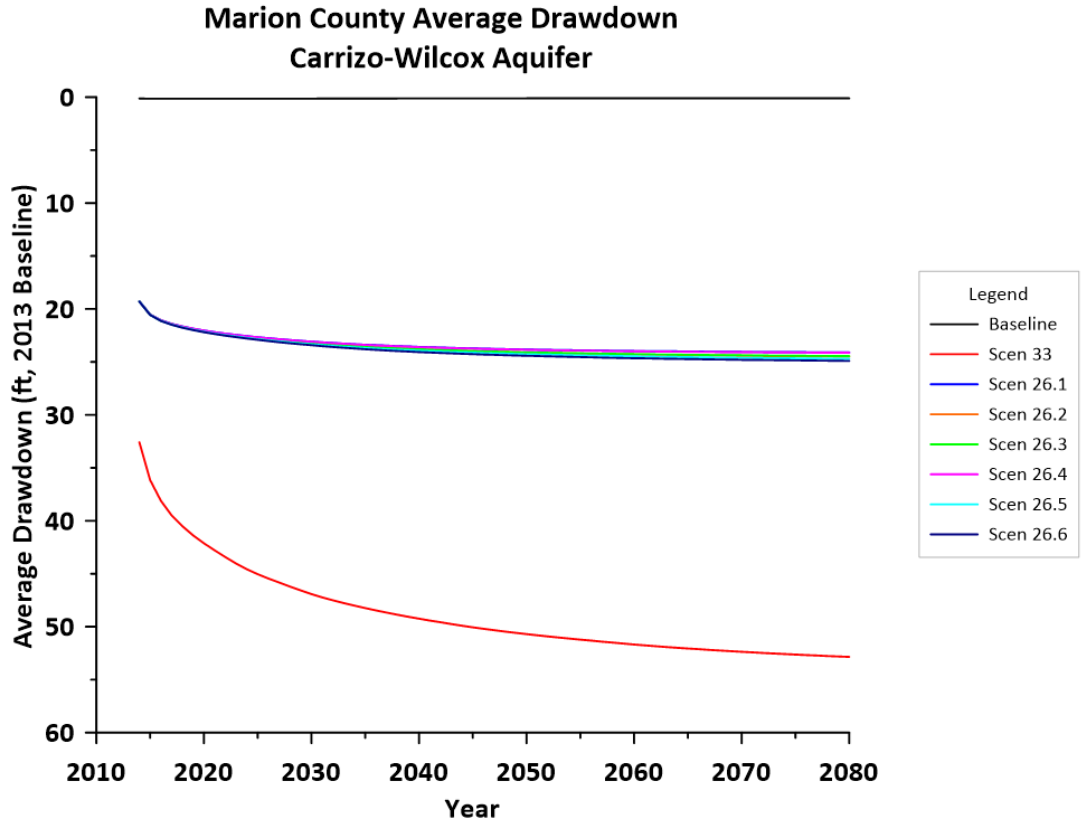

Gregg County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-20
0
20
40
60
80
100
120
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

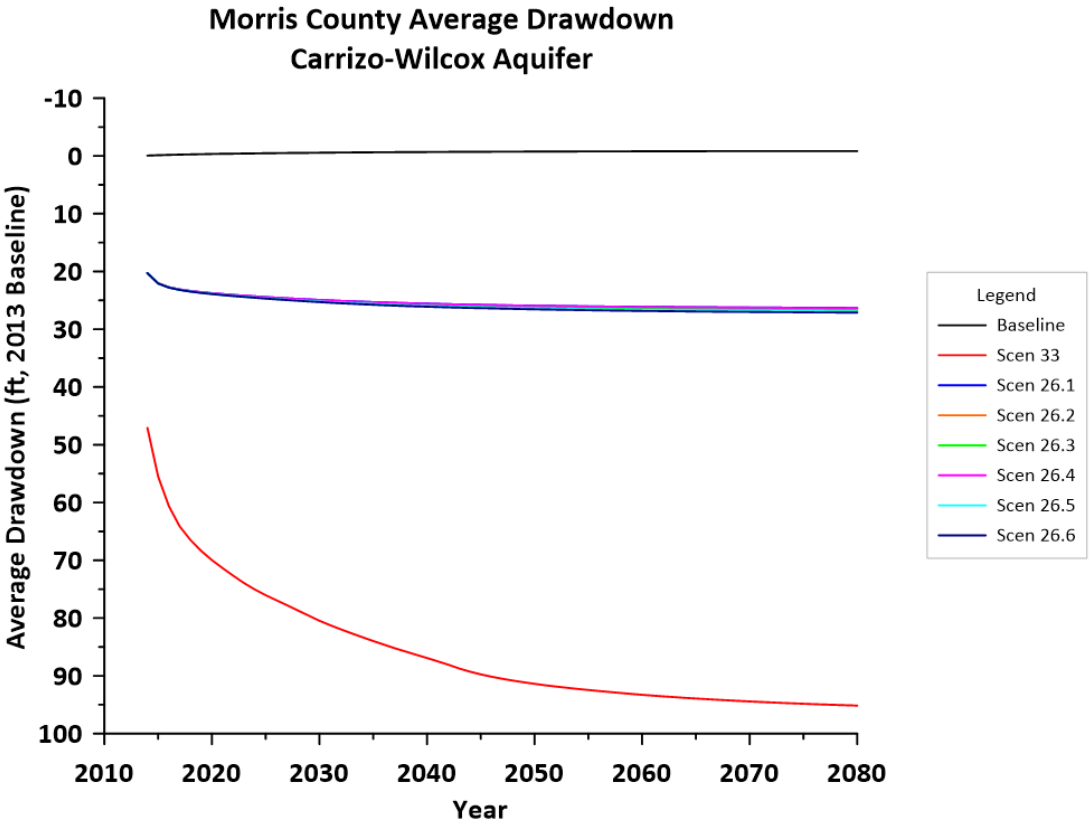

Harrison County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-4
0
4
8
12
16
20
24
28
32
36
40
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

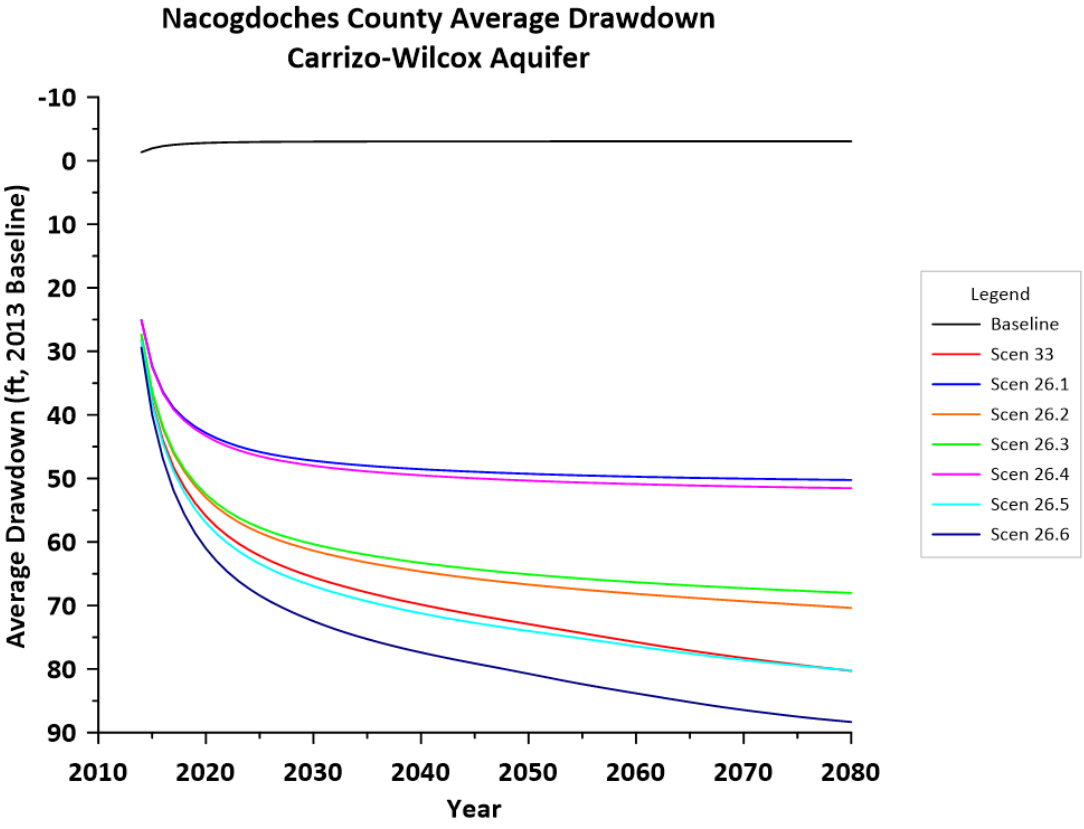

Henderson County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-20
0
20
40
60
80
100
120
140
160
180
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

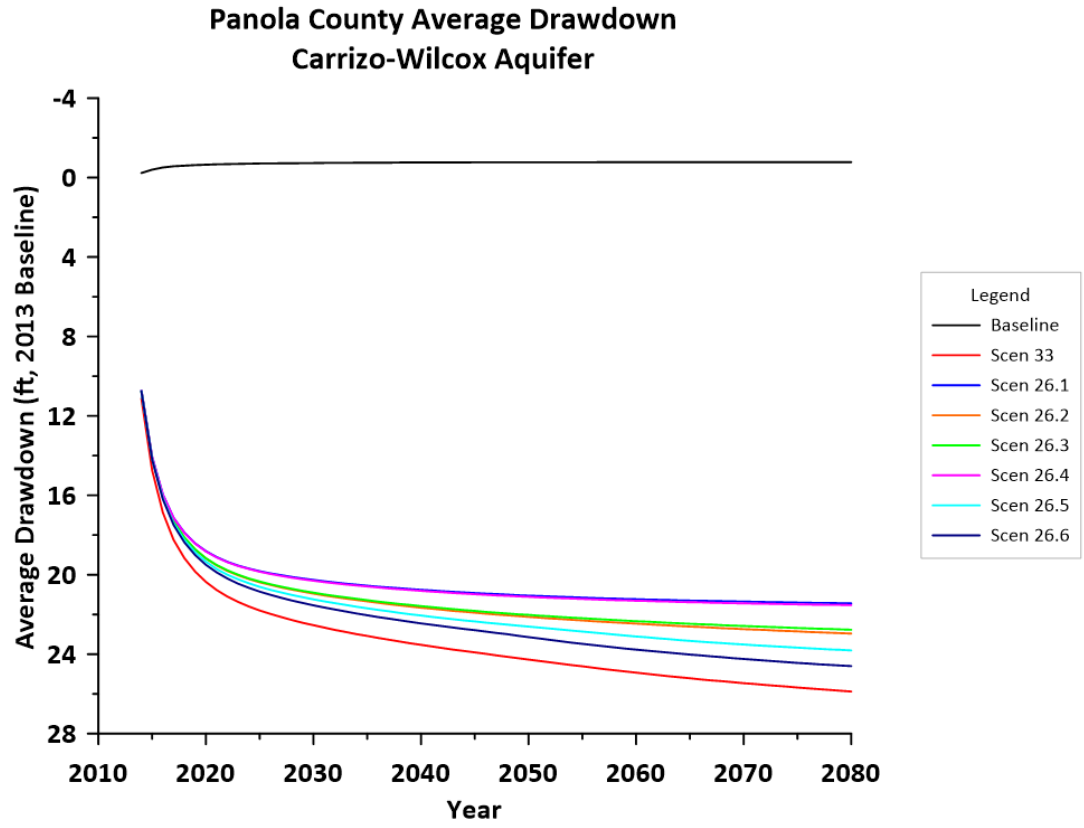

Hopkins County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-10
0
10
20
30
40
50
60
70
80
90
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

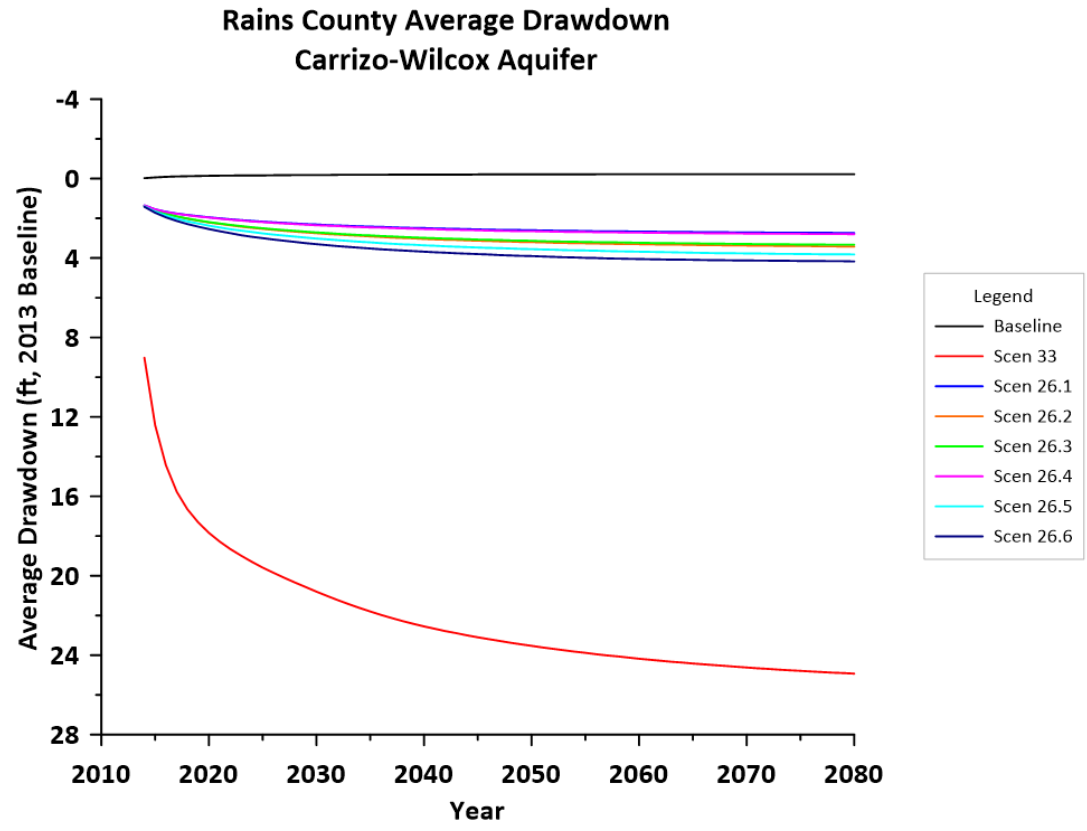

Houston County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-20
0
20
40
60
80
100
120
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

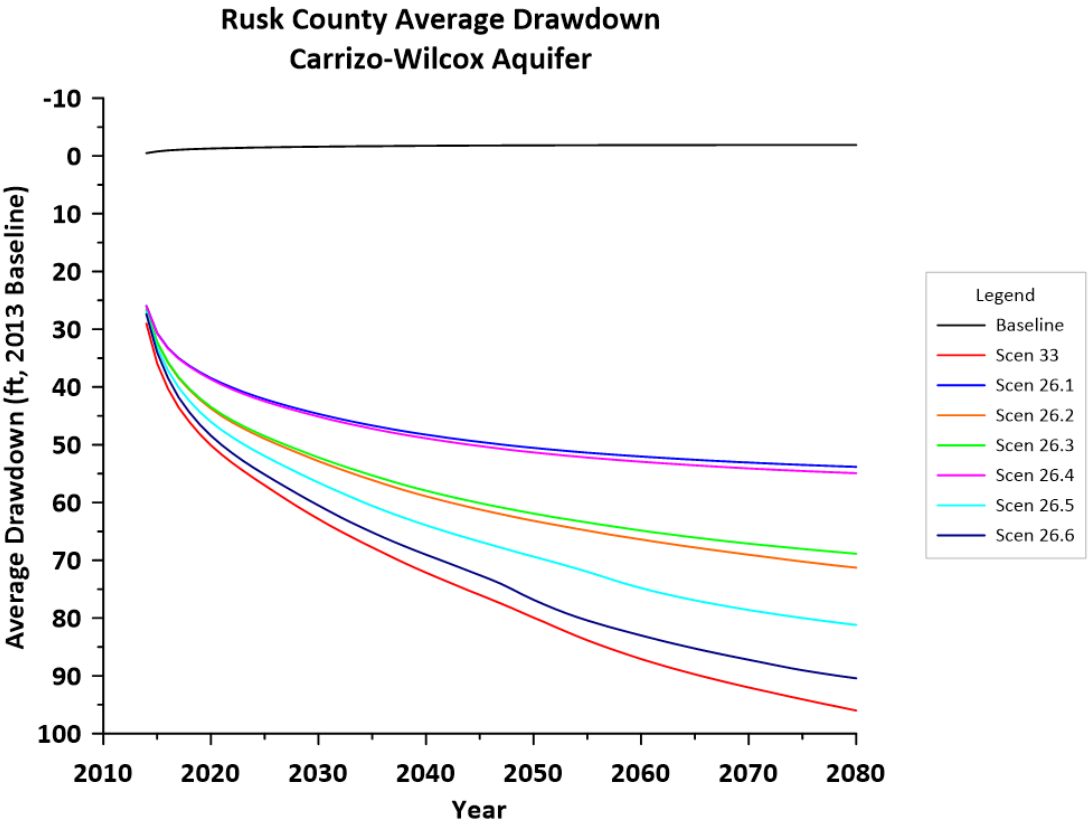

Marion County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
0
10
20
30
40
50
60
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

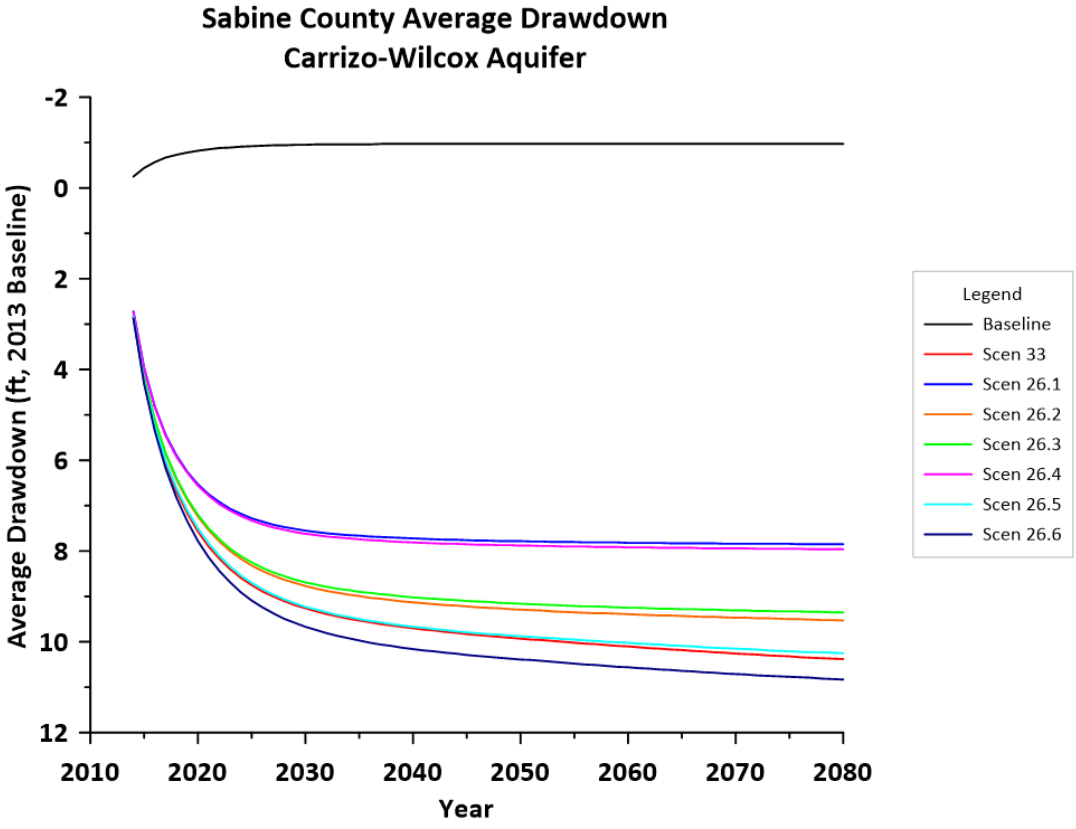

Morris County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-10
0
10
20
30
40
50
60
70
80
90
100
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

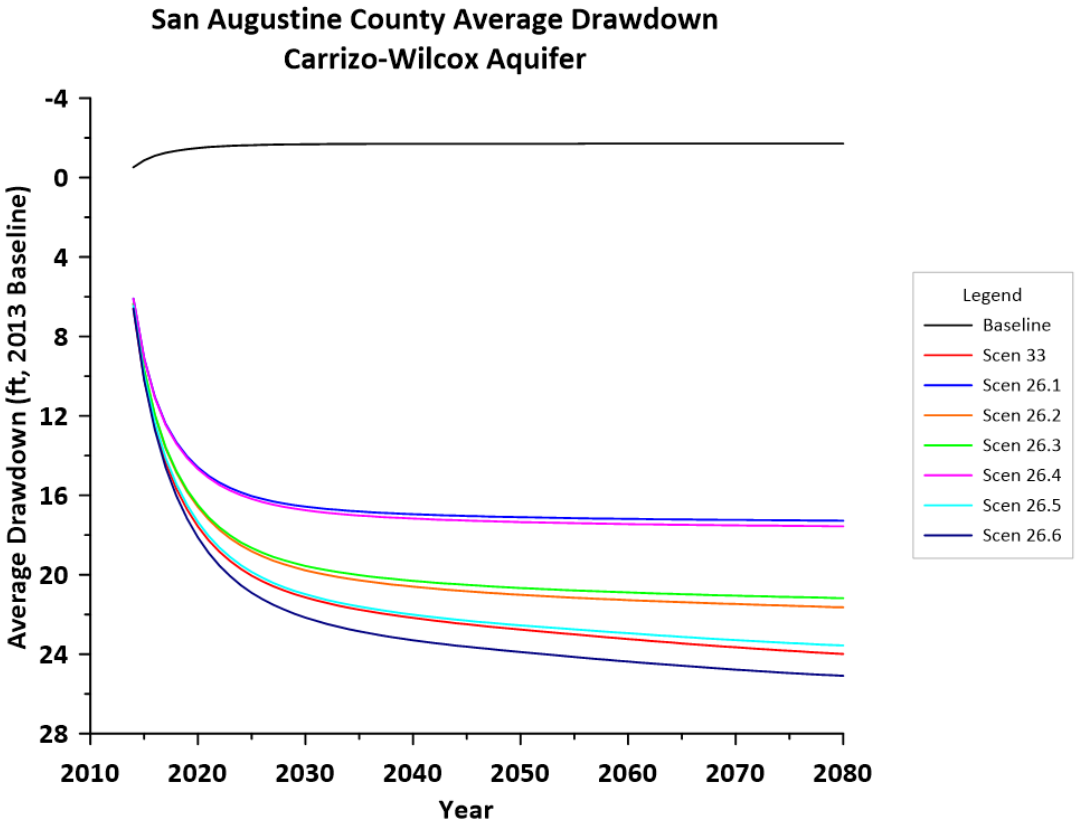

Nacogdoches County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-10
0
10
20
30
40
50
60
70
80
90
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

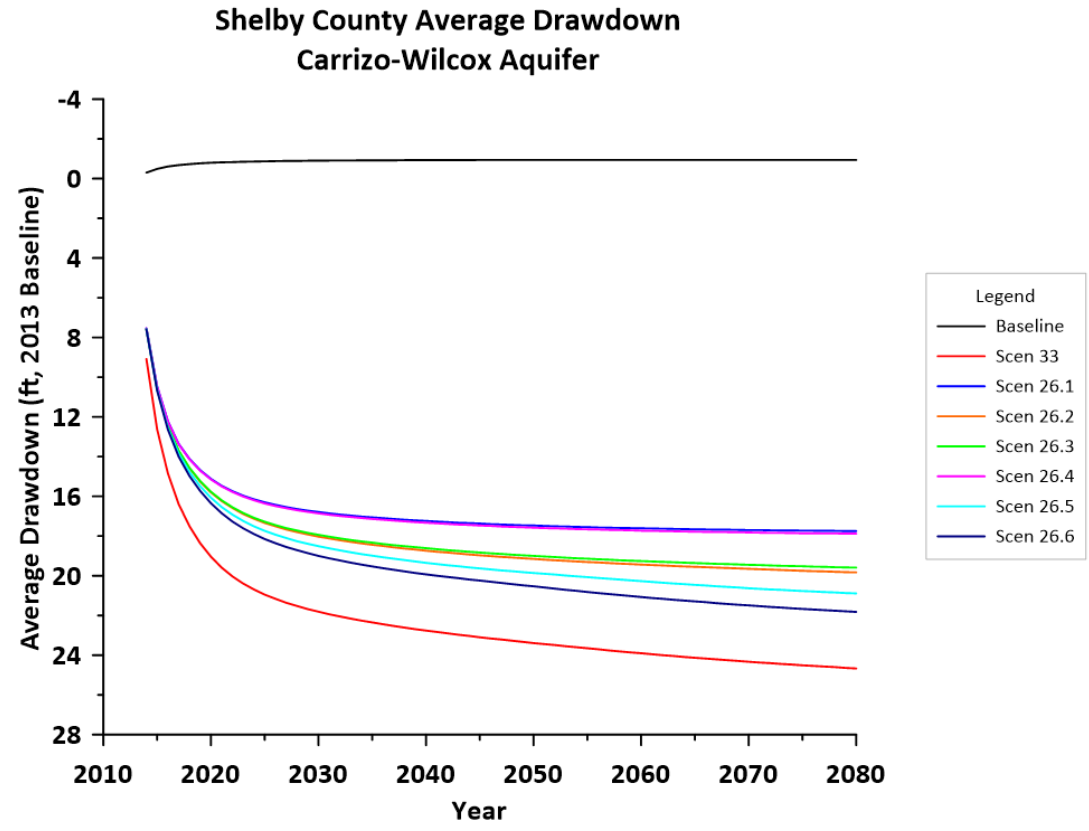

Panola County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-4
0
4
8
12
16
20
24
28
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

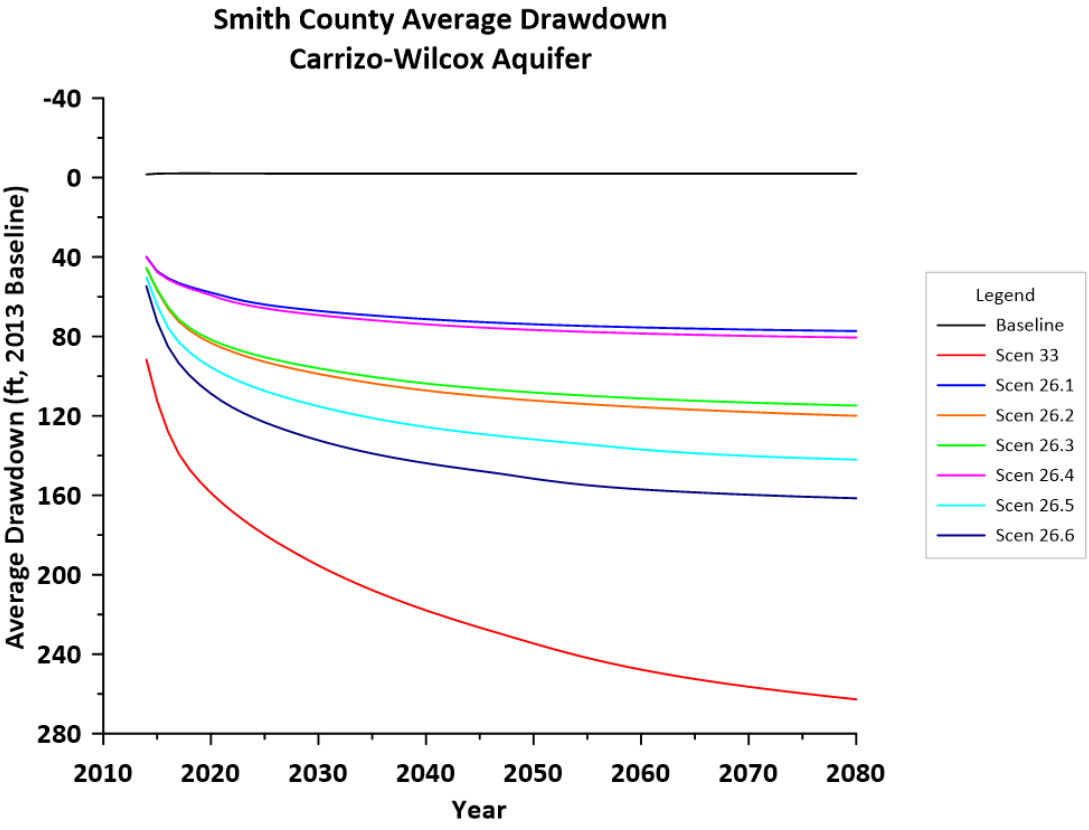

Rains County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-4
0
4
8
12
16
20
24
28
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

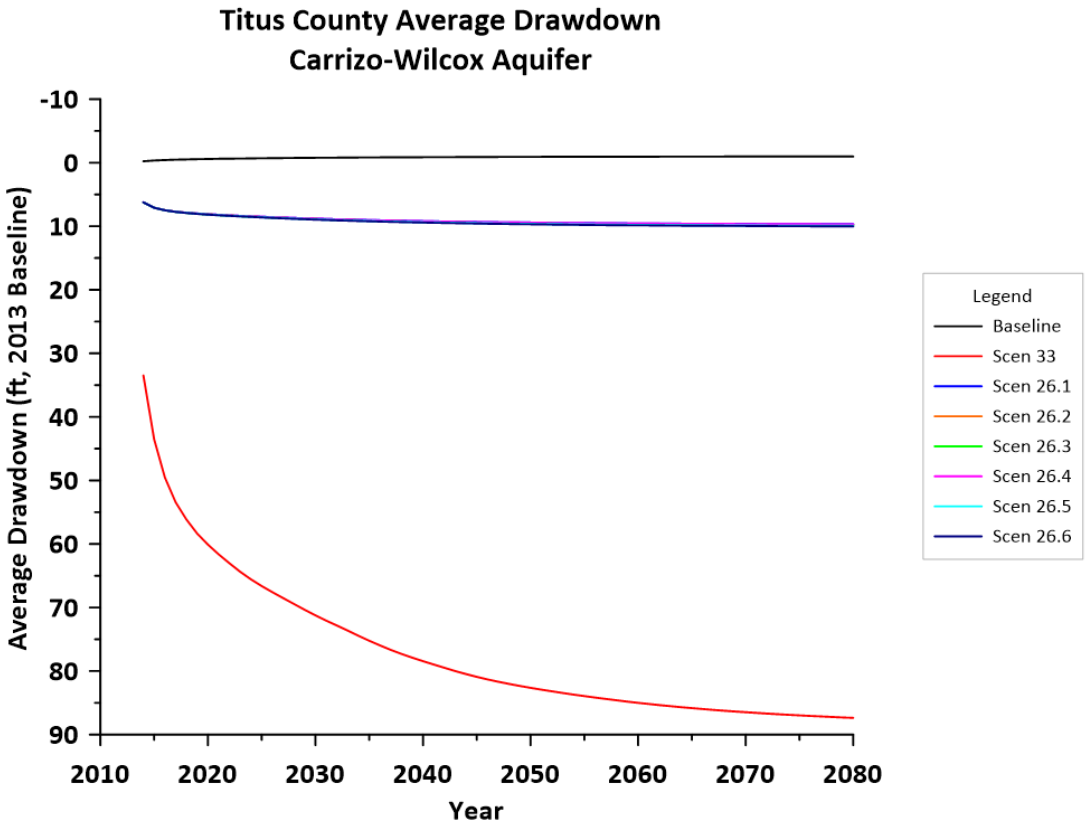

Rusk County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-10
0
10
20
30
40
50
60
70
80
90
100
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

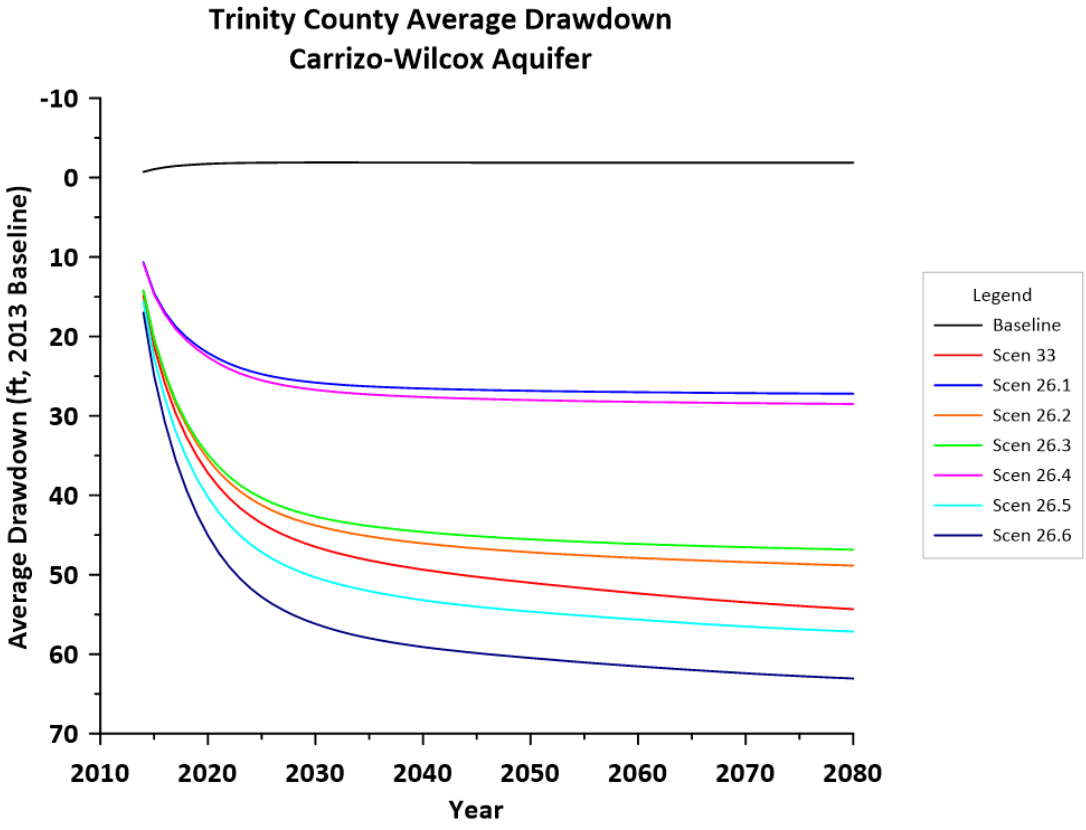

Sabine County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-2
0
2
4
6
8
10
12
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

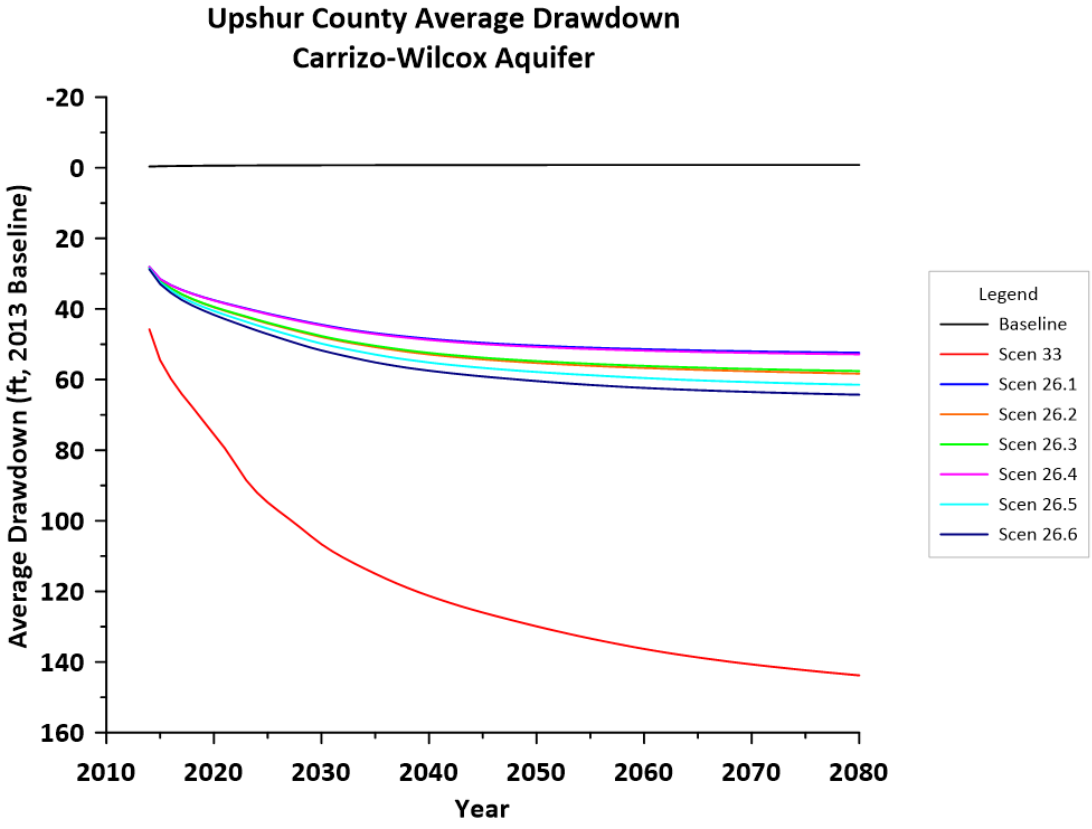

San Augustine County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-4
0
4
8
12
16
20
24
28
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

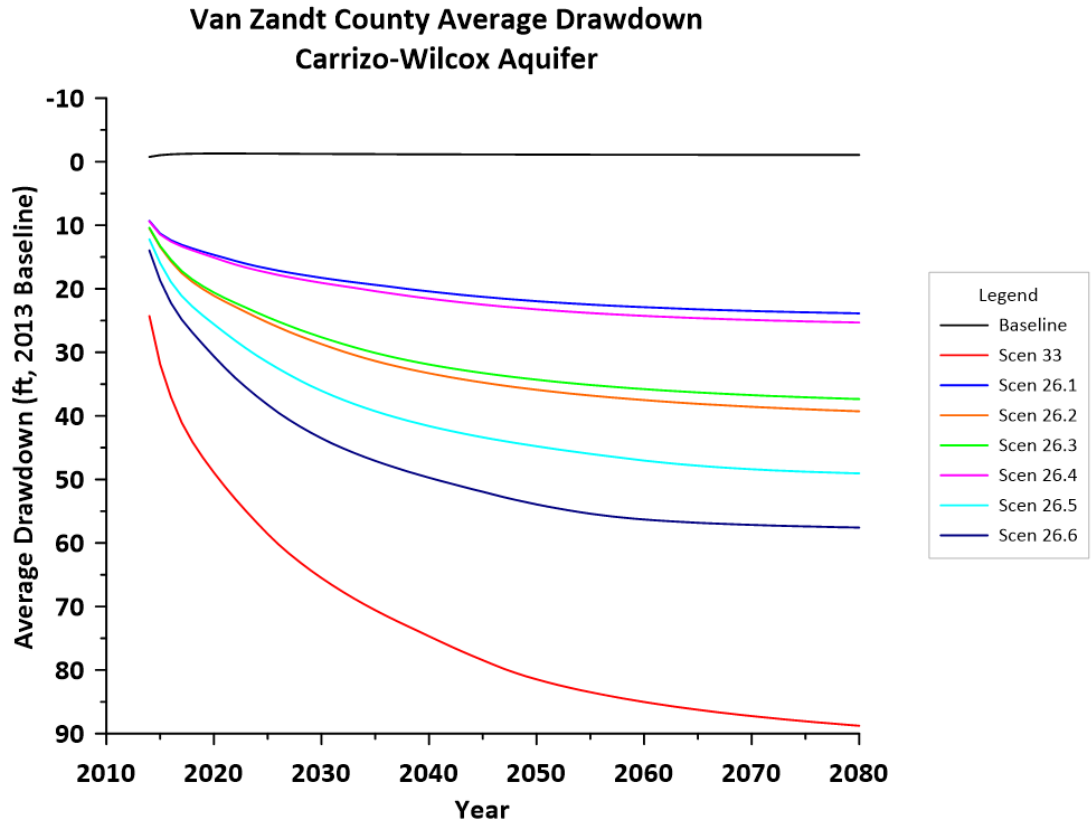

Shelby County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-4
0
4
8
12
16
20
24
28
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

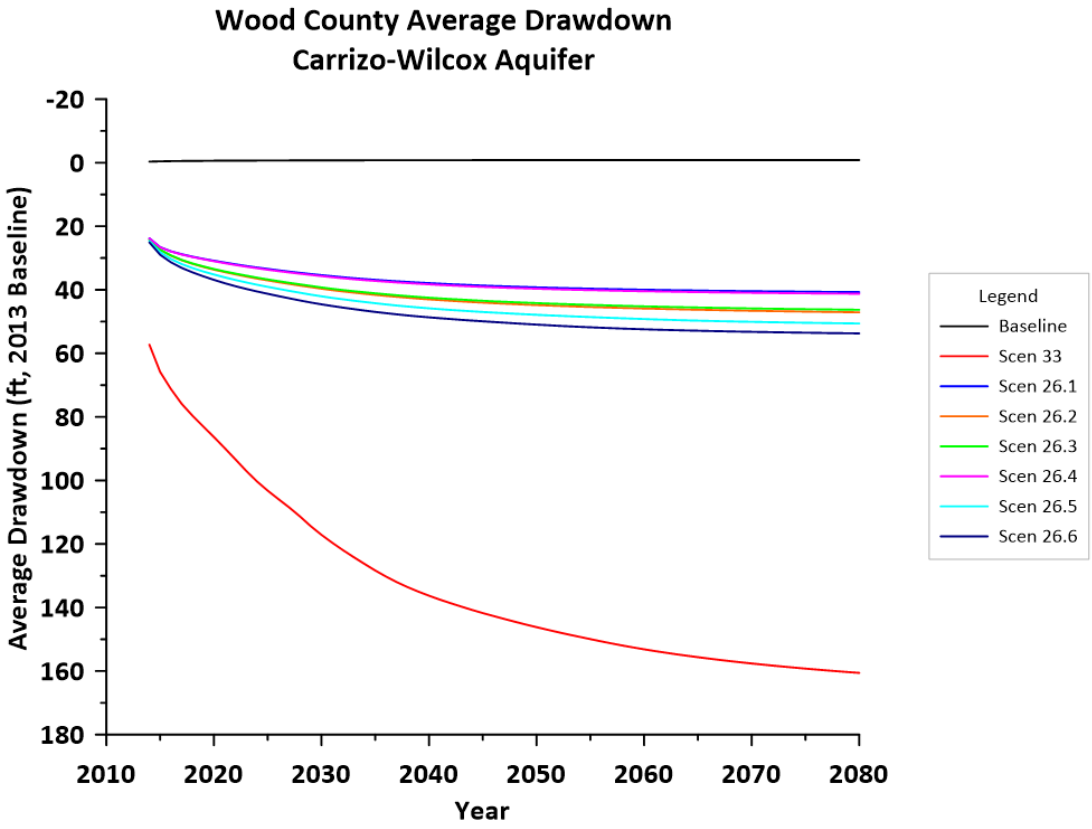

Smith County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-40
0
40
80
120
160
200
240
280
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6


Titus County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-10
0
10
20
30
40
50
60
70
80
90
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6


Trinity County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-10
0
10
20
30
40
50
60
70
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6


Upshur County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-20
0
20
40
60
80
100
120
140
160
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6


Van Zandt County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-10
0
10
20
30
40
50
60
70
80
90
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6


Wood County Average Drawdown
Carrizo-Wilcox Aquifer
Average Drawdown (ft, 2013 Baseline)
-20
0
20
40
60
80
100
120
140
160
180
2010
2020
2030
2040
2050
2060
2070
2080
Year
Legend
Baseline
Scen 33
Scen 26.1
Scen 26.2
Scen 26.3
Scen 26.4
Scen 26.5
Scen 26.6

Appendix B

Average Drawdown by County in GMA 11
All Scenarios

Table B-1
Average Drawdown (ft, 2013 to 2080) by County in GMA 11
Baseline Scenario

County	Sparta	Queen City	Carrizo-Wilcox
Anderson	3	1	1
Angelina	0	0	-3
Bowie	NP	NP	0
Camp	NP	0	-1
Cass	4	1	0
Cherokee	2	0	-1
Franklin	NP	NP	-1
Gregg	NP	1	-1
Harrison	NP	1	0
Henderson	NP	1	0
Hopkins	NP	NP	-1
Houston	0	0	-2
Marion	3	1	0
Morris	NP	1	-1
Nacogdoches	2	2	-3
Panola	NP	NP	-1
Rains	NP	NP	0
Rusk	0	0	-2
Sabine	0	0	-1
SanAugustine	0	0	-2
Shelby	0	0	-1
Smith	2	0	-2
Titus	NP	0	-1
Trinity	0	0	-2
Upshur	2	0	-1
VanZandt	NP	1	-1
Wood	2	1	-1

NP = Not Present

Table B-2
Average Drawdown (ft, 2013 to 2080) by County in GMA 11
Scenario 33

County	Sparta	Queen City	Carrizo-Wilcox
Anderson	28	60	180
Angelina	6	27	65
Bowie	NP	NP	18
Camp	NP	16	100
Cass	121	67	92
Cherokee	9	42	177
Franklin	NP	NP	120
Gregg	NP	61	116
Harrison	NP	50	36
Henderson	NP	40	155
Hopkins	NP	NP	80
Houston	3	14	83
Marion	123	69	53
Morris	NP	77	95
Nacogdoches	7	27	80
Panola	NP	NP	26
Rains	NP	NP	25
Rusk	37	18	96
Sabine	1	3	10
SanAugustine	2	7	24
Shelby	15	10	25
Smith	94	141	263
Titus	NP	7	87
Trinity	6	18	54
Upshur	12	53	144
VanZandt	NP	55	89
Wood	12	24	161

NP = Not Present

Table B-3
Average Drawdown (ft, 2013 to 2080) by County in GMA 11
Scenario 26.1

County	Sparta	Queen City	Carrizo-Wilcox
Anderson	6	4	38
Angelina	3	11	43
Bowie	NP	NP	13
Camp	NP	2	37
Cass	9	3	42
Cherokee	3	3	50
Franklin	NP	NP	18
Gregg	NP	8	52
Harrison	NP	2	22
Henderson	NP	3	39
Hopkins	NP	NP	15
Houston	2	3	30
Marion	5	4	24
Morris	NP	5	26
Nacogdoches	5	8	50
Panola	NP	NP	21
Rains	NP	NP	3
Rusk	23	10	54
Sabine	1	3	8
SanAugustine	2	5	17
Shelby	10	7	18
Smith	3	5	77
Titus	NP	1	10
Trinity	3	7	27
Upshur	2	5	52
VanZandt	NP	2	24
Wood	2	2	41

NP = Not Present

Table B-4
Average Drawdown (ft, 2013 to 2080) by County in GMA 11
Scenario 26.2

County	Sparta	Queen City	Carrizo-Wilcox
Anderson	26	56	154
Angelina	4	17	59
Bowie	NP	NP	13
Camp	NP	2	38
Cass	9	3	42
Cherokee	7	30	136
Franklin	NP	NP	19
Gregg	NP	9	60
Harrison	NP	2	23
Henderson	NP	29	98
Hopkins	NP	NP	16
Houston	2	9	75
Marion	5	4	24
Morris	NP	5	27
Nacogdoches	5	10	70
Panola	NP	NP	23
Rains	NP	NP	3
Rusk	31	14	71
Sabine	1	3	10
SanAugustine	2	6	22
Shelby	12	8	20
Smith	3	7	120
Titus	NP	1	10
Trinity	4	13	49
Upshur	3	6	58
VanZandt	NP	5	39
Wood	2	2	47

NP = Not Present

Table B-5
Average Drawdown (ft, 2013 to 2080) by County in GMA 11
Scenario 26.3

County	Sparta	Queen City	Carrizo-Wilcox
Anderson	7	7	146
Angelina	4	14	58
Bowie	NP	NP	13
Camp	NP	2	38
Cass	9	3	42
Cherokee	4	6	126
Franklin	NP	NP	19
Gregg	NP	9	59
Harrison	NP	2	23
Henderson	NP	5	91
Hopkins	NP	NP	16
Houston	2	6	71
Marion	5	4	24
Morris	NP	5	27
Nacogdoches	5	10	68
Panola	NP	NP	23
Rains	NP	NP	3
Rusk	30	13	69
Sabine	1	3	9
SanAugustine	2	6	21
Shelby	11	8	20
Smith	3	6	115
Titus	NP	1	10
Trinity	4	12	47
Upshur	3	6	58
VanZandt	NP	3	37
Wood	2	2	46

NP = Not Present

Table B-6
Average Drawdown (ft, 2013 to 2080) by County in GMA 11
Scenario 26.4

County	Sparta	Queen City	Carrizo-Wilcox
Anderson	21	44	43
Angelina	3	13	44
Bowie	NP	NP	13
Camp	NP	2	37
Cass	9	3	42
Cherokee	6	25	55
Franklin	NP	NP	18
Gregg	NP	8	53
Harrison	NP	2	22
Henderson	NP	25	43
Hopkins	NP	NP	15
Houston	2	6	32
Marion	5	4	24
Morris	NP	5	26
Nacogdoches	5	9	52
Panola	NP	NP	22
Rains	NP	NP	3
Rusk	24	10	55
Sabine	1	3	8
SanAugustine	2	5	18
Shelby	10	7	18
Smith	3	5	81
Titus	NP	1	10
Trinity	3	9	29
Upshur	2	5	53
VanZandt	NP	4	25
Wood	2	2	41

NP = Not Present

Table B-7
Average Drawdown (ft, 2013 to 2080) by County in GMA 11
Scenario 26.5

County	Sparta	Queen City	Carrizo-Wilcox
Anderson	8	9	197
Angelina	4	16	66
Bowie	NP	NP	13
Camp	NP	2	39
Cass	9	3	42
Cherokee	4	8	174
Franklin	NP	NP	19
Gregg	NP	10	64
Harrison	NP	2	23
Henderson	NP	6	132
Hopkins	NP	NP	16
Houston	2	7	91
Marion	5	4	25
Morris	NP	5	27
Nacogdoches	5	10	80
Panola	NP	NP	24
Rains	NP	NP	4
Rusk	36	17	81
Sabine	1	3	10
SanAugustine	2	7	24
Shelby	13	9	21
Smith	3	7	142
Titus	NP	1	10
Trinity	5	14	57
Upshur	3	6	61
VanZandt	NP	4	49
Wood	2	2	51

NP = Not Present

Table B-8
Average Drawdown (ft, 2013 to 2080) by County in GMA 11
Scenario 26.6

County	Sparta	Queen City	Carrizo-Wilcox
Anderson	9	9	225
Angelina	4	17	71
Bowie	NP	NP	13
Camp	NP	2	40
Cass	9	3	42
Cherokee	4	9	203
Franklin	NP	NP	20
Gregg	NP	10	68
Harrison	NP	2	24
Henderson	NP	7	161
Hopkins	NP	NP	17
Houston	2	8	102
Marion	5	4	25
Morris	NP	5	27
Nacogdoches	5	11	88
Panola	NP	NP	25
Rains	NP	NP	4
Rusk	41	20	90
Sabine	1	3	11
SanAugustine	2	7	25
Shelby	14	10	22
Smith	4	7	161
Titus	NP	1	10
Trinity	5	15	63
Upshur	3	6	64
VanZandt	NP	5	58
Wood	2	2	54

NP = Not Present

Appendix C

River Basin Groundwater Budgets
All Scenarios

Cypress Basin Groundwater Budgets
All Values in AF/yr

	Baseline	Scenario 33 (Current DFC)	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Inflow								
Recharge	48,254	48,254	48,254	48,254	48,254	48,254	48,254	48,254
Alluvium (Zone 1)	0	32,812	0	0	0	0	0	0
Arkansas (Zone 198)	0	1,135	197	197	197	197	197	198
Louisiana (Zone 499)	0	240	0	0	0	0	0	0
Sabine (Zone 611)	258	0	0	0	0	0	0	0
Sulphur (Zone 811)	1,518	6,022	3,957	3,962	3,962	3,957	3,965	3,968
Total Inflow	50,030	88,463	52,408	52,414	52,413	52,408	52,417	52,420
Outflow								
Pumping	14,611	81,967	33,612	33,612	33,612	33,612	33,612	33,612
Evapotranspiration	18,343	6,486	15,232	15,200	15,203	15,230	15,183	15,166
Alluvium (Zone 1)	15,897	0	2,582	2,402	2,420	2,569	2,306	2,214
Arkansas (Zone 198)	392	0	0	0	0	0	0	0
Louisiana (Zone 499)	789	0	368	367	367	368	367	367
Sabine (Zone 611)	0	1,373	780	1,008	985	797	1,130	1,247
Total Outflow	50,033	89,826	52,574	52,589	52,587	52,575	52,598	52,606
Storage Change								
Confined	0	-89	-28	-29	-29	-28	-29	-30
Unconfined	-4	-1,274	-138	-147	-145	-139	-151	-156
Total Storage Change	-4	-1,363	-165	-175	-174	-166	-181	-186
Inflow - Outflow	-3	-1,363	-165	-175	-174	-166	-181	-186
Model Error	-1	0	0	0	0	0	0	0

Neches Basin Groundwater Budgets
All Values in AF/yr

		Baseline	Scenario 33 (Current DFC)	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Inflow									
	Overlying Formations (GHB)	1,811	3,732	2,877	3,238	3,062	3,047	3,156	3,222
	Recharge	89,945	89,945	89,945	89,945	89,945	89,945	89,945	89,945
	Alluvium (Zone 1)	0	58,852	6,933	37,397	14,310	30,160	17,430	19,239
	GMA 14 - Neches (Zone 514)	4,554	9,266	8,061	8,999	8,915	8,123	9,359	9,671
	Sabine (Zone 611)	4,156	8,435	5,638	7,780	7,558	5,798	8,900	9,975
	GMA 14 - Sabine (Zone 614)	2	2	2	2	2	2	2	2
	Trinity (Zone 911)	4,731	23,671	11,765	21,753	20,973	12,537	24,507	26,230
Total Inflow		105,199	193,903	125,221	169,115	144,765	149,613	153,300	158,283
Outflow									
	Pumping	69,405	183,651	102,959	151,665	124,538	130,085	134,597	140,681
	Evapotranspiration	25,191	14,209	22,950	19,554	21,801	20,562	21,153	20,675
	Alluvium (Zone 1)	10,590	0	0	0	0	0	0	0
Total Outflow		105,186	197,859	125,908	171,220	146,339	150,647	155,750	161,356
Storage Change									
	Confined	11	-638	-246	-490	-456	-270	-577	-651
	Unconfined	1	-3,318	-441	-1,615	-1,119	-764	-1,874	-2,422
Total Storage Change		12	-3,957	-687	-2,105	-1,574	-1,034	-2,451	-3,073
Inflow - Outflow		13	-3,957	-687	-2,105	-1,574	-1,034	-2,450	-3,073
Model Error		0	0	0	0	0	0	0	0

Sabine Basin Groundwater Budgets
All Values in AF/yr

		Baseline	Scenario 33 (Current DFC)	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Inflow									
	Overlying Formations (GHB)	117	146	141	145	144	141	146	147
	Recharge	67,100	67,100	67,100	67,100	67,100	67,100	67,100	67,100
	Alluvium (Zone 1)	0	34,464	1,759	3,257	3,101	1,873	4,055	4,820
	Cypress (Zone 311)	0	1,373	780	1,008	985	797	1,130	1,247
	Louisiana (Zone 499)	588	1,159	1,057	1,114	1,109	1,060	1,137	1,157
	GMA 8 Sabine (Zone 608)	0	1	0	0	0	0	0	0
	Sabine (Zone 614)	216	292	290	290	290	290	291	291
	Trinity (Zone 911)	147	264	256	264	263	257	269	274
Total Inflow		68,168	104,799	71,382	73,179	72,993	71,518	74,127	75,037
Outflow									
	Pumping	28,411	87,048	51,554	51,554	51,554	51,554	51,554	51,554
	Evapotranspiration	18,873	10,814	14,543	14,285	14,309	14,525	14,162	14,043
	Alluvium (Zone 1)	16,327	0	0	0	0	0	0	0
	Cypress (Zone 311)	258	0	0	0	0	0	0	0
	Neches (Zone 511)	4,156	8,435	5,638	7,780	7,558	5,798	8,900	9,975
	GMA 14 Neches (Zone 511)	26	46	41	45	44	41	46	47
	Sulphur (Zone 811)	109	227	11	9	9	11	7	6
Total Outflow		68,160	106,570	71,787	73,672	73,474	71,929	74,670	75,626
Storage Change									
	Confined	2	-152	-56	-68	-66	-57	-74	-79
	Unconfined	6	-1,618	-348	-425	-415	-354	-469	-510
Total Storage Change		8	-1,771	-405	-493	-482	-411	-543	-589
Inflow - Outflow		8	-1,771	-405	-493	-482	-411	-543	-589
Model Error		0	0	0	0	0	0	0	0

Sulphur Basin Groundwater Budgets
All Values in AF/yr

		Baseline	Scenario 33 (Current DFC)	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Inflow									
	Recharge	10,660	10,660	10,660	10,660	10,660	10,660	10,660	10,660
	Alluvium (Zone 1)	513	11,293	7,962	7,968	7,967	7,963	7,970	7,973
	Arkansas (Zone 198)	0	548	239	239	239	239	239	239
	Sabine (Zone 611)	109	227	11	9	9	11	7	6
	GMA 8 Sulphur (Zone 808)	7	6	7	7	7	7	7	7
Total Inflow		11,289	22,735	18,879	18,882	18,882	18,879	18,884	18,886
Outflow									
	Pumping	5,478	15,806	12,598	12,598	12,598	12,598	12,598	12,598
	Evapotranspiration	3,821	1,111	2,359	2,357	2,358	2,359	2,356	2,355
	Arkansas (Zone 198)	471	0	0	0	0	0	0	0
	Cypress (Zone 311)	1,518	6,022	3,957	3,962	3,962	3,957	3,965	3,968
Total Outflow		11,288	22,939	18,914	18,918	18,917	18,914	18,920	18,922
Storage Change									
	Confined	0	-8	-2	-2	-2	-2	-2	-2
	Unconfined	1	-197	-33	-33	-33	-33	-33	-34
Total Storage Change		1	-205	-35	-36	-36	-35	-36	-36
Inflow - Outflow		1	-205	-35	-36	-36	-35	-36	-36
Model Error		0	0	0	0	0	0	0	0

Trinity Basin Groundwater Budgets
All Values in AF/yr

		Baseline	Scenario 33 (Current DFC)	Scenario 26.1	Scenario 26.2	Scenario 26.3	Scenario 26.4	Scenario 26.5	Scenario 26.6
Inflow									
	Overlying Formations (GHB)	1,419	2,279	1,976	2,159	2,123	2,007	2,192	2,236
	Recharge	19,373	19,373	19,373	19,373	19,373	19,373	19,373	19,373
	Alluvium (Zone 1)	0	5,386	0	4,357	1,503	0	4,067	5,814
	GMA 12 Trinity (Zone 912)	5,480	12,935	7,330	12,398	12,092	7,575	14,016	15,240
	GMA 14 Trinity (Zone 914)	638	3,557	2,050	3,331	3,234	2,120	3,792	4,153
Total Inflow		26,910	43,531	30,729	41,619	38,326	31,075	43,441	46,816
Outflow									
	Pumping	8,888	16,593	8,016	16,223	11,672	12,566	13,733	15,673
	Evapotranspiration	7,373	3,618	6,577	3,878	5,776	4,416	5,460	5,275
	Alluvium (Zone 1)	5,770	0	4,212	0	0	1,499	0	0
	Neches (Zone 511)	4,731	23,671	11,765	21,753	20,973	12,537	24,507	26,230
	Sabine (Zone 611)	147	264	256	264	263	257	269	274
Total Outflow		26,908	44,146	30,827	42,118	38,684	31,276	43,969	47,452
Storage Change									
	Confined	2	-156	-48	-138	-128	-55	-167	-190
	Unconfined	-1	-459	-50	-361	-231	-146	-362	-446
Total Storage Change		1	-615	-98	-499	-359	-201	-529	-636
Inflow - Outflow		2	-615	-98	-499	-359	-201	-529	-636
Model Error		0	0	0	0	0	0	0	0