

Final Report: Groundwater Availability Model for the Central Portion
of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

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12 Appendix A: Locations and Specifications for Wells Used for 113 Aquifer Pumping Test Interpretations

Two tables are included in this appendix to provide well locations (Table A.1) and well specifications (Table A.2) for the pumping wells associated with the 113 aquifer pumping tests interpreted as part of this study.

Table A.1. Test and well identification, well location, and source of well information and aquifer pumping test data for the 113 wells for which analysis of transmissivity values are presented in Section 13 (Appendix B).

Test ID	Well ID	Decimal Latitude	Decimal Longitude	County	Well and Test Data Source
AT-01P	G0110001K	30.10938	-97.296099	Bastrop	TCEQ Well Records
AT-02P	G0110001L	30.11325	-97.325608	Bastrop	TCEQ Well Records
AT-03P	G0110002E	30.32533	-97.312691	Bastrop	TCEQ Well Records
AT-04P	G0110002F	30.3036	-97.263443	Bastrop	TCEQ Well Records
AT-05P	G0110002H	30.29941	-97.267693	Bastrop	TCEQ Well Records
AT-06P	G0110013AA	30.06691	-97.359189	Bastrop	TCEQ Well Records
AT-09P	G0110013AD	30.32167	-97.3137	Bastrop	TCEQ Well Records
AT-10P	G0110013E	30.07962	-97.353586	Bastrop	TCEQ Well Records
AT-11P	G0110013H	30.2868	-97.339706	Bastrop	TCEQ Well Records
AT-12P	G0110013M	30.09319	-97.260639	Bastrop	TCEQ Well Records
AT-14P	G0110013S	30.19687	-97.306008	Bastrop	TCEQ Well Records
AT-15P	G0110013W	30.09307	-97.260658	Bastrop	TCEQ Well Records
AT-16P	G0110014A	30.2866	-97.238319	Bastrop	TCEQ Well Records
AT-17P	G0110020C	30.08884	-97.264158	Bastrop	TCEQ Well Records
AT-18P	G0110020E	30.08226	-97.318531	Bastrop	TCEQ Well Records
AT-20C	Shell Mining Co. Well 1	30.30362	-97.26346	Bastrop	RW Harden & Associates (1984)
AT-21C	LCRA Lake Bastrop Well SB-1	30.14583	-97.2725	Bastrop	Thornhill Group (2014a)
AT-22C	LCRA Lake Bastrop Well SB-3	30.15111	-97.271944	Bastrop	Thornhill Group (2014a)
AT-70P	G1440005N	30.21589	-97.14151	Bastrop	TCEQ Well Records
AT-23P	G0210001L	30.73011	-96.451287	Brazos	TCEQ Well Records
AT-24P	G0210001N	30.72679	-96.477639	Brazos	TCEQ Well Records
AT-25P	G0210002E	30.69863	-96.48863	Brazos	TCEQ Well Records
AT-26P	G0210002G	30.69849	-96.488646	Brazos	TCEQ Well Records
AT-27P	G0210002H	30.6988	-96.451515	Brazos	TCEQ Well Records
AT-28P	G0210005B	30.78203	-96.343492	Brazos	TCEQ Well Records
AT-29P	G0210005C	30.69936	-96.286906	Brazos	TCEQ Well Records
AT-30P	G0210005D	30.78926	-96.336036	Brazos	TCEQ Well Records
AT-31P	G0210005E	30.80634	-96.317621	Brazos	TCEQ Well Records
AT-32P	G0210005F	30.80017	-96.322433	Brazos	TCEQ Well Records
AT-33P	G0210017I	30.64714	-96.485519	Brazos	TCEQ Well Records
AT-34P	G0210065B	30.64962	-96.416858	Brazos	TCEQ Well Records
AT-35C	Texas A&M Well 7	30.66639	-96.490031	Brazos	RW Harden & Associates (1979a)
AT-36C	City of College Station Well 1	30.70047	-96.460799	Brazos	RW Harden & Associates (1979b)
AT-37C	City of College Station Well 2	30.70186	-96.470243	Brazos	RW Harden & Associates (1979c)

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Test ID	Well ID	Decimal Latitude	Decimal Longitude	County	Well and Test Data Source
AT-38C	Texas A&M Riverside Campus Well A-7	30.64326	-96.471631	Brazos	RW Harden & Associates (1976)
AT-19C	Blue Water Well PW-2	30.5032	-96.8128	Burleson	RW Harden & Associates (2016b)
AT-39P	G0260014E	30.45641	-96.783528	Burleson	TCEQ Well Records
AT-40P	G0260015C	30.38686	-96.564394	Burleson	TCEQ Well Records
AT-41P	G0260050A	30.50679	-96.820706	Burleson	TCEQ Well Records
AT-42C	Blue Water Well PW-13	30.42394	-96.82004	Burleson	RW Harden & Associates (2016c)
AT-43C	Western Burleson County Well PW-1	30.5069	-96.820591	Burleson	RW Harden & Associates (2007)
AT-94P	G1660009C	30.63225	-96.787734	Burleson	TCEQ Well Records
AT-07P	G0110013AB	29.79633	-97.344722	Caldwell	TCEQ Well Records
AT-08P	G0110013AC	29.83499	-97.472744	Caldwell	TCEQ Well Records
AT-44P	G0280001D	29.86217	-97.615274	Caldwell	TCEQ Well Records
AT-45P	G0280001K	29.81273	-97.562775	Caldwell	TCEQ Well Records
AT-46P	G0280002C	29.69023	-97.651384	Caldwell	TCEQ Well Records
AT-47P	G0810001A	31.72199	-96.160092	Freestone	TCEQ Well Records
AT-48P	G0810001B	31.72822	-96.151913	Freestone	TCEQ Well Records
AT-49P	G0810002B	31.63268	-96.261856	Freestone	TCEQ Well Records
AT-50P	G0810002C	31.62006	-96.281919	Freestone	TCEQ Well Records
AT-51P	G0810002D	31.62777	-96.250494	Freestone	TCEQ Well Records
AT-52P	G0810005L	31.66208	-96.156806	Freestone	TCEQ Well Records
AT-53P	G0810010C	31.7195	-96.110928	Freestone	TCEQ Well Records
AT-54P	G0810013G	31.66938	-95.941631	Freestone	TCEQ Well Records
AT-55P	G0810016A	31.80071	-96.234939	Freestone	TCEQ Well Records
AT-56P	G0810029B	31.72994	-96.207511	Freestone	TCEQ Well Records
AT-57P	G0810034C	31.94158	-96.146413	Freestone	TCEQ Well Records
AT-58P	G0810037A	31.67537	-96.194486	Freestone	TCEQ Well Records
AT-59P	G0810037B	31.66825	-96.194443	Freestone	TCEQ Well Records
AT-60P	G0810039A	31.8898	-96.109886	Freestone	TCEQ Well Records
AT-61P	G0810041A	31.60079	-95.831333	Freestone	TCEQ Well Records
AT-62P	G0890002D	29.26865	-97.767159	Gonzales	TCEQ Well Records
AT-63P	G0890002E	29.27371	-97.757658	Gonzales	TCEQ Well Records
AT-64P	G0890002F	29.27371	-97.757658	Gonzales	TCEQ Well Records
AT-65P	G0890003E	29.69434	-97.301247	Gonzales	TCEQ Well Records
AT-13P	G0110013P	30.36819	-97.114858	Lee	TCEQ Well Records
AT-66P	G1440001G	30.18918	-96.938842	Lee	TCEQ Well Records
AT-67P	G1440005A	30.13543	-97.004799	Lee	TCEQ Well Records
AT-68P	G1440005B	30.24015	-97.039625	Lee	TCEQ Well Records
AT-69P	G1440005C	30.37324	-96.871094	Lee	TCEQ Well Records
AT-71P	G1440005P	30.15415	-96.920151	Lee	TCEQ Well Records
AT-72C	Sandow Mine Well H (9)-2	30.45417	-97.125875	Lee	RW Harden & Associates (2001)
AT-73C	Forestar Well 5	30.45656	-96.970519	Lee	Thornhill Group (2014b)
AT-74C	End Op Well EO-TW-3	30.35448	-97.117803	Lee	Thornhill Group (2009)
AT-75C	Forestar Well 7	30.46895	-96.987747	Lee	Thornhill Group (2014c)
AT-76C	Forestar Well 8	30.42558	-96.990111	Lee	Thornhill Group (2014d)

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Test ID	Well ID	Decimal Latitude	Decimal Longitude	County	Well and Test Data Source
AT-77C	Sustainable Water Resources Well 1	30.45613	-96.970431	Lee	Thornhill Group (2014e)
AT-78P	G1450001D	31.46827	-96.07061	Leon	TCEQ Well Records
AT-79P	G1450002D	31.25347	-95.979423	Leon	TCEQ Well Records
AT-80P	G1450002E	31.26109	-95.991532	Leon	TCEQ Well Records
AT-81P	G1450003D	31.57973	-95.863592	Leon	TCEQ Well Records
AT-82P	G1450006W	31.06927	-96.204544	Leon	TCEQ Well Records
AT-83P	G1450007B	31.36145	-96.146181	Leon	TCEQ Well Records
AT-84P	G1450007D	31.36321	-96.145237	Leon	TCEQ Well Records
AT-85P	G1450010B	31.53806	-95.796389	Leon	TCEQ Well Records
AT-86P	G1450015D	31.44545	-96.043294	Leon	TCEQ Well Records
AT-87P	G1450024B	31.40988	-96.237498	Leon	TCEQ Well Records
AT-88P	G1570001C	30.95988	-95.917947	Madison	TCEQ Well Records
AT-89P	G1570003B	31.02652	-95.748547	Madison	TCEQ Well Records
AT-90P	G1570004C	30.92056	-96.108833	Madison	TCEQ Well Records
AT-100C	Shell Milam Mine Well CF-83	30.75629	-96.876059	Milam	RW Harden & Associates (1980)
AT-101C	Shell Milam Mine Well B-35	30.64328	-96.942688	Milam	RW Harden & Associates (1982)
AT-91P	G1660002G	30.63481	-96.991083	Milam	TCEQ Well Records
AT-92P	G1660002I	30.66643	-96.995957	Milam	TCEQ Well Records
AT-93P	G1660002J	30.66636	-96.995856	Milam	TCEQ Well Records
AT-95P	G1660009E	30.64825	-96.854706	Milam	TCEQ Well Records
AT-96P	G1660012E	30.55944	-97.071114	Milam	TCEQ Well Records
AT-97P	G1660014A	30.82729	-96.912202	Milam	TCEQ Well Records
AT-98P	G1660015A	30.69131	-96.899704	Milam	TCEQ Well Records
AT-99P	G1660015H	30.67154	-97.003972	Milam	TCEQ Well Records
AT-102P	G1980001C	31.16324	-96.665914	Robertson	TCEQ Well Records
AT-103P	G1980001D	31.15884	-96.652911	Robertson	TCEQ Well Records
AT-104P	G1980001E	31.16547	-96.655222	Robertson	TCEQ Well Records
AT-105P	G1980002C	30.975	-96.673439	Robertson	TCEQ Well Records
AT-106P	G1980003A	31.02818	-96.487642	Robertson	TCEQ Well Records
AT-107P	G1980003C	31.02993	-96.491278	Robertson	TCEQ Well Records
AT-108P	G1980003D	31.02879	-96.474809	Robertson	TCEQ Well Records
AT-109P	G1980022B	31.08776	-96.697267	Robertson	TCEQ Well Records
AT-110C	Calvert Mine Well	31.0899	-96.665016	Robertson	RW Harden & Associates (1987)
AT-111C	Texas New Mexico Power Co Production Well 1	31.04071	-96.685185	Robertson	RW Harden & Associates (1991)
AT-112C	Texas New Mexico Power Co Production Well 2	31.0479	-96.675284	Robertson	RW Harden & Associates (1991)
AT-113C	Texas New Mexico Power Co Production Well 3	31.05137	-96.666594	Robertson	RW Harden & Associates (1991)

ID = identification

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Table A.2. Specifications for aquifer pumping test wells.

Test ID	Well Total Depth (feet)	Depth to Top of Uppermost Screen (feet)	Depth to Bottom of Lowermost Screen (feet)	Length from Top of Uppermost Screen to Bottom of Lowermost Screen (feet)	Length of Screen Open to the Aquifer (feet)	Primary Model Layer
AT-01P	650	288	630	342	240	6
AT-02P	55	39	45	6	6	6
AT-03P	598	102	578	476	220	8
AT-04P	461	315	450	135	135	7
AT-05P	782	400	760	360	242	8
AT-06P	602	435	592	157	96	7
AT-09P	670	420	650	230	150	8
AT-10P	615	441	600	159	118	7
AT-11P	725	627	700	73	73	8
AT-12P	716	626	711	85	85	6
AT-14P	660	490	650	160	160	8
AT-15P	718	611	708	97	97	6
AT-16P	610	500	600	100	100	6
AT-17P	1020	940	1004	64	64	6
AT-18P	524	455	510	55	55	6
AT-20C	461	315	450	135	131	7
AT-21C	1393	810	1266	456	334	7
AT-22C	1346	754	1270	516	394	7
AT-70P	1190	836	1168	332	298	6
AT-23P	2867	2402	2852	450	375	7
AT-24P	2770	2328	2750	422	375	7
AT-25P	2884	2364	2864	500	466	7
AT-26P	1360	1120	1340	220	168	6
AT-27P	540	446	520	74	74	1
AT-28P	760	510	750	240	130	1
AT-29P	1008	805	1008	203	173	1
AT-30P	780	530	754	224	160	1
AT-31P	780	499	767	268	170	1
AT-32P	800	585	770	185	115	1
AT-33P	505	485	505	20	20	1
AT-34P	3363	2168	2505	337	337	6
AT-35C	3018	2491	3012	521	436	7
AT-36C	2973	2530	2960	430	430	7
AT-37C	2975	2520	2910	390	390	7
AT-38C	3010	2742	2990	248	203	7
AT-19C	2420	2000	2400	400		7
AT-39P	814	740	800	60	60	3
AT-40P	1656	1512	1570	58	58	1
AT-41P	2241	1830	2241	411	411	7
AT-42C	2688	2290	2668	378	378	6
AT-43C	2240	1930	2260	330	278	7
AT-94P	1680	1490	1620	130	100	6

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Test ID	Well Total Depth (feet)	Depth to Top of Uppermost Screen (feet)	Depth to Bottom of Lowermost Screen (feet)	Length from Top of Uppermost Screen to Bottom of Lowermost Screen (feet)	Length of Screen Open to the Aquifer (feet)	Primary Model Layer
AT-07P	1060	710	1050	340	245	5
AT-08P	550	378	538	160	160	6
AT-44P	302	180	290	110	110	8
AT-45P	365	135	357	222	110	6
AT-46P	325	190	430	240	145	6
AT-47P	726	495	716	221	136	8
AT-48P	764	420	740	320	173	8
AT-49P	680	451	670	219	130	8
AT-50P	650	415	625	210	107	8
AT-51P	740	390	720	330	196	8
AT-52P	715	650	710	60	60	8
AT-53P	560	515	555	40	40	7
AT-54P	685	530	684	154	154	6
AT-55P	290	204	285	81	60	8
AT-56P	535	490	530	40	40	8
AT-57P	340	220	340	120	120	8
AT-58P	736	540	726	186	98	8
AT-59P	600	506	572	66	48	8
AT-60P	290	245	285	40	40	8
AT-61P	363	274	354	80	80	5
AT-62P	1580	1368	1560	192	192	5
AT-63P	1850	1380	1840	460	440	5
AT-64P	1830	1340	1760	420	420	5
AT-65P	866	426	856	430	162	1
AT-13P	500	419	484	65	65	6
AT-66P	1996	1745	1996	251	251	5
AT-67P	1442	1060	1190	130	100	3
AT-68P	897	855	897	42	42	5
AT-69P	640	544	640	96	96	3
AT-71P	2226	2061	2205	144	144	5
AT-72C	448	238	438	200	200	7
AT-73C	2125	1515	2105	590	402	7
AT-74C	1620	1060	1590	530	300	7
AT-75C	2236	1676	2216	540	374	7
AT-76C	2304	1660	2284	624	ng	7
AT-77C	2145	1515	2105	590	402	7
AT-78P	970	851	953	102	102	6
AT-79P	1033	932	1022	90	90	6
AT-80P	1274	1121	1253	132	90	6
AT-81P	810	765	807	42	42	6
AT-82P	500	420	500	80	80	3
AT-83P	700	545	660	115	70	6
AT-84P	1273	1110	1265	155	104	6

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Test ID	Well Total Depth (feet)	Depth to Top of Uppermost Screen (feet)	Depth to Bottom of Lowermost Screen (feet)	Length from Top of Uppermost Screen to Bottom of Lowermost Screen (feet)	Length of Screen Open to the Aquifer (feet)	Primary Model Layer
AT-85P	410	345	405	60	60	5
AT-86P	710	650	700	50	50	6
AT-87P	780	620	760	140	140	7
AT-88P	1225	1060	1210	150	140	1
AT-89P	840	750	830	80	80	1
AT-90P	665	612	660	48	39	1
AT-100C	530	322	515	193	193	6
AT-101C	388	280	386	106	106	6
AT-91P	455	241	341	100	100	7
AT-92P	356	226	346	120	120	7
AT-93P	380	238	370	132	132	8
AT-95P	1715	1462	1715	253	253	7
AT-96P	374	258	364	106	106	7
AT-97P	400	385	486	101	101	8
AT-98P	721	540	720	180	120	6
AT-99P	485	190	483	293	173	8
AT-102P	495	399	485	86	71	8
AT-103P	527	345	517	172	112	8
AT-104P	490	424	486	62	62	8
AT-105P	738	633	738	105	105	7
AT-106P	1217	1058	1212	154	136	7
AT-107P	1234	1093	1214	121	107	7
AT-108P	1440	1142	1420	278	278	7
AT-109P	472	436	466	30	30	8
AT-110C	272	120	264	144	130	7
AT-111C	999	614	984	370	260	8
AT-112C	1077	580	1062	482	396	8
AT-113C	1076	582	1061	479	335	8

Note: ID = identification

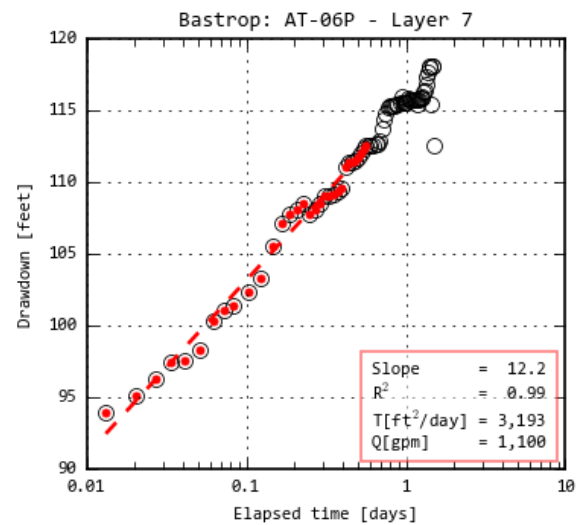
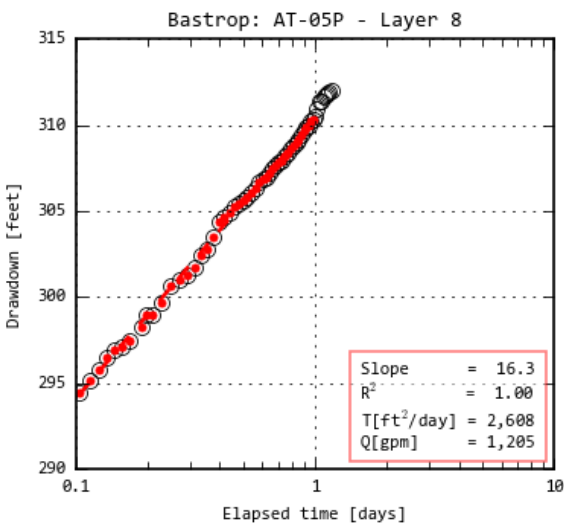
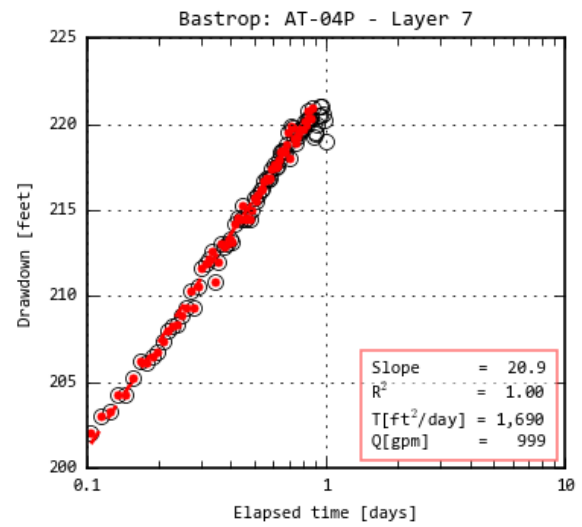
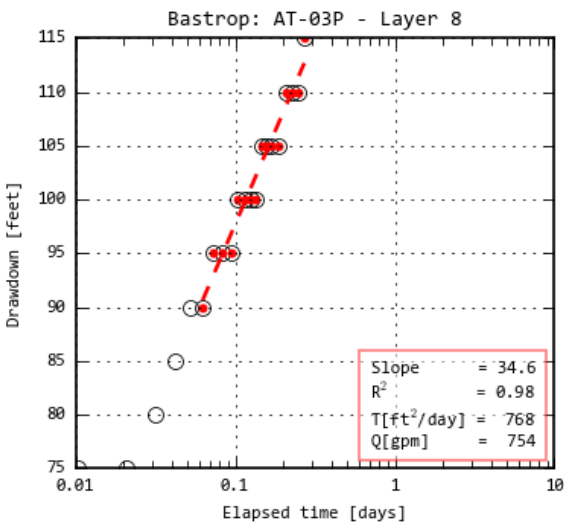
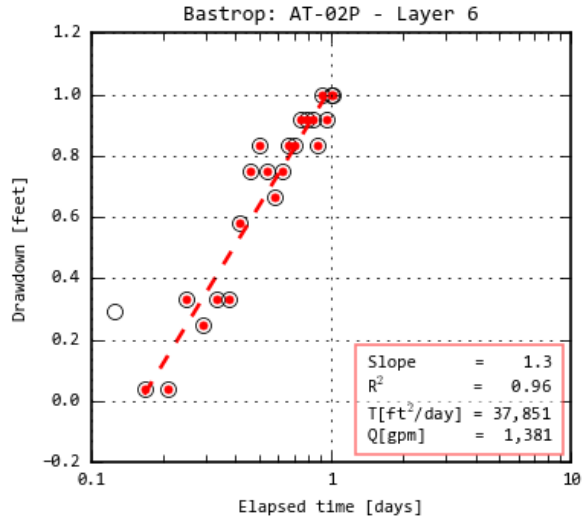
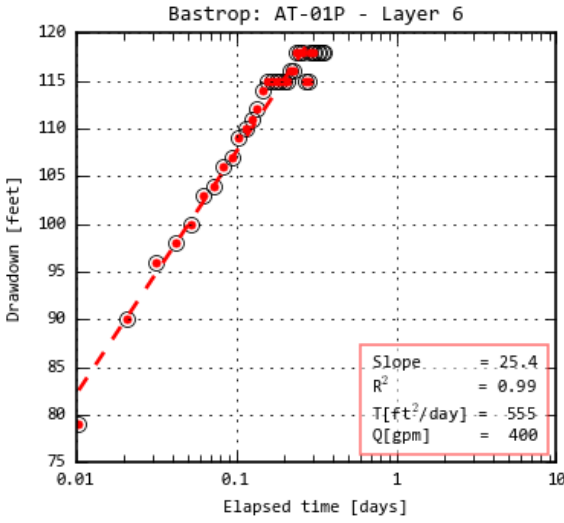
13 Appendix B: Cooper-Jacob Analysis to Calculate Transmissivity Values for 113 Aquifer Pumping Tests

This appendix contains plots of drawdown versus time and the Cooper-Jacob analysis conducted for each of the 113 aquifer pumping tests analyzed for this study. Each plot shows drawdown as a function of time on a semi-log axis. Measured drawdown values are plotted as black open circles. Drawdown data used to calculate either a single transmissivity value or an early-time transmissivity based on early-time data are shown as solid red dots. The red dashed line on the plots shows the straight-line used to calculate this transmissivity value. The blue dots are the data used to calculate a late-time transmissivity. The associated straight-line used to calculate this transmissivity is shown as a dashed blue line. Summary statistics are displayed in the lower right corner of the plot within a red rectangle for the early-time transmissivity data and within a blue rectangle for the late-time transmissivity data. The summary statistics include the slope of the Cooper-Jacob analysis; the coefficient of determination, R^2 , that quantifies the quality of the slope estimated from the drawdown data; the estimated transmissivity, T, in square feet per day; and the flow rate at the well during the aquifer pumping test, Q, in gallons per minute. The plots are organized alphabetically by county and then test identification number.

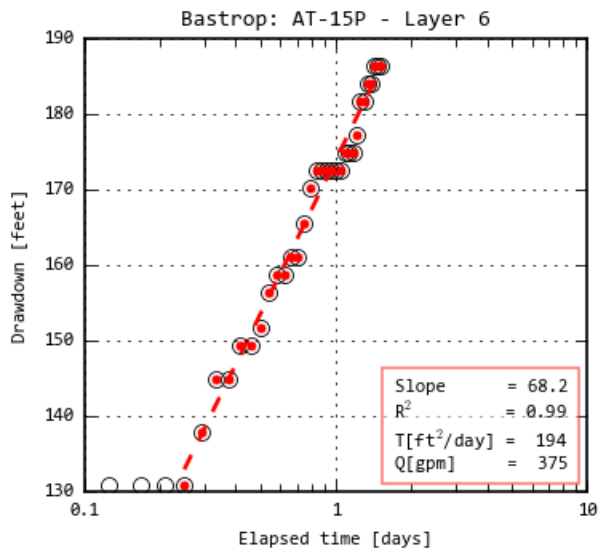
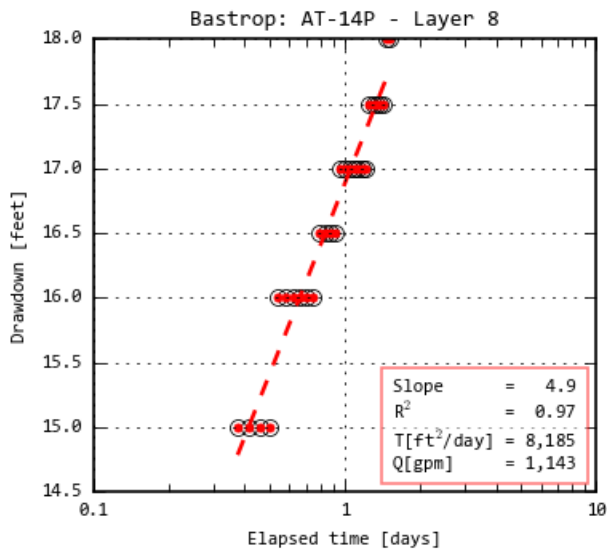
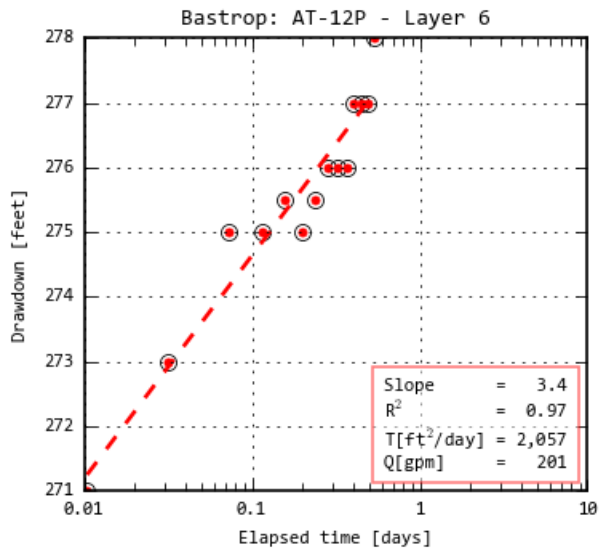
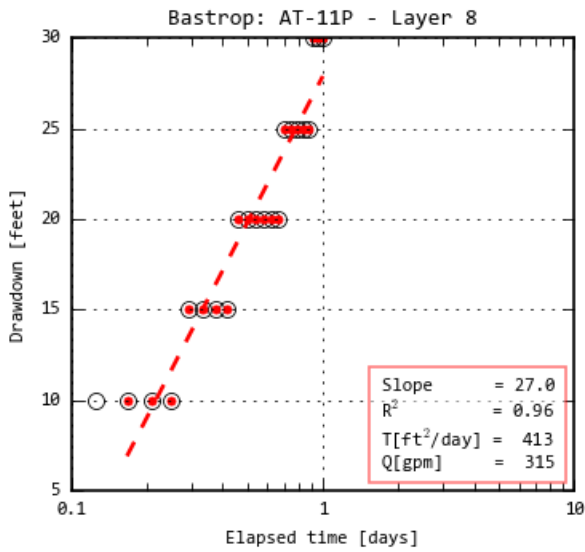
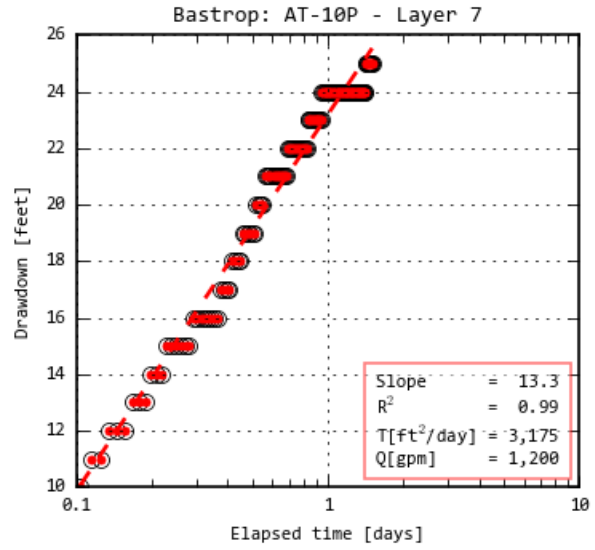
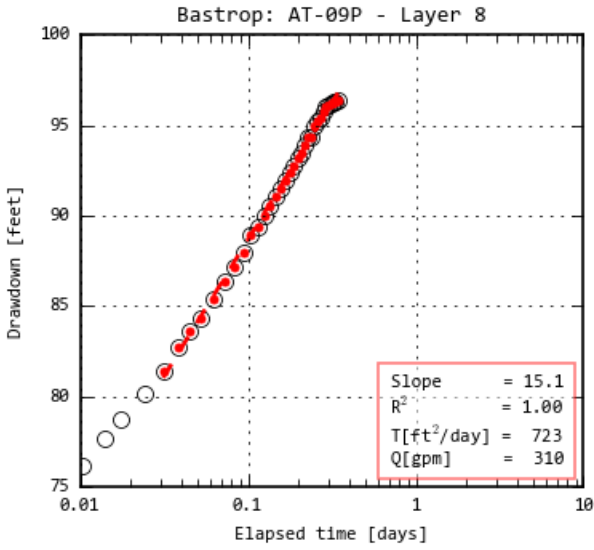
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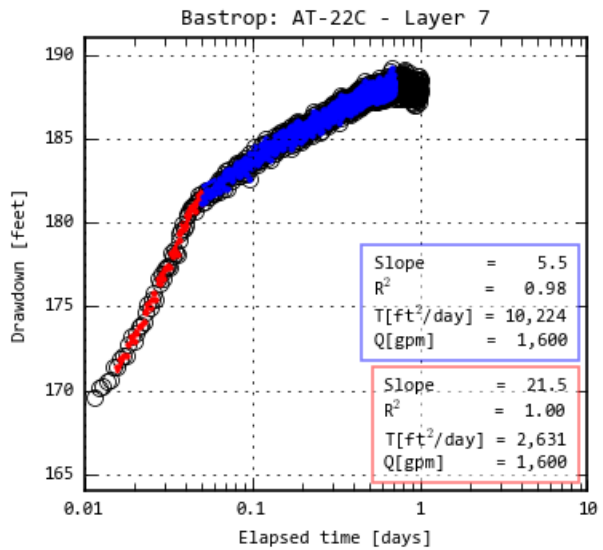
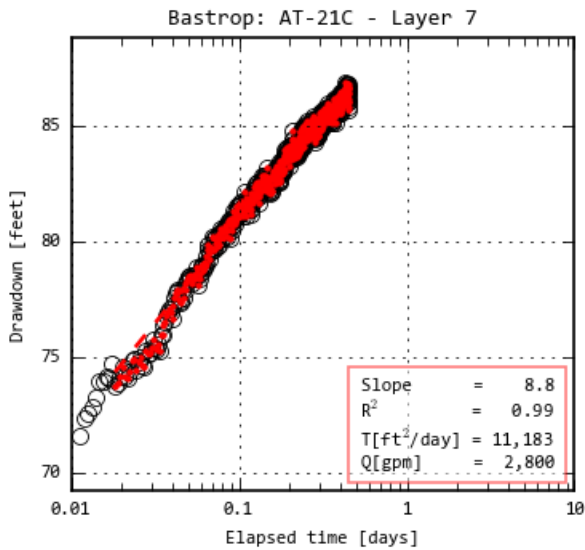
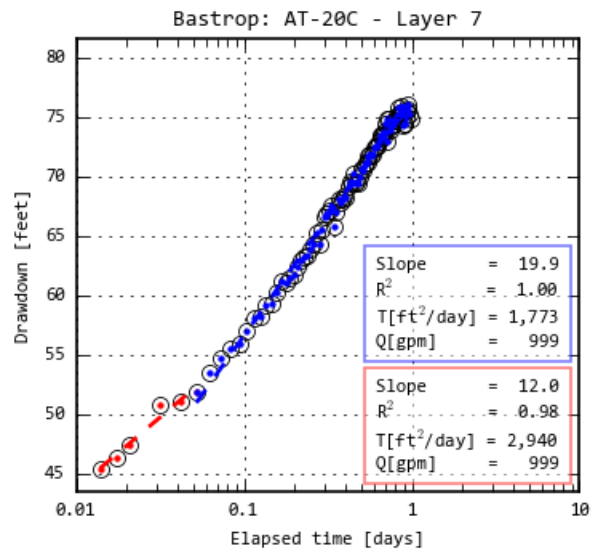
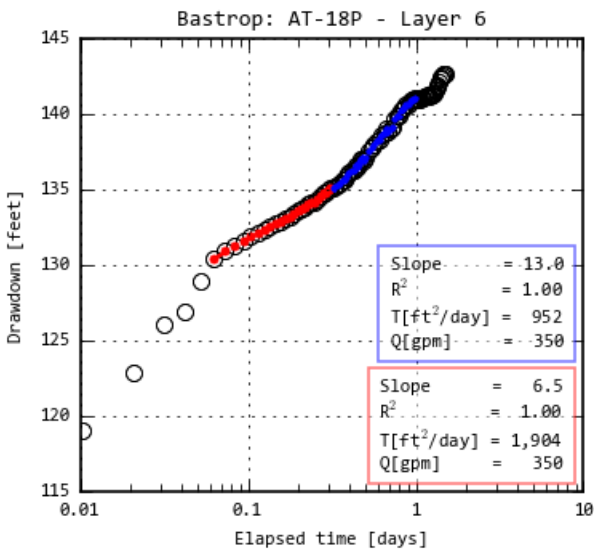
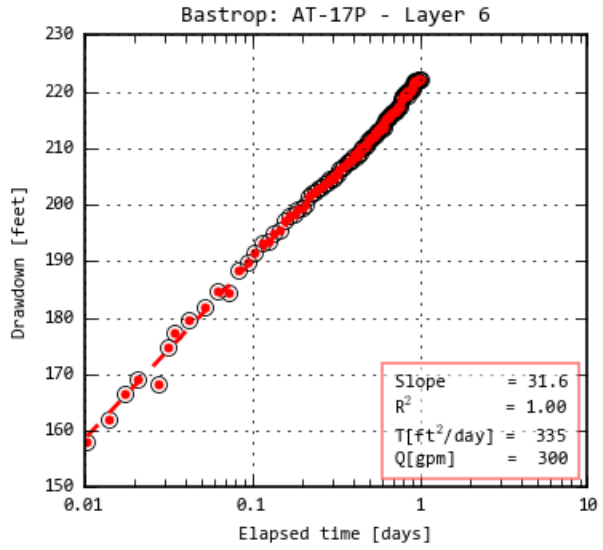
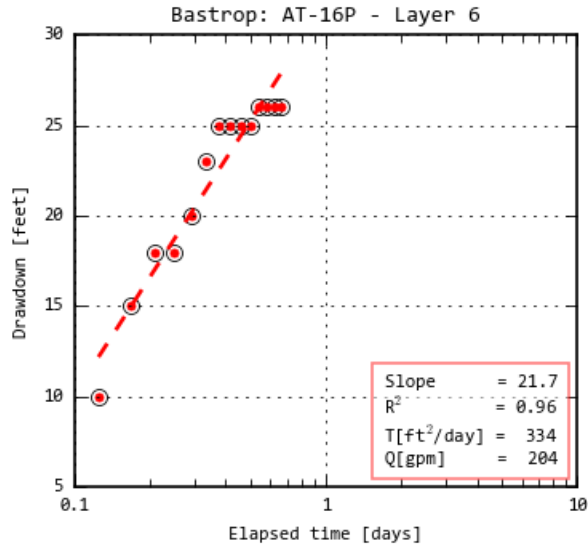
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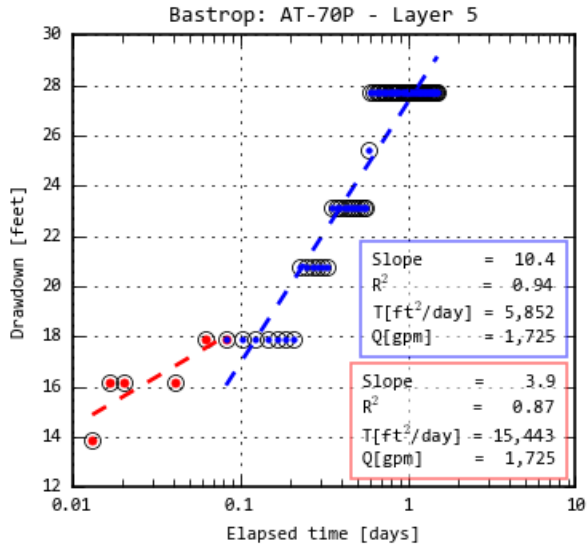
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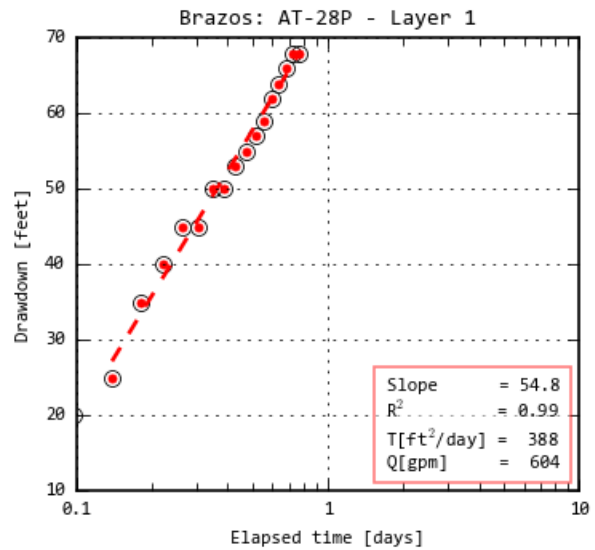
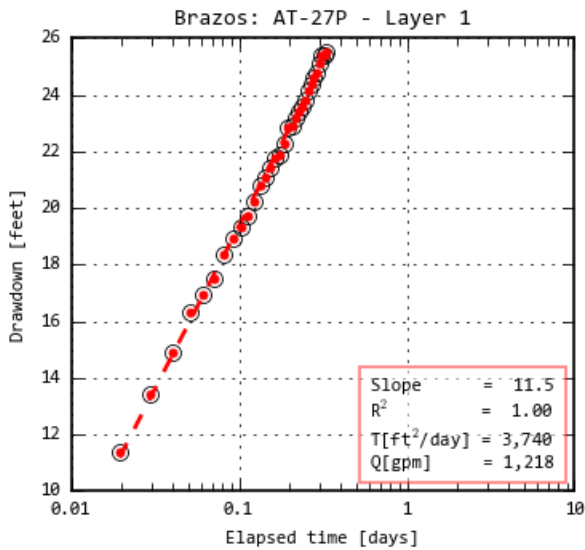
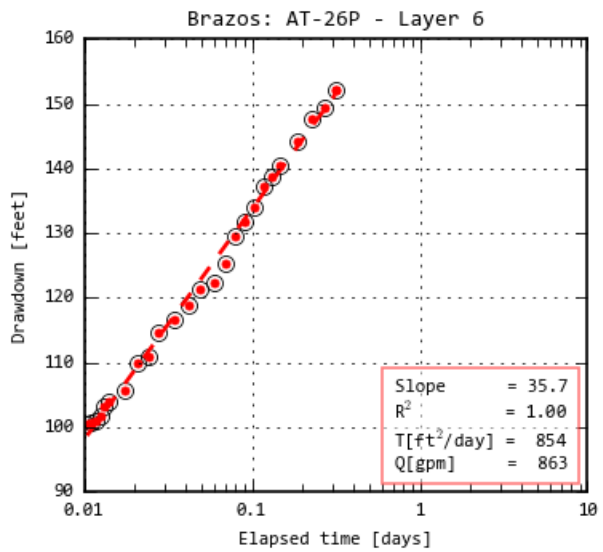
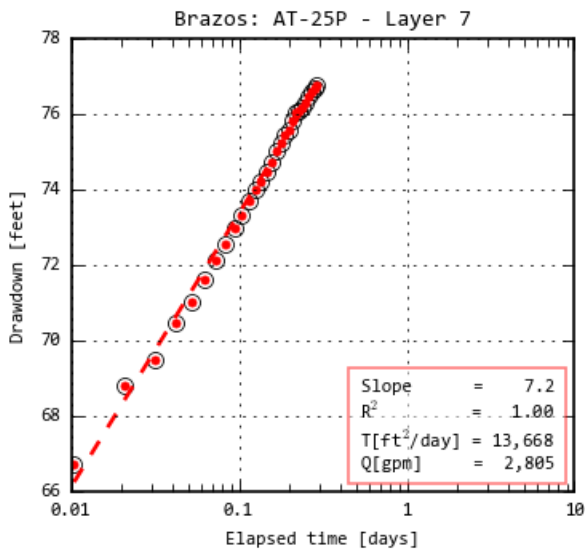
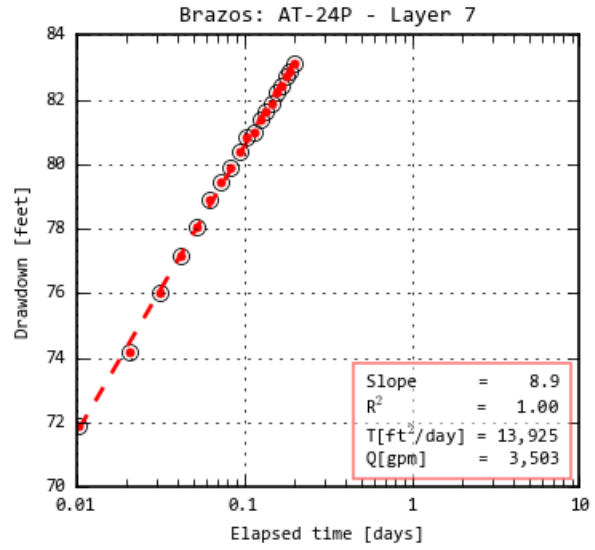
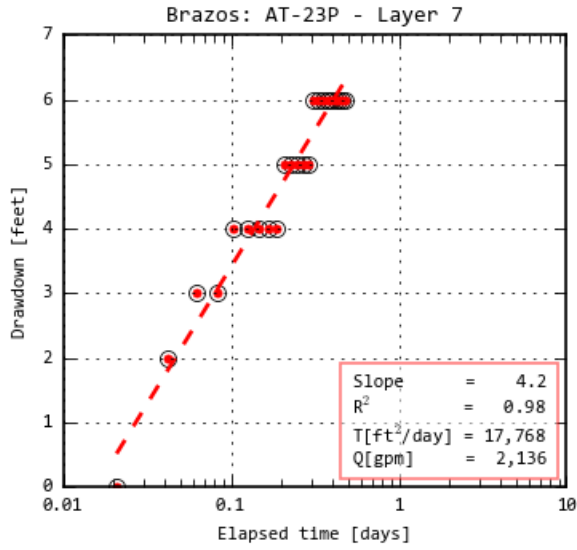
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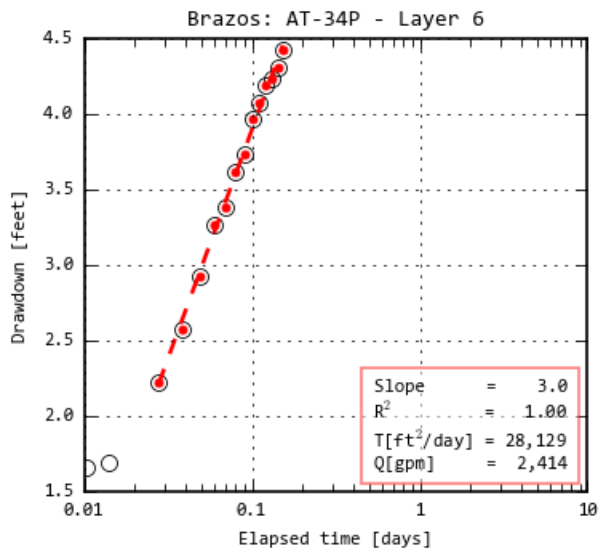
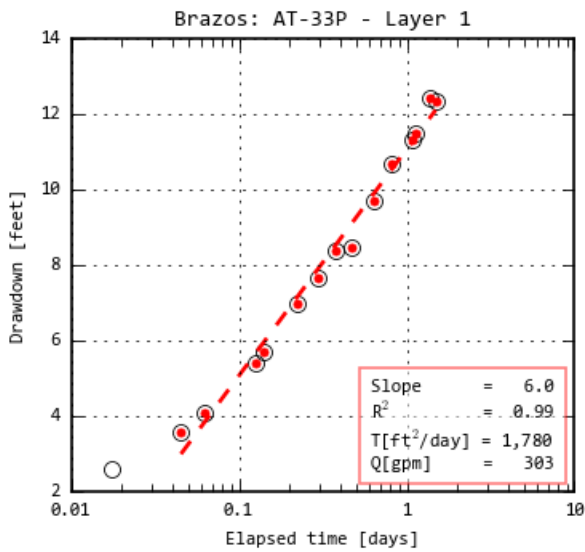
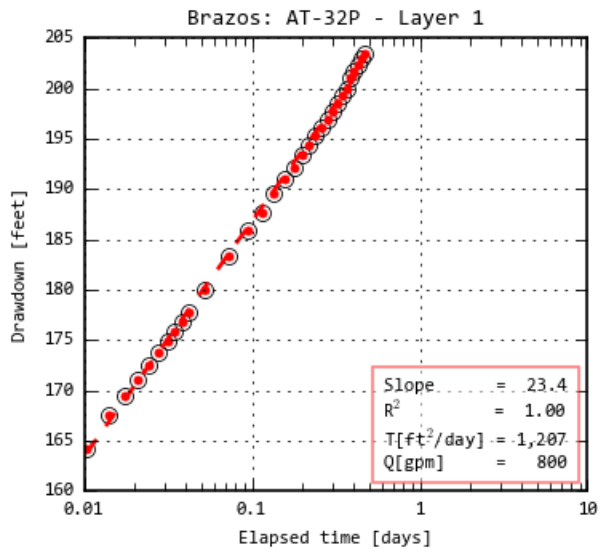
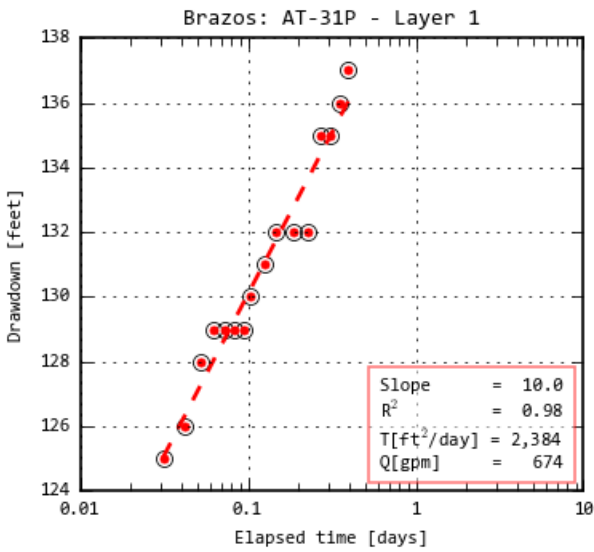
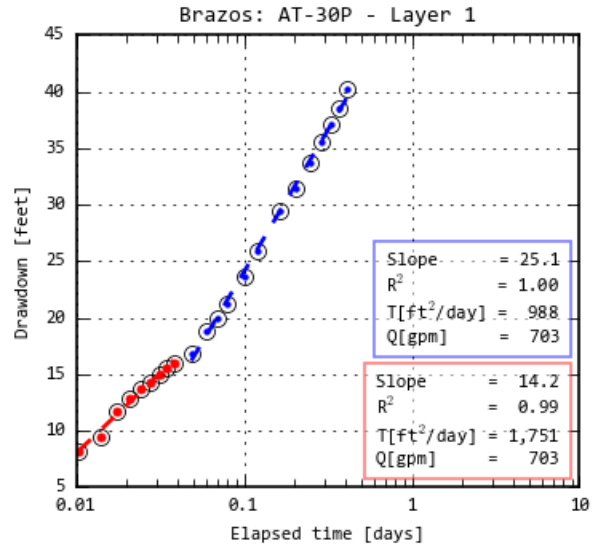
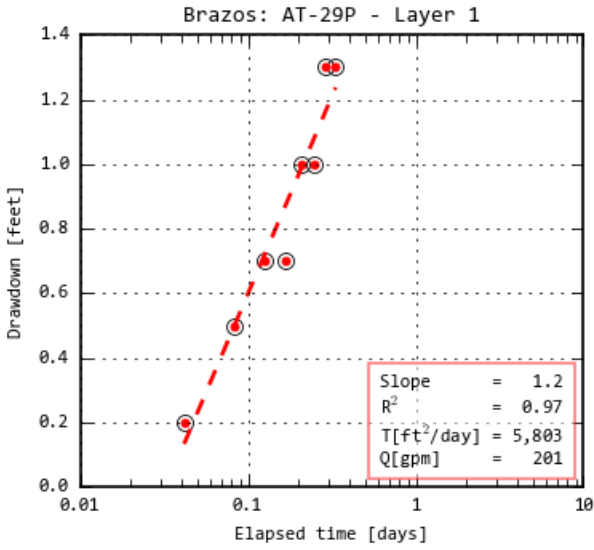
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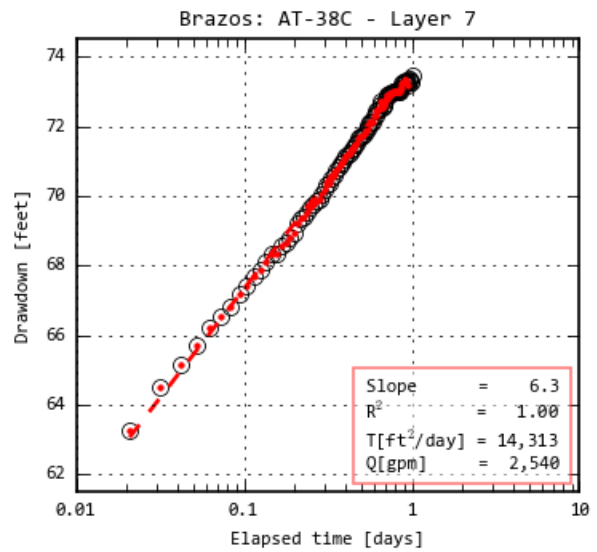
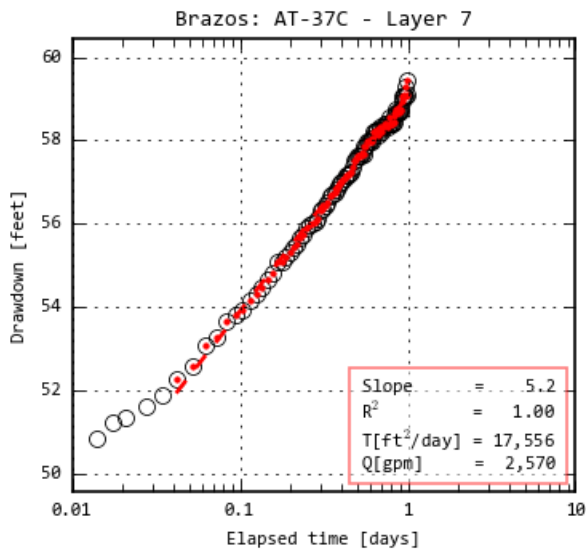
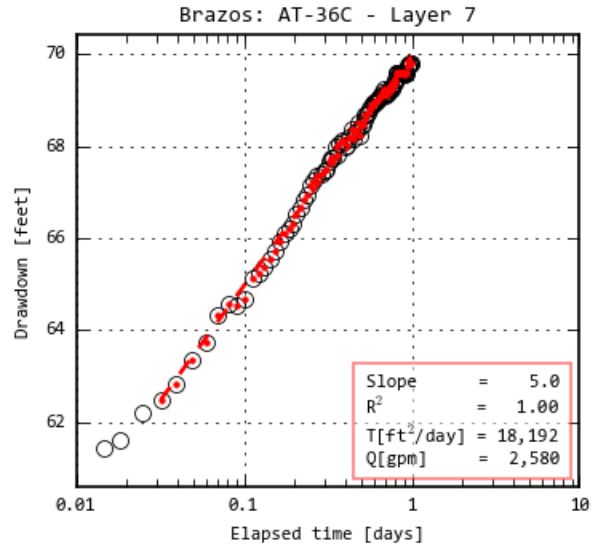
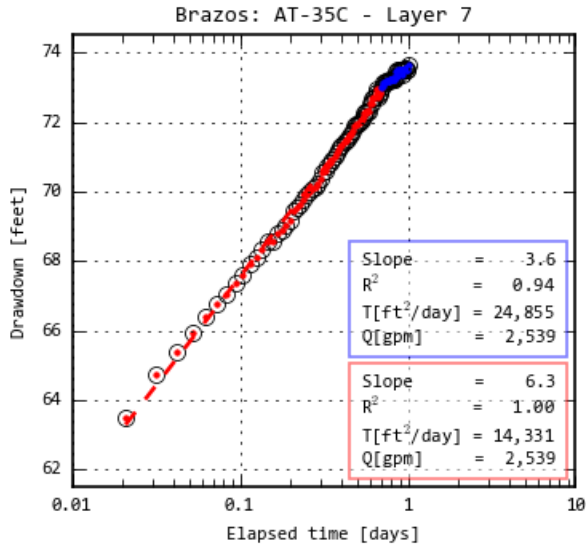
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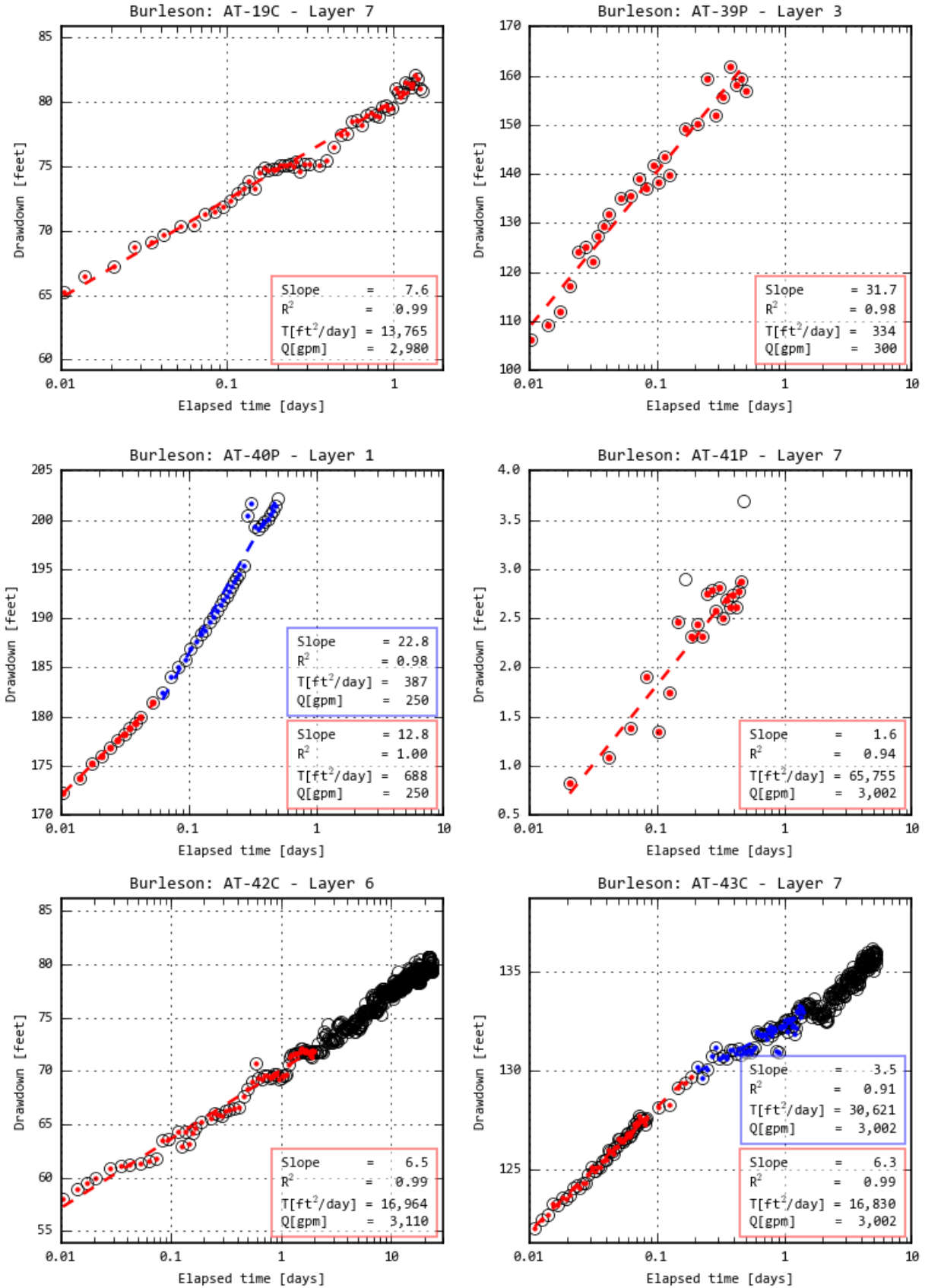
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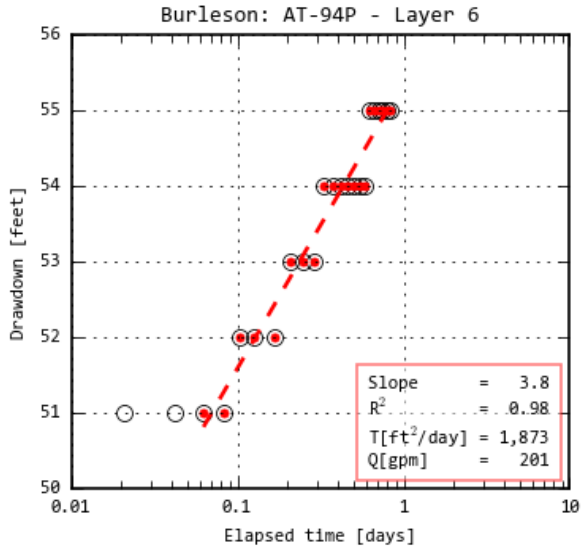
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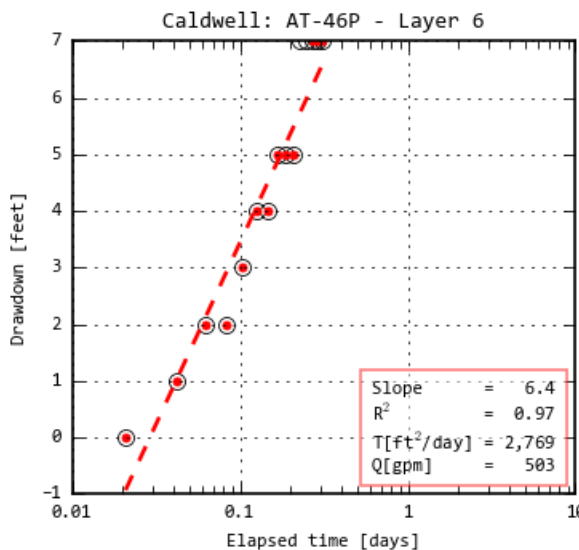
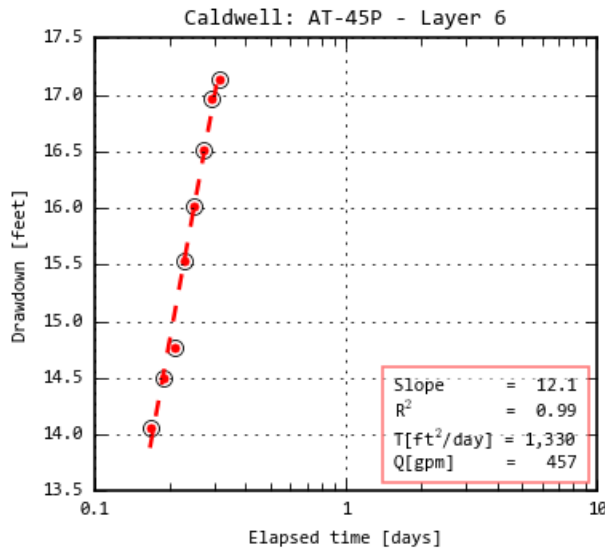
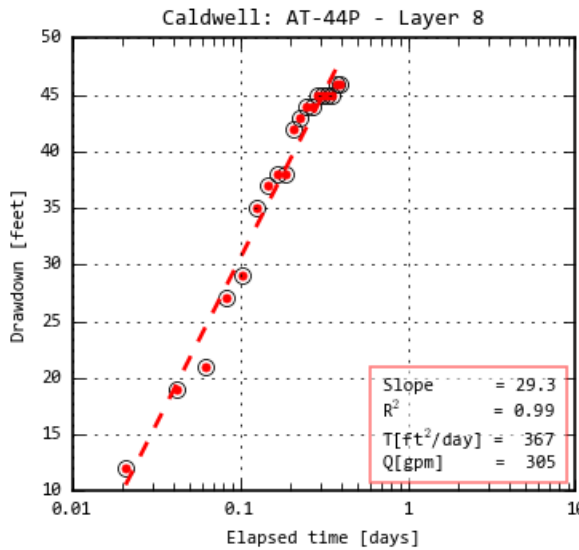
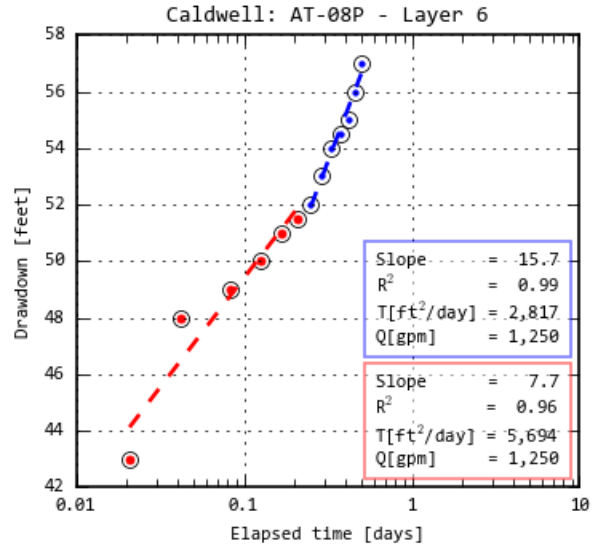
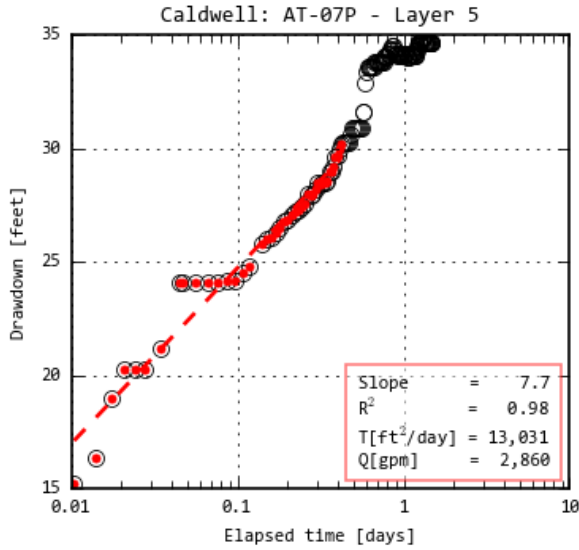
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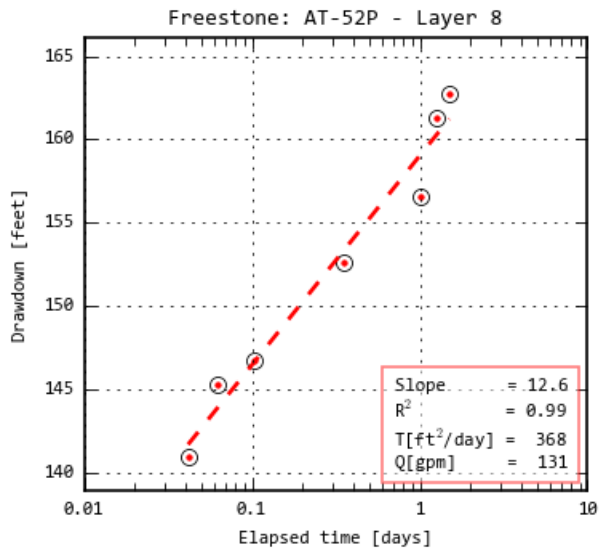
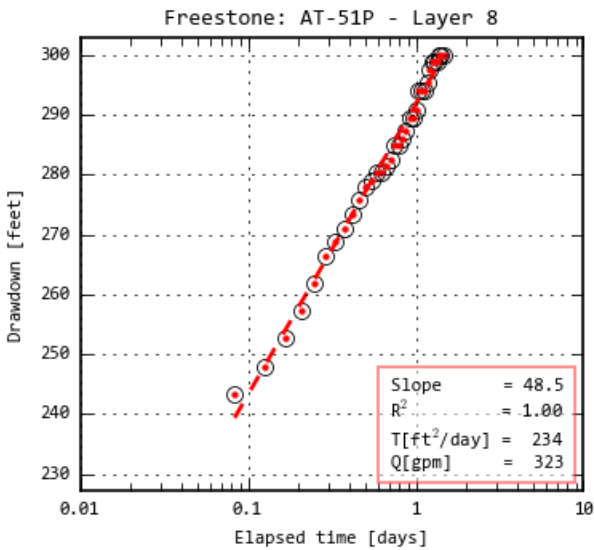
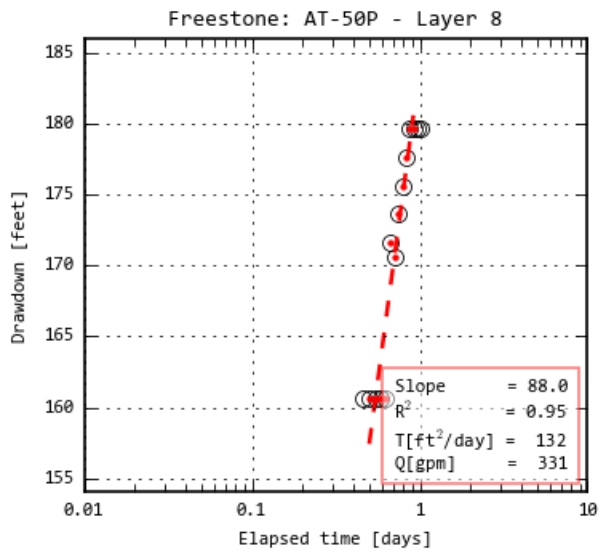
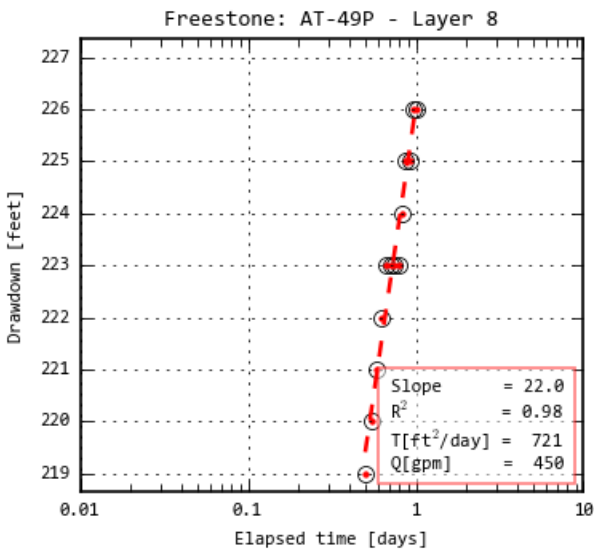
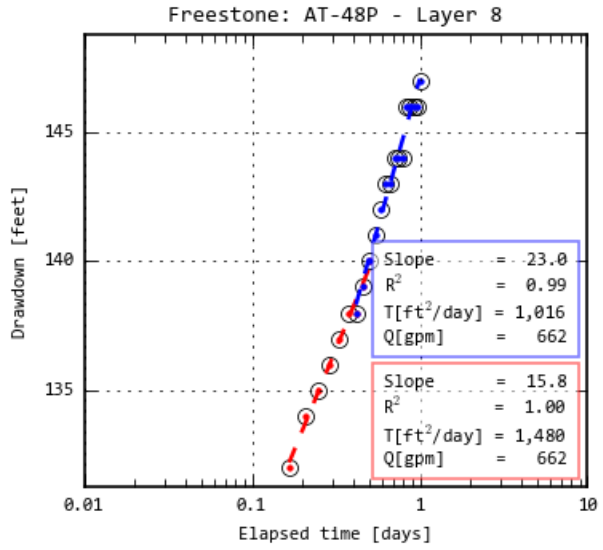
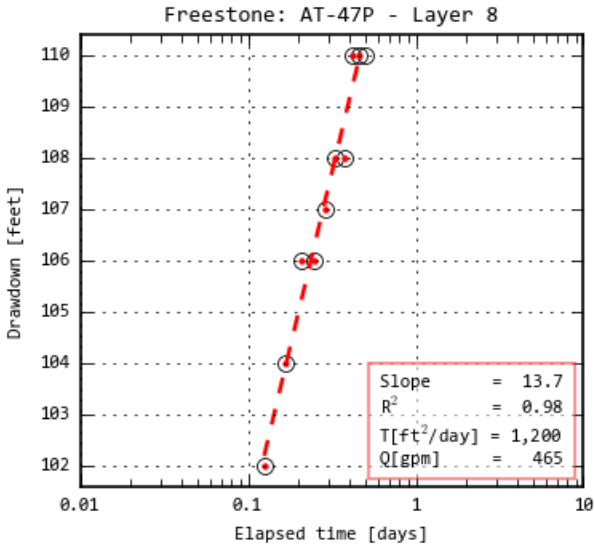
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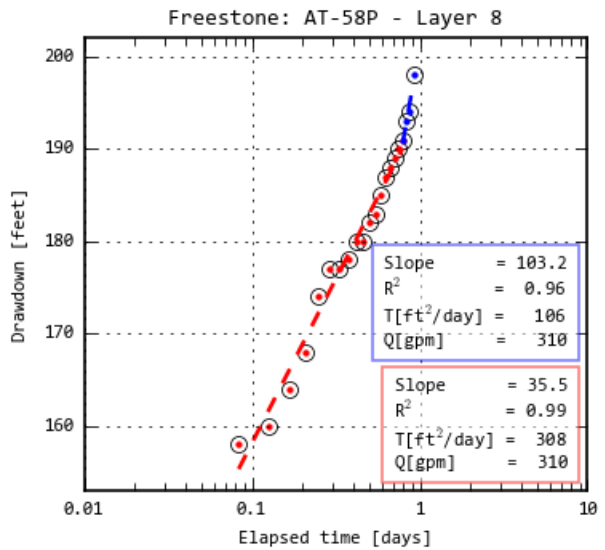
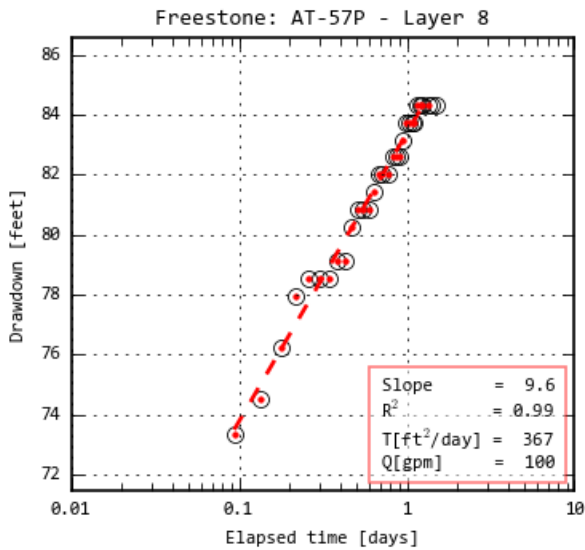
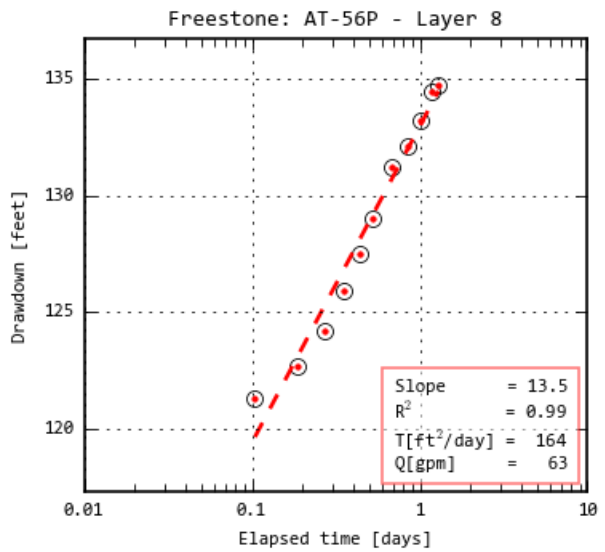
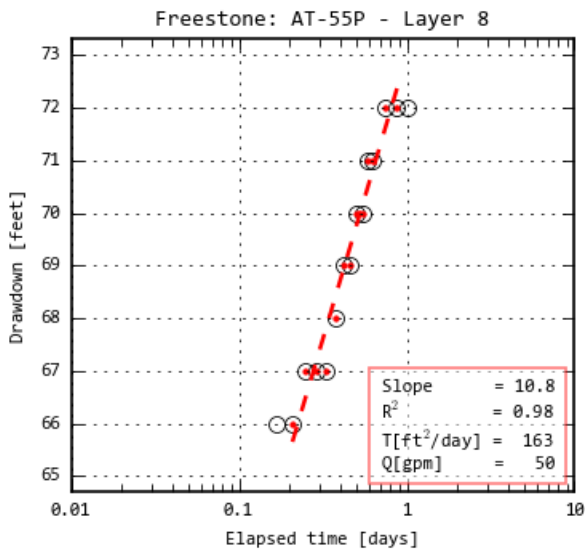
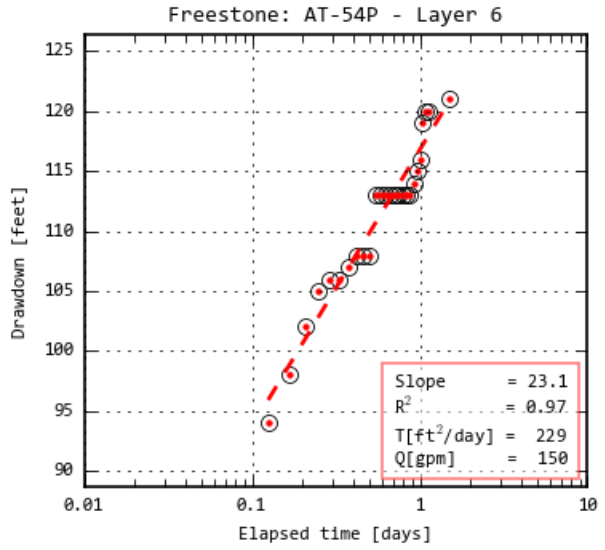
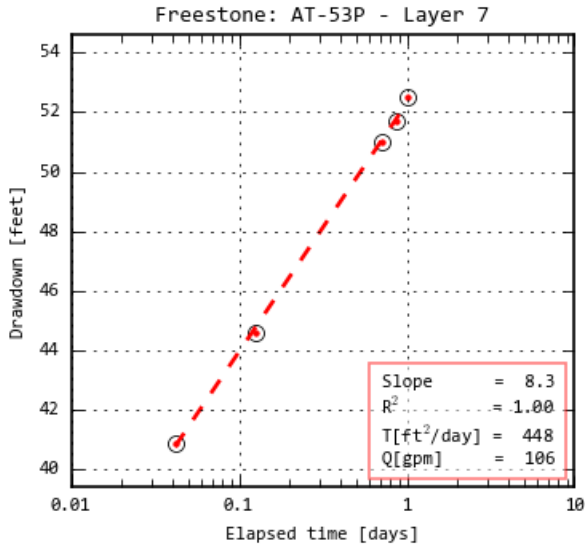
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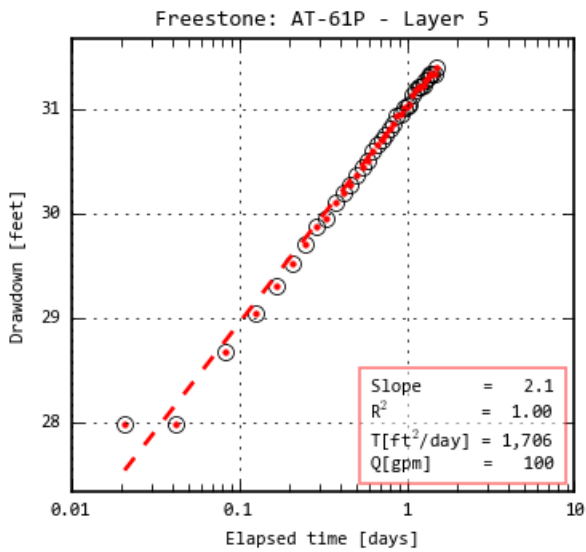
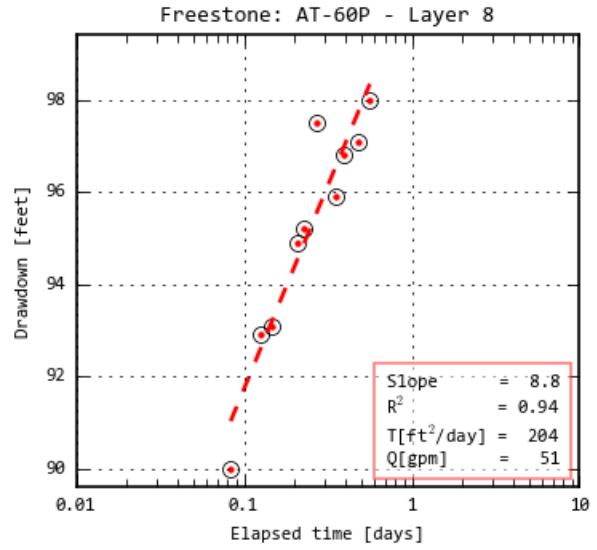
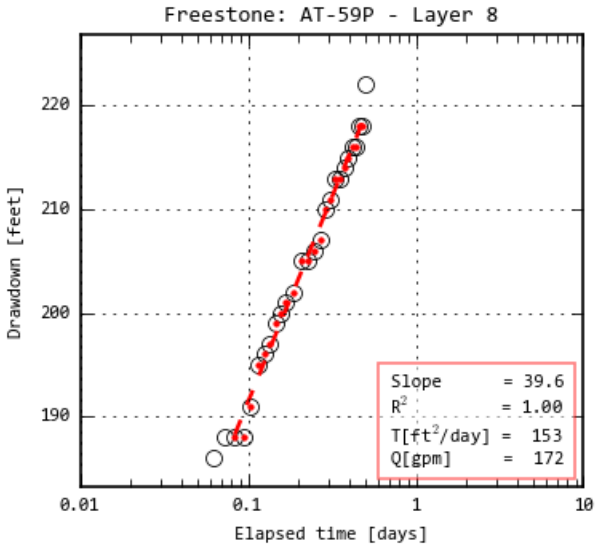
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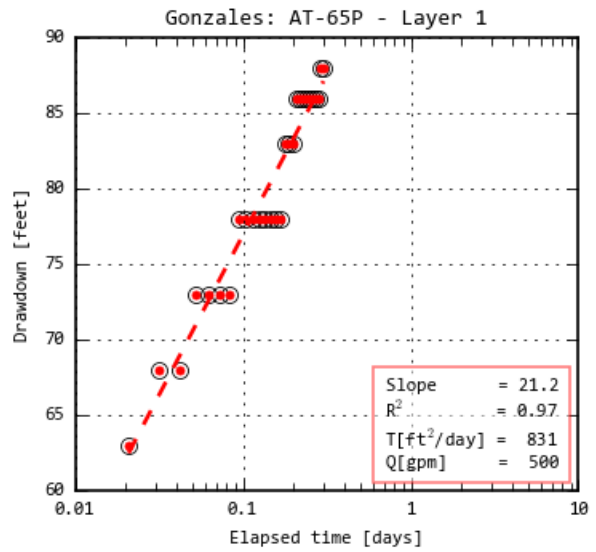
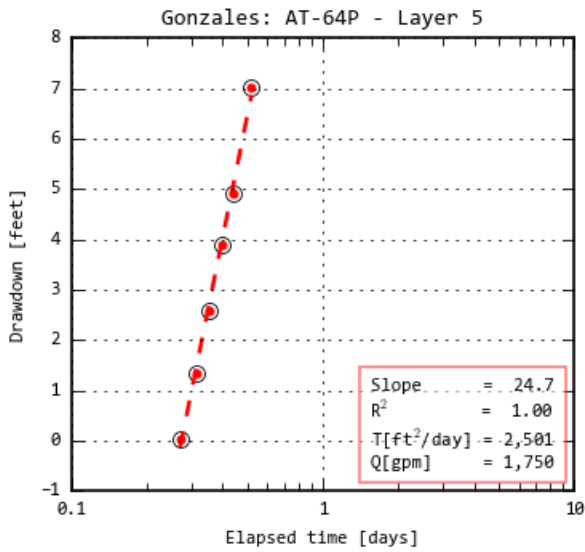
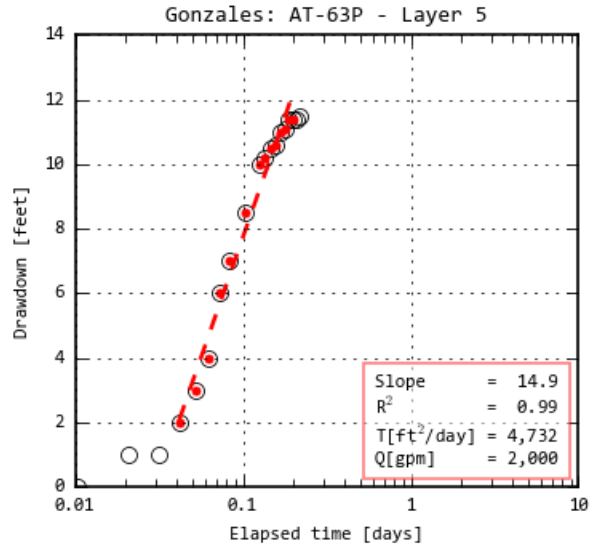
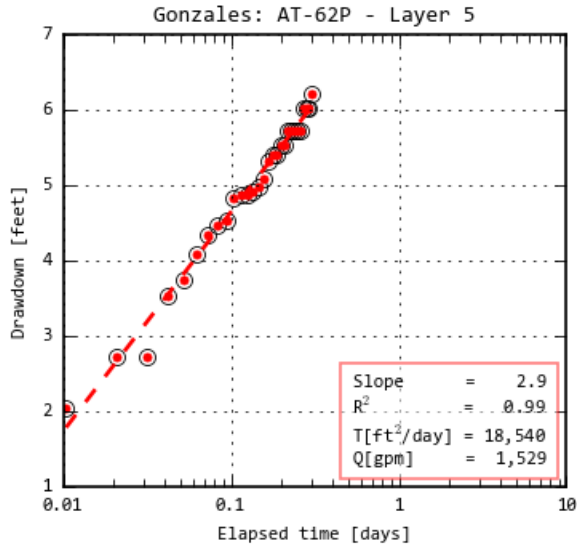
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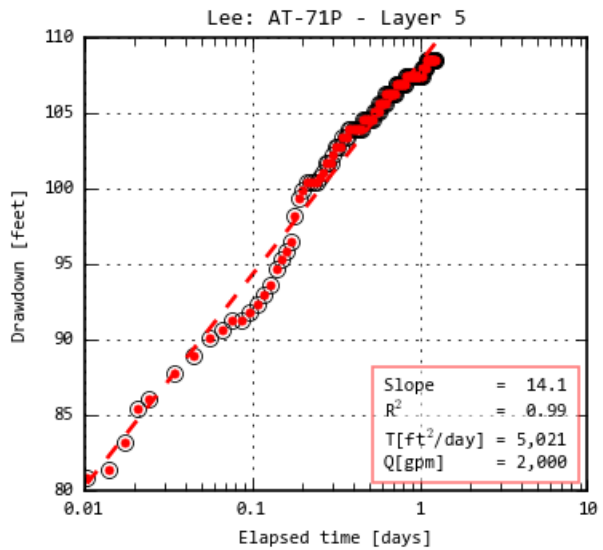
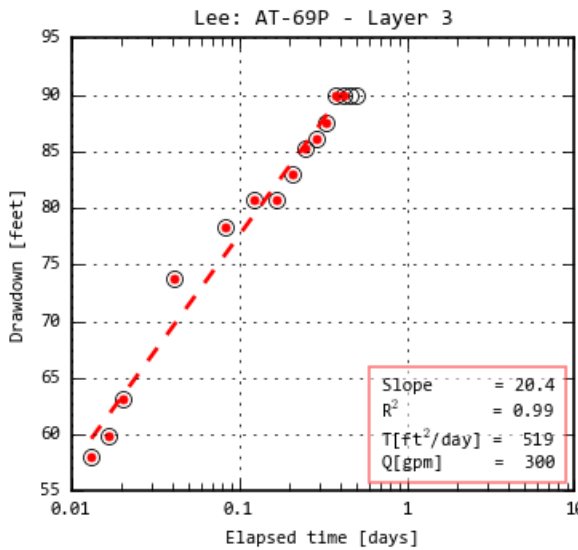
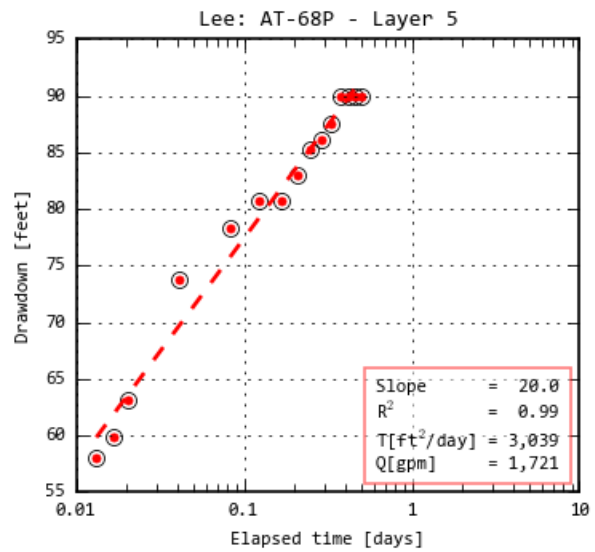
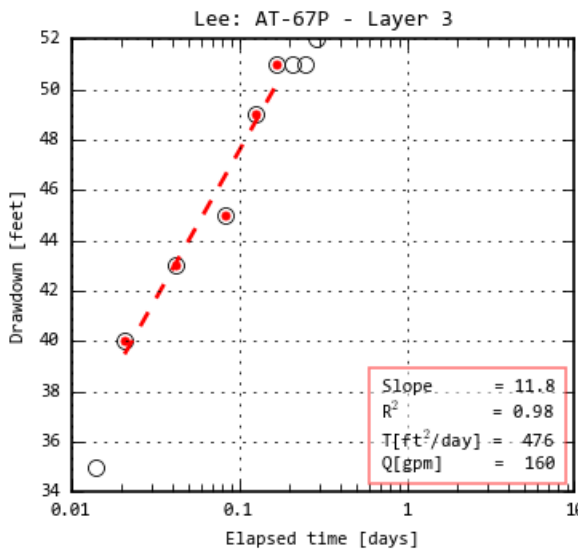
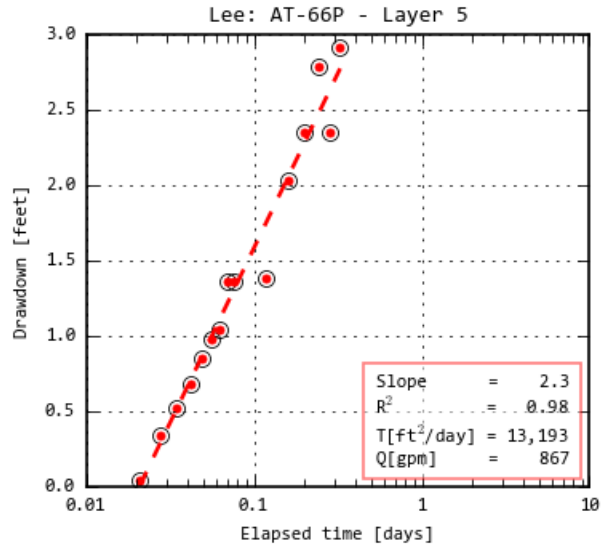
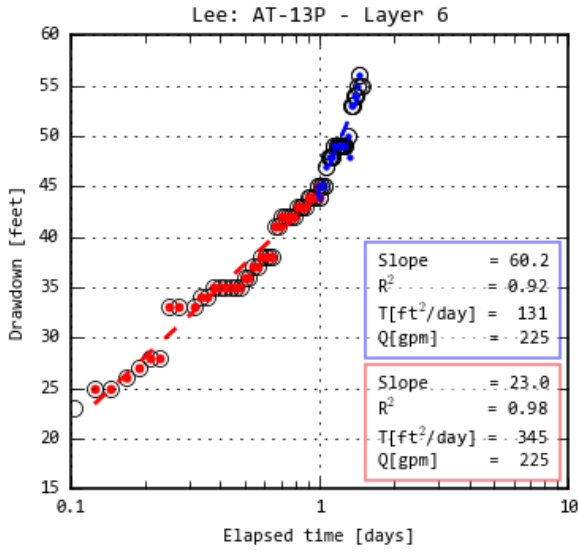
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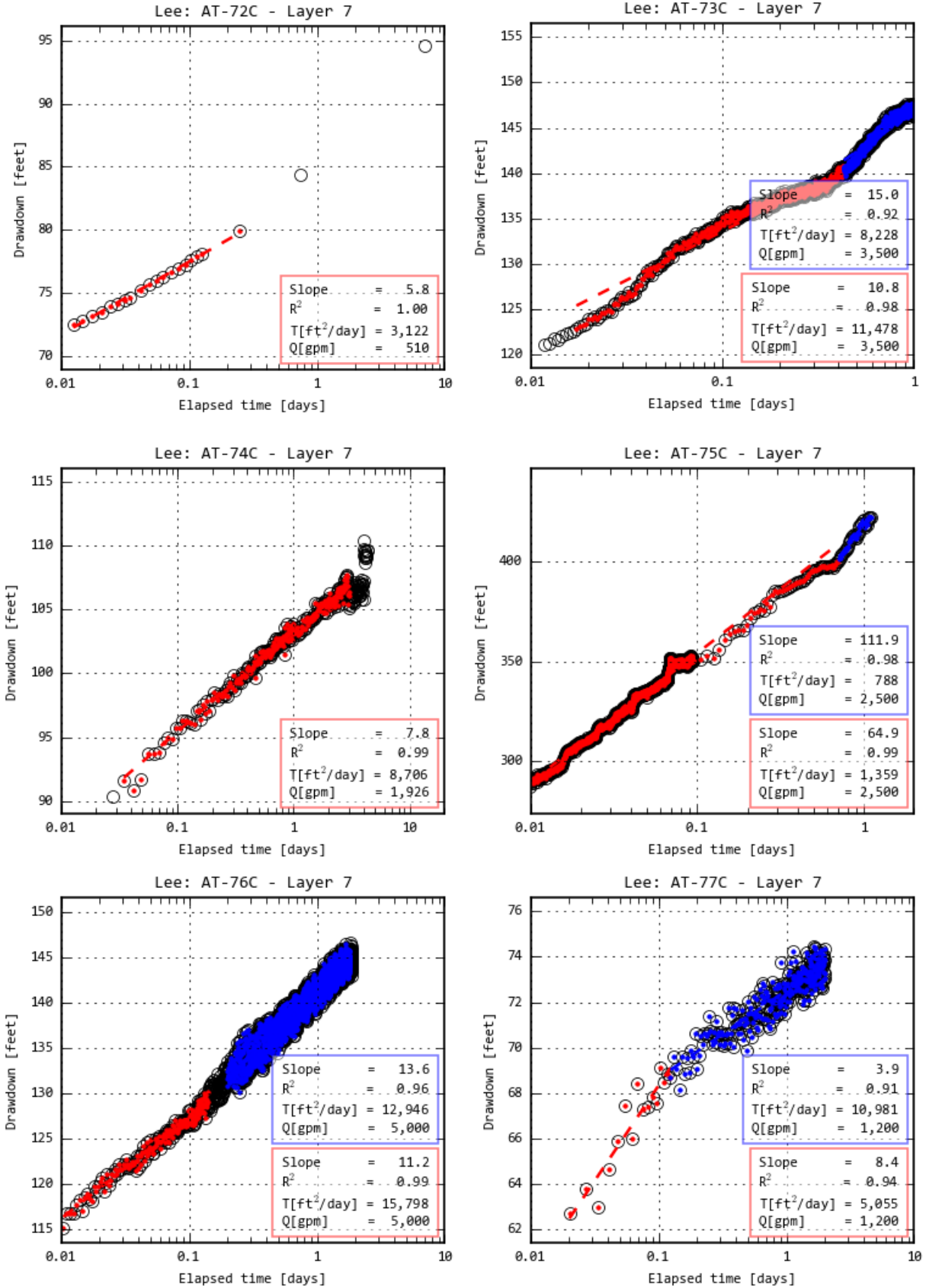
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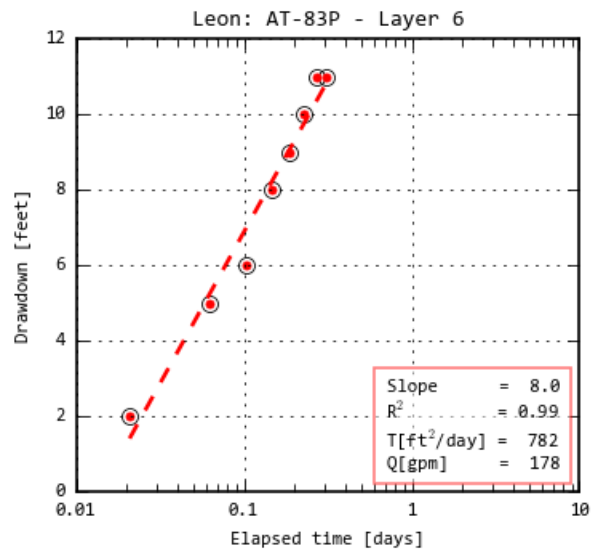
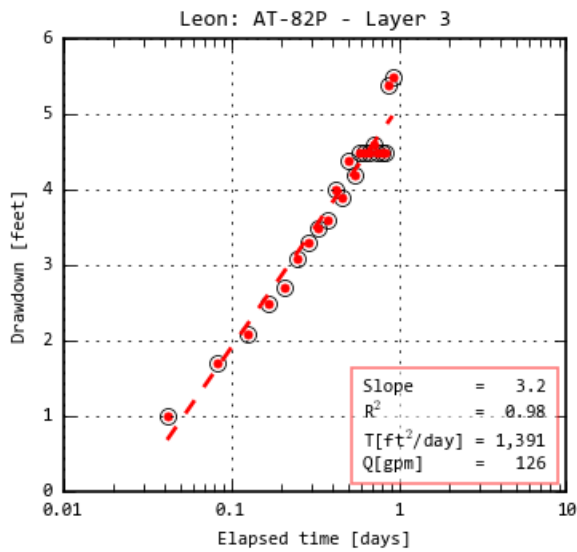
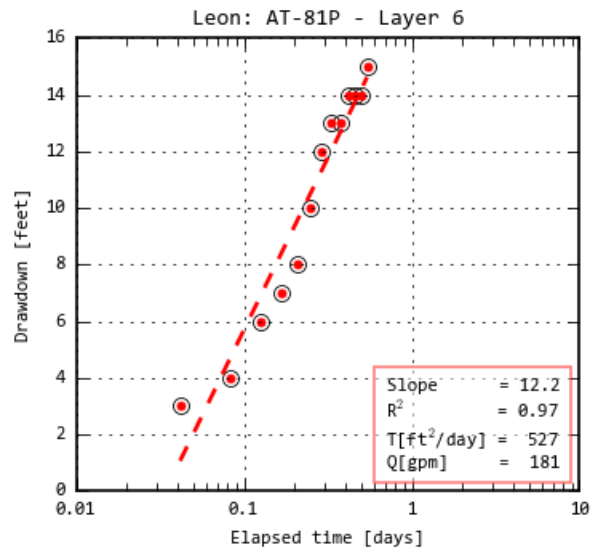
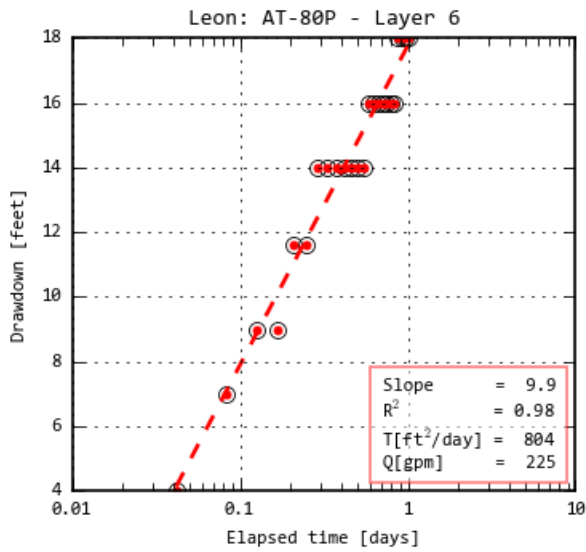
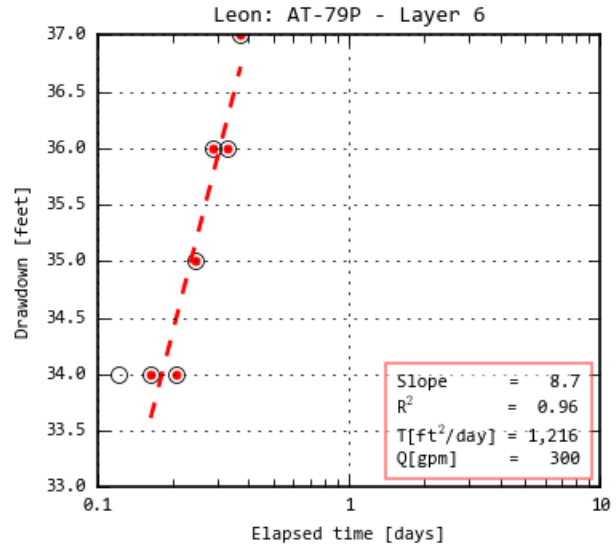
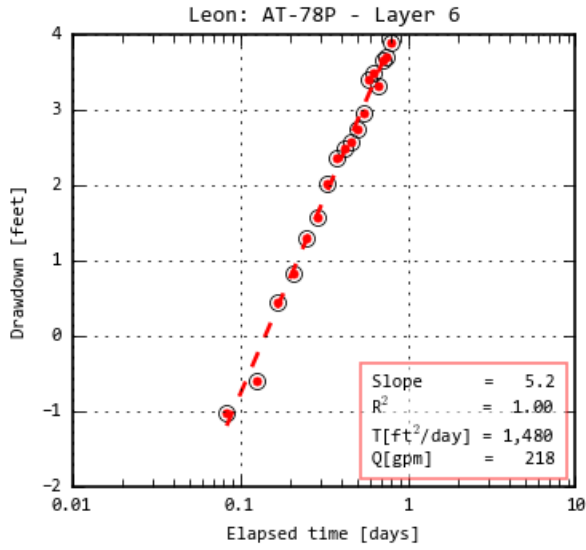
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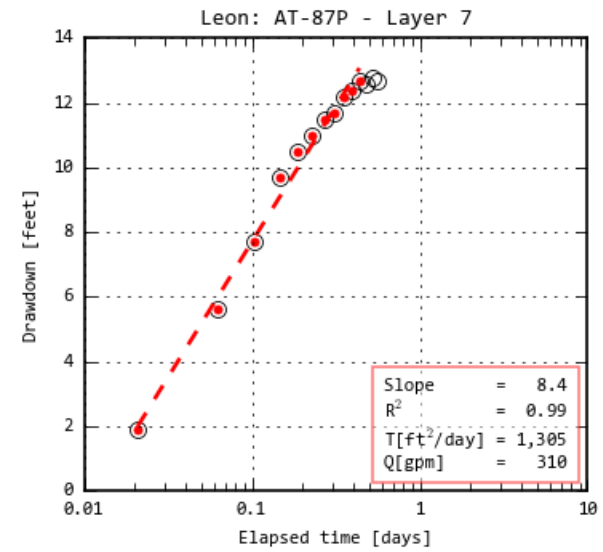
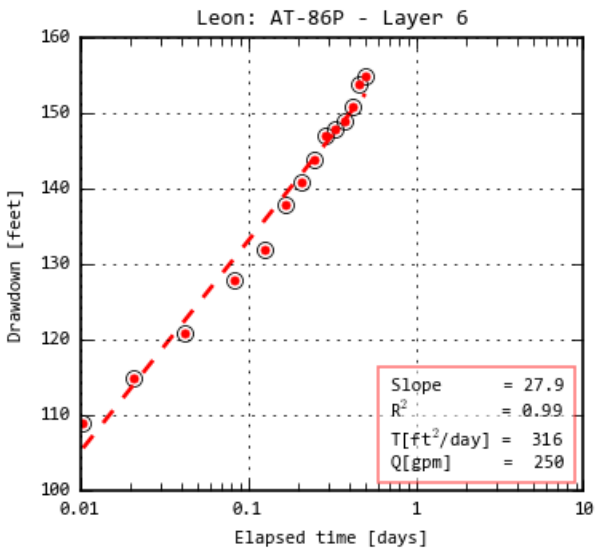
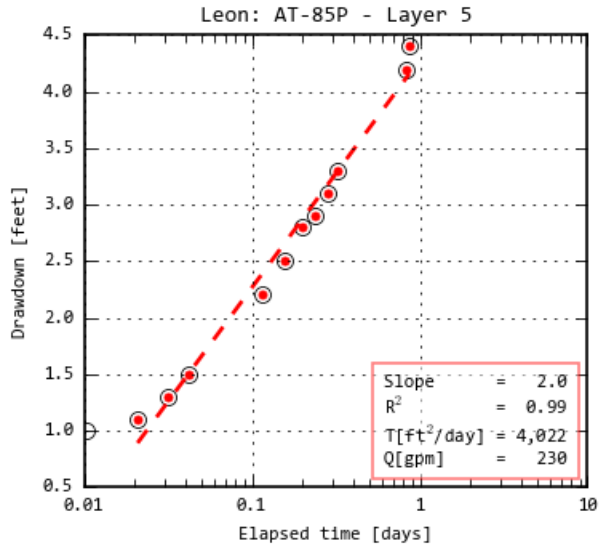
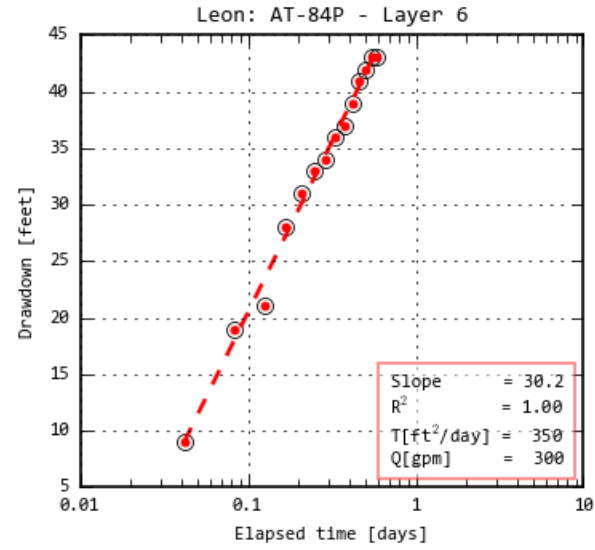
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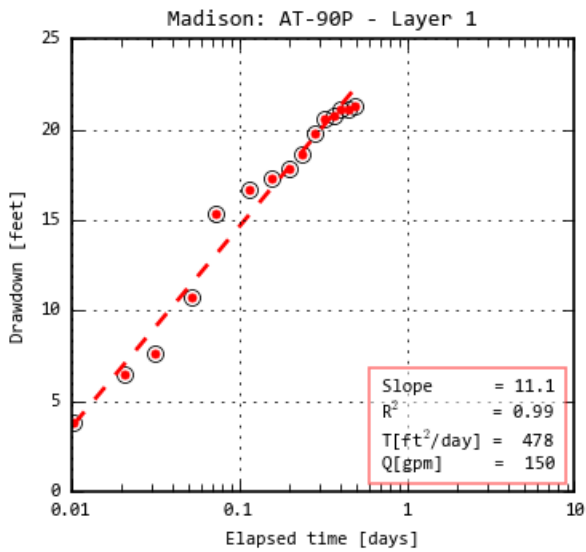
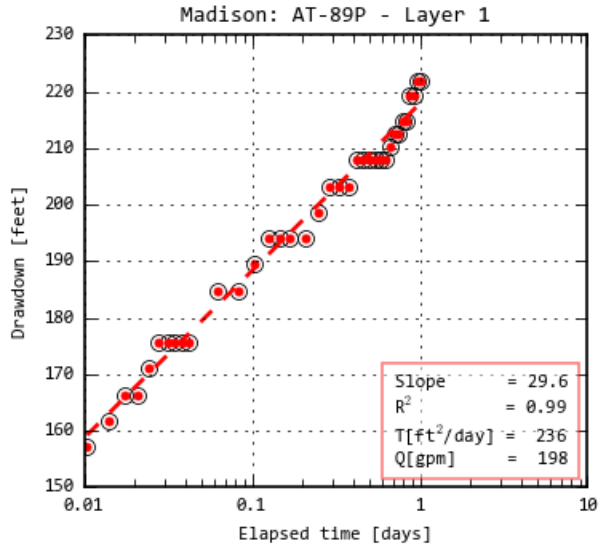
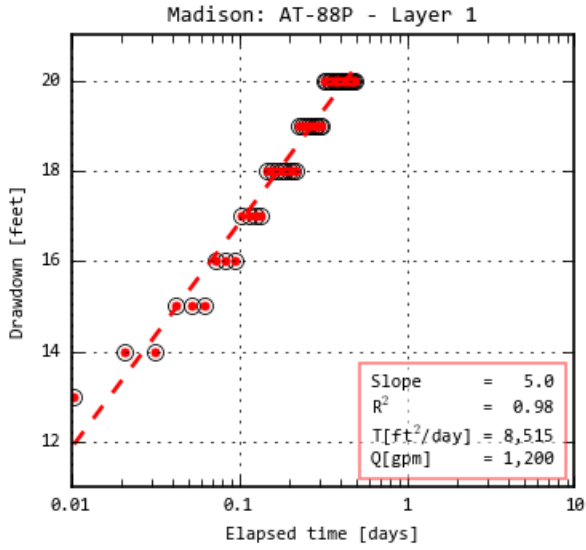
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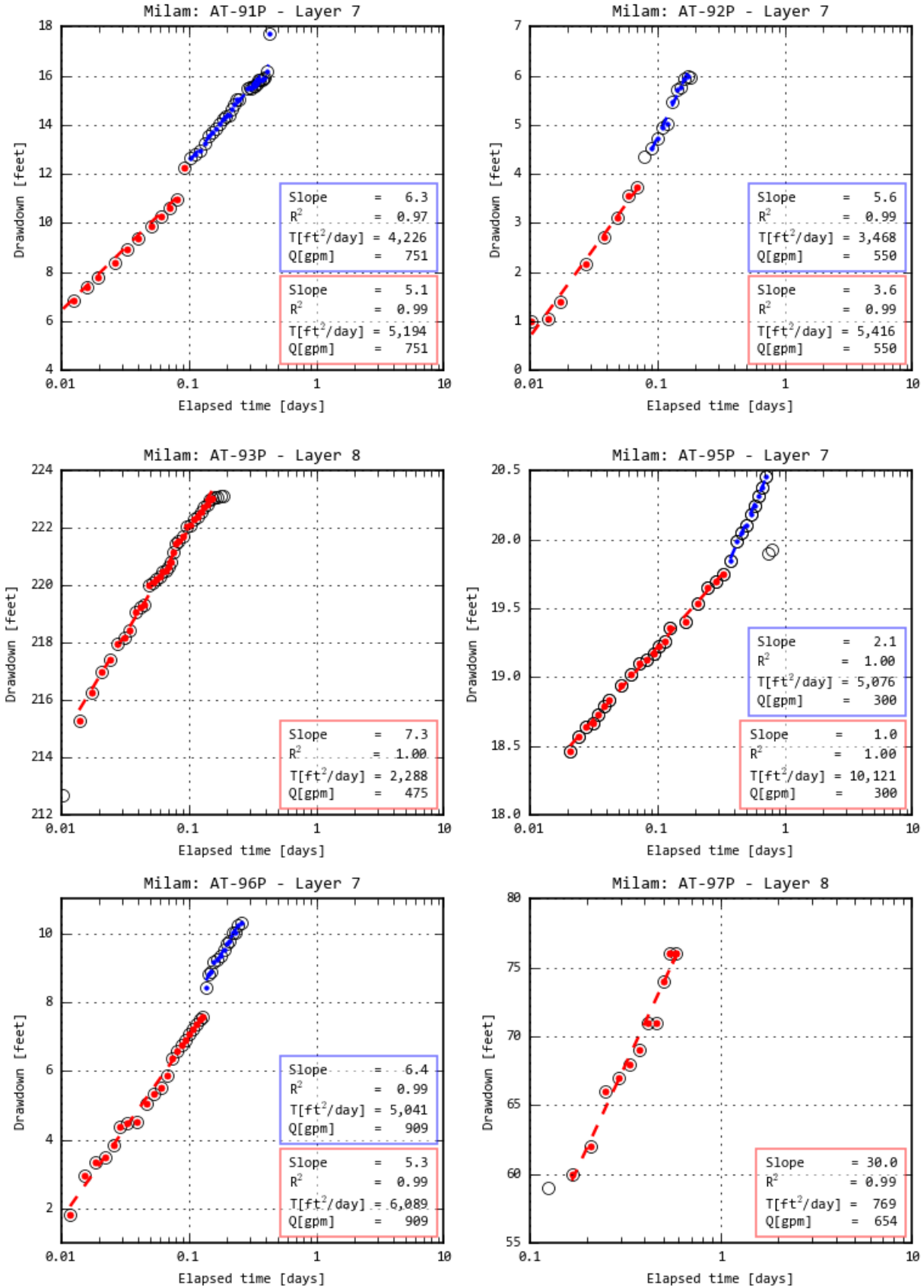
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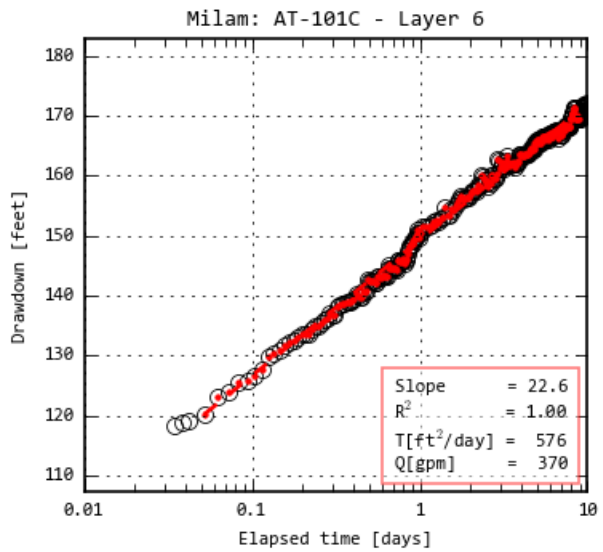
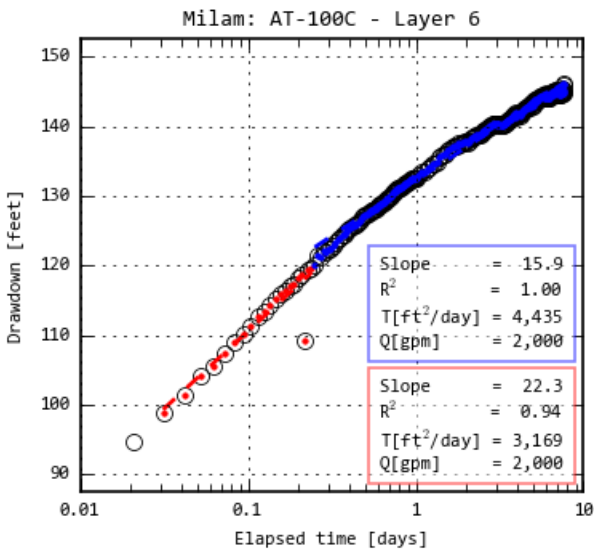
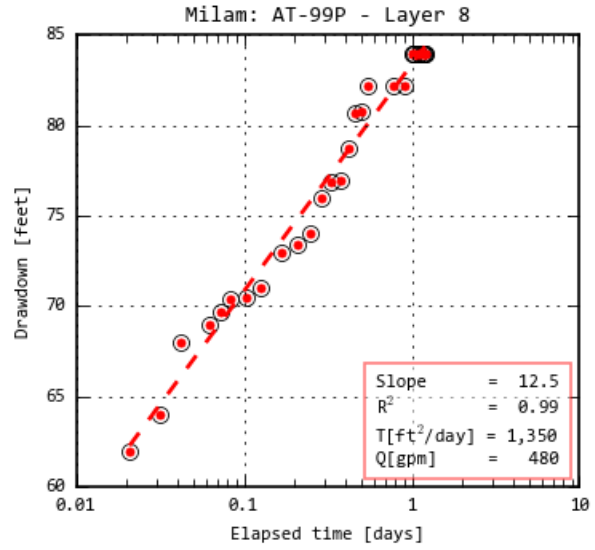
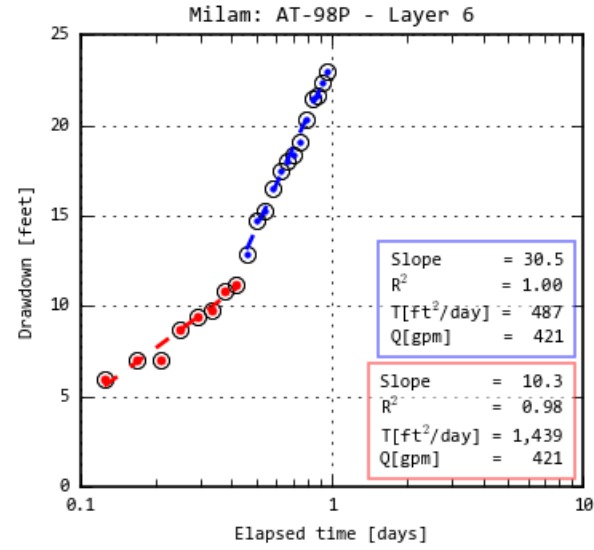
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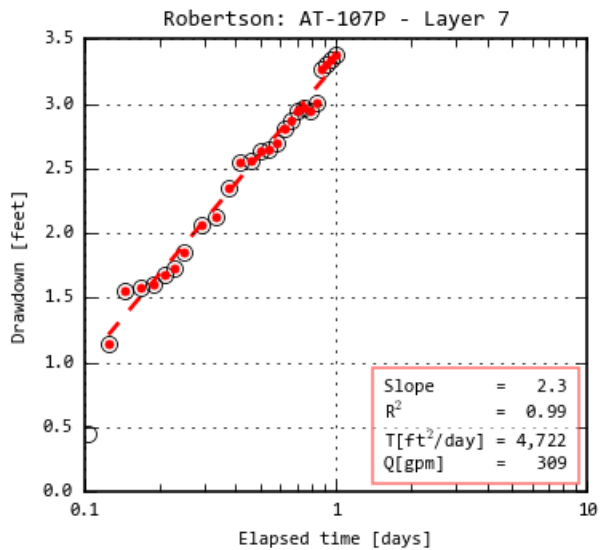
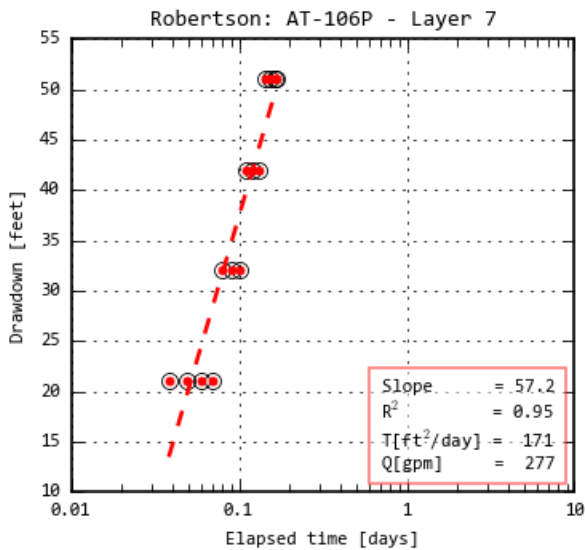
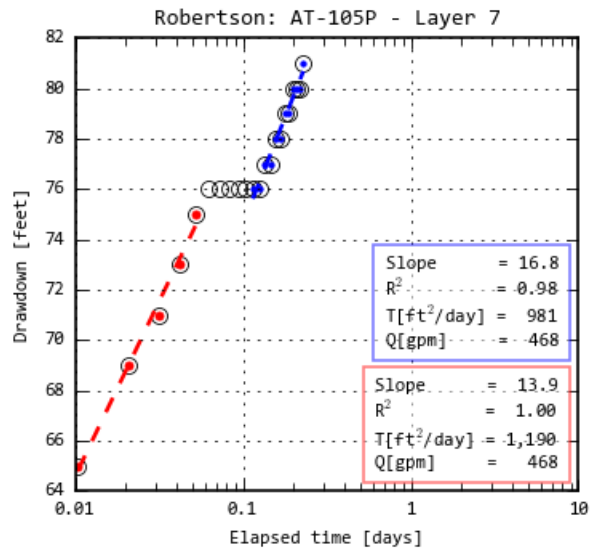
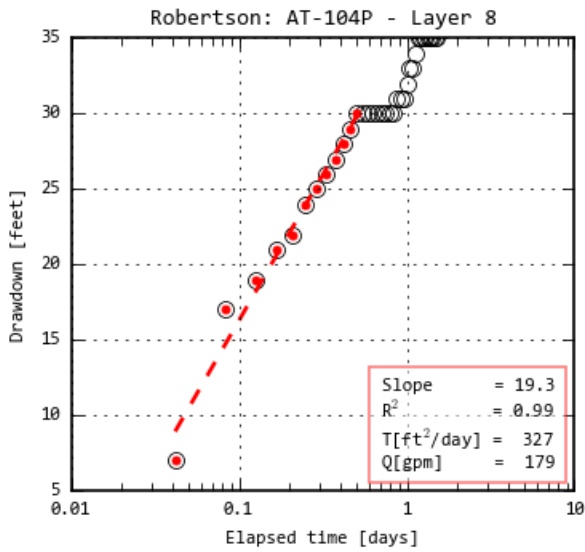
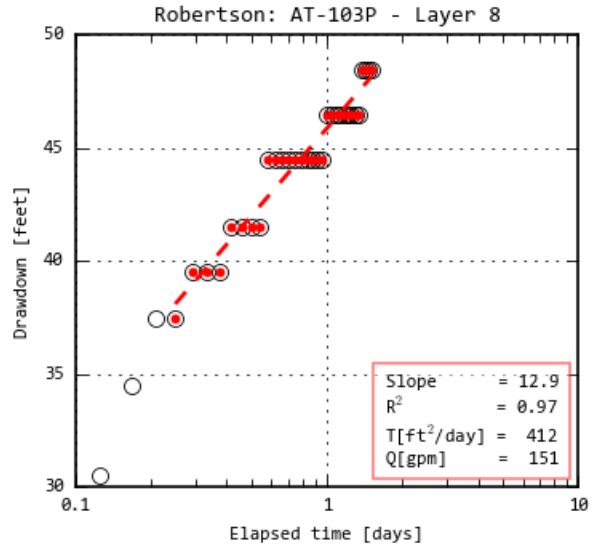
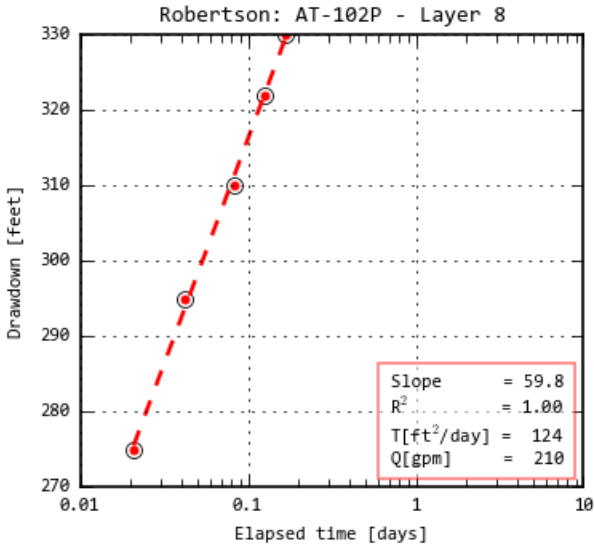
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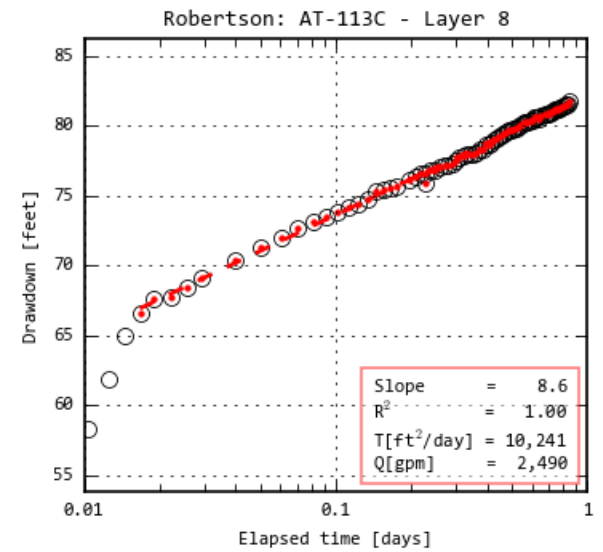
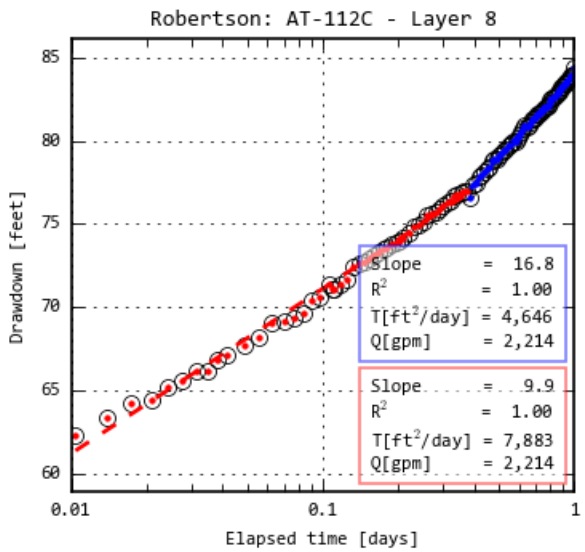
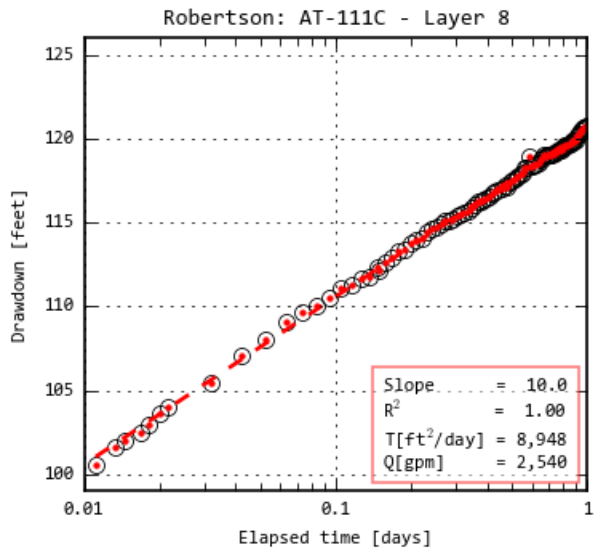
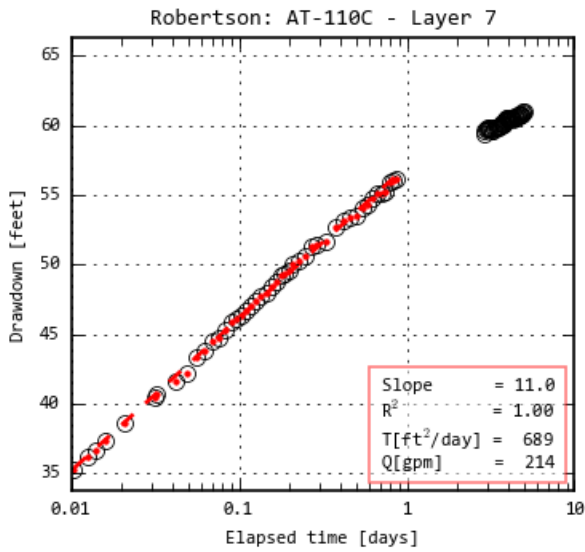
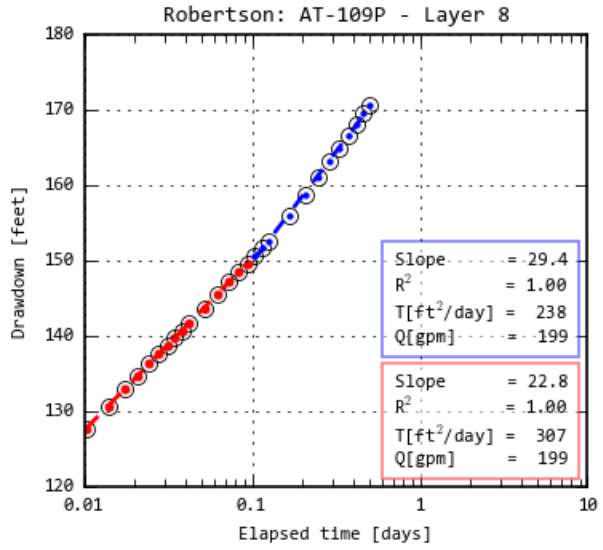
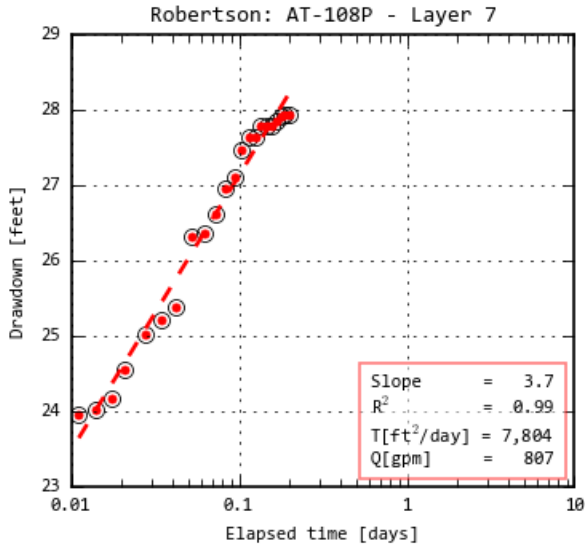
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14 Appendix C: Cooper-Jacob Analysis to Calculate Transmissivity Values for Simulated Aquifer Pumping Test Data Using the Analytical Element Model TTim

This appendix contains plots showing Cooper-Jacob analyses of drawdown data created using the Analytical Element Model TTim for seven of the 113 aquifer pumping tests discussed in Section 3.1.4.1 and shown in Appendix B. The TTim-generated drawdown data were created using the well screen length as the aquifer thickness, the transmissivities calculated from the aquifer pumping test (see Appendix B), and the specific storage coefficient at the well location from the 2004 groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers. An explanation of the information on these plots is provided in Table C.1.

Table C.1. Explanation of information on the plots in this appendix.

Plot Symbol	Description
Dots	TTim-generated time-drawdown data not interpreted
Solid Line	TTim-generated time-drawdown data interpreted ^{(a)(b)}
Dashed Line	Cooper-Jacob analysis ^{(a)(b)} (color coordinated with TTim-generated time-drawdown data)
Box	Cooper-Jacob summary statistics ^(a) (color coordinated with TTim-generated time-drawdown data)

^(a) Black lines/box = no fault; Colored lines/box = with fault; different colors reflect different interpreted transmissivities for different portions of the drawdown data

^(b) When the interpreted TTim-generated time-drawdown data closely approximates a straight line, the Cooper-Jacob analysis overlaps the data resulting in an inability to distinguish between the two lines.

The summary statistics for the Cooper-Jacob analysis include the slope of the straight line; the coefficient of determination, R^2 , that quantifies the quality of the slope estimated from the drawdown data; the estimated transmissivity, T, in square feet per day; and the flow rate at the well during the aquifer pumping test, Q, in gallons per minute.

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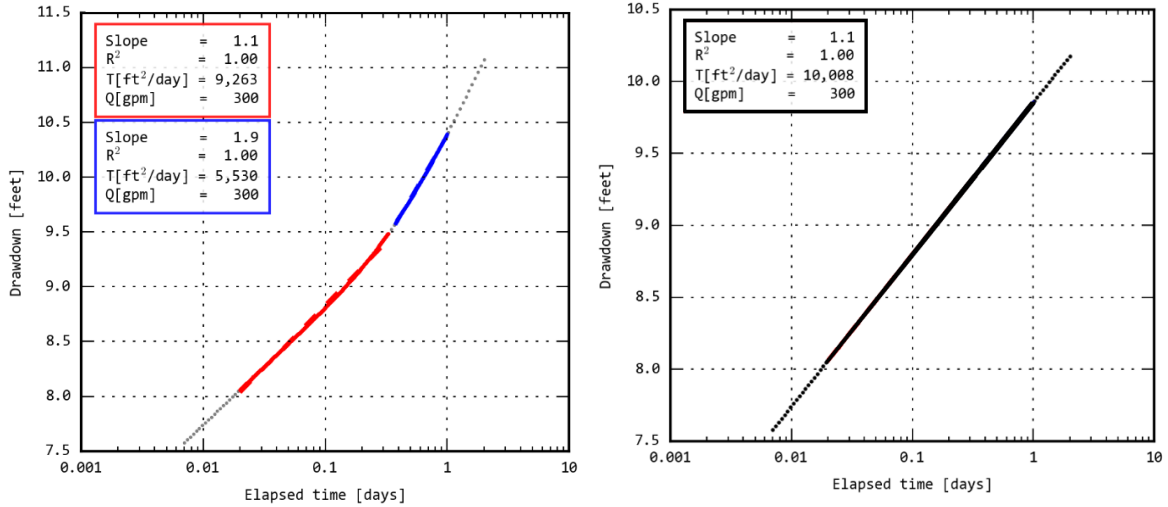


Figure C.1. Cooper-Jacob analysis of TTim-generated time-drawdown data for aquifer pumping test AT-95P for this study faults (left plot) and no faults (right plot).

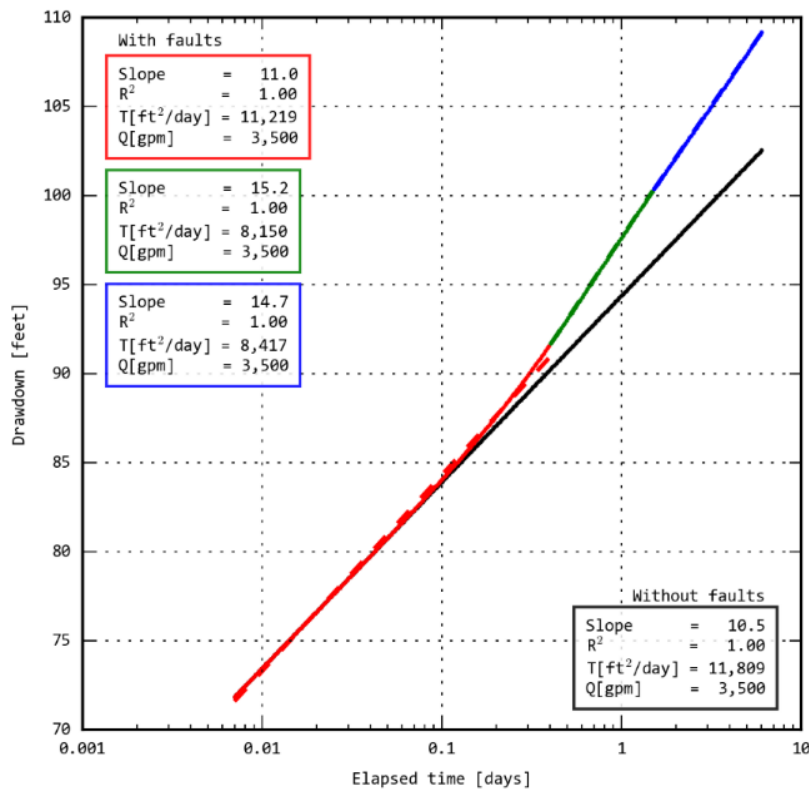


Figure C.2. Cooper-Jacob analysis of TTim-generated time-drawdown data for aquifer pumping test AT-73C for this study faults and no faults.

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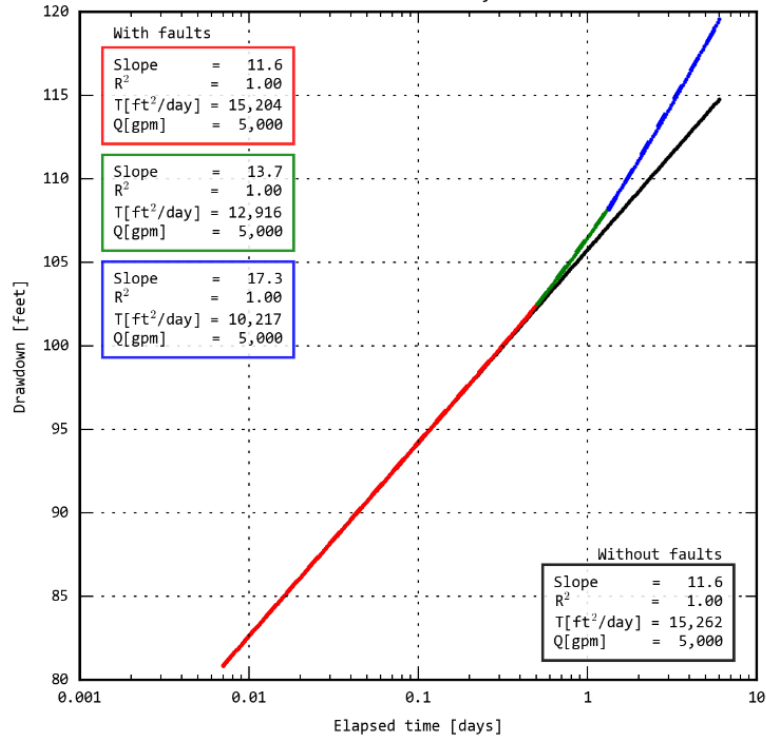


Figure C.3. Cooper-Jacob analysis of TTim-generated time-drawdown data for aquifer pumping test AT-76C for this study faults and no faults.

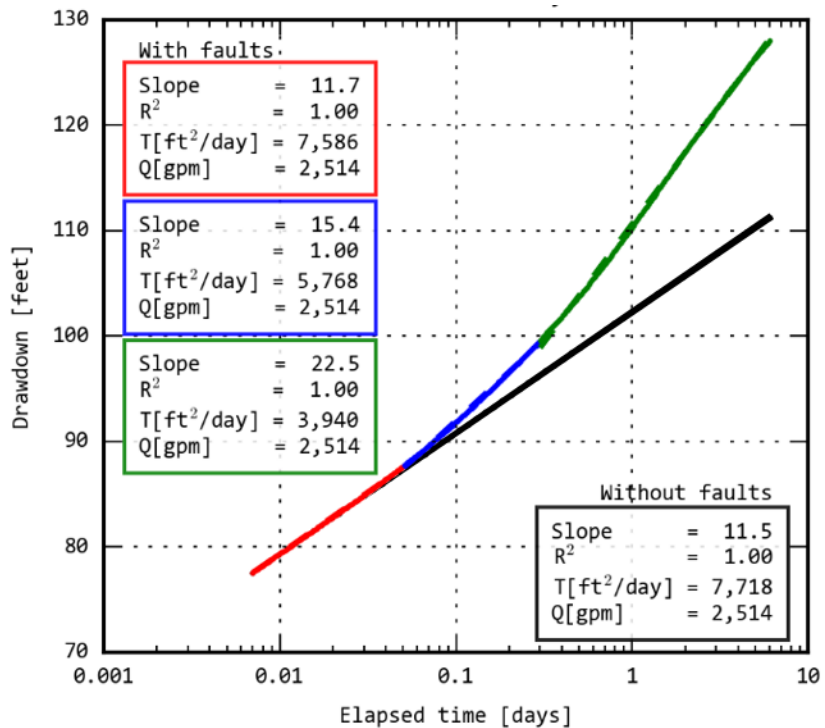


Figure C.4. Cooper-Jacob analysis of TTim-generated time-drawdown data for aquifer pumping test AT-112C for this study faults and no faults.

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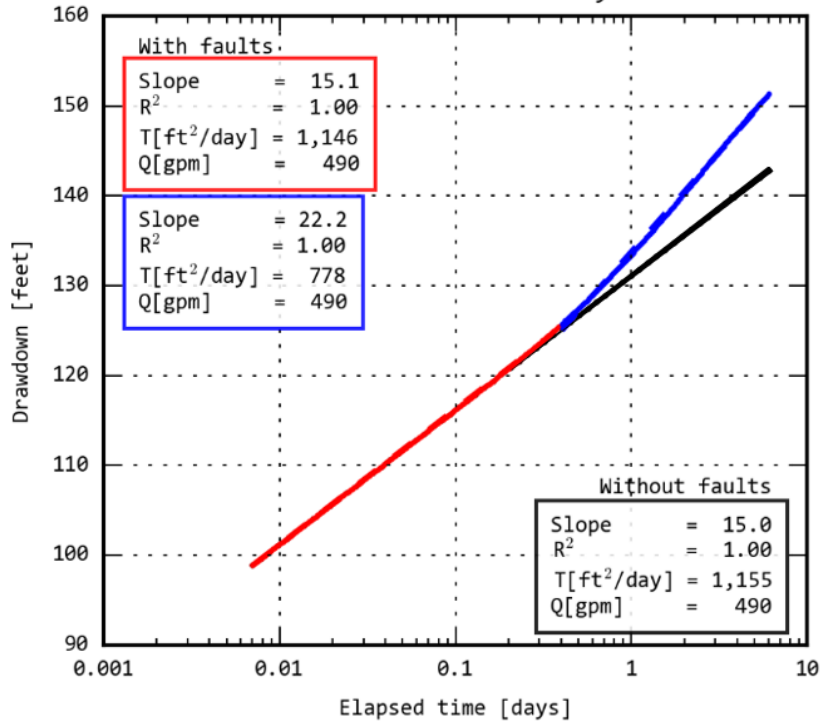


Figure C.5. Cooper-Jacob analysis of TTim-generated time-drawdown data for aquifer pumping test AT-105P for this study faults and no faults.

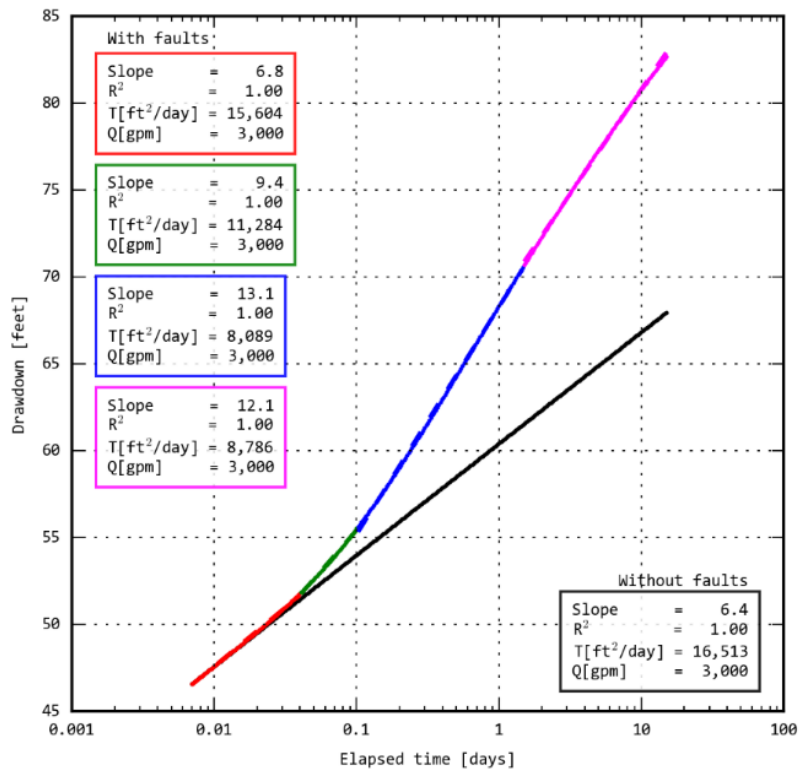


Figure C.6. Cooper-Jacob analysis of TTim-generated time-drawdown data for aquifer pumping test AT-43C for this study faults and no faults.

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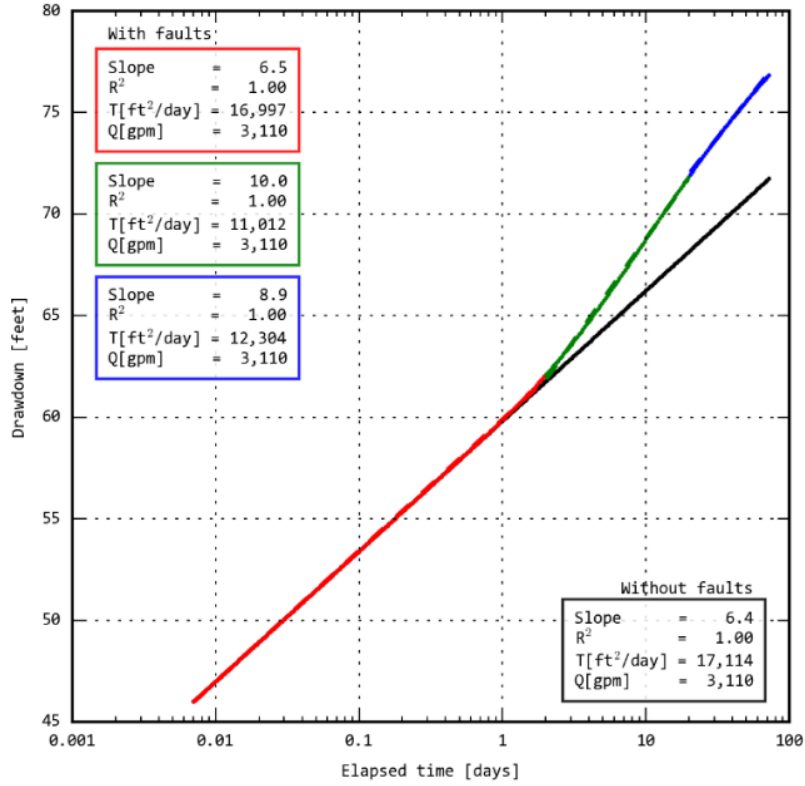


Figure C.7. Cooper-Jacob analysis of TTim-generated time-drawdown data for aquifer pumping test AT-42C for this study faults and no faults.

15 Appendix D: Bar Charts Showing Pumping from 1930 to 2010 for Counties outside of Groundwater Management Area 12

Bar charts of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers, as reported by the pumping source, by type for the counties located in the model domain but outside Groundwater Management Area 12 are provided in this appendix. Pumping is summed for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010. The charts are ordered alphabetically by county.

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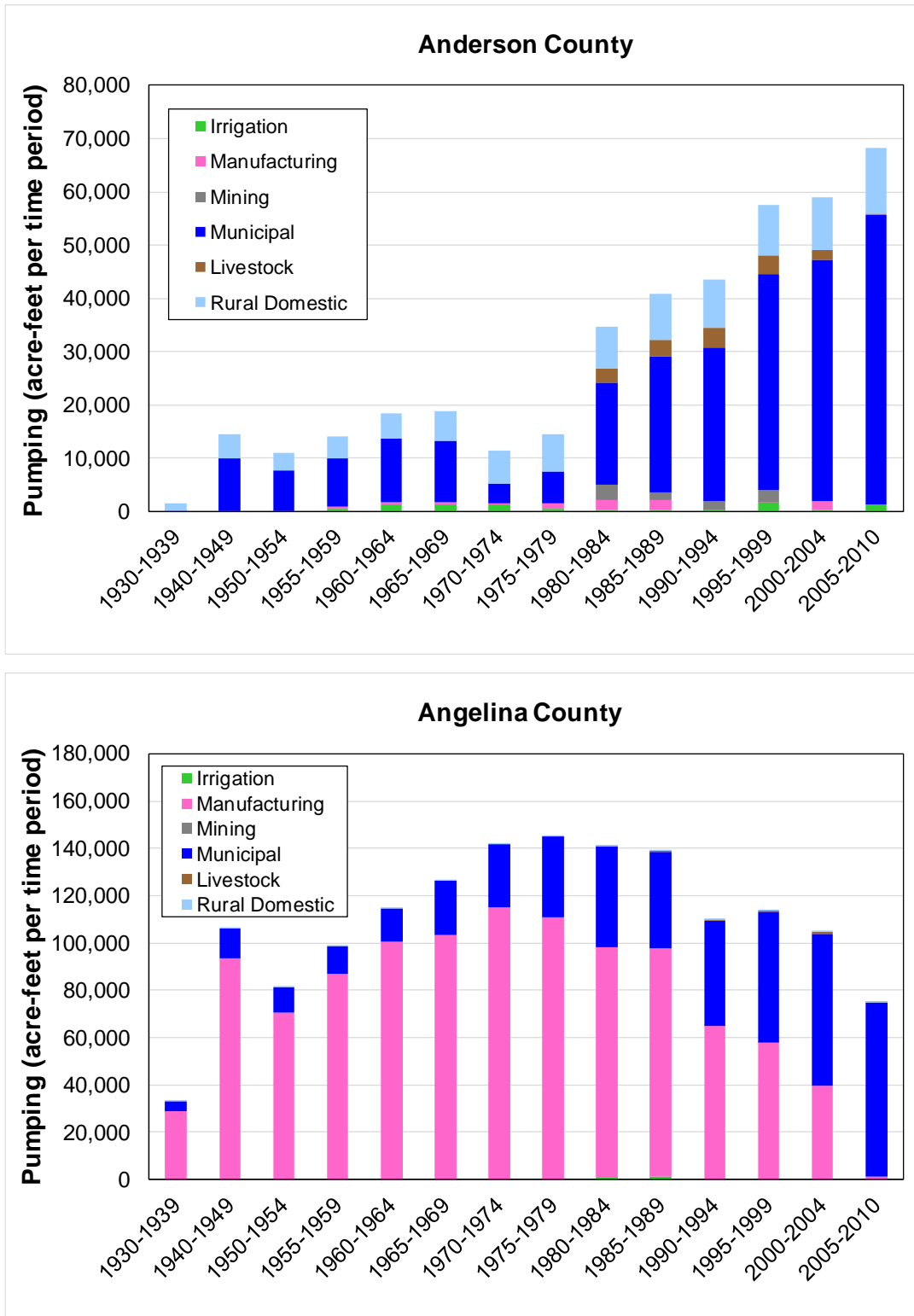


Figure D.1. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) Anderson and (b) Angelina counties.

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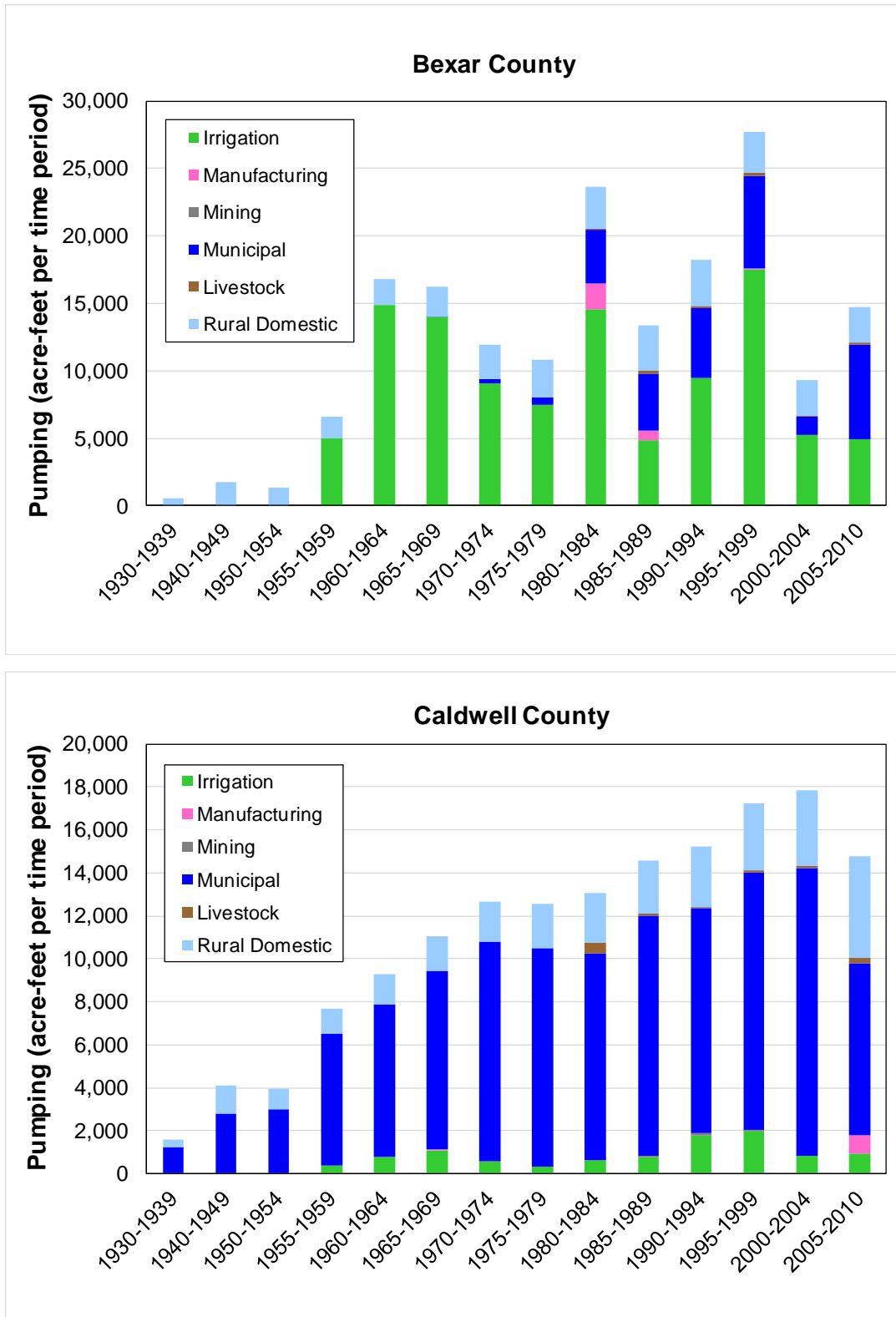


Figure D.2. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) Bexar and (b) Caldwell counties.

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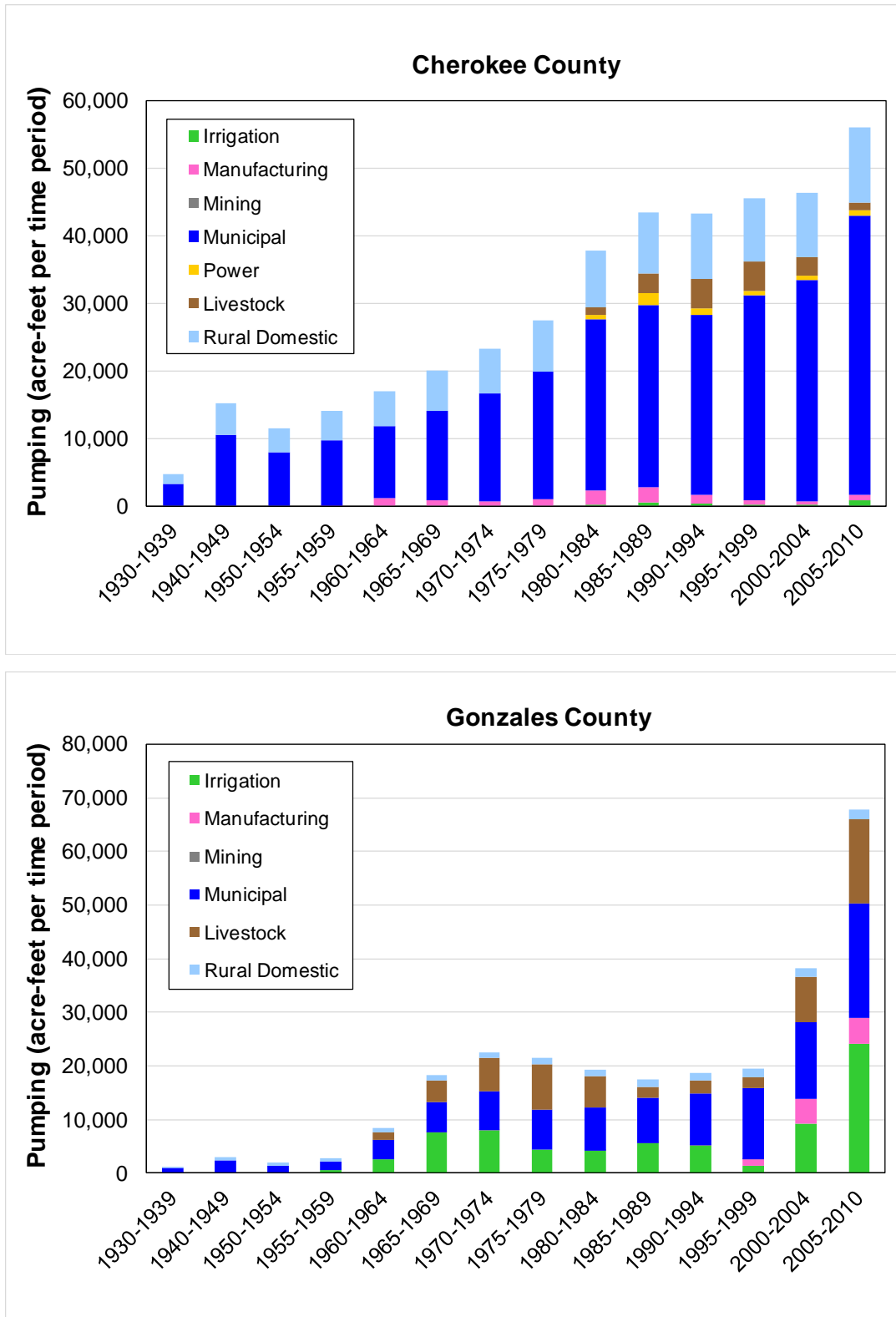


Figure D.3. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) Cherokee and (b) Gonzales counties.

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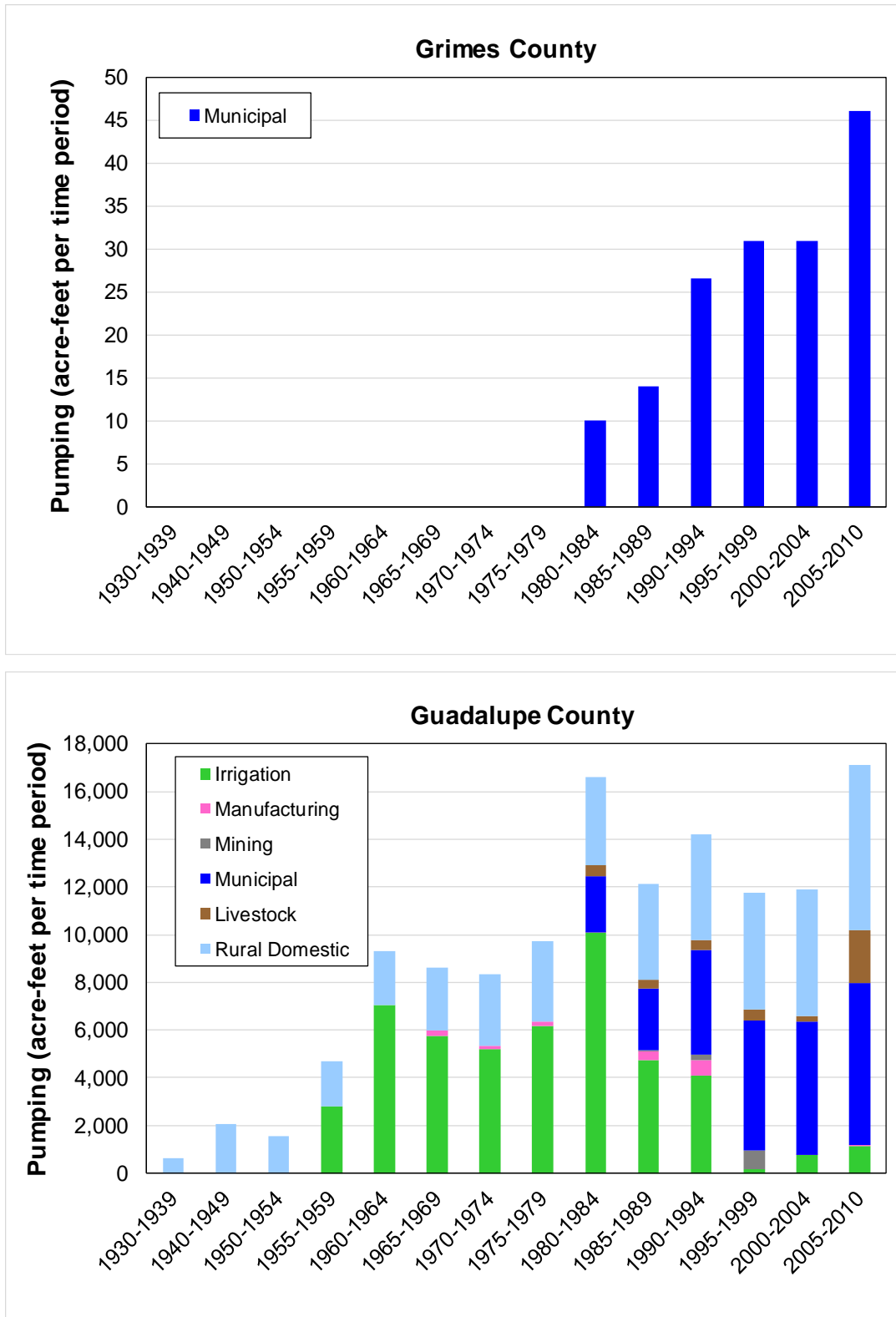


Figure D.4. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) Grimes and (b) Guadalupe counties.

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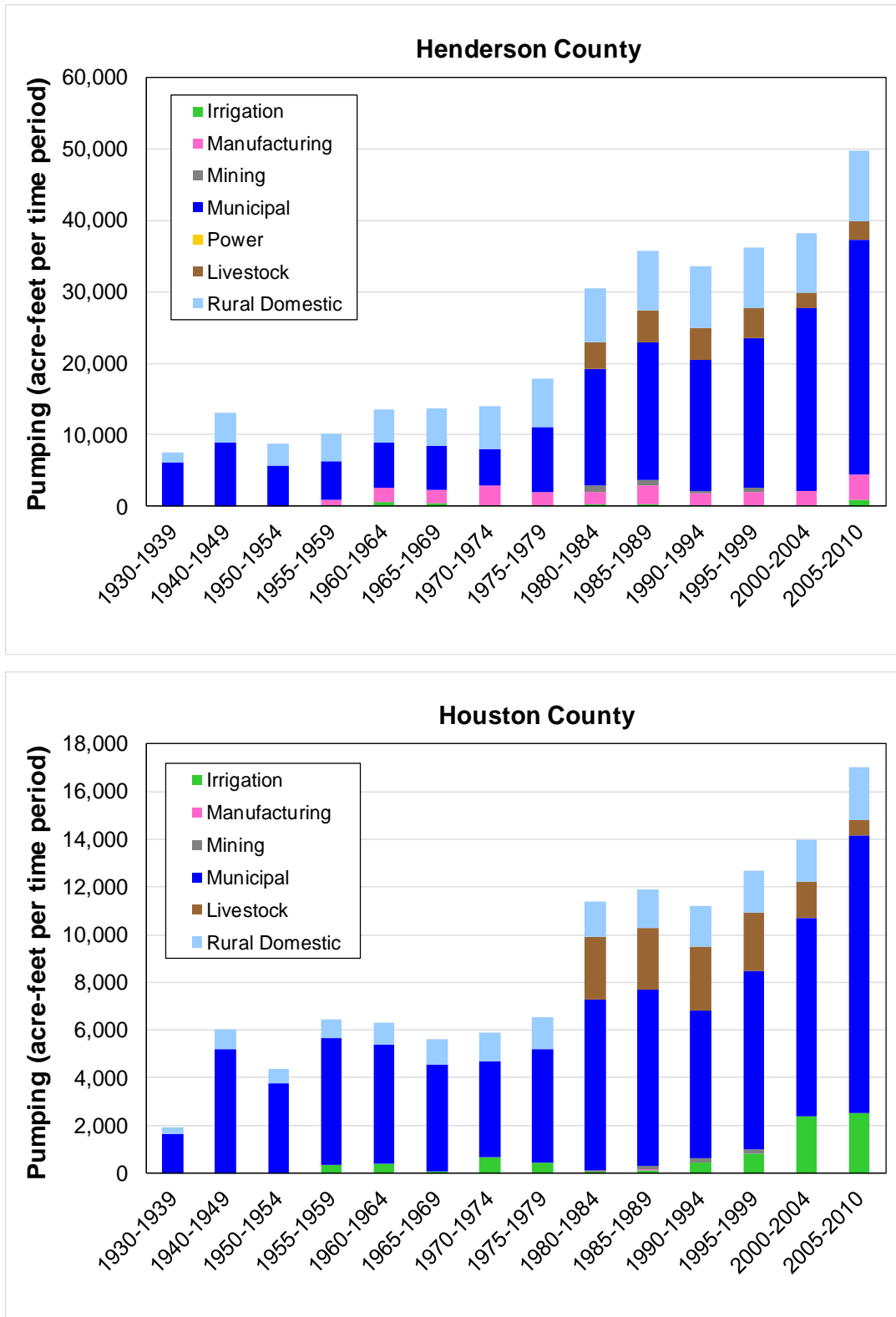


Figure D.5. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) Henderson and (b) Houston counties.

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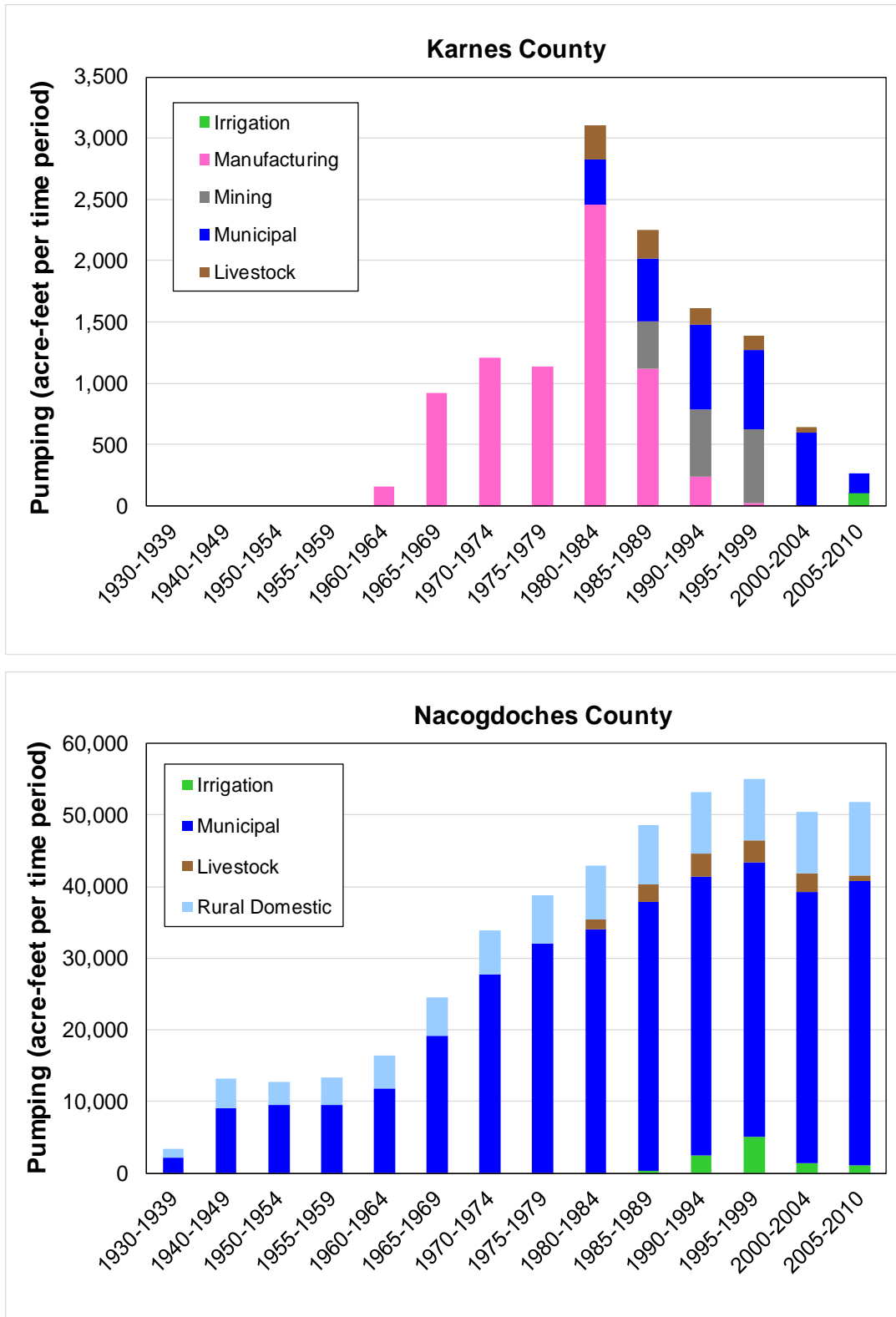


Figure D.6. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) Karnes and (b) Nacogdoches counties.

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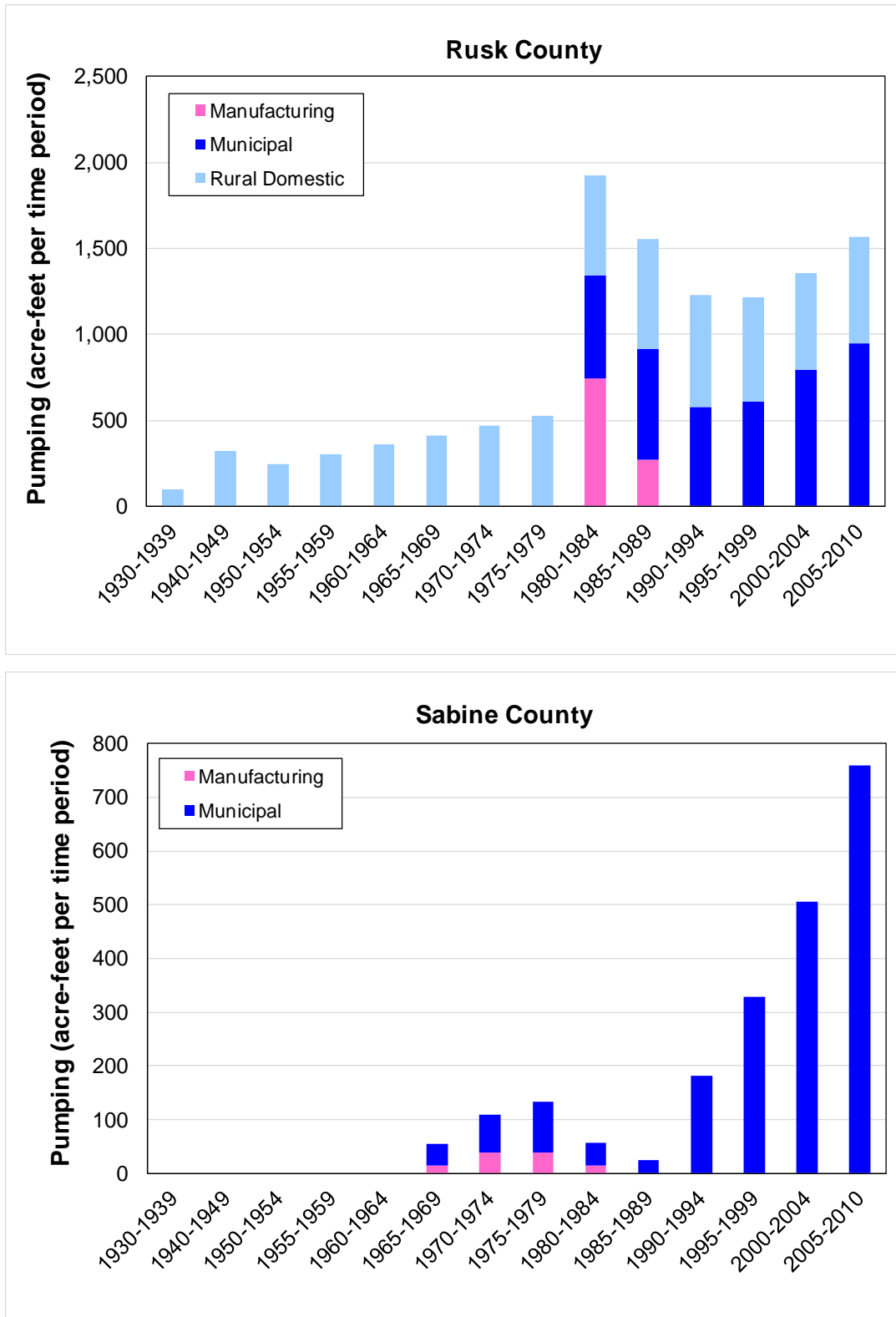


Figure D.7. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) Rusk and (b) Sabine counties.

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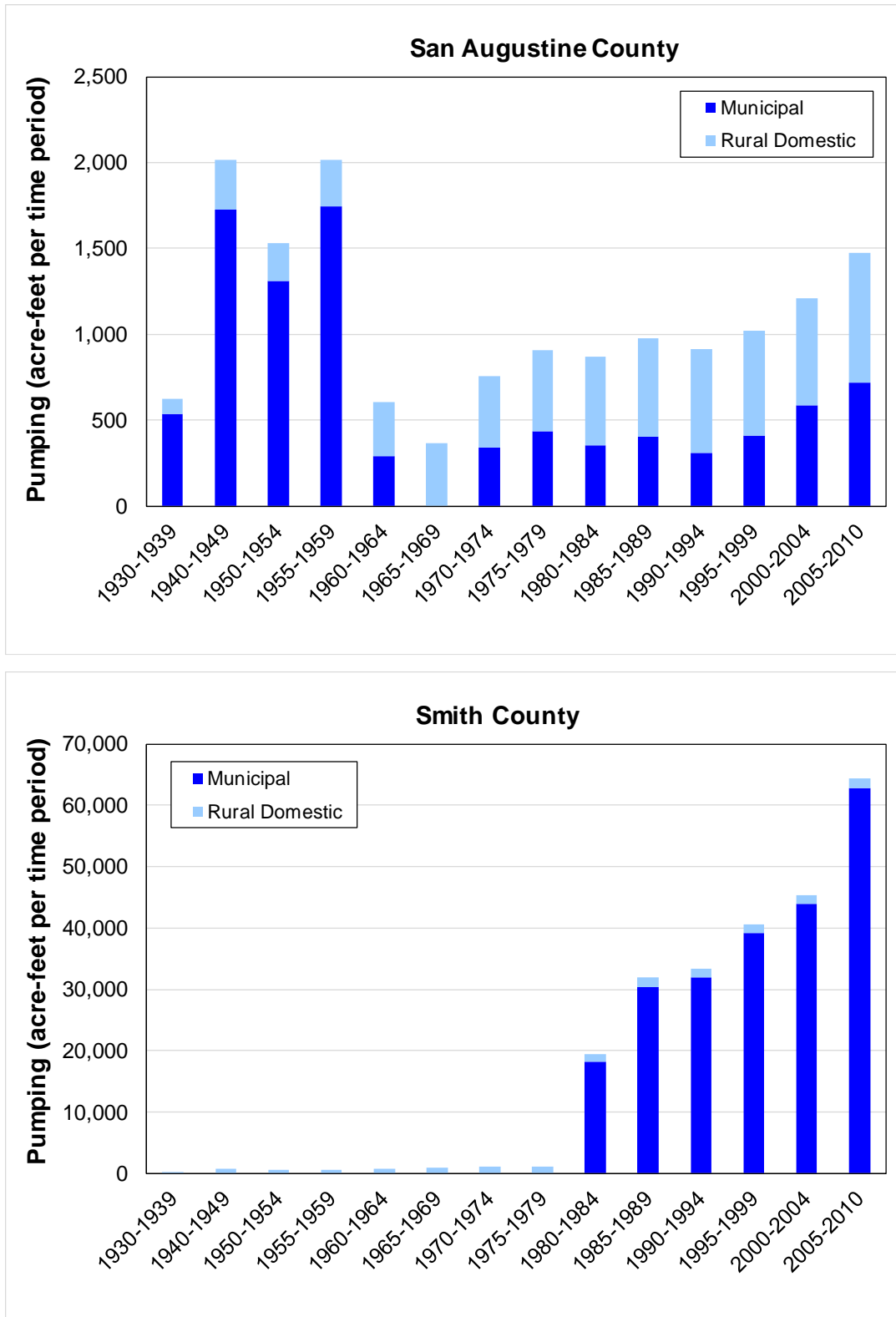


Figure D.8. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) San Augustine and (b) Smith counties.

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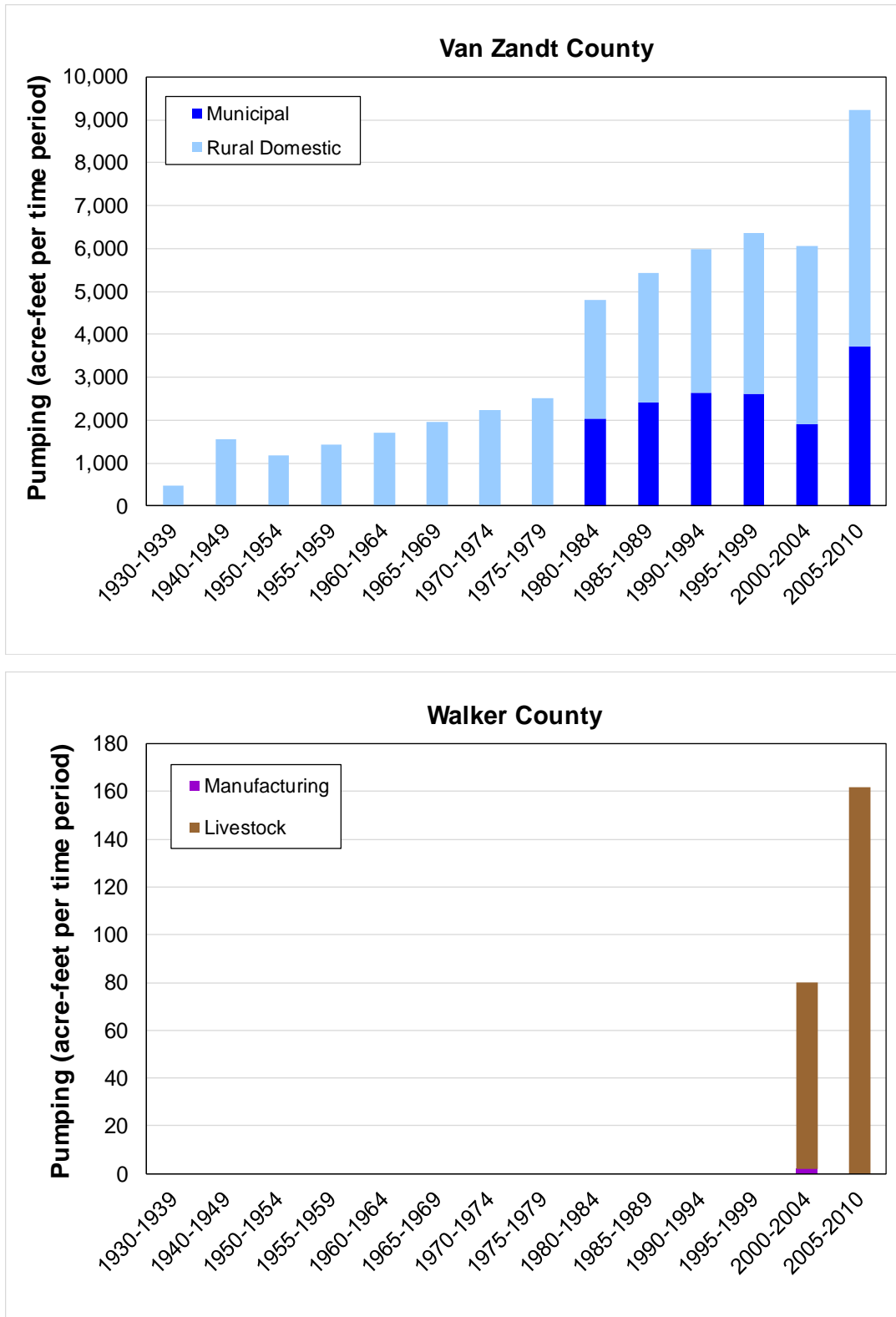


Figure D.9. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) Van Zandt and (b) Walker counties.

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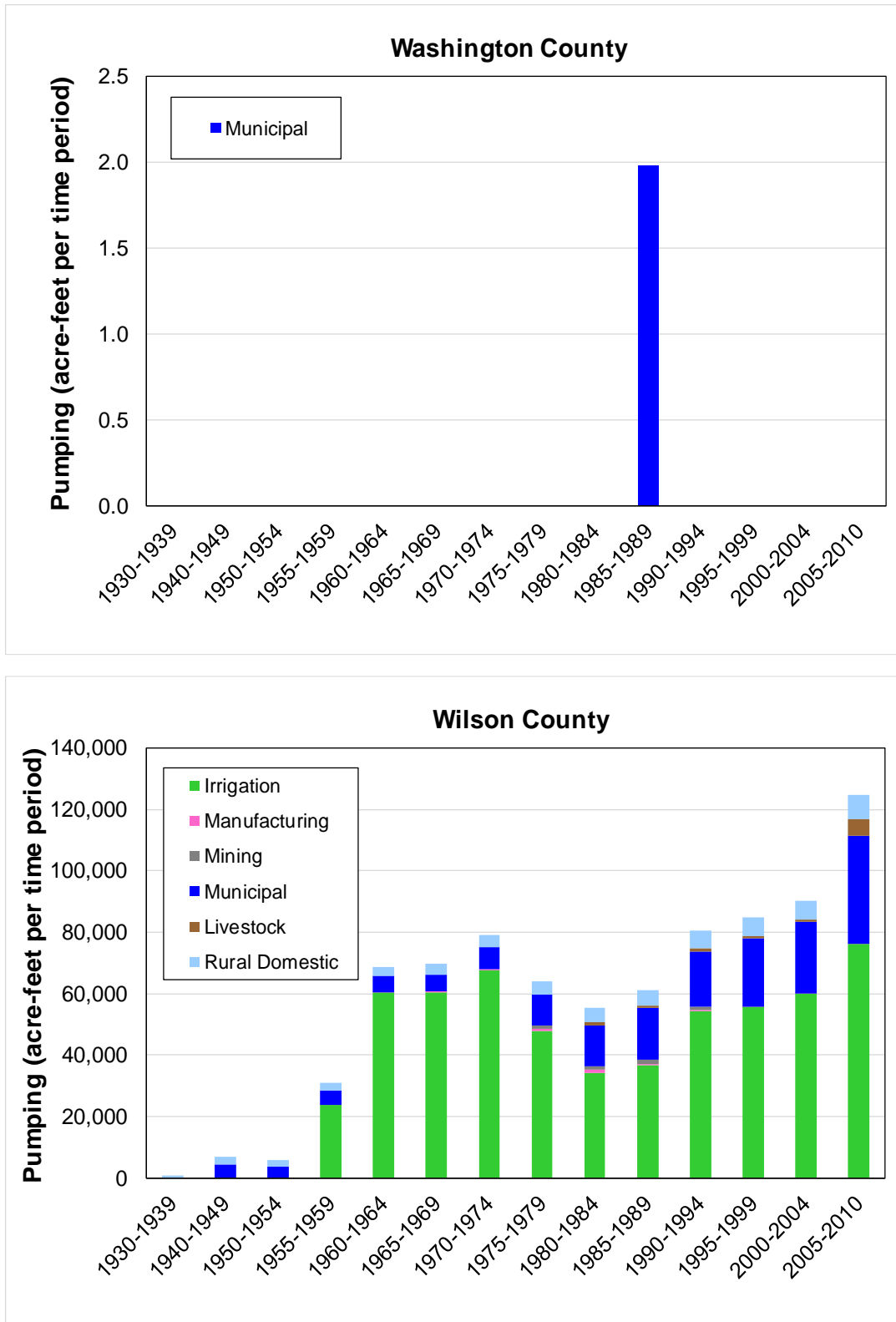


Figure D.10. Bar chart of combined pumping from the Carrizo-Wilcox, Queen City, and Sparta aquifers by type for 10-year intervals from 1930 through 1949 and 5-year intervals from 1950 through 2010 for (a) Washington and (b) Wilson counties.

16 Appendix E: Results of Aquifer Pumping Tests Performed by the Vista Ridge Project

Results of aquifer pumping tests performed in Burleson County by the Vista Ridge project are provided in this appendix. In the interest of creating and maintaining the best, most accurate groundwater planning tools for public use, Garney Construction authorized INTERA to include these data in development of the updated groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers.

Table E.1. Well information and analysis results for the aquifer pumping tests performed by the Vista Ridge project.

Well	Aquifer	Decimal Latitude	Decimal Longitude	Test Pumping Rate (gpm)	Test Length	Estimated Transmissivity (ft ² /day)	Screen Top Depth ^(a) (feet)	Screen Bottom Depth ^(b) (feet)
CW-2	Carrizo	30.43564	96.80366	1,650	48 days	3,422	960	1,255
CW-3	Carrizo	30.42803	96.80739	2,000	36 hours	2,366	980	1,220
CW-5	Carrizo	30.43037	96.82592	1,816	36 hours	3,342	950	1,220
CW-7	Carrizo	30.41233	96.81705	2,075	28 days	3,743	945	1,250
CW-9	Carrizo	30.42052	96.81123	2,000	36 hours	3,075	990	1,260
PW-10	Simsboro	30.41916	96.80507	3,000	36 hours r	16,979	2,330	2,790
PW-11	Simsboro	30.41392	96.7928	3,100	36 hours	15,642	2,340	2,700
PW-13	Simsboro	30.44583	96.76865	3,100	23.75 days	18,316	2,290	2,668
PW-15	Simsboro	30.41001	96.78026	3,503	36.5 hours	15,374	2,220	2,590
PW-16	Simsboro	30.40794	96.77606	3,110	36 hours r	13,369	2,250	2,650
PW-17	Simsboro	30.41709	96.77139	3,110	36 hours r	17,112	2,375	2,740

^(a) depth to top of uppermost screen

^(b) depth to bottom of lowermost screen

Note: gpm = gallons per minute; ft²/day = square feet per day

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17 Appendix F: Tabulation of Pumping in the Well Package from 1930 to 2010 by County and Hydrogeologic Unit

Pumping in the model Well Package tabulated by county, hydrogeologic unit, and year is provided in this appendix. The total pumping for each county and year is also provided. Pumping for the years 1930 through 1949 can be found in Table F.1, pumping for the years 1950 through 1969 can be found in Table F.2, pumping for the years 1970 through 1989 can be found in Table F.3, and pumping for the years 1990 through 2010 can be found in Table F.4. Data are in alphabetical order by county in each table. Only hydrogeology units with pumping in the county are included in the tables.

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Table F.1. Pumping in the model Well Package by county, hydrogeologic unit, and year for the years 1930 through 1949.

Hydrogeologic Unit	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
Anderson																				
TOTAL	19	155	315	436	564	715	826	958	1,077	1,203	1,292	2,109	2,288	2,410	2,560	2,702	2,838	2,938	3,020	3,238
SPARTA	-	3	6	10	13	16	19	22	26	29	32	35	38	41	45	48	51	54	57	61
WECHES	-	1	3	4	5	7	8	9	10	12	13	14	16	17	18	20	21	22	24	25
QUEEN CITY	12	125	261	361	467	596	683	791	887	989	1,053	1,171	1,283	1,338	1,421	1,496	1,566	1,599	1,614	1,738
REKLAW	-	2	4	6	8	9	11	13	15	17	19	21	23	25	26	28	30	32	34	36
CARRIZO	3	4	6	8	10	11	16	20	25	30	34	39	43	48	52	57	62	67	72	104
CALVERT BLUFF	-	1	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9	9	10	11
SIMSBORO	4	19	34	47	60	73	86	98	110	122	135	823	879	934	989	1,044	1,099	1,155	1,210	1,265
HOOPER	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Angelina																				
TOTAL	-	740	1,481	2,221	2,961	3,702	4,442	5,183	5,923	6,663	7,404	8,048	7,997	8,599	9,161	10,228	10,814	8,764	9,678	10,089
SPARTA	-	1	1	2	3	3	4	4	5	208	3,223	3,545	3,560	3,950	4,103	4,396	4,689	3,641	3,853	4,087
REKLAW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARRIZO	-	740	1,479	2,219	2,959	3,699	4,438	5,178	5,918	6,456	4,181	4,502	4,437	4,649	5,058	5,832	6,125	5,123	5,825	6,002
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bastrop																				
TOTAL	153	193	233	273	314	354	434	515	595	675	756	836	916	968	1,020	1,072	1,124	1,175	1,227	1,279
ALLUVIUM	83	94	106	118	130	141	153	165	177	189	200	212	224	238	252	267	281	295	309	324
SPARTA	-	1	3	4	6	7	8	10	11	13	14	16	17	18	20	21	23	24	25	27
WECHES	-	0	1	1	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5	5
QUEEN CITY	42	46	50	54	58	62	66	69	73	77	81	85	89	101	113	126	138	150	162	268
REKLAW	-	2	4	5	7	9	11	12	14	16	18	19	21	23	25	26	28	30	32	33
CARRIZO	28	32	37	41	45	49	54	58	62	67	71	75	80	89	99	109	119	129	139	55
CALVERT BLUFF	-	7	14	21	29	36	43	50	57	64	71	79	86	93	100	107	114	121	129	136
SIMSBORO	-	3	5	8	11	14	32	51	70	88	107	126	144	145	146	147	148	148	149	150
HOOPER	-	7	14	21	28	35	66	97	128	159	190	221	252	256	260	264	268	273	277	281
Bexar																				
TOTAL	-	12	24	36	48	60	72	84	96	107	119	131	143	155	167	179	191	203	215	227
CARRIZO	-	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3
CALVERT BLUFF	-	9	18	27	35	44	53	62	71	80	89	98	106	115	124	133	142	151	160	168
SIMSBORO	-	1	2	2	3	4	5	6	6	7	8	9	10	10	11	12	13	14	14	15
HOOPER	-	2	4	6	8	11	13	15	17	19	21	23	25	27	29	32	34	36	38	40
Brazos																				
TOTAL	-	-	-	-	-	-	-	-	-	598	1,196	1,572	1,808	2,195	2,531	2,109	2,276	2,838	3,050	2,833
ALLUVIUM	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SPARTA	-	-	-	-	-	-	-	-	-	598	1,196	1,572	1,808	2,131	2,403	1,989	2,244	2,779	2,991	2,774
QUEEN CITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARRIZO	-	-	-	-	-	-	-	-	-	-	-	-	-	32	64	60	16	29	29	29

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Hydrogeologic Unit	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	32	64	60	16	29	29	29
Burleson																				
TOTAL	22	28	33	38	44	49	55	60	65	71	280	313	329	343	358	372	387	402	416	430
ALLUVIUM	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SPARTA	22	25	29	32	35	38	42	45	48	51	95	123	90	98	106	114	122	129	137	144
WECHES	-	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	14	15	16
QUEEN CITY	-	1	3	4	5	6	8	9	10	12	13	14	16	17	18	19	21	22	23	25
REKLAW	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CARRIZO	-	0	0	0	0	0	0	0	0	0	163	166	213	217	222	226	231	236	241	245
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caldwell																				
TOTAL	69	89	110	130	150	171	191	211	232	252	272	293	313	349	386	422	459	495	532	568
WECHES	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUEEN CITY	-	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3
REKLAW	-	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3
CARRIZO	-	1	1	2	2	3	3	4	5	5	6	6	7	7	8	9	9	10	10	11
CALVERT BLUFF	69	84	99	114	129	144	159	174	189	204	219	234	249	280	311	342	373	404	436	467
SIMSBORO	-	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13
HOOPER	-	4	8	11	15	19	23	27	31	34	38	42	46	50	53	57	61	65	69	72
Cherokee																				
TOTAL	-	105	209	314	525	777	1,017	1,261	1,502	1,743	1,990	2,248	2,579	2,898	3,239	4,297	3,767	3,939	4,101	4,270
SPARTA	-	2	5	7	9	12	14	16	19	21	23	26	28	30	33	35	37	39	42	44
WECHES	-	2	3	5	7	9	10	12	14	15	17	19	21	22	24	26	27	29	31	33
QUEEN CITY	-	22	45	67	90	112	134	157	179	202	224	246	269	291	314	336	358	381	403	426
REKLAW	-	5	11	16	22	27	32	38	43	49	54	60	65	70	76	81	87	92	97	103
CARRIZO	-	68	136	204	378	593	797	1,004	1,216	1,436	1,662	1,897	2,196	2,484	2,793	3,819	3,257	3,397	3,527	3,665
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	-	5	10	14	19	24	29	33	31	20	9	-	-	-	-	-	-	-	-	-
Falls																				
TOTAL	-	1	1	2	2	3	3	4	5	5	6	6	7	7	8	9	9	10	10	11
SIMSBORO	-	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
HOOPER	-	0	1	1	2	2	3	3	4	4	4	5	5	6	6	7	7	8	8	8
Fayette																				
TOTAL	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SPARTA	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUEEN CITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARRIZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Hydrogeologic Unit	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	
Freestone																					
TOTAL	-	15	29	44	58	73	96	120	144	167	191	202	212	235	258	281	304	327	350	373	
QUEEN CITY	-	1	1	2	2	3	4	4	5	5	6	7	7	8	8	9	10	10	11	11	
REKLAW	-	1	2	3	4	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	
CARRIZO	-	1	3	4	5	7	8	9	10	12	13	14	16	17	18	20	21	22	23	25	
CALVERT BLUFF	-	8	15	23	31	39	46	54	62	70	77	85	93	101	108	116	124	132	139	147	
SIMSBORO	-	2	3	5	6	8	15	22	29	36	43	42	41	48	54	61	68	74	117	127	
HOOPER	-	2	5	7	10	12	19	25	31	37	43	44	45	51	57	63	69	74	45	47	
Gonzales																					
TOTAL	31	47	64	80	97	114	130	147	163	180	196	213	230	246	263	279	287	294	301	308	
SPARTA	15	19	24	28	32	36	40	44	48	53	57	61	65	69	73	77	84	82	81	79	
WECHES	-	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	
QUEEN CITY	10	15	21	26	31	36	42	47	52	57	63	68	73	78	83	89	82	84	86	87	
REKLAW	-	1	1	2	3	4	4	5	6	6	7	8	8	9	10	11	11	12	13	13	
CARRIZO	5	11	17	23	29	35	41	46	52	58	64	70	76	82	88	94	99	105	111	117	
CALVERT BLUFF	-	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
HOOPER	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Guadalupe																					
TOTAL	-	14	28	43	57	71	85	100	114	128	142	157	171	185	199	214	228	242	256	271	
QUEEN CITY	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
REKLAW	-	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	
CARRIZO	-	2	5	7	10	12	15	17	19	22	24	27	29	32	34	37	39	41	44	46	
CALVERT BLUFF	-	6	12	18	23	29	35	41	47	53	59	65	70	76	82	88	94	100	106	111	
SIMSBORO	-	1	2	3	4	5	6	7	8	9	10	11	13	14	15	16	17	18	19	20	
HOOPER	-	5	10	14	19	24	29	34	38	43	48	53	57	62	67	72	77	81	86	91	
Henderson																					
TOTAL	498	553	608	663	718	773	828	883	938	993	1,048	1,104	1,160	1,216	1,277	1,338	1,399	1,460	1,521	1,582	
QUEEN CITY	-	15	29	44	59	74	88	103	118	133	147	162	177	192	206	221	236	250	265	280	
REKLAW	-	3	6	9	11	14	17	20	23	26	29	31	34	37	40	43	46	49	52	54	
CARRIZO	-	2	3	5	6	8	10	11	13	14	16	18	19	21	22	24	26	27	29	30	
CALVERT BLUFF	-	5	10	16	21	26	31	37	42	47	52	57	63	68	73	78	84	89	94	99	
SIMSBORO	498	526	553	581	608	636	663	691	718	746	773	802	831	859	893	926	960	993	1,027	1,061	
HOOPER	-	3	6	9	12	15	18	21	24	27	30	33	36	39	42	46	49	52	55	58	
Houston																					
TOTAL	-	42	85	127	169	212	254	296	338	381	423	465	508	550	586	623	659	695	732	768	
SPARTA	-	34	67	101	134	168	202	235	269	302	336	370	403	437	466	496	525	554	584	613	
WECHES	-	1	2	3	4	6	7	8	9	10	11	12	13	14	15	17	18	19	20	21	
QUEEN CITY	-	1	2	3	4	6	7	8	9	10	11	12	13	15	16	17	18	19	20	21	
REKLAW	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CARRIZO	-	6	13	19	26	32	39	45	52	58	65	71	78	84	89	94	98	103	108	113	

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Hydrogeologic Unit	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Karnes																				
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARRIZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lee																				
TOTAL	49	65	81	97	112	128	144	160	175	195	216	236	256	301	312	324	335	347	358	369
SPARTA	-	1	3	4	6	7	9	10	12	13	15	16	18	19	21	22	24	25	27	28
WECHES	-	1	2	3	4	5	6	7	8	9	10	11	12	13	13	14	15	16	17	18
QUEEN CITY	20	25	30	35	41	46	51	56	62	67	72	77	82	97	99	100	101	102	104	105
REKLAW	-	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2
CARRIZO	30	36	42	48	55	61	67	74	80	91	101	112	123	148	154	160	166	172	178	184
CALVERT BLUFF	-	1	3	4	5	6	8	9	10	12	13	14	15	17	18	19	20	22	23	24
SIMSBORO	-	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5
HOOPER	-	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3
Leon																				
TOTAL	-	13	26	38	51	64	78	100	123	146	202	263	323	383	408	434	459	484	509	534
SPARTA	-	2	4	7	9	11	13	15	17	20	22	24	26	28	30	33	35	37	39	41
WECHES	-	2	3	5	6	8	9	11	12	14	15	17	18	20	21	23	24	26	28	29
QUEEN CITY	-	7	15	22	29	37	44	51	58	66	80	95	111	126	134	142	151	159	167	176
REKLAW	-	1	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	17	17
CARRIZO	-	0	1	1	2	2	3	3	4	4	12	22	32	41	44	47	50	53	56	58
CALVERT BLUFF	-	0	1	1	2	2	3	14	24	34	65	95	125	156	165	175	184	194	203	212
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limestone																				
TOTAL	-	5	10	15	20	25	30	35	40	45	50	55	60	64	69	74	79	84	89	94
CALVERT BLUFF	-	2	3	5	7	9	10	12	14	16	17	19	21	23	24	26	28	30	31	33
SIMSBORO	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
HOOPER	-	2	4	7	9	11	13	15	18	20	22	24	26	29	31	33	35	38	40	42
Madison																				
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43	86
SPARTA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	43	86
QUEEN CITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARRIZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Milam																				
TOTAL	230	251	271	291	311	331	352	372	392	412	432	453	473	493	513	534	554	574	594	614
ALLUVIUM	-	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
QUEEN CITY	-	1	1	2	3	4	4	5	6	7	7	8	9	10	10	11	12	12	13	14
REKLAW	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

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Hydrogeologic Unit	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
CARRIZO	-	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9
CALVERT BLUFF	-	3	6	10	13	16	19	23	26	29	32	36	39	42	45	49	52	55	58	62
SIMSBORO	230	243	255	267	279	291	303	316	328	340	352	364	376	388	401	413	425	437	449	461
HOOPER	-	3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	40	43	45	48
Nacogdoches																				
TOTAL	-	77	154	231	307	384	461	538	615	692	2,775	815	4,110	1,618	1,721	1,891	2,394	5,616	5,856	6,118
SPARTA	-	6	13	19	26	32	39	45	52	58	65	71	772	821	910	975	1,040	836	885	938
WECHES	-	6	12	18	24	30	35	41	47	53	59	65	71	77	83	89	94	100	106	112
QUEEN CITY	-	8	16	24	32	41	49	57	65	73	81	89	97	105	114	122	130	138	146	154
REKLAW	-	5	9	14	18	23	28	32	37	41	46	51	55	60	64	69	74	78	83	87
CARRIZO	-	51	102	153	204	256	307	358	409	460	2,510	525	3,099	540	534	621	1,032	4,431	4,603	4,793
CALVERT BLUFF	-	1	1	2	3	3	4	4	5	6	13	13	14	15	15	16	23	30	31	31
SIMSBORO	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	2	2	2
Navarro																				
TOTAL	-	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10
CALVERT BLUFF	-	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
SIMSBORO	-	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1
HOOPER	-	0	1	1	2	2	3	3	3	4	4	5	5	6	6	6	7	7	8	8
Robertson																				
TOTAL	115	136	157	179	200	221	243	264	285	307	328	349	385	420	500	580	659	739	819	899
ALLUVIUM	-	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3
SPARTA	-	1	2	3	4	6	7	8	9	10	11	12	13	15	16	17	18	19	20	21
WECHES	-	1	2	2	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	14
QUEEN CITY	-	3	5	8	10	13	15	18	21	23	26	28	31	33	36	39	41	44	46	49
REKLAW	-	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	18	19	21
CARRIZO	-	1	2	2	3	4	5	5	6	7	8	9	9	10	11	12	12	13	14	15
CALVERT BLUFF	-	2	3	5	7	8	10	12	13	15	17	18	20	22	24	25	27	29	30	32
SIMSBORO	115	127	140	153	166	178	191	204	217	229	242	255	268	281	347	414	480	547	614	680
HOOPER	-	0	1	1	2	2	3	3	3	4	4	5	19	34	39	44	49	54	59	64
Rusk																				
TOTAL	-	2	4	7	9	11	13	16	18	20	22	25	27	29	31	34	36	38	40	43
SPARTA	-	0	0	0	1	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3
QUEEN CITY	-	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13
REKLAW	-	1	2	2	3	4	5	5	6	7	8	8	9	10	11	12	12	13	14	15
CARRIZO	-	0	1	1	1	2	2	3	3	3	4	4	4	5	5	5	6	6	7	7
CALVERT BLUFF	-	0	1	1	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5	5
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sabine																				
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REKLAW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Hydrogeologic Unit	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
San Augustine																				
TOTAL	-	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38
SPARTA	-	1	2	3	5	6	7	8	9	10	11	12	14	15	16	17	18	19	20	21
WECHES	-	0	1	1	2	2	3	3	4	4	5	5	5	6	6	7	7	8	8	9
QUEEN CITY	-	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2
REKLAW	-	0	0	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	3	4
CARRIZO	-	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
CALVERT BLUFF	-	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Smith																				
TOTAL	-	5	10	15	20	25	30	35	40	46	51	56	61	66	71	76	81	86	91	96
SPARTA	-	2	4	5	7	9	11	13	14	16	18	20	22	23	25	27	29	31	32	34
WECHES	-	0	0	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	4
QUEEN CITY	-	3	6	9	12	15	18	21	25	28	31	34	37	40	43	46	49	52	55	58
CARRIZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Van Zandt																				
TOTAL	-	11	21	32	43	53	64	75	85	96	106	117	128	138	149	160	170	181	192	202
QUEEN CITY	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	20
REKLAW	-	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13
CARRIZO	-	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9
CALVERT BLUFF	-	4	9	13	18	22	27	31	36	40	44	49	53	58	62	67	71	76	80	84
SIMSBORO	-	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	14	15	16
HOOPER	-	3	6	10	13	16	19	22	25	29	32	35	38	41	44	48	51	54	57	60
Williamson																				
TOTAL	-	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13
CALVERT BLUFF	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SIMSBORO	-	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
HOOPER	-	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	9	9	10	10
Wilson																				
TOTAL	3	23	44	65	86	106	127	148	169	189	210	266	297	775	824	874	923	972	1,021	1,071
SPARTA	-	1	1	2	2	3	3	4	4	5	5	6	7	7	8	8	9	9	10	10
WECHES	-	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	12	12	13
QUEEN CITY	-	5	10	15	20	25	30	35	41	46	51	56	61	178	192	207	221	235	250	264
REKLAW	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CARRIZO	3	12	20	29	38	47	56	65	74	83	92	136	156	510	538	566	594	622	650	678
CALVERT BLUFF	-	5	9	14	18	23	27	32	36	41	45	50	54	59	64	68	73	77	82	86
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grand Total	1,189	2,585	4,004	5,386	6,880	8,438	9,994	11,584	13,159	15,342	19,739	20,366	24,817	24,688	26,658	29,152	30,483	32,959	35,081	36,436

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Table F.2. Pumping in the model Well Package by county, hydrogeologic unit, and year for the years 1950 through 1969.

Formation	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
Anderson																				
TOTAL	3,186	3,197	3,256	3,366	3,534	3,710	3,890	4,050	4,669	4,472	4,798	4,900	5,443	5,894	5,857	6,100	6,180	6,456	6,345	4,602
SPARTA	64	67	70	73	77	80	83	86	89	93	96	99	102	105	109	112	115	118	121	124
WECHES	26	27	29	30	31	33	34	35	37	38	39	41	42	43	44	46	47	48	50	51
QUEEN CITY	1,616	1,558	1,548	1,589	1,688	1,787	1,885	1,984	2,113	2,210	2,308	2,405	2,503	2,600	2,698	2,798	2,908	3,016	3,114	3,215
REKLAW	38	40	41	43	45	47	49	51	53	55	57	58	60	62	64	66	68	70	72	74
CARRIZO	111	118	125	132	139	545	574	587	727	685	780	768	939	1,024	987	1,020	1,018	1,035	980	473
CALVERT BLUFF	11	12	12	13	13	14	18	18	110	86	80	65	64	64	65	71	98	121	127	153
SIMSBORO	1,320	1,375	1,430	1,486	1,541	1,205	1,247	1,288	1,451	1,241	1,377	1,417	1,689	1,954	1,851	1,946	1,882	2,000	1,830	458
HOOPER	-	-	-	-	-	-	-	-	90	65	61	47	44	41	39	42	45	48	51	54
Angelina																				
TOTAL	10,744	11,185	11,626	12,549	12,989	13,614	14,936	15,466	15,367	16,227	16,531	19,576	16,103	20,325	17,128	18,922	19,863	20,042	21,558	20,931
SPARTA	3,399	3,569	3,739	3,909	4,078	3,512	3,206	3,358	3,409	3,606	3,731	4,050	3,426	4,449	3,491	3,770	3,981	3,901	3,862	4,078
REKLAW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARRIZO	6,668	6,905	7,142	7,861	8,098	9,403	11,092	11,440	11,280	11,903	12,059	14,720	11,996	14,990	12,943	14,402	15,090	15,365	16,928	16,042
CALVERT BLUFF	677	711	745	779	813	699	638	668	678	718	742	806	681	886	694	750	792	775	768	811
Bastrop																				
TOTAL	1,331	1,383	1,434	1,486	1,538	1,590	1,917	1,681	1,990	2,018	1,702	2,297	2,058	2,482	3,546	3,901	3,969	4,135	3,890	4,129
ALLUVIUM	338	352	366	381	395	409	604	452	453	411	294	405	398	531	563	433	471	545	453	515
SPARTA	28	30	31	32	34	35	37	38	41	43	45	48	50	56	84	95	101	102	103	104
WECHES	6	6	6	7	7	7	7	8	8	8	9	9	9	9	10	10	10	11	11	11
QUEEN CITY	287	306	326	345	364	383	495	385	612	646	336	739	413	476	447	524	507	565	409	454
REKLAW	35	37	39	40	42	44	46	47	49	51	53	54	56	58	60	61	63	65	67	69
CARRIZO	58	61	64	67	69	72	75	78	88	106	119	127	139	202	535	621	624	657	651	646
CALVERT BLUFF	143	150	157	164	171	179	186	193	229	250	273	305	333	426	867	1,094	1,102	1,012	1,006	1,004
SIMSBORO	151	152	152	153	154	155	70	73	76	78	81	84	87	89	92	102	105	199	252	281
HOOPER	285	289	293	297	302	306	397	407	434	424	492	526	574	635	889	960	986	980	938	1,046
Bexar																				
TOTAL	239	251	263	275	287	298	310	322	2,769	2,915	3,061	3,208	3,354	3,500	3,646	3,510	3,374	3,241	3,105	2,989
CARRIZO	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6
CALVERT BLUFF	177	186	195	204	213	222	231	239	2,683	2,826	2,969	3,112	3,255	3,398	3,541	3,402	3,263	3,124	2,985	2,846
SIMSBORO	16	17	18	18	19	20	21	22	22	23	24	25	26	26	27	28	29	33	34	55
HOOPER	42	44	46	48	51	53	55	57	59	61	63	65	67	70	72	74	76	78	80	82
Brazos																				
TOTAL	3,162	3,995	4,502	4,063	4,769	5,362	6,219	5,829	5,865	5,713	5,977	6,173	7,380	8,741	8,173	8,776	9,147	9,951	9,920	10,816
ALLUVIUM	0	0	0	0	0	68	143	173	112	137	153	194	210	228	234	235	208	203	242	202
SPARTA	3,162	3,995	4,502	3,706	3,073	3,410	3,931	3,023	3,079	2,958	2,912	2,990	3,585	4,257	2,989	3,246	3,410	3,711	3,308	3,595

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Formation	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
QUEEN CITY	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARRIZO	-	-	-	357	320	359	360	390	405	339	299	299	351	395	343	399	432	463	424	440
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	-	-	-	-	1,376	1,525	1,785	2,243	2,269	2,279	2,613	2,691	3,234	3,862	4,607	4,895	5,097	5,574	5,946	6,579
Burleson																				
TOTAL	449	463	477	491	478	560	529	542	513	513	477	432	459	582	652	593	670	674	664	723
ALLUVIUM	5	5	5	5	5	5	4	5	5	5	5	5	5	3	3	3	3	3	2	2
SPARTA	152	159	167	174	181	189	216	218	220	197	165	119	124	221	283	257	282	240	243	228
WECHES	17	18	19	19	20	21	22	23	24	25	25	26	27	28	29	30	31	31	32	33
QUEEN CITY	26	27	29	30	31	41	41	43	46	49	49	46	48	49	51	58	61	66	72	85
REKLAW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CARRIZO	250	254	259	263	240	305	245	253	219	238	233	236	255	281	287	246	294	333	315	374
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caldwell																				
TOTAL	605	641	678	901	1,124	1,348	1,549	1,381	1,691	1,652	1,634	1,636	1,809	2,065	2,153	2,151	2,147	2,346	2,176	2,237
WECHES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUEEN CITY	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6
REKLAW	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	5	6	6	6
CARRIZO	11	12	13	13	14	14	15	15	96	78	60	42	52	86	120	105	95	92	75	65
CALVERT BLUFF	498	529	560	703	847	990	1,180	1,030	1,236	1,179	1,202	1,236	1,356	1,544	1,555	1,556	1,572	1,731	1,368	1,408
SIMSBORO	13	14	15	90	165	241	247	224	245	275	249	231	269	300	305	318	307	351	560	581
HOOPER	76	80	84	88	92	95	99	103	107	111	114	118	122	126	163	162	162	161	161	172
Cherokee																				
TOTAL	4,444	4,611	4,782	5,885	5,115	5,380	5,545	5,682	6,101	6,311	6,612	7,624	6,925	7,080	7,187	8,899	7,468	7,576	7,526	7,706
SPARTA	46	49	51	53	56	80	83	87	88	90	94	99	105	110	121	119	124	129	130	140
WECHES	34	36	38	39	41	43	45	46	48	50	51	53	55	57	58	60	62	63	65	67
QUEEN CITY	448	470	493	515	538	560	582	605	627	650	815	953	860	883	835	857	885	914	940	969
REKLAW	108	114	119	125	130	135	141	146	152	157	162	168	173	179	184	190	202	207	213	217
CARRIZO	3,807	3,942	4,082	5,152	4,351	4,562	4,694	4,798	5,186	5,365	5,489	6,350	5,732	5,851	5,989	7,657	6,175	6,249	6,156	6,283
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	20	11	18	25
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	3	5
Falls																				
TOTAL	11	12	13	13	14	14	15	15	16	17	17	18	18	19	19	20	21	21	22	22
SIMSBORO	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	5	5	5
HOOPER	9	9	10	10	11	11	12	12	13	13	13	14	14	15	15	16	16	17	17	17
Fayette																				
TOTAL	0	0	0	0	0	0	0	1	12	11	11	11	17	15	105	102	99	95	92	88

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Formation	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
SPARTA	0	0	0	0	0	0	0	1	1	1	1	1	6	5	91	88	85	82	79	76
QUEEN CITY	-	-	-	-	-	-	-	-	11	11	11	11	10	10	10	10	10	9	9	9
CARRIZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	3	3	2	2
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1
Freestone																				
TOTAL	396	419	443	466	489	512	535	558	607	624	641	639	677	733	729	738	1,011	1,041	1,031	1,257
QUEEN CITY	12	13	13	14	14	15	15	16	17	17	18	18	19	20	20	21	21	22	23	23
REKLAW	18	18	19	20	21	22	23	24	25	25	26	27	28	29	30	31	32	32	33	34
CARRIZO	26	27	29	30	31	33	34	35	36	38	39	40	42	43	44	46	47	48	50	51
CALVERT BLUFF	155	163	170	178	186	193	201	209	243	251	259	261	262	264	266	273	280	288	295	302
SIMSBORO	137	147	157	167	177	187	197	207	217	221	225	215	246	171	166	165	186	196	206	220
HOOPER	50	52	55	57	59	62	64	67	69	72	74	77	79	206	202	202	445	455	425	627
Gonzales																				
TOTAL	316	294	299	305	311	321	333	344	632	638	621	636	1,066	1,892	2,553	2,692	2,962	3,172	3,422	3,503
SPARTA	77	76	74	72	71	69	68	66	64	65	66	67	114	142	132	152	209	204	201	217
WECHES	10	10	11	11	12	12	13	13	14	14	15	15	16	17	18	18	19	20	20	21
QUEEN CITY	89	91	93	94	96	98	99	101	103	106	109	112	236	275	296	331	384	408	432	465
REKLAW	14	15	15	16	17	18	18	19	20	20	21	22	22	23	24	25	25	26	27	27
CARRIZO	123	100	104	109	113	122	132	142	385	393	377	393	641	1,298	1,858	1,937	2,091	2,277	2,495	2,516
CALVERT BLUFF	2	2	2	3	3	3	3	3	46	40	33	27	35	135	222	226	230	234	243	253
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOOPER	-	-	-	-	-	-	-	-	-	-	-	-	2	2	2	3	3	3	4	4
Guadalupe																				
TOTAL	285	299	313	328	342	356	370	385	1,791	1,810	1,828	1,847	1,866	1,885	1,903	1,828	1,753	1,677	1,602	1,527
QUEEN CITY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
REKLAW	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3
CARRIZO	49	51	54	56	58	61	63	66	532	536	540	544	548	552	556	528	501	474	358	338
CALVERT BLUFF	117	123	129	135	141	147	153	158	628	636	643	650	658	665	672	648	624	600	488	472
SIMSBORO	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	37	38	39	305	283
HOOPER	96	101	105	110	115	120	124	129	598	604	611	617	623	630	636	611	586	561	447	429
Henderson																				
TOTAL	1,643	1,704	1,765	1,826	1,887	1,971	1,757	1,792	2,337	2,339	2,437	2,476	2,701	2,876	3,012	2,971	2,848	2,762	2,626	2,552
QUEEN CITY	295	309	324	339	354	374	392	407	422	437	449	466	482	497	547	569	578	590	601	629
REKLAW	57	60	63	66	69	72	74	77	80	83	86	89	92	94	97	100	103	106	109	112
CARRIZO	32	34	35	37	38	46	47	49	65	70	75	82	82	86	86	84	83	83	79	80
CALVERT BLUFF	105	110	115	120	125	131	136	141	146	152	157	162	167	172	178	183	188	193	199	204

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Formation	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
SIMSBORO	1,094	1,128	1,161	1,195	1,228	1,273	1,029	1,036	1,503	1,468	1,532	1,530	1,731	1,872	1,929	1,866	1,733	1,633	1,493	1,387
HOOPER	61	64	67	70	73	76	79	82	120	129	139	148	146	153	175	169	163	157	146	142
Houston																				
TOTAL	805	841	877	914	950	1,071	1,217	1,376	1,864	1,792	1,391	1,192	1,178	1,295	1,254	1,169	1,265	1,172	1,041	951
SPARTA	643	672	701	731	760	874	1,020	1,172	1,545	1,483	1,084	899	943	1,075	1,039	943	1,084	985	797	811
WECHES	22	23	24	25	27	28	29	30	31	32	33	34	35	36	38	39	40	41	42	43
QUEEN CITY	22	24	25	26	27	28	29	30	139	123	108	92	76	61	45	46	47	48	50	52
REKLAW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CARRIZO	117	122	127	132	136	141	139	143	149	153	166	166	123	123	132	141	94	98	151	45
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Karnes																				
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARRIZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lee																				
TOTAL	381	392	404	415	427	461	485	504	527	546	531	652	544	1,310	1,290	1,332	1,358	1,482	1,487	1,715
SPARTA	30	31	33	34	36	49	52	54	57	57	60	79	65	133	132	132	133	135	137	144
WECHES	19	20	21	22	23	24	25	26	27	28	29	30	31	35	36	37	38	39	39	40
QUEEN CITY	106	107	230	232	233	234	242	250	259	269	279	389	288	719	691	707	701	795	785	958
REKLAW	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4
CARRIZO	190	196	80	86	92	104	112	119	127	130	96	90	92	189	182	191	205	216	212	245
CALVERT BLUFF	26	27	28	29	31	38	40	42	44	46	50	46	50	195	207	218	230	242	254	265
SIMSBORO	5	5	6	6	6	6	7	7	7	7	8	8	8	27	28	28	28	28	29	29
HOOPER	3	3	3	3	4	4	4	4	4	5	6	7	8	8	12	16	20	23	27	31
Leon																				
TOTAL	565	595	625	655	685	715	706	731	949	973	1,012	940	873	909	895	863	866	912	870	919
SPARTA	43	46	48	50	52	54	56	59	61	63	65	67	69	72	74	76	78	80	82	85
WECHES	31	32	34	35	37	38	40	41	43	44	46	47	49	51	52	54	55	57	58	60
QUEEN CITY	281	288	295	301	308	315	294	307	372	368	368	332	348	373	388	404	407	423	411	436
REKLAW	18	19	20	21	22	23	24	25	26	27	28	28	29	30	31	32	33	34	35	36
CARRIZO	42	50	58	67	75	83	89	94	112	118	123	123	112	140	134	92	75	85	78	81
CALVERT BLUFF	149	160	170	181	191	202	203	205	336	354	382	343	266	244	215	206	217	233	205	221
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limestone																				
CALVERT BLUFF	99	104	109	114	119	124	129	134	139	144	149	154	159	164	169	180	191	202	212	225
SIMSBORO	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
HOOPER	44	46	49	51	53	55	57	60	62	64	66	68	71	73	75	83	91	100	108	117
Madison																				

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Formation	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
TOTAL	129	172	215	258	300	363	353	379	474	418	371	436	501	583	536	577	570	641	626	735
SPARTA	129	172	215	258	300	360	351	376	413	355	296	358	420	499	448	480	468	527	500	594
QUEEN CITY	-	-	-	-	-	3	3	3	38	39	49	50	51	52	53	57	56	63	70	79
CARRIZO	-	-	-	-	-	-	-	-	22	24	26	28	30	32	34	40	45	51	57	62
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Milam																				
TOTAL	638	1,046	1,478	1,967	2,501	2,652	2,812	2,901	2,949	2,905	2,956	3,049	3,875	3,970	3,927	3,951	3,813	3,970	4,227	4,214
ALLUVIUM	4	393	804	1,273	1,787	1,918	1,877	2,055	2,006	1,962	2,012	2,101	2,009	1,945	1,948	2,101	1,999	1,962	2,131	2,002
QUEEN CITY	15	15	16	17	18	18	19	20	21	21	22	23	23	24	25	26	26	27	28	29
REKLAW	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	36	37	38	39	40
CARRIZO	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19
CALVERT BLUFF	65	68	71	75	78	81	84	88	106	122	130	138	147	164	162	160	158	157	155	159
SIMSBORO	474	486	498	510	522	534	726	630	703	683	670	662	1,260	1,398	1,325	1,196	1,157	1,347	1,434	1,534
HOOPER	50	53	55	58	60	63	65	68	70	73	75	78	387	390	415	416	417	421	421	431
Nacogdoches																				
TOTAL	6,135	6,367	7,098	7,330	7,562	12,387	12,376	12,301	12,655	12,399	7,928	15,182	7,868	9,680	8,703	15,100	15,784	15,930	16,225	11,595
SPARTA	807	847	888	928	968	861	807	843	860	906	937	1,007	889	1,100	914	977	1,025	1,015	1,014	1,064
WECHES	118	124	130	136	142	148	153	159	165	171	177	183	189	195	201	207	212	218	224	230
QUEEN CITY	162	170	178	187	195	203	211	219	227	235	243	251	260	268	276	284	292	300	308	316
REKLAW	92	96	101	106	110	115	119	124	129	133	138	142	147	152	156	161	165	170	177	182
CARRIZO	4,922	5,095	5,759	5,931	6,104	11,019	11,046	10,915	11,235	10,914	6,400	13,564	6,348	7,929	7,096	13,392	13,989	14,103	14,357	9,612
CALVERT BLUFF	32	33	40	40	41	39	38	38	37	38	31	32	34	36	54	71	90	112	134	177
SIMSBORO	2	2	3	3	3	2	2	2	2	2	1	1	1	1	5	10	10	11	11	14
Navarro																				
TOTAL	11	11	12	12	13	13	14	14	20	20	21	21	40	40	39	39	38	37	37	
CALVERT BLUFF	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	5	5	5	5
SIMSBORO	1	1	1	1	1	1	1	1	1	1	1	2	2	5	5	5	5	5	5	5
HOOPER	9	9	10	10	10	11	11	12	17	17	17	18	18	30	30	29	28	28	27	26
Robertson																				
TOTAL	1,156	3,262	5,346	7,372	9,352	11,722	14,248	16,421	21,040	22,754	24,381	25,804	27,724	29,427	30,984	27,665	24,733	21,673	18,344	15,755
ALLUVIUM	180	2,207	4,211	6,157	8,058	10,342	12,798	15,035	17,499	19,048	20,503	21,709	23,282	24,632	26,096	23,164	20,459	17,704	14,762	12,083
SPARTA	22	24	25	26	27	28	29	30	31	33	34	35	36	37	38	39	40	41	43	44
WECHES	15	16	17	17	18	19	20	20	21	22	23	23	24	25	26	26	27	28	29	29
QUEEN CITY	51	54	57	59	62	64	67	69	72	75	77	80	82	85	87	90	93	95	98	100
REKLAW	22	23	24	25	26	27	28	29	30	31	32	34	35	36	37	38	39	40	41	42
CARRIZO	15	16	17	18	19	19	20	21	332	357	382	407	382	631	788	712	636	537	464	392
CALVERT BLUFF	34	35	37	39	40	42	44	45	822	885	948	1,011	946	1,115	1,123	1,018	913	773	673	573

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Formation	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
SIMSBORO	747	814	880	947	1,014	1,086	1,147	1,103	2,009	2,066	2,135	2,245	2,511	2,494	2,414	2,233	2,221	2,201	1,997	2,271
HOOPER	69	74	79	84	89	94	95	68	223	237	248	260	426	372	375	344	304	254	237	221
Rusk																				
TOTAL	45	47	49	51	54	56	58	60	63	111	121	123	125	128	132	159	127	129	131	133
SPARTA	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6
QUEEN CITY	13	14	15	15	16	17	17	18	19	20	20	21	22	22	23	24	24	25	26	26
REKLAW	15	16	17	18	18	19	20	21	22	22	23	24	25	25	26	27	28	28	29	30
CARRIZO	7	8	8	8	9	9	9	10	10	56	65	65	65	66	68	93	59	60	60	60
CALVERT BLUFF	6	6	6	7	7	7	7	8	8	8	8	9	9	9	10	10	10	10	11	11
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sabine																				
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	10	9	10
REKLAW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	10	9	10
San Augustine																				
TOTAL	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78
SPARTA	23	24	25	26	27	28	29	30	32	33	34	35	36	37	38	39	41	42	43	44
WECHES	9	9	10	10	11	11	12	12	13	13	14	14	14	15	15	16	16	17	17	18
QUEEN CITY	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
REKLAW	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8
CARRIZO	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
CALVERT BLUFF	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3
Smith																				
TOTAL	101	106	111	116	121	127	132	137	142	147	152	157	162	167	172	177	182	187	192	197
SPARTA	36	38	40	41	43	45	47	49	50	52	54	56	58	59	61	63	65	67	69	70
WECHES	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7
QUEEN CITY	61	64	68	71	74	77	80	83	86	89	92	95	98	101	104	107	111	114	117	120
CARRIZO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Van Zandt																				
TOTAL	213	224	234	245	255	266	277	287	298	309	319	330	341	351	362	373	383	394	404	415
QUEEN CITY	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
REKLAW	13	14	15	15	16	17	17	18	19	19	20	21	21	22	23	23	24	25	26	26
CARRIZO	10	10	11	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19
CALVERT BLUFF	89	93	98	102	107	111	116	120	124	129	133	138	142	147	151	156	160	164	169	173
SIMSBORO	17	18	19	20	20	21	22	23	24	25	25	26	27	28	29	30	31	31	32	33
HOOPER	64	67	70	73	76	79	83	86	89	92	95	98	102	105	108	111	114	118	121	124
Williamson																				

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Formation	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
TOTAL	13	14	15	15	16	17	17	18	19	19	20	21	21	22	22	23	24	24	25	26
CALVERT BLUFF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
SIMSBORO	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	5
HOOPER	11	11	12	12	13	13	14	14	15	15	16	16	17	18	18	19	19	20	20	21
Wilson																				
TOTAL	1,120	1,198	1,249	1,300	1,350	1,432	1,483	1,536	13,415	13,388	13,509	13,602	13,964	14,358	14,355	14,278	14,237	14,365	13,951	14,267
SPARTA	11	11	12	13	13	14	14	15	15	16	16	17	18	18	19	19	20	20	21	21
WECHES	14	14	15	16	16	17	18	18	19	20	20	21	22	22	23	24	24	25	26	26
QUEEN CITY	279	293	307	322	336	351	365	380	394	315	376	371	367	362	357	361	360	359	358	392
REKLAW	20	21	22	23	24	25	26	27	28	29	30	30	31	32	33	34	35	36	37	38
CARRIZO	706	764	793	823	852	881	911	940	12,003	12,058	12,113	12,290	12,686	13,187	13,299	13,068	13,168	13,355	12,963	13,251
CALVERT BLUFF	91	95	100	104	109	144	150	157	957	951	954	871	841	736	624	771	629	569	546	539
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grand Total	38,261	42,876	47,717	52,763	56,631	66,493	72,264	74,902	98,969	101,242	99,270	113,194	107,295	120,558	119,572	127,159	125,163	124,392	121,836	114,352

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Table F.3. Pumping in the model Well Package by county, hydrogeologic unit, and year for the years 1970 through 1989.

Formation	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Anderson																				
TOTAL	4,760	4,878	4,936	5,040	5,353	5,590	5,613	5,973	6,260	6,352	7,767	7,022	7,369	7,716	8,033	8,764	8,820	9,166	9,430	9,119
SPARTA	135	138	145	152	154	160	161	167	175	175	184	183	186	189	204	211	212	216	222	225
WECHES	52	54	55	56	58	59	60	61	63	64	65	67	68	69	71	72	73	74	76	77
QUEEN CITY	3,315	3,414	3,494	3,591	3,689	3,783	3,878	3,972	4,066	4,160	4,551	3,812	3,912	4,011	4,111	4,353	4,348	4,594	4,167	3,894
REKLAW	75	77	79	81	83	85	87	89	90	92	94	96	98	100	102	104	106	107	109	111
CARRIZO	494	464	448	458	636	707	631	724	817	752	1,556	1,435	1,470	1,409	1,700	1,689	1,667	1,680	1,779	1,770
CALVERT BLUFF	159	186	155	137	155	163	144	245	276	291	411	392	430	465	550	566	502	587	561	536
SIMSBORO	477	495	514	532	548	608	634	703	768	817	869	990	1,147	1,405	1,221	1,691	1,839	1,832	2,437	2,429
HOOPER	52	50	47	32	30	24	18	12	5	-	37	47	57	67	75	79	74	75	78	78
Angelina																				
TOTAL	20,979	22,014	22,500	22,664	23,749	23,284	23,139	23,139	23,812	22,788	23,877	22,736	22,846	22,535	23,130	22,970	22,199	21,797	20,098	25,653
SPARTA	4,023	4,331	4,415	4,400	4,542	4,245	4,305	4,135	4,154	3,918	3,864	3,565	3,583	3,516	3,506	3,571	3,466	3,469	2,912	4,572
REKLAW	-	-	-	-	-	-	-	-	-	-	24	24	32	30	24	26	29	29	33	32
CARRIZO	16,156	16,822	17,207	17,389	18,304	18,196	17,979	18,183	18,833	18,092	19,223	18,441	18,522	18,293	18,905	18,665	18,018	17,613	16,578	20,142
CALVERT BLUFF	800	861	878	875	903	843	855	821	825	777	766	706	710	696	694	707	686	687	575	907
Bastrop																				
TOTAL	4,454	4,764	4,780	5,087	5,210	5,506	5,186	5,335	5,706	5,727	7,248	6,721	7,236	6,981	7,372	6,726	6,747	7,690	7,665	8,172
ALLUVIUM	578	991	992	1,344	1,437	1,531	1,379	1,679	1,754	962	923	902	1,304	1,367	1,390	63	224	386	301	186
SPARTA	104	105	106	107	107	107	109	111	114	116	163	154	143	133	123	116	113	116	121	129
WECHES	11	12	12	12	13	13	13	14	14	14	14	15	15	15	16	16	16	16	17	17
QUEEN CITY	488	543	520	437	451	603	678	488	756	742	1,095	1,068	1,046	866	887	793	503	573	764	768
REKLAW	70	72	74	76	77	79	81	83	84	86	88	90	91	93	95	97	98	100	102	104
CARRIZO	640	635	629	624	618	613	607	602	573	568	656	566	476	562	528	491	533	594	678	765
CALVERT BLUFF	1,001	1,001	996	1,001	1,014	1,007	1,012	1,019	1,067	1,264	1,595	1,425	1,281	1,123	1,071	1,001	896	1,009	1,027	1,162
SIMSBORO	282	280	280	287	289	348	247	251	248	403	665	618	875	873	1,398	1,914	2,248	2,462	2,548	2,765
HOOPER	1,280	1,125	1,172	1,200	1,203	1,205	1,060	1,089	1,096	1,572	2,049	1,884	2,004	1,948	1,864	2,236	2,115	2,434	2,109	2,277
Bexar																				
TOTAL	2,760	2,546	2,332	2,118	1,904	1,958	2,012	2,068	2,123	2,179	4,051	3,798	3,546	3,292	3,239	1,744	1,741	1,521	1,696	1,872
CARRIZO	7	7	7	7	7	7	7	8	8	8	8	8	8	9	9	9	9	9	9	10
CALVERT BLUFF	2,629	2,412	2,194	1,977	1,760	1,812	1,863	1,915	1,966	2,017	3,886	3,631	3,376	3,121	3,055	1,562	1,554	1,335	1,504	1,674
SIMSBORO	40	41	42	43	44	44	45	47	48	50	51	51	52	51	62	58	60	57	61	64
HOOPER	84	86	88	91	93	95	97	99	101	103	105	107	110	112	114	116	118	120	122	124
Brazos																				
TOTAL	11,828	13,541	14,032	14,142	15,617	15,848	20,949	19,820	22,879	17,777	20,485	22,497	23,689	23,615	26,698	23,762	21,897	23,387	25,187	24,155
ALLUVIUM	182	129	103	80	47	57	56	54	42	43	51	80	123	120	64	7	6	20	39	28
SPARTA	3,929	4,577	4,519	4,718	5,255	5,471	6,495	6,426	7,278	5,584	6,379	7,080	5,783	5,608	6,213	5,151	4,718	5,090	5,510	5,327

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Formation	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
QUEEN CITY	-	-	-	-	-	-	-	-	0	2	20	22	19	20	28	27	28	28	30	30
CARRIZO	472	583	694	805	916	1,027	1,137	1,248	1,359	1,260	1,355	1,533	992	925	1,016	886	823	891	981	995
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SIMSBORO	7,245	8,252	8,716	8,539	9,399	9,294	13,260	12,092	14,199	10,888	12,680	13,781	16,772	16,942	19,377	17,691	16,323	17,358	18,628	17,774
Burleson																				
TOTAL	741	758	779	735	796	850	924	1,111	1,196	1,189	1,885	1,887	1,979	1,906	2,063	2,156	1,935	1,959	2,017	1,912
ALLUVIUM	2	2	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	8	7
SPARTA	261	271	271	289	304	308	349	432	438	434	618	625	688	670	681	683	636	608	664	602
WECHES	34	35	36	36	37	38	39	40	41	42	49	50	50	51	51	53	53	54	55	55
QUEEN CITY	88	97	107	99	113	117	127	140	146	123	359	342	367	396	407	439	398	414	448	434
REKLAW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CARRIZO	356	354	363	310	342	387	409	499	570	589	854	864	869	785	919	977	843	879	838	809
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	5	4	4	4	4	4	4	4	4	4
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Caldwell																				
TOTAL	2,329	2,603	2,506	2,507	2,721	2,850	2,523	2,762	2,395	2,355	2,918	2,397	2,906	2,932	3,228	2,958	3,034	2,948	3,068	3,234
WECHES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUEEN CITY	6	6	6	6	7	7	7	7	7	7	9	9	9	9	9	9	9	9	10	10
REKLAW	6	6	6	7	7	7	7	7	7	7	8	8	8	8	8	8	9	9	9	9
CARRIZO	63	64	63	60	58	55	52	50	47	44	82	91	100	109	117	70	71	71	72	74
CALVERT BLUFF	1,475	1,653	1,583	1,589	1,725	1,628	1,430	1,569	1,348	1,140	1,290	979	1,919	1,903	2,020	1,796	1,927	1,771	1,803	1,911
SIMSBORO	604	696	664	658	730	957	828	924	775	944	1,103	868	369	394	493	549	474	545	593	648
HOOPER	175	178	183	186	195	196	198	205	212	212	427	443	502	510	581	526	544	542	581	581
Cherokee																				
TOTAL	7,810	10,328	8,021	8,072	8,276	8,415	8,525	8,623	9,040	9,236	9,755	9,732	12,317	10,130	10,166	12,516	10,009	11,254	12,518	9,066
SPARTA	144	148	151	157	155	158	161	166	197	231	261	240	262	269	276	265	198	196	288	295
WECHES	69	70	72	74	75	77	79	81	82	84	86	87	89	91	93	94	96	98	99	101
QUEEN CITY	1,010	1,036	1,062	1,040	1,064	1,085	1,111	1,137	1,164	1,208	1,272	1,299	1,364	1,405	1,440	1,462	1,473	1,501	1,508	1,514
REKLAW	224	237	237	242	259	265	268	275	277	281	290	302	313	321	321	331	335	337	349	351
CARRIZO	6,326	8,778	6,428	6,470	6,629	6,739	6,820	6,887	7,231	7,340	7,727	7,690	10,151	7,915	7,880	10,131	7,671	8,881	10,033	6,545
CALVERT BLUFF	27	40	47	56	60	62	59	52	60	62	78	78	91	88	115	190	190	196	197	202
SIMSBORO	9	18	24	34	34	30	28	26	28	30	40	36	46	41	42	44	45	45	43	58
Falls																				
TOTAL	23	23	24	25	25	26	26	27	27	28	29	29	30	30	31	31	32	33	33	34
SIMSBORO	5	5	5	5	5	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7
HOOPER	18	18	19	19	20	20	21	21	21	22	22	23	23	24	24	25	25	25	26	26
Fayette																				
TOTAL	85	82	79	76	72	69	65	62	58	56	59	51	44	38	32	35	33	37	37	37

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Formation	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SPARTA	73	71	68	65	62	59	56	53	50	48	51	44	37	31	25	28	27	31	31	31
QUEEN CITY	9	8	8	8	8	8	7	7	7	7	7	6	6	6	6	6	5	5	5	5
CARRIZO	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CALVERT BLUFF	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1
Freestone																				
TOTAL	1,318	1,299	1,350	1,357	1,436	1,602	1,647	1,894	2,124	2,027	2,874	3,170	3,474	3,667	4,001	3,808	3,675	3,636	3,903	3,863
QUEEN CITY	24	24	25	26	26	27	27	28	29	29	60	70	80	90	100	60	56	57	59	56
REKLAW	35	36	37	38	39	40	40	41	42	43	44	45	46	47	47	48	49	50	51	52
CARRIZO	52	53	55	56	57	59	60	61	63	64	112	129	145	161	178	115	109	110	114	110
CALVERT BLUFF	310	319	327	344	354	365	373	383	403	408	561	613	668	750	845	689	666	677	718	717
SIMSBORO	246	295	327	321	347	489	522	642	789	713	860	927	974	923	1,003	1,335	1,513	1,485	1,496	1,608
HOOPER	651	572	580	573	613	623	625	739	798	770	1,238	1,387	1,561	1,697	1,828	1,561	1,281	1,257	1,466	1,319
Gonzales																				
TOTAL	3,677	3,791	3,843	3,957	4,065	3,849	3,764	3,626	3,427	3,367	3,757	3,488	3,310	2,890	2,718	2,606	2,473	2,754	3,517	3,352
SPARTA	221	224	251	263	274	285	303	317	335	352	422	372	332	286	247	244	223	229	320	323
WECHES	22	22	23	24	24	25	26	26	27	27	28	28	28	27	27	27	28	28	29	29
QUEEN CITY	493	520	559	590	621	652	687	719	753	787	861	735	613	474	352	352	352	357	363	369
REKLAW	28	29	29	30	31	32	32	33	34	34	35	36	36	37	38	39	39	40	41	41
CARRIZO	2,656	2,737	2,721	2,789	2,853	2,619	2,505	2,345	2,120	2,033	2,262	2,168	2,148	1,912	1,898	1,807	1,705	1,957	2,525	2,367
CALVERT BLUFF	253	254	255	255	256	230	204	178	152	126	141	144	147	151	154	136	124	141	237	221
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HOOPER	5	5	5	6	6	6	7	7	8	8	6	5	3	2	2	2	2	2	2	2
Guadalupe																				
TOTAL	1,563	1,599	1,635	1,671	1,707	1,771	1,835	1,900	1,964	2,028	2,080	2,266	2,451	2,637	4,778	2,099	1,853	1,626	1,298	2,282
QUEEN CITY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2
REKLAW	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5
CARRIZO	263	245	250	237	205	212	219	226	202	208	261	268	268	275	389	237	223	216	201	247
CALVERT BLUFF	566	675	691	649	553	572	592	611	623	642	666	716	841	900	1,498	712	715	630	507	865
SIMSBORO	207	188	192	177	242	252	263	273	221	228	219	245	257	282	522	205	162	137	96	185
HOOPER	522	486	497	603	702	729	757	784	912	944	929	1,031	1,078	1,174	2,364	938	747	636	487	977
Henderson																				
TOTAL	2,467	2,425	2,654	3,071	3,387	3,495	3,296	3,625	3,606	3,705	5,407	5,628	5,967	6,259	7,157	7,259	7,171	6,854	7,457	6,965
QUEEN CITY	652	678	771	1,078	1,064	981	957	1,010	963	989	1,360	1,415	1,464	1,495	1,582	1,609	1,695	1,554	1,693	1,665
REKLAW	115	117	120	123	126	129	132	135	137	140	143	146	149	152	155	157	160	163	166	169
CARRIZO	81	82	81	105	94	110	118	127	150	150	270	284	282	268	290	293	319	323	358	379
CALVERT BLUFF	209	218	257	411	399	359	344	352	332	352	430	456	480	493	513	526	561	538	596	555

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Formation	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SIMSBORO	1,268	1,122	1,257	1,177	1,472	1,729	1,555	1,738	1,752	1,807	2,703	2,853	3,086	3,356	4,083	4,078	3,824	3,760	3,999	3,620
HOOPER	141	208	167	176	231	187	190	264	272	267	501	474	506	496	534	596	611	516	645	577
Houston																				
TOTAL	1,008	1,062	1,192	1,306	1,263	1,280	1,258	1,259	1,355	1,340	1,814	1,838	1,952	2,003	2,376	2,392	2,198	2,315	2,285	2,165
SPARTA	827	843	846	871	885	868	854	843	833	822	1,142	1,203	1,241	1,312	1,452	1,414	1,320	1,288	1,221	1,243
WECHES	44	45	46	48	49	50	51	52	53	54	55	56	57	59	60	61	62	63	64	65
QUEEN CITY	76	101	137	154	175	159	144	131	110	93	209	217	232	230	259	266	239	255	266	267
REKLAW	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
CARRIZO	60	73	163	233	154	203	208	233	358	371	385	337	392	369	570	615	550	676	697	548
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	23	26	29	32	35	36	27	31	34	37
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	4
Karnes																				
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	795	362	184	31	23	46	46	123
CARRIZO	-	-	-	-	-	-	-	-	-	-	-	-	795	362	184	31	23	46	46	123
Lee																				
TOTAL	1,859	1,854	1,629	1,795	2,251	2,303	1,681	2,622	1,925	1,899	2,465	2,319	2,411	2,335	2,674	2,983	3,002	3,112	3,222	3,189
SPARTA	146	149	151	147	152	157	161	166	171	176	184	179	184	228	245	235	217	223	225	231
WECHES	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	55	56	57	58	59
QUEEN CITY	1,093	704	588	685	906	771	573	884	654	633	967	938	970	919	1,088	1,112	1,172	1,228	1,252	1,212
REKLAW	4	4	4	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6
CARRIZO	232	564	427	479	687	901	503	1,161	721	743	848	773	865	833	1,022	1,063	1,073	1,074	1,127	1,034
CALVERT BLUFF	278	356	380	400	421	387	354	321	287	254	372	334	296	258	220	475	440	478	508	600
SIMSBORO	29	29	29	29	29	30	30	30	30	30	31	31	30	30	30	29	29	37	38	38
HOOPER	35	6	6	6	7	7	7	7	7	7	7	8	8	8	8	8	8	8	9	9
Leon																				
TOTAL	984	1,032	1,062	1,122	1,191	1,242	1,345	1,483	1,646	1,628	2,688	2,798	3,218	3,432	3,718	3,897	3,708	3,988	4,287	3,864
SPARTA	87	89	91	93	96	98	100	102	104	106	152	166	181	196	211	222	205	223	232	223
WECHES	61	63	64	66	67	69	70	72	73	75	77	78	80	81	83	84	86	87	89	90
QUEEN CITY	407	405	426	466	498	529	571	626	650	617	1,014	1,077	1,173	1,195	1,337	1,383	1,173	1,286	1,423	1,252
REKLAW	37	38	39	39	40	41	42	43	44	45	46	47	48	49	50	50	51	52	53	54
CARRIZO	136	176	178	202	221	211	222	240	276	292	633	738	849	911	1,035	1,057	1,032	1,147	1,272	1,134
CALVERT BLUFF	256	261	264	255	269	295	339	400	497	492	768	693	888	989	984	1,070	1,124	1,166	1,181	1,081
SIMSBORO	-	-	-	-	-	-	-	-	-	-	-	-	-	11	19	31	37	26	37	30
Limestone																				
TOTAL	222	232	241	251	261	261	258	255	252	249	363	382	421	476	532	824	941	2,010	2,198	2,323
CALVERT BLUFF	70	71	73	75	77	78	80	82	84	85	141	150	158	166	175	167	165	167	171	165
SIMSBORO	40	41	43	44	45	46	47	48	49	50	51	52	72	110	148	454	576	1,644	1,824	1,960
HOOPER	112	119	126	133	140	137	131	126	120	114	171	181	190	200	209	203	200	199	204	198
Madison																				

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Formation	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
TOTAL	694	668	738	697	706	682	662	726	985	439	1,980	2,169	2,154	2,655	2,439	2,408	2,618	1,920	1,993	2,156
SPARTA	575	570	656	631	656	645	627	693	955	412	1,704	1,838	1,834	2,290	2,121	2,108	2,311	1,610	1,724	1,864
QUEEN CITY	67	55	49	43	37	27	27	27	27	28	27	27	32	31	33	41	40	39	37	45
CARRIZO	52	43	33	23	13	11	8	5	3	-	248	305	288	332	282	255	262	266	227	242
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	5	6	4	4	5
Milam																				
TOTAL	4,351	4,400	4,457	4,440	4,201	4,176	4,102	4,456	5,367	5,723	6,477	6,191	6,571	6,280	6,900	7,019	6,743	6,838	18,713	18,051
ALLUVIUM	2,019	1,952	1,970	2,063	2,001	2,089	2,044	2,015	1,917	2,015	1,990	2,108	2,074	2,070	2,026	2,169	2,307	2,222	2,198	2,219
QUEEN CITY	29	30	31	32	32	33	34	34	35	36	50	51	52	53	55	56	55	56	73	58
REKLAW	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
CARRIZO	20	20	21	21	22	22	23	23	24	24	58	59	61	63	64	65	60	63	99	63
CALVERT BLUFF	165	177	204	214	255	276	280	417	487	498	520	437	498	506	548	520	485	473	603	565
SIMSBORO	1,637	1,734	1,736	1,609	1,381	1,242	1,208	1,442	2,276	2,503	2,994	2,614	2,935	2,678	3,195	3,184	3,339	3,521	14,956	14,611
HOOPER	440	446	453	457	466	468	466	477	580	598	815	870	899	856	957	968	439	446	726	476
Nacogdoches																				
TOTAL	17,172	12,475	20,031	12,451	13,374	17,748	13,359	14,665	13,097	12,647	13,272	12,902	13,014	12,964	13,000	13,218	13,307	13,505	13,353	15,826
SPARTA	1,059	1,127	1,150	1,154	1,188	1,135	1,153	1,126	1,136	1,095	1,091	1,037	1,047	1,040	1,045	1,064	1,049	1,056	951	1,290
WECHES	236	242	248	254	260	266	272	277	283	289	295	301	307	313	319	325	331	336	342	348
QUEEN CITY	324	333	341	349	357	365	373	381	389	397	406	414	422	430	438	446	454	462	470	479
REKLAW	187	192	197	202	206	211	215	220	225	230	235	244	248	244	248	253	257	262	266	271
CARRIZO	15,143	10,282	17,740	10,135	11,023	15,405	10,937	12,198	10,558	10,105	10,699	10,326	10,398	10,338	10,318	10,520	10,612	10,753	10,653	12,815
CALVERT BLUFF	205	271	331	334	310	335	373	416	455	472	469	495	505	511	537	511	505	531	559	519
SIMSBORO	18	28	25	24	30	31	35	46	51	58	77	85	86	89	95	99	99	104	111	105
Navarro																				
TOTAL	37	37	37	37	37	37	37	37	37	37	37	38	39	40	41	41	40	41	42	42
CALVERT BLUFF	5	5	5	5	5	5	5	5	5	4	4	5	5	5	5	5	5	5	5	5
SIMSBORO	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
HOOPER	27	27	27	27	27	27	28	28	28	28	28	29	30	30	31	31	31	31	32	32
Robertson																				
TOTAL	15,884	16,058	16,139	15,896	16,197	15,457	14,998	14,452	13,974	13,781	18,797	18,394	17,655	17,670	17,583	17,826	14,882	11,313	17,396	15,496
ALLUVIUM	12,078	12,128	12,110	12,022	12,074	11,514	11,071	10,615	10,081	9,531	13,232	12,962	12,842	12,558	12,392	12,576	10,094	6,732	11,735	10,331
SPARTA	45	46	47	48	49	50	52	53	54	55	99	100	105	107	111	116	116	111	133	113
WECHES	30	31	32	32	33	34	35	36	36	37	38	39	39	40	41	42	42	43	44	45
QUEEN CITY	103	105	108	111	113	116	118	121	123	126	255	263	272	279	287	303	303	292	347	285
REKLAW	43	44	45	47	48	49	50	51	52	53	54	55	56	57	58	60	61	62	63	64
CARRIZO	393	339	340	341	342	331	378	365	366	363	483	497	453	476	459	443	383	303	430	380
CALVERT BLUFF	575	621	624	626	628	609	589	569	550	530	896	897	897	897	898	932	834	676	972	804

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Formation	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
SIMSBORO	2,383	2,518	2,609	2,446	2,686	2,535	2,486	2,411	2,478	2,825	3,413	3,260	2,641	2,903	2,987	2,983	2,685	2,764	3,238	3,007
HOOPER	234	225	224	223	224	219	219	232	234	262	326	322	350	352	351	373	363	329	435	468
Rusk																				
TOTAL	136	140	142	144	147	149	151	153	269	301	410	445	453	428	517	392	438	582	565	509
SPARTA	6	6	6	6	7	7	7	7	7	7	7	8	8	8	8	8	8	9	9	9
QUEEN CITY	27	28	28	29	30	30	31	32	32	33	34	34	35	36	36	37	38	38	39	40
REKLAW	31	31	32	33	34	35	35	36	37	38	38	39	40	41	41	42	43	44	45	45
CARRIZO	61	63	64	64	64	65	65	65	180	209	240	206	199	226	292	165	216	361	314	253
CALVERT BLUFF	11	12	12	12	12	13	13	13	14	14	14	14	15	15	15	16	16	16	16	17
SIMSBORO	-	-	-	-	-	-	-	-	-	-	76	143	157	102	124	124	117	115	142	146
Sabine																				
TOTAL	12	13	13	15	18	15	16	18	21	25	25	16	-	-	-	-	-	-	-	-
REKLAW	12	13	13	15	18	15	16	18	21	25	25	16	-	-	-	-	-	-	-	-
San Augustine																				
TOTAL	92	98	105	104	108	130	128	133	141	150	150	149	169	163	172	175	183	189	198	199
SPARTA	45	46	47	48	50	51	52	53	54	55	56	57	59	60	61	62	63	64	65	66
WECHES	18	18	19	19	20	20	21	21	22	22	23	23	23	24	24	25	25	26	26	27
QUEEN CITY	3	3	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5
REKLAW	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11
CARRIZO	15	19	24	21	23	44	39	43	49	56	54	51	69	61	68	69	75	79	86	86
CALVERT BLUFF	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4
Smith																				
TOTAL	202	208	213	218	223	228	233	238	243	248	2,656	2,318	2,619	4,454	5,724	6,432	6,242	6,164	6,199	6,016
SPARTA	72	74	76	78	79	81	83	85	87	88	105	107	109	110	132	148	123	121	123	133
WECHES	8	8	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11
QUEEN CITY	123	126	129	132	135	138	141	144	147	150	168	172	175	177	201	218	194	193	196	208
CARRIZO	-	-	-	-	-	-	-	-	-	-	1,252	1,024	1,182	2,243	2,919	3,256	3,202	3,112	3,083	2,969
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	689	649	734	1,152	1,453	1,665	1,622	1,671	1,741	1,679
SIMSBORO	-	-	-	-	-	-	-	-	-	-	432	357	409	762	1,008	1,135	1,090	1,056	1,046	1,016
Van Zandt																				
TOTAL	426	436	447	458	468	479	490	500	511	522	885	962	967	936	960	973	1,021	1,047	1,086	1,125
QUEEN CITY	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	58	59	60	61
REKLAW	27	28	28	29	30	30	31	32	32	33	34	34	35	36	36	37	38	38	39	40
CARRIZO	19	20	20	21	21	22	22	22	23	23	24	24	25	25	26	26	27	27	28	28
CALVERT BLUFF	178	182	187	191	195	200	204	209	213	218	455	551	570	533	546	550	592	592	633	662
SIMSBORO	34	35	36	36	37	38	39	40	41	42	132	111	88	86	97	99	97	109	102	111
HOOPER	127	130	133	137	140	143	146	149	152	156	188	189	196	202	200	205	210	222	225	224
Williamson																				

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Formation	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
TOTAL	26	27	28	28	29	30	30	31	32	32	33	34	34	35	36	36	37	38	38	39
CALVERT BLUFF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SIMSBORO	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	7	7	7
HOOPER	21	22	22	23	23	24	24	25	26	26	27	27	28	28	29	29	30	30	31	31
Wilson																				
TOTAL	14,801	15,740	16,120	16,479	17,728	16,040	14,670	13,432	10,869	9,455	10,090	10,295	10,692	10,935	11,751	10,393	10,542	11,556	13,221	14,433
SPARTA	22	22	23	24	24	25	25	26	26	35	36	43	42	32	30	30	31	31	32	32
WECHES	27	28	28	29	30	30	31	32	32	33	34	35	35	36	37	37	38	39	39	40
QUEEN CITY	396	453	426	408	433	422	446	471	480	455	489	496	534	503	579	607	554	542	597	615
REKLAW	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
CARRIZO	13,768	14,632	15,051	15,258	16,289	14,669	13,342	12,135	9,631	8,304	8,814	9,011	9,289	9,545	10,206	8,884	9,060	10,028	11,586	12,665
CALVERT BLUFF	548	564	550	717	909	849	780	723	653	581	627	616	646	644	692	628	648	681	794	841
SIMSBORO	-	-	-	-	-	-	-	-	-	-	42	44	94	123	155	152	156	179	116	183
Grand Total	122,696	125,130	132,065	125,961	132,519	135,372	132,923	134,424	135,343	127,291	154,332	152,673	160,329	159,795	171,253	166,478	157,539	159,326	182,769	185,272

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Table F.4. Pumping in the model Well Package by county, hydrogeologic unit, and year for the years 1990 – 2010.

Formation	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Anderson																					
TOTAL	9,317	8,545	9,566	10,059	10,236	12,177	12,793	12,497	13,647	13,380	13,260	11,992	12,131	12,272	11,623	11,617	12,275	11,322	11,582	12,342	12,211
SPARTA	224	228	229	234	232	239	246	247	254	257	260	264	268	273	278	282	287	284	289	294	297
WECHES	78	79	80	81	82	83	84	85	86	86	87	88	89	90	91	92	93	94	95	95	96
QUEEN CITY	4,535	3,834	4,263	4,417	5,570	7,154	7,137	6,942	7,238	7,559	7,866	6,884	6,927	6,993	6,528	6,413	6,738	6,102	6,415	6,848	7,088
REKLAW	113	115	117	119	122	124	126	128	130	132	134	137	139	141	143	145	147	149	151	154	156
CARRIZO	1,458	1,424	1,463	1,540	1,434	1,554	1,938	1,872	2,316	1,893	1,498	1,452	1,483	1,475	1,428	1,482	1,525	1,435	1,442	1,556	1,437
CALVERT BLUFF	549	511	568	633	587	614	673	667	876	754	680	585	586	601	609	568	675	612	621	717	635
SIMSBORO	2,281	2,274	2,750	2,931	2,120	2,303	2,478	2,448	2,623	2,595	2,653	2,539	2,597	2,665	2,508	2,623	2,794	2,628	2,552	2,643	2,489
HOOPER	78	79	95	104	89	106	110	108	124	103	81	43	42	34	37	12	15	19	18	35	12
Angelina																					
TOTAL	19,471	18,519	18,369	17,826	18,028	18,548	18,965	19,103	20,841	20,274	21,940	18,831	18,636	19,508	14,568	13,481	14,199	12,603	11,904	11,507	10,999
SPARTA	2,859	2,647	2,424	2,345	2,352	2,452	2,297	2,199	2,269	2,102	2,352	1,712	1,588	1,800	411	160	194	48	47	47	45
REKLAW	31	37	33	37	33	47	49	121	123	124	126	52	57	61	64	60	61	55	40	47	58
CARRIZO	16,017	15,312	15,435	14,982	15,181	15,567	16,167	16,352	18,003	17,636	19,000	16,732	16,681	17,297	14,019	13,237	13,914	12,500	11,816	11,412	10,896
CALVERT BLUFF	564	522	477	461	462	482	451	432	446	412	462	334	309	351	74	23	30	1	1	1	-
Bastrop																					
TOTAL	8,088	7,986	7,959	8,506	8,749	9,143	10,365	9,792	10,815	11,390	11,967	11,718	17,167	12,739	11,793	13,261	14,332	12,214	14,347	17,418	19,832
ALLUVIUM	486	766	872	931	903	928	1,050	1,115	1,115	1,349	1,212	1,212	1,300	1,345	1,235	1,348	1,452	1,254	1,564	1,504	1,171
SPARTA	131	133	135	132	125	115	121	115	119	122	143	139	140	143	157	149	150	144	149	255	370
WECHES	17	18	19	19	20	21	21	22	23	24	24	25	26	26	27	28	29	29	30	31	31
QUEEN CITY	773	750	787	850	799	752	895	636	829	998	276	237	241	221	230	221	222	204	209	357	1,218
REKLAW	105	109	113	116	120	123	127	131	134	138	141	145	149	152	156	159	163	167	170	174	177
CARRIZO	747	742	752	742	808	1,065	1,190	1,034	1,140	1,051	1,297	1,265	1,700	1,228	1,129	1,290	1,321	1,039	1,097	1,610	1,835
CALVERT BLUFF	1,137	1,082	1,105	1,101	1,220	1,242	1,344	1,244	1,298	1,474	1,807	1,741	2,686	1,955	1,666	1,893	1,974	1,849	2,233	3,119	4,093
SIMSBORO	2,545	2,354	2,254	2,491	2,518	2,588	3,009	3,053	3,577	3,836	5,185	5,149	8,280	5,861	5,485	6,883	7,375	6,134	7,305	8,241	8,025
HOOPER	2,147	2,032	1,923	2,124	2,238	2,307	2,608	2,442	2,579	2,399	1,881	1,804	2,646	1,808	1,708	1,290	1,646	1,395	1,590	2,127	2,910
Bexar																					
TOTAL	2,436	1,899	1,830	2,433	4,672	4,061	4,288	3,948	4,946	3,659	1,617	1,693	2,197	1,299	1,288	1,342	1,392	853	1,152	2,120	1,297
CARRIZO	10	11	11	12	13	14	15	15	16	17	18	19	19	20	21	22	22	23	24	25	39
CALVERT BLUFF	2,234	1,701	1,638	2,247	4,488	3,881	4,108	3,774	4,777	3,494	1,457	1,537	2,048	1,150	1,153	1,211	1,264	729	1,010	1,980	1,144
SIMSBORO	66	64	60	56	55	53	55	51	48	46	43	41	36	37	25	24	22	21	19	17	16
HOOPER	126	124	121	118	116	113	110	107	105	102	99	97	94	91	88	86	83	80	100	98	99
Brazos																					
TOTAL	25,291	24,255	26,734	27,850	26,642	26,883	28,879	28,682	32,236	31,222	31,766	29,634	40,001	34,225	31,064	44,593	34,075	30,402	37,561	38,366	40,331
ALLUVIUM	215	182	215	129	15	89	143	117	118	83	81	126	125	226	471	750	586	717	766	805	916
SPARTA	5,675	5,648	6,342	6,522	5,990	5,846	6,227	6,248	6,672	6,395	6,180	5,456	5,266	5,084	5,072	5,154	8,024	6,902	4,218	3,563	3,455

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Formation	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
QUEEN CITY	27	29	27	33	34	34	37	34	32	21	20	25	27	59	64	92	33	31	62	38	37
CARRIZO	1,098	1,097	1,240	1,281	1,144	1,103	1,158	1,166	1,182	1,109	937	972	875	783	730	757	866	667	104	693	740
CALVERT BLUFF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,432	1,265	-	-	-
SIMSBORO	18,276	17,298	18,910	19,885	19,459	19,811	21,314	21,117	24,232	23,612	24,549	23,055	33,709	28,073	24,727	37,840	23,134	20,819	32,411	33,267	35,182
Burleson																					
TOTAL	2,094	2,088	2,144	2,489	2,465	2,484	2,741	2,614	2,673	2,534	2,711	2,535	2,620	2,638	2,880	3,325	3,355	3,380	3,729	4,093	4,367
ALLUVIUM	41	38	10	4	31	98	155	13	61	64	71	111	138	164	502	840	903	945	1,159	1,377	2,021
SPARTA	677	726	720	929	905	937	937	919	910	874	901	851	840	809	780	822	795	846	817	855	762
WECHES	56	57	59	61	61	62	64	64	63	64	65	65	66	68	67	67	68	68	68	68	71
QUEEN CITY	406	401	442	488	487	481	530	521	515	490	520	496	513	519	505	487	497	495	465	475	457
REKLAW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CARRIZO	870	821	867	953	929	863	1,002	1,030	1,053	977	1,027	912	949	952	893	982	950	922	1,077	1,141	941
CALVERT BLUFF	4	4	5	5	5	5	6	6	5	5	32	21	22	34	41	34	43	13	30	44	37
SIMSBORO	40	41	40	49	47	38	47	61	66	60	94	80	90	93	92	93	101	91	114	134	78
Caldwell																					
TOTAL	3,828	2,905	3,760	3,379	3,437	3,519	4,107	3,586	4,248	4,028	3,268	3,266	4,375	3,449	3,377	1,794	1,889	1,912	2,185	2,565	2,190
WECHES	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
QUEEN CITY	11	11	11	10	12	13	14	13	14	15	30	23	24	26	31	63	57	56	55	41	56
REKLAW	9	10	11	11	12	13	13	14	15	15	16	17	18	18	19	20	20	21	22	22	23
CARRIZO	201	40	289	92	83	103	105	102	232	209	90	109	500	84	82	104	109	74	102	114	156
CALVERT BLUFF	2,417	1,764	2,319	2,082	2,135	1,583	1,527	1,110	1,276	1,212	1,015	1,018	1,002	977	916	452	410	348	442	559	534
SIMSBORO	571	531	505	557	551	1,140	1,707	1,641	1,900	1,738	1,269	1,272	1,950	1,429	1,288	63	143	224	305	514	83
HOOPER	618	549	626	626	645	669	740	707	812	838	848	827	880	914	1,041	1,092	1,149	1,188	1,258	1,313	1,337
Cherokee																					
TOTAL	11,685	9,390	9,629	12,241	7,731	7,768	7,590	7,898	8,560	8,294	8,559	8,450	8,133	8,211	8,916	8,799	8,997	8,492	8,510	8,763	9,174
SPARTA	283	281	272	277	267	272	275	269	287	283	298	284	271	274	279	288	280	272	295	283	291
WECHES	103	101	98	96	94	91	89	87	84	82	80	77	75	73	70	68	66	63	61	59	57
QUEEN CITY	1,606	1,559	1,468	1,465	1,466	1,470	1,481	1,480	1,419	1,418	1,469	1,430	1,441	1,423	1,401	1,406	1,406	1,359	1,365	1,361	1,367
REKLAW	353	350	352	354	353	356	357	356	363	362	362	416	362	394	382	390	408	409	417	420	424
CARRIZO	9,079	6,828	7,124	9,748	4,455	4,515	4,340	4,557	5,093	5,002	5,126	5,021	4,898	4,963	5,547	5,441	5,538	5,058	5,087	5,341	5,720
CALVERT BLUFF	207	216	241	231	222	213	233	263	350	248	311	331	302	337	318	315	362	364	354	393	414
SIMSBORO	55	55	74	70	874	851	815	887	964	898	913	890	783	748	920	891	937	966	931	906	902
Falls																					
TOTAL	34	34	35	35	35	35	35	35	36	36	36	36	36	37	37	37	37	37	37	38	38
SIMSBORO	7	8	8	8	8	8	8	8	8	8	8	8	9	9	9	9	9	9	9	9	9
HOOPER	27	27	27	27	27	27	27	27	27	28	28	28	28	28	28	28	28	28	28	28	29
Fayette																					
TOTAL	36	46	40	53	84	77	74	74	76	77	119	107	100	125	153	191	167	104	111	117	86

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Formation	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SPARTA	30	41	34	48	74	69	66	66	68	69	108	95	89	110	145	177	153	90	101	107	76
QUEEN CITY	5	4	4	4	9	7	7	7	7	7	10	11	10	14	-	-	-	-	-	-	-
CARRIZO	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	9	9	9	7	7	7
CALVERT BLUFF	1	1	1	1	1	1	1	1	1	1	1	1	1	0	3	5	5	5	3	3	3
Freestone																					
TOTAL	4,091	3,843	4,077	4,073	4,321	4,337	4,748	4,447	4,894	4,763	4,962	8,138	9,481	7,447	8,436	7,616	6,505	5,619	6,057	7,098	6,090
QUEEN CITY	57	57	65	63	64	67	74	65	68	70	70	66	67	71	82	52	55	56	44	45	48
REKLAW	53	53	53	53	54	54	54	54	55	55	55	55	56	56	56	56	57	57	57	58	58
CARRIZO	111	112	125	122	124	128	140	124	130	132	132	119	119	114	178	121	100	112	479	511	373
CALVERT BLUFF	763	769	847	890	893	889	981	921	935	930	943	4,328	5,715	3,533	4,661	3,921	2,806	1,720	1,802	2,917	2,317
SIMSBORO	1,594	1,472	1,455	1,394	1,390	1,314	1,480	1,416	1,505	1,601	1,683	1,619	1,667	1,837	1,717	1,762	1,801	2,014	1,970	1,917	1,922
HOOPER	1,514	1,381	1,532	1,550	1,796	1,885	2,019	1,866	2,202	1,974	2,077	1,949	1,859	1,835	1,742	1,704	1,686	1,659	1,704	1,650	1,372
Gonzales																					
TOTAL	4,293	3,281	3,275	2,380	2,328	2,433	2,751	2,982	2,196	2,179	6,494	7,135	8,361	15,104	14,728	18,233	21,985	20,256	24,768	29,662	27,225
SPARTA	330	304	300	281	299	323	376	359	273	327	568	501	502	467	449	703	702	650	652	613	976
WECHES	30	30	31	31	31	31	31	32	32	32	66	71	75	75	71	71	93	87	81	94	49
QUEEN CITY	391	371	399	389	382	406	388	480	455	452	875	816	958	2,250	2,844	3,944	5,077	4,549	5,968	5,989	5,021
REKLAW	42	42	42	42	43	43	43	43	43	43	43	44	44	44	44	44	44	44	44	45	45
CARRIZO	3,181	2,313	2,276	1,555	1,496	1,546	1,811	1,983	1,335	1,240	4,880	5,633	6,687	12,167	11,213	13,345	15,937	14,806	17,908	22,825	21,035
CALVERT BLUFF	318	219	226	80	75	82	100	85	51	70	48	58	75	83	90	105	109	98	94	80	85
SIMSBORO	-	-	-	-	-	-	-	-	1	2	2	2	2	2	1	2	2	2	2	2	2
HOOPER	2	2	2	2	2	2	1	2	6	13	12	12	18	17	15	19	21	19	19	15	14
Guadalupe																					
TOTAL	2,314	2,172	2,749	1,521	1,400	1,384	1,511	1,487	1,569	1,727	2,119	2,185	2,156	1,992	2,092	2,411	2,527	2,350	2,521	2,758	2,641
QUEEN CITY	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4
REKLAW	5	6	6	6	7	7	7	8	8	9	9	9	10	10	10	11	11	11	12	12	12
CARRIZO	249	247	548	721	569	560	615	609	681	826	1,114	1,182	1,116	997	1,071	1,209	1,201	1,160	1,281	1,386	1,116
CALVERT BLUFF	881	833	943	414	433	434	477	464	472	481	528	528	550	539	553	688	742	687	701	765	843
SIMSBORO	188	175	201	69	72	72	76	78	79	81	89	90	93	91	94	96	105	94	108	110	128
HOOPER	990	910	1,048	309	317	309	333	326	326	327	377	373	384	352	361	405	465	394	416	482	538
Henderson																					
TOTAL	6,809	6,712	6,388	6,840	6,894	7,063	7,286	6,997	7,547	7,444	8,215	7,783	7,383	7,389	7,449	7,966	7,805	7,498	7,878	9,082	8,445
QUEEN CITY	1,680	1,709	1,598	1,637	1,652	1,692	1,742	1,646	1,743	1,714	1,783	1,572	1,466	1,583	1,552	1,637	1,714	1,527	1,534	1,748	1,584
REKLAW	172	171	171	170	170	169	169	169	168	168	167	167	166	166	165	165	164	164	164	163	166
CARRIZO	358	351	358	378	388	410	434	403	442	442	427	411	388	513	520	536	523	454	539	493	496
CALVERT BLUFF	551	553	529	536	554	554	570	548	576	582	586	550	498	522	540	566	613	609	651	593	618

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Formation	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SIMSBORO	3,468	3,304	3,184	3,537	3,494	3,600	3,675	3,655	3,982	3,904	4,662	4,577	4,444	4,124	4,190	4,547	4,237	4,152	4,388	5,558	5,009
HOOPER	581	623	548	581	637	637	696	576	636	634	591	506	420	482	482	515	553	592	602	527	573
Houston																					
TOTAL	2,224	2,065	2,048	2,083	2,353	2,348	2,465	2,374	2,483	2,556	2,871	2,686	2,975	2,500	2,527	2,549	2,691	2,946	2,267	2,157	2,105
SPARTA	1,265	1,266	1,242	1,164	1,194	1,170	1,201	1,149	1,191	1,247	1,422	1,248	1,414	1,140	1,031	978	986	1,043	909	911	937
WECHES	66	67	68	69	69	70	71	72	73	73	74	75	76	77	77	78	79	80	80	81	82
QUEEN CITY	276	250	243	324	305	291	312	296	318	332	444	364	445	328	396	430	486	580	299	331	287
REKLAW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
CARRIZO	573	433	445	473	726	765	822	802	843	844	821	922	920	899	912	937	989	1,051	918	758	751
CALVERT BLUFF	39	41	42	42	46	41	45	41	44	46	71	48	70	37	72	71	81	101	37	45	30
SIMSBORO	5	7	8	10	12	10	14	14	14	14	38	28	50	18	38	55	68	90	22	30	16
Karnes																					
TOTAL	116	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CARRIZO	116	110	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lee																					
TOTAL	3,446	3,251	3,389	4,081	6,810	8,095	9,407	9,292	11,449	12,425	12,861	12,516	12,613	12,291	12,437	13,668	13,909	9,875	11,326	12,315	11,023
SPARTA	229	232	253	266	265	267	275	255	275	282	413	382	398	375	355	321	305	303	309	324	323
WECHES	60	60	60	60	60	60	59	59	58	58	58	56	56	56	56	56	56	56	54	54	55
QUEEN CITY	1,208	1,152	1,215	1,361	1,342	1,287	1,362	1,272	1,335	1,321	853	883	908	826	908	819	652	494	523	877	1,120
REKLAW	6	7	7	7	8	8	8	9	9	9	9	10	10	10	11	11	11	12	12	12	13
CARRIZO	1,336	1,206	1,264	1,363	1,332	1,208	1,315	1,229	1,331	1,392	1,613	1,605	1,586	1,491	1,531	1,906	1,929	1,620	1,943	1,977	1,950
CALVERT BLUFF	561	545	535	797	1,283	1,495	1,298	1,248	1,261	1,166	818	734	977	706	601	576	580	416	475	667	885
SIMSBORO	38	39	44	215	2,508	3,756	5,076	5,205	7,165	8,180	8,881	8,629	8,458	8,573	8,833	9,753	9,394	6,292	6,853	7,406	5,889
HOOPER	9	10	10	11	12	13	14	14	15	16	216	217	219	254	141	226	982	682	1,157	997	789
Leon																					
TOTAL	3,924	3,980	3,973	3,929	3,759	4,024	4,041	4,401	4,289	4,229	4,358	3,878	3,817	3,721	3,893	3,570	4,704	11,251	5,562	4,390	4,524
SPARTA	223	225	218	215	206	221	207	223	203	206	204	201	195	206	189	151	150	153	156	156	153
WECHES	92	95	98	101	104	106	109	112	115	118	121	124	127	130	133	136	138	141	144	147	150
QUEEN CITY	1,254	1,239	1,212	1,217	1,126	1,215	1,181	1,257	1,141	1,122	1,111	964	946	969	979	749	748	755	796	827	861
REKLAW	55	54	54	53	52	52	51	50	50	49	48	48	47	46	46	45	44	44	43	42	42
CARRIZO	1,163	1,256	1,274	1,194	1,124	1,191	1,192	1,322	1,308	1,318	1,342	1,083	1,097	1,003	1,013	819	1,617	4,726	1,916	1,222	1,406
CALVERT BLUFF	1,101	1,078	1,079	1,106	1,103	1,206	1,253	1,385	1,413	1,358	1,474	1,342	1,289	1,251	1,343	1,448	1,793	5,230	2,307	1,757	1,560
SIMSBORO	37	32	39	44	44	33	47	52	59	57	58	118	116	116	191	222	213	202	200	238	353
Limestone																					
TOTAL	2,507	2,129	2,291	2,316	2,306	2,207	2,346	2,322	2,607	2,598	2,808	2,623	2,465	2,540	2,434	2,383	2,538	2,924	2,579	2,530	773
CALVERT BLUFF	226	167	156	165	171	167	170	165	162	165	164	153	158	173	150	120	119	119	119	118	116
SIMSBORO	2,021	1,755	1,836	1,839	1,823	1,732	1,871	1,858	2,127	2,119	2,322	2,162	2,012	2,058	1,996	2,003	2,161	2,542	2,194	2,147	498
HOOPER	260	207	299	312	313	308	306	299	318	313	323	308	295	309	287	260	257	263	266	264	159
Madison																					

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Formation	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL	2,127	2,283	1,928	1,949	2,138	2,072	2,326	2,129	2,247	2,223	2,632	2,270	2,345	2,228	2,354	2,462	2,479	2,508	2,489	2,601	2,818
SPARTA	1,840	1,985	1,637	1,625	1,804	1,746	1,978	1,782	1,878	1,876	2,160	1,806	1,858	1,794	1,828	2,037	2,013	2,066	2,046	2,127	2,113
QUEEN CITY	45	40	23	48	50	52	63	70	71	66	67	64	72	26	23	29	63	46	80	82	84
CARRIZO	238	254	264	272	277	268	278	270	291	274	399	394	409	402	497	390	397	390	358	392	620
CALVERT BLUFF	3	3	3	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	-	-
Milam																					
TOTAL	18,028	17,898	26,050	32,707	32,840	31,979	32,720	28,431	26,635	28,228	28,784	28,904	28,855	31,658	31,197	32,436	31,649	28,966	20,011	18,297	20,125
ALLUVIUM	2,314	2,313	2,410	1,508	2,256	2,375	2,364	2,180	2,427	2,267	2,242	2,575	2,575	2,647	3,349	3,993	4,151	4,521	4,943	5,545	7,415
QUEEN CITY	58	60	58	59	65	64	64	63	64	66	138	145	157	408	625	808	936	732	518	448	429
REKLAW	61	61	62	62	62	63	63	63	64	64	64	65	65	65	66	66	66	67	67	67	68
CARRIZO	64	65	59	58	76	76	72	72	70	70	64	64	65	92	83	83	88	74	64	71	67
CALVERT BLUFF	463	510	486	547	563	603	620	662	704	724	704	618	807	1,166	1,013	1,140	1,240	1,105	1,111	1,055	926
SIMSBORO	14,591	14,407	22,540	29,985	29,284	28,248	28,987	24,840	22,703	24,445	25,011	24,872	24,588	26,147	25,084	25,204	23,902	21,446	12,434	10,273	10,462
HOOPER	476	481	436	488	534	551	550	550	604	592	561	567	598	1,132	978	1,141	1,266	1,022	874	836	759
Nacogdoches																					
TOTAL	12,972	20,497	12,625	13,024	19,223	13,493	19,891	11,871	19,885	12,195	12,514	11,507	10,910	11,143	9,705	9,693	8,842	7,751	8,280	7,024	7,679
SPARTA	953	908	861	842	841	858	824	802	813	777	824	694	666	706	425	372	376	344	341	339	335
WECHES	354	352	349	347	345	342	340	338	335	333	331	328	326	324	321	319	317	314	312	310	307
QUEEN CITY	487	489	491	493	496	498	500	502	505	507	509	511	514	516	518	520	523	525	527	529	532
REKLAW	276	276	277	278	279	280	280	307	312	310	311	307	308	314	315	311	312	312	313	314	318
CARRIZO	10,249	17,813	9,941	10,373	16,634	10,926	17,463	9,258	17,228	9,628	9,775	8,998	8,286	8,208	6,979	6,492	6,122	5,222	5,663	4,473	4,766
CALVERT BLUFF	547	550	588	575	525	494	410	556	580	536	638	561	702	934	988	1,416	1,026	884	956	914	1,228
SIMSBORO	107	109	116	115	103	95	73	109	111	104	126	108	108	141	158	263	166	150	168	144	191
Navarro																					
TOTAL	42	44	44	46	49	49	54	51	55	56	59	61	62	63	65	63	64	67	68	70	73
CALVERT BLUFF	5	5	4	4	5	4	5	4	4	4	4	4	4	4	4	3	3	3	3	3	3
SIMSBORO	5	5	5	5	5	5	6	5	5	6	6	6	6	6	6	5	5	6	6	6	7
HOOPER	32	34	35	37	39	40	43	42	45	47	49	51	52	53	55	54	56	58	59	61	63
Robertson																					
TOTAL	20,935	22,228	20,157	15,084	27,853	26,747	31,997	26,310	33,093	31,122	28,500	32,947	36,374	30,396	49,856	67,580	65,993	64,463	71,670	69,540	82,192
ALLUVIUM	13,852	14,235	11,624	5,096	11,528	10,376	13,898	8,461	12,723	11,519	11,360	16,408	19,136	14,699	33,495	50,443	48,540	46,864	51,213	49,909	60,773
SPARTA	127	131	134	138	144	162	149	156	147	149	247	289	313	288	431	557	541	526	573	581	691
WECHES	45	46	47	47	48	49	49	50	51	51	52	52	53	54	54	55	56	56	57	58	58
QUEEN CITY	285	289	294	299	300	334	301	312	286	286	361	395	418	408	486	583	571	552	651	646	700
REKLAW	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65	65
CARRIZO	463	470	417	259	250	253	288	245	273	265	242	310	331	287	427	546	490	452	423	402	447
CALVERT BLUFF	946	967	874	591	578	625	619	546	582	566	536	619	671	636	907	1,130	1,002	925	935	911	1,297

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Formation	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
SIMSBORO	3,202	3,075	3,215	4,766	11,253	11,198	12,573	12,357	15,050	14,321	10,849	9,766	10,229	8,858	9,465	10,125	9,731	10,087	17,002	16,120	16,775
HOOPER	1,951	2,950	3,487	3,822	3,687	3,687	4,054	4,119	3,916	3,901	4,787	5,044	5,158	5,103	4,526	4,076	4,998	4,935	751	849	1,385
Rusk																					
TOTAL	504	422	325	351	340	328	329	310	332	323	337	345	348	363	352	346	356	362	347	362	350
SPARTA	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
QUEEN CITY	40	40	39	38	38	37	36	36	35	34	34	33	32	32	31	30	30	29	28	28	27
REKLAW	46	45	44	43	42	42	41	40	39	38	37	36	35	34	33	32	32	31	30	29	28
CARRIZO	251	196	112	132	130	110	109	93	100	100	109	106	79	101	98	104	112	124	106	132	102
CALVERT BLUFF	17	17	17	16	16	16	16	16	16	16	15	15	15	15	15	15	14	14	14	14	14
SIMSBORO	142	115	103	111	105	114	118	116	133	126	133	145	177	172	166	155	159	155	160	150	170
Sabine																					
TOTAL	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REKLAW	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
San Augustine																					
TOTAL	194	187	169	172	151	144	165	172	132	137	133	133	134	192	225	259	232	253	275	241	215
SPARTA	68	67	67	67	67	67	66	66	66	66	66	65	65	65	65	65	64	64	64	64	64
WECHES	27	27	28	28	29	29	29	30	30	31	31	31	32	32	33	33	33	34	34	34	35
QUEEN CITY	5	5	5	4	4	4	4	4	4	3	3	3	3	3	2	2	2	2	2	2	1
REKLAW	12	12	12	12	12	12	12	12	12	12	13	13	13	13	13	13	13	13	13	13	14
CARRIZO	78	71	53	56	35	27	48	55	15	19	15	15	15	73	107	140	112	134	155	120	94
CALVERT BLUFF	4	4	4	5	5	5	5	5	5	5	6	6	6	6	6	6	6	7	7	7	7
Smith																					
TOTAL	6,342	6,005	6,743	7,139	7,093	7,559	7,831	7,833	8,154	8,870	8,906	8,459	8,455	9,022	9,221	9,909	10,889	9,090	10,175	10,235	10,225
SPARTA	145	141	129	120	131	124	126	110	126	129	130	128	114	115	115	116	117	118	58	56	53
WECHES	11	11	10	10	9	9	8	8	7	7	6	6	5	4	4	3	3	2	2	1	1
QUEEN CITY	221	221	213	208	224	220	227	214	234	241	247	249	239	243	248	253	258	263	207	208	210
CARRIZO	3,112	2,939	3,362	3,611	3,534	3,801	3,967	4,004	4,103	4,516	4,598	4,489	4,572	4,750	4,869	5,317	5,848	4,852	5,452	5,452	5,452
CALVERT BLUFF	1,779	1,678	1,883	1,967	1,983	2,108	2,146	2,143	2,276	2,426	2,343	2,041	1,961	2,284	2,315	2,398	2,661	2,181	2,234	2,240	2,232
SIMSBORO	1,074	1,015	1,147	1,224	1,212	1,297	1,357	1,356	1,407	1,551	1,582	1,547	1,563	1,626	1,669	1,822	2,002	1,674	2,221	2,278	2,278
Van Zandt																					
TOTAL	1,155	1,176	1,212	1,146	1,097	1,153	1,097	1,305	1,392	1,171	1,225	1,157	1,143	1,170	1,147	1,737	1,745	1,686	1,540	1,578	1,580
QUEEN CITY	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82
REKLAW	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	58	59
CARRIZO	29	30	31	32	33	34	35	37	38	39	40	41	42	43	44	45	47	48	49	50	51
CALVERT BLUFF	692	699	718	616	563	587	515	711	748	526	541	483	464	487	455	1,006	1,011	965	843	848	824
SIMSBORO	110	111	122	143	140	160	166	174	207	200	220	197	199	197	196	223	218	205	223	248	265
HOOPER	223	232	236	246	250	259	267	268	281	286	302	312	312	315	322	331	336	332	287	293	298
Williamson																					

Final Report: Groundwater Availability Model for the Central Portion
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Formation	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
TOTAL	40	42	44	47	49	52	54	56	59	61	69	72	73	77	79	92	97	100	102	103	115
CALVERT BLUFF	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
SIMSBORO	7	7	8	8	9	9	10	10	11	12	12	13	13	14	14	15	15	16	16	17	17
HOOPER	32	34	36	38	39	41	43	45	47	49	57	59	60	62	64	77	81	84	85	86	98
Wilson																					
TOTAL	16,624	15,337	17,537	13,494	15,387	14,764	19,609	17,641	14,918	17,223	21,851	15,394	14,815	16,723	19,298	20,989	26,690	10,631	19,993	21,605	21,951
SPARTA	33	33	33	34	34	34	35	35	35	36	36	36	37	37	37	38	38	38	39	39	39
WECHES	41	42	43	44	45	46	48	49	50	51	52	54	55	56	57	58	59	61	62	63	64
QUEEN CITY	595	558	546	569	578	611	671	609	644	676	1,825	1,283	1,233	1,410	1,604	1,848	2,286	1,052	1,605	1,700	1,908
REKLAW	59	62	66	69	72	76	79	82	86	89	93	96	99	103	106	109	113	116	119	123	126
CARRIZO	14,785	13,611	15,704	11,788	13,546	12,906	17,513	15,654	13,031	15,240	18,679	13,008	12,480	14,014	16,195	17,334	22,239	8,291	16,341	17,525	17,652
CALVERT BLUFF	948	898	1,002	825	976	928	1,106	1,022	910	957	1,009	760	732	953	1,171	1,424	1,767	905	1,655	1,973	2,017
SIMSBORO	163	132	143	167	134	162	158	189	162	173	158	157	179	150	127	179	188	168	172	182	145
Grand Total	190,969	189,328	195,093	197,254	218,469	214,924	240,464	218,641	242,015	234,421	244,941	236,454	258,162	250,521	263,193	302,403	302,416	269,916	289,028	298,976	310,676

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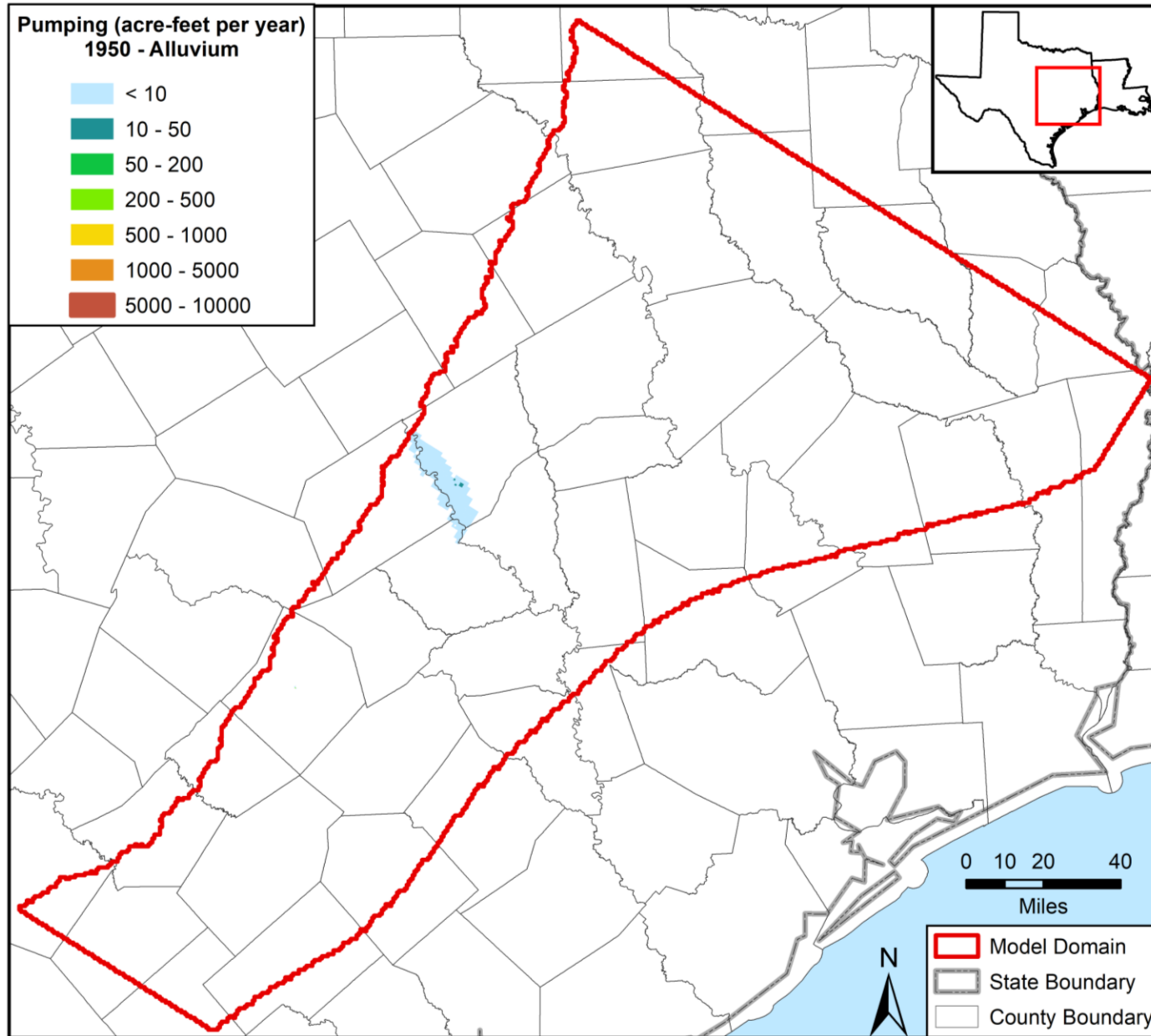
18 Appendix G: Maps Showing Pumping Rate per Grid Cell for Each Hydrogeologic Unit for 1950, 1970, 1990, and 2010

Figures showing the spatial distribution of annual pumping for the hydrogeologic units for each grid cell in the model for the years 1950, 1970, 1990, and 2010 are provided in this appendix. The figures are presented in order by hydrogeologic unit and year.

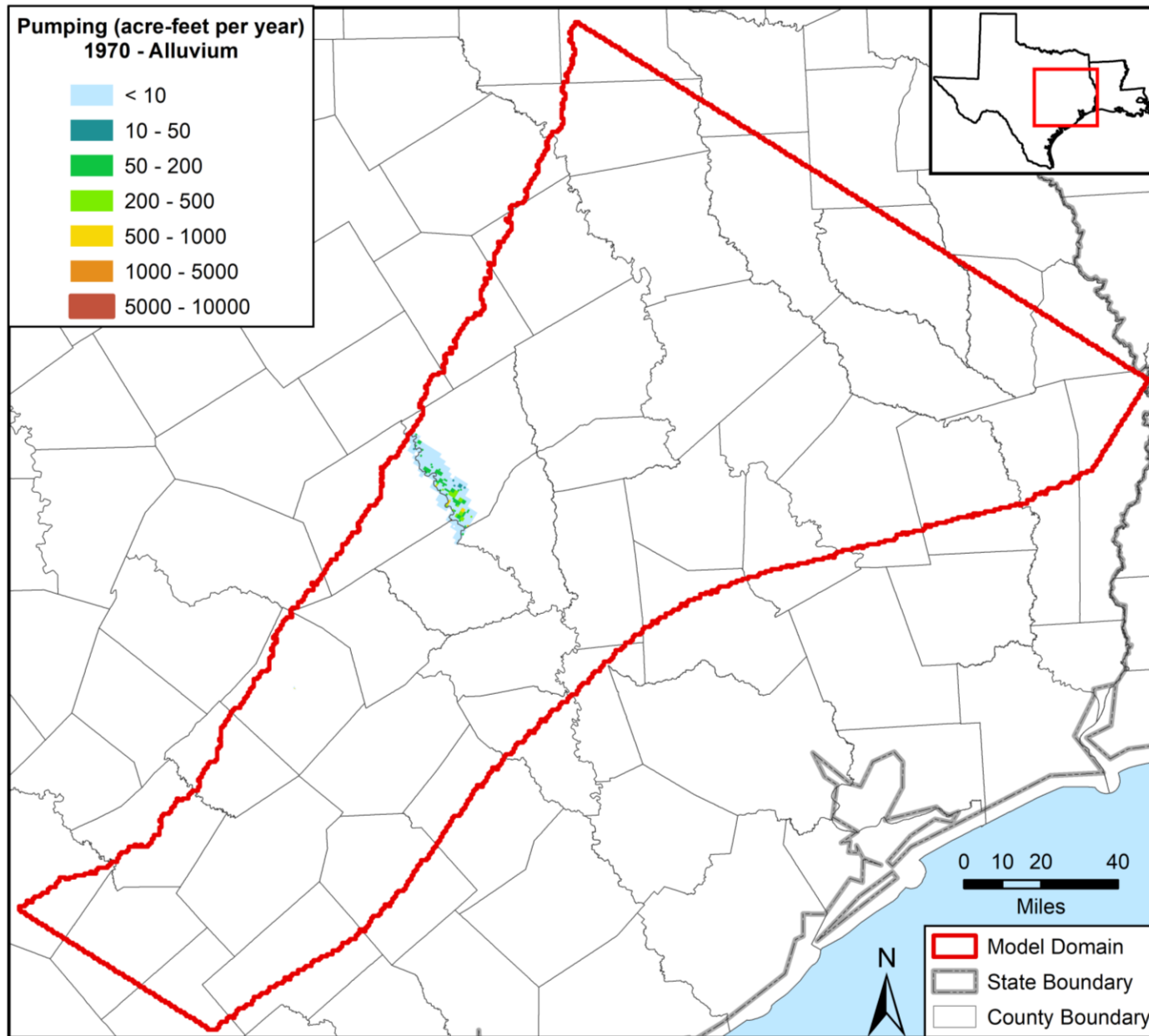
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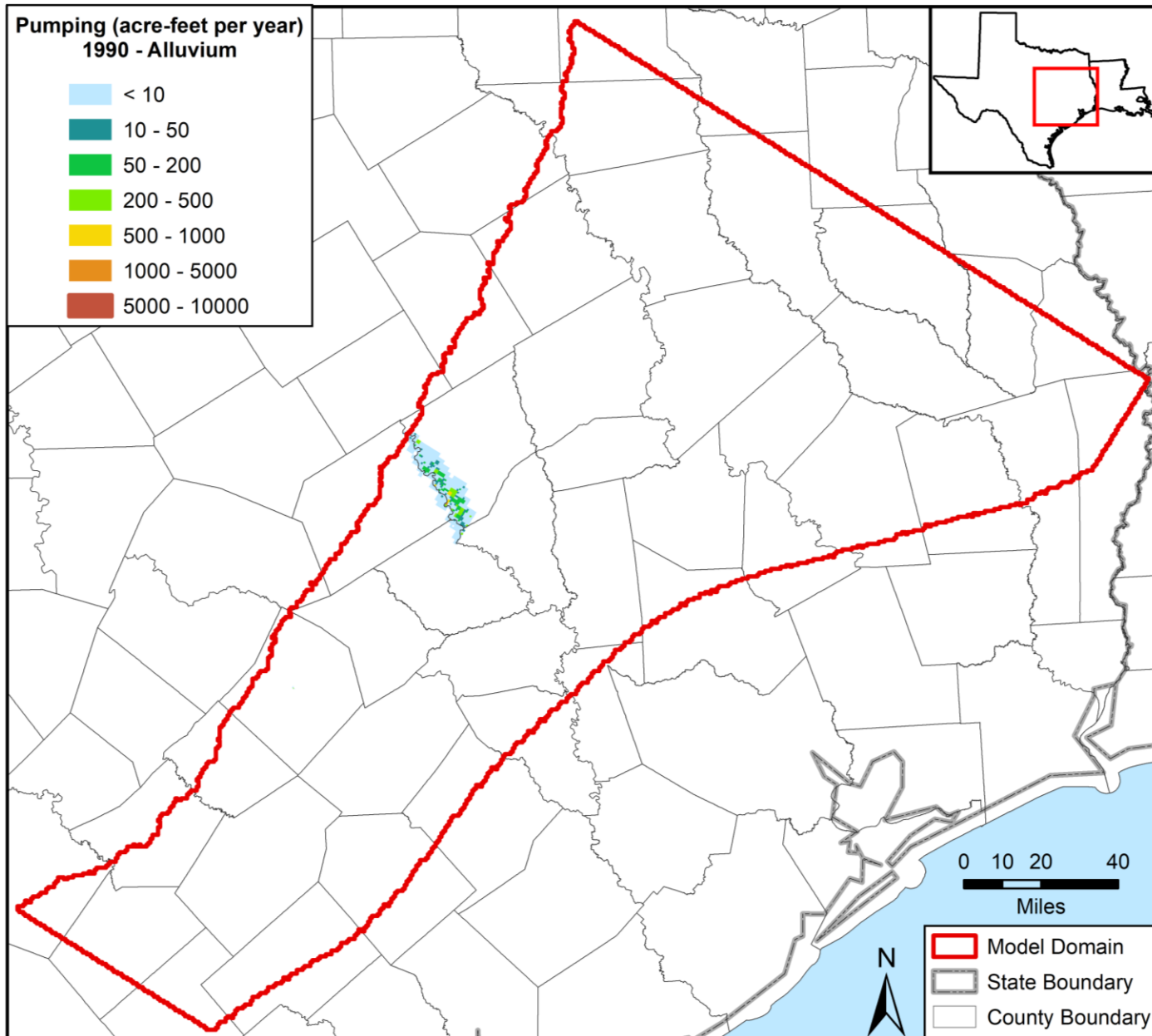
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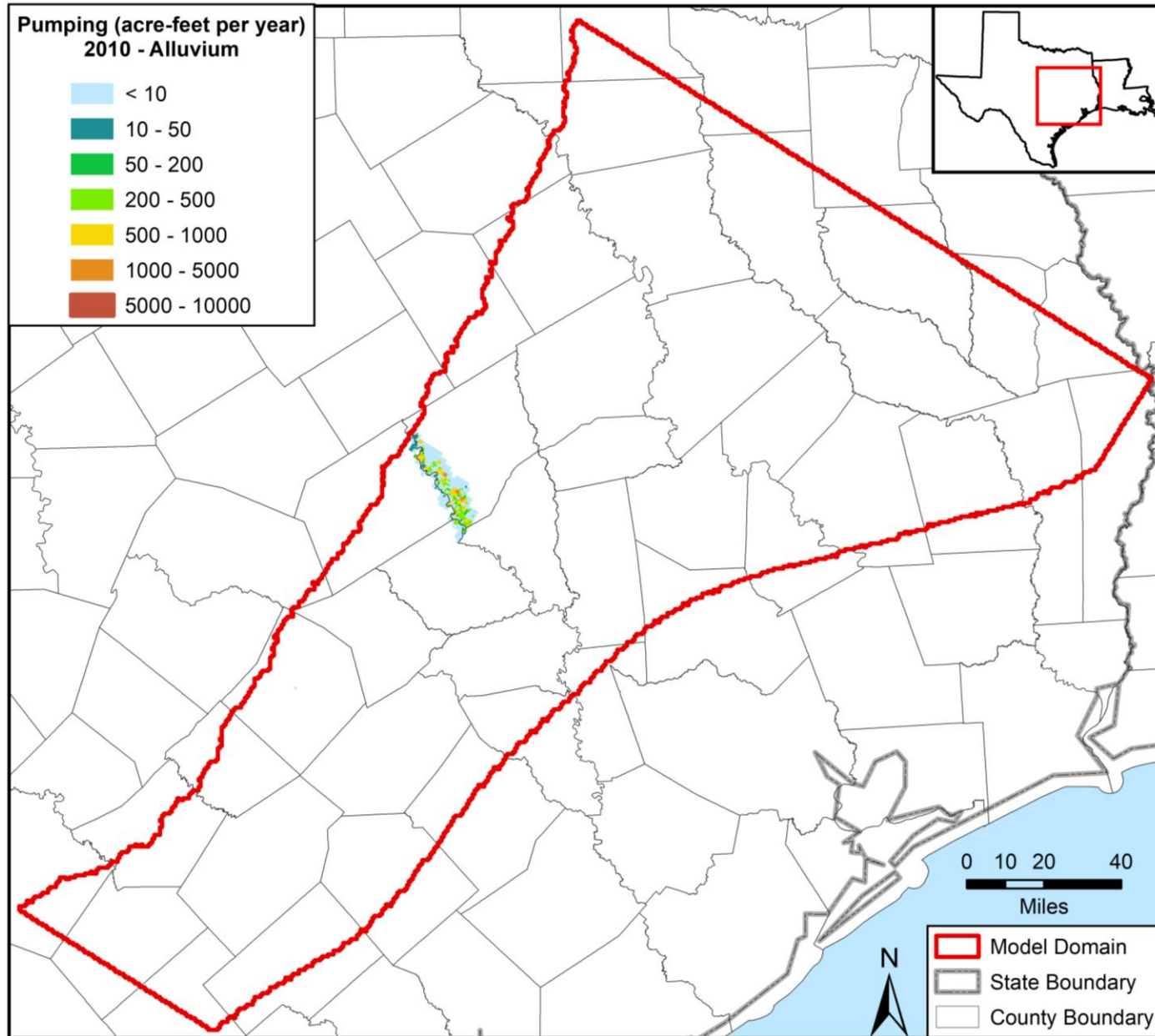
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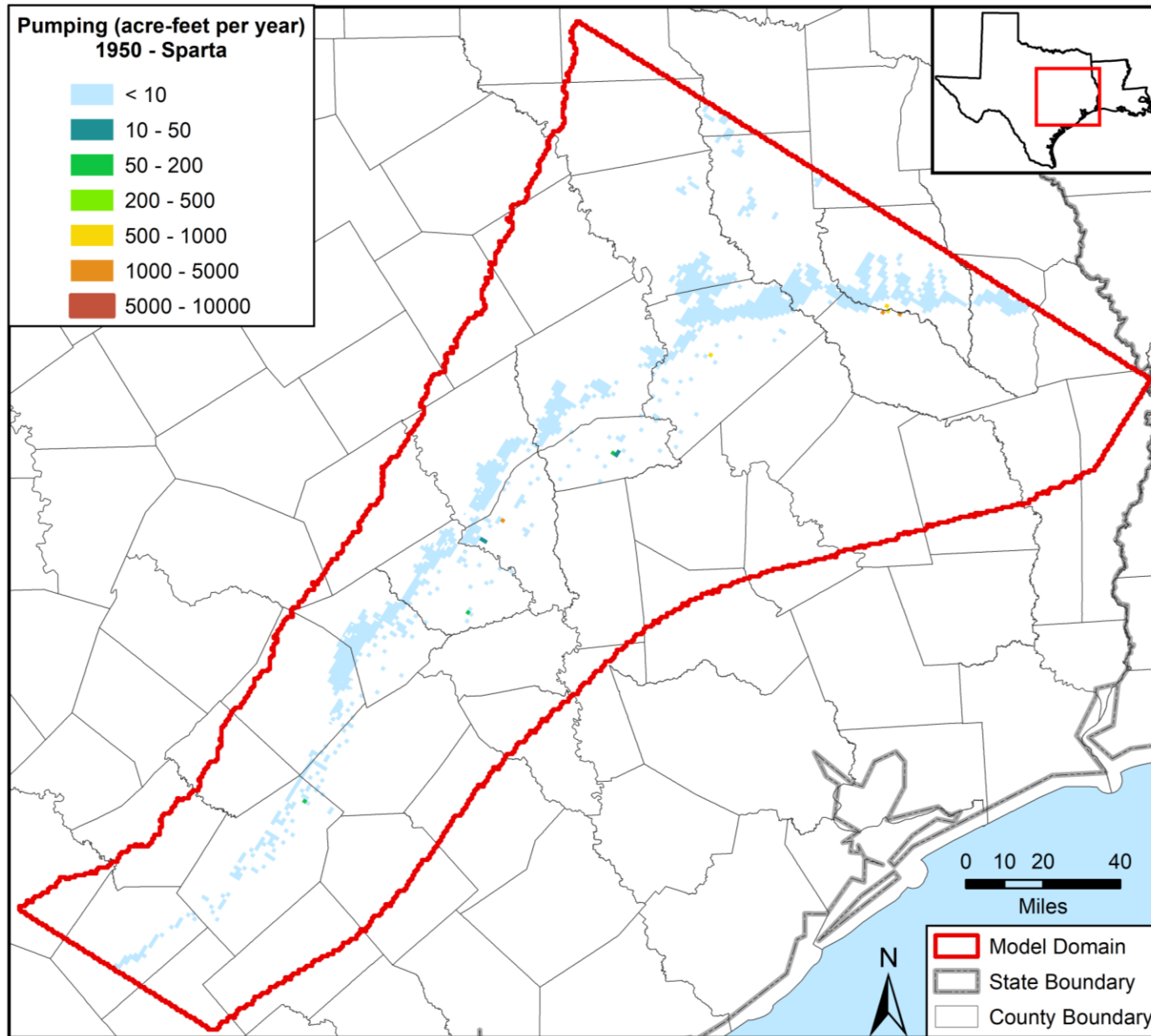
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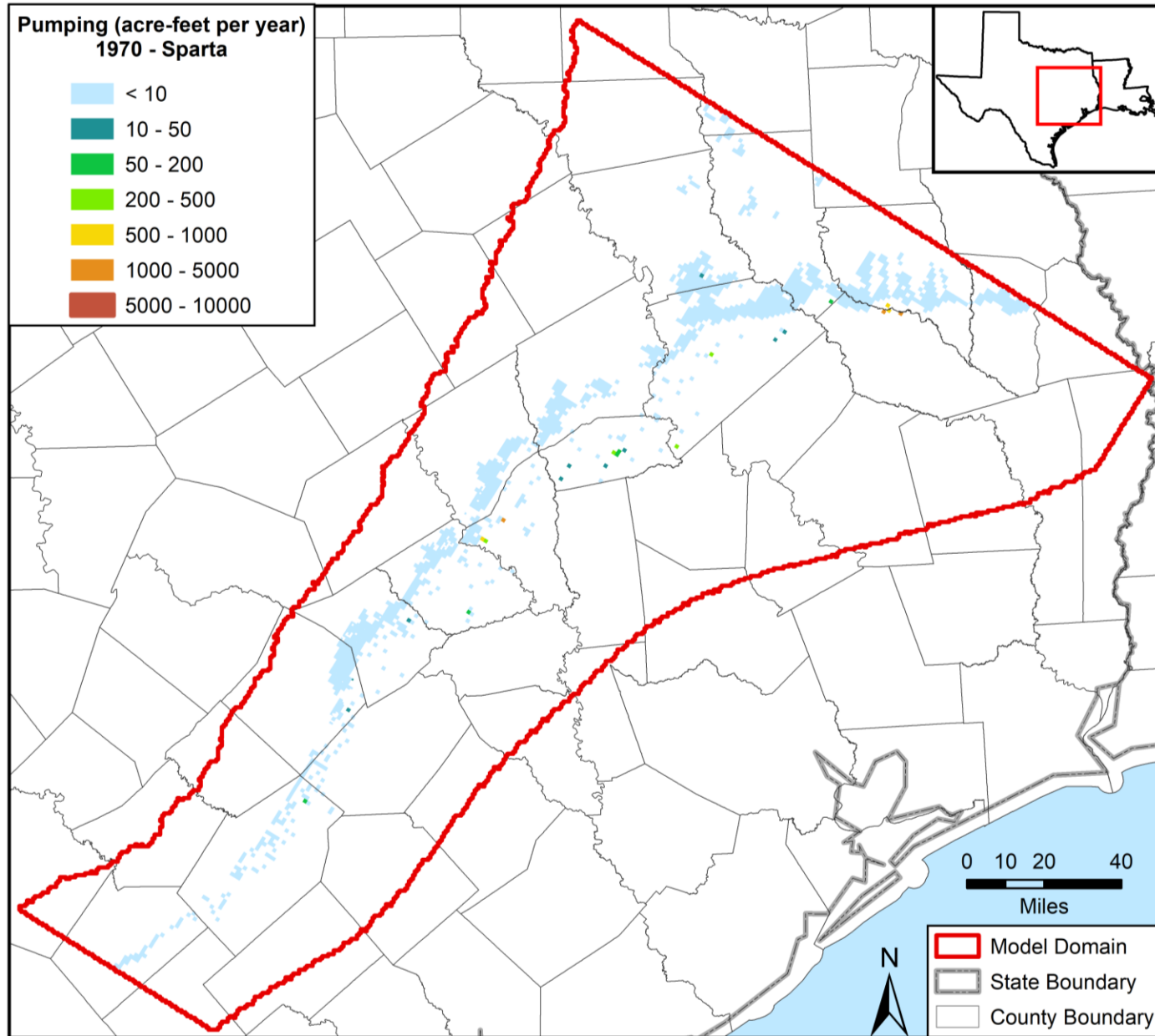
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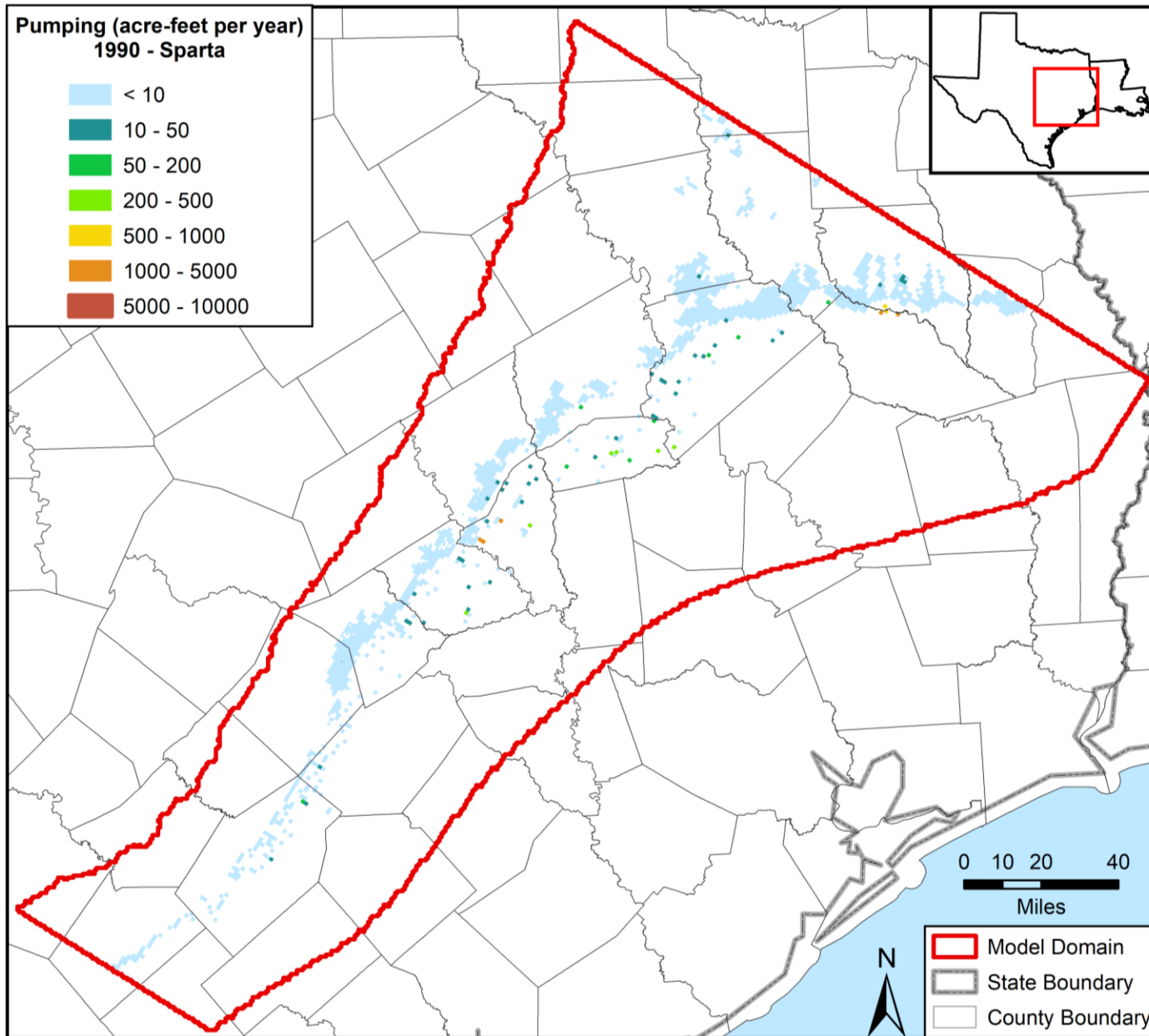
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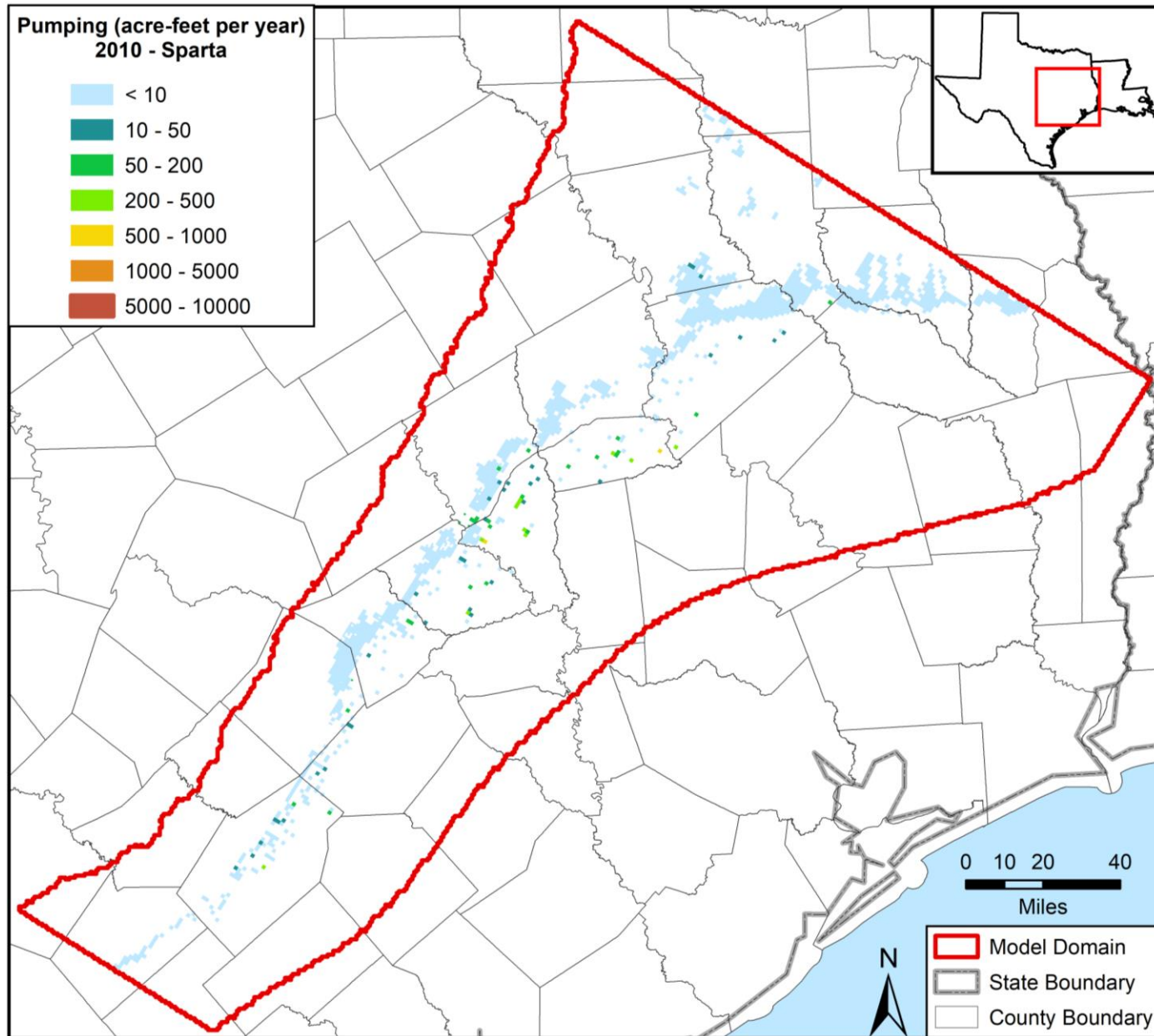
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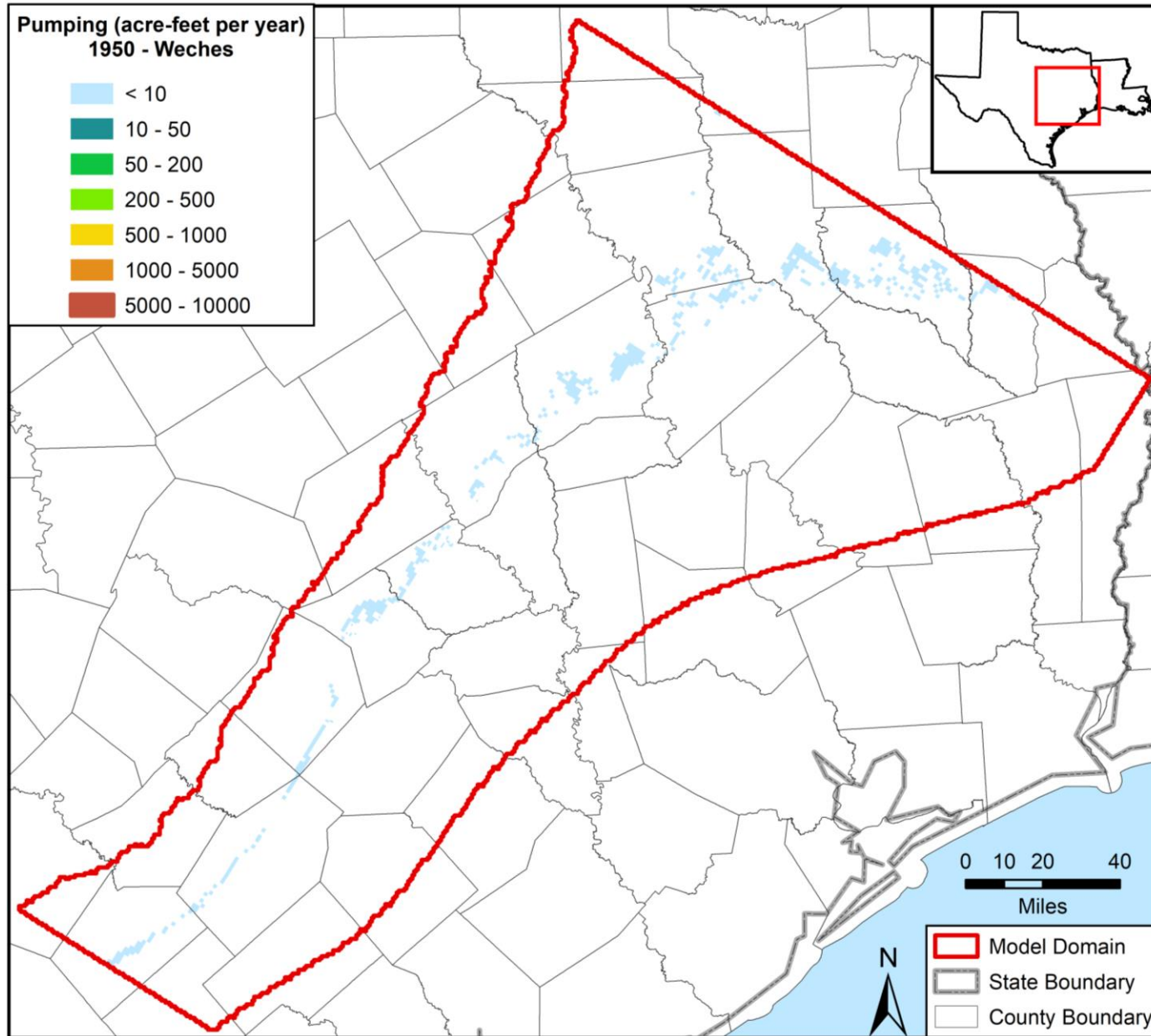
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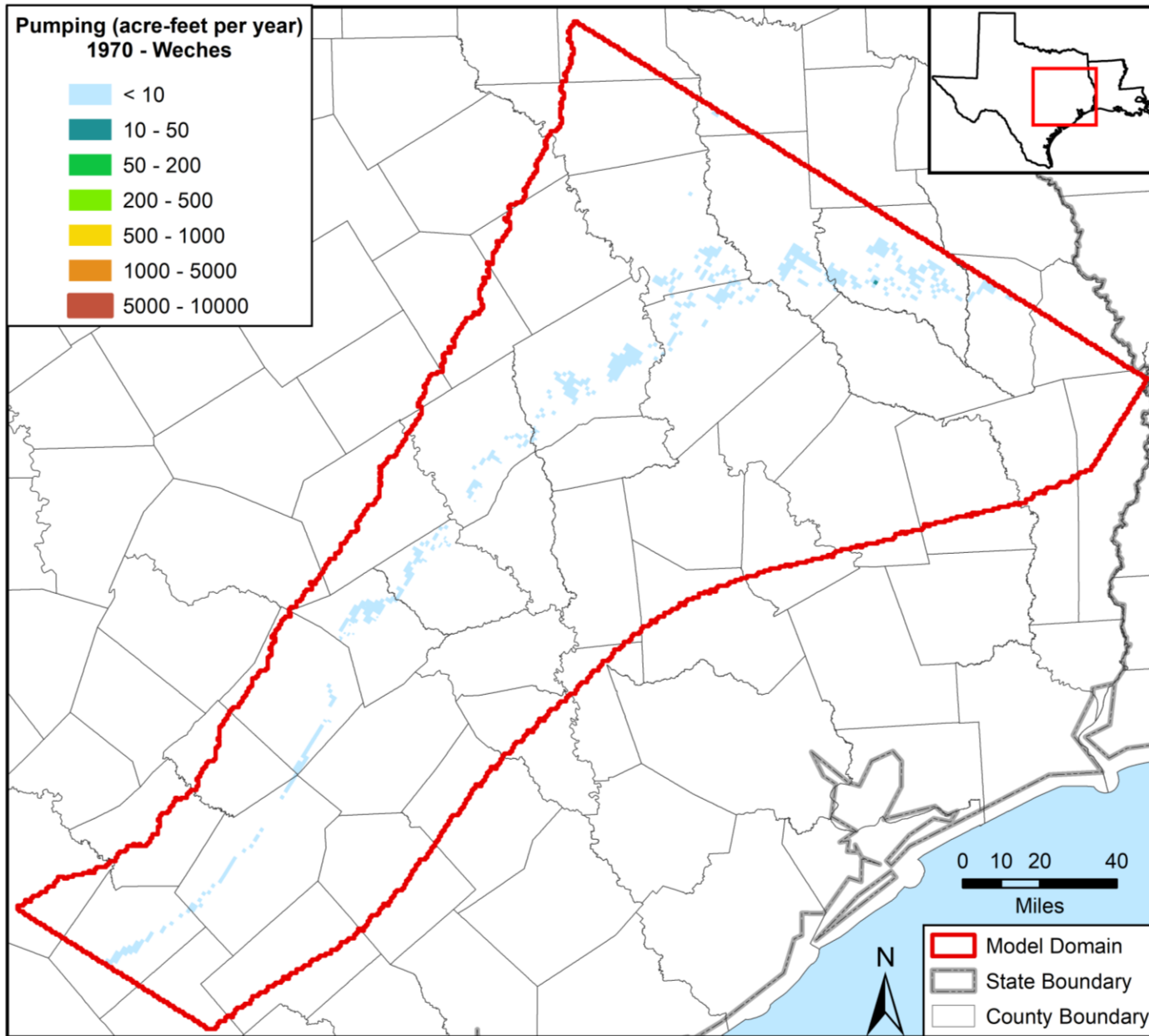
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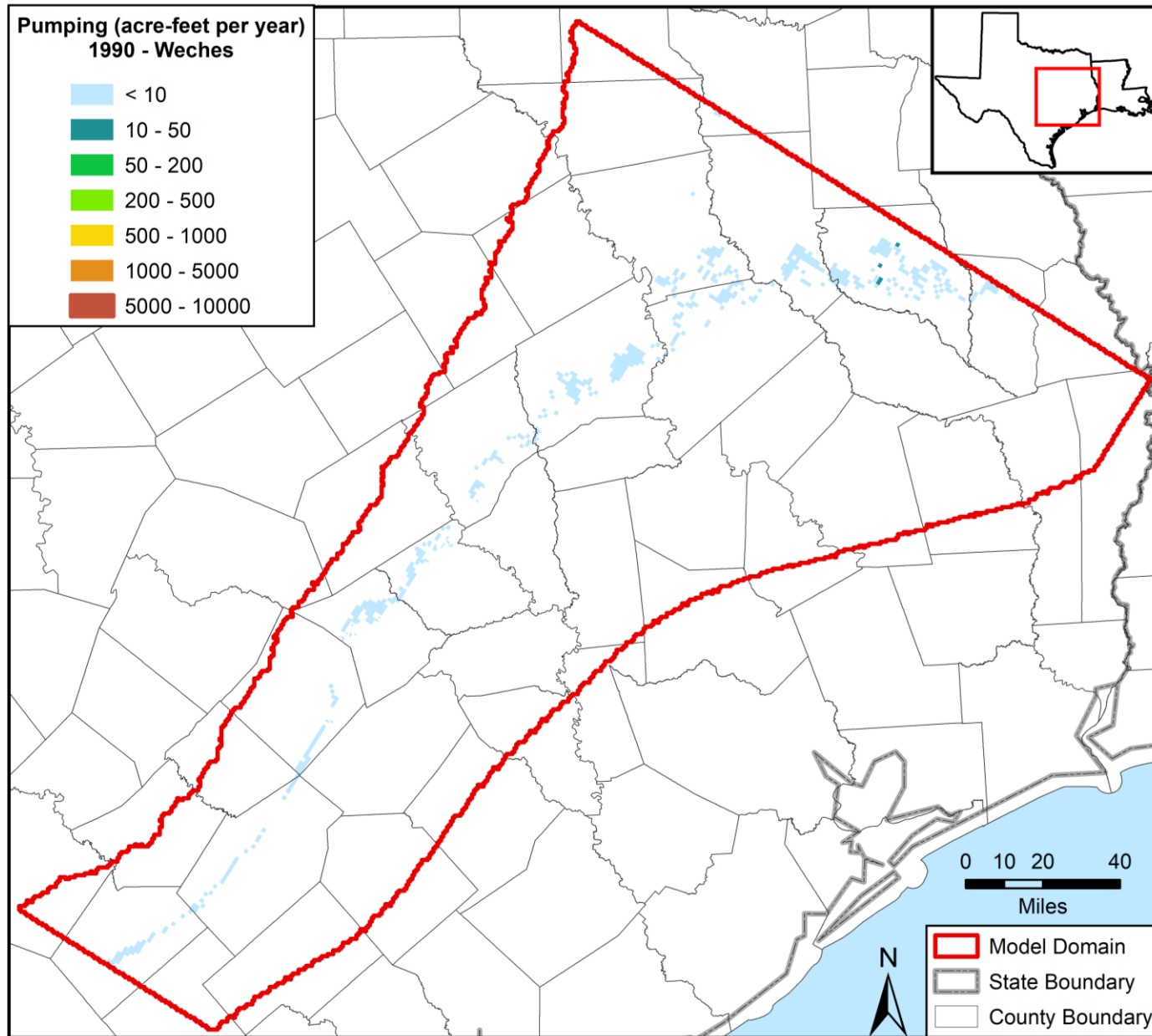
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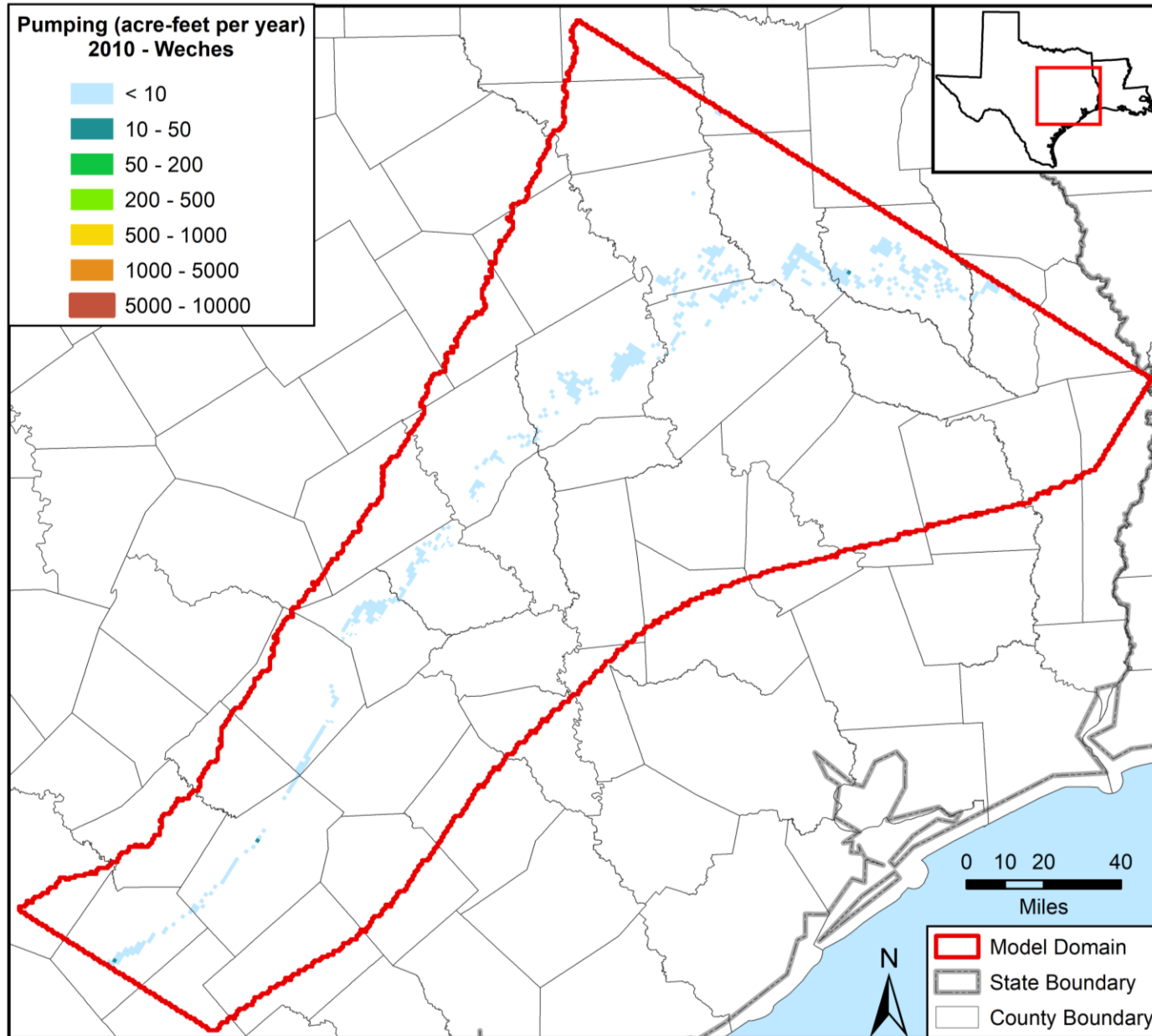
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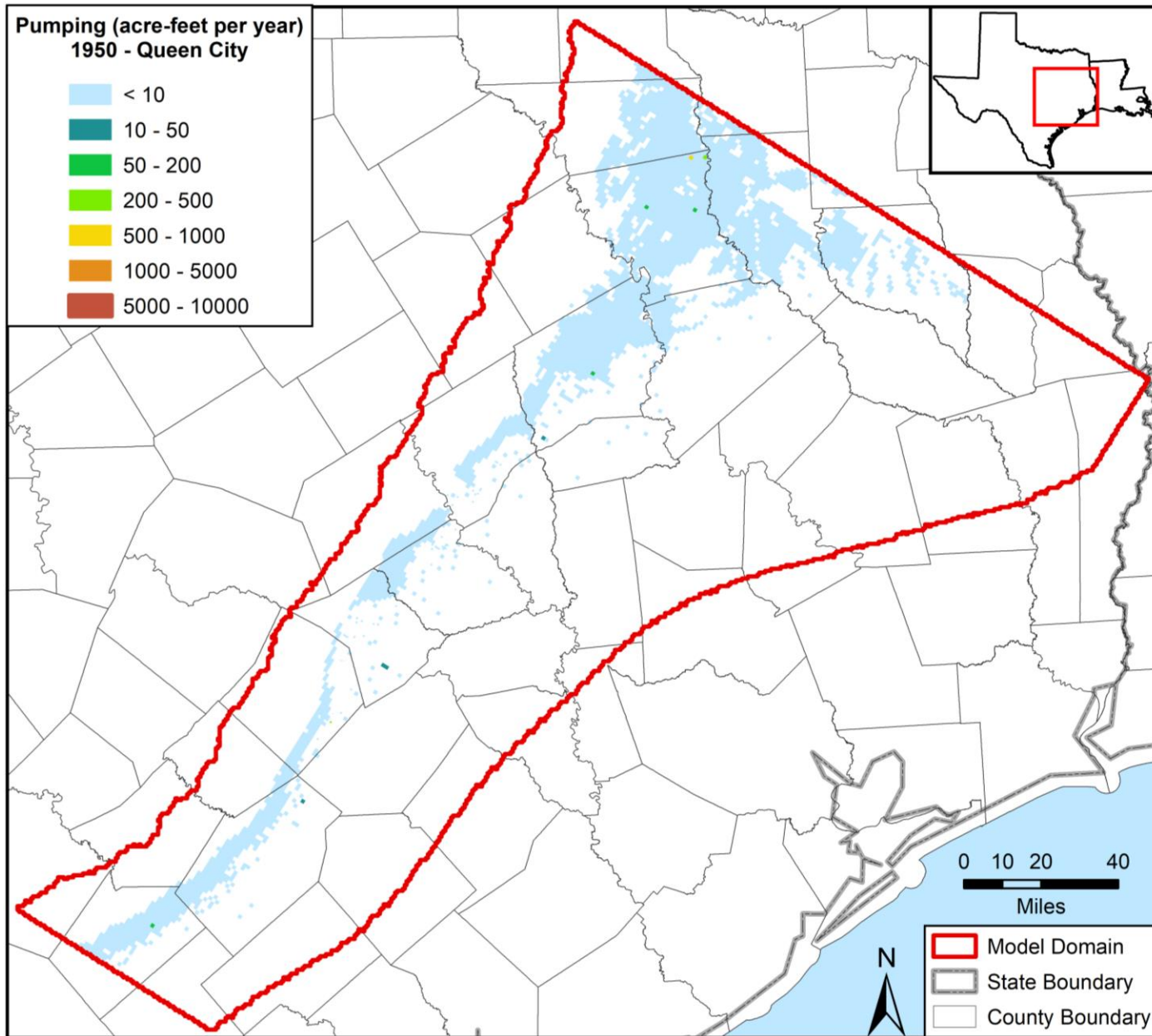
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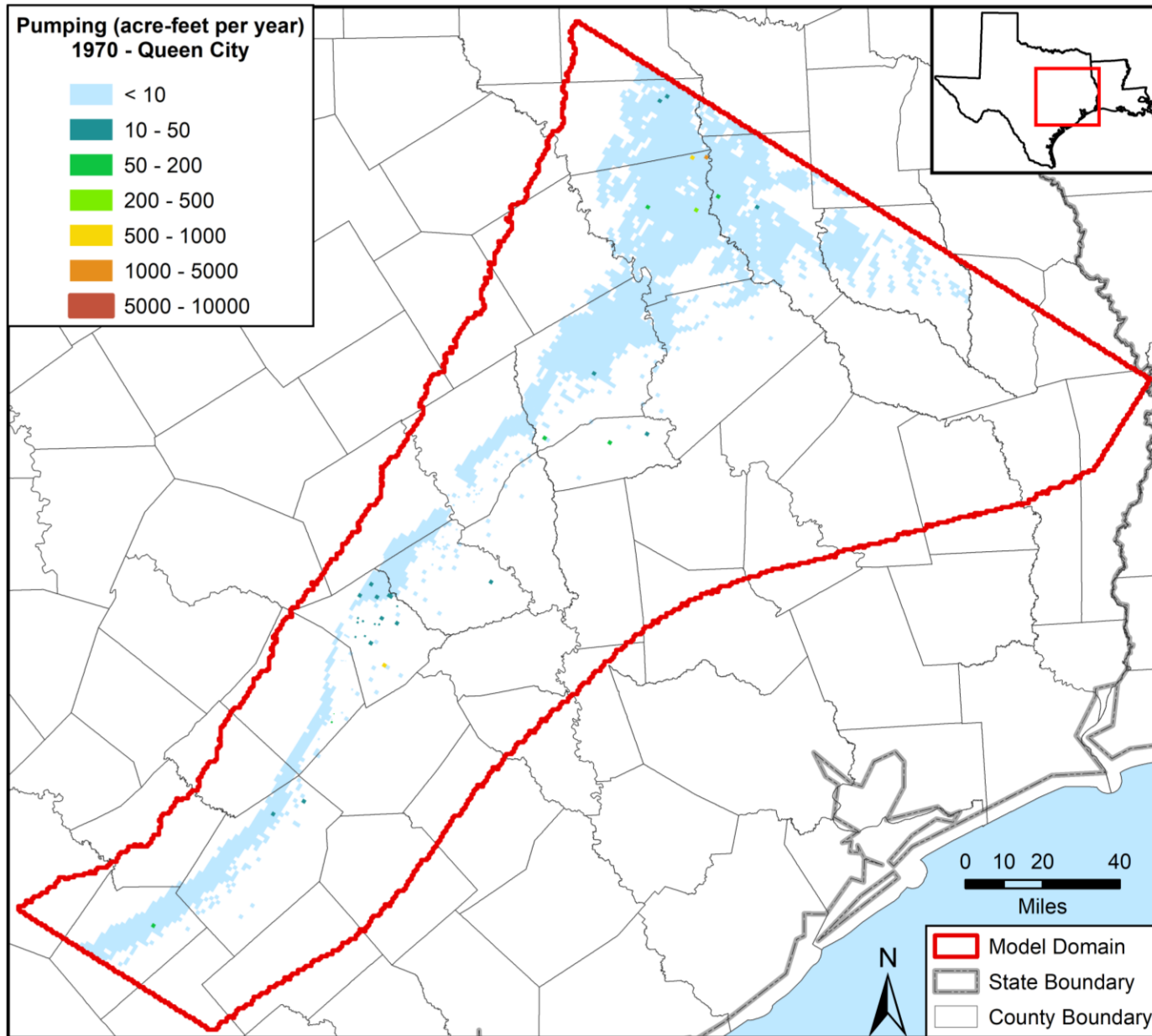
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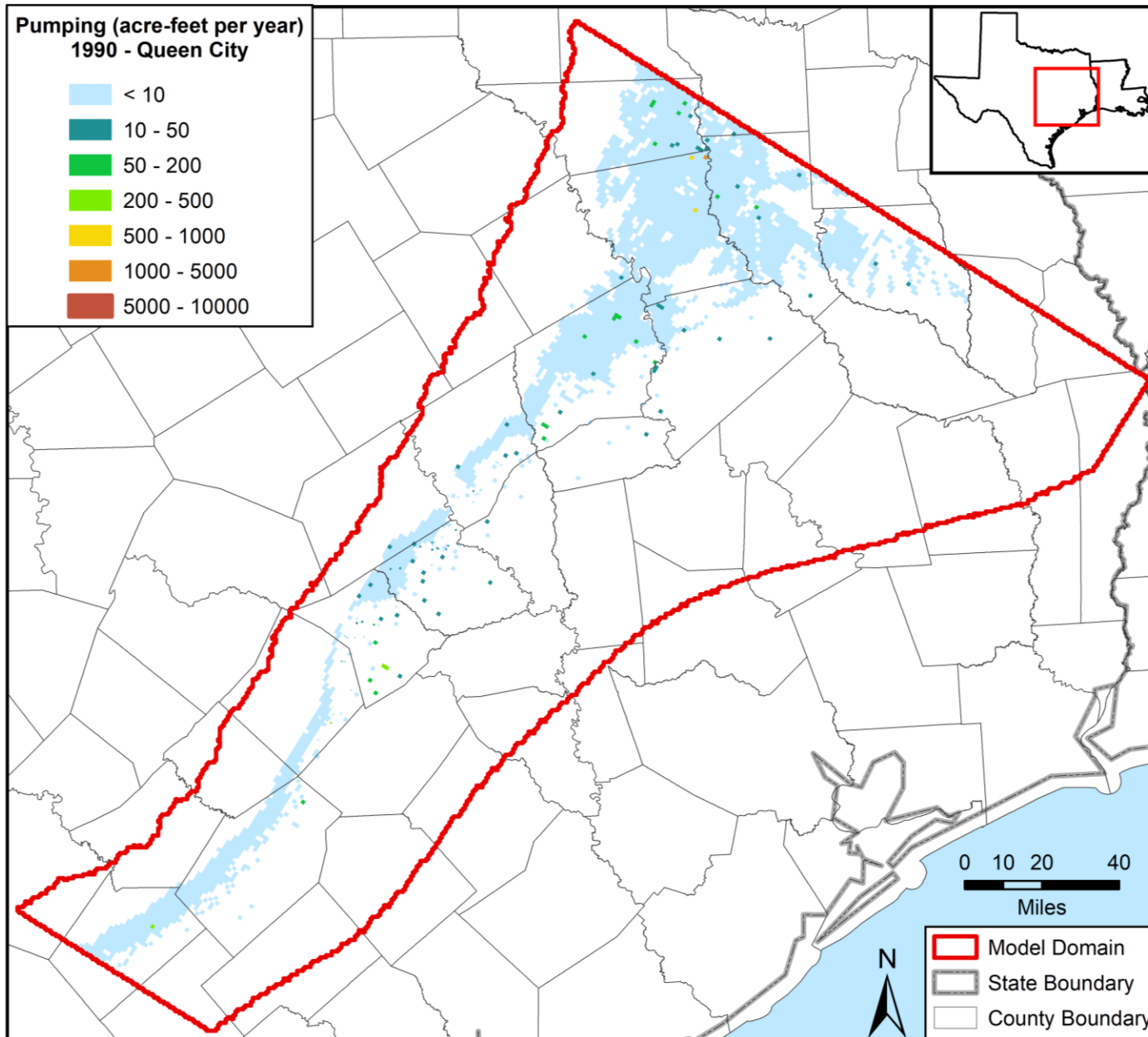
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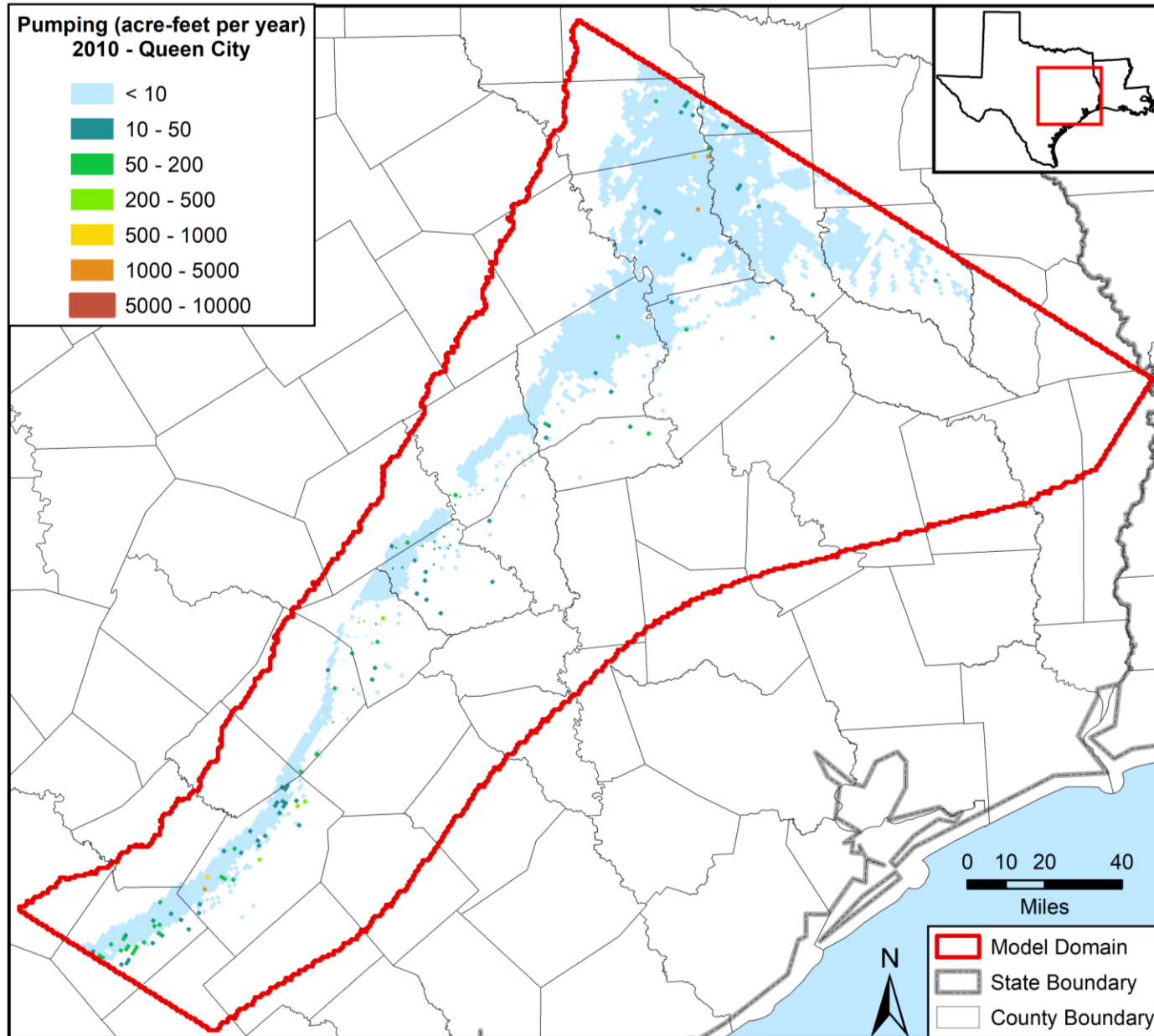
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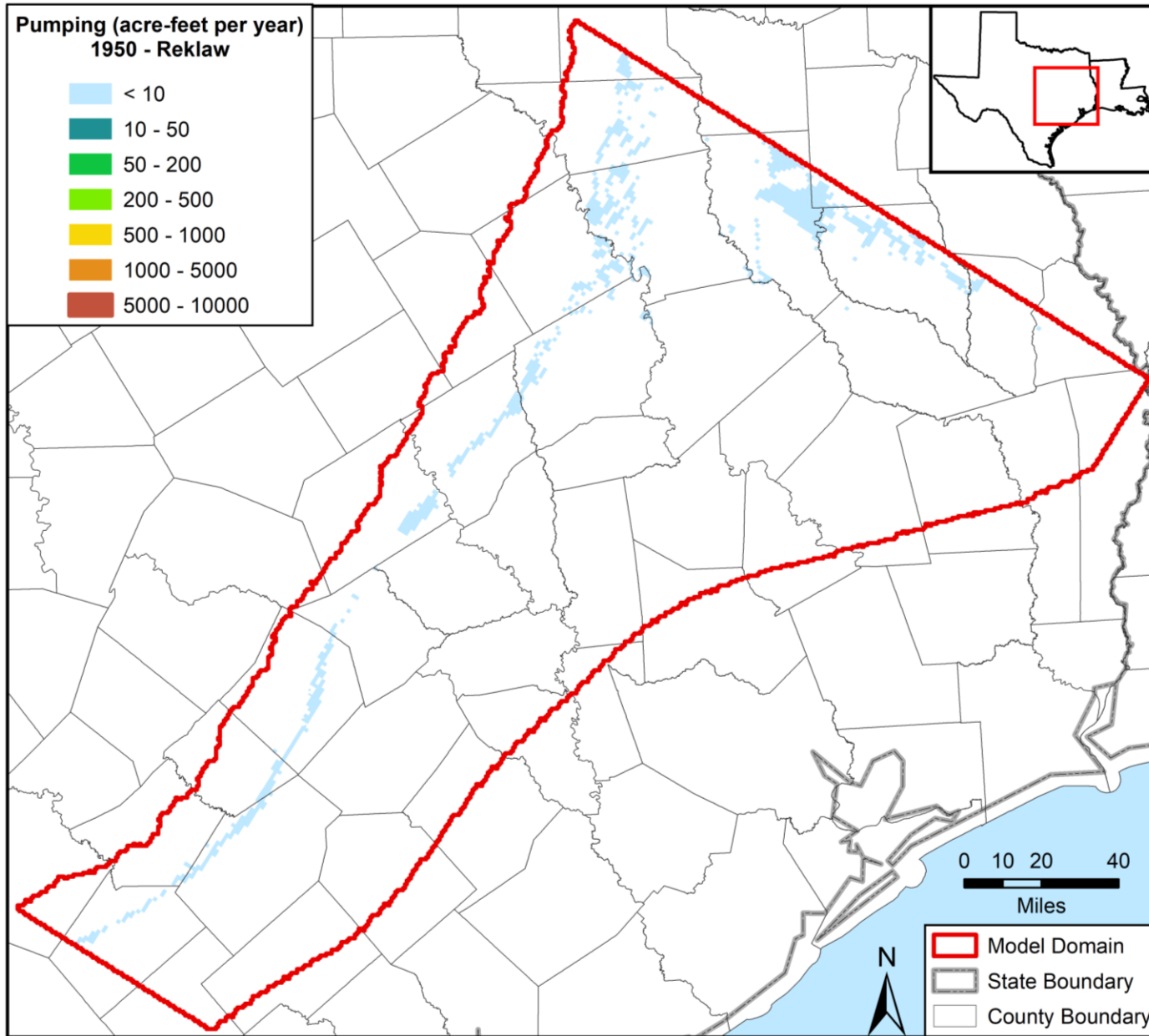
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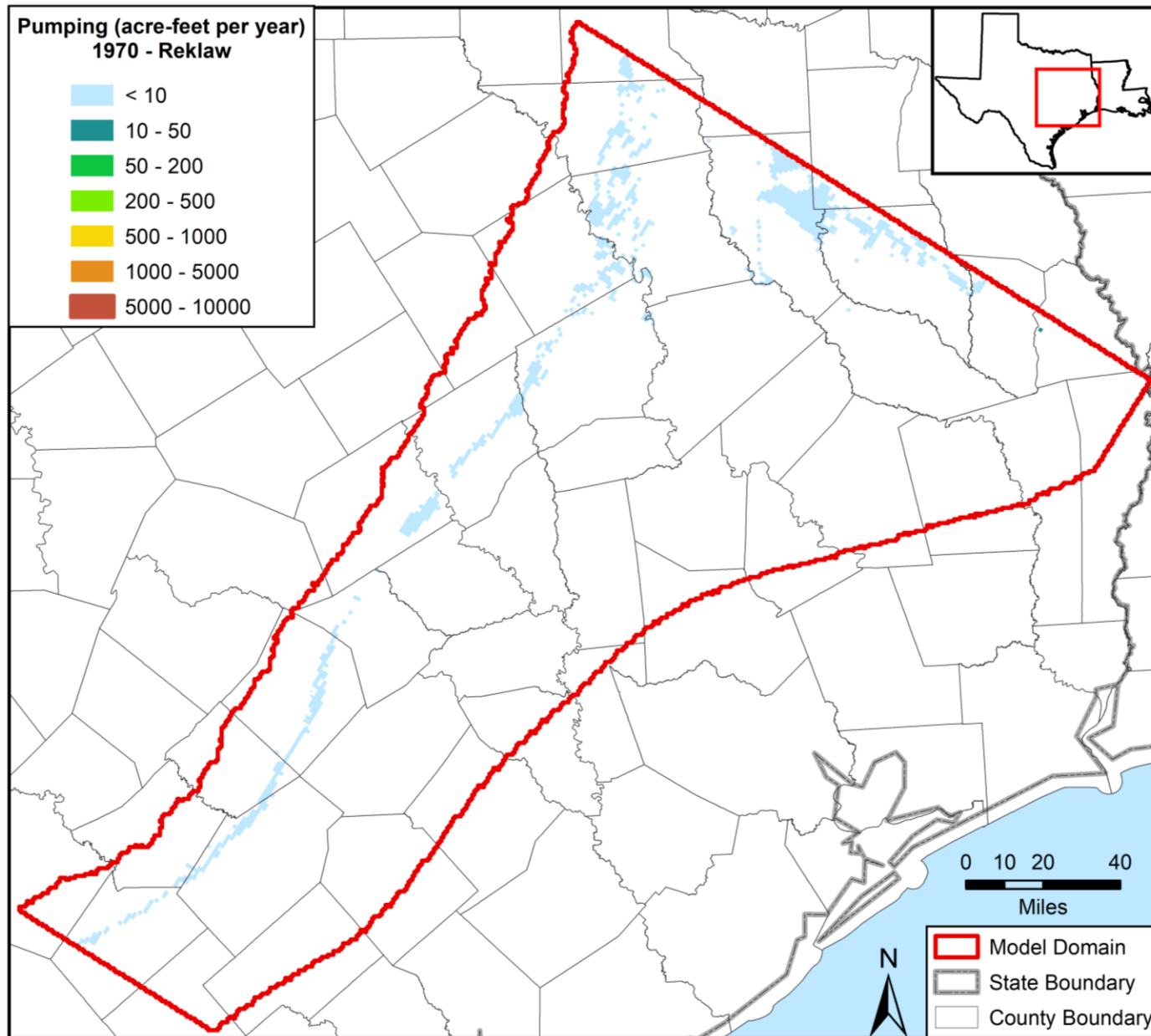
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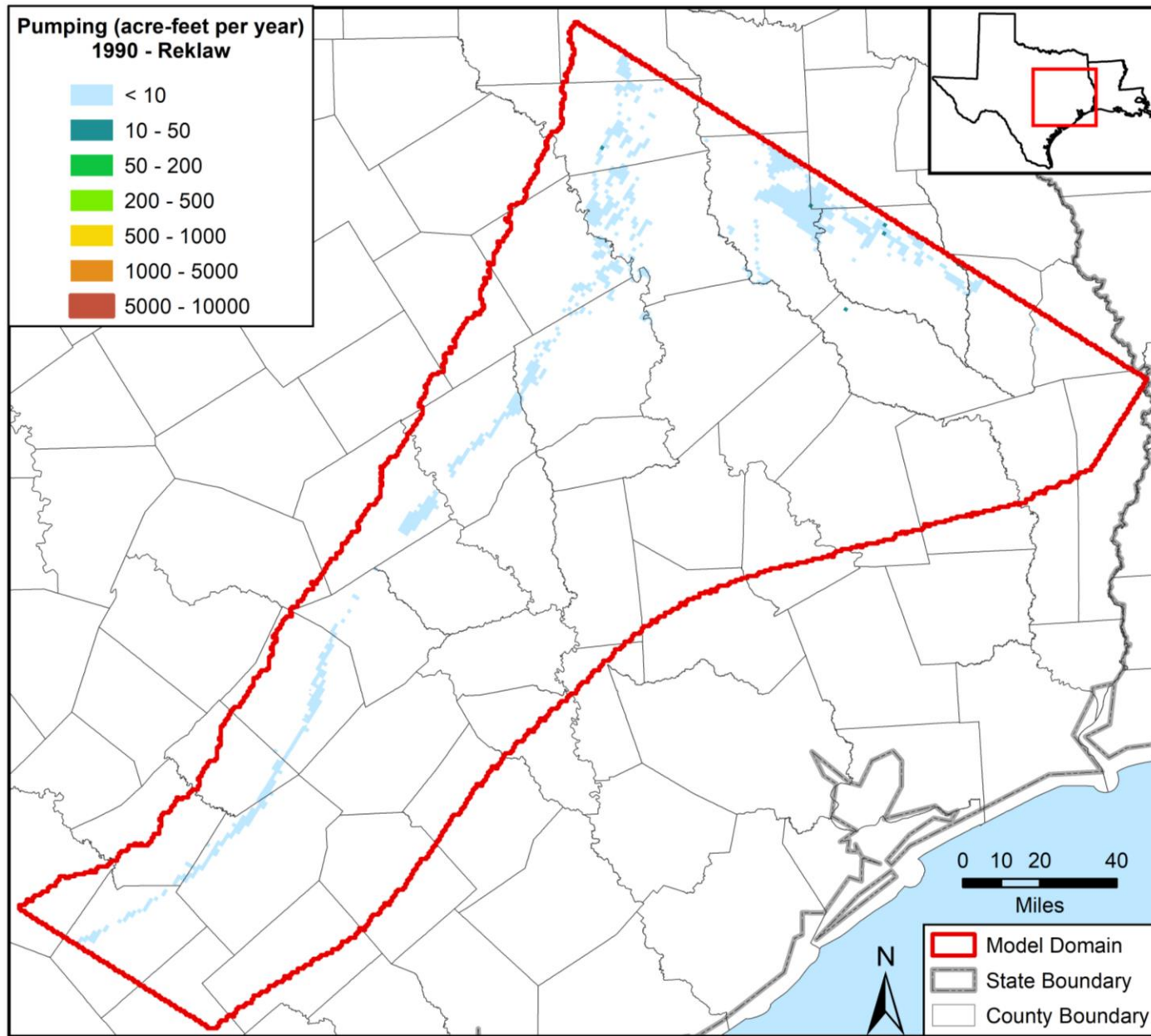
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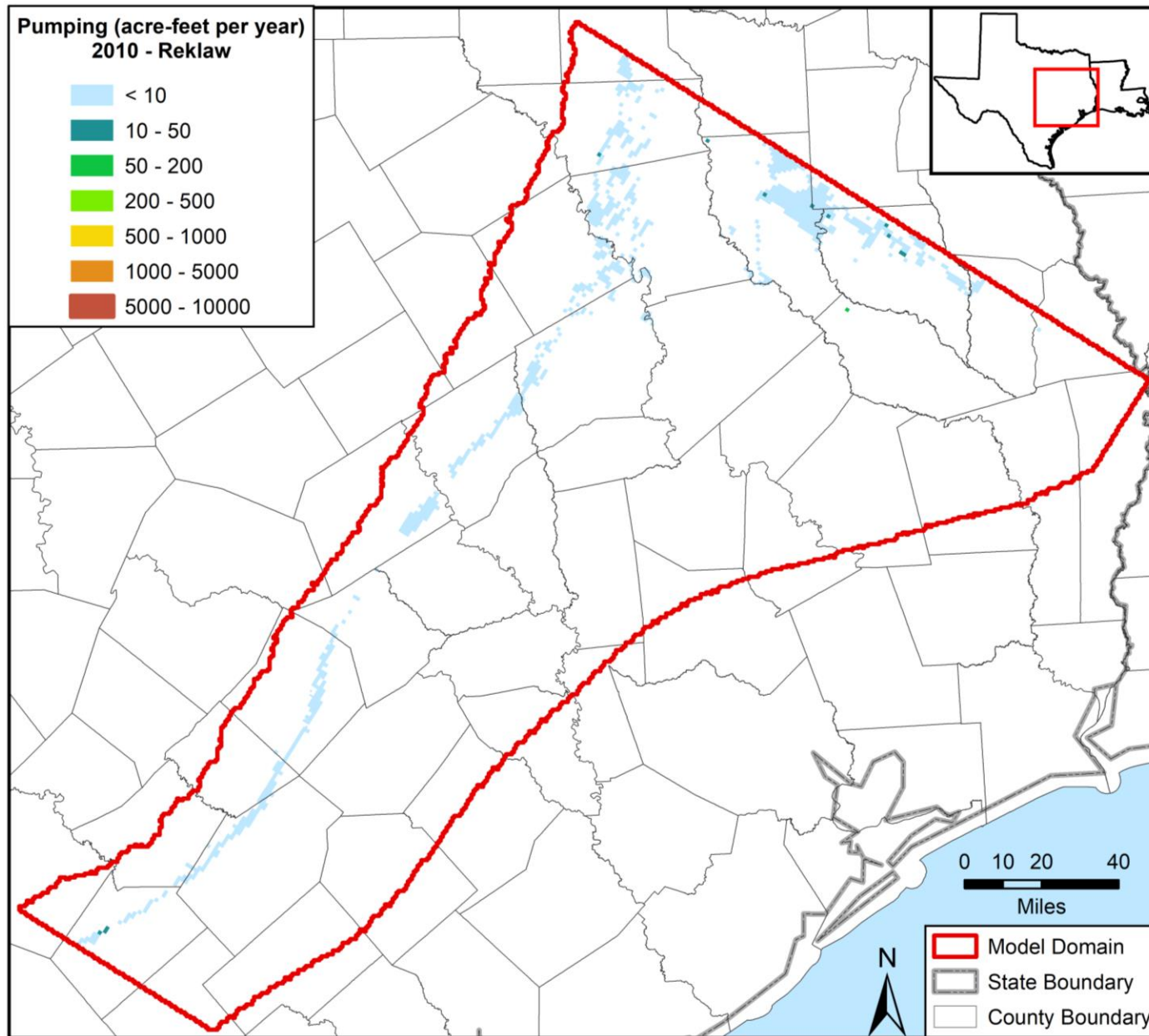
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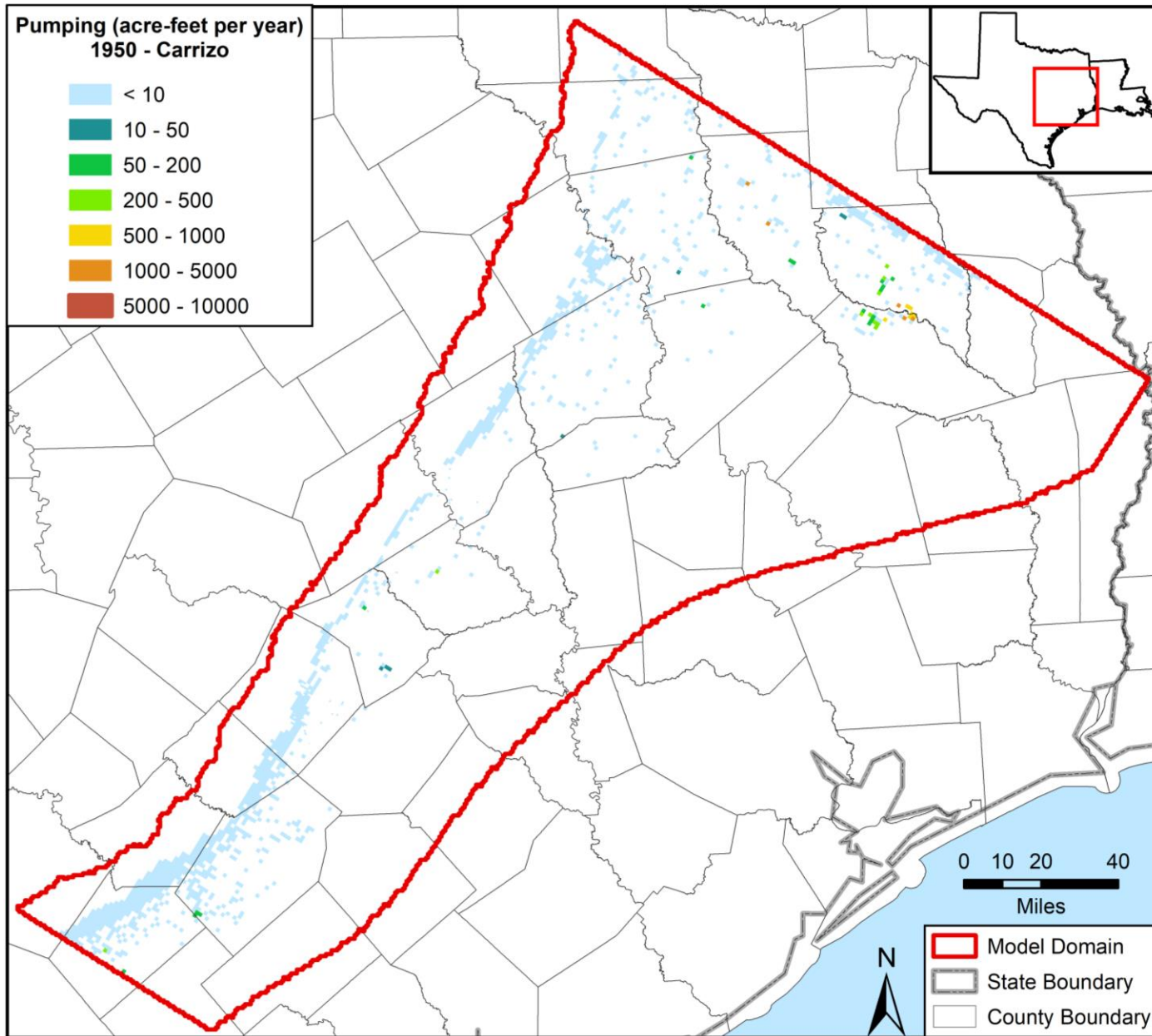
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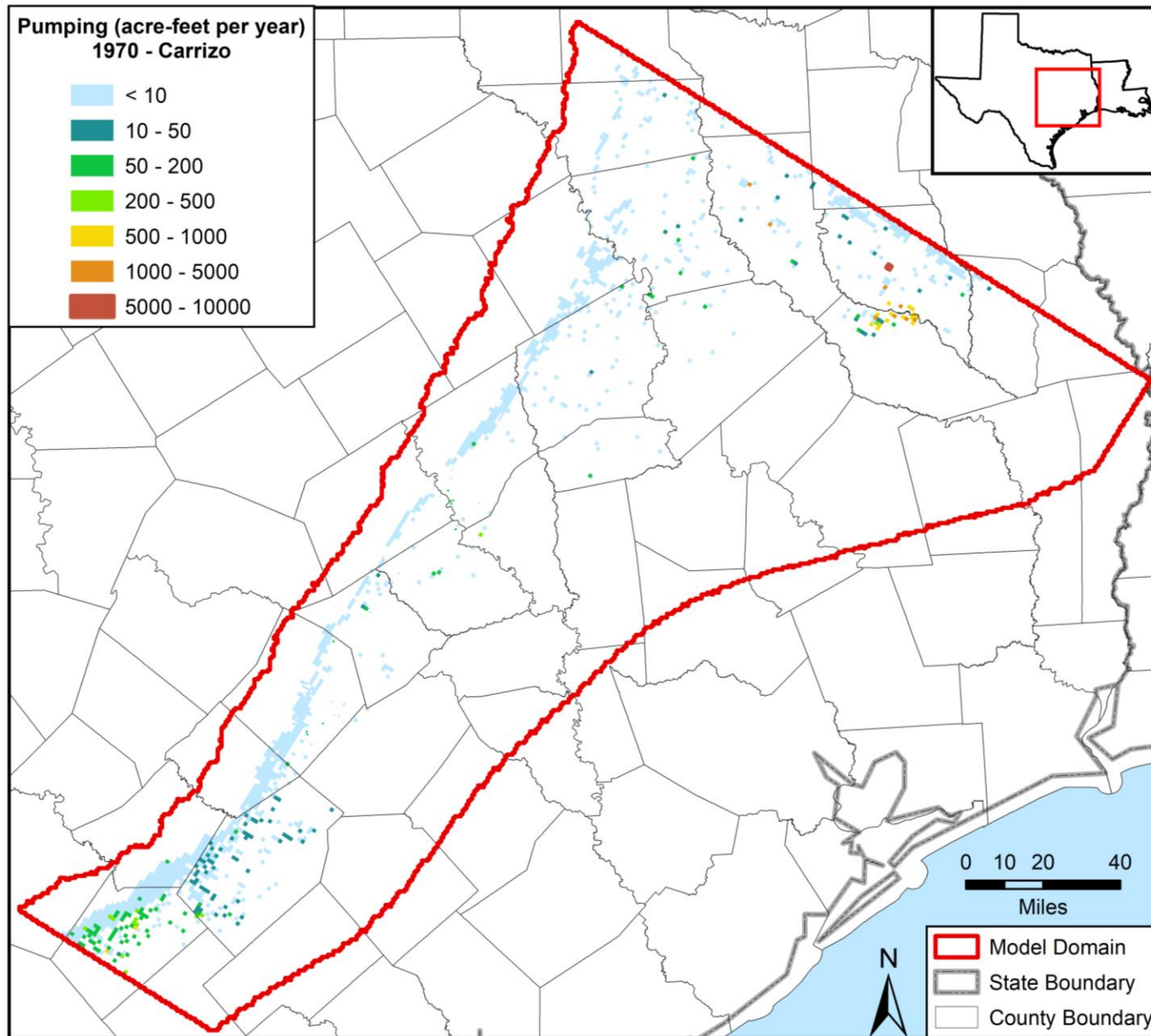
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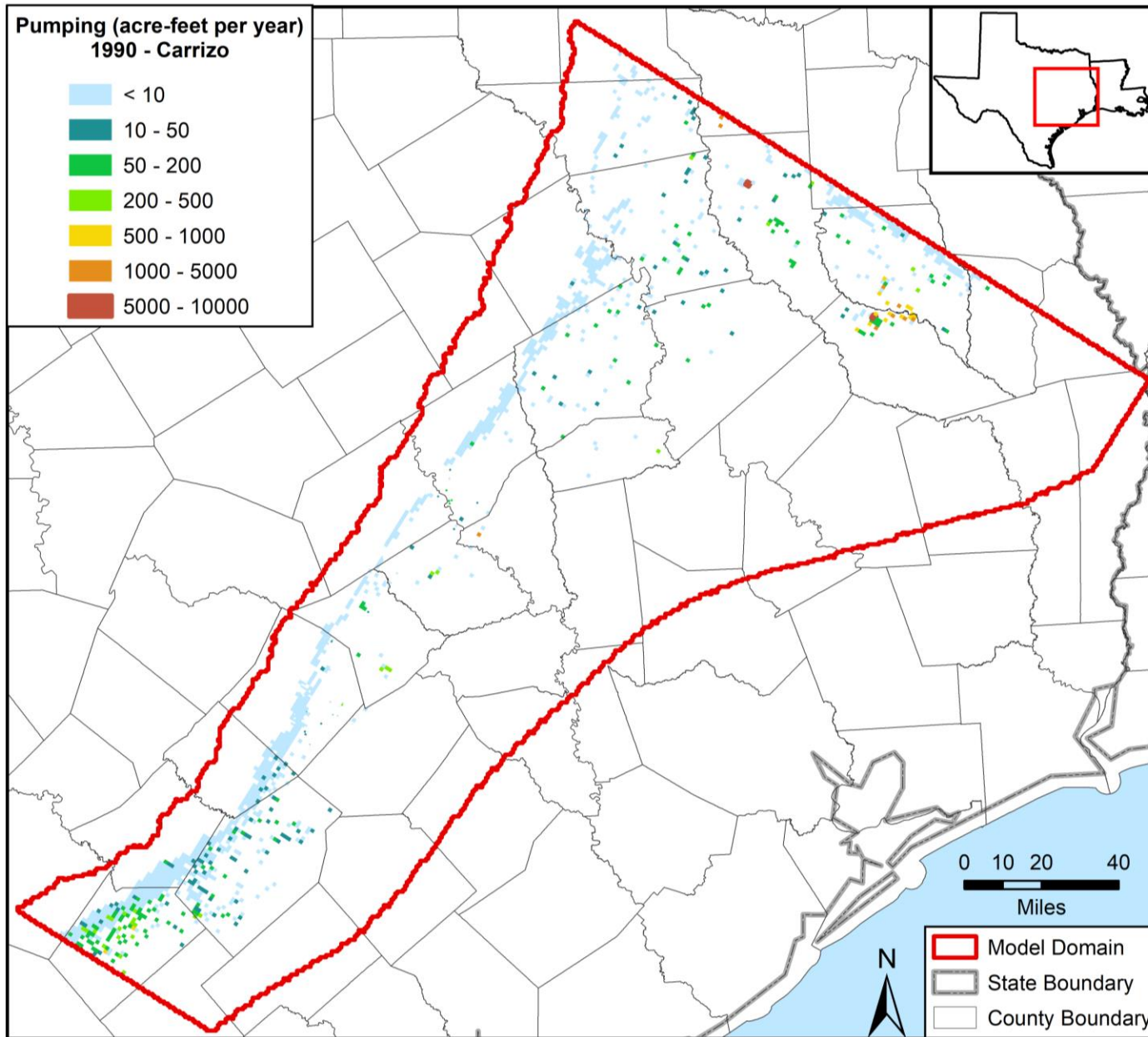
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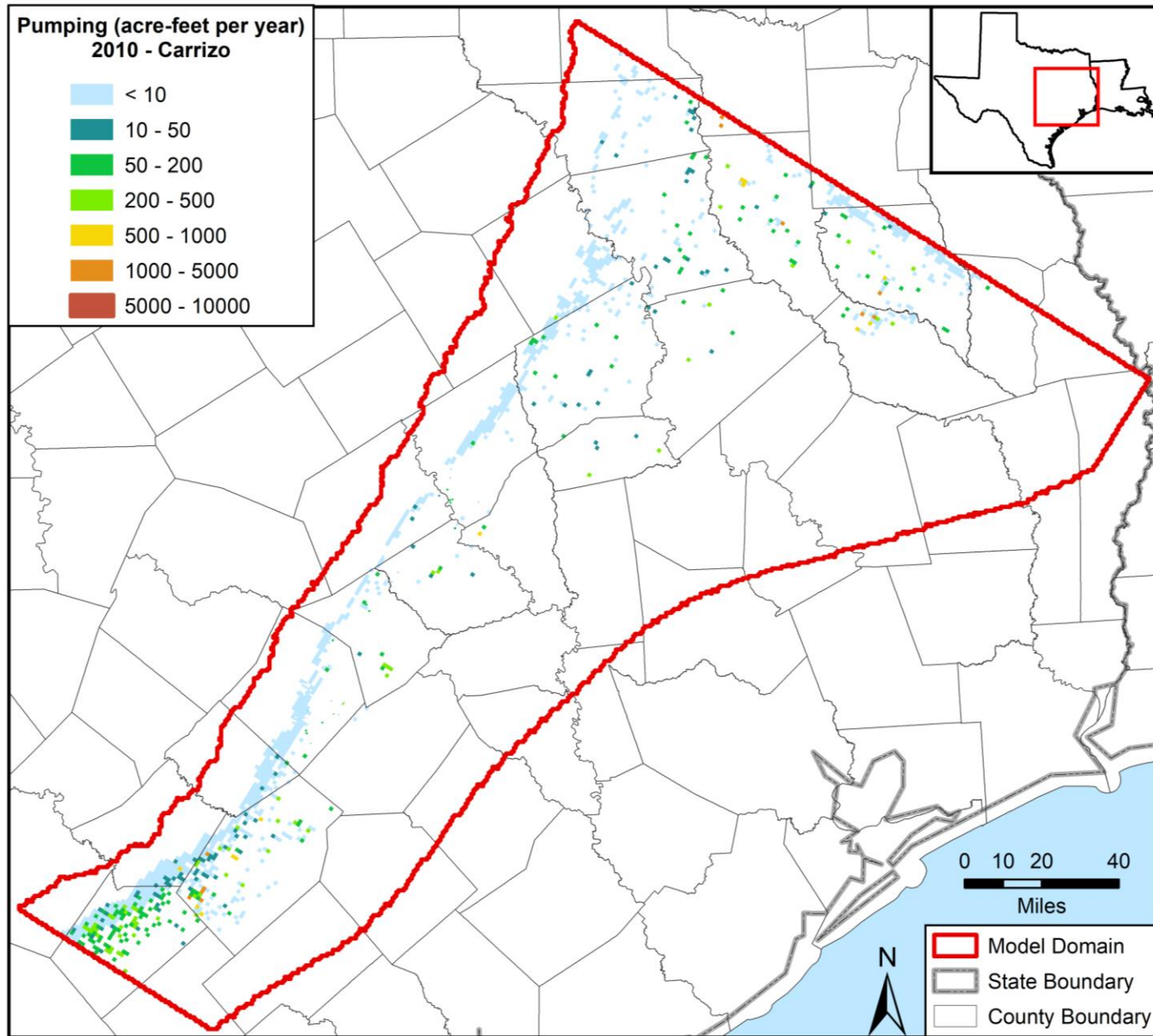
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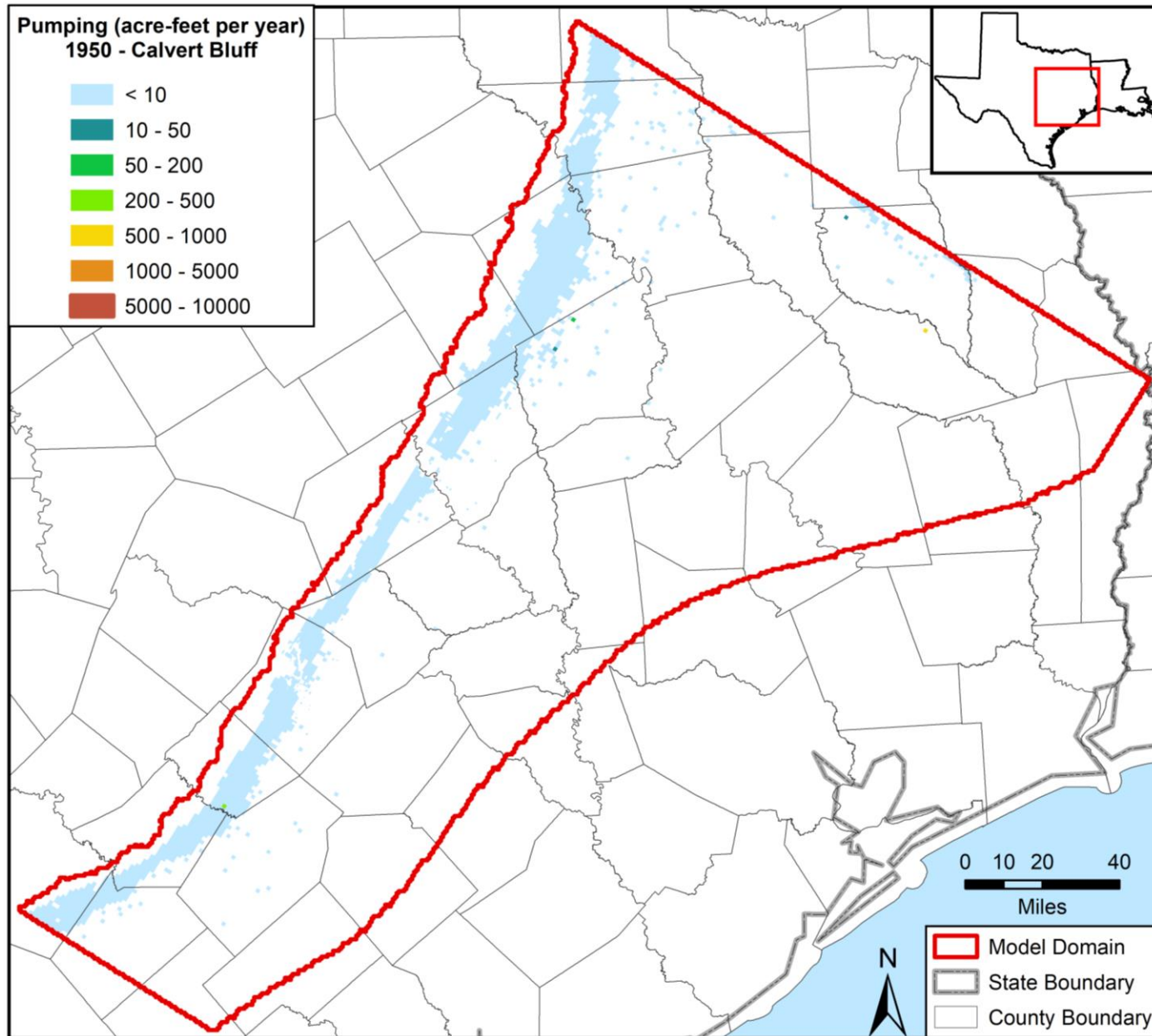
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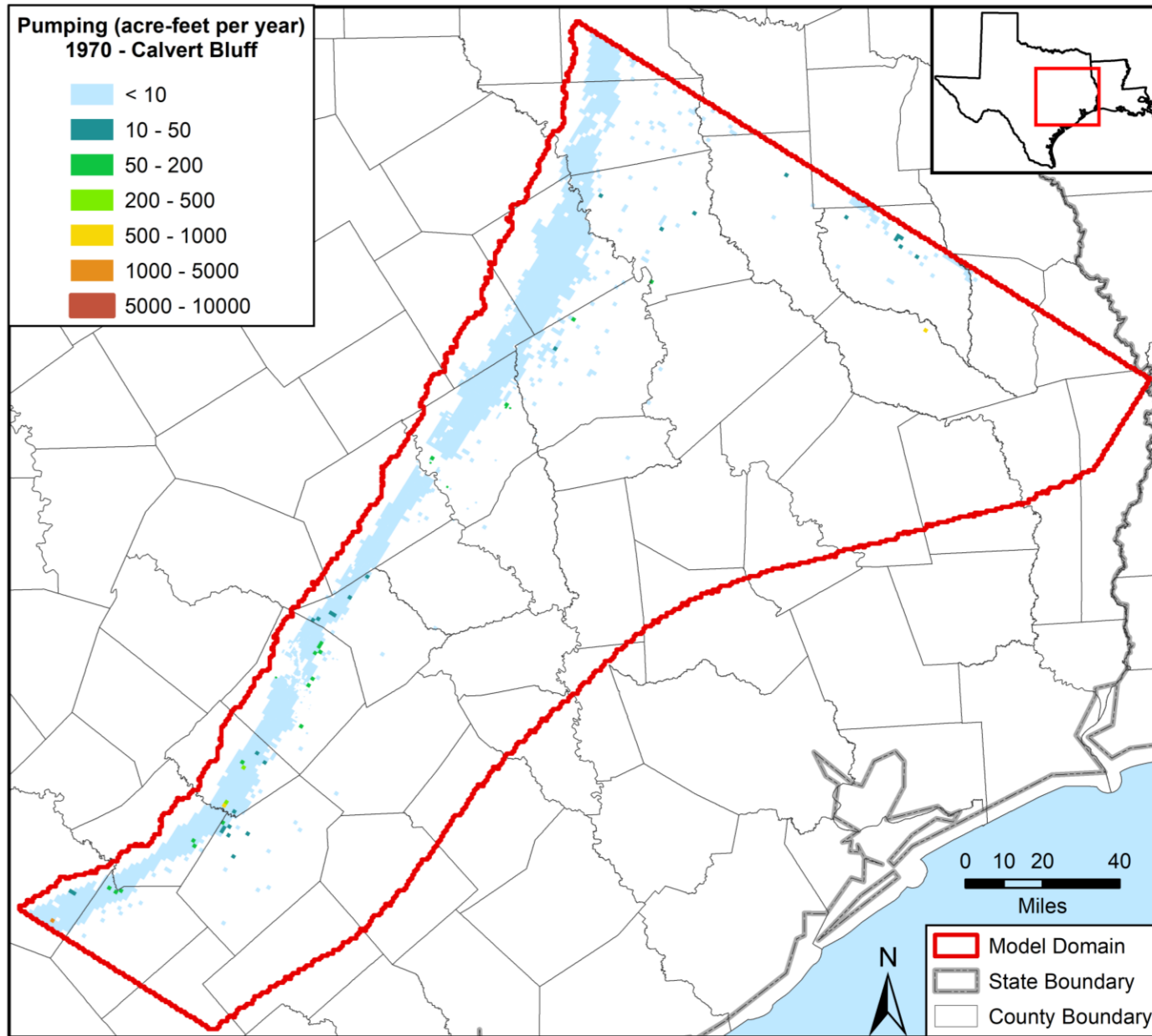
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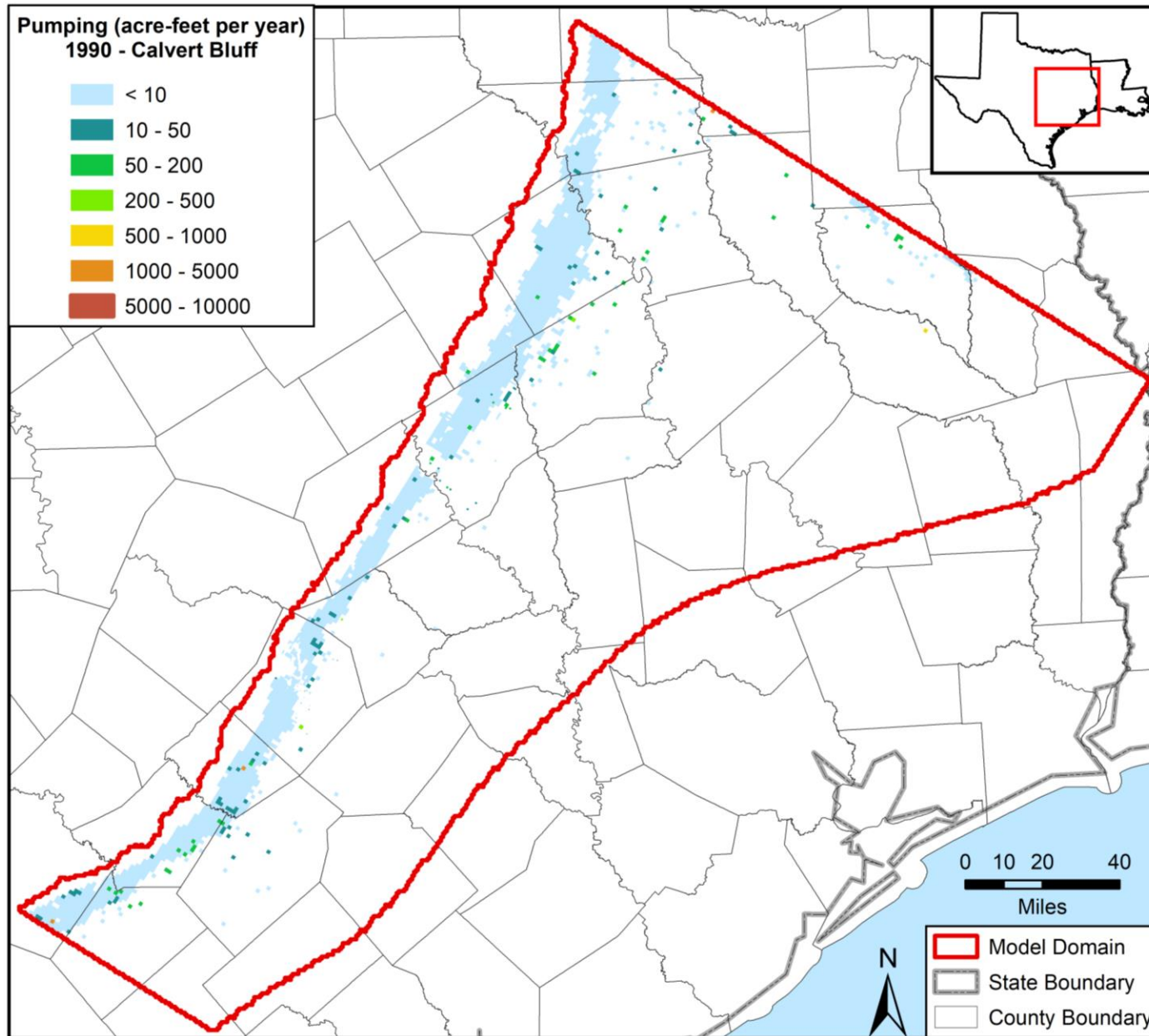
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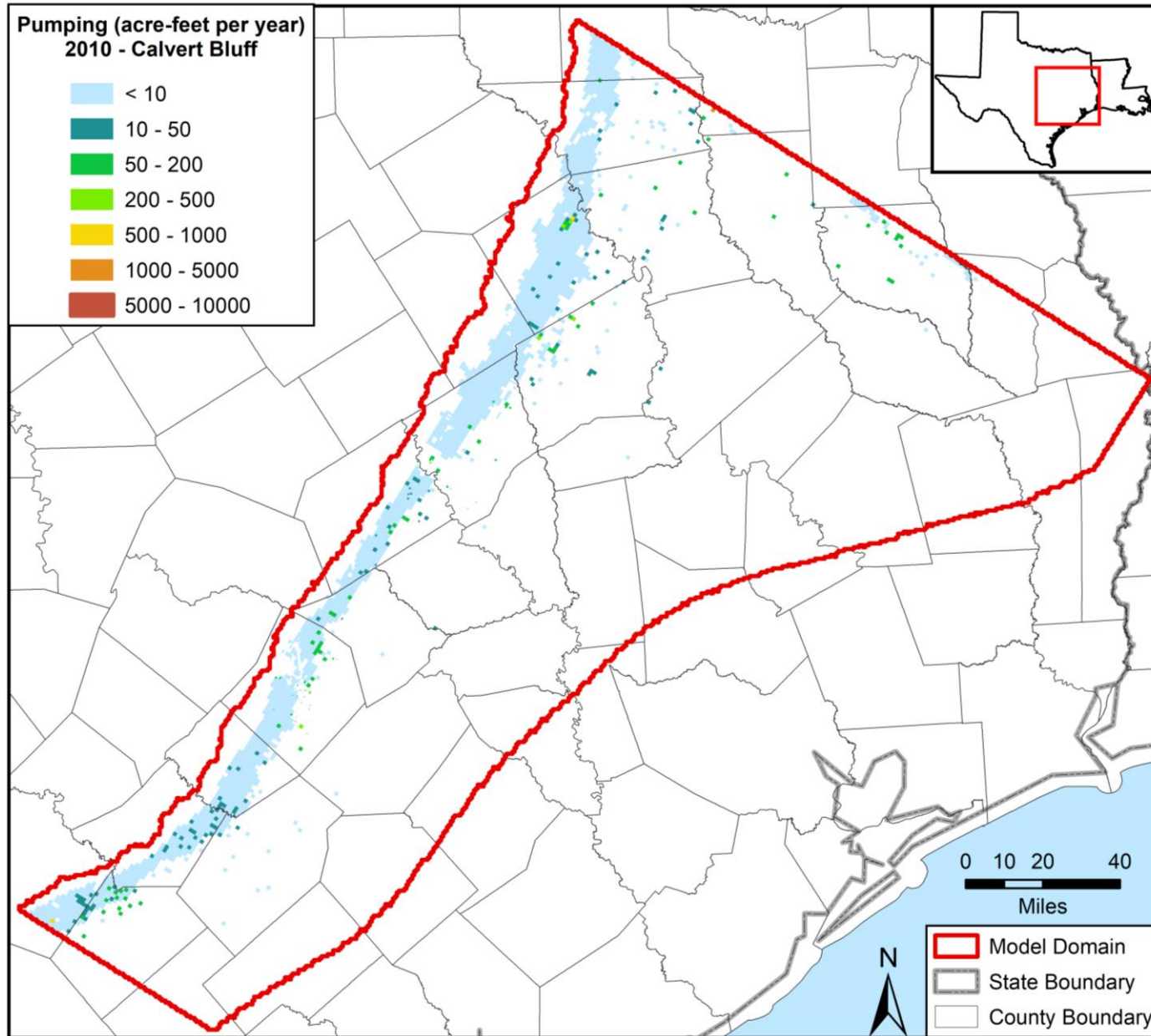
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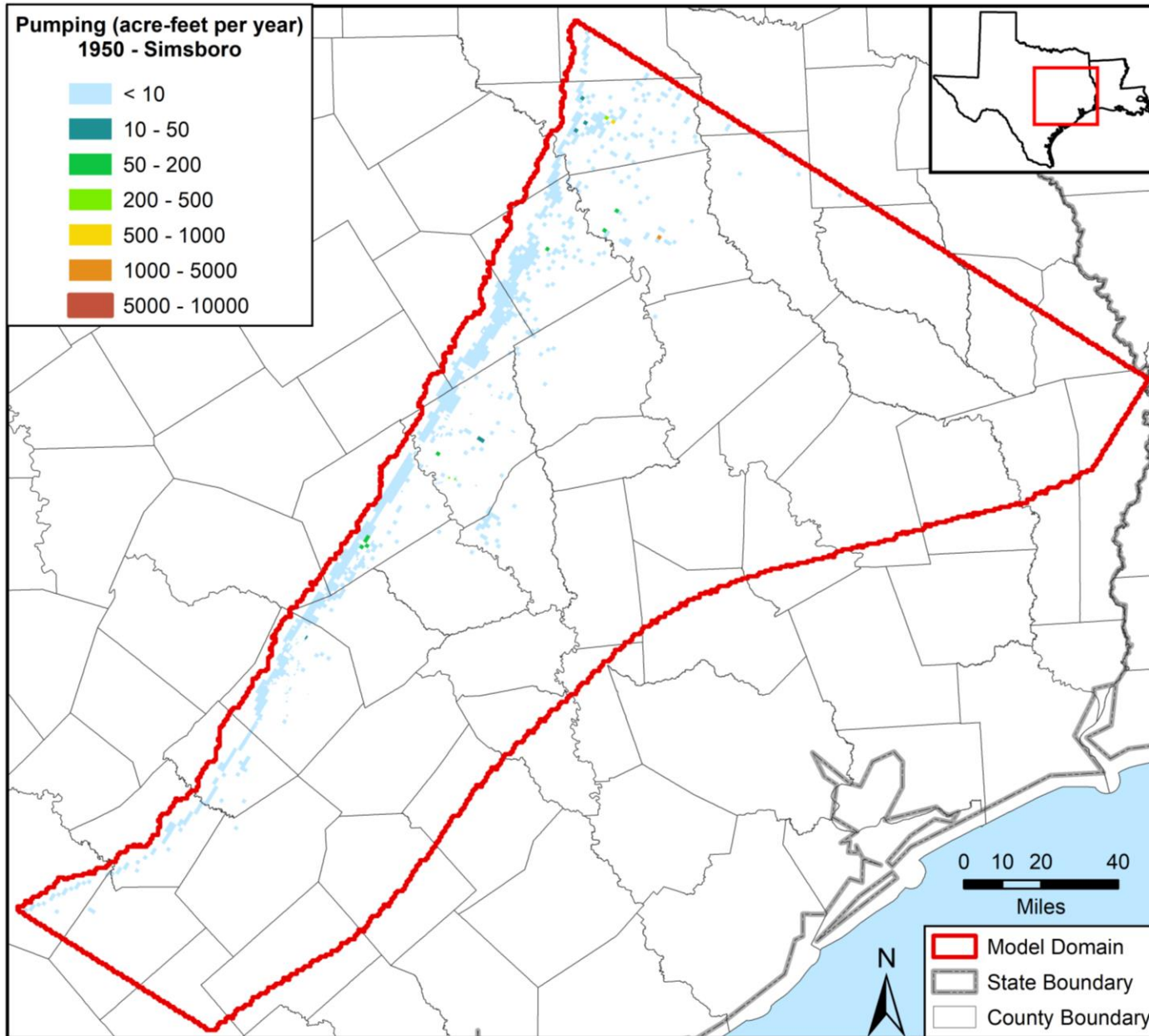
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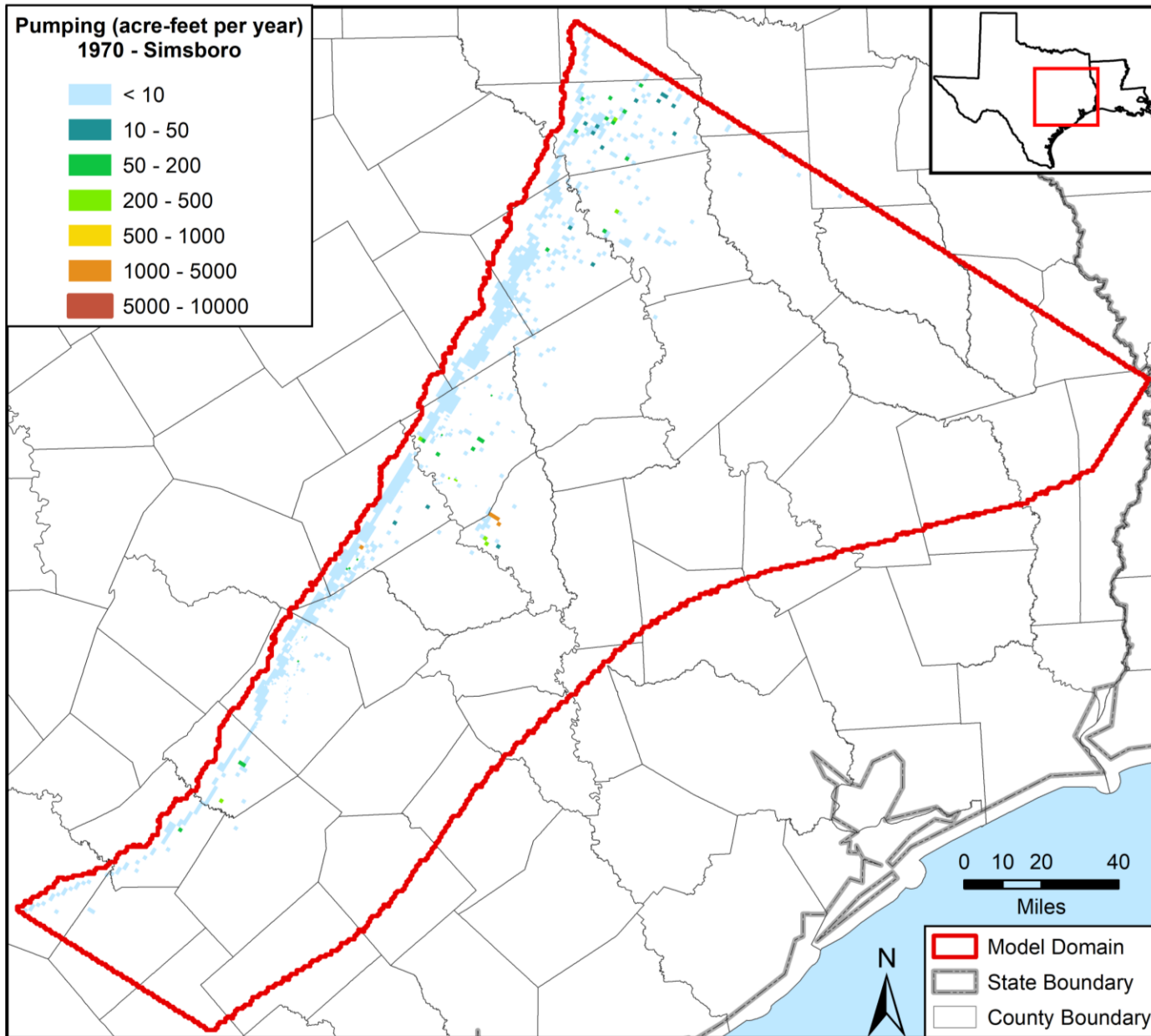
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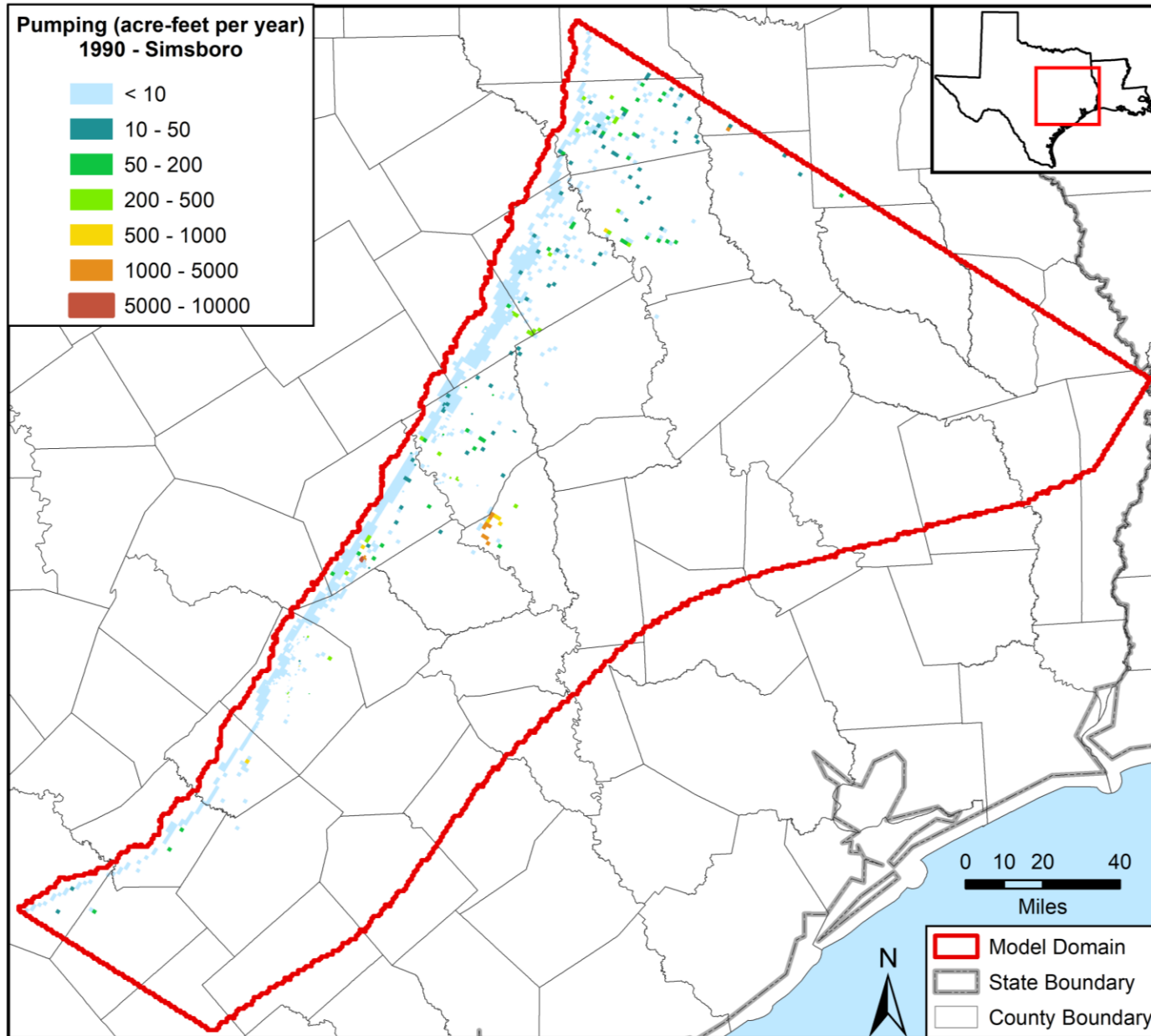
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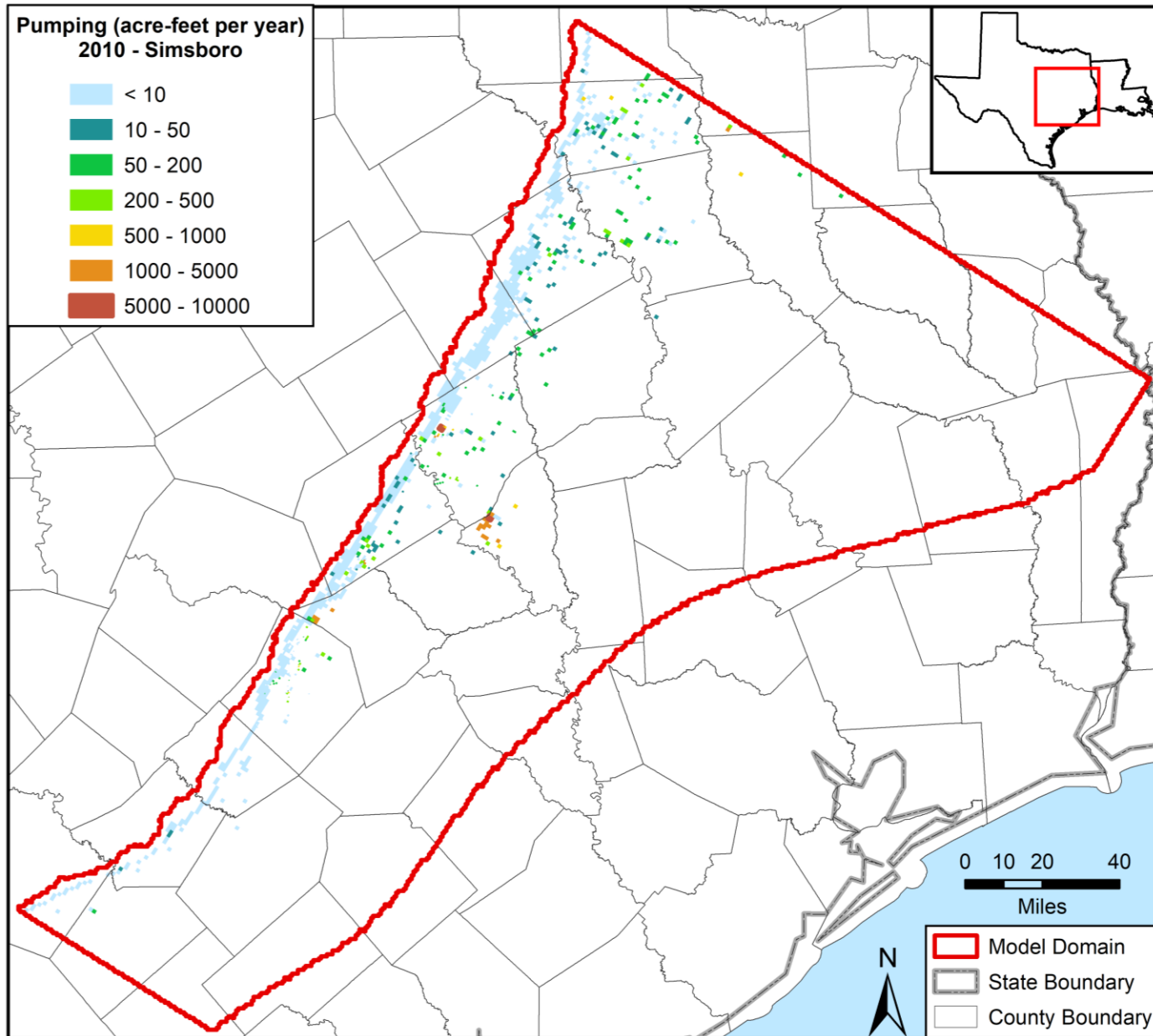
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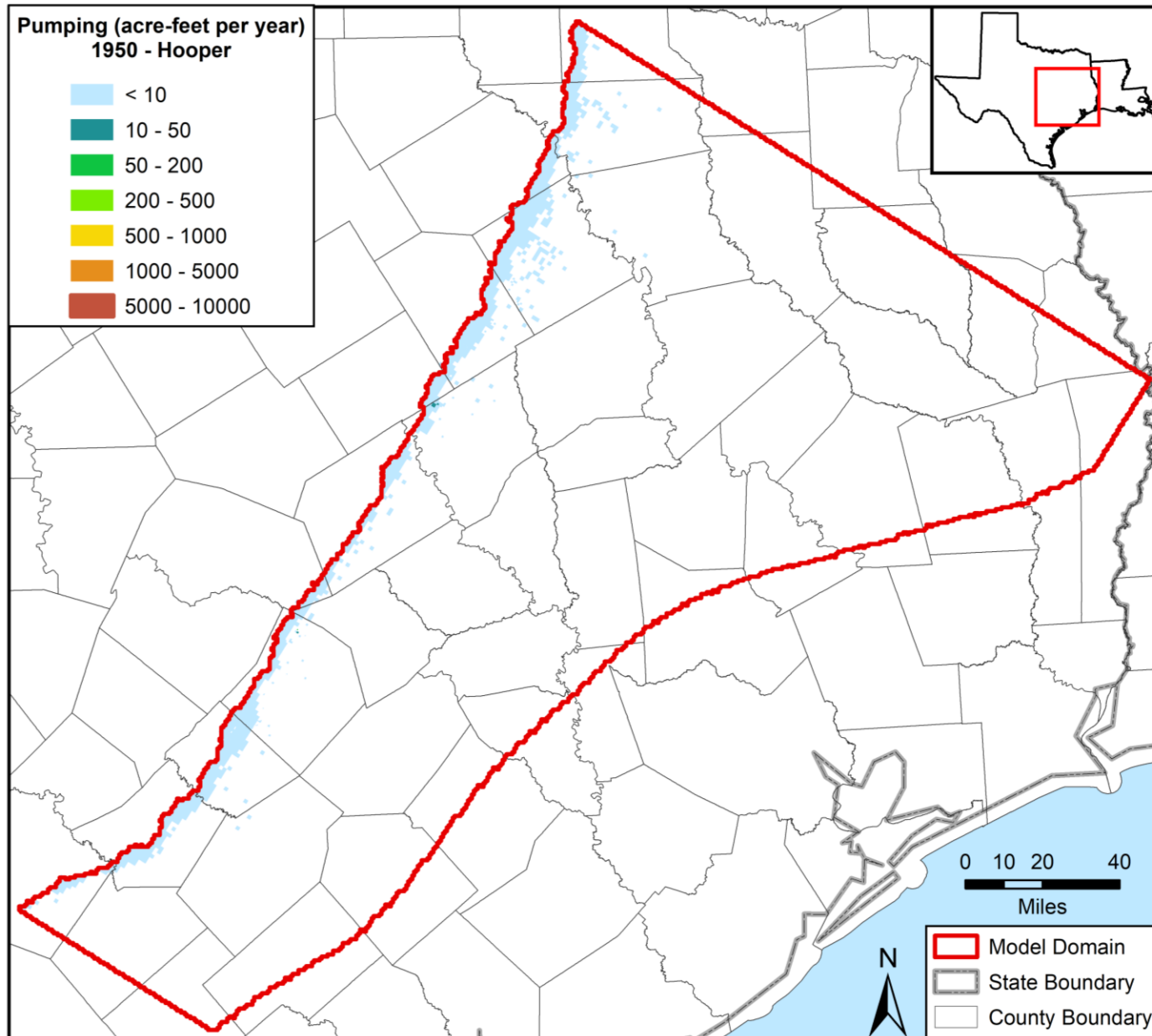
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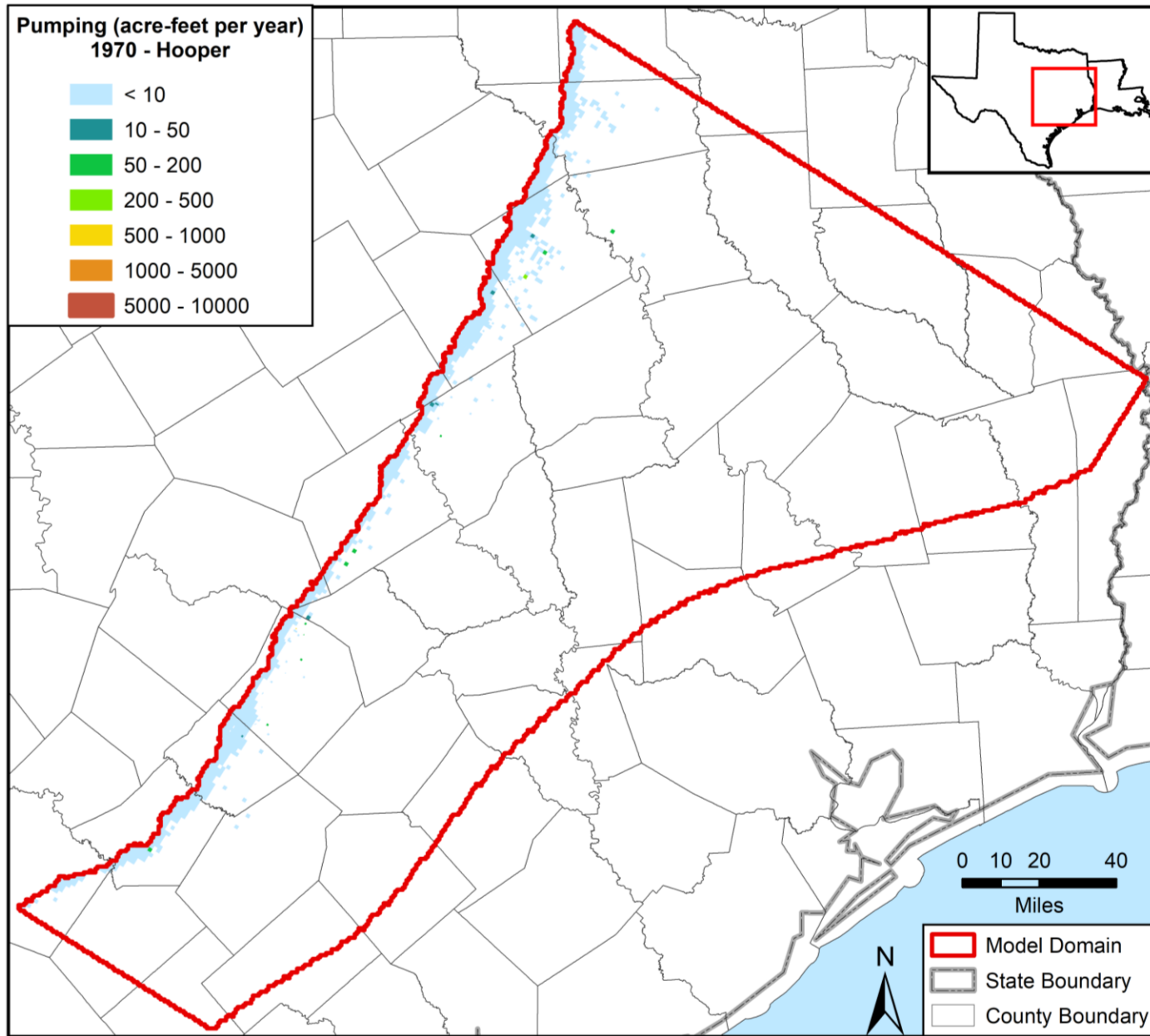
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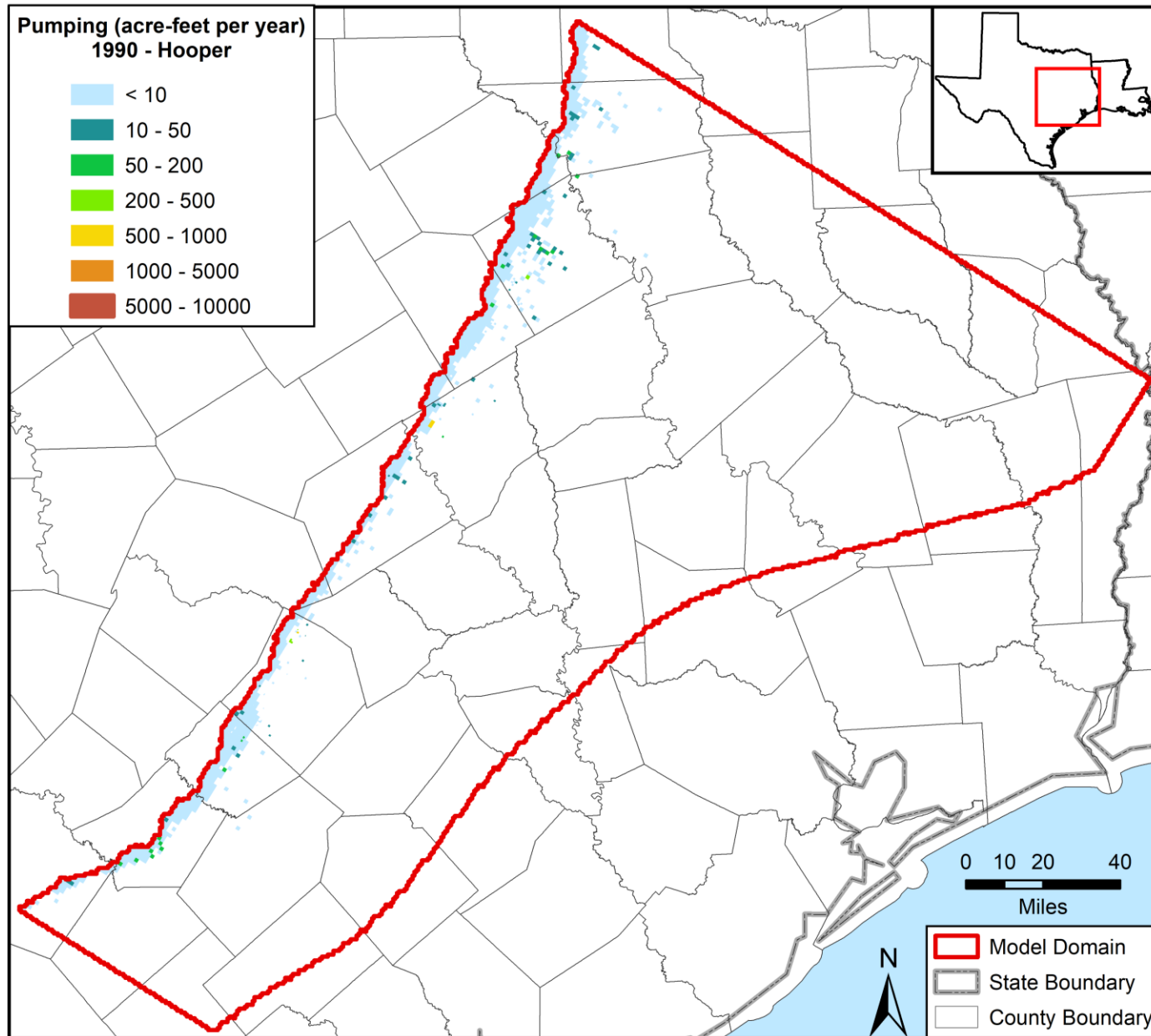
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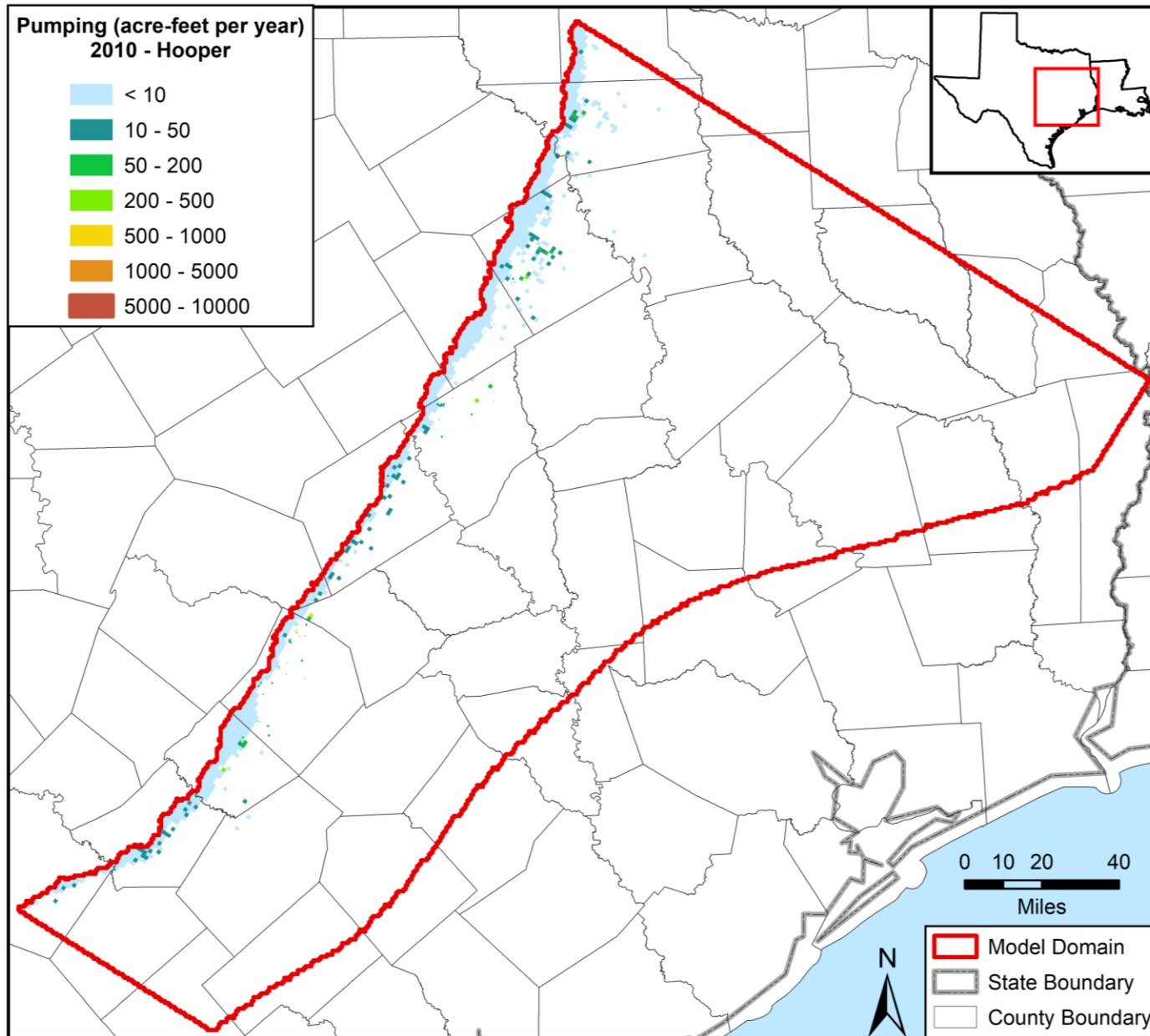
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19 Appendix H: Attributes Associated with the Model Drain Cells Table Provided Electronically

The number of drain cells in the updated groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers is too numerous (7,013) to include in this report. Therefore, included with the electronic deliverable of the model report is a file (GMA12_GAM_Drain_Table.xlsx) containing property data for the drains in the model. The attributes of that table are:

- Column A: The node number in MODFLOW
- Column B: The model layer in which the drain is located
- Column C: The elevation of the drain in units of feet above mean sea level
- Column D: The conductance assigned to the drain in units of square feet per day

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20 Appendix I: Attributes Associated with the General-Head Boundary Cells Table Provided Electronically

The number of cells with a general-head boundary in the updated groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers is too numerous (16,117) to include in this report. Therefore, included with the electronic deliverable of the model report is a file (GMA12_GAM_GHB_Table.xlsx) containing property data for the general-head boundary cells in the model. The attributes of that table are:

- Column A: The node number in MODFLOW
- Column B: The model layer with the general-head boundary cell
- Column C: Steady-state head specified at the general-head boundary in units of feet above mean sea level
- Column D: 2010 head specified at the general-head boundary in units of feet above mean sea level
- Column E: Conductance for the general-head boundary in units of square feet per day

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21 Appendix J: Attributes Associated with the River Cells Table Provided Electronically

The number of river cells in the updated groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers is too numerous (5,660) to include in this report. Therefore, included with the electronic deliverable of the model report is a file (GMA12_GAM_River_Table.xlsx) containing property data for the river cells in the model. The attributes of that table are:

- Column A: The node number in MODFLOW
- Column B: The model layer with the river cell
- Column C: Elevation of the bottom of the river in units of feet above mean sea level
- Column D: Elevation of the water level in the river in units of feet above mean sea level
- Column E: Conductance for the river cell in units of square feet per day

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22 Appendix K: Attributes Associated with the Evapotranspiration Cells Table Provided Electronically

The number of evapotranspiration cells in the updated groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers is too numerous (10,524) to include in this report. Therefore, included with the electronic deliverable of the model report is a file (GMA12_GAM_ET_Table.xlsx) containing property data for the evapotranspiration cells in the model. The attributes of that table are:

- Column A: The node number in MODFLOW
- Column B: The model layer with the evapotranspiration cell
- Column C: The evapotranspiration surface elevation in units of feet above mean sea level
- Column D: The evapotranspiration rate in units of feet per day
- Column E: The evapotranspiration extinction depth in units of feet

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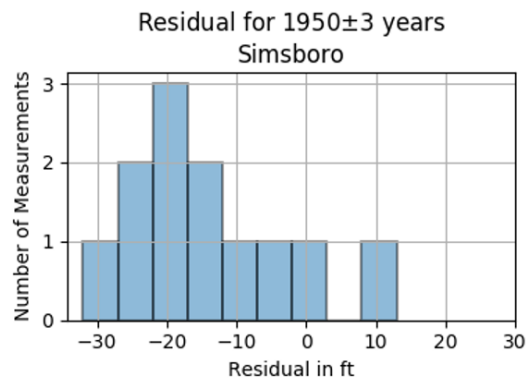
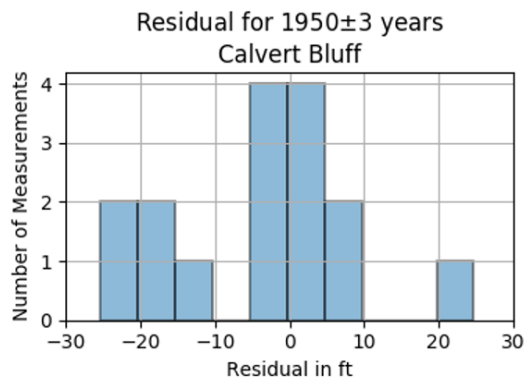
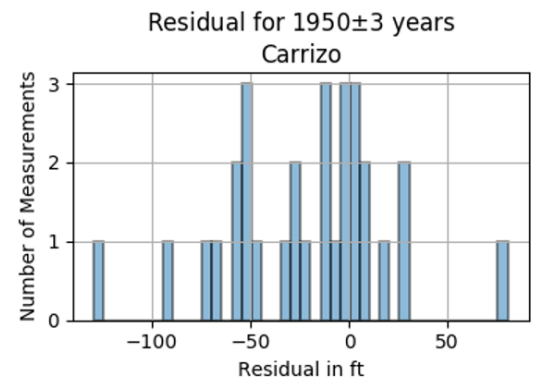
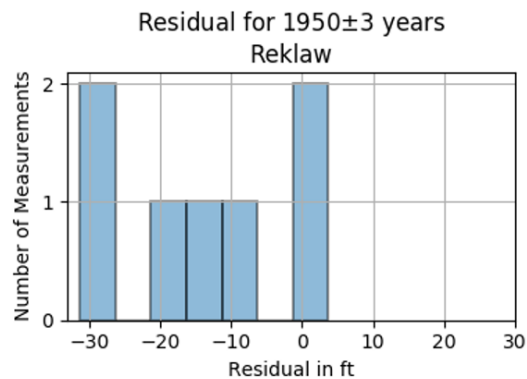
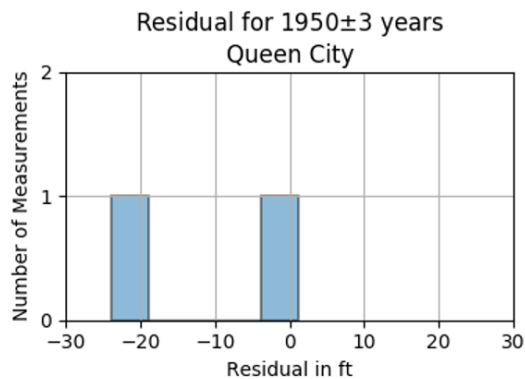
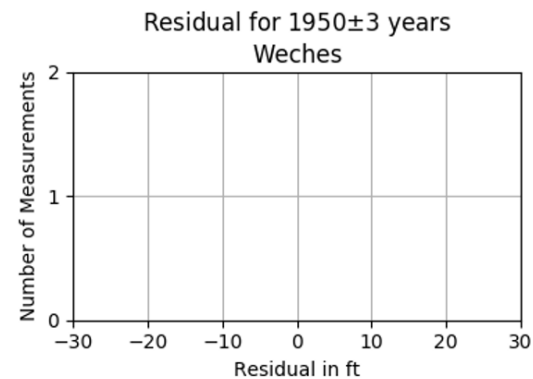
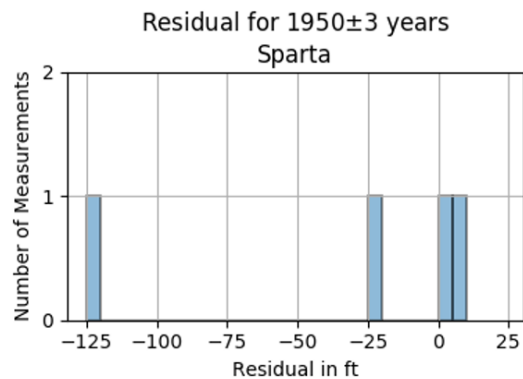
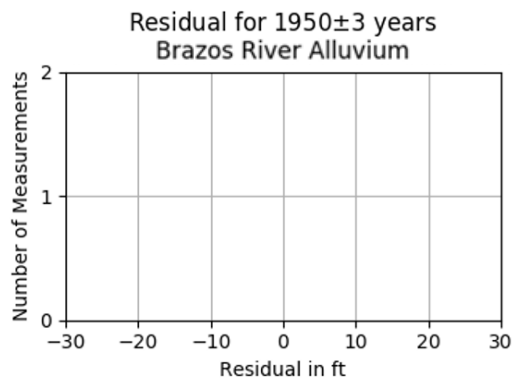
23 Appendix L: Residual Histograms

Histograms of residuals (observed head minus simulated head) by hydrogeologic unit for the years 1950, 1970, 1990, and 2010 are provided in this appendix. The residuals are the average for a three-year period centered on the year of interest. For calculating the residuals, the simulated value was taken as the value at the model grid containing the well interpolated to the location of the well. The histogram plots are presented in order by year and hydrogeologic unit. Note that there are no targets in the Colorado River alluvium.

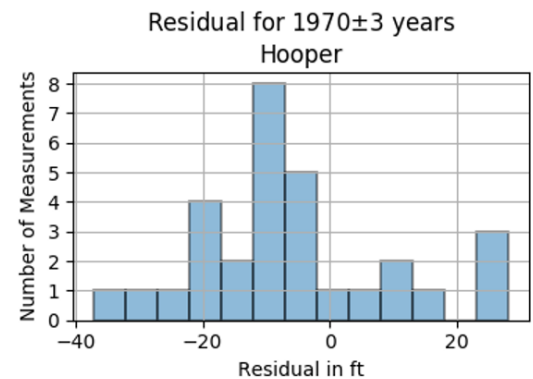
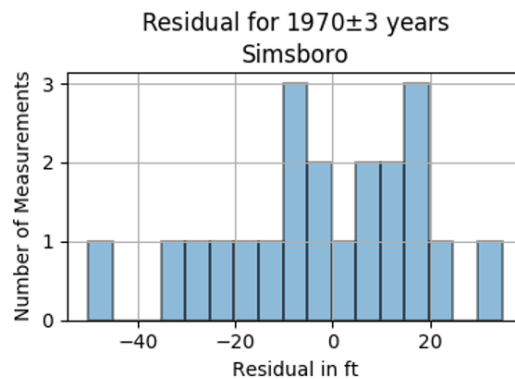
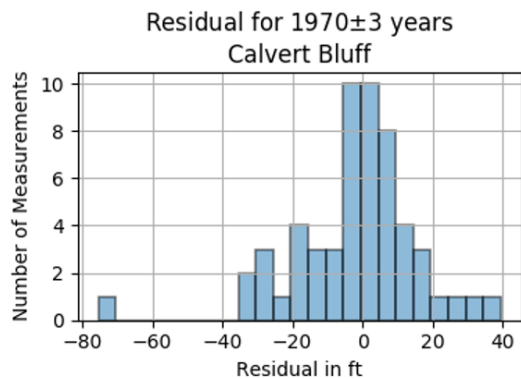
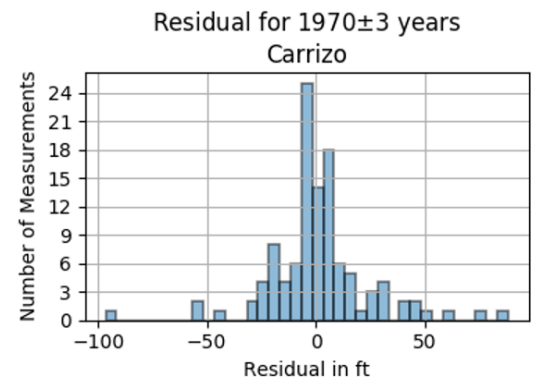
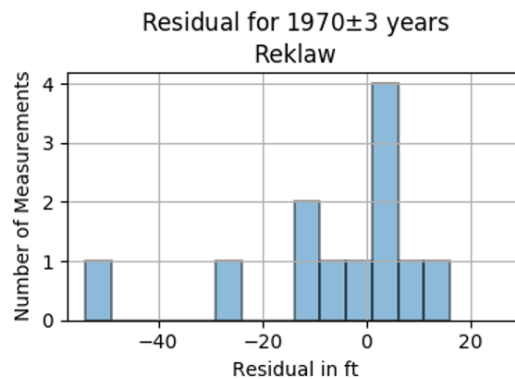
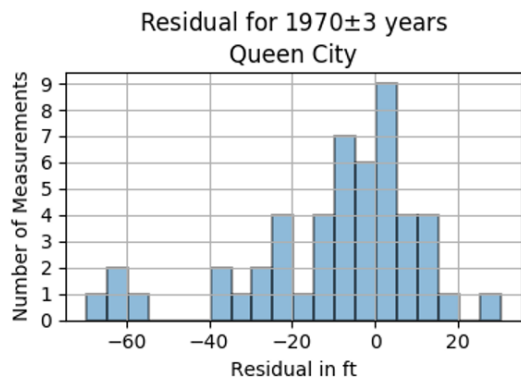
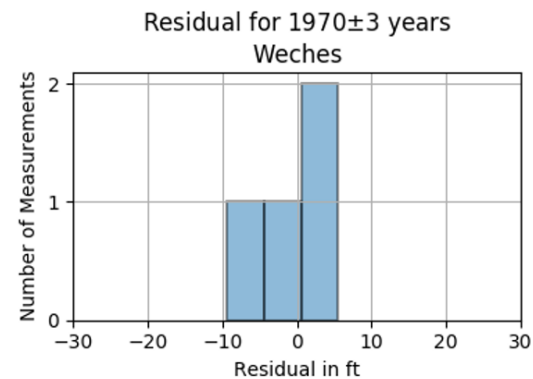
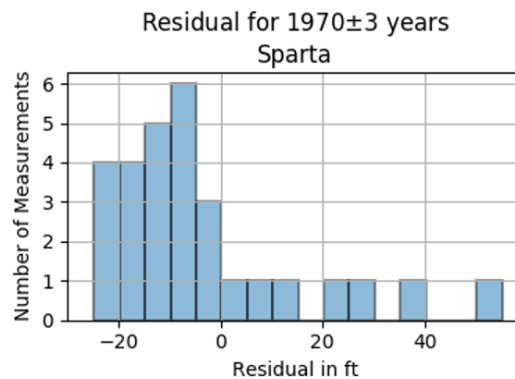
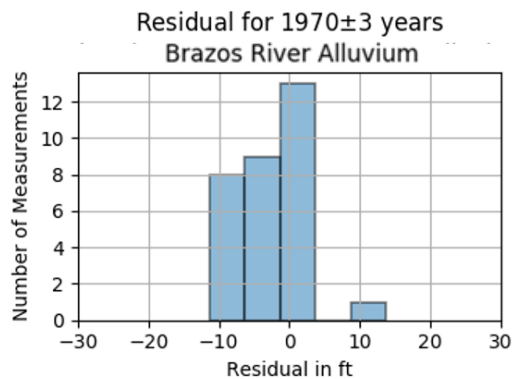
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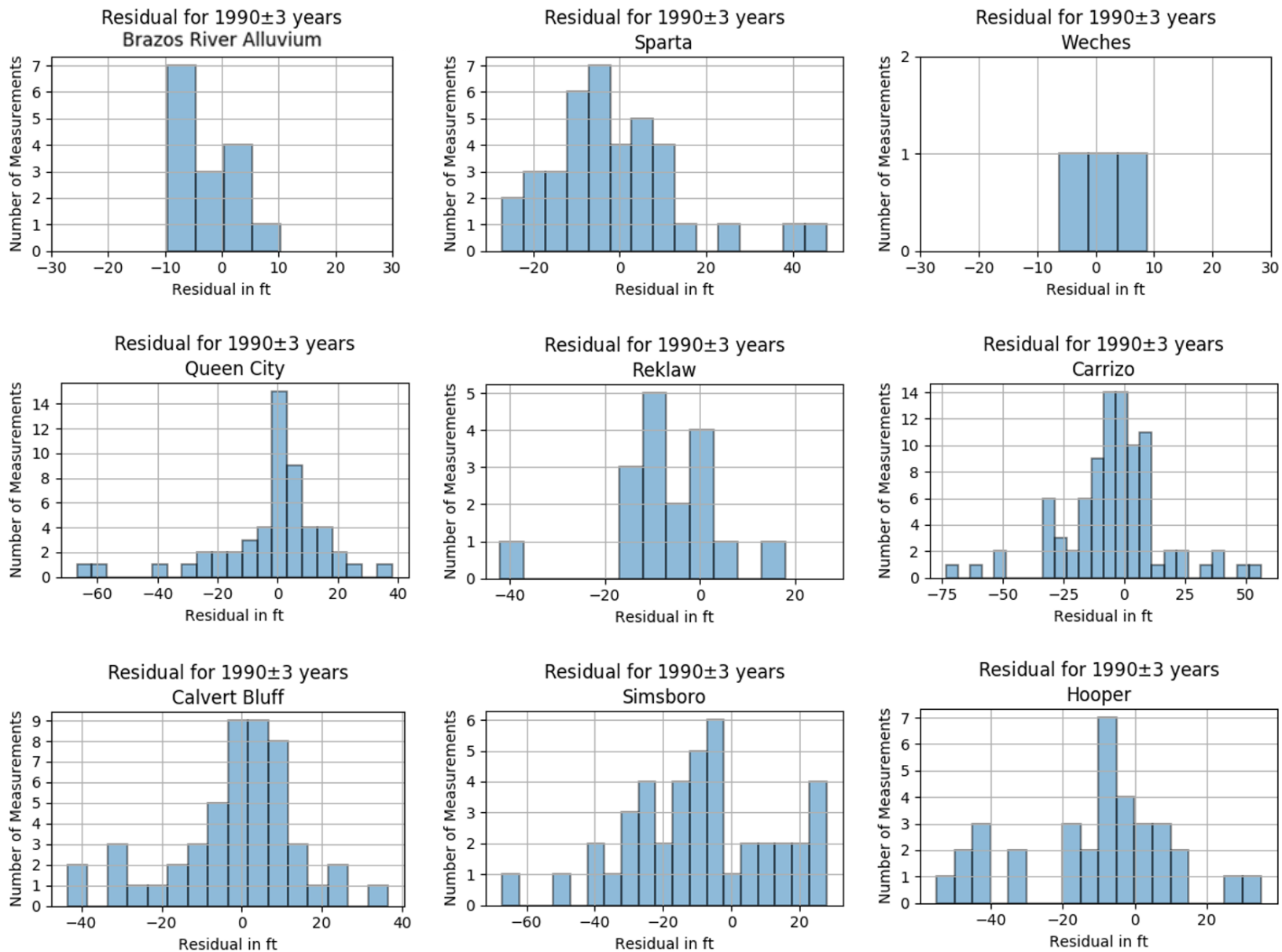
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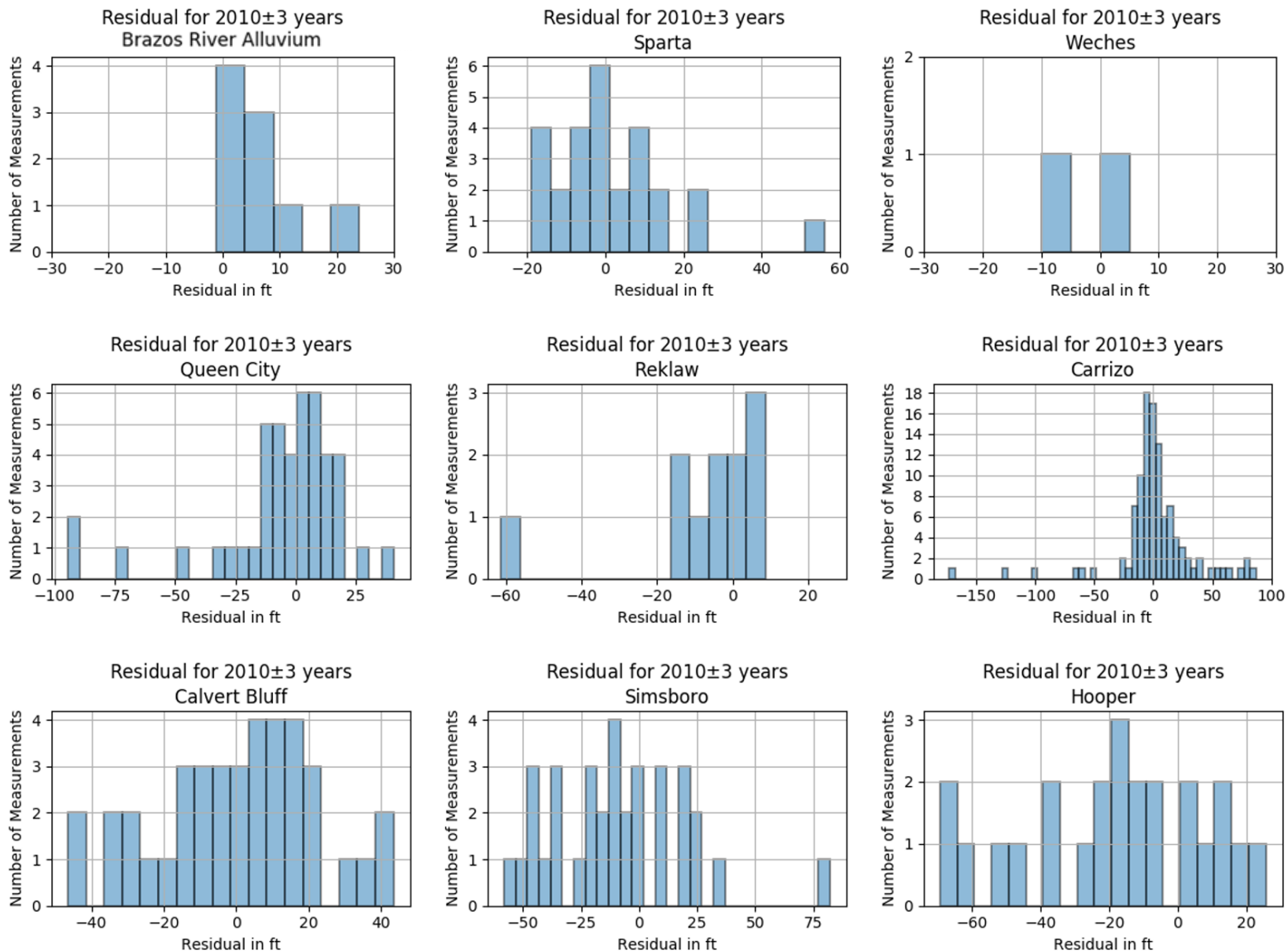
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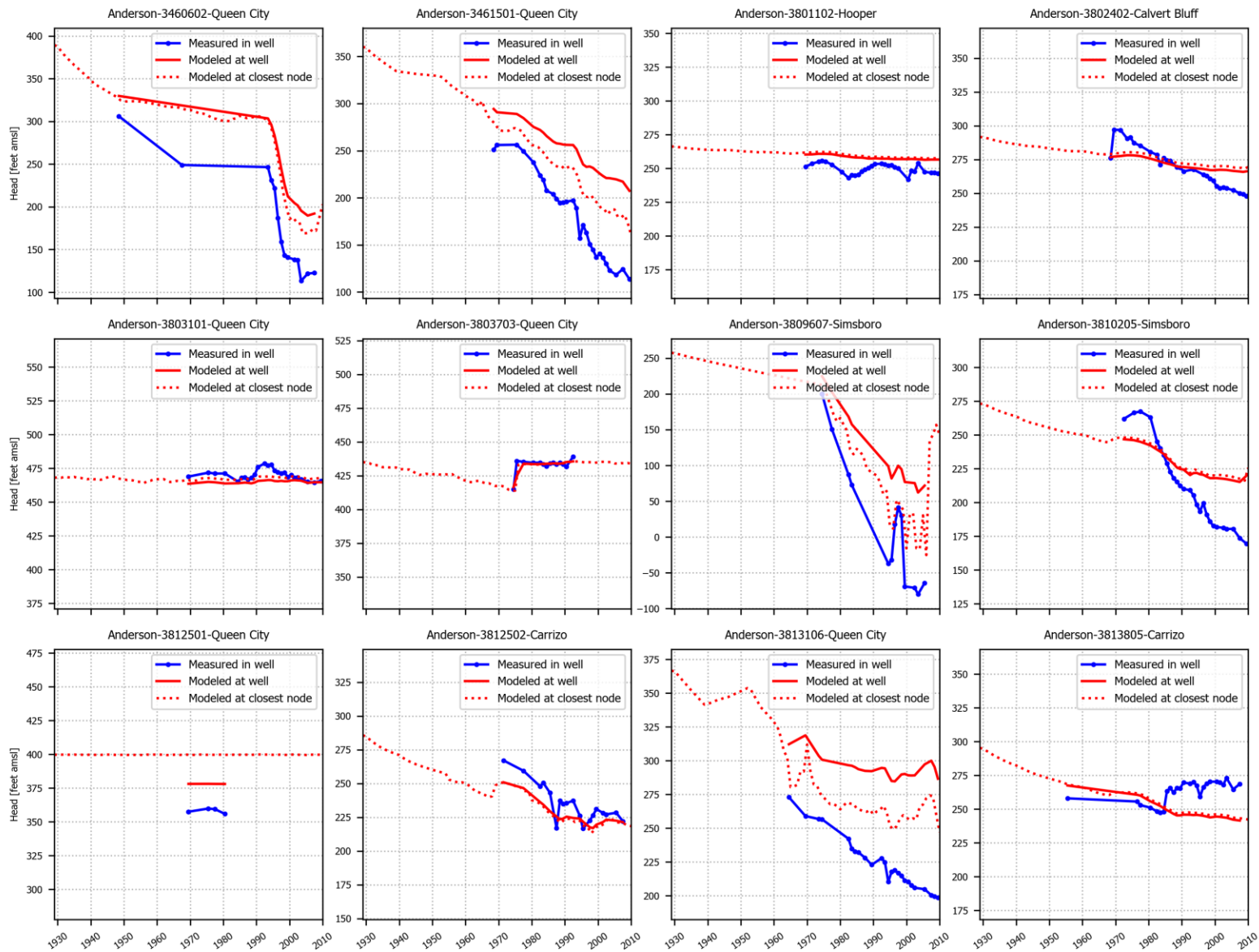
24 Appendix M: Observed Versus Simulated Hydrographs

Hydrographs of simulated versus observed drawdown for all of the wells with transient calibration targets are provided in this appendix. Each figure shows three sets of hydraulic head data for a well. The observed hydraulic head values at the well are shown as a blue line. The hydraulic heads simulated by the model for the middle of the grid cell or node containing the well are shown as a dotted red line. The model hydraulic heads interpolated from the nodal values onto the location of the well are shown as a solid red line. The header on the hydrographs provides the county in which the well is located, the state well number for the well, and the hydrogeologic unit in which the well is completed. The hydrographs are presented in order by county and state well number.

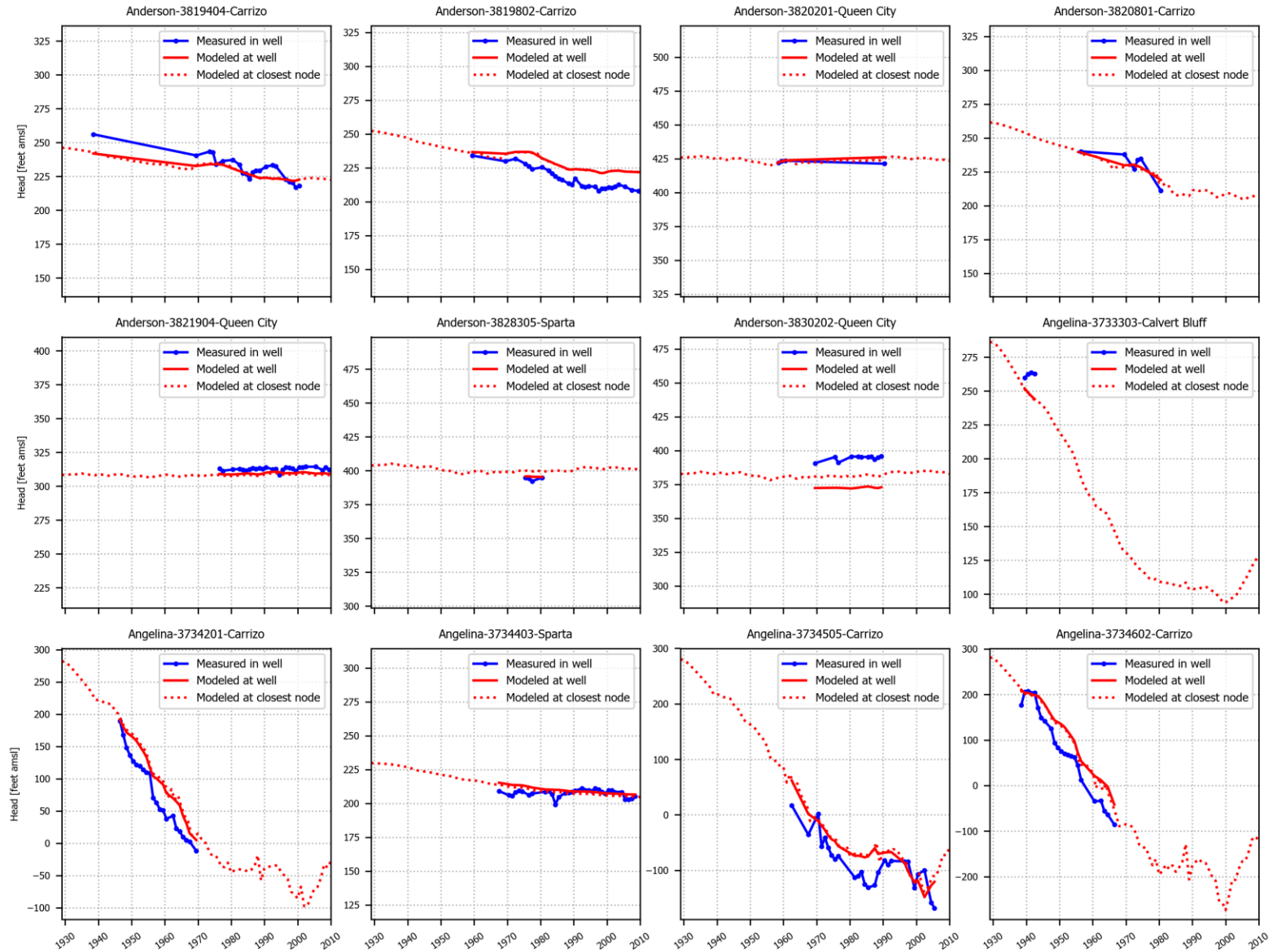
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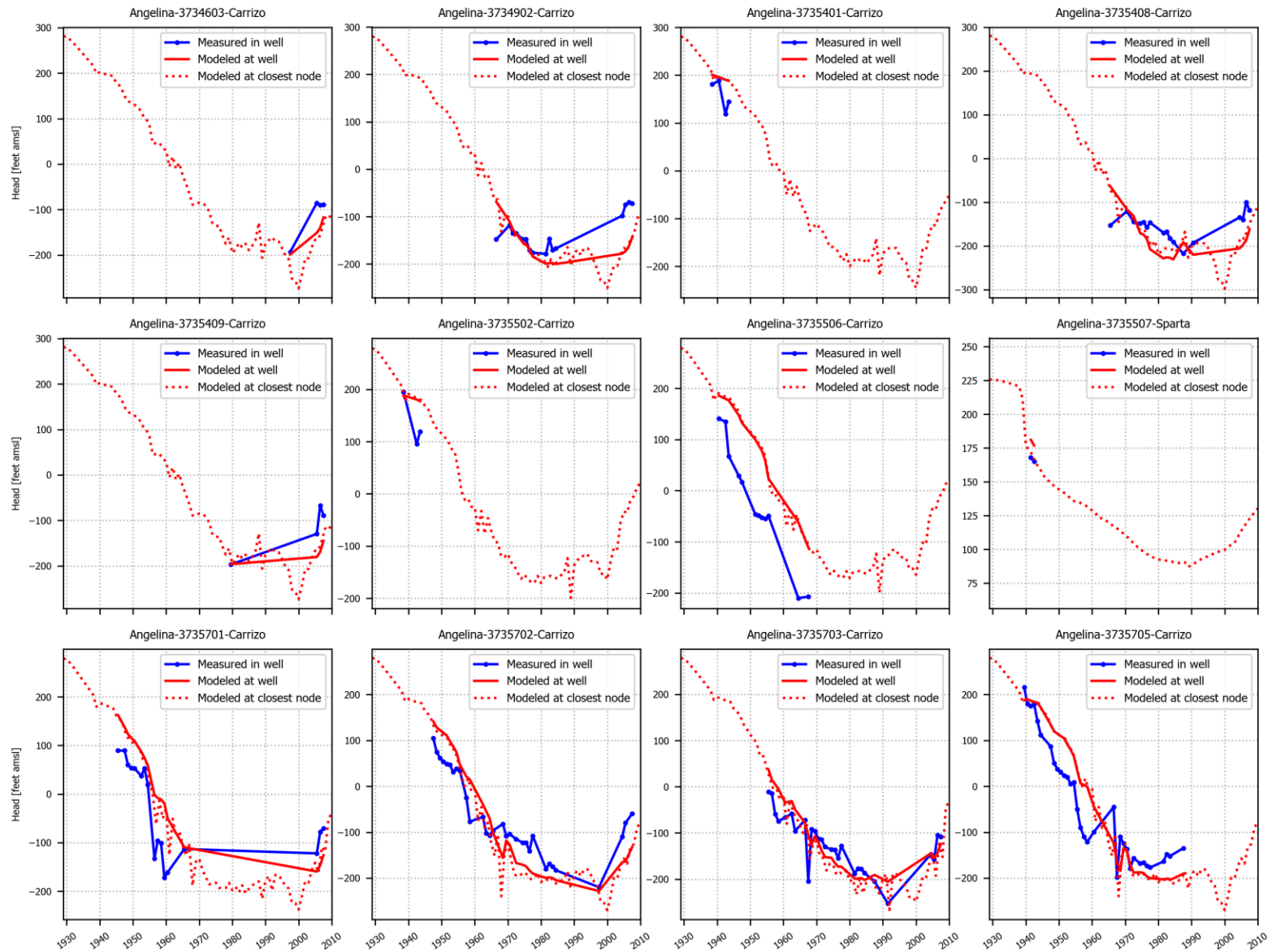
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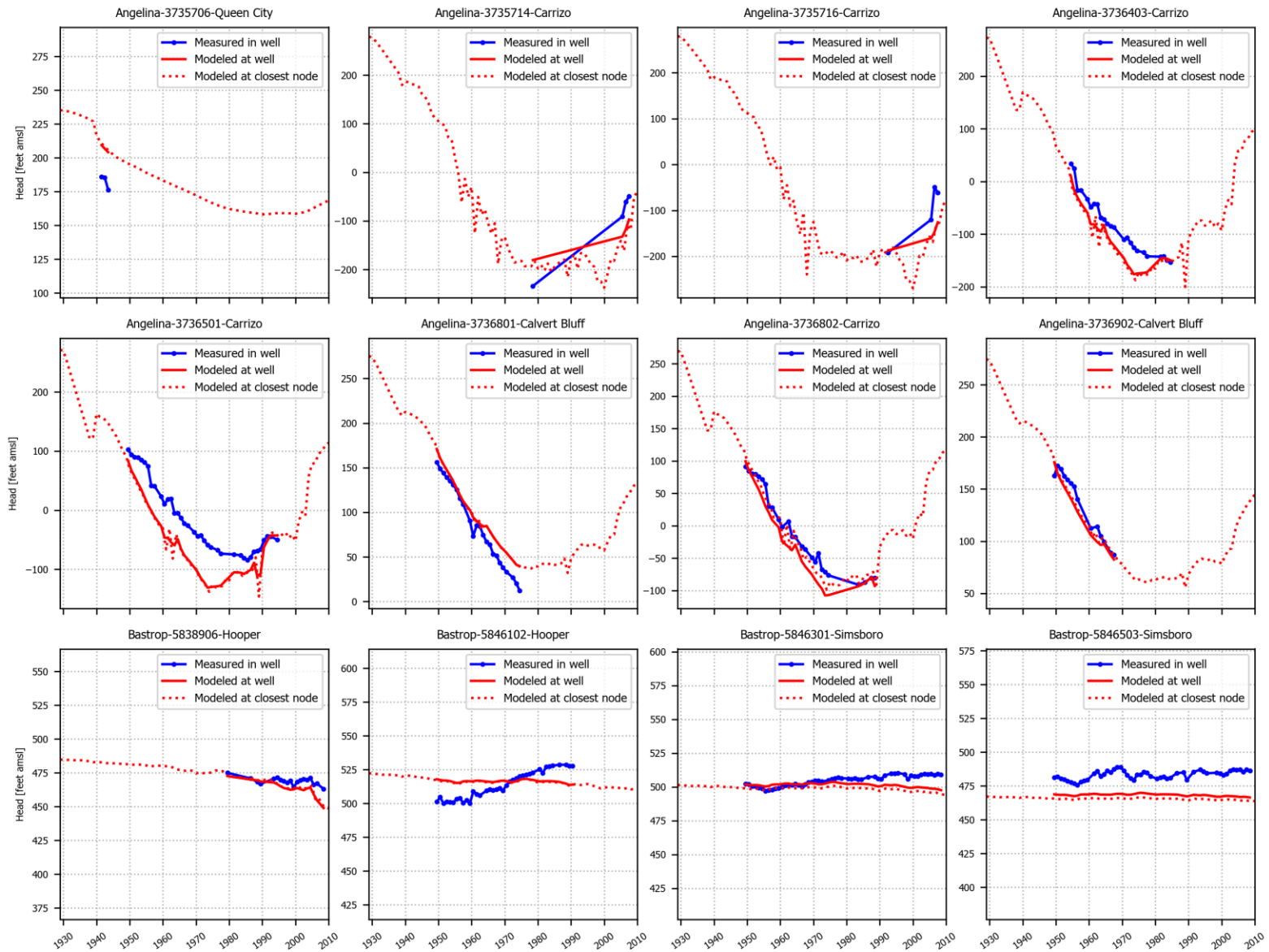
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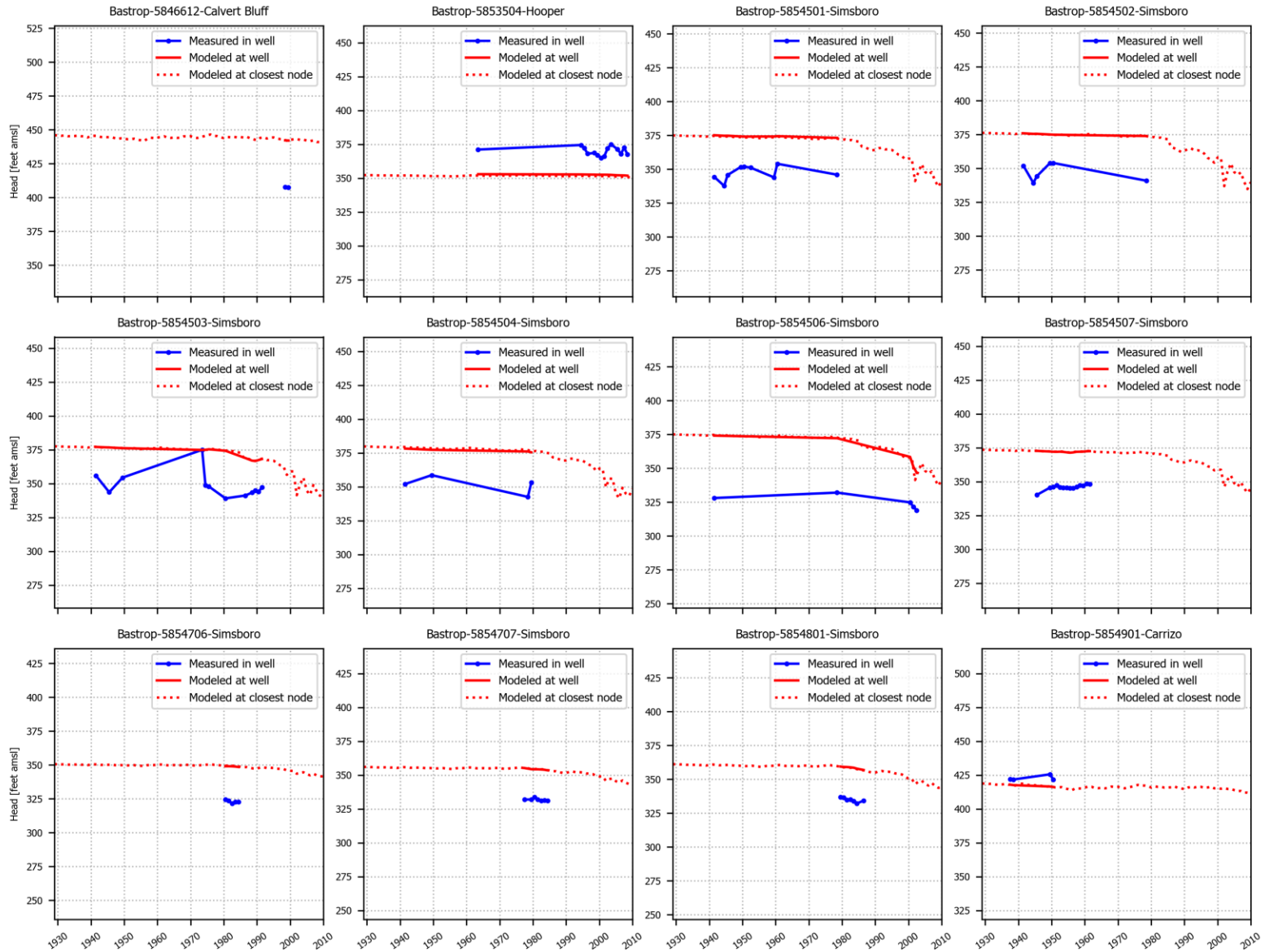
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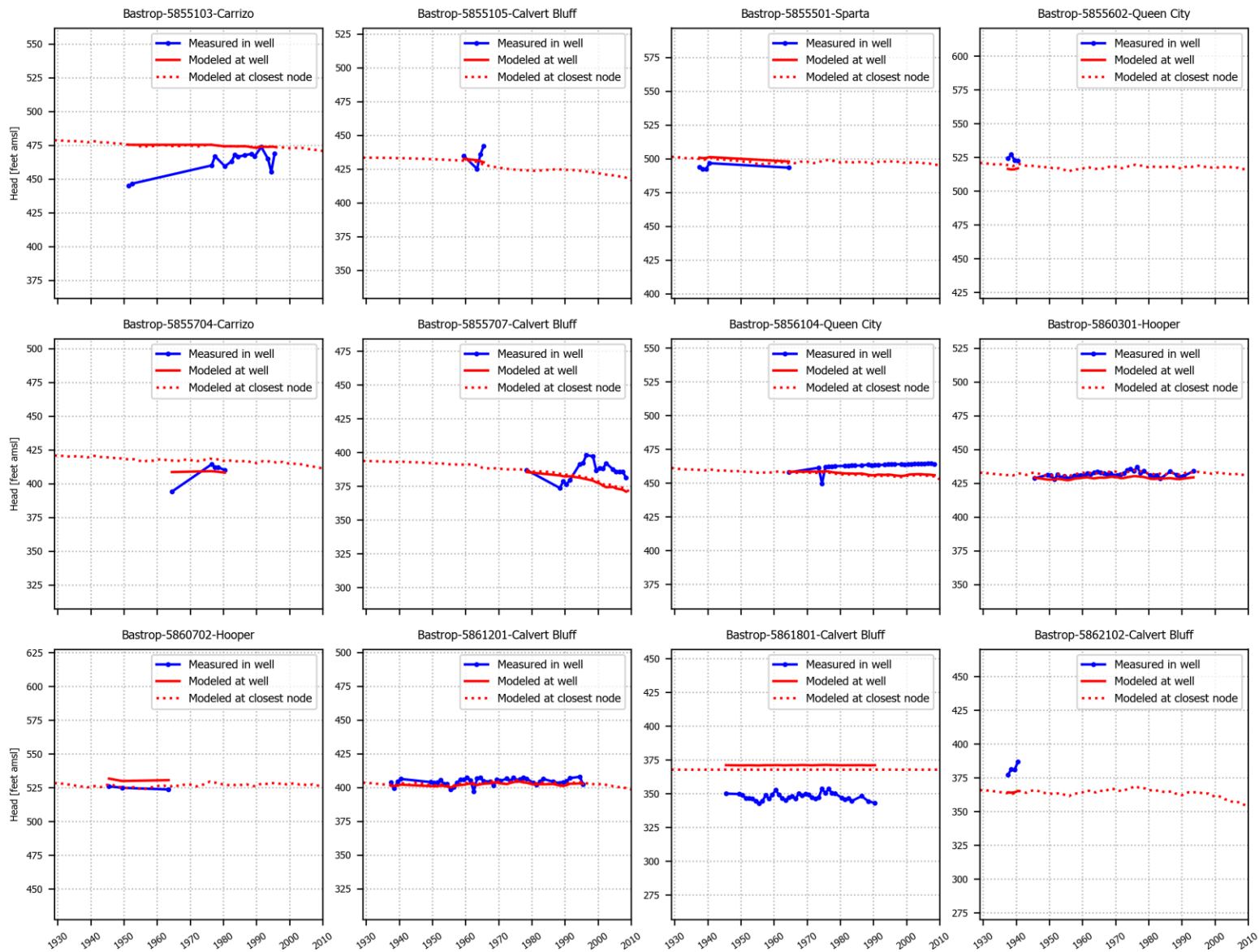
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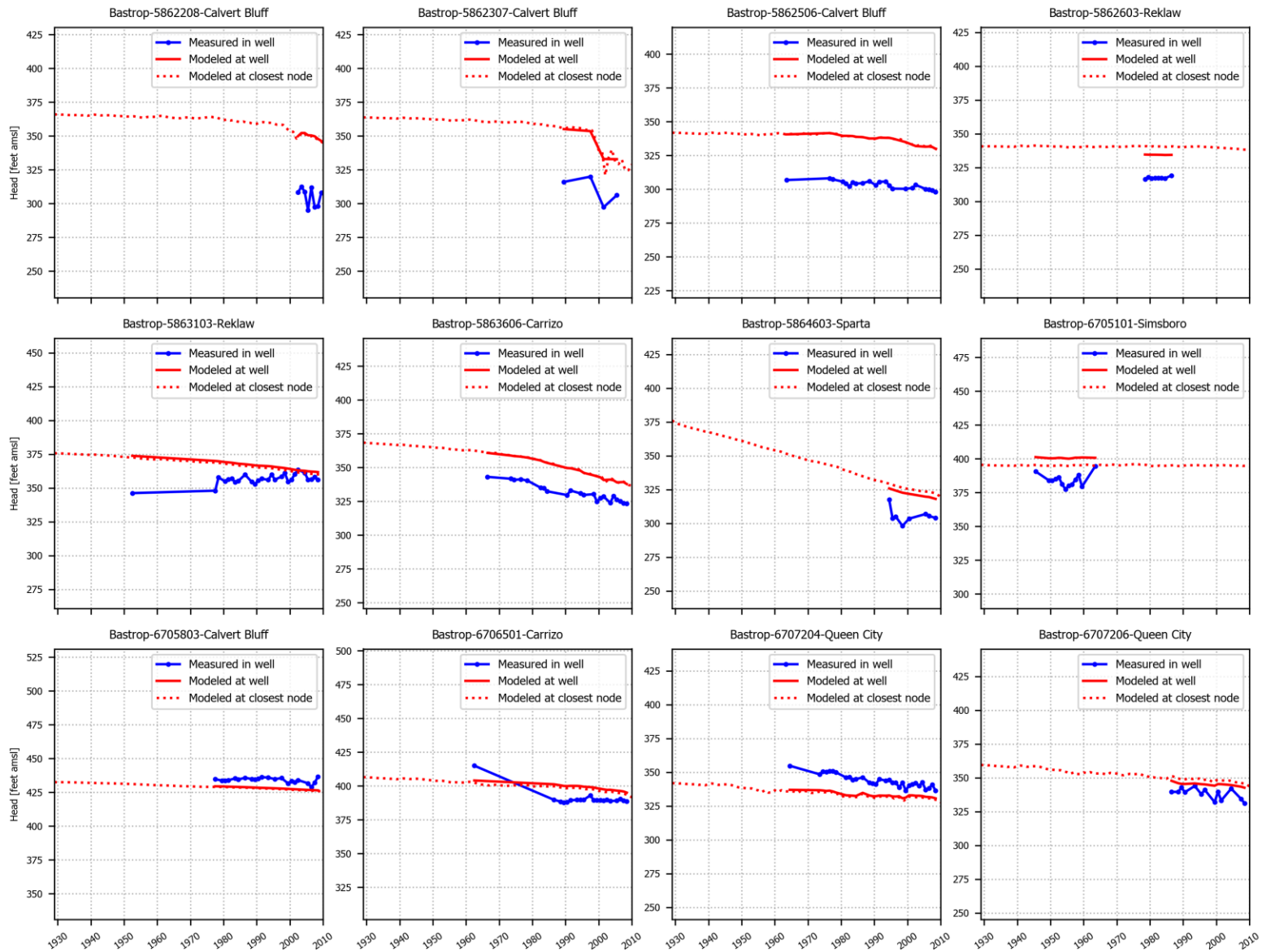
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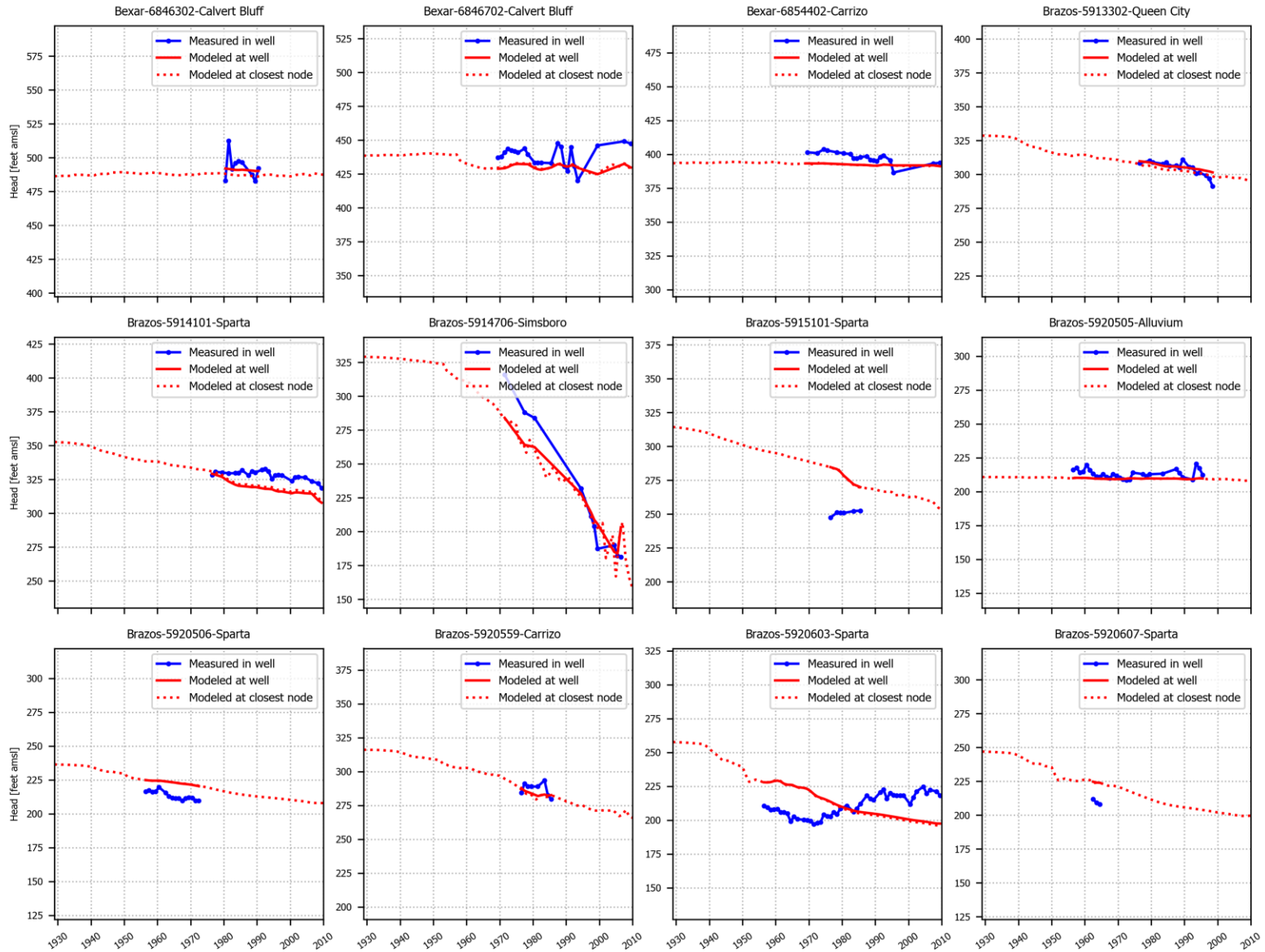
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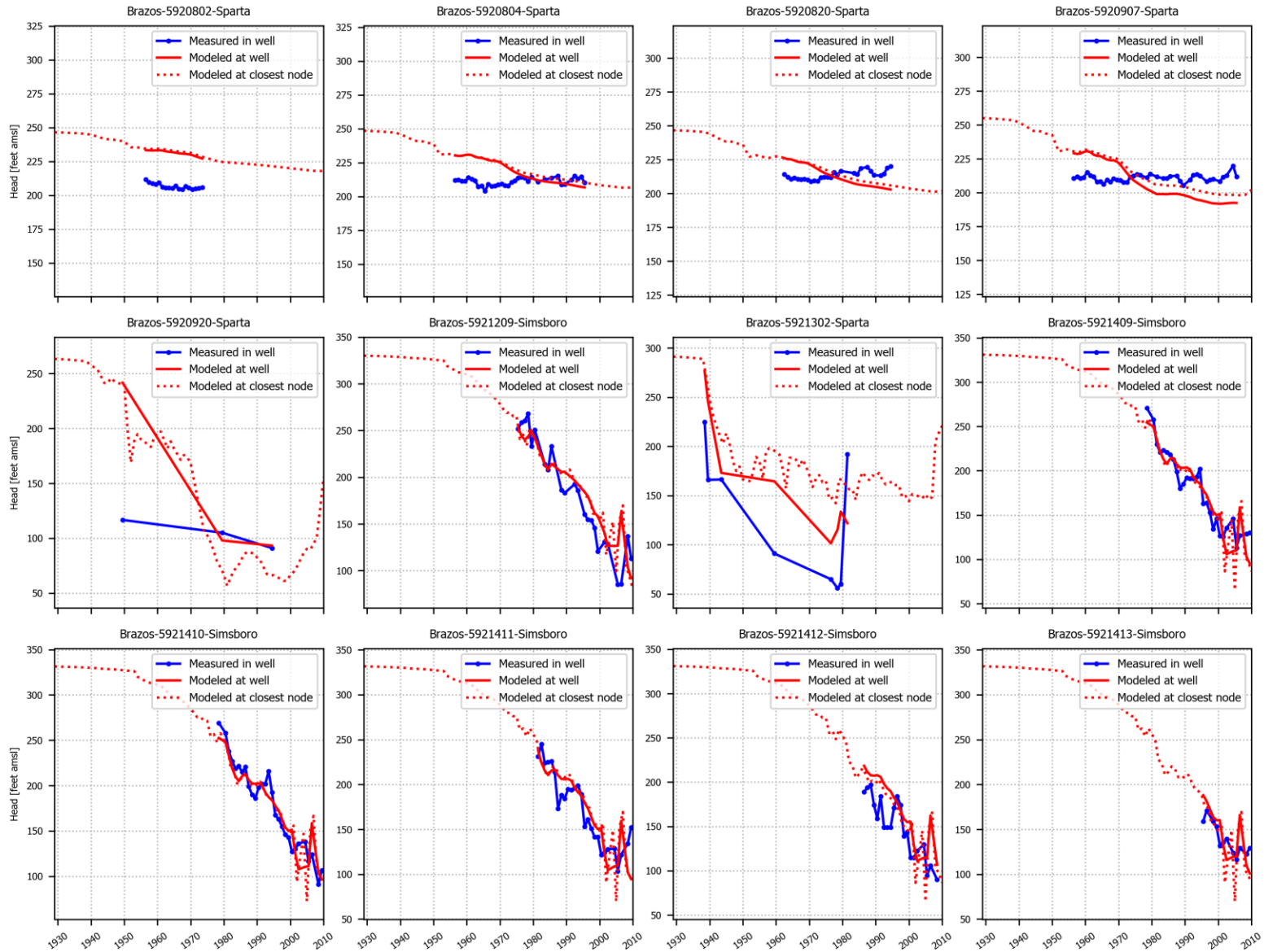
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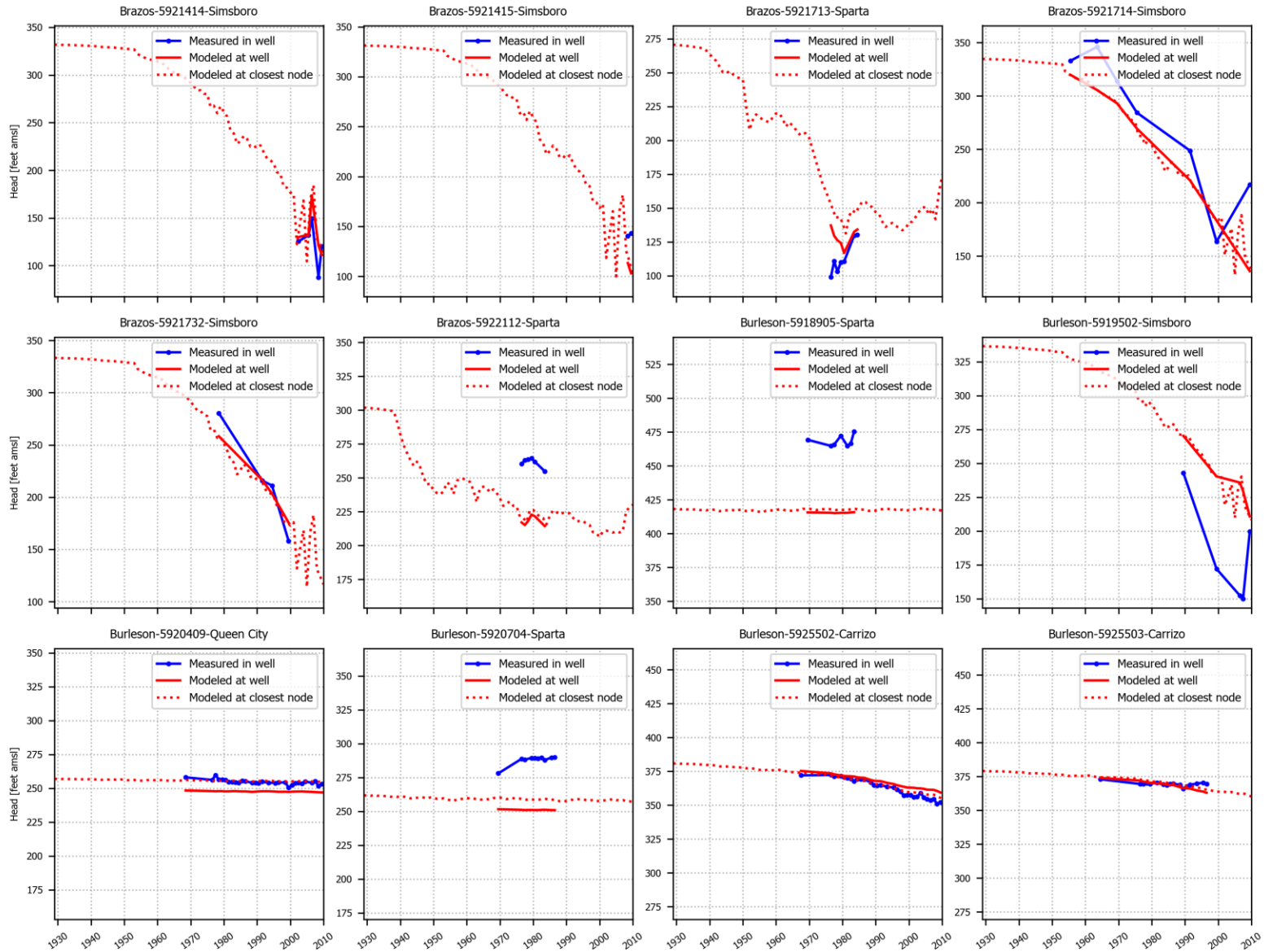
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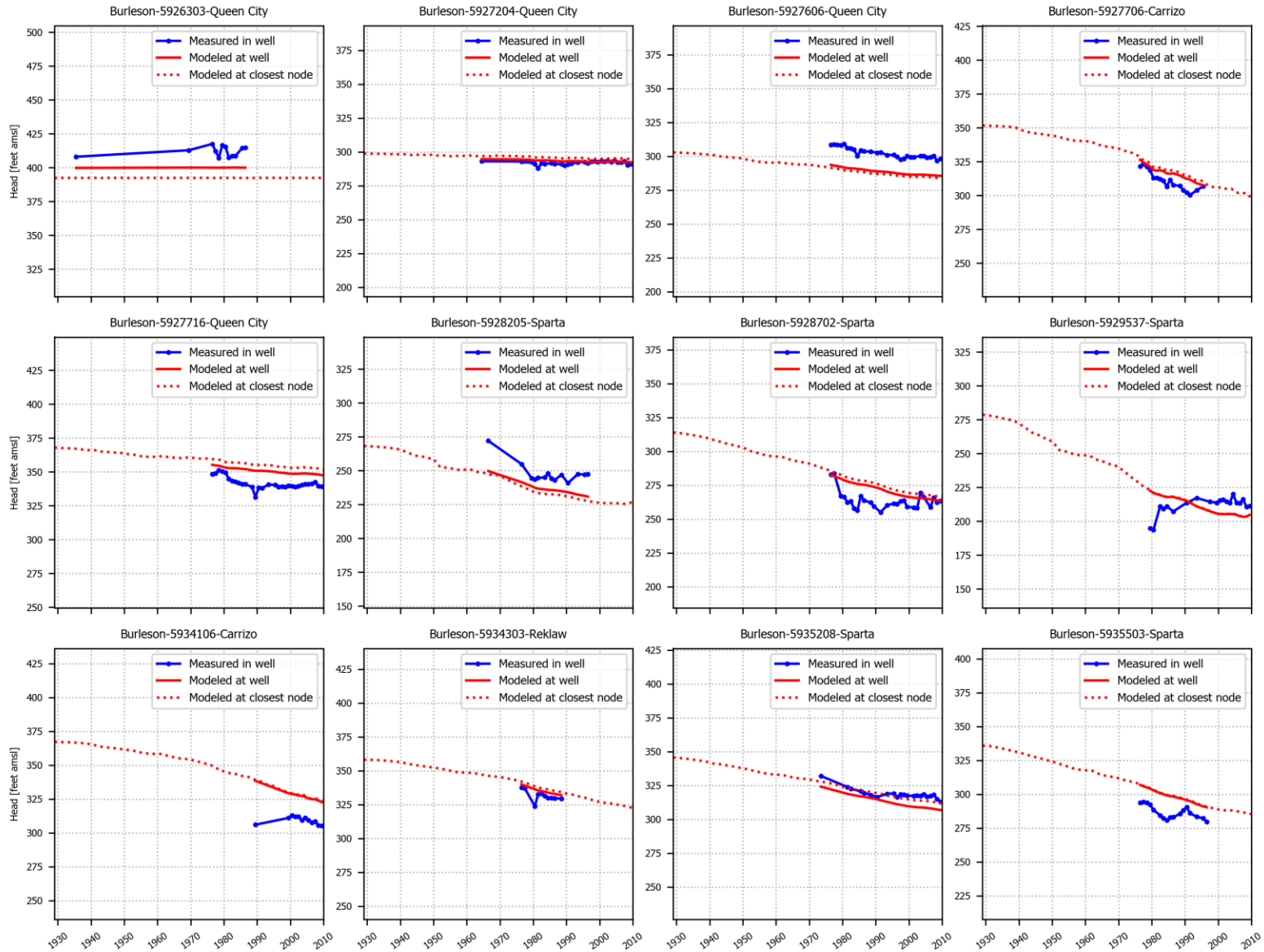
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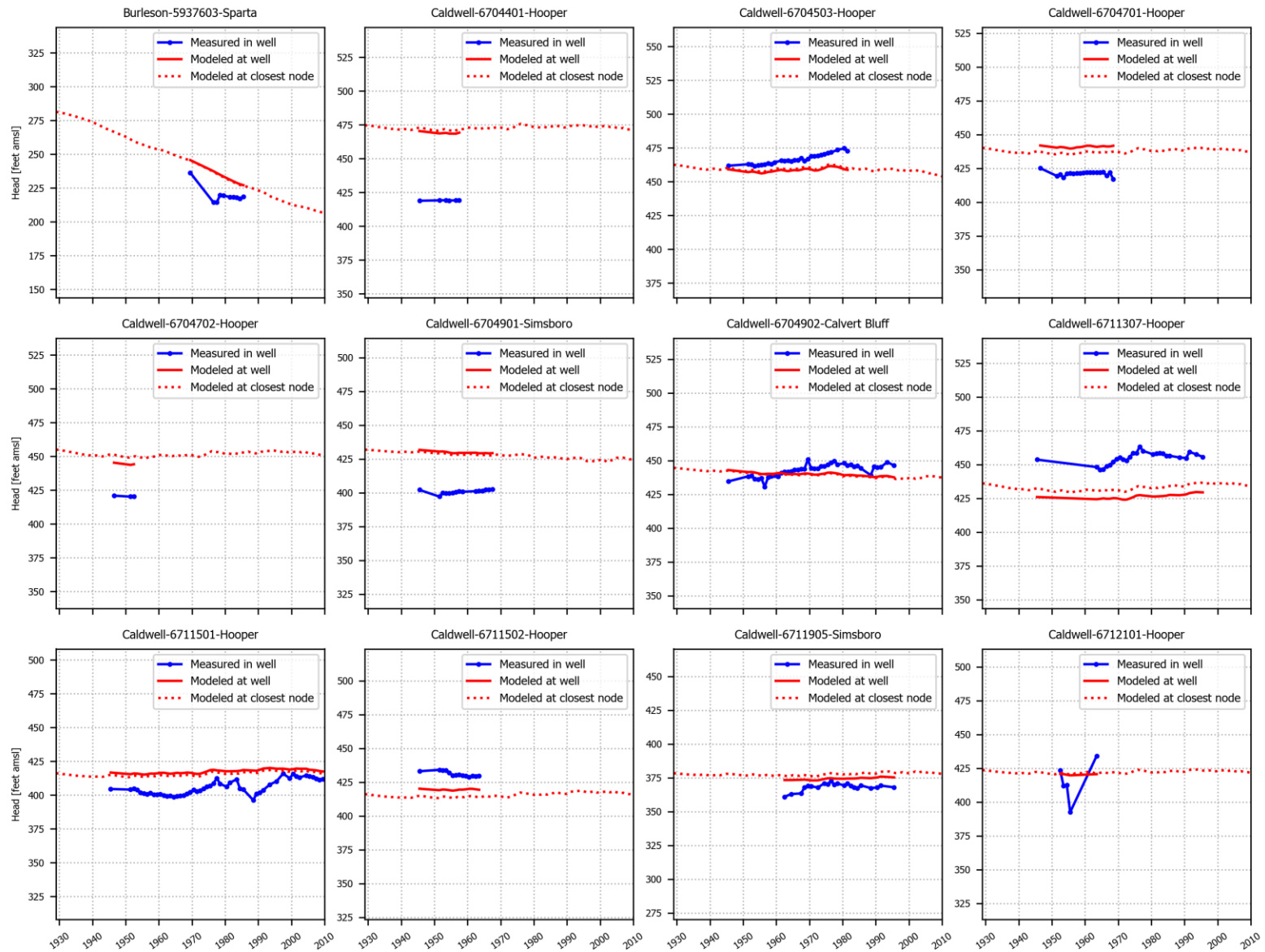
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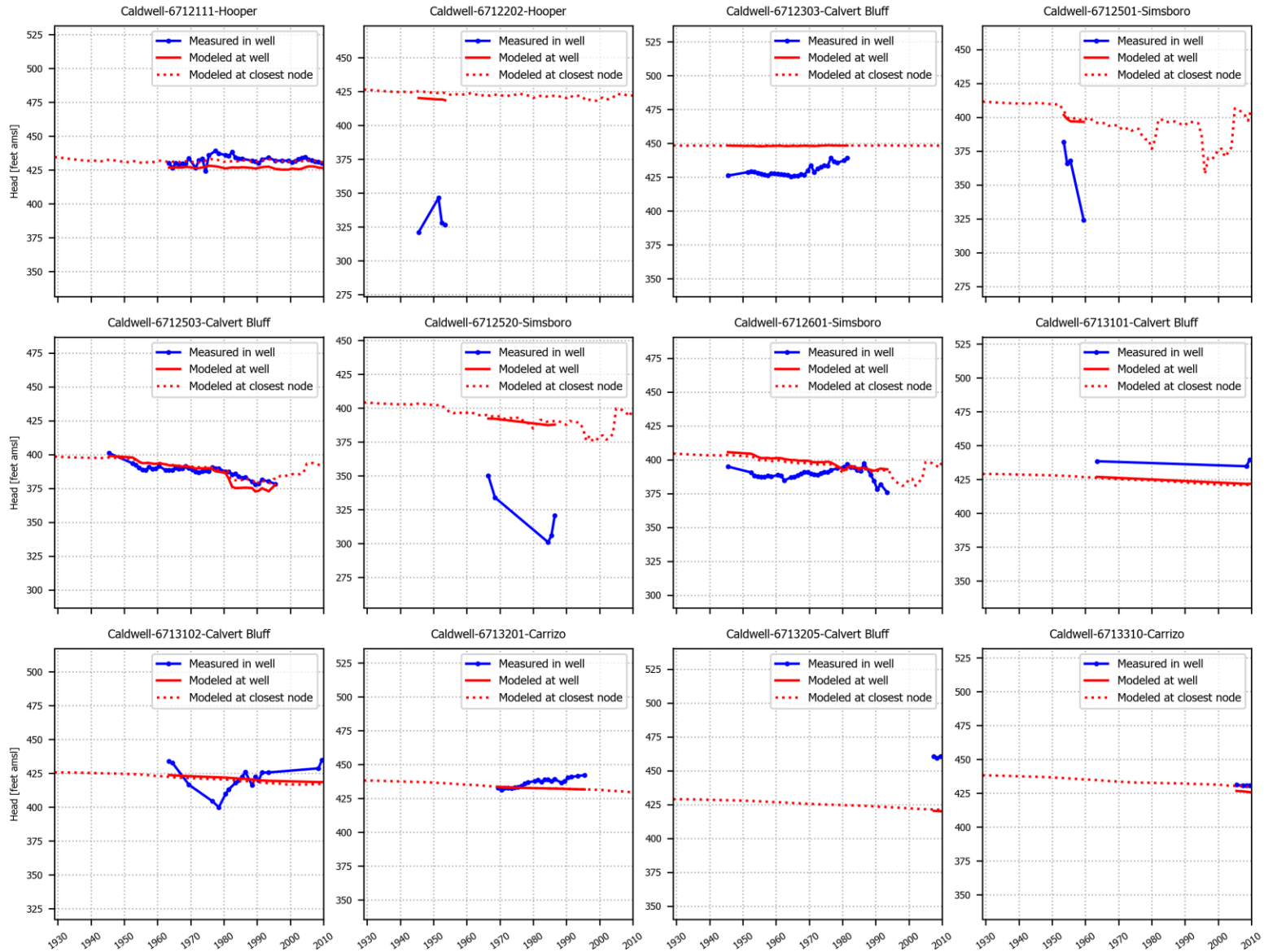
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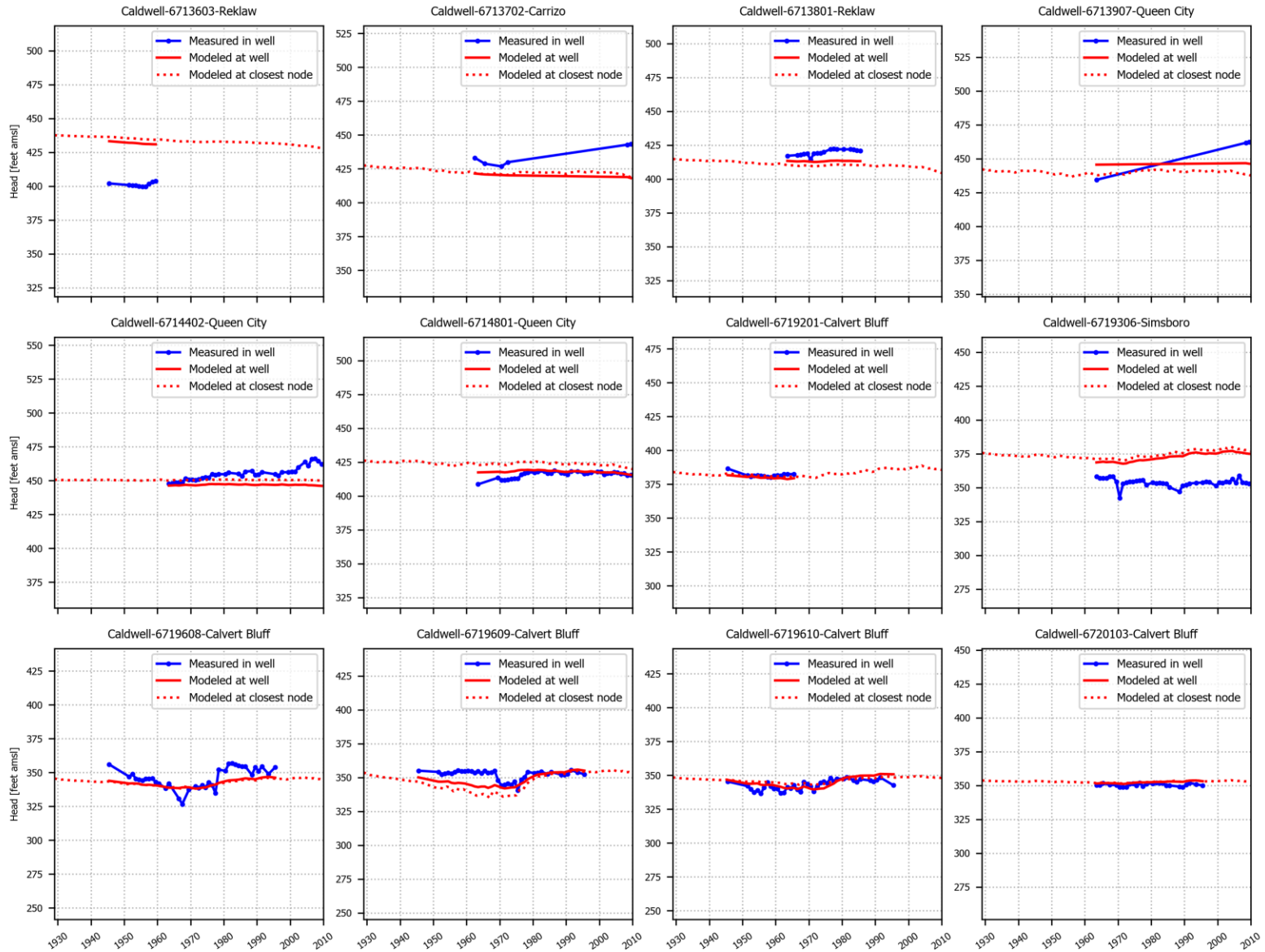
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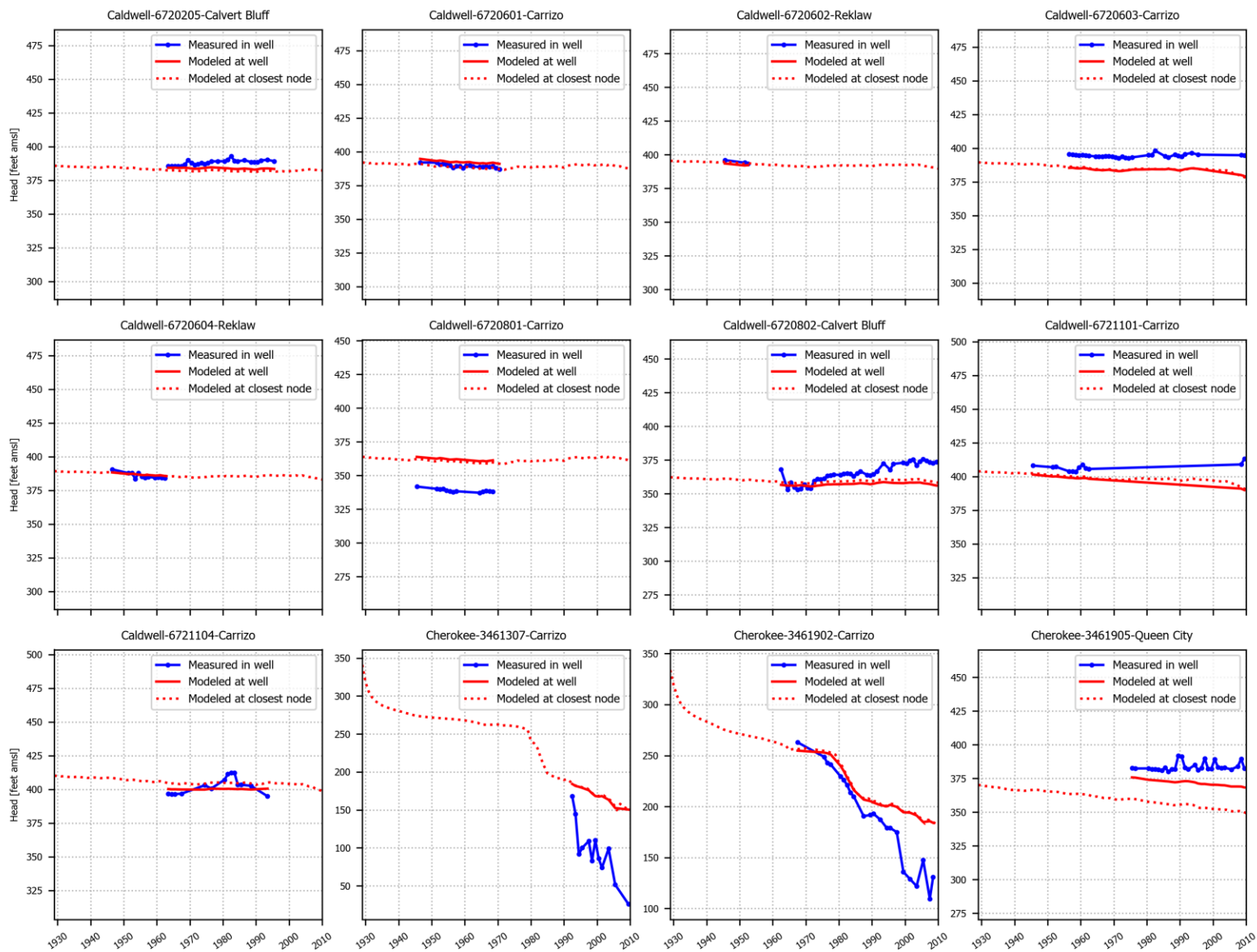
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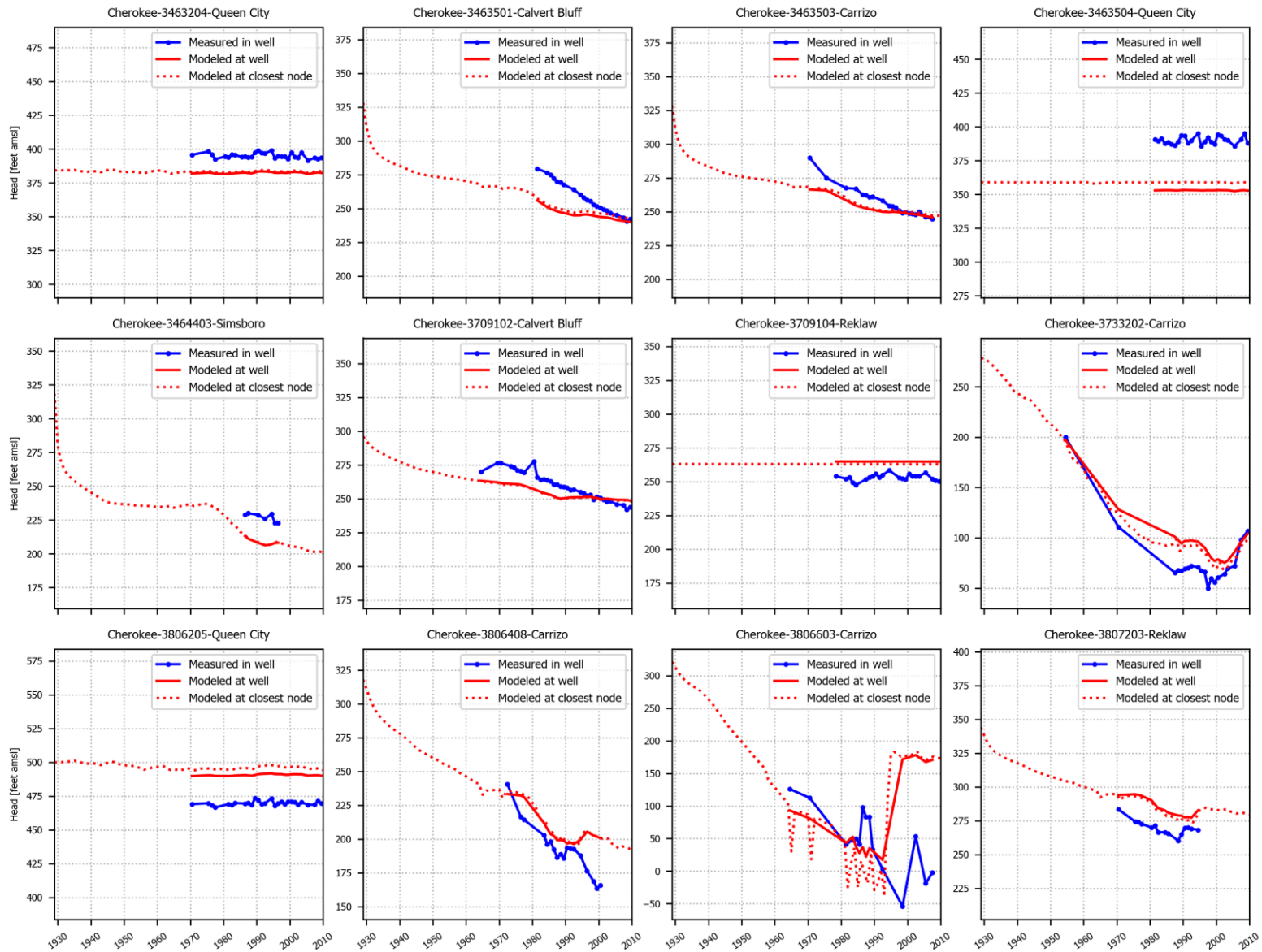
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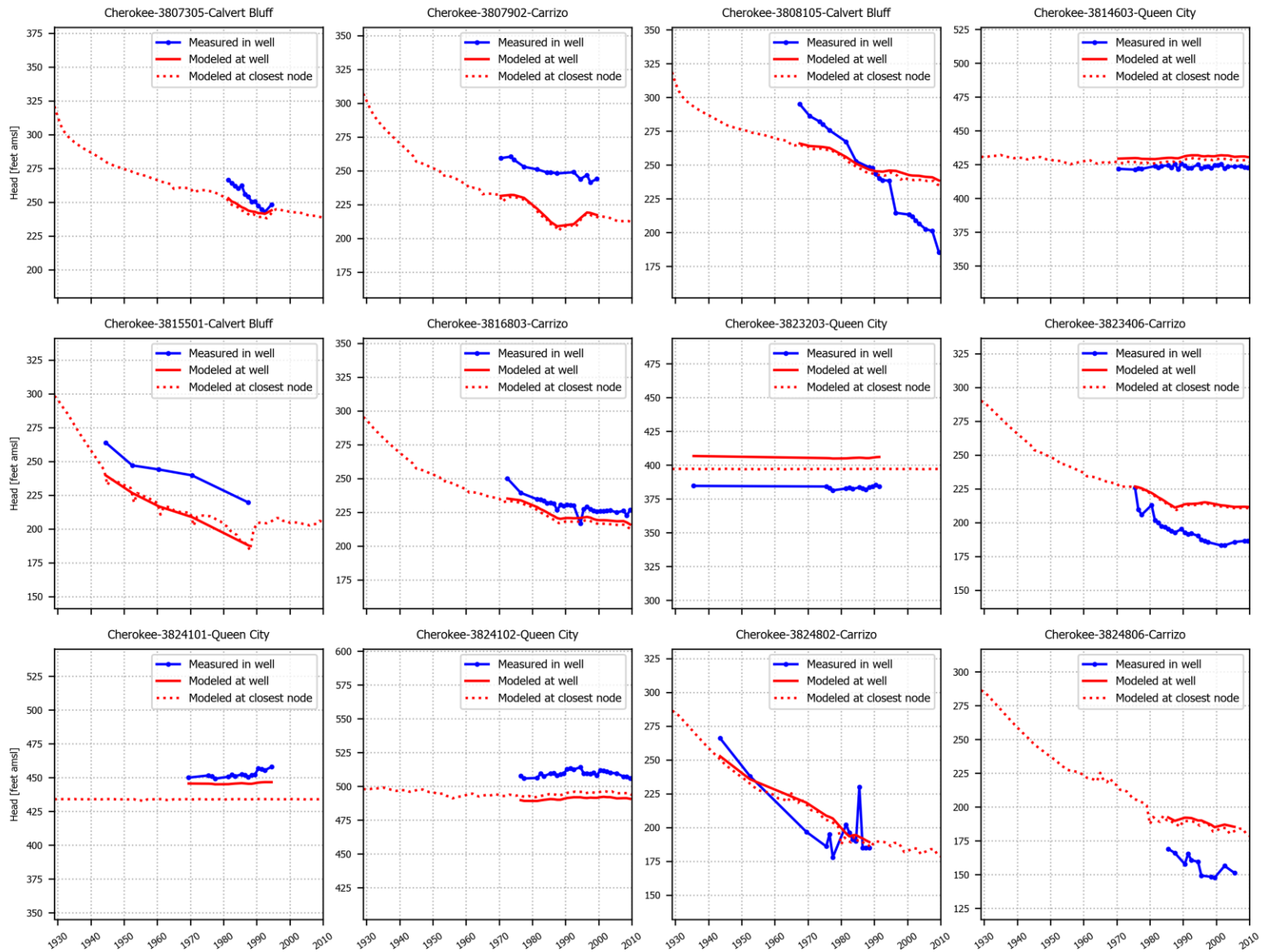
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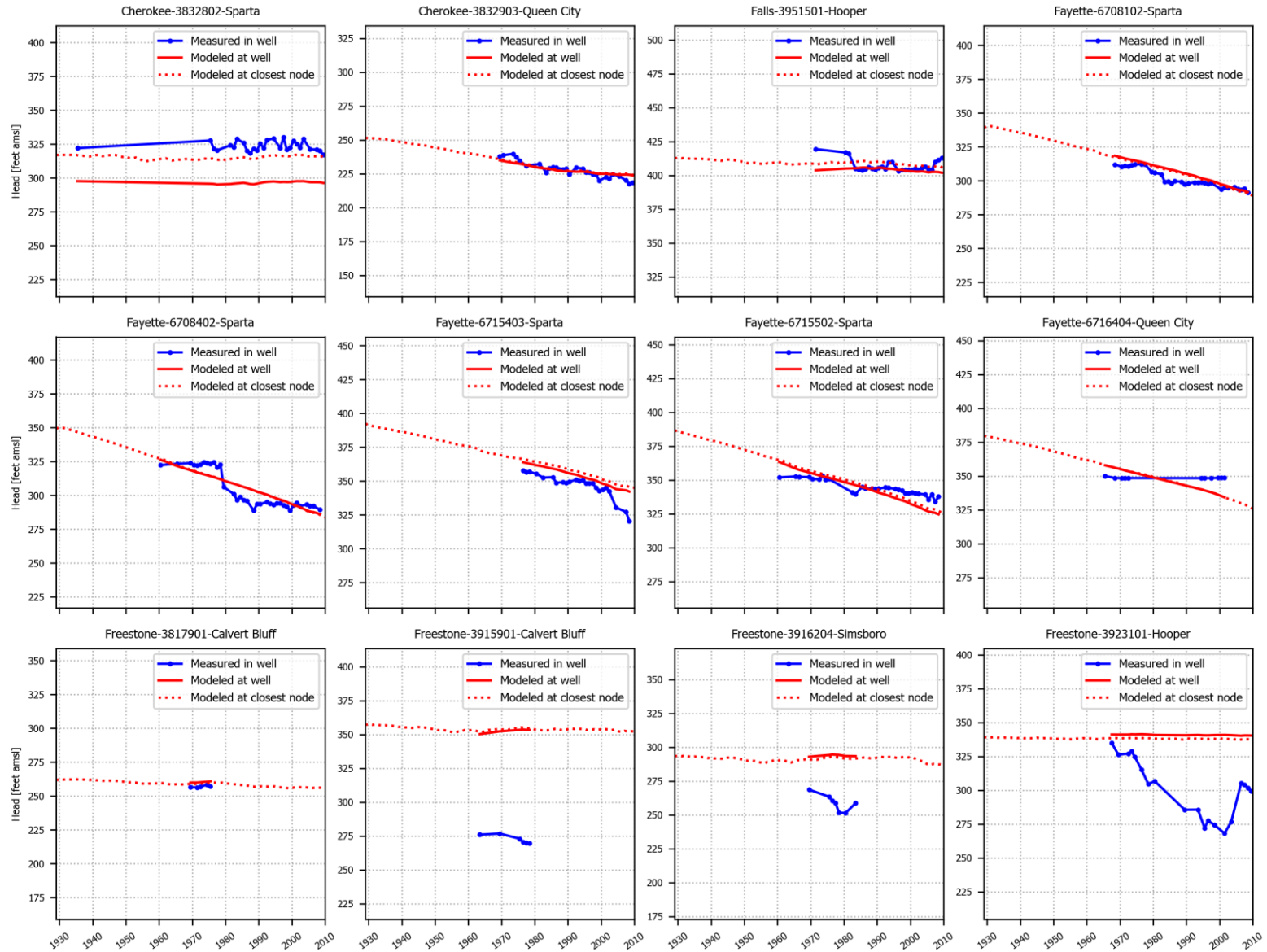
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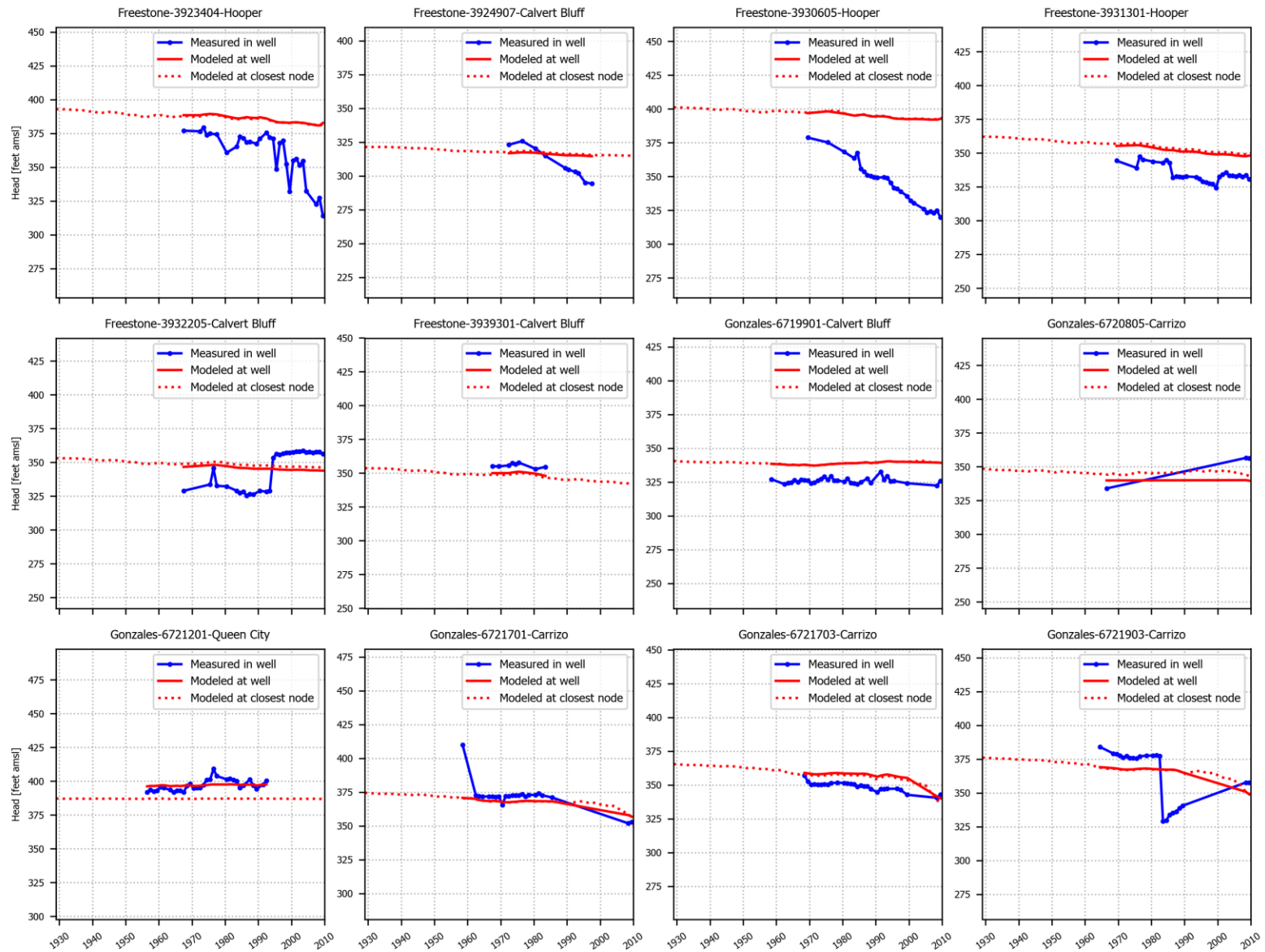
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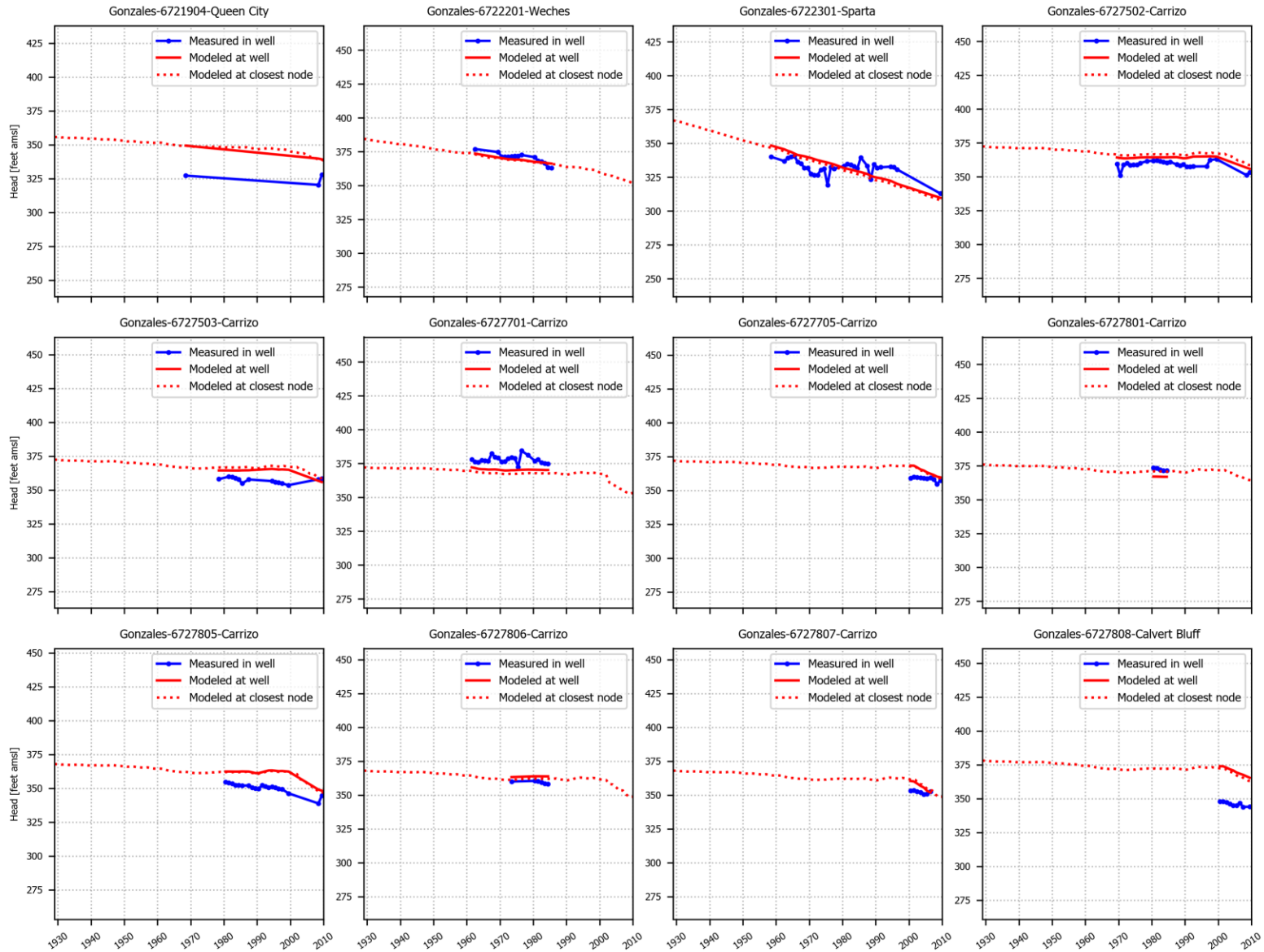
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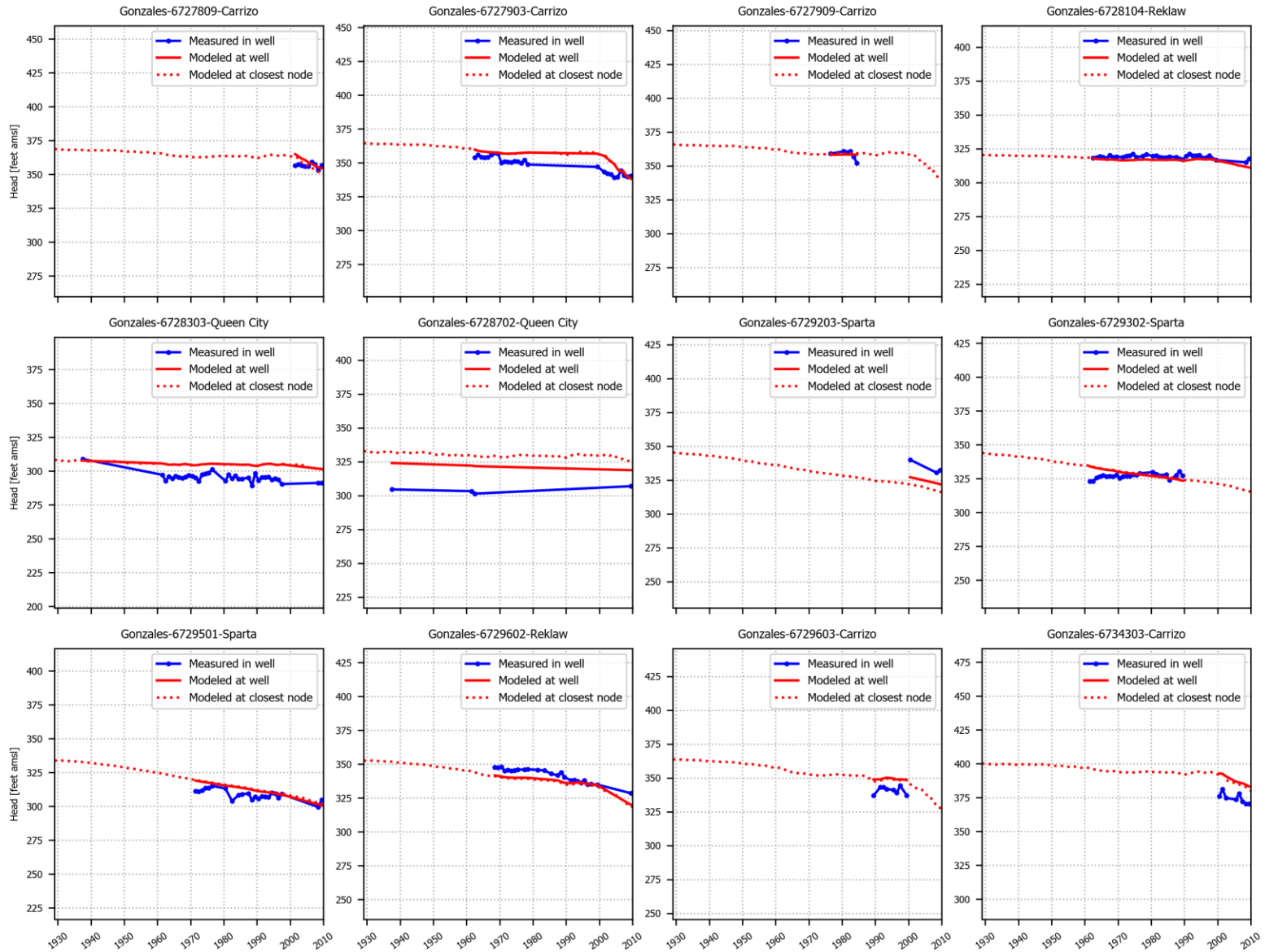
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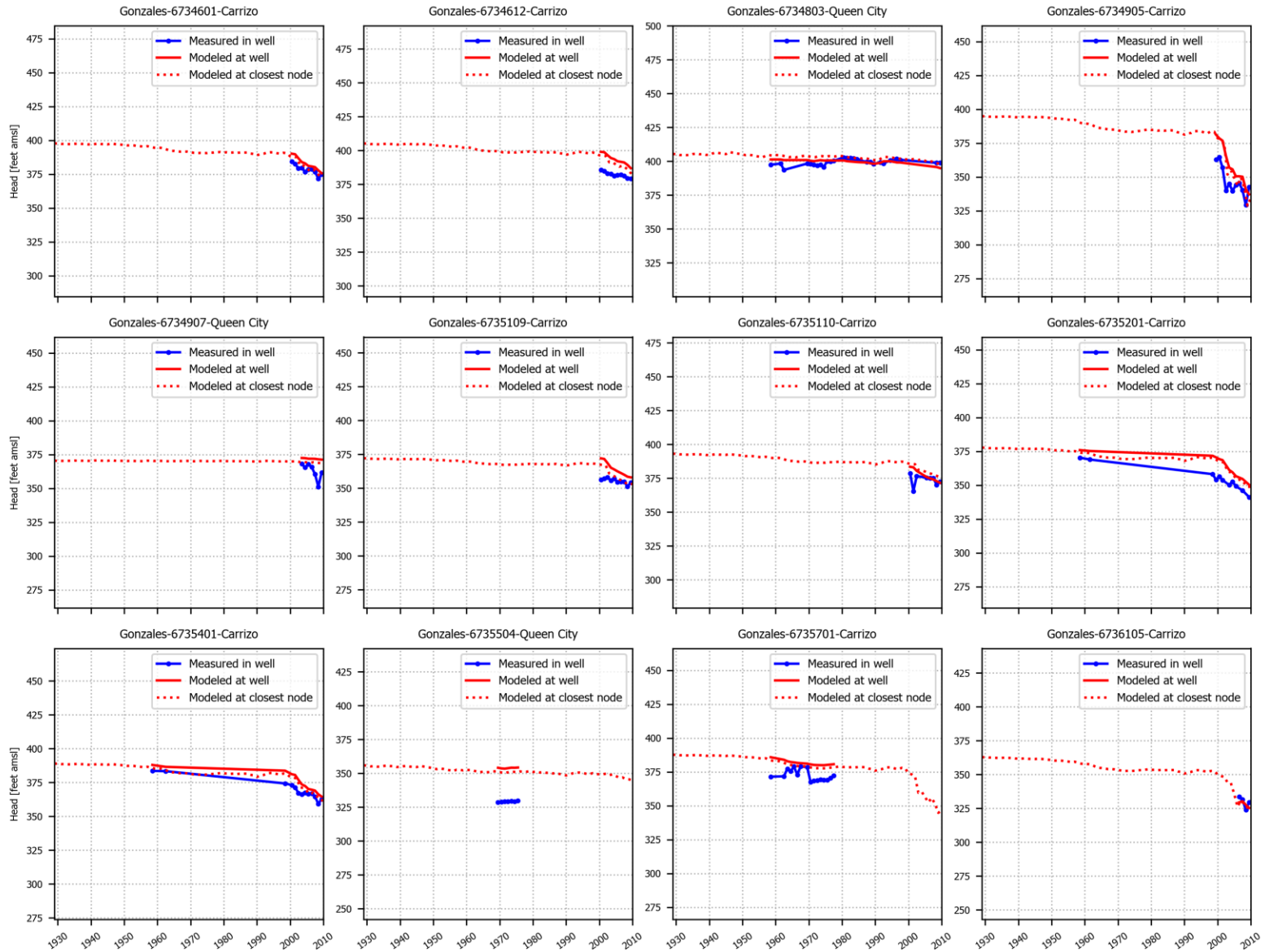
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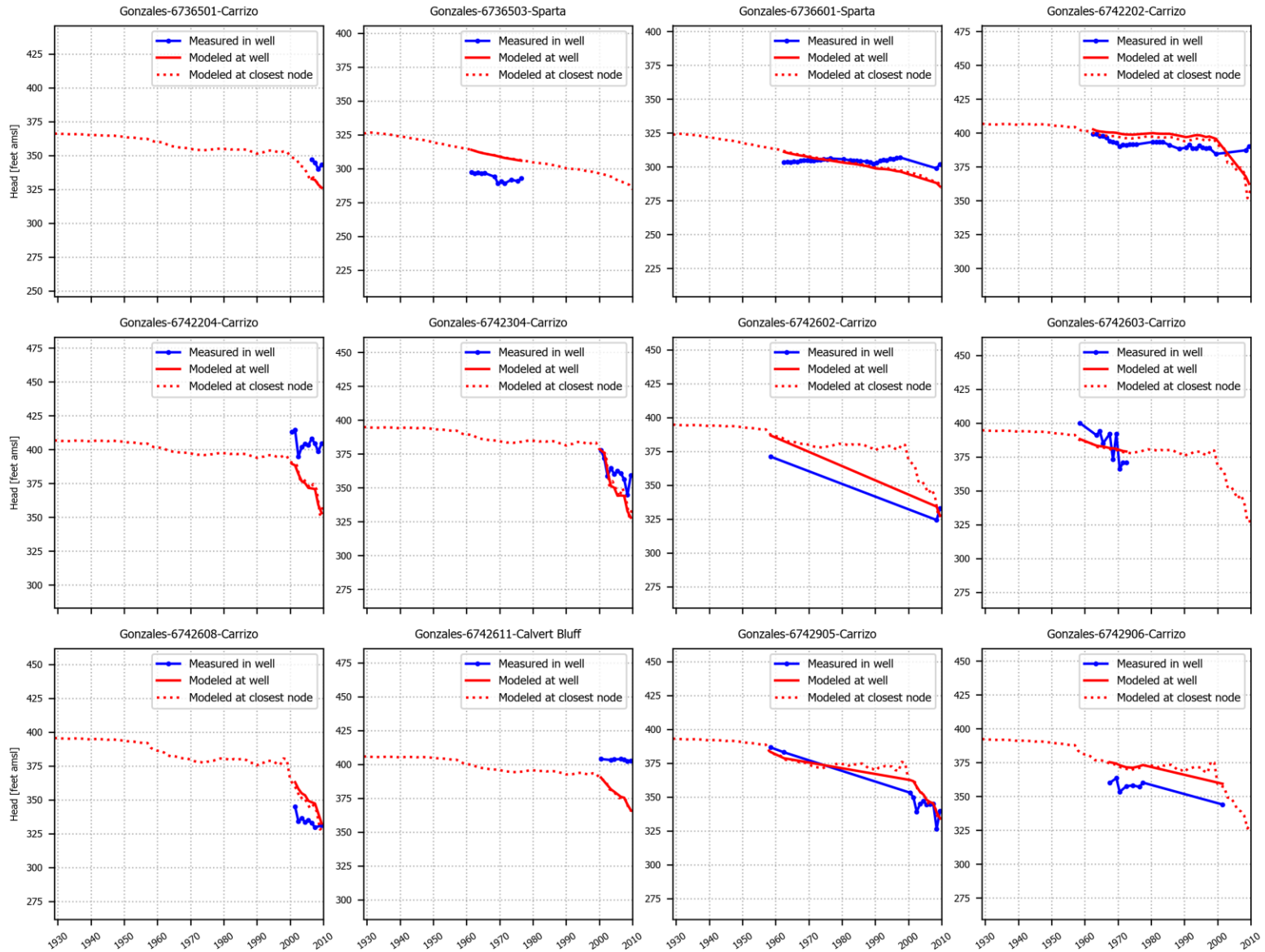
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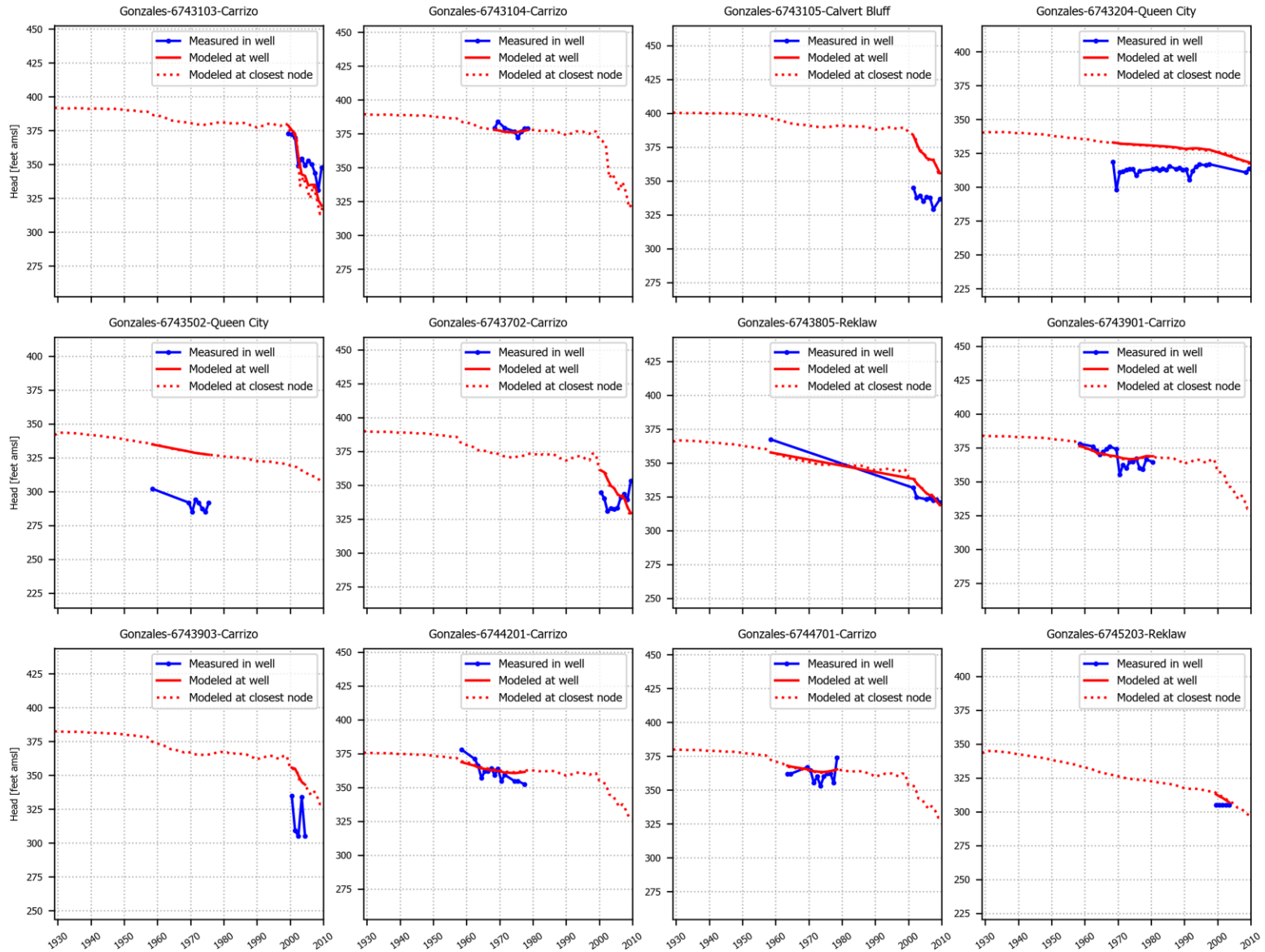
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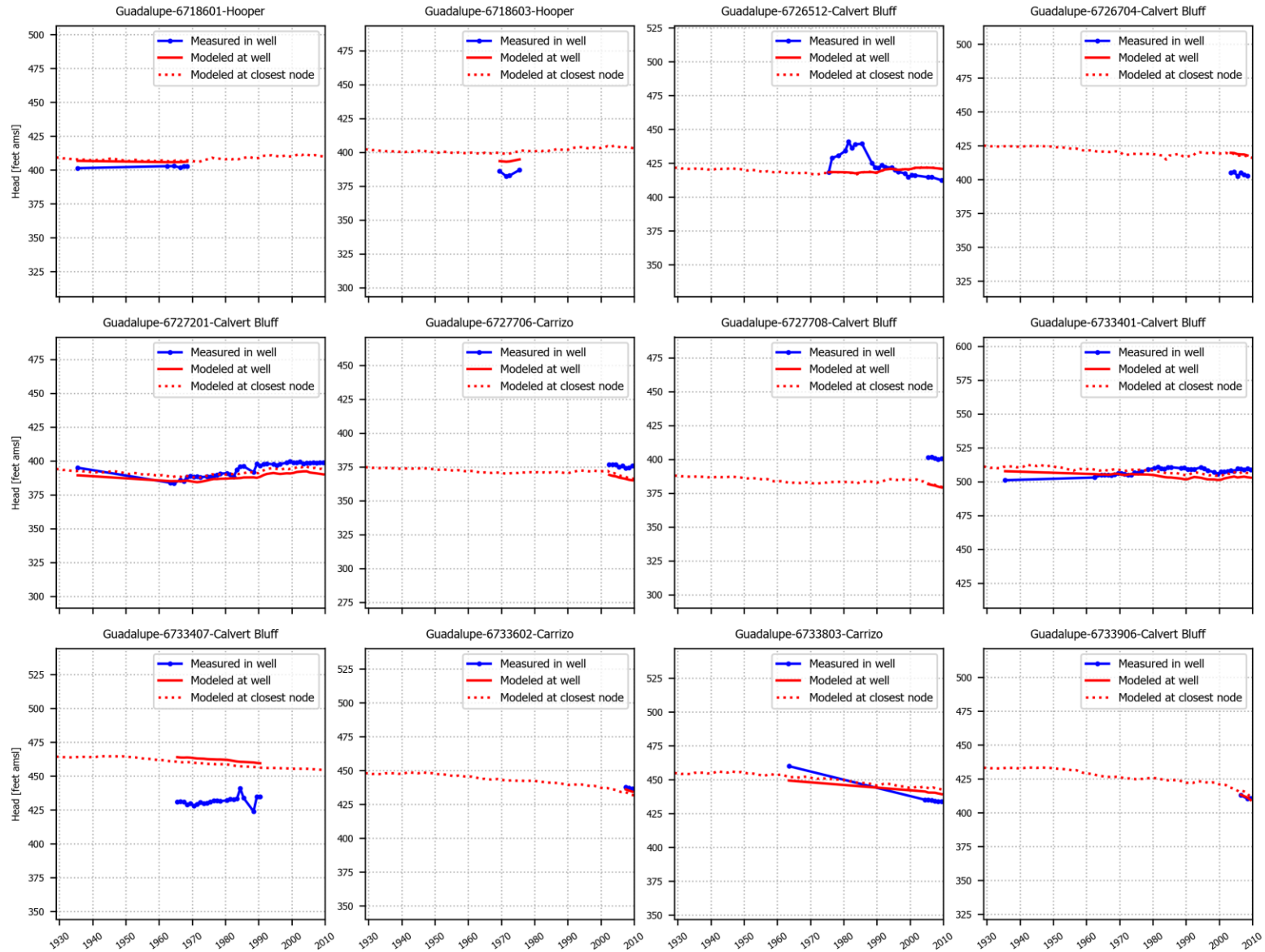
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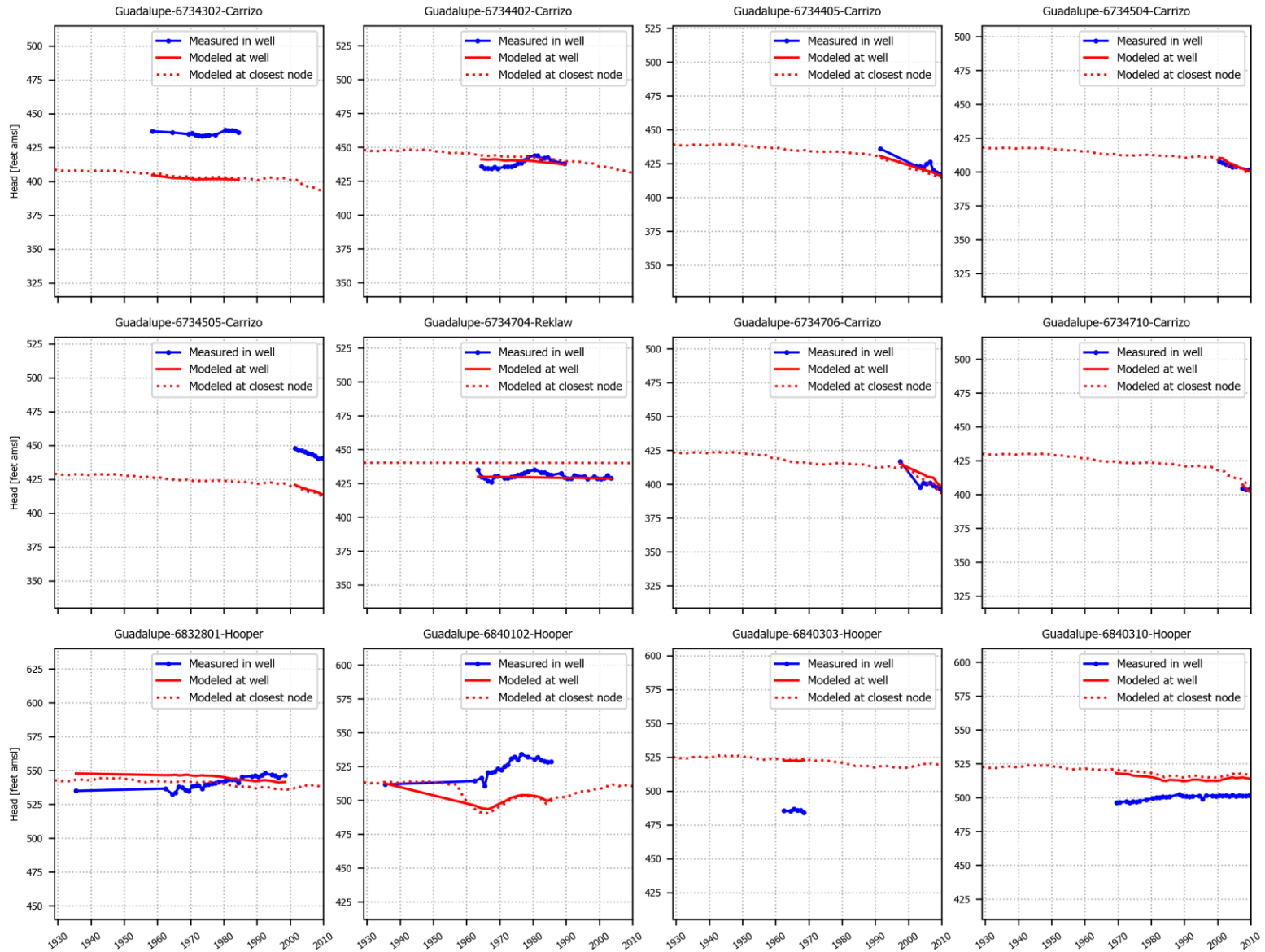
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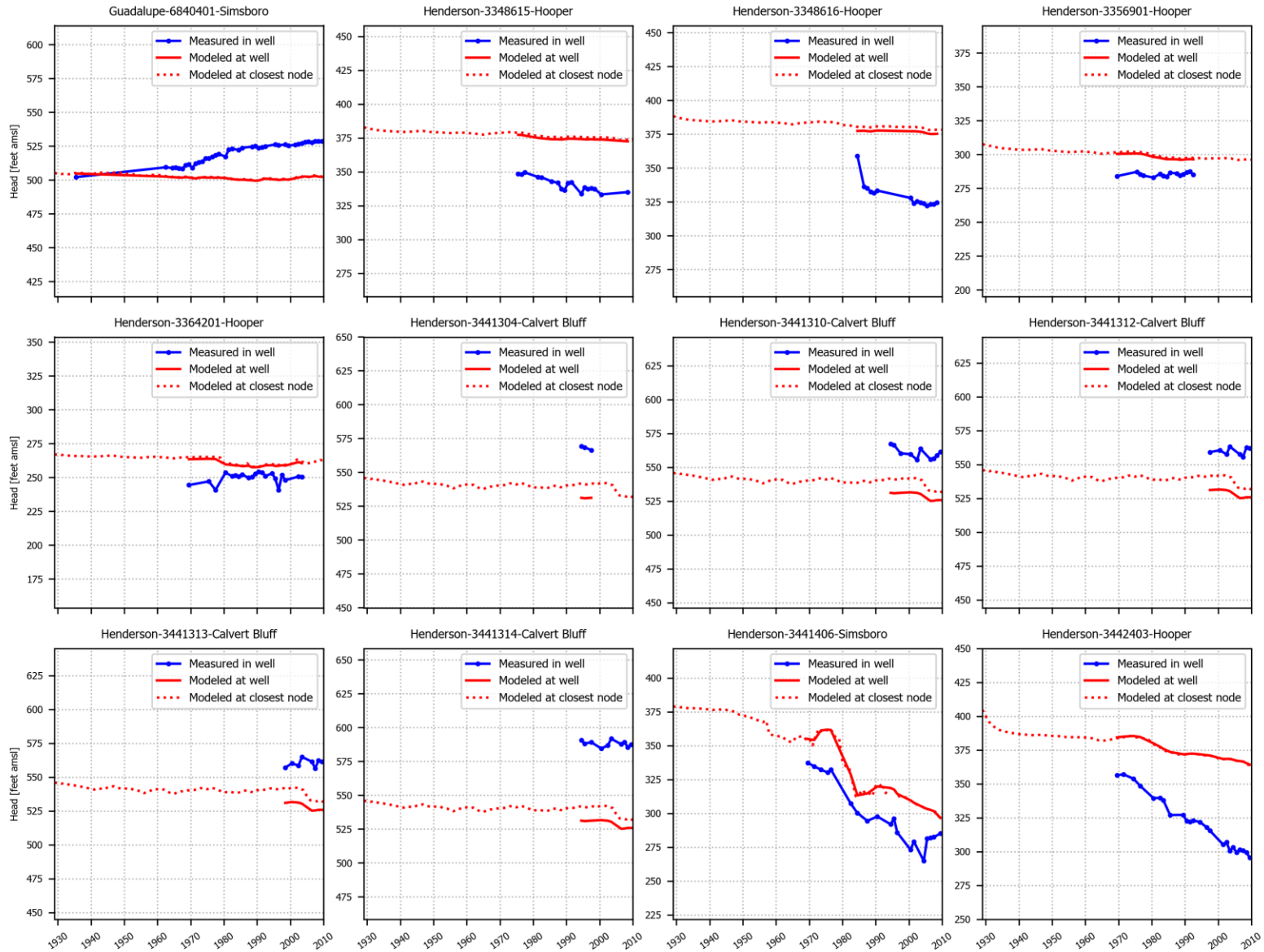
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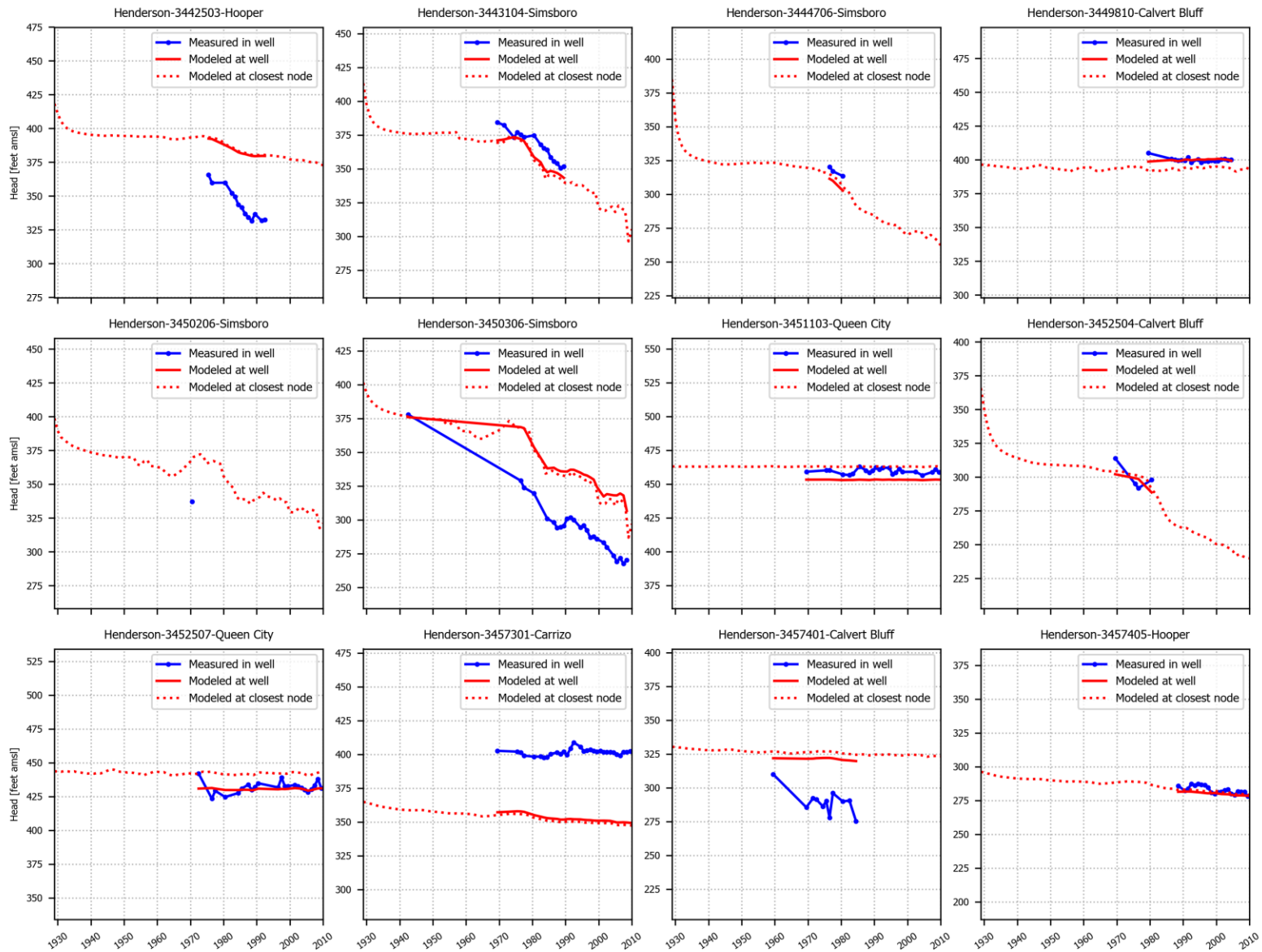
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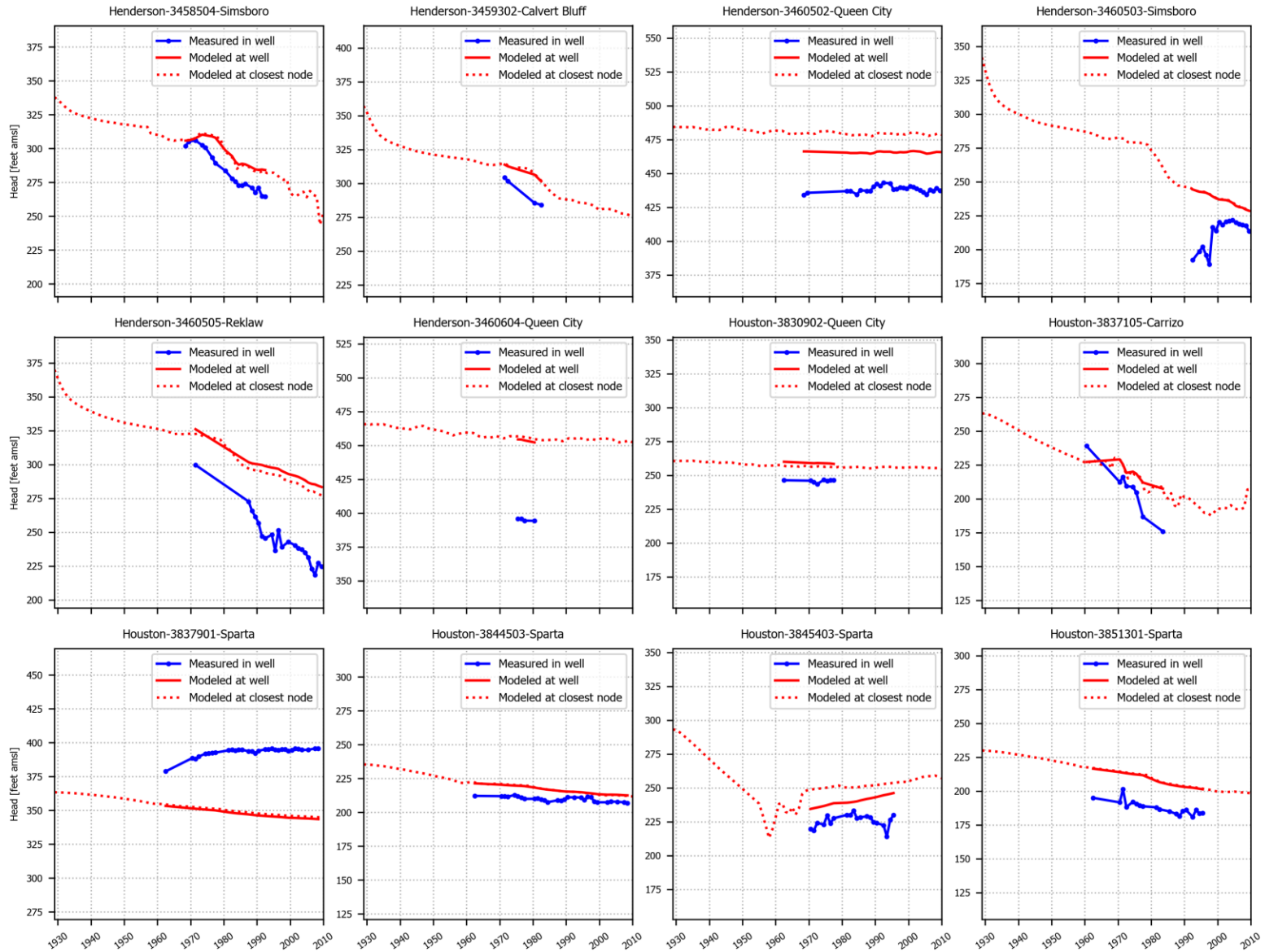
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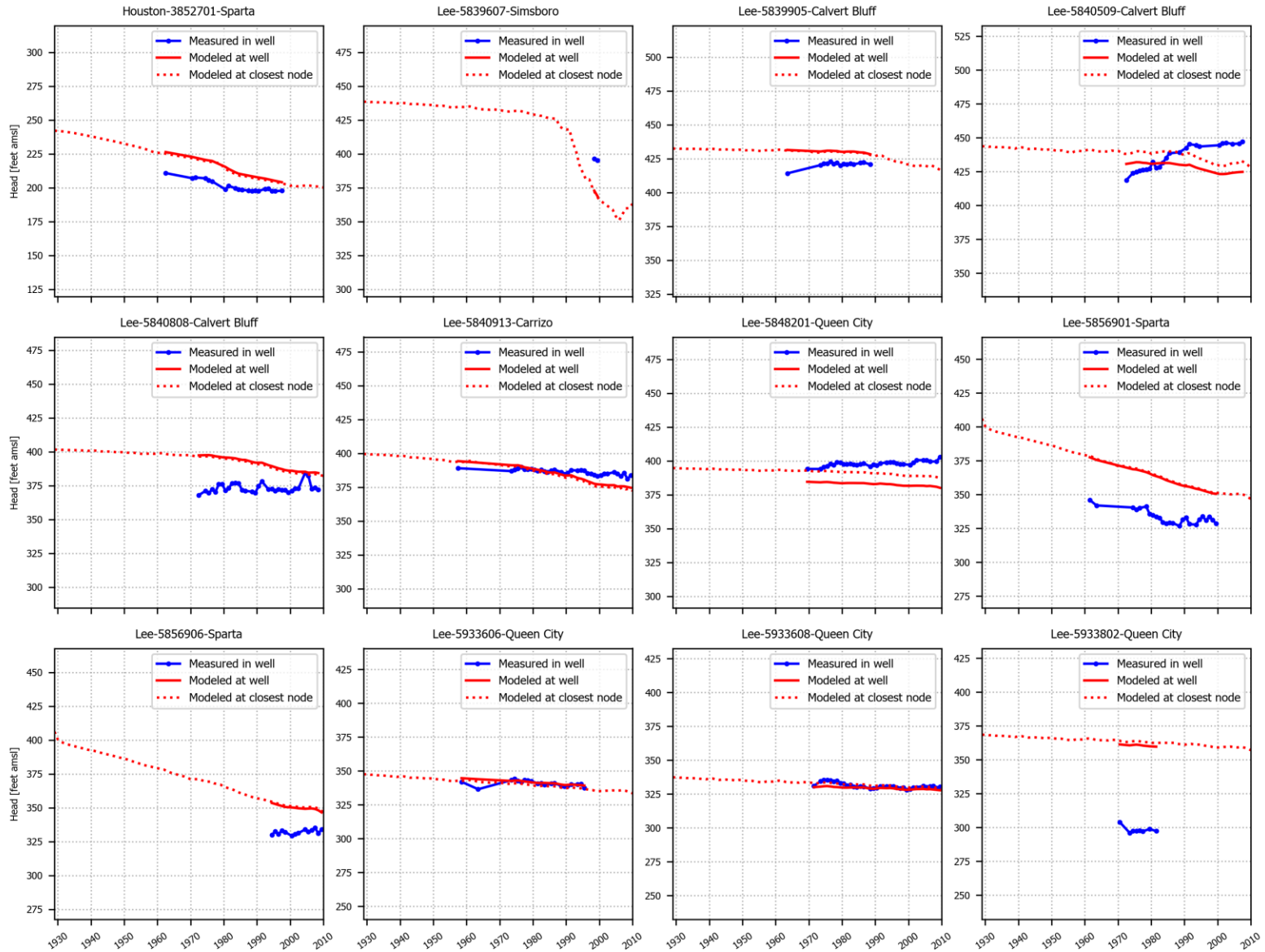
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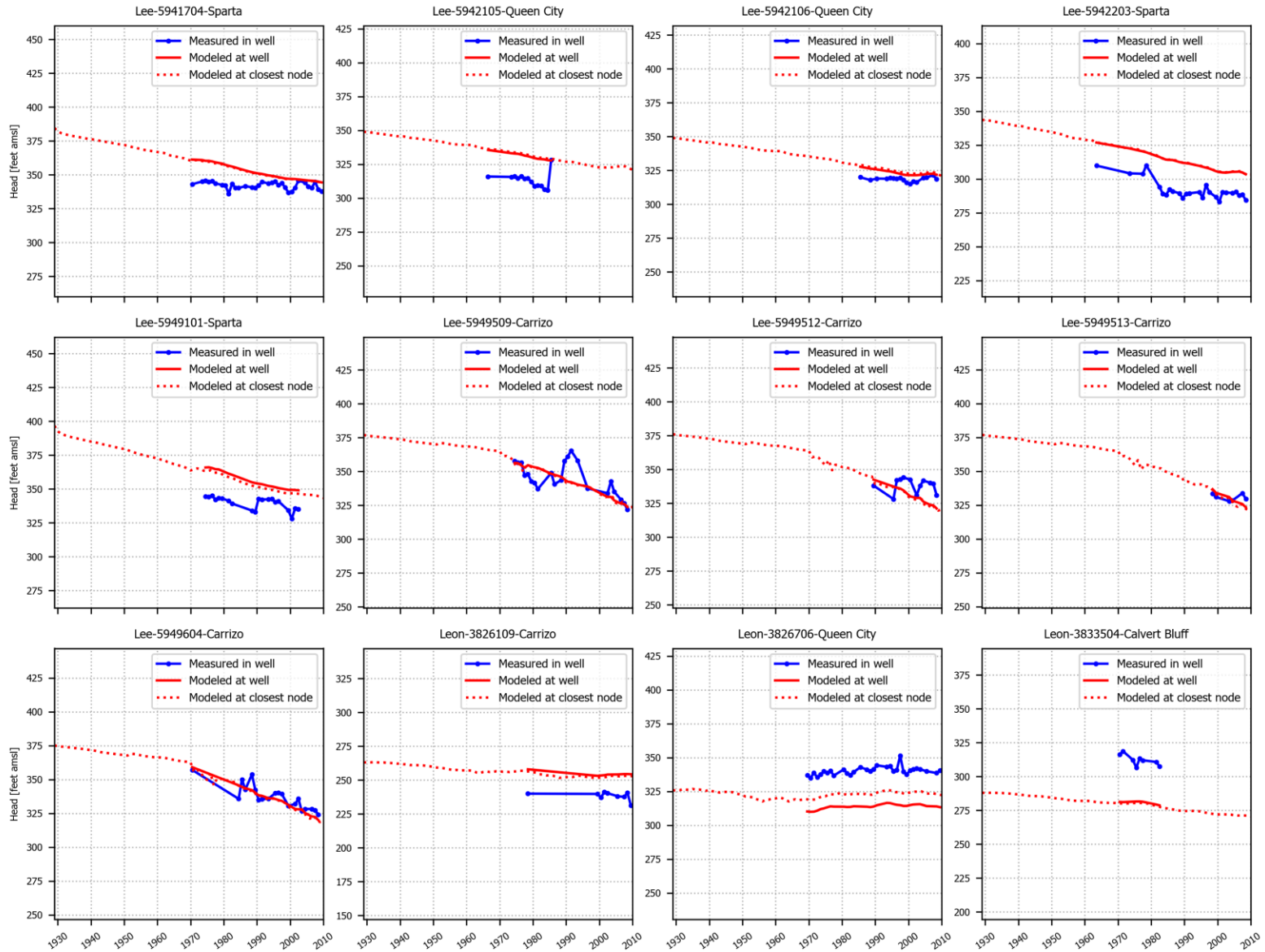
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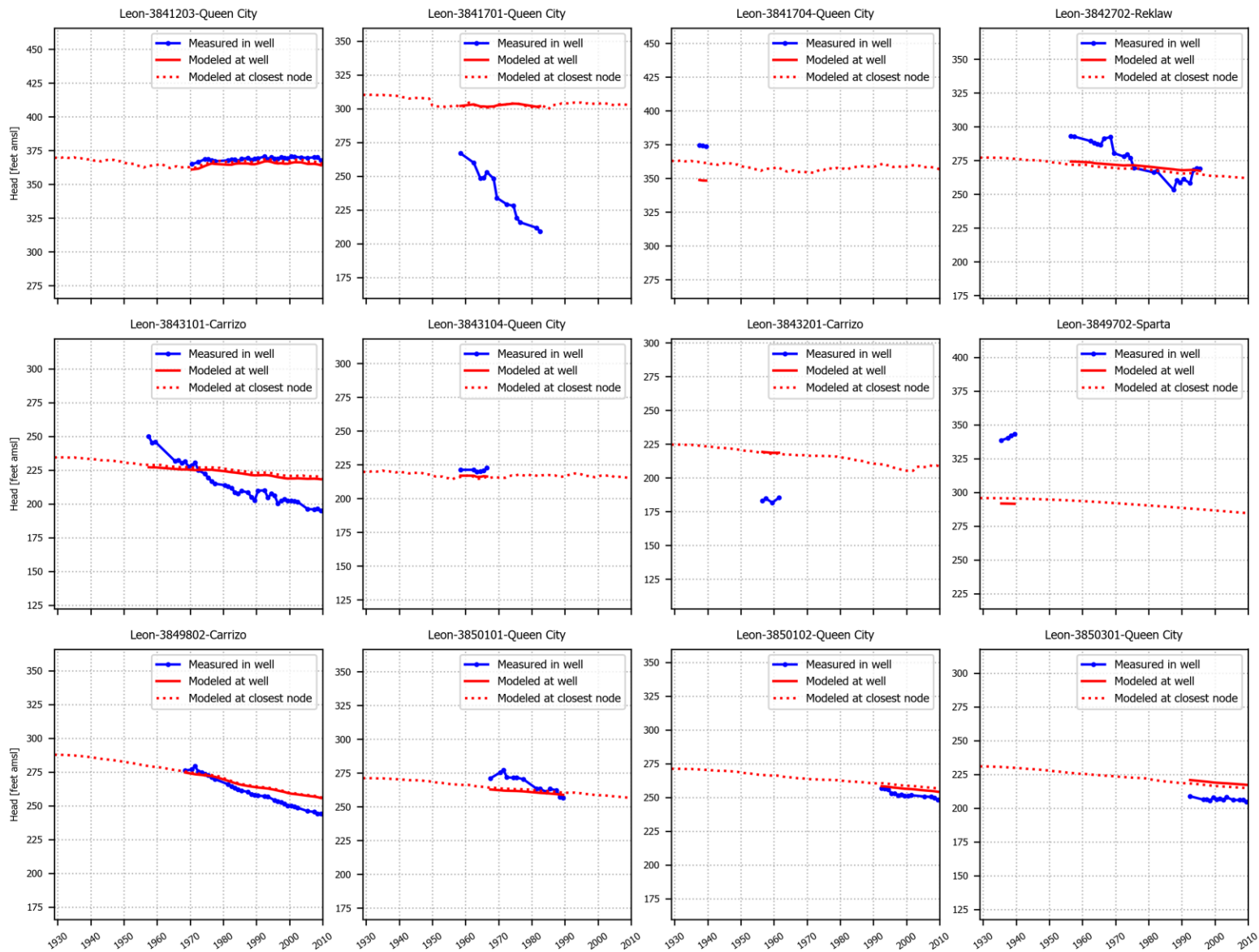
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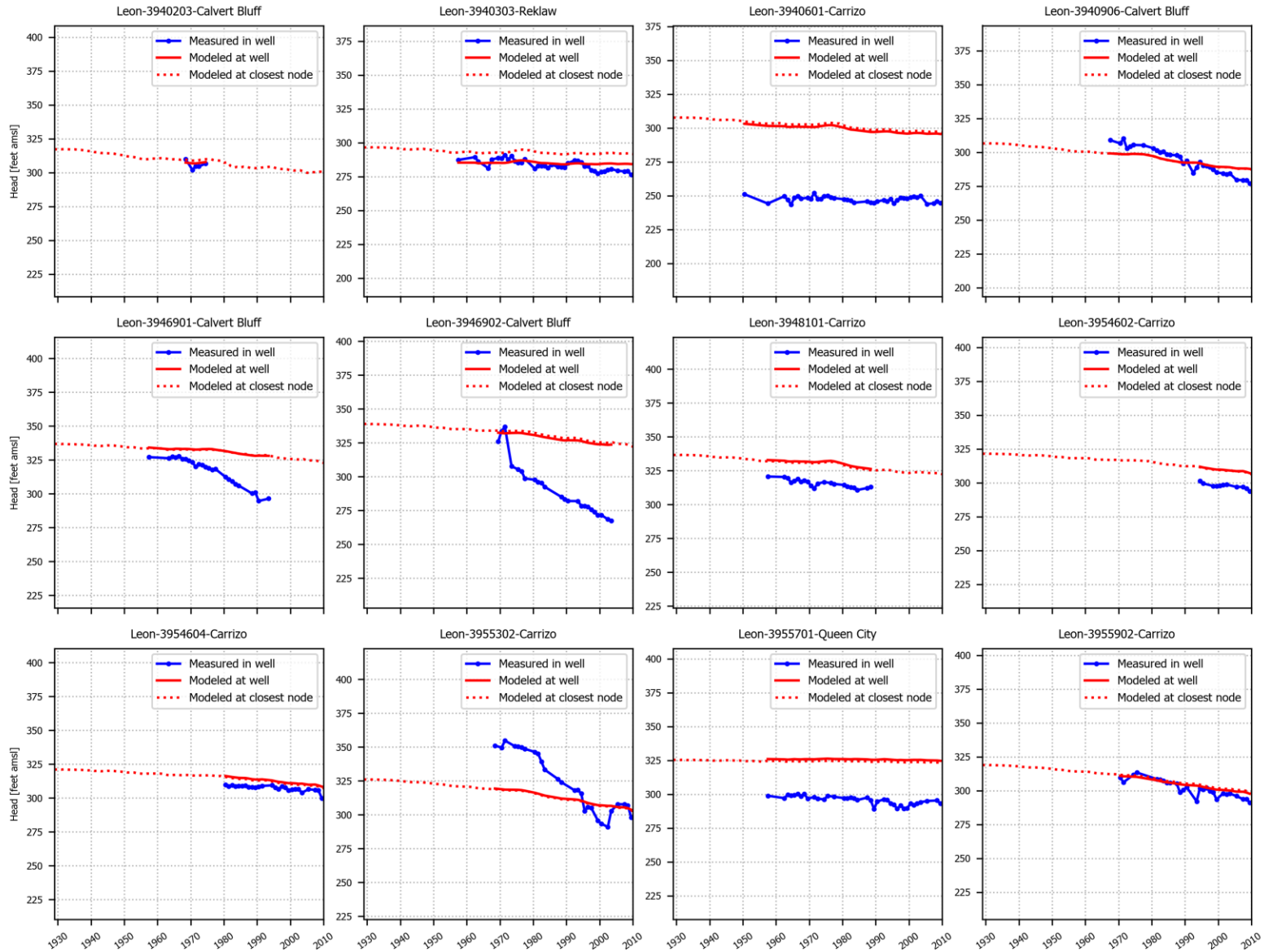
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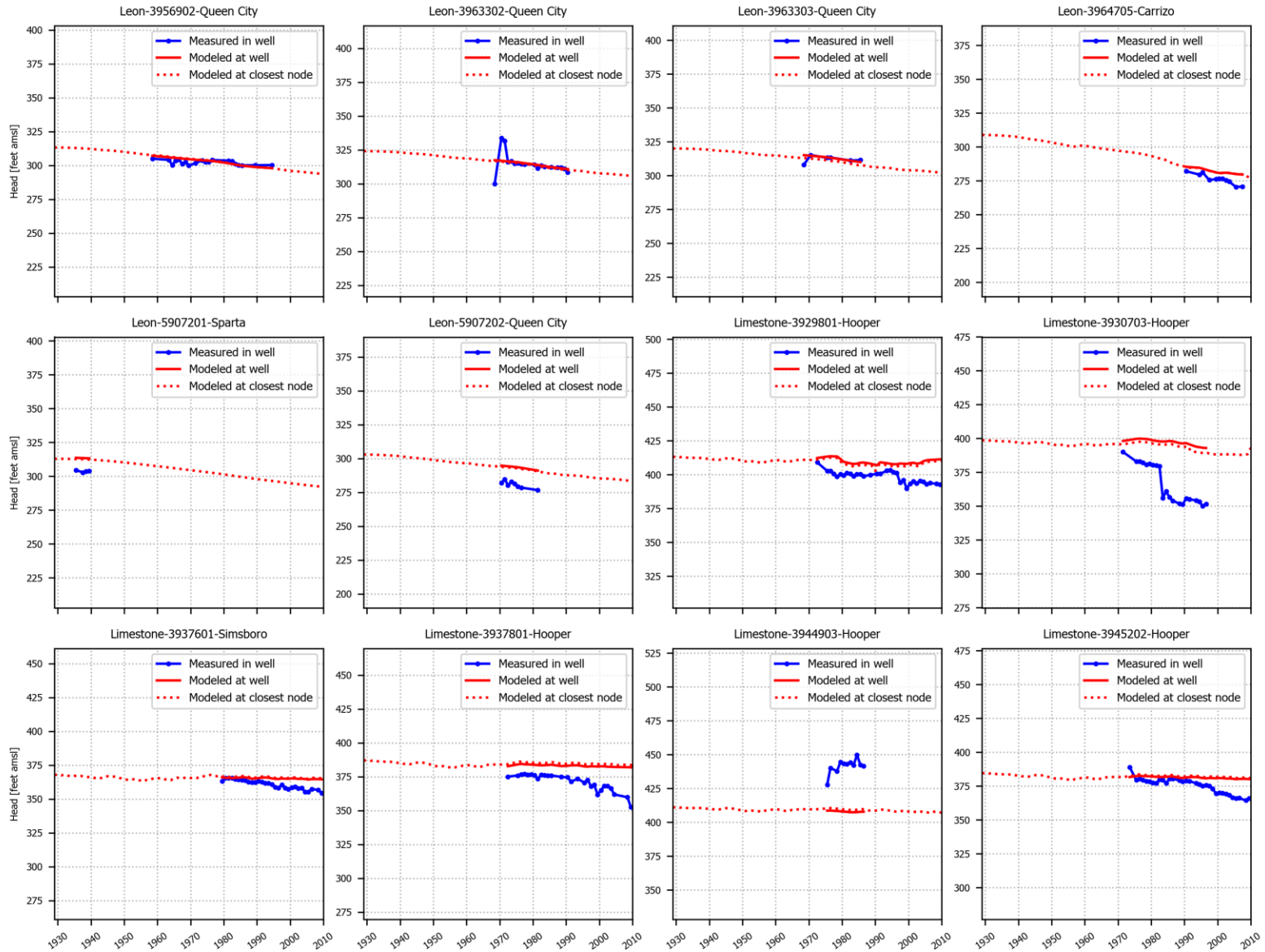
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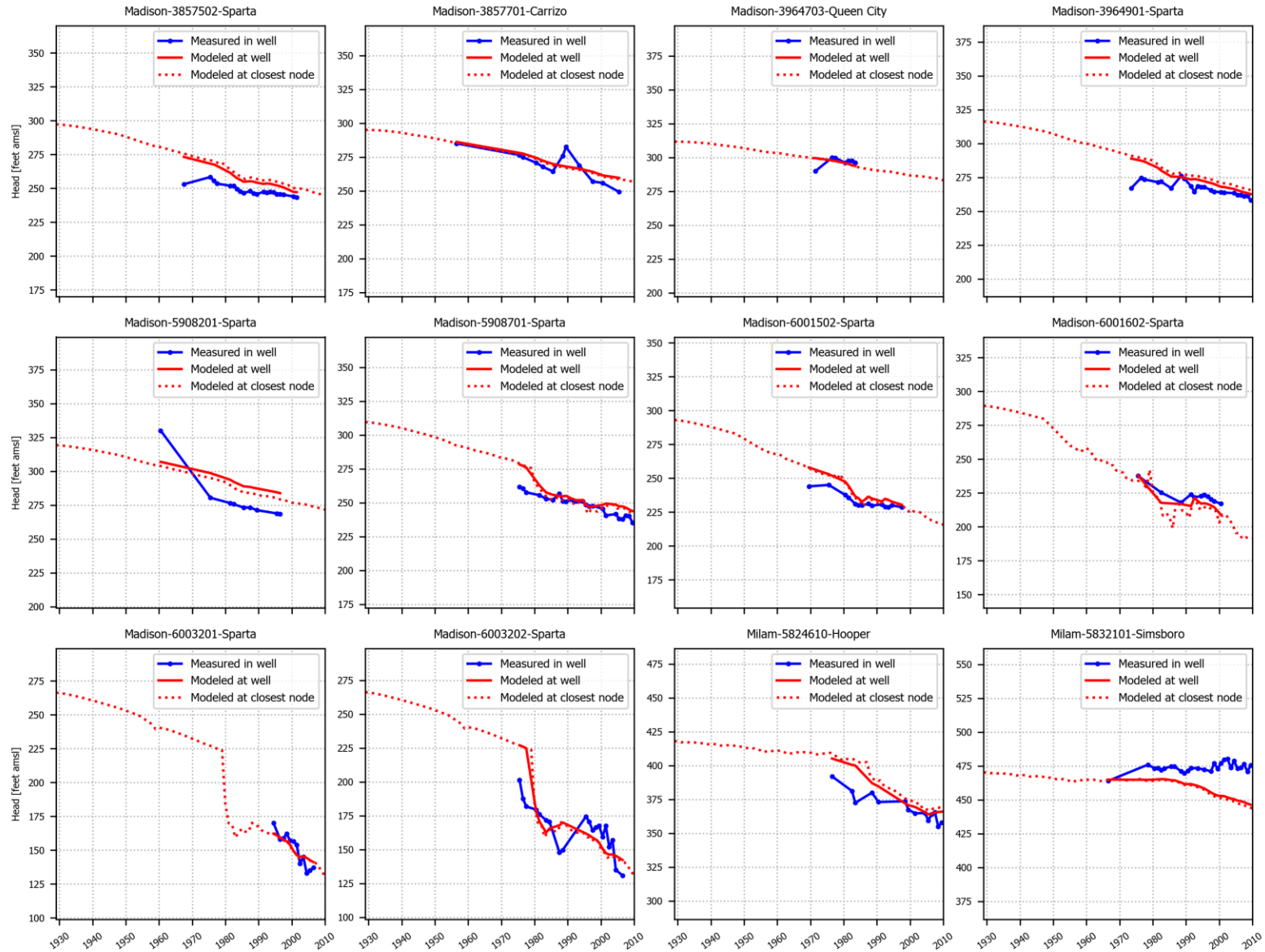
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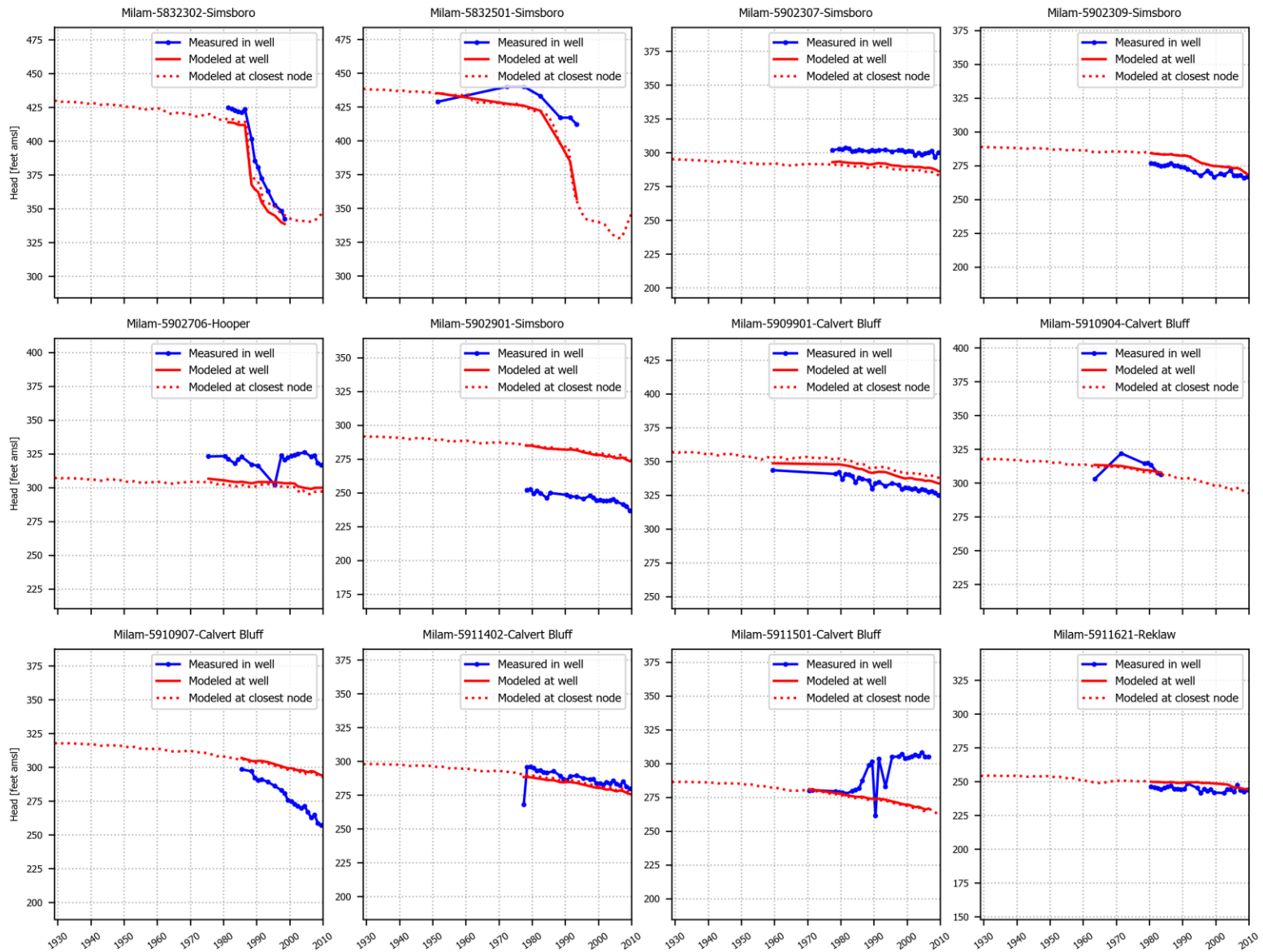
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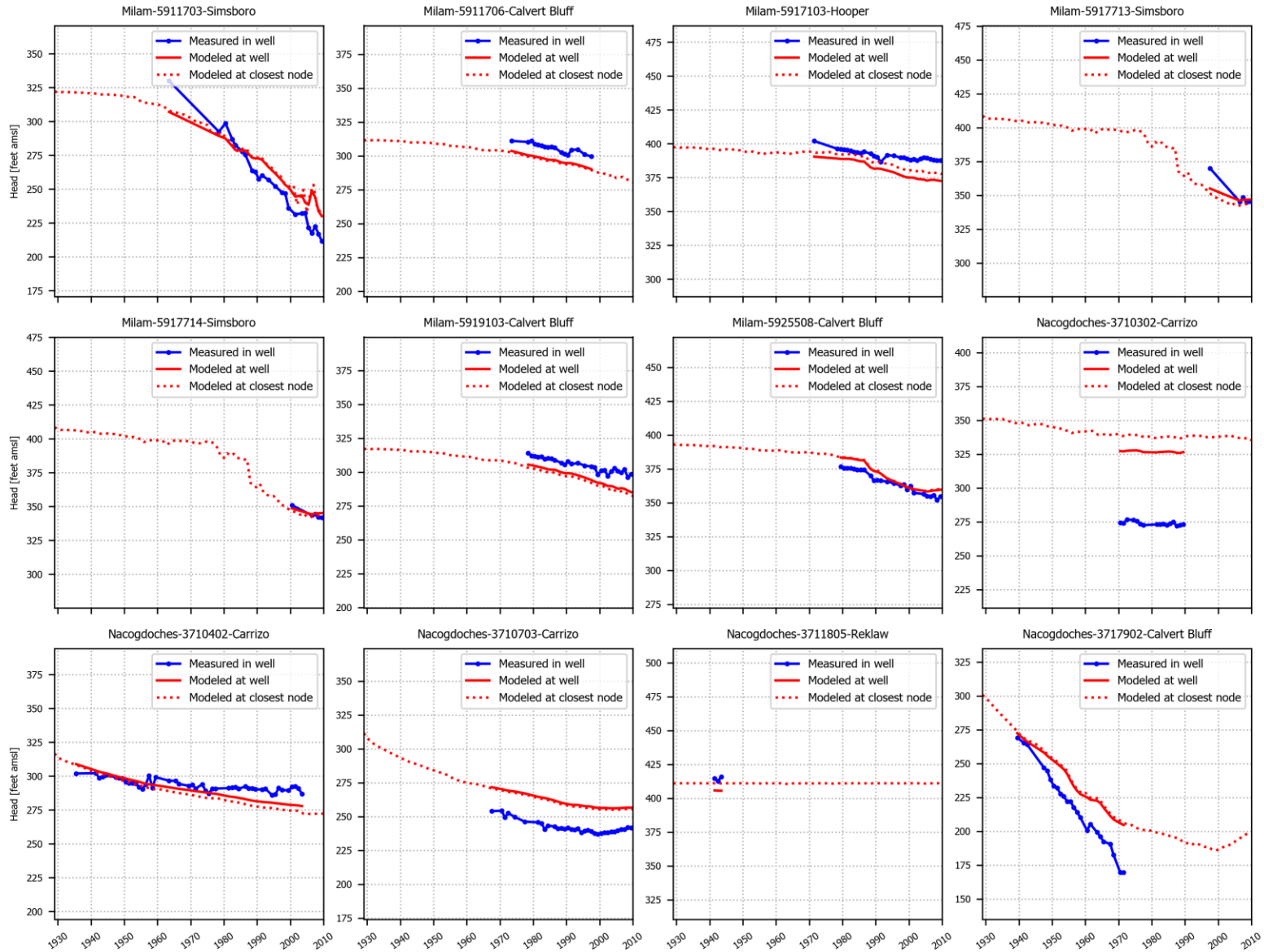
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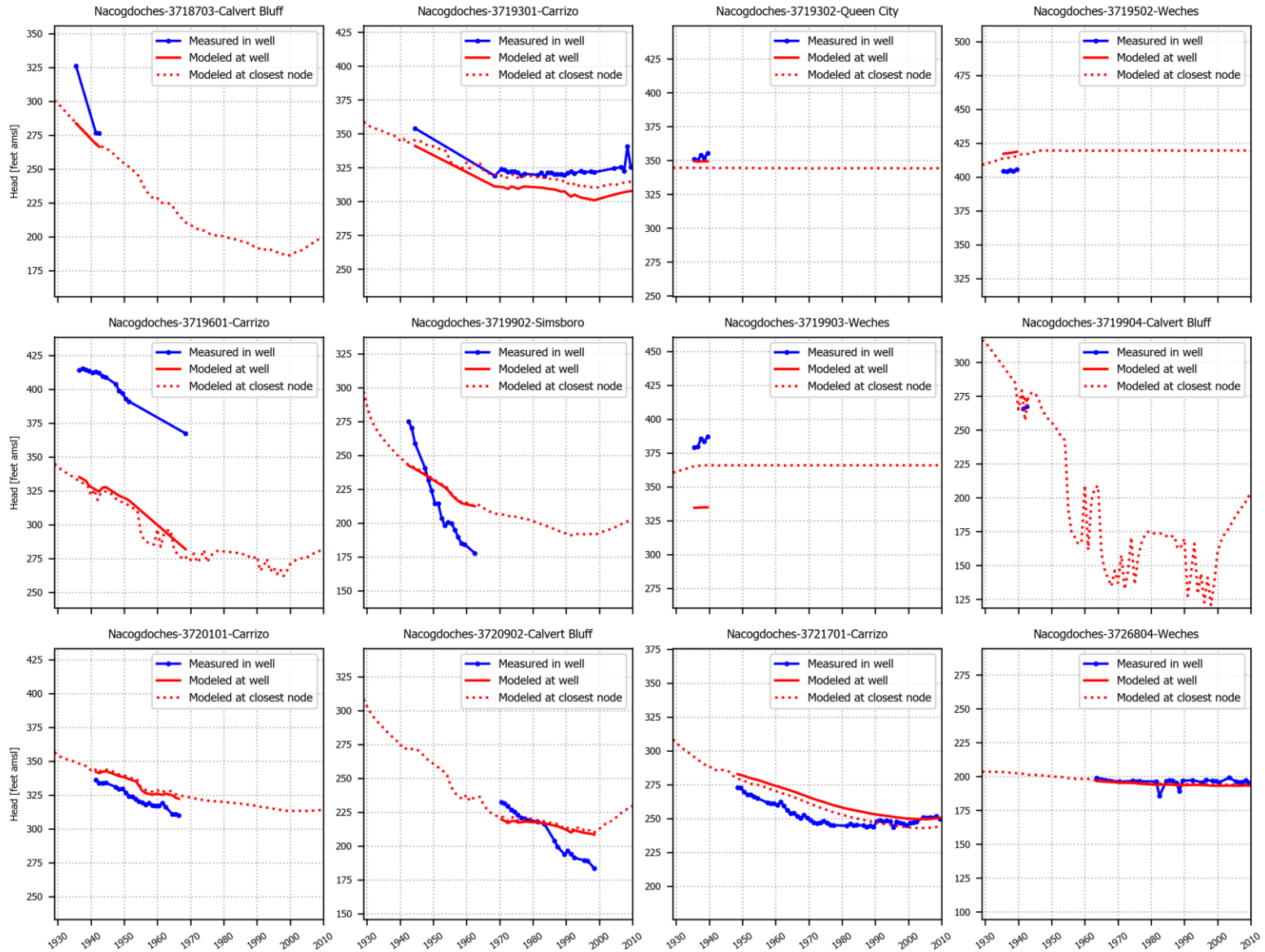
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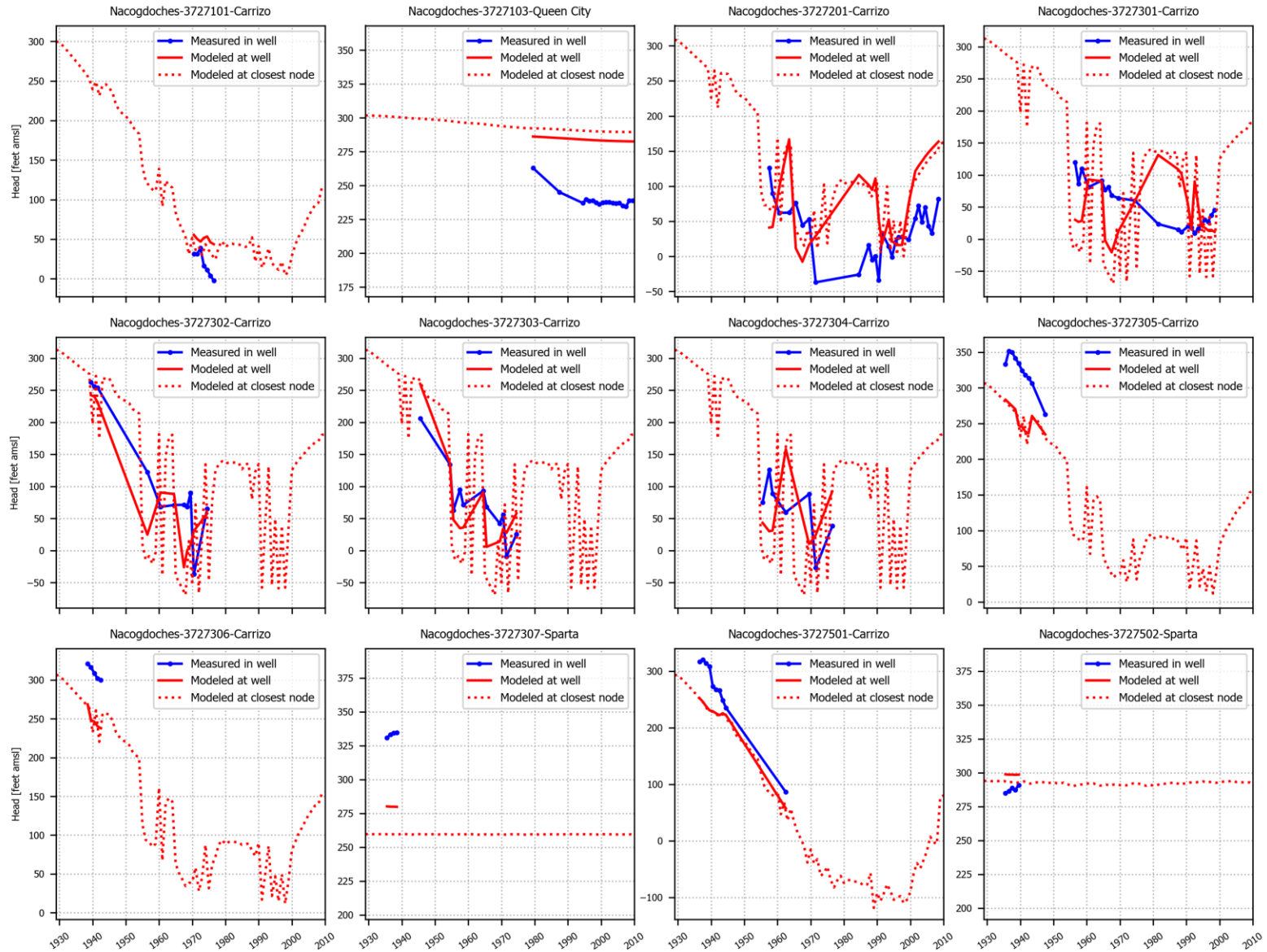
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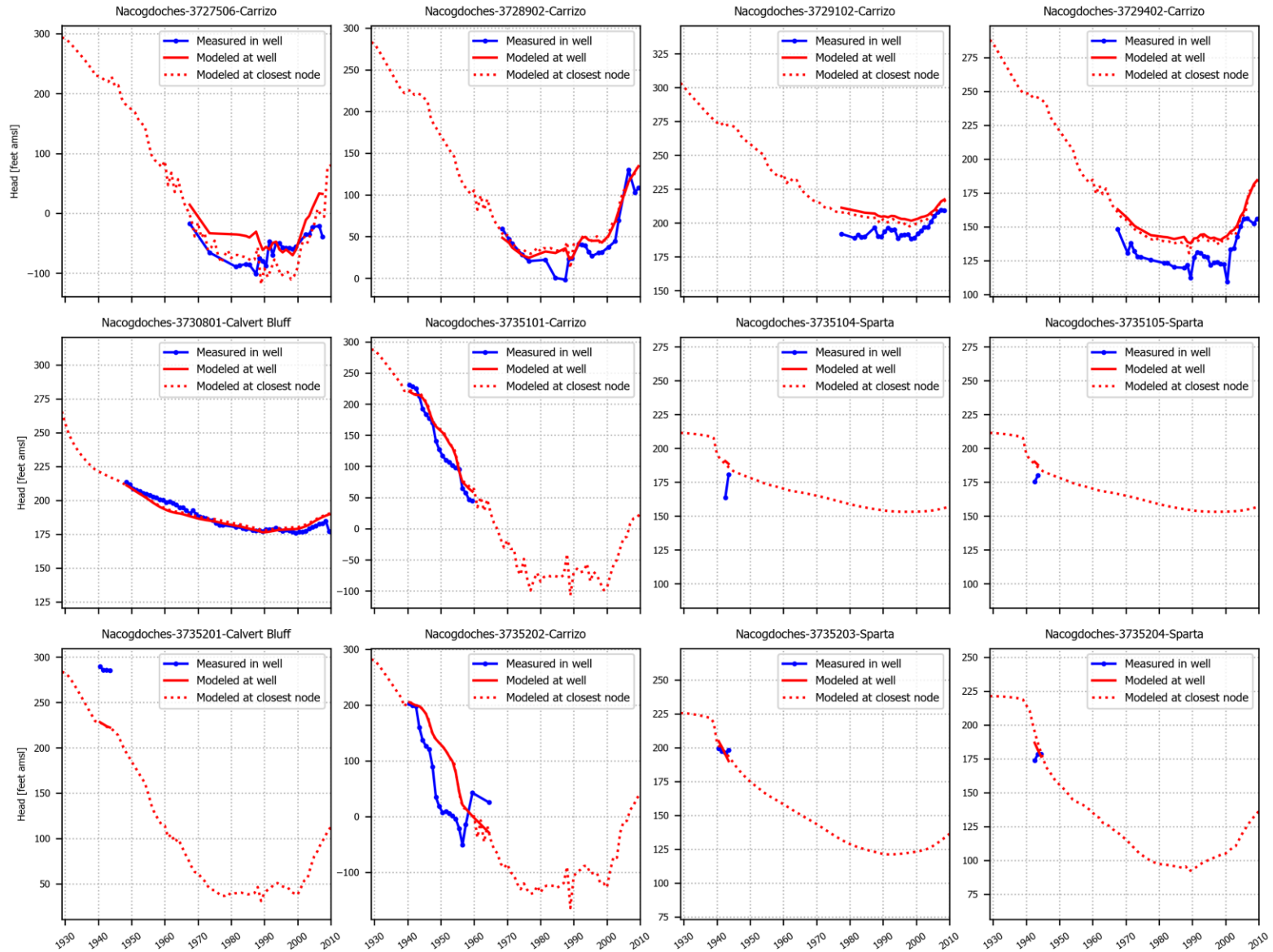
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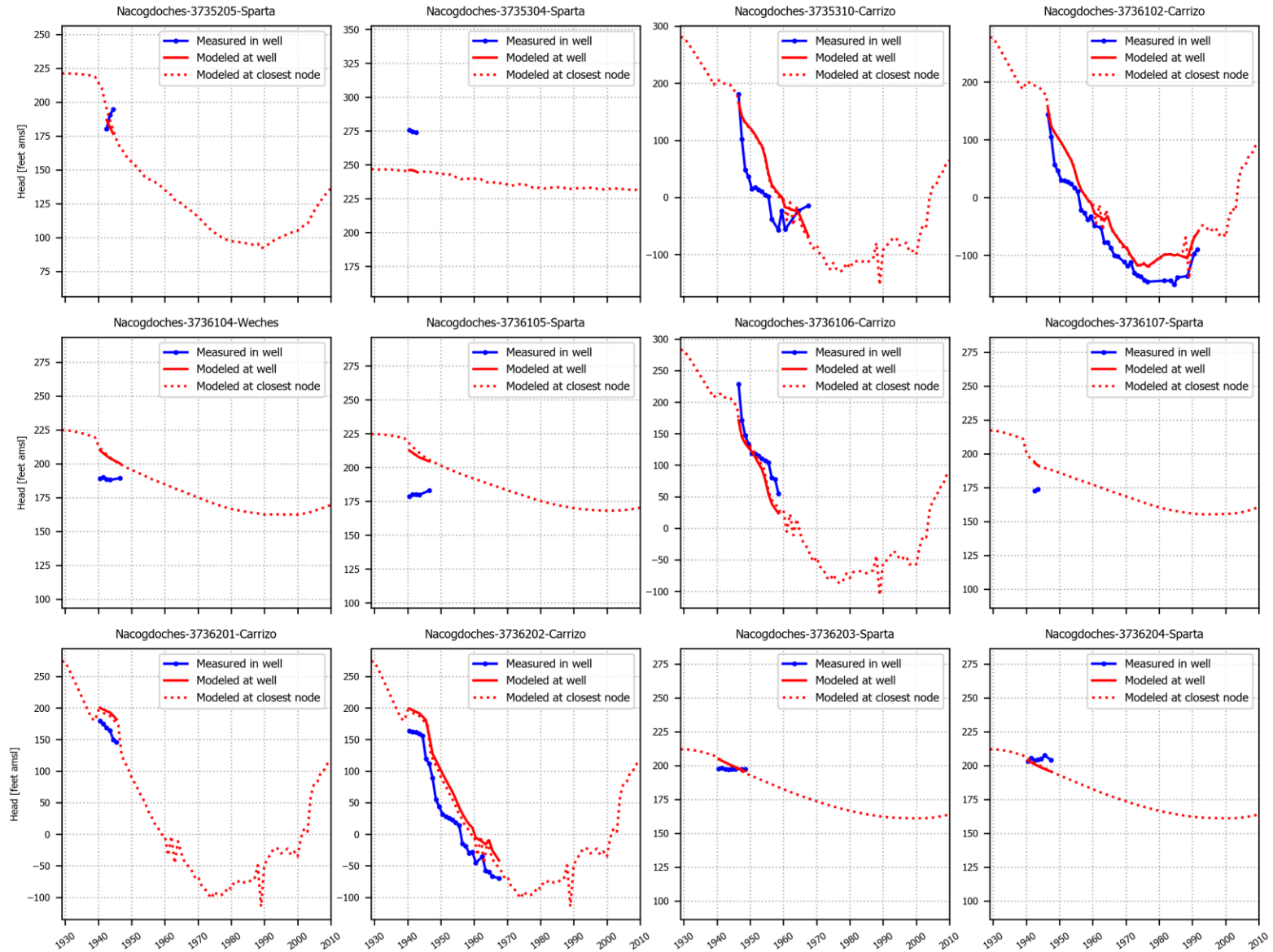
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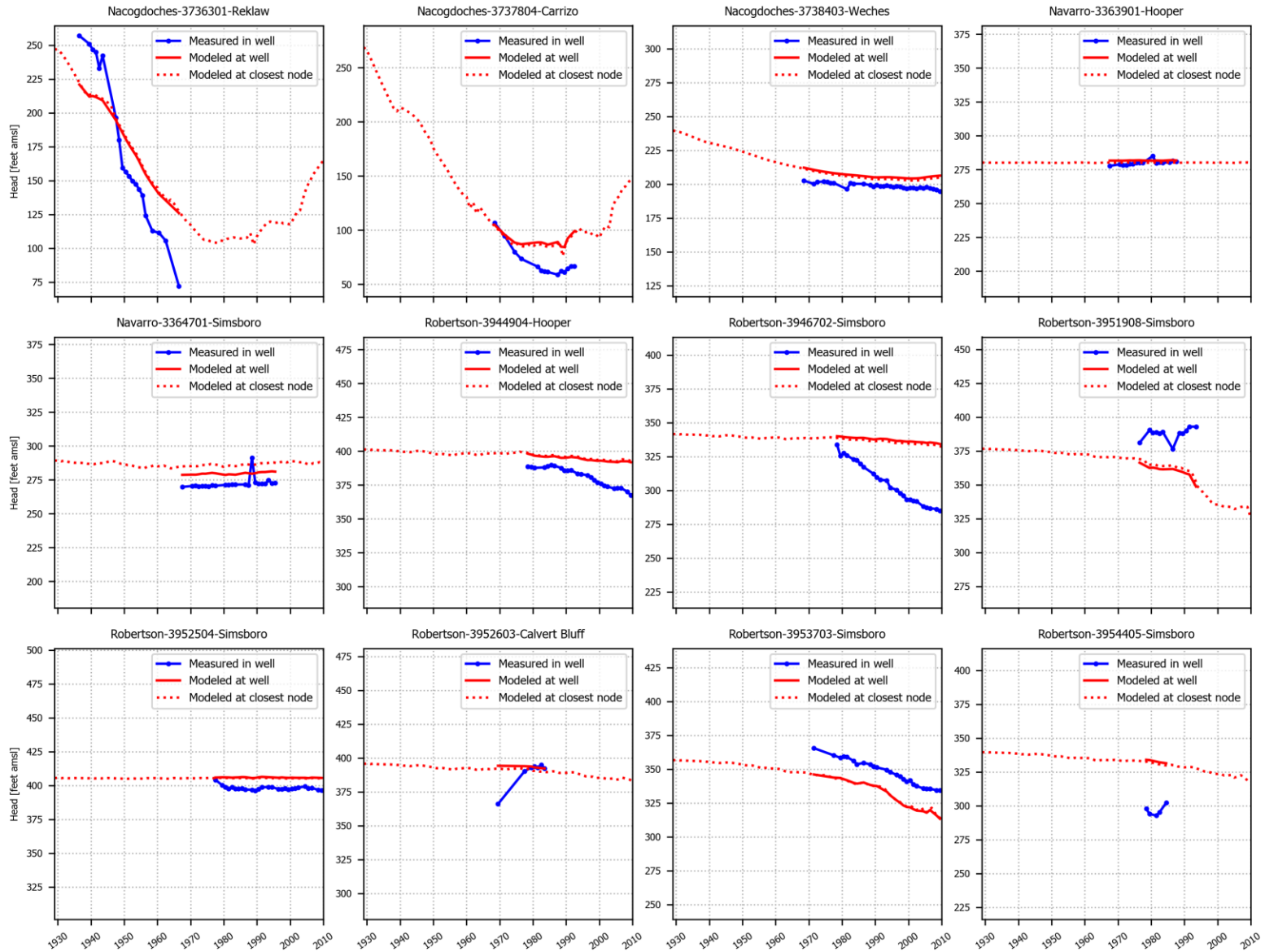
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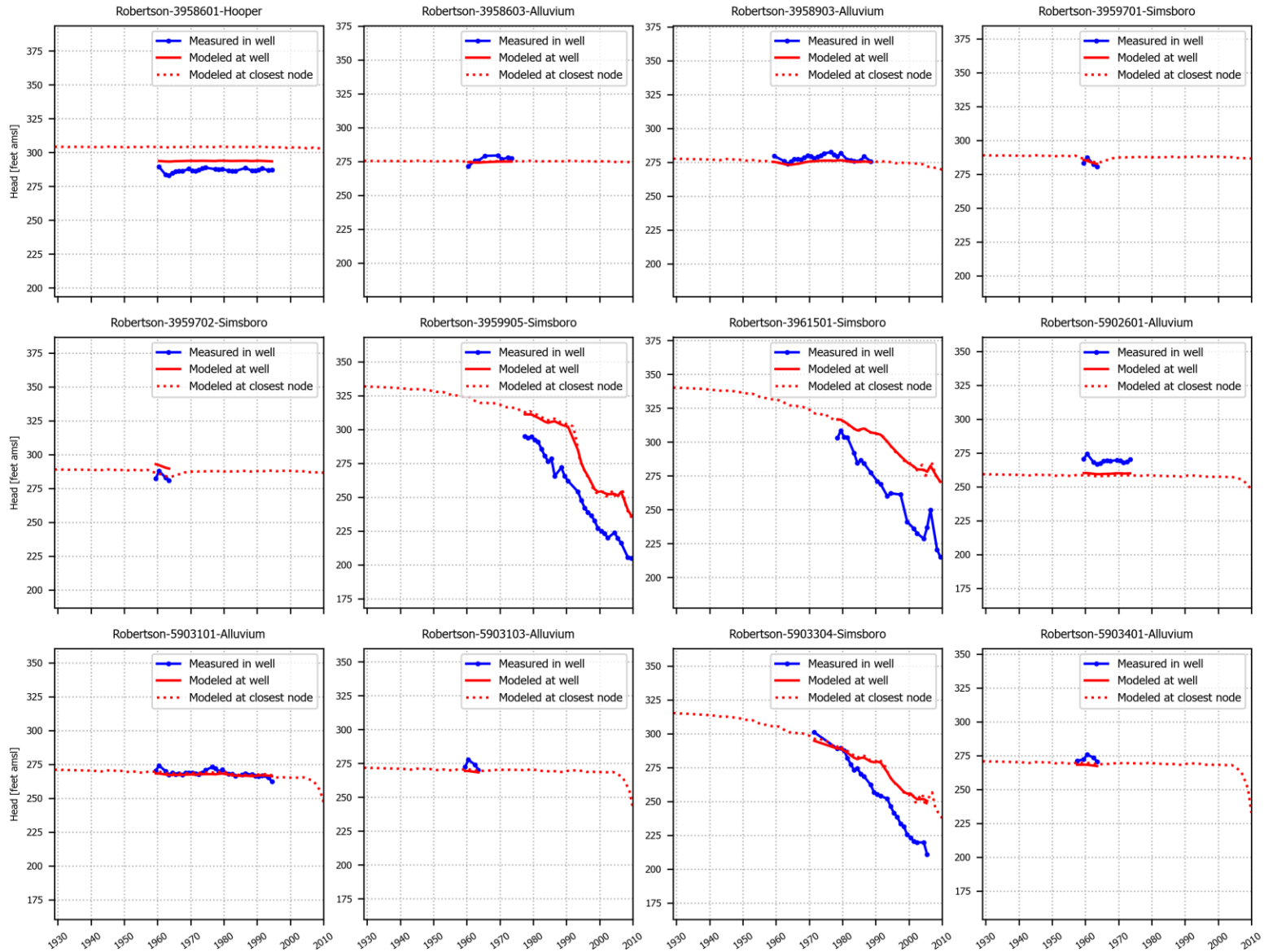
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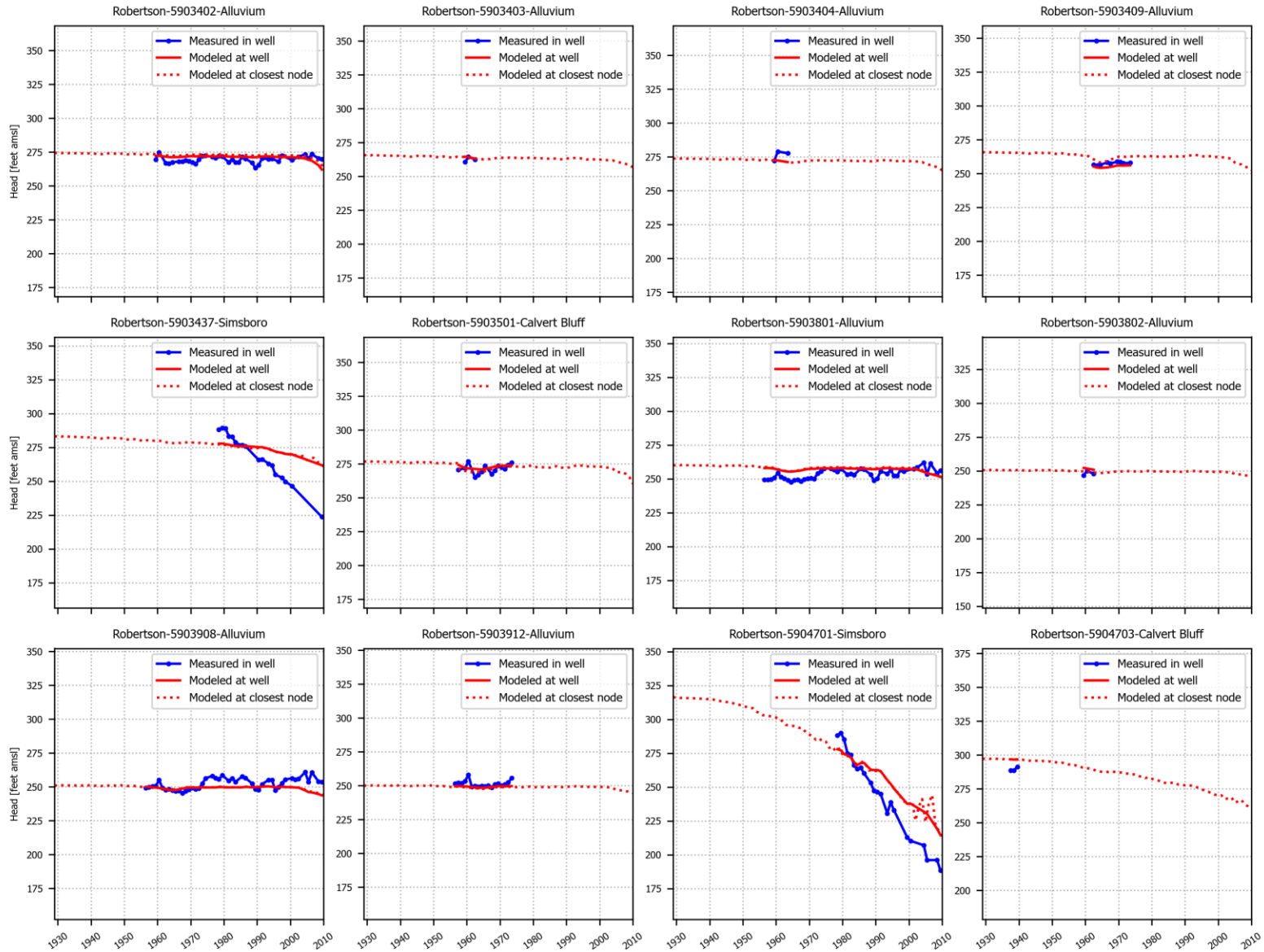
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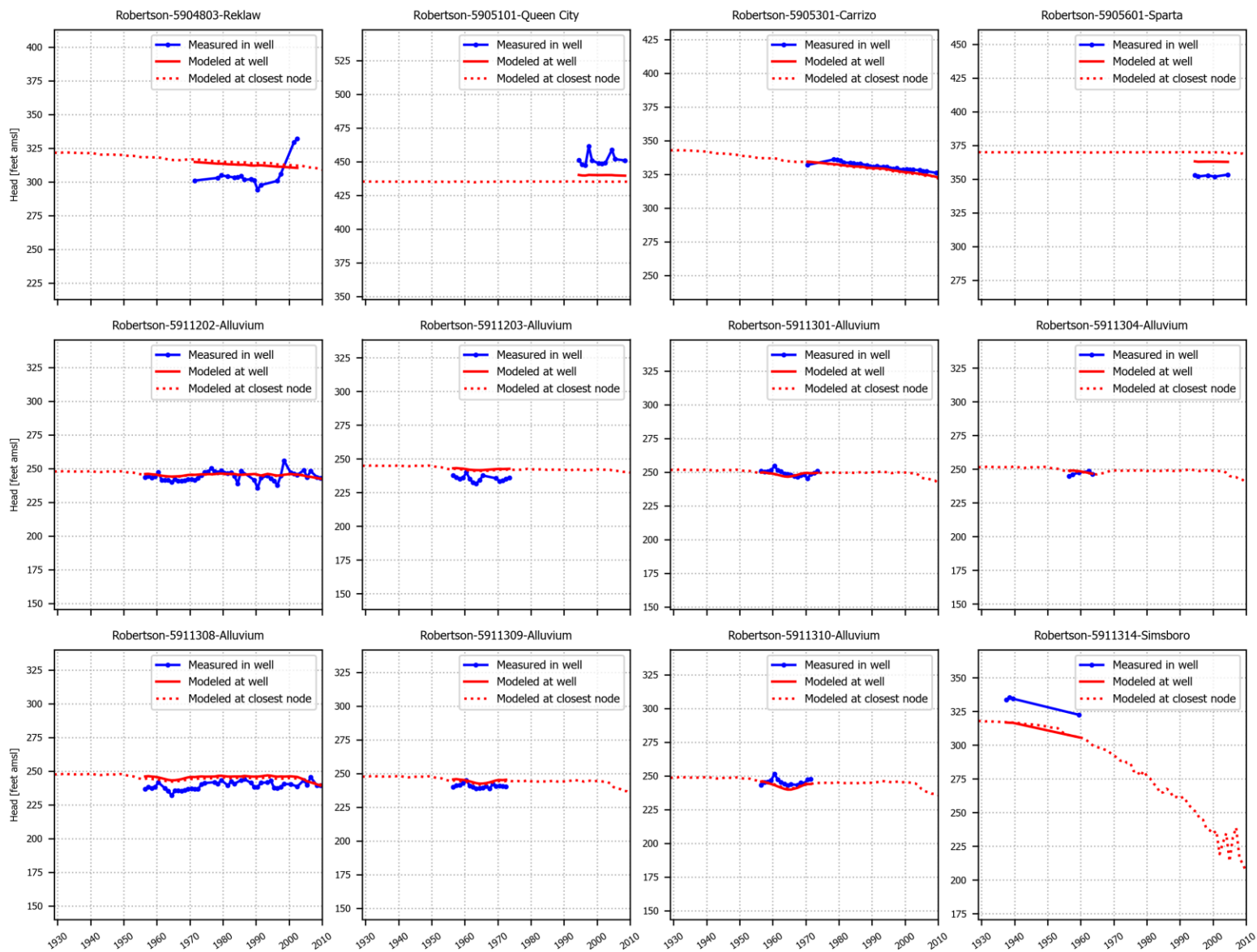
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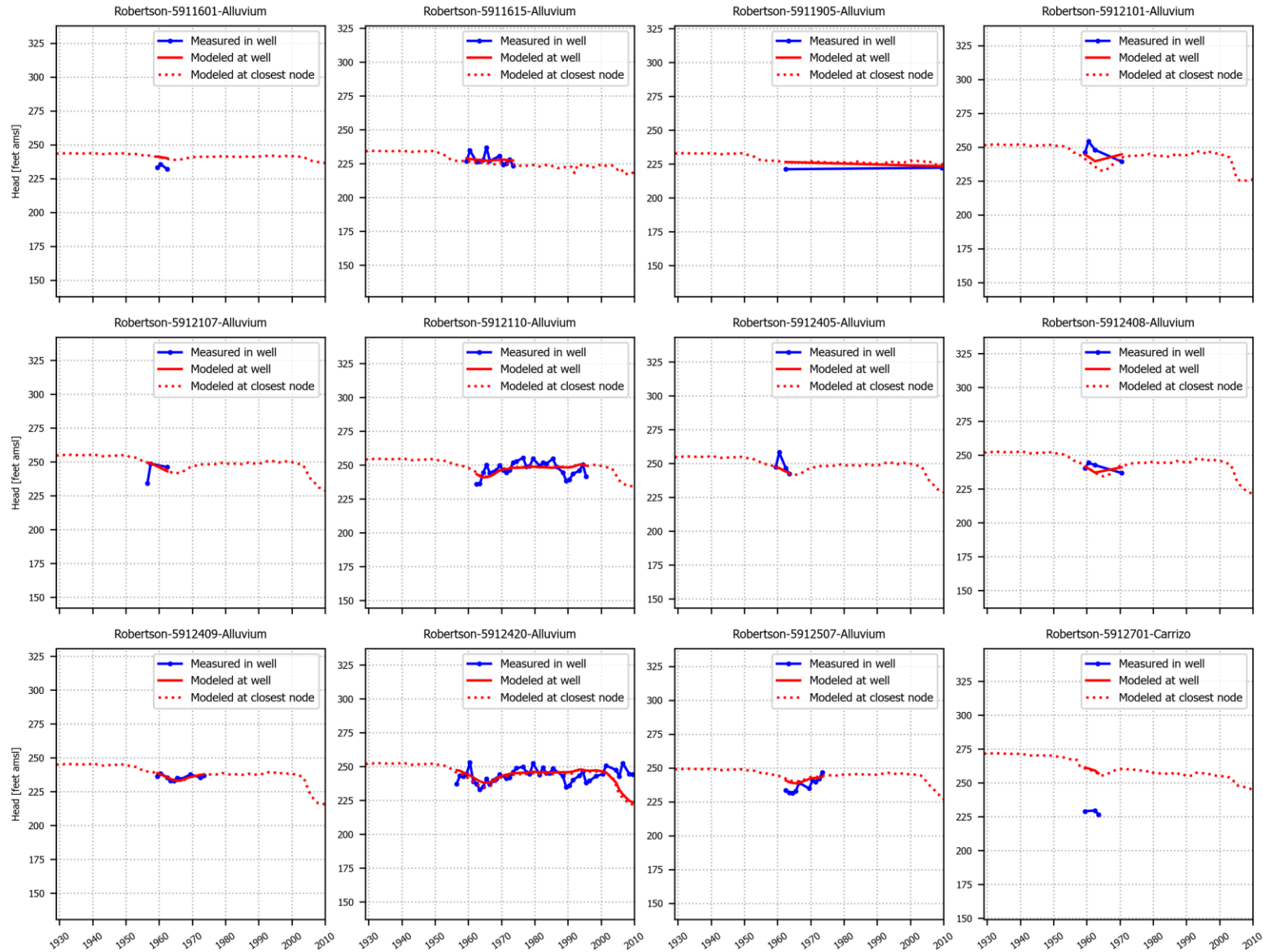
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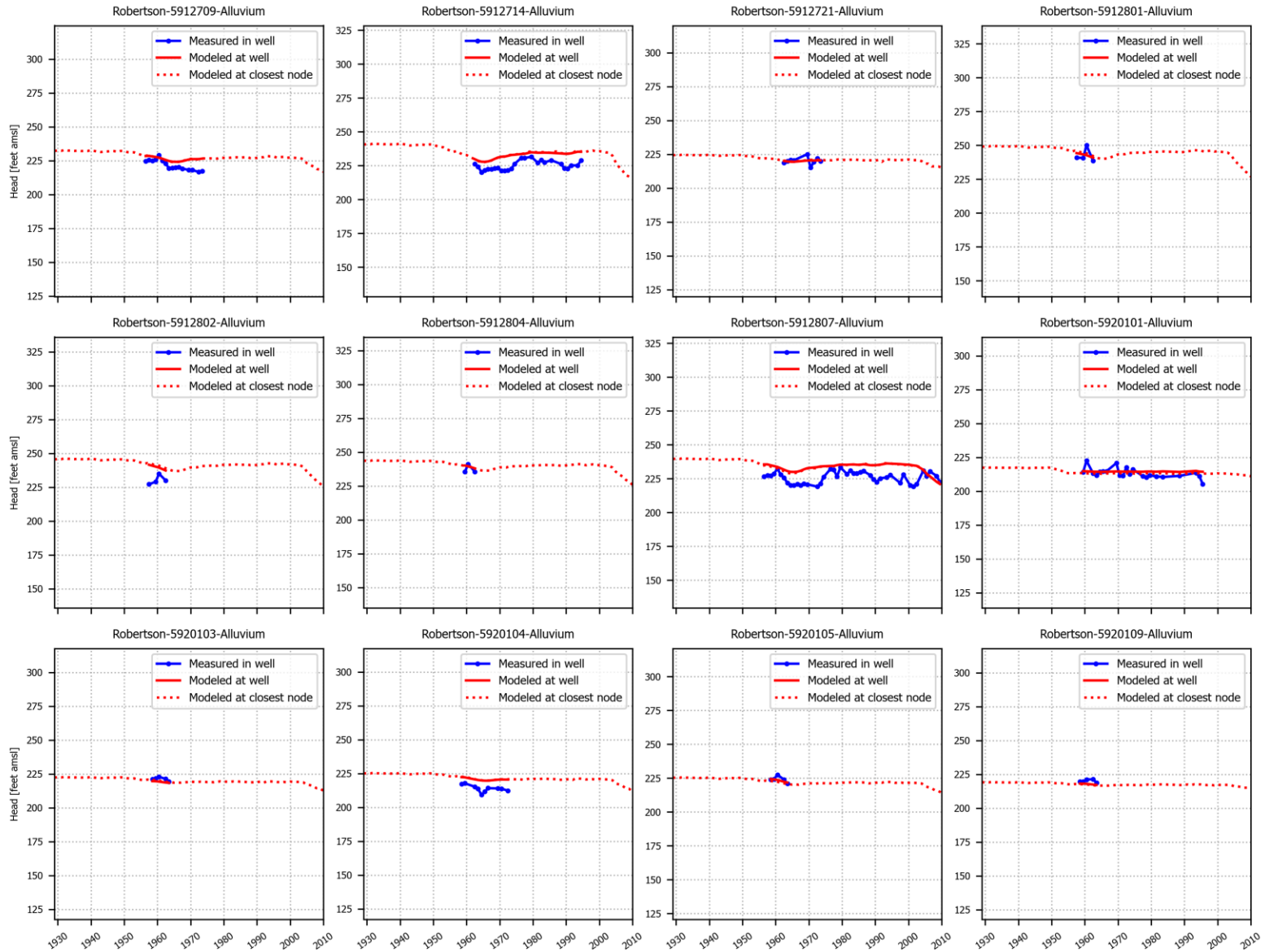
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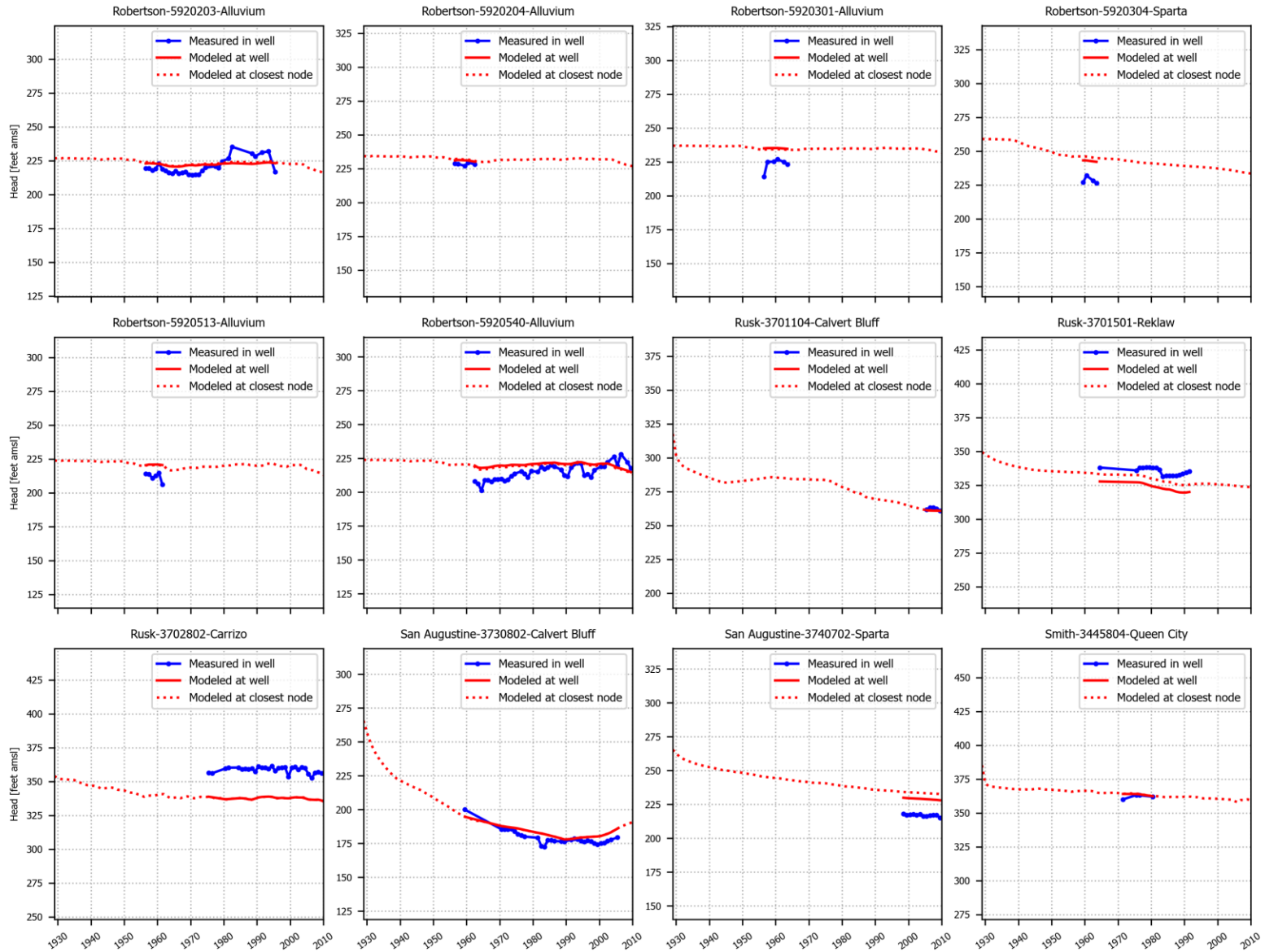
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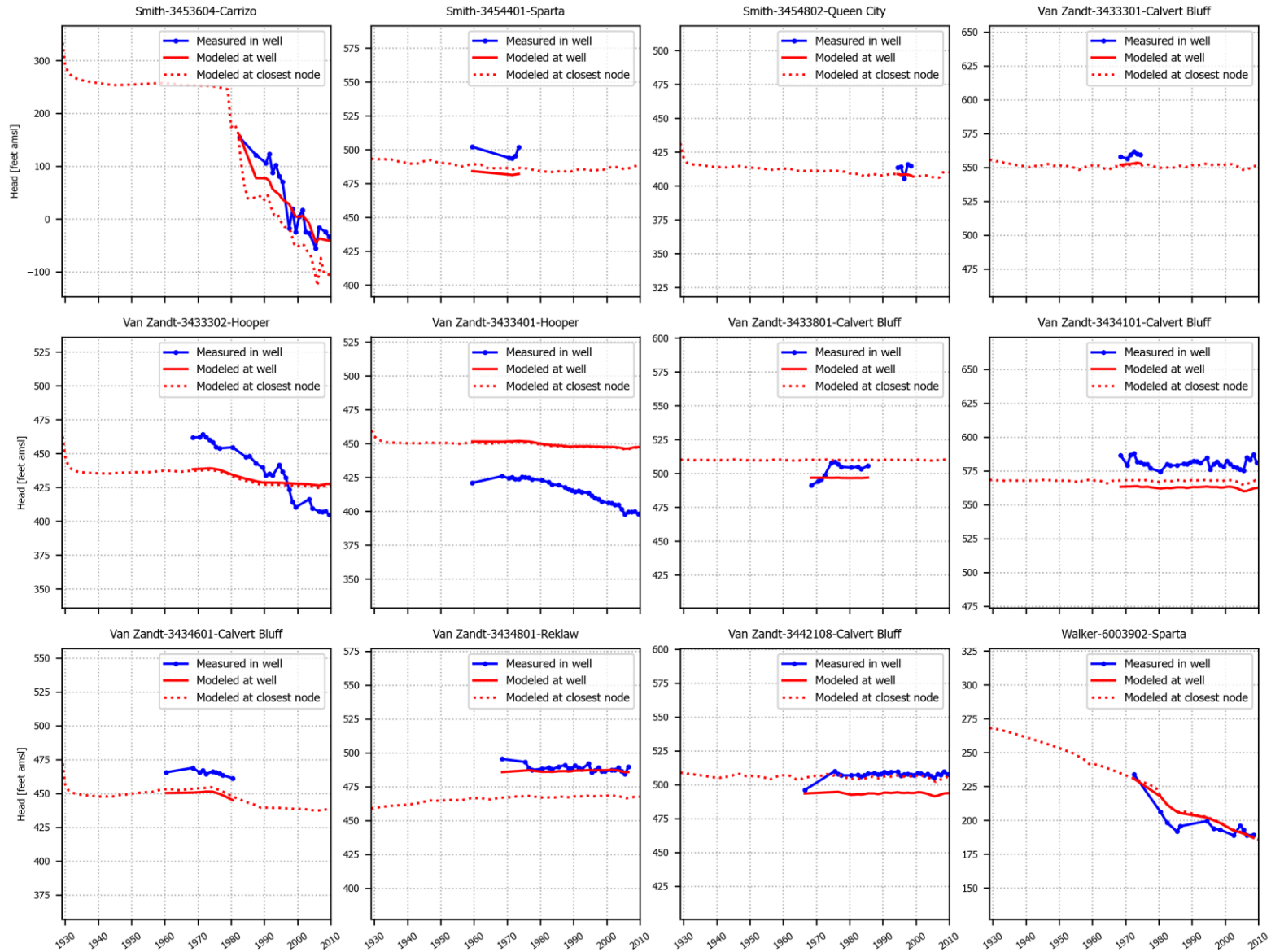
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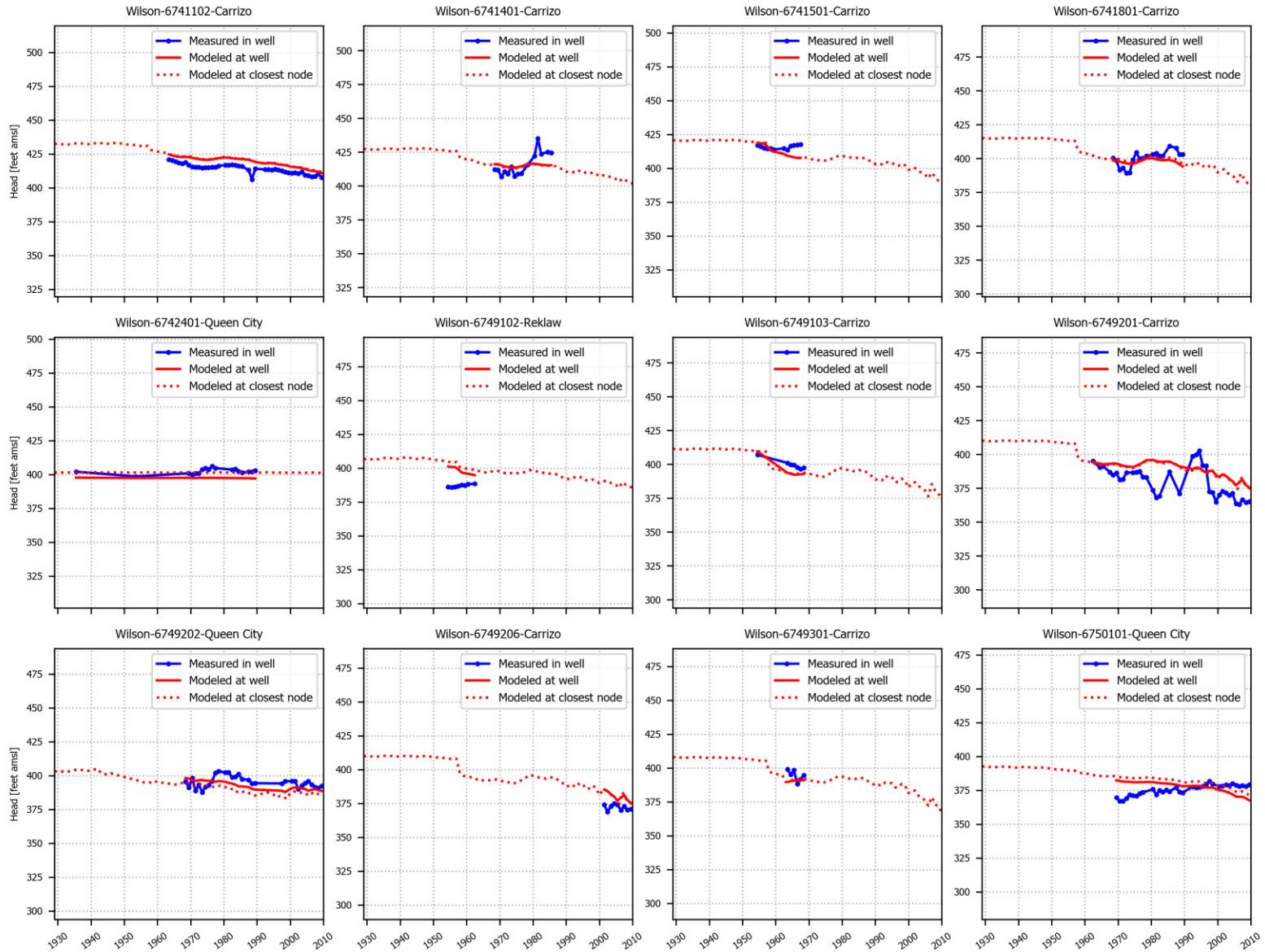
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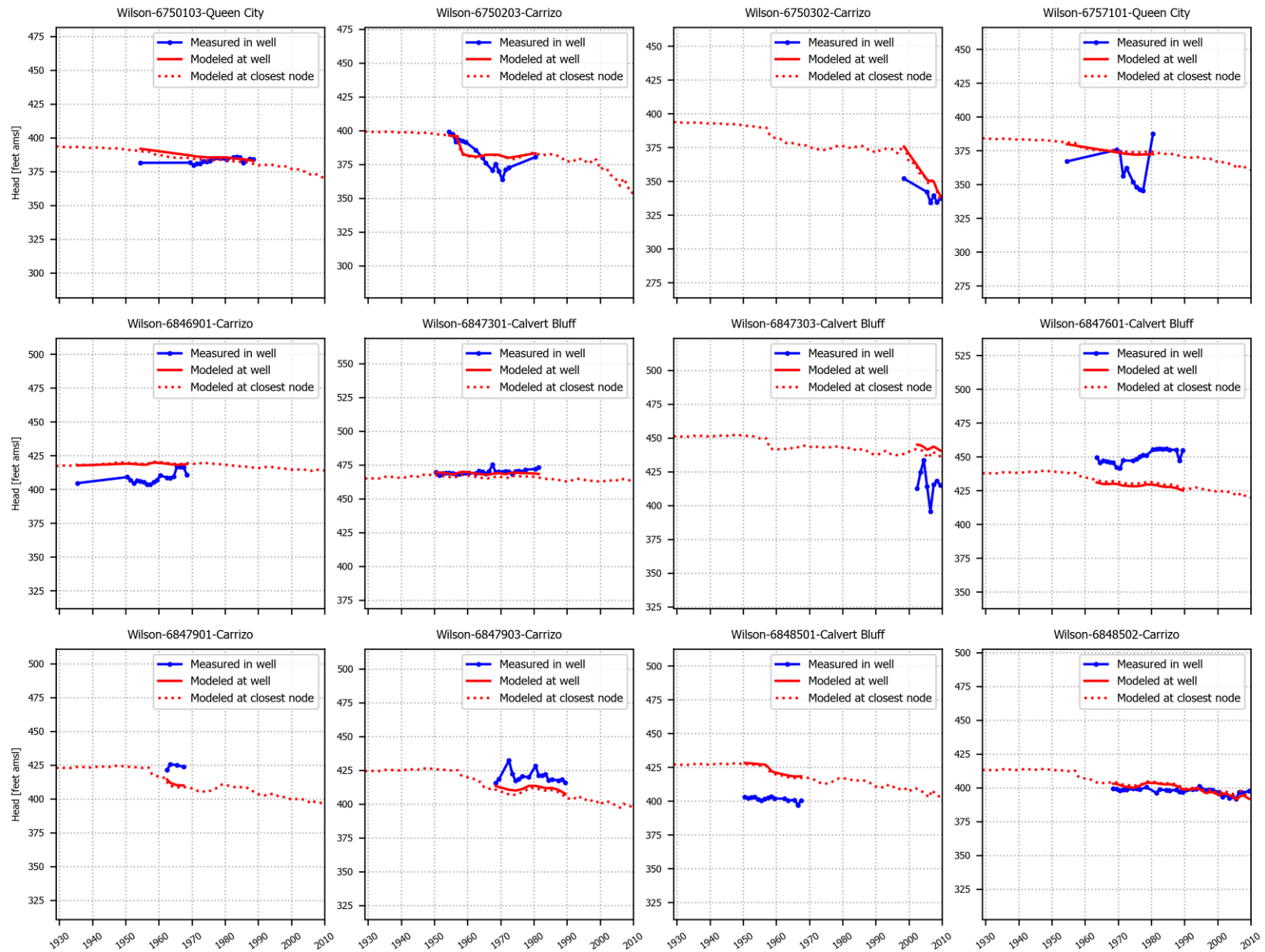
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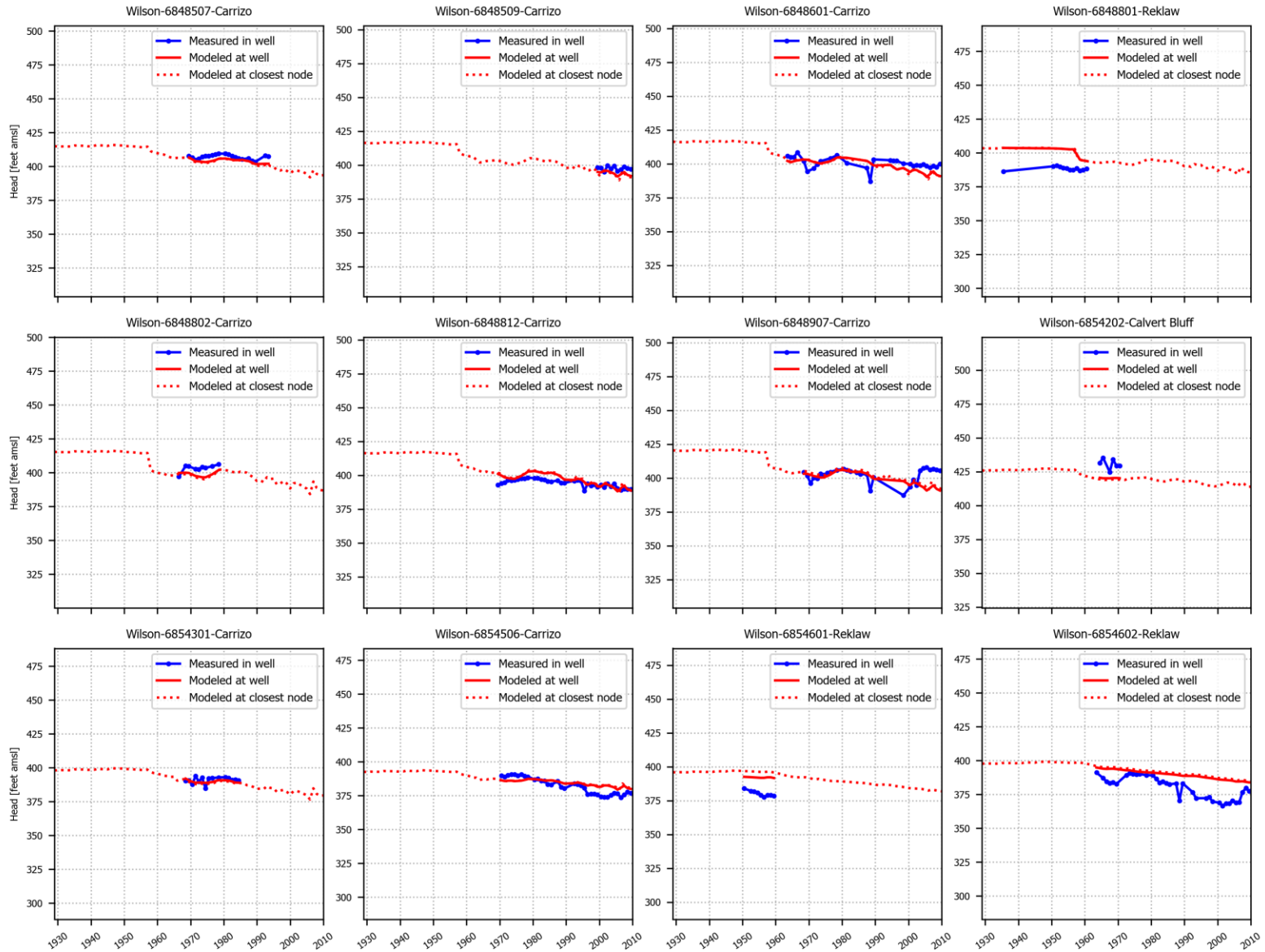
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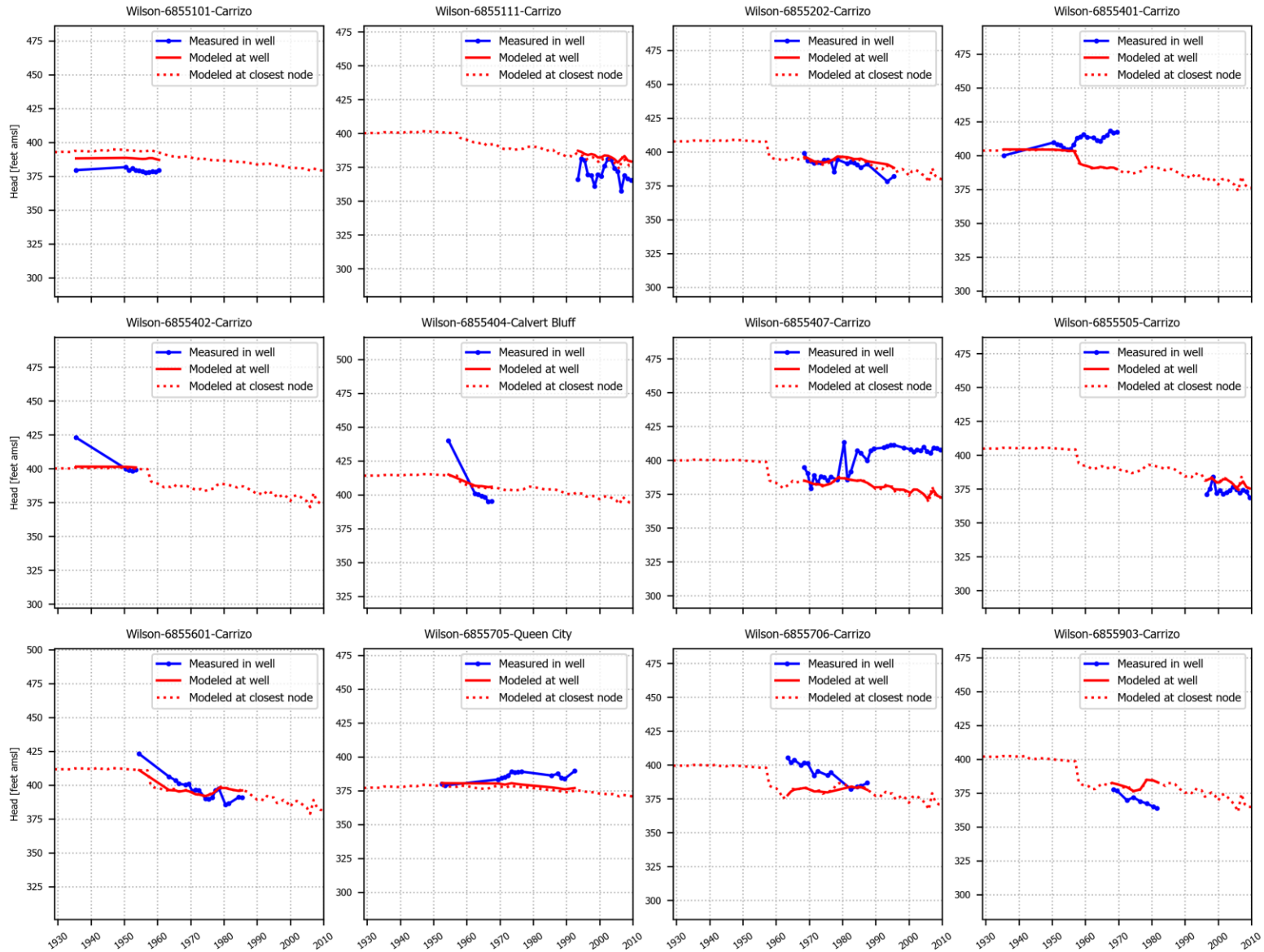
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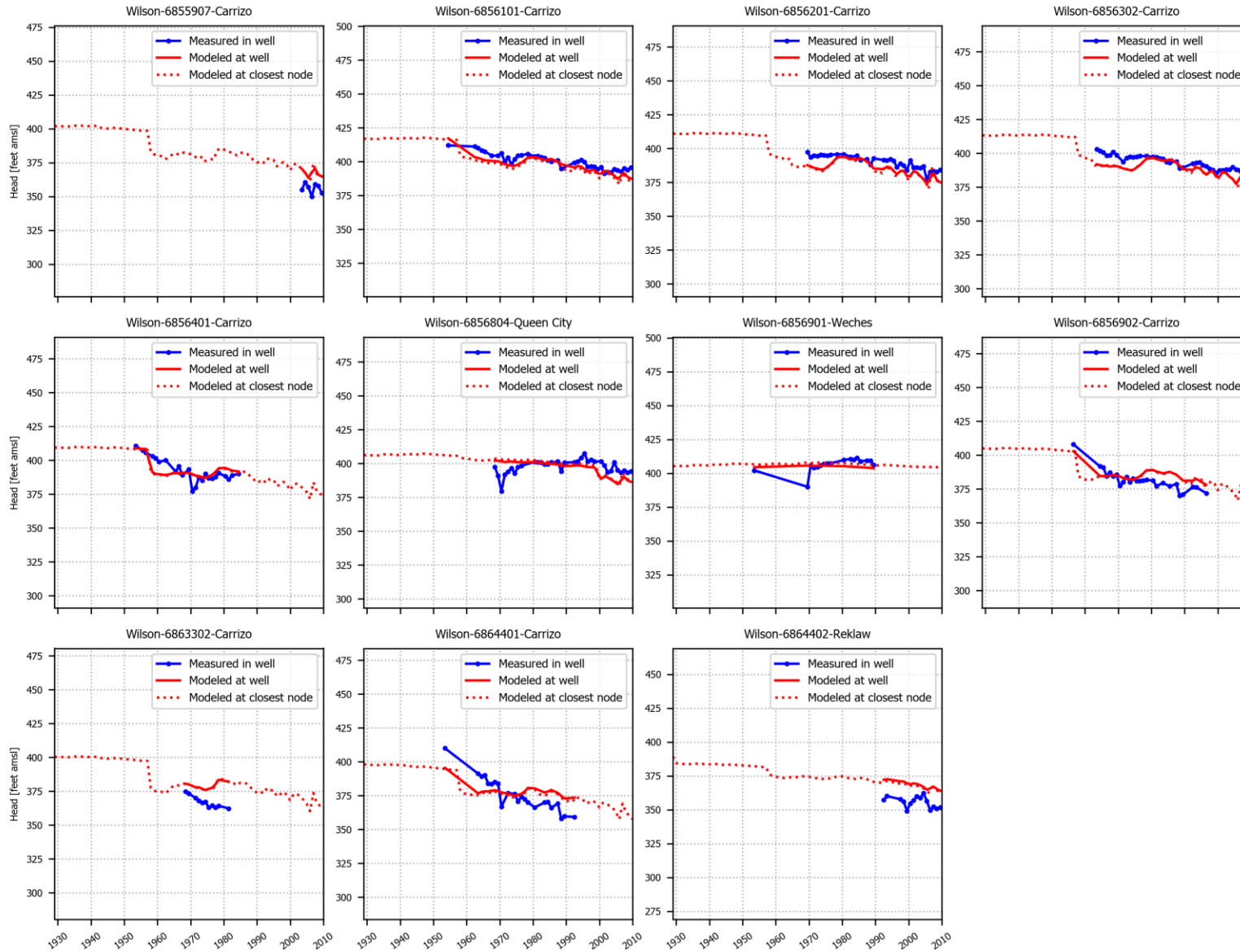
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25 Appendix N: Steady-State Water Budgets by County and Layer

Tables summarizing the steady-state water budget by county and model layer are presented in this appendix. The total water budget for the county is also provided. The tables are ordered alphabetically by county.

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Final Report: Groundwater Availability Model for the Central Portion
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Table N.1. Anderson County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	136,013	-93,446	-47,083	1,002	4,566	-1,044	0
3	0	0	0	0	0	0	0
4	0	0	0	4	-4	0	0
5	0	0	0	932	-932	0	0
6	0	0	0	28	-28	0	0
7	0	0	0	1,328	-1,327	0	0
8	0	0	0	1,219	-1,219	0	0
9	0	0	0	365	-365	0	0
10	0	0	0	690	-690	0	0
Total	136,013	-93,446	-47,083	5,567	0	-1,044	0

Table N.2. Angelina County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	3,096	-2,952	-705	-281	842	0	0
3	0	0	0	-409	-695	0	1,103
4	0	0	0	-24	24	0	0
5	0	0	0	-206	206	0	0
6	0	0	0	-9	9	0	0
7	0	0	0	300	-300	0	0
8	0	0	0	204	-204	0	0
9	0	0	0	-124	124	0	0
10	0	0	0	7	-7	0	0
Total	3,096	-2,952	-705	-543	0	0	1,103

Table N.3. Austin County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	121	125	0	-246
4	0	0	0	1	-1	0	0
5	0	0	0	47	-47	0	0
6	0	0	0	1	-1	0	0
7	0	0	0	73	-73	0	0
8	0	0	0	2	-2	0	0
9	0	0	0	-5	5	0	0
10	0	0	0	5	-5	0	0
Total	0	0	0	246	0	0	-246

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Table N.4. Bastrop County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	12,564	-41,496	-240	0	29,278	-106	0
2	50,144	-15,789	-5,837	1,588	-29,916	-190	0
3	0	0	0	-131	-412	0	542
4	0	0	0	-5	5	0	0
5	0	0	0	-1,353	1,353	0	0
6	0	0	0	-33	33	0	0
7	0	0	0	-932	932	0	0
8	0	0	0	-44	44	0	0
9	0	0	0	198	-198	0	0
10	0	0	0	1,119	-1,119	0	0
Total	62,708	-57,285	-6,078	408	0	-297	542

Table N.5. Bexar County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	6,076	-2,554	0	-565	-2,957	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	39	-48	0	9
8	0	0	0	-1,150	1,501	0	-351
9	0	0	0	-503	548	0	-45
10	0	0	0	-827	956	0	-128
Total	6,076	-2,554	0	-3,006	0	0	-516

Table N.6. Brazos County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	333	-1,580	0	585	661	0	0
2	0	0	0	3	-3	0	0
3	0	0	0	226	3	0	-229
4	0	0	0	14	-14	0	0
5	0	0	0	214	-213	0	0
6	0	0	0	-1	1	0	0
7	0	0	0	361	-361	0	0
8	0	0	0	-21	21	0	0
9	0	0	0	85	-85	0	0
10	0	0	0	10	-10	0	0
Total	333	-1,580	0	1,476	0	0	-229

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Table N.7. Burleson County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	6	-7,234	0	1,546	3,798	0	0
2	15,329	-12,023	-180	913	-4,005	-34	0
3	0	0	0	388	150	0	-538
4	0	0	0	10	-10	0	0
5	0	0	0	-303	303	0	0
6	0	0	0	3	-3	0	0
7	0	0	0	98	-98	0	0
8	0	0	0	81	-81	0	0
9	0	0	0	-30	30	0	0
10	0	0	0	84	-84	0	0
Total	17,220	-19,257	-180	2,789	0	-34	-538

Table N.8. Caldwell County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	28,153	-17,956	-5,940	-352	-3,905	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	-419	419	0	0
6	0	0	0	-139	139	0	0
7	0	0	0	-2,909	2,909	0	0
8	0	0	0	-314	314	0	0
9	0	0	0	288	-288	0	0
10	0	0	0	-411	411	0	0
Total	28,153	-17,956	-5,940	-4,257	0	0	0

Table N.9. Cherokee County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	126,303	-51,580	-68,633	-2,747	-1,536	-1,809	0
3	0	0	0	-200	117	0	83
4	0	0	0	0	0	0	0
5	0	0	0	-888	888	0	0
6	0	0	0	26	47	0	-73
7	0	0	0	472	-336	0	-137
8	0	0	0	120	83	0	-203
9	0	0	0	18	350	0	-368
10	0	0	0	-54	386	0	-332
Total	126,303	-51,580	-68,633	-3,254	0	-1,809	-1,029

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Table N.10. Colorado County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	40	222	0	-261
4	0	0	0	1	-1	0	0
5	0	0	0	142	-142	0	0
6	0	0	0	0	0	0	0
7	0	0	0	76	-76	0	0
8	0	0	0	2	-2	0	0
9	0	0	0	-8	8	0	0
10	0	0	0	8	-8	0	0
Total	0	0	0	261	0	0	-261

Table N.11. DeWitt County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-109	303	0	-194
4	0	0	0	-3	3	0	0
5	0	0	0	133	-133	0	0
6	0	0	0	-3	3	0	0
7	0	0	0	171	-171	0	0
8	0	0	0	3	-3	0	0
9	0	0	0	-7	7	0	0
10	0	0	0	9	-9	0	0
Total	0	0	0	194	0	0	-194

Table N.12. Falls County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	4,806	0	-3,751	-504	-520	-30	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	-260	260	0	0
10	0	0	0	-260	260	0	0
Total	4,806	0	-3,751	-1,025	0	-30	0

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Table N.13. Fayette County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	282	0	-37	-45	-201	0	0
3	0	0	0	-729	321	0	408
4	0	0	0	-10	10	0	0
5	0	0	0	2	-2	0	0
6	0	0	0	15	-15	0	0
7	0	0	0	88	-88	0	0
8	0	0	0	63	-63	0	0
9	0	0	0	-82	82	0	0
10	0	0	0	45	-45	0	0
Total	282	0	-37	-654	0	0	408

Table N.14. Freestone County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	113,264	-79,278	-30,025	2,114	-5,650	-429	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	-91	91	0	0
6	0	0	0	-10	10	0	0
7	0	0	0	-1,862	1,862	0	0
8	0	0	0	-2,155	2,155	0	0
9	0	0	0	-1,253	1,253	0	0
10	0	0	0	-280	280	0	0
Total	113,264	-79,278	-30,025	-3,536	0	-429	0

Table N.15. Gonzales County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	15,895	-28,301	-1,632	2,942	11,096	0	0
3	0	0	0	620	935	0	-1,555
4	0	0	0	39	-39	0	0
5	0	0	0	1,496	-1,496	0	0
6	0	0	0	160	-161	0	0
7	0	0	0	7,905	-7,905	0	0
8	0	0	0	1,448	-1,448	0	0
9	0	0	0	429	-429	0	0
10	0	0	0	554	-554	0	0
Total	15,895	-28,301	-1,632	15,593	0	0	-1,555

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Table N.16. Grimes County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-134	143	0	-9
4	0	0	0	-3	3	0	0
5	0	0	0	-25	25	0	0
6	0	0	0	-2	2	0	0
7	0	0	0	141	-141	0	0
8	0	0	0	-7	7	0	0
9	0	0	0	35	-35	0	0
10	0	0	0	3	-3	0	0
Total	0	0	0	9	0	0	-9

Table N.17. Guadalupe County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	23,880	-8,436	-1,252	-3,449	-10,649	-94	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	-30	30	0	0
6	0	0	0	-5	5	0	0
7	0	0	0	-5,663	5,663	0	0
8	0	0	0	-2,076	2,076	0	0
9	0	0	0	-1,146	1,146	0	0
10	0	0	0	-1,728	1,728	0	0
Total	23,880	-8,436	-1,252	-14,098	0	-94	0

Table N.18. Henderson County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	101,794	-61,222	-39,683	4,144	-3,862	-1,170	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	280	-70	0	-210
6	0	0	0	-75	87	0	-12
7	0	0	0	-1,193	1,308	0	-115
8	0	0	0	-712	933	0	-221
9	0	0	0	-1,077	1,244	0	-167
10	0	0	0	-219	360	0	-141
Total	101,794	-61,222	-39,683	1,149	0	-1,170	-866

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Table N.19. Houston County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	46,778	-40,114	-9,099	-997	4,505	-1,072	0
3	0	0	0	-225	-1,759	0	1,984
4	0	0	0	-50	50	0	0
5	0	0	0	-608	607	0	0
6	0	0	0	-69	69	0	0
7	0	0	0	710	-710	0	0
8	0	0	0	642	-642	0	0
9	0	0	0	1,813	-1,813	0	0
10	0	0	0	307	-307	0	0
Total	46,778	-40,114	-9,099	1,522	0	-1,072	1,984

Table N.20. Jasper County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-115	-58	0	173
4	0	0	0	-5	5	0	0
5	0	0	0	-12	12	0	0
6	0	0	0	-1	1	0	0
7	0	0	0	-36	36	0	0
8	0	0	0	-4	4	0	0
9	0	0	0	6	-6	0	0
10	0	0	0	-5	5	0	0
Total	0	0	0	-173	0	0	173

Table N.21. Karnes County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	305	88	0	-393
4	0	0	0	8	21	0	-29
5	0	0	0	212	60	0	-272
6	0	0	0	10	34	0	-43
7	0	0	0	937	-213	0	-724
8	0	0	0	67	0	0	-68
9	0	0	0	184	16	0	-199
10	0	0	0	209	-5	0	-204
Total	0	0	0	1,932	0	0	-1,932

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Table N.22. Lavaca County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-12	437	0	-425
4	0	0	0	0	0	0	0
5	0	0	0	148	-148	0	0
6	0	0	0	1	-1	0	0
7	0	0	0	280	-280	0	0
8	0	0	0	6	-6	0	0
9	0	0	0	-7	7	0	0
10	0	0	0	9	-9	0	0
Total	0	0	0	425	0	0	-425

Table N.23. Lee County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	23,761	-14,764	-10,163	2,053	-743	-142	0
3	0	0	0	-15	-670	0	685
4	0	0	0	-8	8	0	0
5	0	0	0	619	-619	0	0
6	0	0	0	6	-6	0	0
7	0	0	0	-965	965	0	0
8	0	0	0	-46	46	0	0
9	0	0	0	-1,232	1,232	0	0
10	0	0	0	213	-213	0	0
Total	23,761	-14,764	-10,163	625	0	-142	685

Table N.24. Leon County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	102,431	-75,156	-32,146	554	6,701	-2,392	0
3	0	0	0	-303	-99	0	401
4	0	0	0	33	-33	0	0
5	0	0	0	-112	112	0	0
6	0	0	0	97	-97	0	0
7	0	0	0	1,389	-1,388	0	0
8	0	0	0	1,333	-1,333	0	0
9	0	0	0	2,936	-2,936	0	0
10	0	0	0	927	-927	0	0
Total	102,431	-75,156	-32,146	6,855	0	-2,392	401

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Table N.25 Limestone County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	46,173	-30,186	-7,834	-3,533	-4,255	-365	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	-456	456	0	0
9	0	0	0	-2,674	2,674	0	0
10	0	0	0	-1,124	1,124	0	0
Total	46,173	-30,186	-7,834	-7,788	0	-365	0

Table N.26. Madison County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	407	-136	0	-271
4	0	0	0	13	-13	0	0
5	0	0	0	-141	141	0	0
6	0	0	0	-6	6	0	0
7	0	0	0	-87	87	0	0
8	0	0	0	-5	5	0	0
9	0	0	0	81	-81	0	0
10	0	0	0	10	-10	0	0
Total	0	0	0	271	0	0	-271

Table N.27. Milam County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	4,017	-14,367	0	3,247	7,176	-73	0
2	51,484	-33,219	-7,885	-1,919	-7,783	-679	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	-4	4	0	0
6	0	0	0	-16	16	0	0
7	0	0	0	-563	563	0	0
8	0	0	0	250	-250	0	0
9	0	0	0	-430	430	0	0
10	0	0	0	156	-156	0	0
Total	55,501	-47,586	-7,885	720	0	-751	0

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Table N.28. Montgomery County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	107	25	0	-132
4	0	0	0	3	-3	0	0
5	0	0	0	19	-19	0	0
6	0	0	0	0	0	0	0
7	0	0	0	2	-2	0	0
8	0	0	0	-1	1	0	0
9	0	0	0	1	-1	0	0
10	0	0	0	1	-1	0	0
Total	0	0	0	132	0	0	-132

Table N.29. Nacogdoches County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	98,289	-53,997	-40,187	1,081	-3,702	-1,489	0
3	0	0	0	976	-1,355	0	379
4	0	0	0	42	-42	0	0
5	0	0	0	709	-709	0	0
6	0	0	0	-23	23	0	0
7	0	0	0	-803	926	0	-123
8	0	0	0	-1,441	1,801	0	-360
9	0	0	0	-1,993	2,326	0	-333
10	0	0	0	-403	732	0	-329
Total	98,289	-53,997	-40,187	-1,855	0	-1,489	-765

Table N.30. Navarro County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	11,890	-8,112	-1,461	-2,028	-289	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	-10	10	0	0
9	0	0	0	-1	1	0	0
10	0	0	0	-278	278	0	0
Total	11,890	-8,112	-1,461	-2,317	0	0	0

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Table N.31. Newton County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-281	-192	0	474
4	0	0	0	-14	19	0	-5
5	0	0	0	-47	178	0	-130
6	0	0	0	-5	-7	0	12
7	0	0	0	56	-15	0	-41
8	0	0	0	-9	34	0	-25
9	0	0	0	146	-36	0	-109
10	0	0	0	-8	20	0	-12
Total	0	0	0	-163	0	0	163

Table N.32. Polk County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	15	-22	0	7
4	0	0	0	1	-1	0	0
5	0	0	0	7	-7	0	0
6	0	0	0	1	-1	0	0
7	0	0	0	-35	35	0	0
8	0	0	0	-2	2	0	0
9	0	0	0	7	-7	0	0
10	0	0	0	-1	1	0	0
Total	0	0	0	-7	0	0	7

Table N.33. Robertson County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	16,478	-23,959	-743	-5,377	13,650	-49	0
2	69,277	-48,800	-14,888	5,137	-10,148	-579	0
3	0	0	0	-264	158	0	105
4	0	0	0	-21	21	0	0
5	0	0	0	609	-609	0	0
6	0	0	0	34	-34	0	0
7	0	0	0	892	-892	0	0
8	0	0	0	154	-154	0	0
9	0	0	0	1,347	-1,347	0	0
10	0	0	0	646	-646	0	0
Total	85,755	-72,759	-15,631	3,157	0	-628	105

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Table N.34. Rusk County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	11,194	-9,475	-1,820	292	-52	-139	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	28	0	-28
6	0	0	0	0	32	0	-32
7	0	0	0	-46	119	0	-72
8	0	0	0	561	-444	0	-117
9	0	0	0	144	148	0	-292
10	0	0	0	180	170	0	-350
Total	11,194	-9,475	-1,820	1,131	0	-139	-891

Table N.35. Sabine County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	427	-856	0	428
4	0	0	0	29	253	0	-282
5	0	0	0	47	453	0	-500
6	0	0	0	8	153	0	-161
7	0	0	0	350	-116	0	-235
8	0	0	0	185	199	0	-384
9	0	0	0	1,357	-418	0	-939
10	0	0	0	177	332	0	-509
Total	0	0	0	2,580	0	0	-2,580

Table N.36. San Augustine County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	15,428	-5,108	-7,578	-1,420	-644	-679	0
3	0	0	0	-114	-21	0	135
4	0	0	0	-17	129	0	-112
5	0	0	0	-201	267	0	-66
6	0	0	0	-13	37	0	-24
7	0	0	0	-105	230	0	-125
8	0	0	0	266	-24	0	-242
9	0	0	0	1,050	-530	0	-520
10	0	0	0	160	556	0	-716
Total	15,428	-5,108	-7,578	-393	0	-679	-1,671

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Table N.37. San Jacinto County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	12	-8	0	-4
4	0	0	0	0	0	0	0
5	0	0	0	-4	4	0	0
6	0	0	0	0	0	0	0
7	0	0	0	-8	8	0	0
8	0	0	0	-1	1	0	0
9	0	0	0	4	-4	0	0
10	0	0	0	0	0	0	0
Total	0	0	0	4	0	0	-4

Table N.38. Smith County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	11,028	-3,262	-4,014	-2,491	-862	-399	0
3	0	0	0	0	0	0	0
4	0	0	0	0	20	0	-20
5	0	0	0	-152	778	0	-626
6	0	0	0	44	62	0	-105
7	0	0	0	317	-79	0	-237
8	0	0	0	312	80	0	-392
9	0	0	0	409	-17	0	-392
10	0	0	0	273	19	0	-292
Total	11,028	-3,262	-4,014	-1,288	0	-399	-2,065

Table N.39. Trinity County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-19	4	0	15
4	0	0	0	-4	4	0	0
5	0	0	0	-39	39	0	0
6	0	0	0	-2	2	0	0
7	0	0	0	-8	8	0	0
8	0	0	0	3	-3	0	0
9	0	0	0	53	-53	0	0
10	0	0	0	0	0	0	0
Total	0	0	0	-15	0	0	15

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Table N.40. Tyler County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-19	-43	0	62
4	0	0	0	-2	2	0	0
5	0	0	0	-5	5	0	0
6	0	0	0	-1	1	0	0
7	0	0	0	-32	32	0	0
8	0	0	0	-1	1	0	0
9	0	0	0	-5	4	0	0
10	0	0	0	2	-2	0	0
Total	0	0	0	-62	0	0	62

Table N.41. Van Zandt County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	34,492	-11,203	-19,188	-331	-2,923	-848	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	-38	155	0	-118
6	0	0	0	-4	21	0	-17
7	0	0	0	-142	182	0	-41
8	0	0	0	-261	653	0	-392
9	0	0	0	-332	589	0	-256
10	0	0	0	-800	1,322	0	-522
Total	34,492	-11,203	-19,188	-1,907	0	-848	-1,346

Table N.42. Walker County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-99	107	0	-8
4	0	0	0	-3	3	0	0
5	0	0	0	-5	5	0	0
6	0	0	0	0	0	0	0
7	0	0	0	100	-100	0	0
8	0	0	0	-1	1	0	0
9	0	0	0	12	-12	0	0
10	0	0	0	4	-4	0	0
Total	0	0	0	8	0	0	-8

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Table N.43. Waller County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	56	67	0	-123
4	0	0	0	1	-1	0	0
5	0	0	0	32	-32	0	0
6	0	0	0	1	-1	0	0
7	0	0	0	32	-32	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	1	-1	0	0
Total	0	0	0	123	0	0	-123

Table N.44. Washington County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-191	60	0	131
4	0	0	0	-5	5	0	0
5	0	0	0	-32	32	0	0
6	0	0	0	-1	1	0	0
7	0	0	0	90	-90	0	0
8	0	0	0	6	-6	0	0
9	0	0	0	-7	7	0	0
10	0	0	0	8	-8	0	0
Total	0	0	0	-131	0	0	131

Table N.45. Williamson County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	3,317	1,086	-1,804	-1,576	-932	-91	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	-298	298	0	0
10	0	0	0	-634	634	0	0
Total	3,317	1,086	-1,804	-2,509	0	-91	0

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Table N.46. Wilson County.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	14,163	-13,899	-75	415	-604	0	0
3	0	0	0	-335	168	0	168
4	0	0	0	-28	71	0	-43
5	0	0	0	-949	1,206	0	-257
6	0	0	0	-16	52	0	-36
7	0	0	0	-833	1,277	0	-444
8	0	0	0	1,788	-1,454	0	-335
9	0	0	0	483	8	0	-491
10	0	0	0	1,211	-722	0	-489
Total	14,163	-13,899	-75	1,737	0	0	-1,926

26 Appendix O: Steady-State Water Budgets by County and Hydrogeologic Unit

Tables summarizing the steady-state water budget by county and hydrogeologic unit are presented in this appendix. The total water budget for the county is also provided. The tables are ordered alphabetically by county.

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Table O.1. Anderson County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps / Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	13,152	-4,387	-2,136	-341	-6,288	0	0
Weches	1,344	-2,224	-798	4	1,741	-67	0
Queen City	112,032	-76,496	-38,734	2,642	1,401	-844	0
Reklaw	2,720	-5,277	-1,690	-36	4,314	-30	0
Carrizo	1,567	-3,747	0	1,130	1,049	0	0
Calvert Bluff	5,192	-1,315	-3,724	237	-287	-103	0
Simsboro	0	0	0	365	-365	0	0
Hooper	0	0	0	690	-690	0	0
Total	136,006	-93,446	-47,083	4,691	877	-1,044	0

Table O.2. Angelina County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps / Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	3,096	-2,952	-705	-690	147	0	1,103
Weches	0	0	0	-24	24	0	0
Queen City	0	0	0	-206	206	0	0
Reklaw	0	0	0	-9	9	0	0
Carrizo	0	0	0	300	-300	0	0
Calvert Bluff	0	0	0	204	-204	0	0
Simsboro	0	0	0	-124	124	0	0
Hooper	0	0	0	7	-7	0	0
Total	3,096	-2,952	-705	-543	0	0	1,103

Table O.3. Austin County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	121	125	0	-246
Weches	0	0	0	1	-1	0	0
Queen City	0	0	0	47	-47	0	0
Reklaw	0	0	0	1	-1	0	0
Carrizo	0	0	0	73	-73	0	0
Calvert Bluff	0	0	0	2	-2	0	0
Simsboro	0	0	0	-5	5	0	0
Hooper	0	0	0	5	-5	0	0
Total	0	0	0	246	0	0	-246

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Table O.4. Bastrop County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	12,564	-41,496	-240	0	29,278	-106	0
Sparta	5,624	-1,939	-733	-1,354	-2,141	0	542
Weches	730	405	-63	-12	-1,060	0	0
Queen City	6,291	5	-342	-1,677	-4,228	-50	0
Reklaw	2,384	-1,405	-693	-28	-199	-59	0
Carrizo	6,955	-1,621	-363	-97	-4,874	0	0
Calvert Bluff	16,520	-9,111	-2,899	111	-4,621	0	0
Simsboro	4,928	247	0	553	-5,729	0	0
Hooper	6,712	-2,370	-744	2,895	-6,412	-82	0
Total	62,708	-57,284	-6,078	393	15	-297	542

Table O.5. Bexar County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	0	0	0	0	0	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	361	-736	0	-227	594	0	9
Calvert Bluff	3,197	-2,130	0	-1,295	580	0	-351
Simsboro	727	-120	0	-503	-60	0	-45
Hooper	1,791	432	0	-481	-1,613	0	-128
Total	6,076	-2,554	0	-2,507	-499	0	-516

Table O.6. Brazos County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	333	-1,580	0	585	661	0	0
Sparta	0	0	0	229	0	0	-229
Weches	0	0	0	14	-14	0	0
Queen City	0	0	0	214	-213	0	0
Reklaw	0	0	0	-1	1	0	0
Carrizo	0	0	0	361	-361	0	0
Calvert Bluff	0	0	0	-21	21	0	0
Simsboro	0	0	0	85	-85	0	0
Hooper	0	0	0	10	-10	0	0
Total	333	-1,580	0	1,476	0	0	-229

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Table O.7. Burleson County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	1,890	-7,234	0	1,546	3,798	0	0
Sparta	7,554	-2,936	-90	245	-4,236	0	-538
Weches	872	-2,259	-89	61	1,451	-34	0
Queen City	6,823	-6,188	0	393	-1,029	0	0
Reklaw	16	-414	0	23	375	0	0
Carrizo	64	-227	0	264	-101	0	0
Calvert Bluff	0	0	0	81	-81	0	0
Simsboro	0	0	0	-30	30	0	0
Hooper	0	0	0	84	-84	0	0
Total	17,220	-19,258	-180	2,666	123	-34	-538

Table O.8. Caldwell County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	32	0	0	-11	-21	0	0
Queen City	1,763	-1,114	-164	-412	-72	0	0
Reklaw	1,289	41	0	-581	-749	0	0
Carrizo	4,084	-871	0	-2,529	-684	0	0
Calvert Bluff	11,902	-12,837	-3,599	-4	4,538	0	0
Simsboro	2,231	-1,359	-581	110	-401	0	0
Hooper	6,853	-1,816	-1,596	-673	-2,768	0	0
Total	28,154	-17,957	-5,940	-4,100	-157	0	0

Table O.9. Cherokee County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	16,228	-4,836	-6,960	-528	-3,961	-27	83
Weches	1,728	-509	-686	-44	-365	-123	0
Queen City	103,068	-36,949	-57,950	-4,039	-2,569	-1,561	0
Reklaw	5,280	-9,285	-3,037	635	6,578	-98	-73
Carrizo	0	0	0	472	-336	0	-137
Calvert Bluff	0	0	0	120	83	0	-203
Simsboro	0	0	0	18	350	0	-368
Hooper	0	0	0	-54	386	0	-332
Total	126,305	-51,580	-68,633	-3,420	167	-1,809	-1,029

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Table O.10. Colorado County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	40	222	0	-261
Weches	0	0	0	1	-1	0	0
Queen City	0	0	0	142	-142	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	76	-76	0	0
Calvert Bluff	0	0	0	2	-2	0	0
Simsboro	0	0	0	-8	8	0	0
Hooper	0	0	0	8	-8	0	0
Total	0	0	0	261	0	0	-261

Table O.11. DeWitt County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	-109	303	0	-194
Weches	0	0	0	-3	3	0	0
Queen City	0	0	0	133	-133	0	0
Reklaw	0	0	0	-3	3	0	0
Carrizo	0	0	0	171	-171	0	0
Calvert Bluff	0	0	0	3	-3	0	0
Simsboro	0	0	0	-7	7	0	0
Hooper	0	0	0	9	-9	0	0
Total	0	0	0	194	0	0	-194

Table O.12. Falls County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	0	0	0	0	0	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	0	0	0	0
Calvert Bluff	0	0	0	0	0	0	0
Simsboro	1,236	0	0	-893	-343	0	0
Hooper	3,570	0	-3,751	-114	325	-30	0
Total	4,806	0	-3,751	-1,007	-18	-30	0

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Table O.13. Fayette County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	282	0	-37	-915	261	0	408
Weches	0	0	0	-10	10	0	0
Queen City	0	0	0	2	-2	0	0
Reklaw	0	0	0	15	-15	0	0
Carrizo	0	0	0	88	-88	0	0
Calvert Bluff	0	0	0	63	-63	0	0
Simsboro	0	0	0	-82	82	0	0
Hooper	0	0	0	45	-45	0	0
Total	282	0	-37	-794	141	0	408

Table O.14. Freestone County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	8,801	-7,658	-993	45	-57	-139	0
Reklaw	3,008	-3,930	-759	54	1,628	0	0
Carrizo	12,639	-7,567	-4,848	-1,920	1,697	0	0
Calvert Bluff	58,686	-34,431	-14,936	-2,042	-7,277	0	0
Simsboro	14,774	-19,446	-425	988	4,109	0	0
Hooper	15,357	-6,243	-8,063	-167	-595	-290	0
Total	113,265	-79,274	-30,025	-3,041	-495	-429	0

Table O.15. Gonzales County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	2,564	-6,239	-235	1,057	4,408	0	-1,555
Weches	1,208	-3,159	-400	35	2,316	0	0
Queen City	8,863	-13,316	-553	1,858	3,149	0	0
Reklaw	1,994	-3,828	-444	2,797	-519	0	0
Carrizo	950	-1,135	0	7,592	-7,406	0	0
Calvert Bluff	316	-623	0	1,027	-721	0	0
Simsboro	0	0	0	429	-429	0	0
Hooper	0	0	0	554	-554	0	0
Total	15,895	-28,300	-1,632	15,349	244	0	-1,555

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Table O.16. Grimes County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	-134	143	0	-9
Weches	0	0	0	-3	3	0	0
Queen City	0	0	0	-25	25	0	0
Reklaw	0	0	0	-2	2	0	0
Carrizo	0	0	0	141	-141	0	0
Calvert Bluff	0	0	0	-7	7	0	0
Simsboro	0	0	0	35	-35	0	0
Hooper	0	0	0	3	-3	0	0
Total	0	0	0	9	0	0	-9

Table O.17. Guadalupe County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	147	0	0	-75	-72	0	0
Reklaw	513	1,734	0	-2,199	-49	0	0
Carrizo	5,773	-15	0	-5,966	208	0	0
Calvert Bluff	10,537	-7,814	-851	-1,923	146	-94	0
Simsboro	2,077	-2,215	-47	-1,321	1,507	0	0
Hooper	4,834	-127	-353	-2,405	-1,949	0	0
Total	23,881	-8,436	-1,252	-13,889	-209	-94	0

Table O.18. Henderson County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	56,205	-29,895	-24,617	3,549	-4,193	-839	-210
Reklaw	1,600	-910	-1,122	101	389	-45	-12
Carrizo	4,833	-435	-261	-1,604	-2,417	0	-115
Calvert Bluff	27,585	-21,071	-10,087	-672	4,526	-59	-221
Simsboro	3,613	-1,830	-645	-1,079	167	-60	-167
Hooper	7,956	-7,080	-2,950	747	1,636	-168	-141
Total	101,793	-61,221	-39,683	1,041	108	-1,170	-866

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Table O.19. Houston County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	31,921	-17,937	-7,851	-162	-7,151	-803	1,984
Weches	1,792	-6,026	-548	-28	4,828	-18	0
Queen City	13,065	-16,152	-699	-1,437	5,473	-251	0
Reklaw	0	0	0	-69	69	0	0
Carrizo	0	0	0	710	-710	0	0
Calvert Bluff	0	0	0	642	-642	0	0
Simsboro	0	0	0	1,813	-1,813	0	0
Hooper	0	0	0	307	-307	0	0
Total	46,778	-40,114	-9,099	1,776	-253	-1,072	1,984

Table O.20. Jasper County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	-115	-58	0	173
Weches	0	0	0	-5	5	0	0
Queen City	0	0	0	-12	12	0	0
Reklaw	0	0	0	-1	1	0	0
Carrizo	0	0	0	-36	36	0	0
Calvert Bluff	0	0	0	-4	4	0	0
Simsboro	0	0	0	6	-6	0	0
Hooper	0	0	0	-5	5	0	0
Total	0	0	0	-173	0	0	173

Table O.21. Karnes County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	305	88	0	-393
Weches	0	0	0	8	21	0	-29
Queen City	0	0	0	212	60	0	-272
Reklaw	0	0	0	10	34	0	-43
Carrizo	0	0	0	937	-213	0	-724
Calvert Bluff	0	0	0	67	0	0	-68
Simsboro	0	0	0	184	16	0	-199
Hooper	0	0	0	209	-5	0	-204
Total	0	0	0	1,932	0	0	-1,932

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Table O.22. Lavaca County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	-12	437	0	-425
Weches	0	0	0	0	0	0	0
Queen City	0	0	0	148	-148	0	0
Reklaw	0	0	0	1	-1	0	0
Carrizo	0	0	0	280	-280	0	0
Calvert Bluff	0	0	0	6	-6	0	0
Simsboro	0	0	0	-7	7	0	0
Hooper	0	0	0	9	-9	0	0
Total	0	0	0	425	0	0	-425

Table O.23. Lee County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	6,749	-8,436	-1,137	1,437	701	0	685
Weches	1,077	-1,749	-154	-58	935	-51	0
Queen City	5,313	-4,331	-2,008	1,402	-376	0	0
Reklaw	238	-1,496	-19	-22	1,298	0	0
Carrizo	2,286	1,876	-55	-1,437	-2,580	-91	0
Calvert Bluff	6,091	-1,113	-4,936	18	-59	0	0
Simsboro	1,470	0	-1,713	-644	887	0	0
Hooper	536	483	-142	-117	-760	0	0
Total	23,761	-14,765	-10,164	579	46	-142	685

Table O.24. Leon County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	22,385	-18,541	-4,482	-415	867	-215	401
Weches	1,672	-1,935	-687	-36	992	-6	0
Queen City	66,655	-47,108	-23,237	674	5,184	-2,168	0
Reklaw	1,336	776	-624	201	-1,690	0	0
Carrizo	5,839	-2,562	-1,522	1,739	-3,493	0	0
Calvert Bluff	4,548	-5,784	-1,592	533	2,299	-3	0
Simsboro	0	0	0	2,936	-2,936	0	0
Hooper	0	0	0	927	-927	0	0
Total	102,435	-75,153	-32,146	6,559	296	-2,392	401

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Table O.25. Limestone County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	0	0	0	0	0	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	0	0	0	0
Calvert Bluff	16,757	-12,935	-1,750	-1,832	-240	0	0
Simsboro	14,774	-11,318	-212	-4,479	1,236	0	0
Hooper	14,642	-5,933	-5,871	-1,309	-1,164	-365	0
Total	46,173	-30,185	-7,834	-7,620	-168	-365	0

Table O.26. Madison County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	407	-136	0	-271
Weches	0	0	0	13	-13	0	0
Queen City	0	0	0	-141	141	0	0
Reklaw	0	0	0	-6	6	0	0
Carrizo	0	0	0	-87	87	0	0
Calvert Bluff	0	0	0	-5	5	0	0
Simsboro	0	0	0	81	-81	0	0
Hooper	0	0	0	10	-10	0	0
Total	0	0	0	271	0	0	-271

Table O.27. Milam County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	4,017	-14,367	0	3,247	7,176	-73	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	6,318	-2,359	-1,346	-1,285	-1,329	0	0
Reklaw	1,472	86	-299	-17	-1,174	-68	0
Carrizo	3,488	-3,453	-85	-1,106	1,156	0	0
Calvert Bluff	18,992	-18,953	-1,426	209	1,580	-402	0
Simsboro	12,316	-5,932	-1,045	-429	-4,909	0	0
Hooper	8,897	-2,609	-3,683	158	-2,556	-208	0
Total	55,501	-47,586	-7,885	777	-57	-751	0

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Table O.28. Montgomery County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	107	25	0	-132
Weches	0	0	0	3	-3	0	0
Queen City	0	0	0	19	-19	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	2	-2	0	0
Calvert Bluff	0	0	0	-1	1	0	0
Simsboro	0	0	0	1	-1	0	0
Hooper	0	0	0	1	-1	0	0
Total	0	0	0	132	0	0	-132

Table O.29. Nacogdoches County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	35,391	-25,067	-9,479	1,508	-2,614	-117	379
Weches	4,352	-4,697	-1,681	122	2,026	-123	0
Queen City	30,984	-4,190	-21,359	1,129	-5,519	-1,046	0
Reklaw	3,456	-3,732	-1,901	-505	2,822	-140	0
Carrizo	21,366	-8,294	-5,693	-717	-6,474	-64	-123
Calvert Bluff	2,744	-8,016	-73	-1,093	6,798	0	-360
Simsboro	0	0	0	-1,993	2,326	0	-333
Hooper	0	0	0	-403	732	0	-329
Total	98,292	-53,996	-40,186	-1,954	98	-1,489	-765

Table O.30. Navarro County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	0	0	0	0	0	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	0	0	0	0
Calvert Bluff	1,485	-2,184	-550	82	1,167	0	0
Simsboro	2,416	-388	-274	-1,240	-515	0	0
Hooper	7,988	-5,539	-637	-1,125	-687	0	0
Total	11,889	-8,111	-1,461	-2,282	-35	0	0

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Table O.31. Newton County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	-281	-192	0	474
Weches	0	0	0	-14	19	0	-5
Queen City	0	0	0	-47	178	0	-130
Reklaw	0	0	0	-5	-7	0	12
Carrizo	0	0	0	56	-15	0	-41
Calvert Bluff	0	0	0	-9	34	0	-25
Simsboro	0	0	0	146	-36	0	-109
Hooper	0	0	0	-8	20	0	-12
Total	0	0	0	-163	0	0	163

Table O.32. Polk County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	15	-22	0	7
Weches	0	0	0	1	-1	0	0
Queen City	0	0	0	7	-7	0	0
Reklaw	0	0	0	1	-1	0	0
Carrizo	0	0	0	-35	35	0	0
Calvert Bluff	0	0	0	-2	2	0	0
Simsboro	0	0	0	7	-7	0	0
Hooper	0	0	0	-1	1	0	0
Total	0	0	0	-7	0	0	7

Table O.33. Robertson County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	8,557	-6,686	-1,408	319	-790	-96	105
Weches	600	-693	-216	47	329	-68	0
Queen City	10,591	-6,077	-2,794	1,221	-2,879	-62	0
Reklaw	1,640	-1,354	-590	-69	467	-94	0
Carrizo	10,218	-4,639	-1,849	789	-4,518	0	0
Calvert Bluff	29,324	-24,290	-6,398	3,251	-1,828	-60	0
Simsboro	6,041	-5,257	-865	2,777	-2,697	0	0
Hooper	2,306	194	-768	499	-2,033	-199	0
Total	85,756	-72,760	-15,631	3,457	-300	-628	105

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Table O.34. Rusk County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	694	0	-138	0	-556	0	0
Weches	0	0	0	0	0	0	0
Queen City	3,265	-392	-750	-84	-1,904	-106	-28
Reklaw	1,216	-1,519	-525	-372	1,265	-33	-32
Carrizo	3,783	-4,005	-304	347	251	0	-72
Calvert Bluff	2,237	-3,559	-104	952	590	0	-117
Simsboro	0	0	0	144	148	0	-292
Hooper	0	0	0	180	170	0	-350
Total	11,194	-9,475	-1,820	1,167	-36	-139	-891

Table O.35. Sabine County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	0	0	0	427	-856	0	428
Weches	0	0	0	29	253	0	-282
Queen City	0	0	0	47	453	0	-500
Reklaw	0	0	0	8	153	0	-161
Carrizo	0	0	0	350	-116	0	-235
Calvert Bluff	0	0	0	185	199	0	-384
Simsboro	0	0	0	1,357	-418	0	-939
Hooper	0	0	0	177	332	0	-509
Total	0	0	0	2,580	0	0	-2,580

Table O.36. San Augustine County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	9,792	-3,397	-4,962	-232	-657	-679	135
Weches	512	0	-367	-75	42	0	-112
Queen City	0	0	0	-201	267	0	-66
Reklaw	352	-352	-301	232	94	0	-24
Carrizo	2,333	0	-1,238	-583	-387	0	-125
Calvert Bluff	2,439	-1,359	-710	-474	345	0	-242
Simsboro	0	0	0	1,050	-530	0	-520
Hooper	0	0	0	160	556	0	-716
Total	15,428	-5,108	-7,578	-123	-270	-679	-1,671

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Table O.37. San Jacinto County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	0	0	0	12	-8	0	-4
Weches	0	0	0	0	0	0	0
Queen City	0	0	0	-4	4	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	-8	8	0	0
Calvert Bluff	0	0	0	-1	1	0	0
Simsboro	0	0	0	4	-4	0	0
Hooper	0	0	0	0	0	0	0
Total	0	0	0	4	0	0	-4

Table O.38. Smith County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	2,687	0	-952	-14	-1,541	-180	0
Weches	0	0	0	0	20	0	-20
Queen City	8,340	-3,262	-3,061	-2,712	1,540	-219	-626
Reklaw	0	0	0	44	62	0	-105
Carrizo	0	0	0	317	-79	0	-237
Calvert Bluff	0	0	0	312	80	0	-392
Simsboro	0	0	0	409	-17	0	-392
Hooper	0	0	0	273	19	0	-292
Total	11,028	-3,262	-4,014	-1,370	82	-399	-2,065

Table O.39. Trinity County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	0	0	0	-19	4	0	15
Weches	0	0	0	-4	4	0	0
Queen City	0	0	0	-39	39	0	0
Reklaw	0	0	0	-2	2	0	0
Carrizo	0	0	0	-8	8	0	0
Calvert Bluff	0	0	0	3	-3	0	0
Simsboro	0	0	0	53	-53	0	0
Hooper	0	0	0	0	0	0	0
Total	0	0	0	-15	0	0	15

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Table O.40. Tyler County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	0	0	0	-19	-43	0	62
Weches	0	0	0	-2	2	0	0
Queen City	0	0	0	-5	5	0	0
Reklaw	0	0	0	-1	1	0	0
Carrizo	0	0	0	-32	32	0	0
Calvert Bluff	0	0	0	-1	1	0	0
Simsboro	0	0	0	-5	4	0	0
Hooper	0	0	0	2	-2	0	0
Total	0	0	0	-62	0	0	62

Table O.41. Van Zandt County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	4,345	-106	-2,242	-343	-1,414	-122	-118
Reklaw	704	-1,366	-11	-180	870	0	-17
Carrizo	2,617	-3,316	0	270	470	0	-41
Calvert Bluff	15,067	-520	-9,976	-378	-3,438	-364	-392
Simsboro	3,330	-288	-3,042	-332	588	0	-256
Hooper	8,429	-5,607	-3,918	-854	2,834	-362	-522
Total	34,492	-11,203	-19,188	-1,818	-90	-848	-1,346

Table O.42. Walker County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	0	0	0	-99	107	0	-8
Weches	0	0	0	-3	3	0	0
Queen City	0	0	0	-5	5	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	100	-100	0	0
Calvert Bluff	0	0	0	-1	1	0	0
Simsboro	0	0	0	12	-12	0	0
Hooper	0	0	0	4	-4	0	0
Total	0	0	0	8	0	0	-8

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Table O.43. Waller County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	0	0	0	56	67	0	-123
Weches	0	0	0	1	-1	0	0
Queen City	0	0	0	32	-32	0	0
Reklaw	0	0	0	1	-1	0	0
Carrizo	0	0	0	32	-32	0	0
Calvert Bluff	0	0	0	0	0	0	0
Simsboro	0	0	0	0	0	0	0
Hooper	0	0	0	1	-1	0	0
Total	0	0	0	123	0	0	-123

Table O.44. Washington County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	0	0	0	-191	60	0	131
Weches	0	0	0	-5	5	0	0
Queen City	0	0	0	-32	32	0	0
Reklaw	0	0	0	-1	1	0	0
Carrizo	0	0	0	90	-90	0	0
Calvert Bluff	0	0	0	6	-6	0	0
Simsboro	0	0	0	-7	7	0	0
Hooper	0	0	0	8	-8	0	0
Total	0	0	0	-131	0	0	131

Table O.45. Williamson County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	0	0	0	0	0	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	0	0	0	0
Calvert Bluff	91	0	0	-19	-73	0	0
Simsboro	734	0	-38	-883	188	0	0
Hooper	2,493	1,086	-1,765	-1,482	-240	-91	0
Total	3,317	1,086	-1,804	-2,384	-125	-91	0

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Table O.46. Wilson County.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General-Head Boundary
Alluvium	16,478	-23,959	-743	-5,377	13,650	-49	0
Sparta	677	-1,460	0	-659	1,274	0	168
Weches	525	-1,427	-37	-5	987	0	-43
Queen City	5,891	-2,728	-5	-1,151	-1,750	0	-257
Reklaw	796	-1,169	0	-15	425	0	-36
Carrizo	4,978	-6,302	0	-309	2,077	0	-444
Calvert Bluff	1,297	-812	-33	1,666	-1,783	0	-335
Simsboro	0	0	0	483	8	0	-491
Hooper	0	0	0	1,211	-722	0	-489
Total	14,163	-13,899	-75	1,221	515	0	-1,926

27 Appendix P: Steady-State Water Budgets by Groundwater Conservation District and Layer

Tables summarizing the steady-state water budget by groundwater conservation district and model layer are presented in this appendix. The total water budget for the groundwater conservation district is also provided. The tables are ordered alphabetically by groundwater conservation district.

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Table P.1. Bluebonnet Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-56	442	0	-386
4	0	0	0	-4	4	0	0
5	0	0	0	50	-50	0	0
6	0	0	0	0	0	0	0
7	0	0	0	347	-347	0	0
8	0	0	0	-7	7	0	0
9	0	0	0	42	-42	0	0
10	0	0	0	13	-13	0	0
Total	0	0	0	386	0	0	-386

Table P.2. Brazos Valley Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	16,812	-25,539	-743	-4,792	14,311	-49	0
2	69,277	-48,800	-14,888	5,140	-10,150	-579	0
3	0	0	0	-37	161	0	-124
4	0	0	0	-7	7	0	0
5	0	0	0	823	-823	0	0
6	0	0	0	32	-32	0	0
7	0	0	0	1,253	-1,253	0	0
8	0	0	0	133	-133	0	0
9	0	0	0	1,432	-1,432	0	0
10	0	0	0	657	-657	0	0
Total	86,089	-74,339	-15,631	4,633	0	-628	-124

Table P.3. Colorado County Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	40	222	0	-261
4	0	0	0	1	-1	0	0
5	0	0	0	142	-142	0	0
6	0	0	0	0	0	0	0
7	0	0	0	76	-76	0	0
8	0	0	0	2	-2	0	0
9	0	0	0	-8	8	0	0
10	0	0	0	8	-8	0	0
Total	0	0	0	261	0	0	-261

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Table P.4. Evergreen Underground Water Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps / Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	14,163	-13,899	-75	415	-604	0	0
3	0	0	0	-31	255	0	-225
4	0	0	0	-20	92	0	-72
5	0	0	0	-737	1,266	0	-529
6	0	0	0	-6	86	0	-80
7	0	0	0	104	1,063	0	-1,168
8	0	0	0	1,856	-1,454	0	-402
9	0	0	0	667	23	0	-690
10	0	0	0	1,420	-728	0	-693
Total	14,163	-13,899	-75	3,669	0	0	-3,858

Table P.5. Fayette County Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	282	0	-37	-45	-201	0	0
3	0	0	0	-729	321	0	408
4	0	0	0	-10	10	0	0
5	0	0	0	2	-2	0	0
6	0	0	0	15	-15	0	0
7	0	0	0	88	-88	0	0
8	0	0	0	63	-63	0	0
9	0	0	0	-82	82	0	0
10	0	0	0	45	-45	0	0
Total	282	0	-37	-654	0	0	408

Table P.6. Gonzales County Underground Water Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	24,007	-29,073	-1,962	1,391	5,637	0	0
3	0	0	0	484	646	0	-1,130
4	0	0	0	31	-31	0	0
5	0	0	0	832	-832	0	0
6	0	0	0	23	-23	0	0
7	0	0	0	4,907	-4,907	0	0
8	0	0	0	306	-306	0	0
9	0	0	0	-156	156	0	0
10	0	0	0	341	-341	0	0
Total	24,007	-29,073	-1,962	8,158	0	0	-1,130

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Table P.7. Guadalupe County Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	23,880	-8,436	-1,252	-3,449	-10,649	-94	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	-30	30	0	0
6	0	0	0	-5	5	0	0
7	0	0	0	-5,663	5,663	0	0
8	0	0	0	-2,076	2,076	0	0
9	0	0	0	-1,146	1,146	0	0
10	0	0	0	-1,728	1,728	0	0
Total	23,880	-8,436	-1,252	-14,098	0	-94	0

Table P.8. Lone Star Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	107	25	0	-132
4	0	0	0	3	-3	0	0
5	0	0	0	19	-19	0	0
6	0	0	0	0	0	0	0
7	0	0	0	2	-2	0	0
8	0	0	0	-1	1	0	0
9	0	0	0	1	-1	0	0
10	0	0	0	1	-1	0	0
Total	0	0	0	132	0	0	-132

Table P.9. Lost Pines Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	12,564	-41,496	-240	0	29,278	-106	0
2	73,905	-30,552	-16,001	3,641	-30,659	-332	0
3	0	0	0	-146	-1,082	0	1,227
4	0	0	0	-13	13	0	0
5	0	0	0	-734	734	0	0
6	0	0	0	-28	28	0	0
7	0	0	0	-1,897	1,897	0	0
8	0	0	0	-89	89	0	0
9	0	0	0	-1,034	1,034	0	0
10	0	0	0	1,332	-1,332	0	0
Total	86,469	-72,047	-16,241	1,033	0	-439	1,227

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Table P.10. Lower Trinity Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	27	-30	0	3
4	0	0	0	1	-1	0	0
5	0	0	0	3	-3	0	0
6	0	0	0	1	-1	0	0
7	0	0	0	-42	42	0	0
8	0	0	0	-2	2	0	0
9	0	0	0	12	-12	0	0
10	0	0	0	-2	2	0	0
Total	0	0	0	-3	0	0	3

Table P.11. Mid-East Texas Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	215,695	-154,425	-62,170	2,668	1,051	-2,821	0
3	0	0	0	104	-235	0	130
4	0	0	0	46	-46	0	0
5	0	0	0	-345	345	0	0
6	0	0	0	81	-82	0	0
7	0	0	0	-560	560	0	0
8	0	0	0	-827	826	0	0
9	0	0	0	1,764	-1,764	0	0
10	0	0	0	657	-657	0	0
Total	215,695	-154,425	-62,170	3,589	0	-2,821	130

Table P.12. Neches and Trinity Valleys Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	357,595	-203,158	-154,351	4,599	-662	-4,023	0
3	0	0	0	-200	117	0	83
4	0	0	0	4	-4	0	0
5	0	0	0	397	-187	0	-210
6	0	0	0	1	84	0	-85
7	0	0	0	711	-460	0	-252
8	0	0	0	644	-221	0	-423
9	0	0	0	-754	1,289	0	-535
10	0	0	0	430	44	0	-474
Total	357,595	-203,158	-154,351	5,833	0	-4,023	-1,895

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Table P.13. Pecan Valley Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	101,391	-56,948	-40,891	800	-2,860	-1,489	0
3	0	0	0	567	-2,050	0	1,482
4	0	0	0	18	-18	0	0
5	0	0	0	503	-503	0	0
6	0	0	0	-32	32	0	0
7	0	0	0	-503	625	0	-123
8	0	0	0	-1,238	1,597	0	-360
9	0	0	0	-2,118	2,451	0	-333
10	0	0	0	-396	725	0	-329
Total	0	0	0	194	0	0	-194

Table P.14. Pineywoods Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-109	303	0	-194
4	0	0	0	-3	3	0	0
5	0	0	0	133	-133	0	0
6	0	0	0	-3	3	0	0
7	0	0	0	171	-171	0	0
8	0	0	0	3	-3	0	0
9	0	0	0	-7	7	0	0
10	0	0	0	9	-9	0	0
Total	101,391	-56,948	-40,891	-2,398	0	-1,489	338

Table P.15. Plum Creek Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	14,120	-11,889	-4,847	871	1,744	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	75	-75	0	0
6	0	0	0	-6	6	0	0
7	0	0	0	-12	12	0	0
8	0	0	0	418	-418	0	0
9	0	0	0	634	-634	0	0
10	0	0	0	635	-635	0	0
Total	14,120	-11,889	-4,847	2,615	0	0	0

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Table P.16. Post Oak Savannah Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	5,908	-21,601	0	4,792	10,974	-73	0
2	66,813	-45,237	-8,064	-1,007	-11,787	-713	0
3	0	0	0	388	150	0	-538
4	0	0	0	10	-10	0	0
5	0	0	0	-307	307	0	0
6	0	0	0	-13	13	0	0
7	0	0	0	-465	465	0	0
8	0	0	0	331	-331	0	0
9	0	0	0	-460	460	0	0
10	0	0	0	240	-240	0	0
Total	72,721	-66,838	-8,064	3,509	0	-786	-538

Table P.17. Rusk County Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	11,194	-9,475	-1,820	292	-52	-139	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	28	0	-28
6	0	0	0	0	32	0	-32
7	0	0	0	-46	119	0	-72
8	0	0	0	561	-444	0	-117
9	0	0	0	144	148	0	-292
10	0	0	0	180	170	0	-350
Total	11,194	-9,475	-1,820	1,131	0	-139	-891

Table P.18. Southeast Texas Groundwater Conservation District.

Model Layer	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	-416	-293	0	709
4	0	0	0	-21	26	0	-5
5	0	0	0	-64	194	0	-130
6	0	0	0	-6	-6	0	12
7	0	0	0	-13	54	0	-41
8	0	0	0	-14	39	0	-25
9	0	0	0	147	-37	0	-109
10	0	0	0	-12	24	0	-12
Total	0	0	0	-398	0	0	398

28 Appendix Q: Steady-State Water Budgets by Groundwater Conservation District and Hydrogeologic Unit

Tables summarizing the steady-state water budget by groundwater conservation district and hydrogeologic unit are presented in this appendix. The total water budget for the groundwater conservation district is also provided. The tables are ordered alphabetically by groundwater conservation district.

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Table Q.1. Bluebonnet Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	-56	442	0	-386
Weches	0	0	0	-4	4	0	0
Queen City	0	0	0	50	-50	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	347	-347	0	0
Calvert Bluff	0	0	0	-7	7	0	0
Simsboro	0	0	0	42	-42	0	0
Hooper	0	0	0	13	-13	0	0
Total	0	0	0	386	0	0	-386

Table Q.2. Brazos Valley Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	16,812	-25,539	-743	-4,792	14,312	-49	0
Sparta	8,557	-6,686	-1,408	548	-791	-96	-124
Weches	600	-693	-216	61	316	-68	0
Queen City	10,591	-6,077	-2,794	1,435	-3,093	-62	0
Reklaw	1,640	-1,354	-590	-71	468	-94	0
Carrizo	10,218	-4,639	-1,849	1,150	-4,879	0	0
Calvert Bluff	29,324	-24,290	-6,398	3,230	-1,807	-60	0
Simsboro	6,041	-5,257	-865	2,862	-2,782	0	0
Hooper	2,306	194	-768	509	-2,043	-199	0
Total	86,090	-74,340	-15,631	4,933	-300	-628	-124

Table Q.3. Colorado County Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	40	222	0	-261
Weches	0	0	0	1	-1	0	0
Queen City	0	0	0	142	-142	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	76	-76	0	0
Calvert Bluff	0	0	0	2	-2	0	0
Simsboro	0	0	0	-8	8	0	0
Hooper	0	0	0	8	-8	0	0
Total	0	0	0	261	0	0	-261

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Table Q.4. Evergreen Underground Water Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	677	-1,460	0	-354	1,362	0	-225
Weches	525	-1,427	-37	3	1,008	0	-72
Queen City	5,891	-2,728	-5	-939	-1,690	0	-529
Reklaw	796	-1,169	0	-6	459	0	-80
Carrizo	4,978	-6,302	0	628	1,864	0	-1,168
Calvert Bluff	1,297	-812	-33	1,733	-1,783	0	-402
Simsboro	0	0	0	667	23	0	-690
Hooper	0	0	0	1,420	-728	0	-693
Total	14,163	-13,899	-75	3,153	515	0	-3,858

Table Q.5. Fayette County Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	282	0	-37	-915	261	0	408
Weches	0	0	0	-10	10	0	0
Queen City	0	0	0	2	-2	0	0
Reklaw	0	0	0	15	-15	0	0
Carrizo	0	0	0	88	-88	0	0
Calvert Bluff	0	0	0	63	-63	0	0
Simsboro	0	0	0	-82	82	0	0
Hooper	0	0	0	45	-45	0	0
Total	282	0	-37	-794	141	0	408

Table Q.6. Gonzales County Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/ Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	2,564	-6,239	-235	921	4,120	0	-1,130
Weches	1,240	-3,159	-400	16	2,303	0	0
Queen City	10,301	-14,044	-717	1,270	3,189	0	0
Reklaw	3,251	-3,787	-444	2,230	-1,250	0	0
Carrizo	4,802	-1,222	0	4,521	-8,101	0	0
Calvert Bluff	1,849	-623	-166	-548	-513	0	0
Simsboro	0	0	0	-156	156	0	0
Hooper	0	0	0	341	-341	0	0
Total	24,007	-29,073	-1,962	8,594	-436	0	-1,130

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Table Q.7. Guadalupe County Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	147	0	0	-75	-72	0	0
Reklaw	513	1,734	0	-2,199	-49	0	0
Carrizo	5,773	-15	0	-5,966	208	0	0
Calvert Bluff	10,537	-7,814	-851	-1,923	146	-94	0
Simsboro	2,077	-2,215	-47	-1,321	1,507	0	0
Hooper	4,834	-127	-353	-2,405	-1,949	0	0
Total	23,881	-8,436	-1,252	-13,889	-209	-94	0

Table Q.8. Lone Star Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	107	25	0	-132
Weches	0	0	0	3	-3	0	0
Queen City	0	0	0	19	-19	0	0
Reklaw	0	0	0	0	0	0	0
Carrizo	0	0	0	2	-2	0	0
Calvert Bluff	0	0	0	-1	1	0	0
Simsboro	0	0	0	1	-1	0	0
Hooper	0	0	0	1	-1	0	0
Total	0	0	0	132	0	0	-132

Table Q.9. Lost Pines Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	12,564	-41,496	-240	0	29,278	-106	0
Sparta	12,373	-10,374	-1,869	83	-1,440	0	1,227
Weches	1,807	-1,344	-217	-70	-125	-51	0
Queen City	11,605	-4,325	-2,350	-275	-4,604	-50	0
Reklaw	2,622	-2,901	-713	-50	1,100	-59	0
Carrizo	9,241	255	-418	-1,534	-7,454	-91	0
Calvert Bluff	22,611	-10,225	-7,835	129	-4,680	0	0
Simsboro	6,398	247	-1,713	-90	-4,842	0	0
Hooper	7,248	-1,886	-886	2,778	-7,172	-82	0
Total	86,469	-72,048	-16,241	972	61	-439	1,227

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Table Q.10. Lower Trinity Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	27	-30	0	3
Weches	0	0	0	1	-1	0	0
Queen City	0	0	0	3	-3	0	0
Reklaw	0	0	0	1	-1	0	0
Carrizo	0	0	0	-42	42	0	0
Calvert Bluff	0	0	0	-2	2	0	0
Simsboro	0	0	0	12	-12	0	0
Hooper	0	0	0	-2	2	0	0
Total	0	0	0	-3	0	0	3

Table Q.11. Mid-East Texas Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	22,385	-18,541	-4,482	-9	731	-215	130
Weches	1,672	-1,935	-687	-23	980	-6	0
Queen City	75,456	-54,766	-24,230	578	5,268	-2,307	0
Reklaw	4,344	-3,154	-1,383	249	-55	0	0
Carrizo	18,477	-10,129	-6,371	-268	-1,709	0	0
Calvert Bluff	63,233	-40,214	-16,528	-1,514	-4,974	-3	0
Simsboro	14,774	-19,446	-425	4,005	1,092	0	0
Hooper	15,357	-6,243	-8,063	770	-1,532	-290	0
Total	215,698	-154,427	-62,170	3,788	-199	-2,821	130

Table Q.12. Neches And Trinity Valleys Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	29,380	-9,222	-9,096	-869	-10,248	-27	83
Weches	3,072	-2,734	-1,484	-40	1,376	-190	0
Queen City	264,798	-140,249	-120,257	4,425	-5,262	-3,244	-210
Reklaw	9,600	-15,472	-5,850	723	11,258	-174	-85
Carrizo	6,400	-4,182	-261	103	-1,808	0	-252
Calvert Bluff	32,776	-22,386	-13,811	-299	4,305	-161	-423
Simsboro	3,613	-1,830	-645	-757	212	-60	-535
Hooper	7,956	-7,080	-2,950	1,395	1,320	-168	-474
Total	357,596	-203,154	-154,354	4,681	1,151	-4,023	-1,895

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Table Q.13. Pecan Valley Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	-109	303	0	-194
Weches	0	0	0	-3	3	0	0
Queen City	0	0	0	133	-133	0	0
Reklaw	0	0	0	-3	3	0	0
Carrizo	0	0	0	171	-171	0	0
Calvert Bluff	0	0	0	3	-3	0	0
Simsboro	0	0	0	-7	7	0	0
Hooper	0	0	0	9	-9	0	0
Total	0	0	0	194	0	0	-194

Table Q.14. Pineywoods Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	38,486	-28,019	-10,184	818	-2,466	-117	1,482
Weches	4,352	-4,697	-1,681	98	2,051	-123	0
Queen City	30,984	-4,190	-21,359	923	-5,313	-1,046	0
Reklaw	3,456	-3,732	-1,901	-514	2,831	-140	0
Carrizo	21,366	-8,294	-5,693	-417	-6,774	-64	-123
Calvert Bluff	2,744	-8,016	-73	-889	6,594	0	-360
Simsboro	0	0	0	-2,118	2,451	0	-333
Hooper	0	0	0	-396	725	0	-329
Total	101,388	-56,948	-40,891	-2,496	98	-1,489	338

Table Q.15. Plum Creek Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	0	0	0	0
Weches	0	0	0	0	0	0	0
Queen City	324	-387	0	6	57	0	0
Reklaw	32	0	0	-18	-14	0	0
Carrizo	157	0	0	-34	-123	0	0
Calvert Bluff	8,940	-9,642	-3,321	757	3,266	0	0
Simsboro	1,295	-840	-581	653	-527	0	0
Hooper	3,373	-1,020	-944	783	-2,192	0	0
Total	14,121	-11,889	-4,847	2,147	468	0	0

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Table Q.16. Post Oak Savannah Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	5,908	-21,601	0	4,792	10,974	-73	0
Sparta	7,554	-2,936	-90	245	-4,236	0	-538
Weches	872	-2,259	-89	61	1,451	-34	0
Queen City	13,142	-8,547	-1,346	-891	-2,358	0	0
Reklaw	1,488	-327	-299	6	-799	-68	0
Carrizo	3,553	-3,680	-85	-842	1,055	0	0
Calvert Bluff	18,992	-18,953	-1,426	290	1,499	-402	0
Simsboro	12,316	-5,932	-1,045	-460	-4,879	0	0
Hooper	8,897	-2,609	-3,683	243	-2,640	-208	0
Total	72,721	-66,843	-8,064	3,443	66	-786	-538

Table Q.17. Rusk County Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	694	0	-138	0	-556	0	0
Weches	0	0	0	0	0	0	0
Queen City	3,265	-392	-750	-84	-1,904	-106	-28
Reklaw	1,216	-1,519	-525	-372	1,265	-33	-32
Carrizo	3,783	-4,005	-304	347	251	0	-72
Calvert Bluff	2,237	-3,559	-104	952	590	0	-117
Simsboro	0	0	0	144	148	0	-292
Hooper	0	0	0	180	170	0	-350
Total	11,194	-9,475	-1,820	1,167	-36	-139	-891

Table Q.18. Southeast Texas Groundwater Conservation District.

Hydrogeologic Unit	Recharge	River-Groundwater Exchange	Streams/Seeps/Spring Flow	Lateral Flow	Vertical Flow	ET	General Head Boundary
Alluvium	0	0	0	0	0	0	0
Sparta	0	0	0	-416	-293	0	709
Weches	0	0	0	-21	26	0	-5
Queen City	0	0	0	-64	194	0	-130
Reklaw	0	0	0	-6	-6	0	12
Carrizo	0	0	0	-13	54	0	-41
Calvert Bluff	0	0	0	-14	39	0	-25
Simsboro	0	0	0	147	-37	0	-109
Hooper	0	0	0	-12	24	0	-12
Total	0	0	0	-398	0	0	398

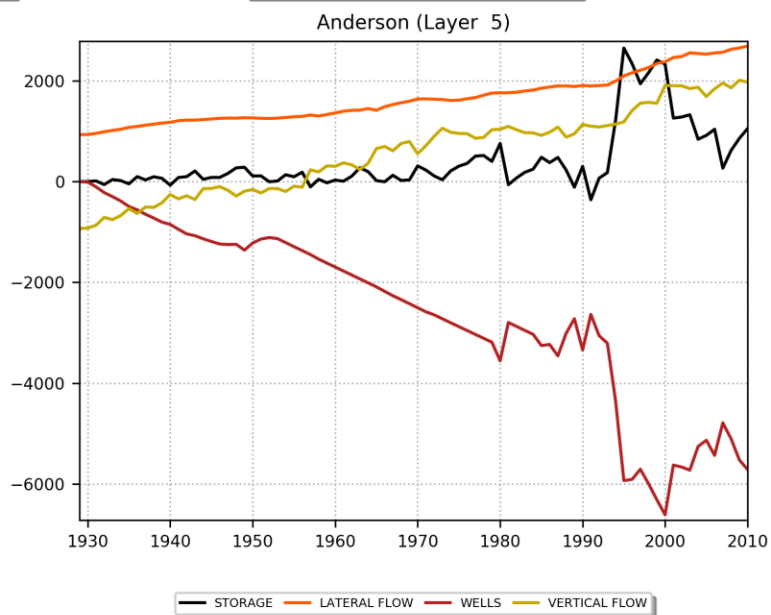
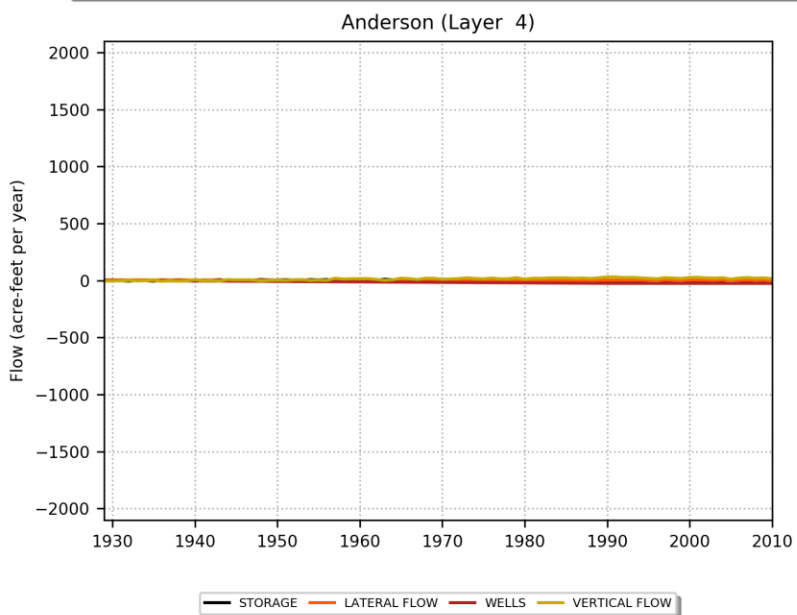
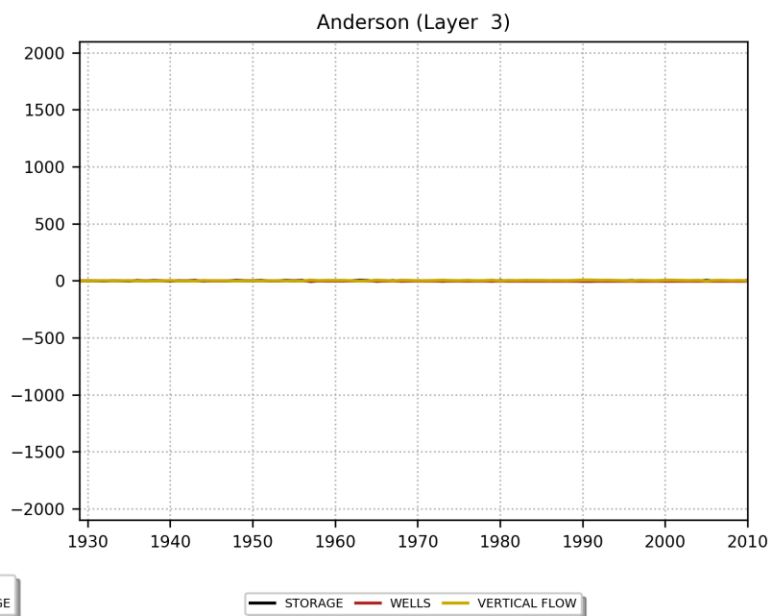
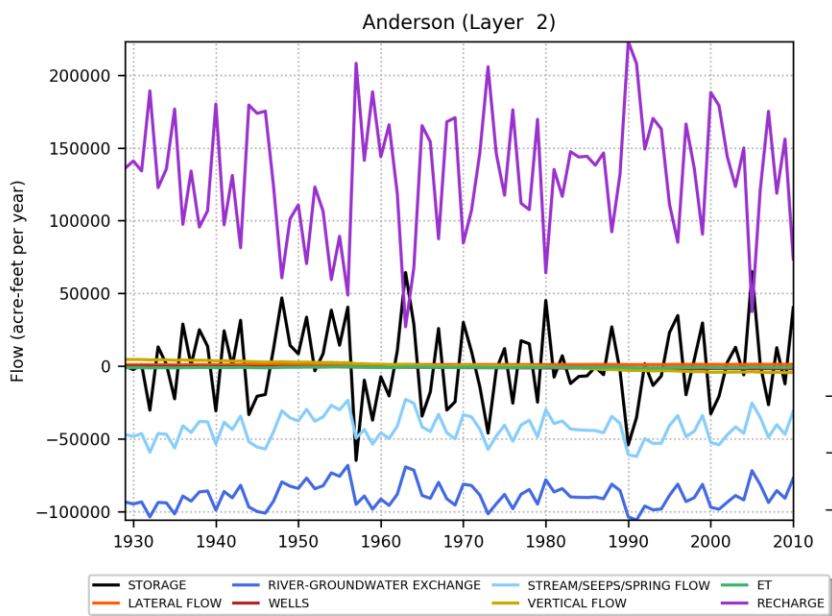
29 Appendix R: Transient Water Budgets by County and Layer

Figures showing the transient water budget by county and model layer are presented in this appendix. The figures are ordered alphabetically by county then layer.

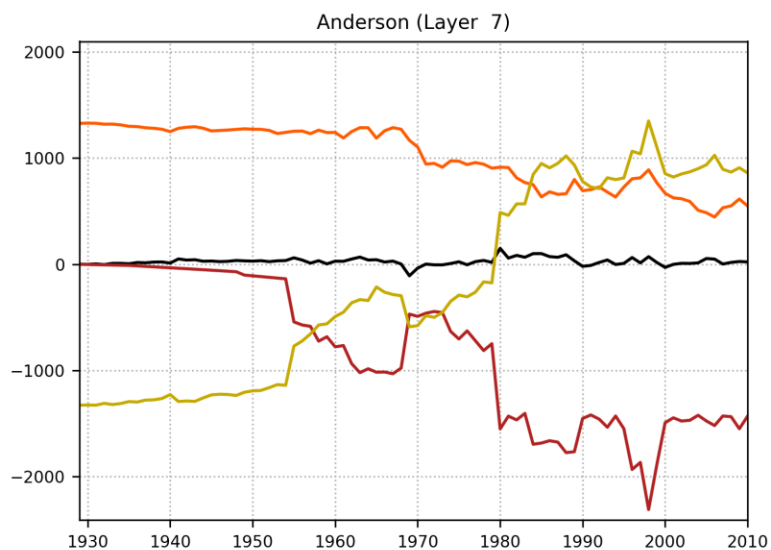
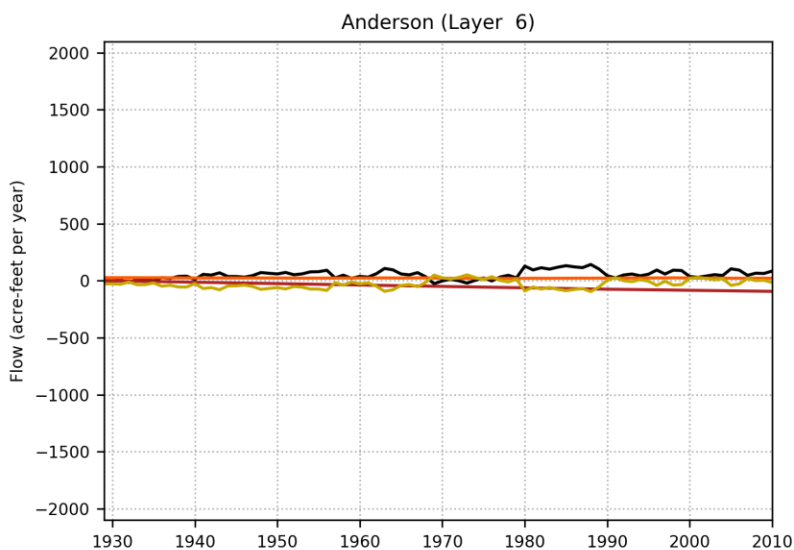
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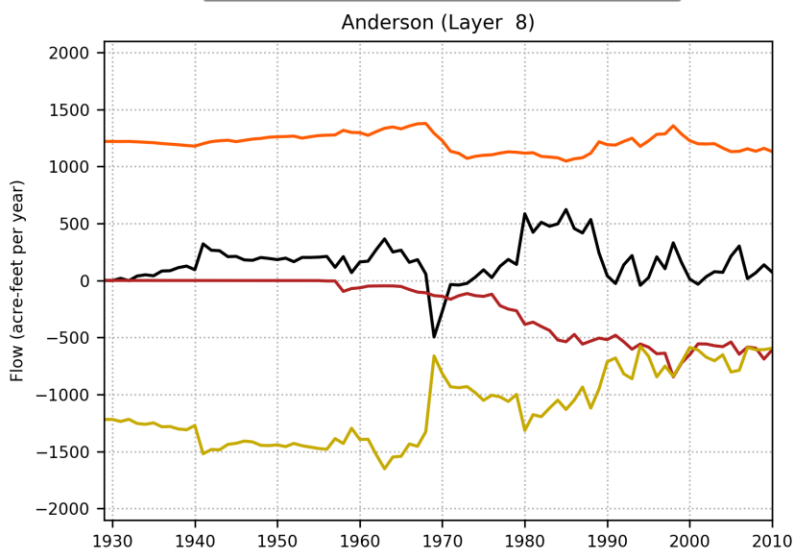


Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

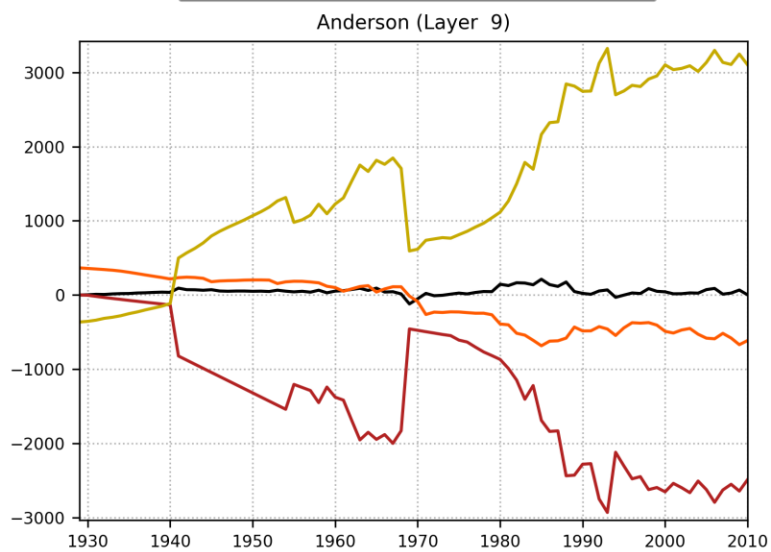


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— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

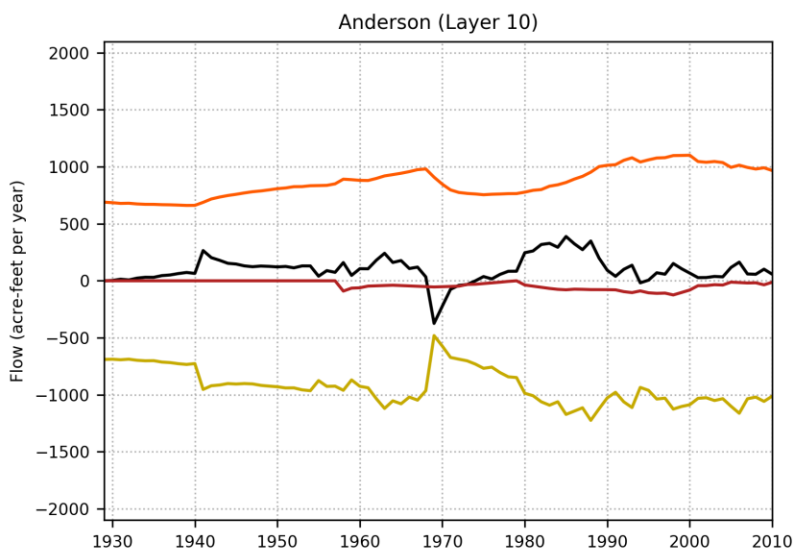


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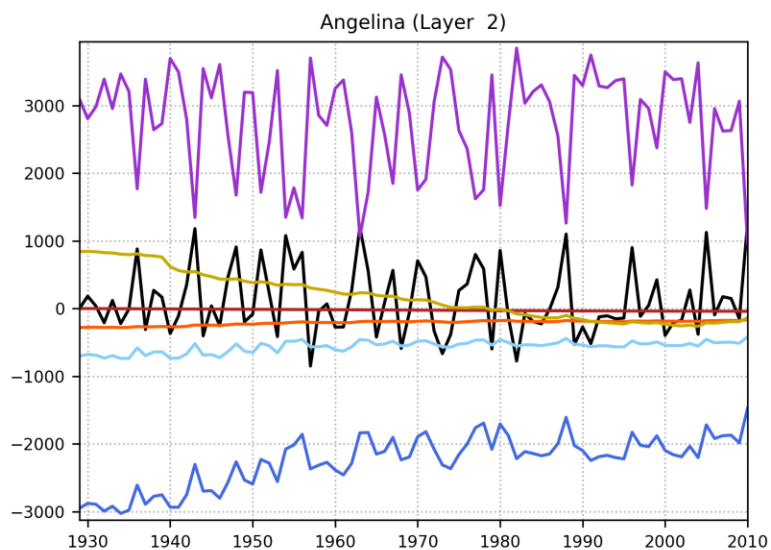


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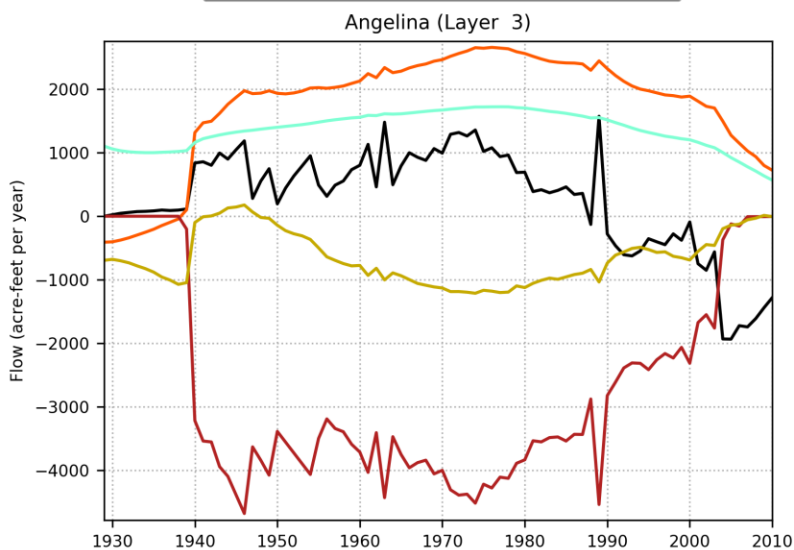
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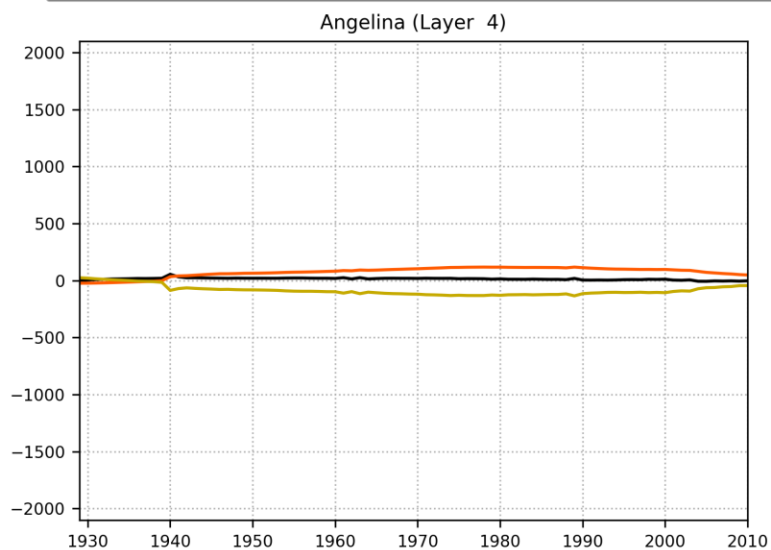
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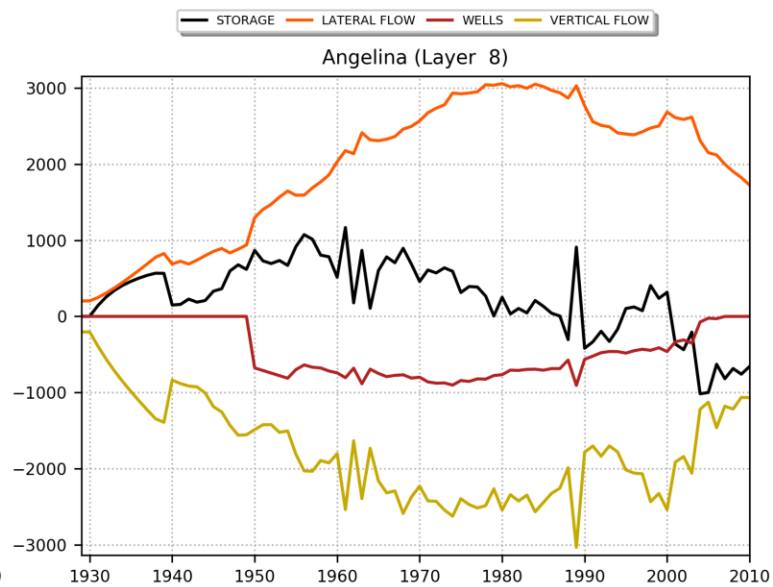
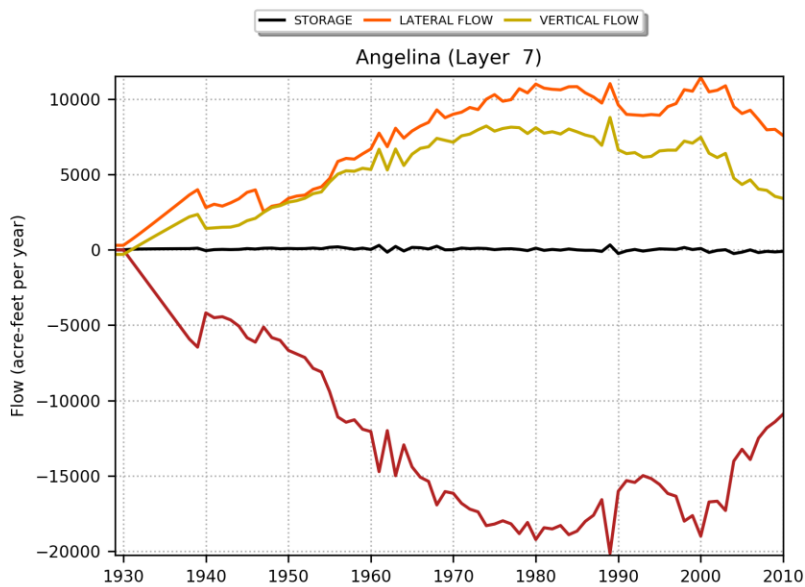
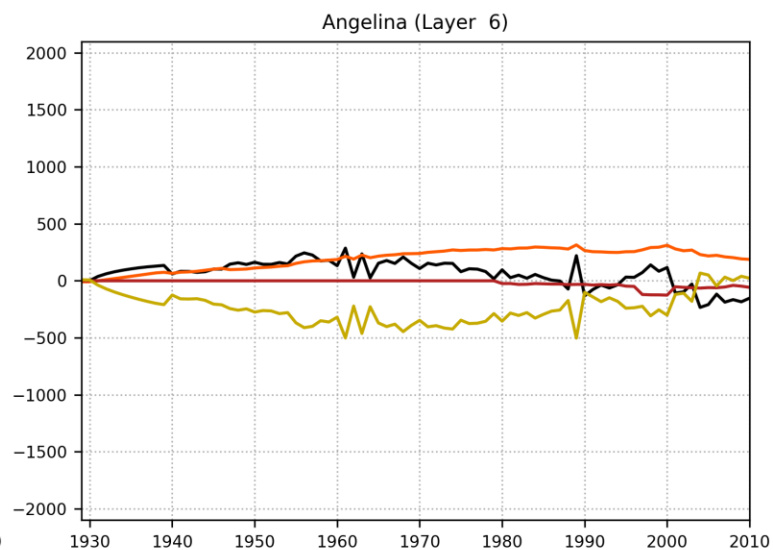
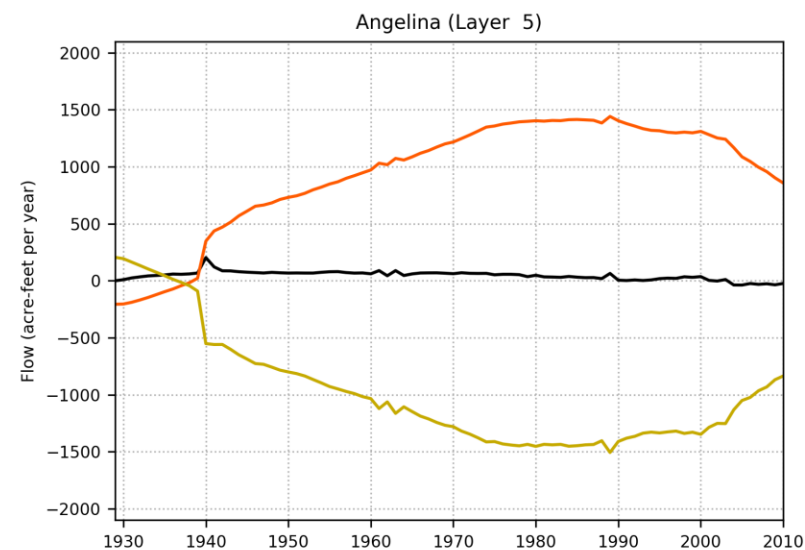


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— LATERAL FLOW

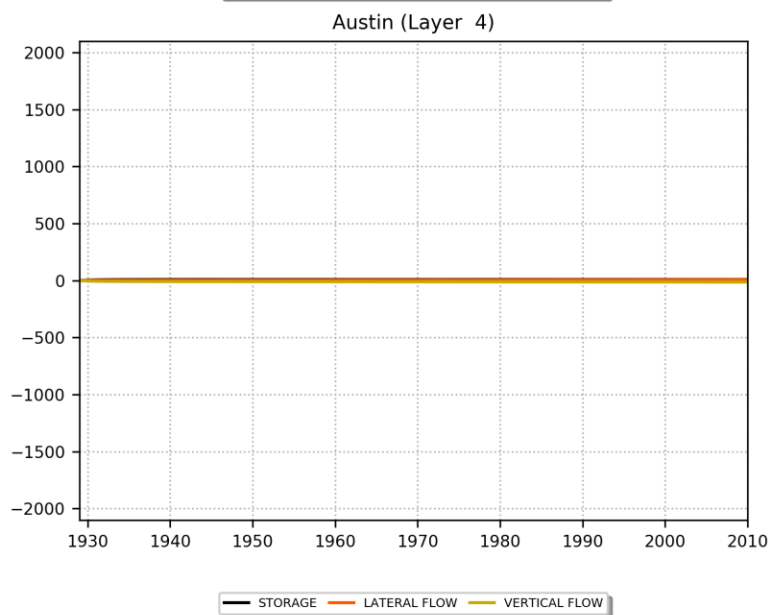
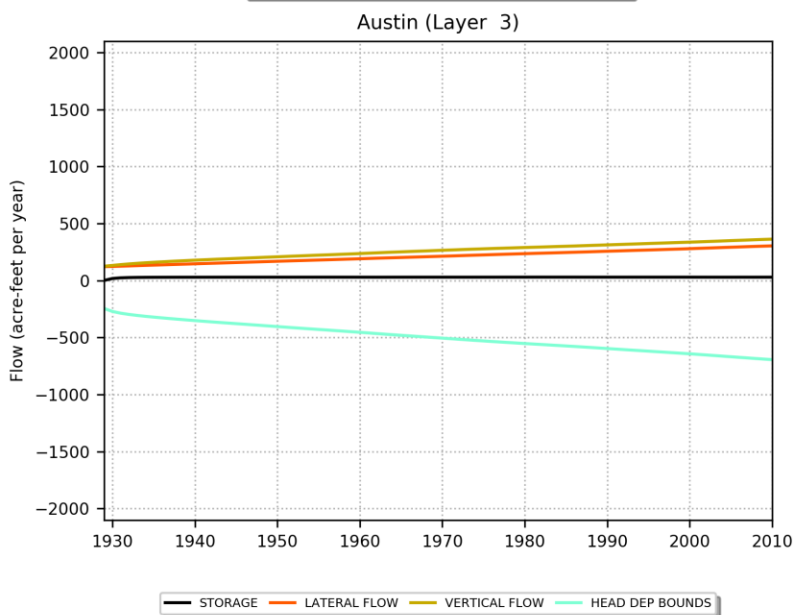
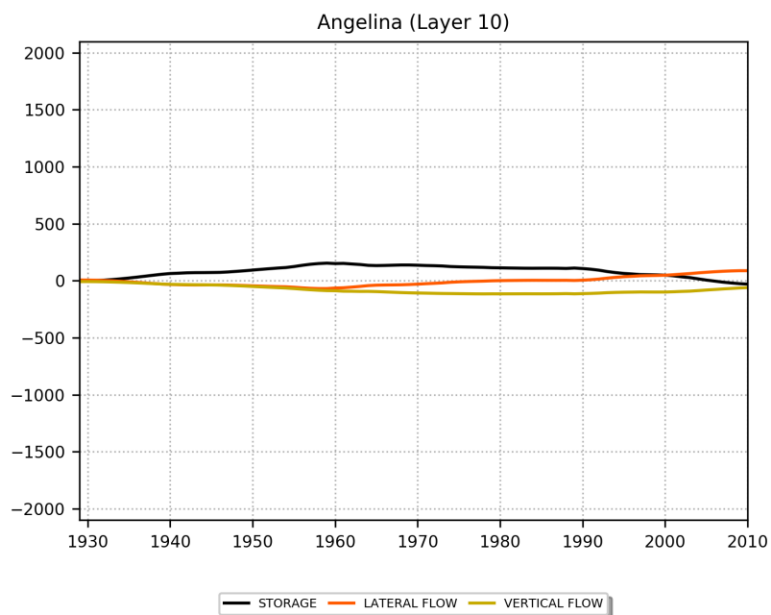
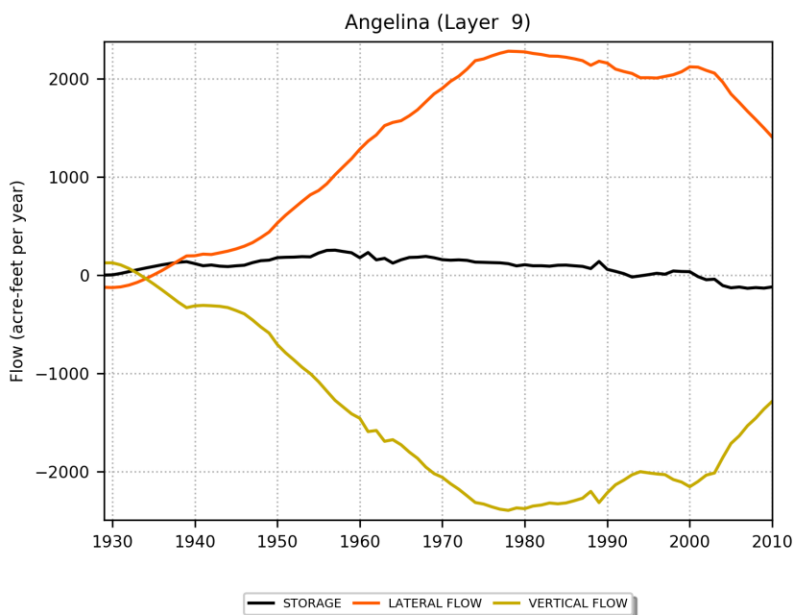


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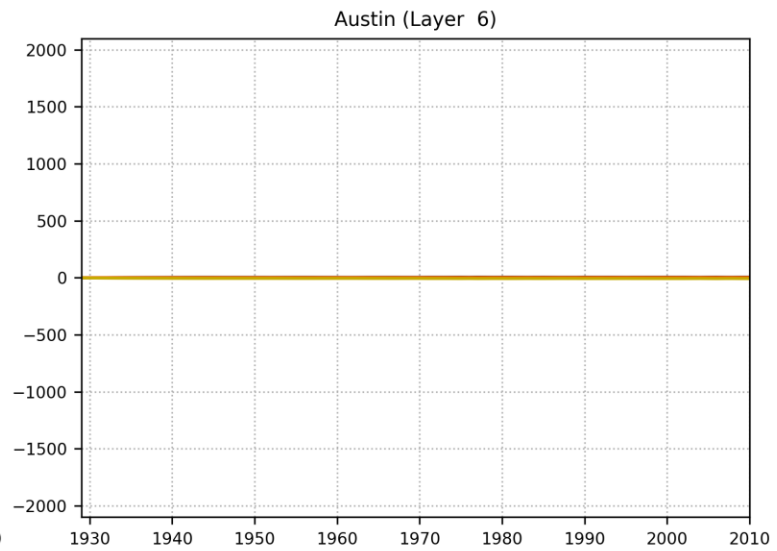
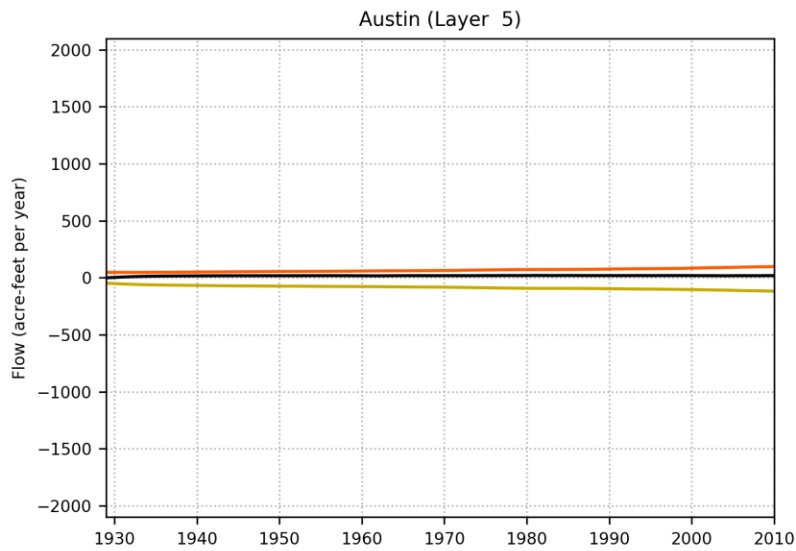
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



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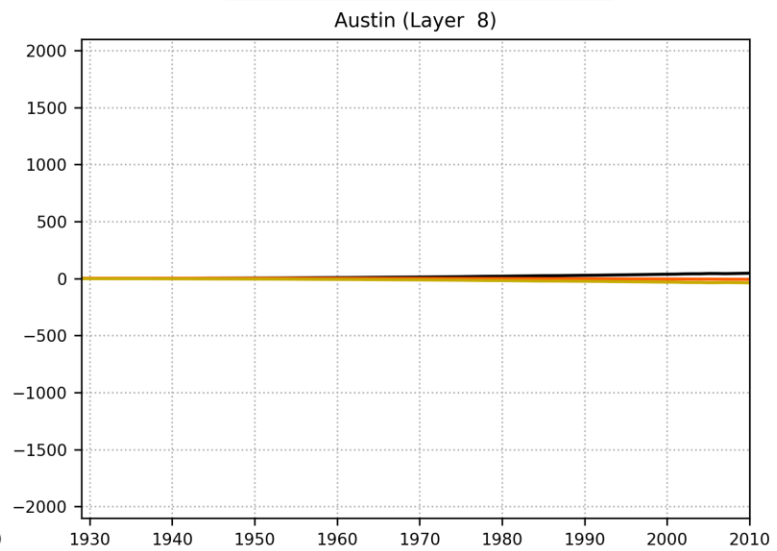
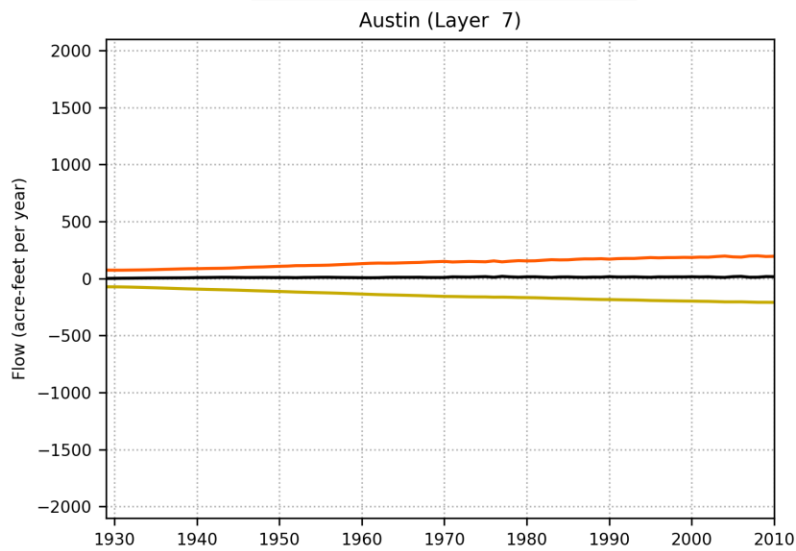


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— STORAGE — LATERAL FLOW — VERTICAL FLOW

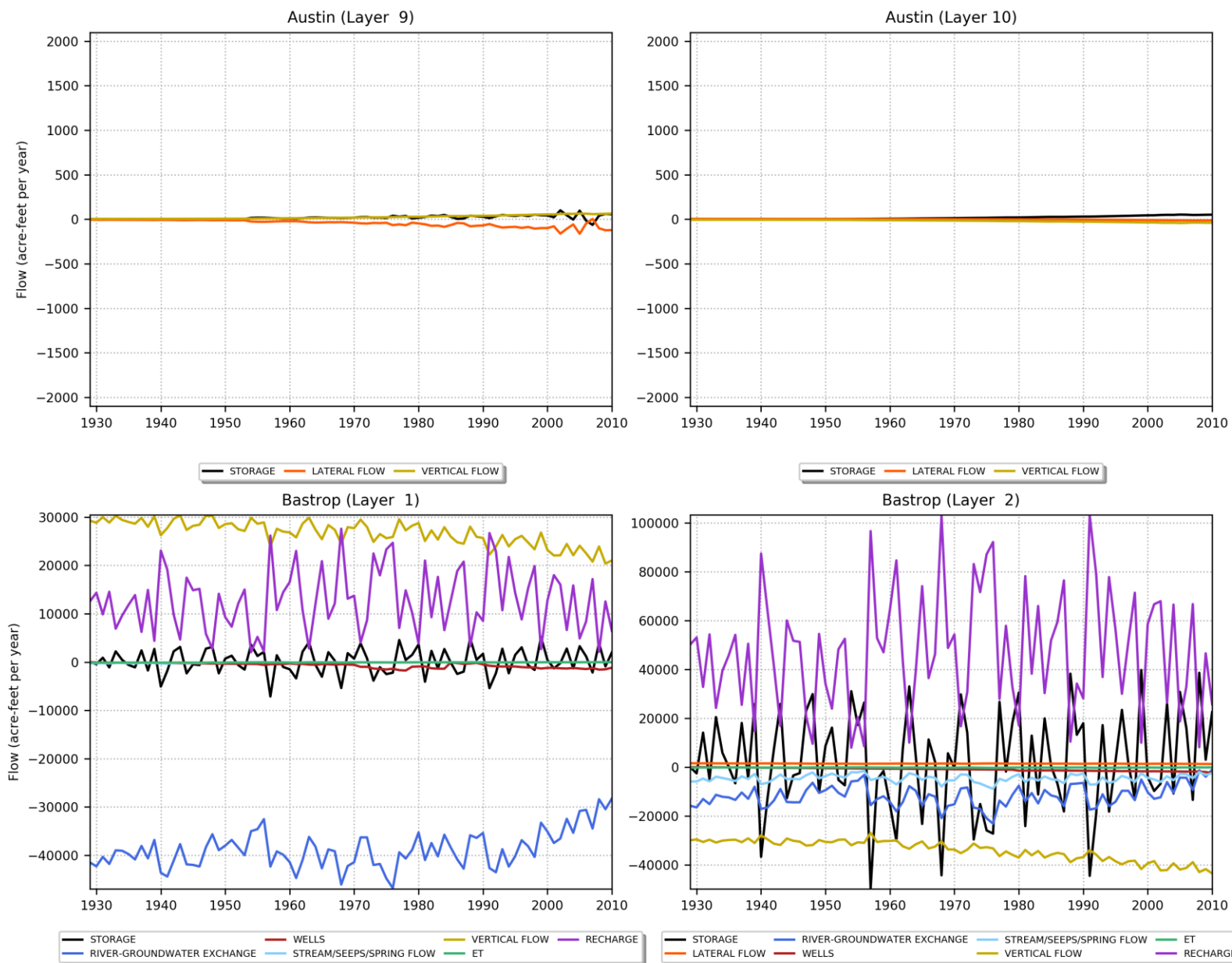
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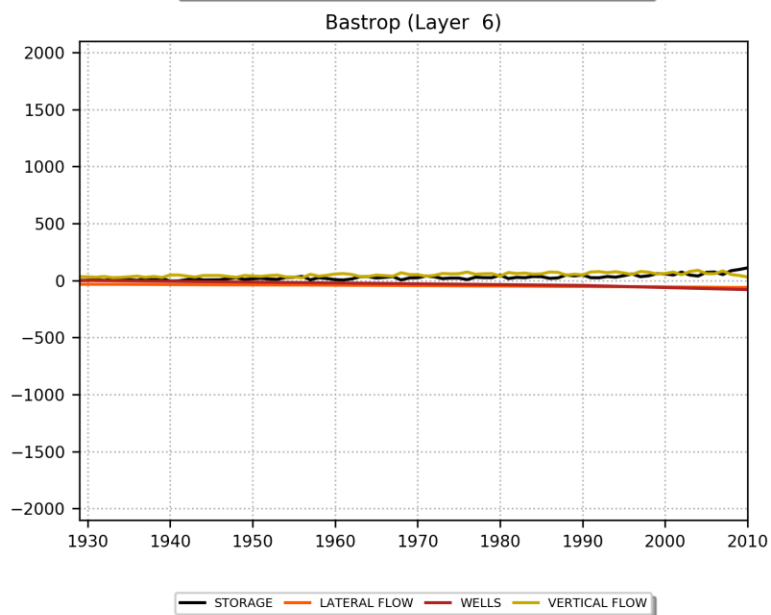
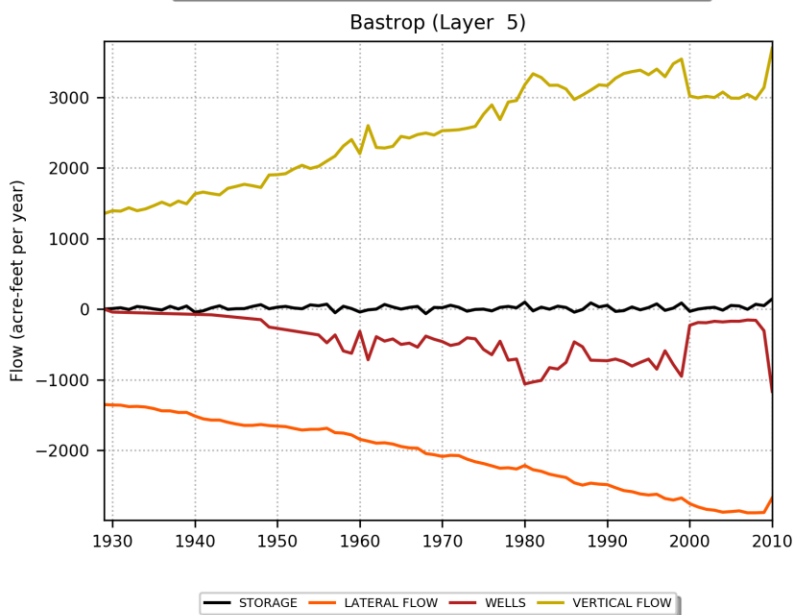
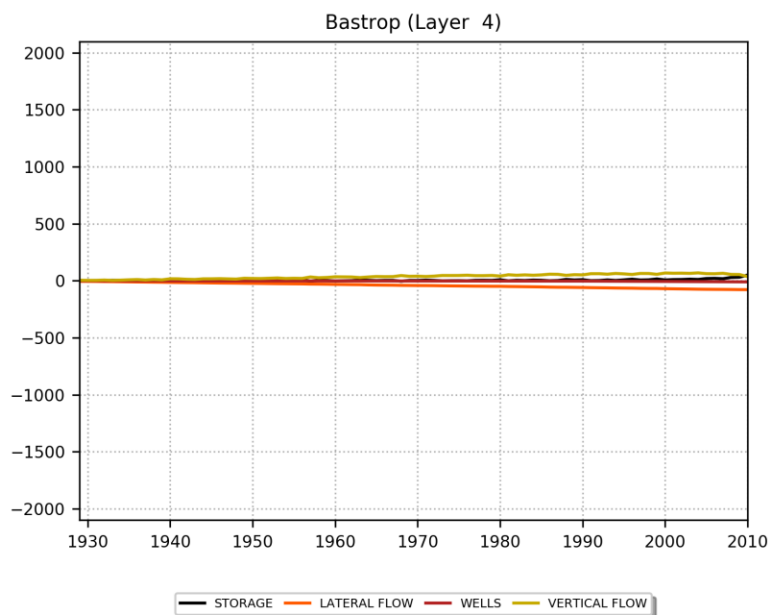
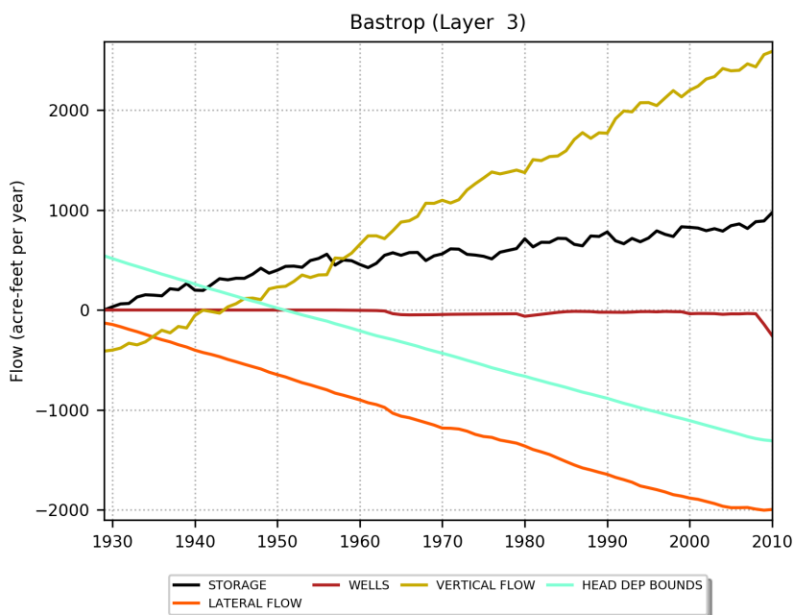
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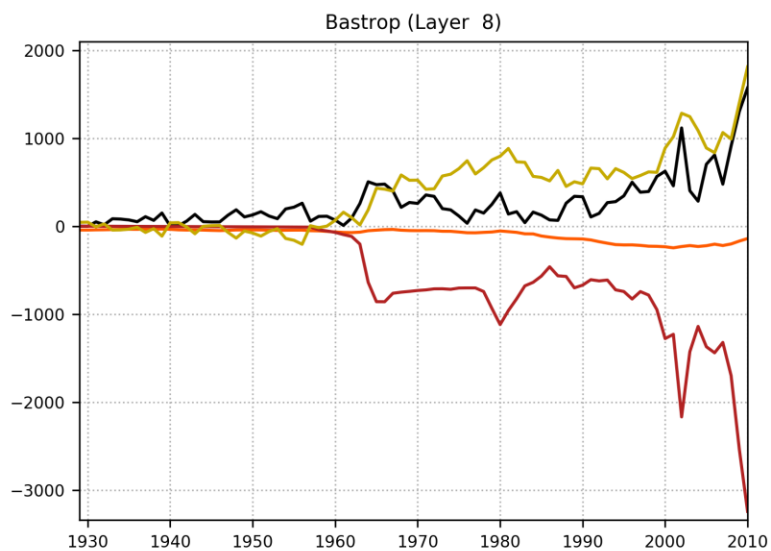
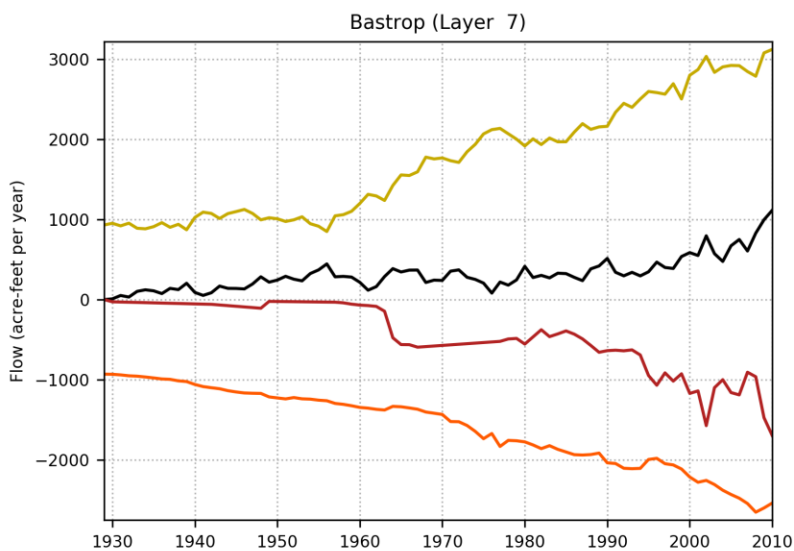
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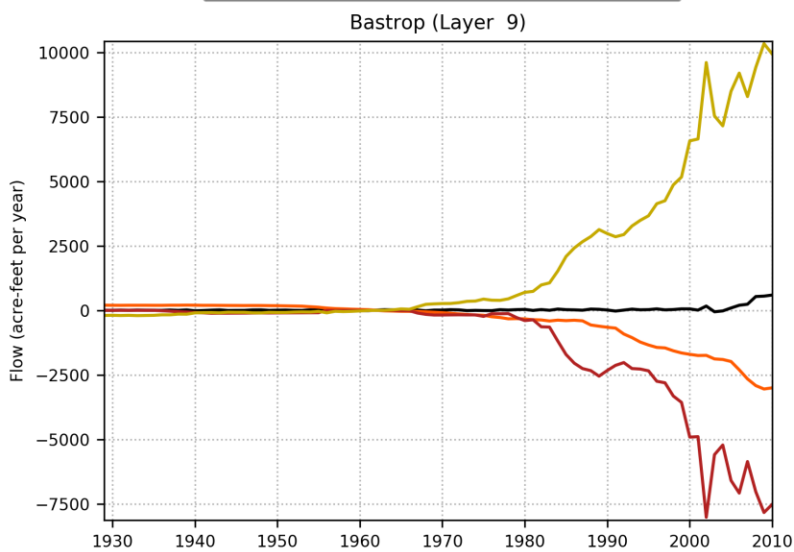


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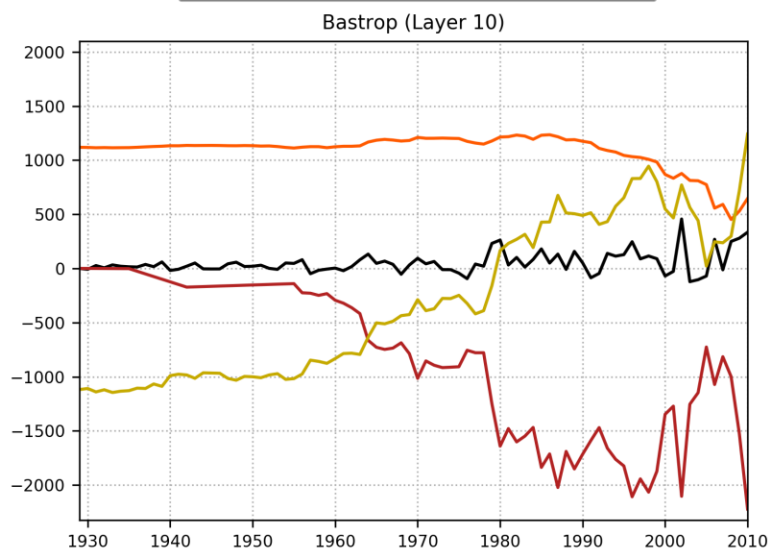


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

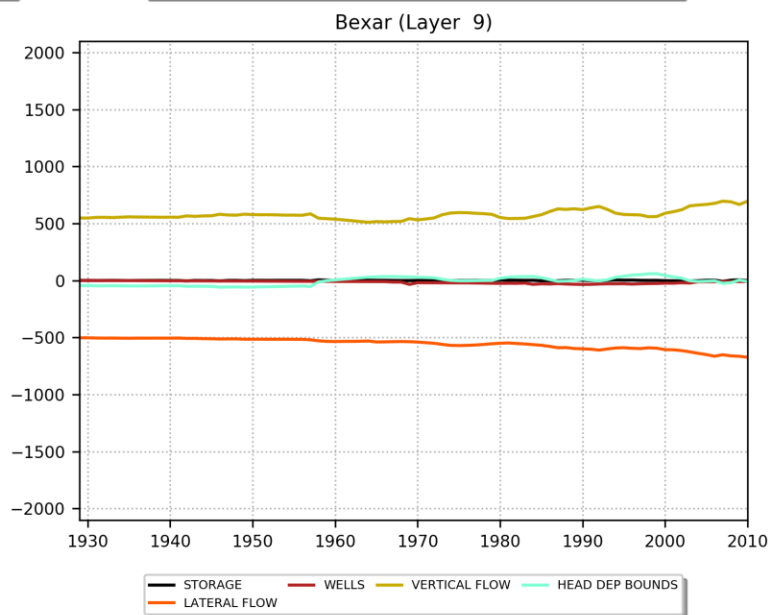
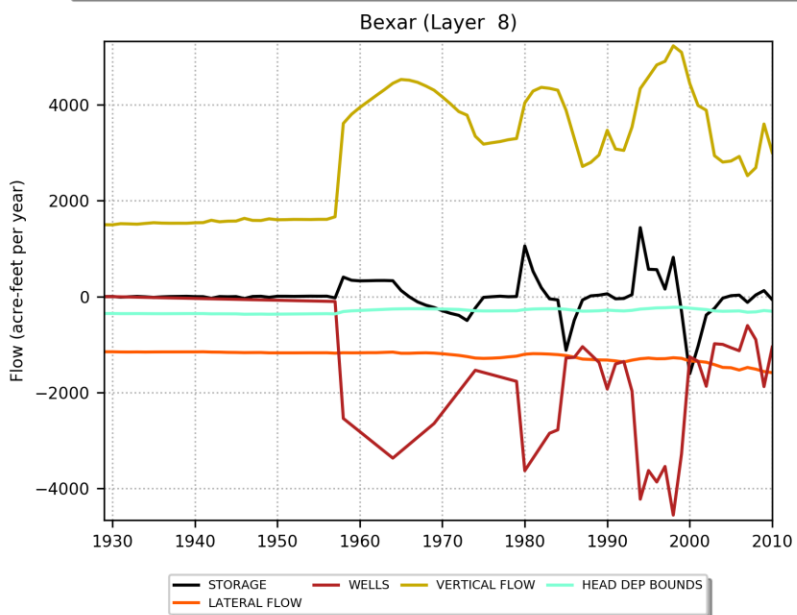
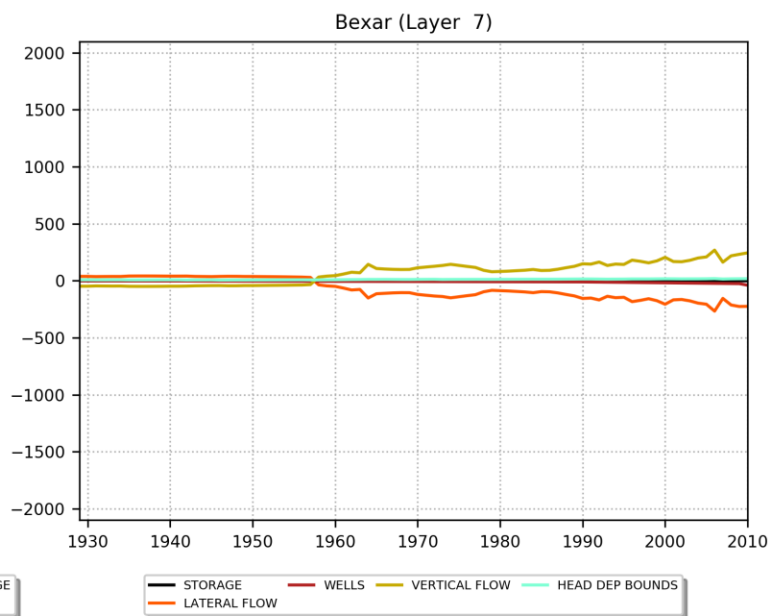
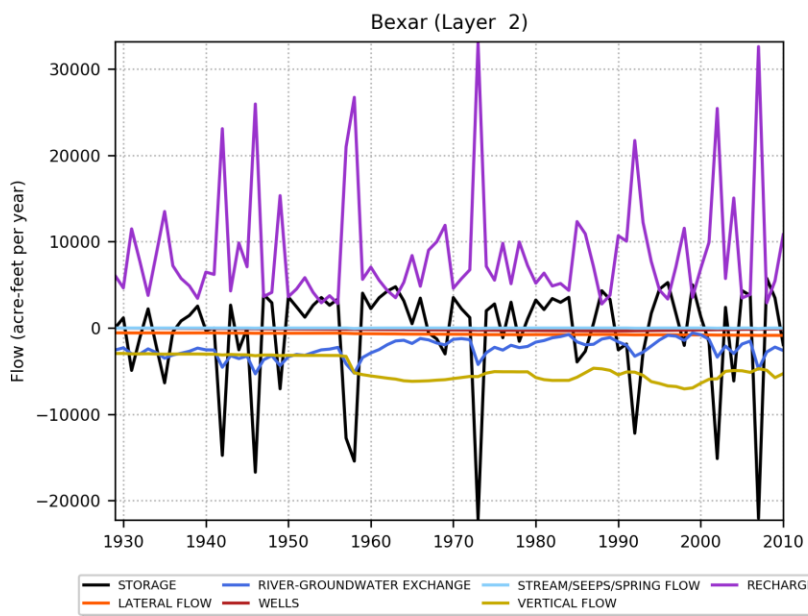


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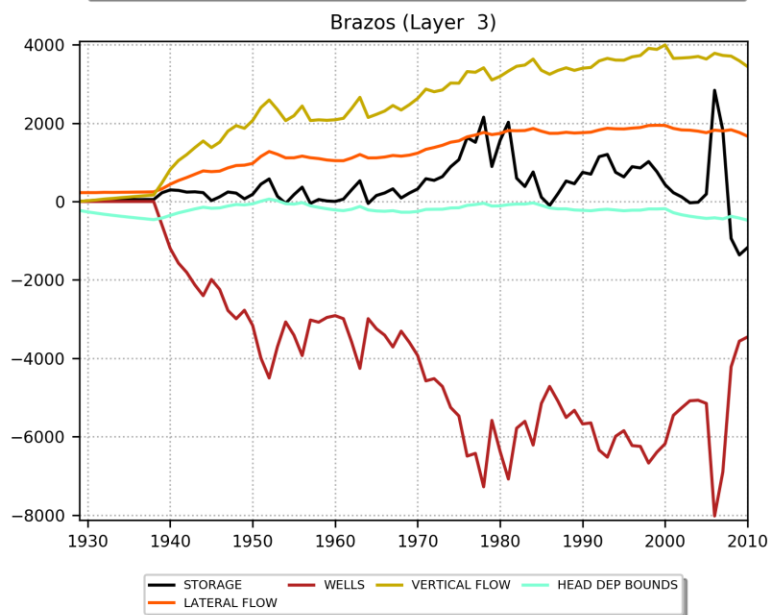
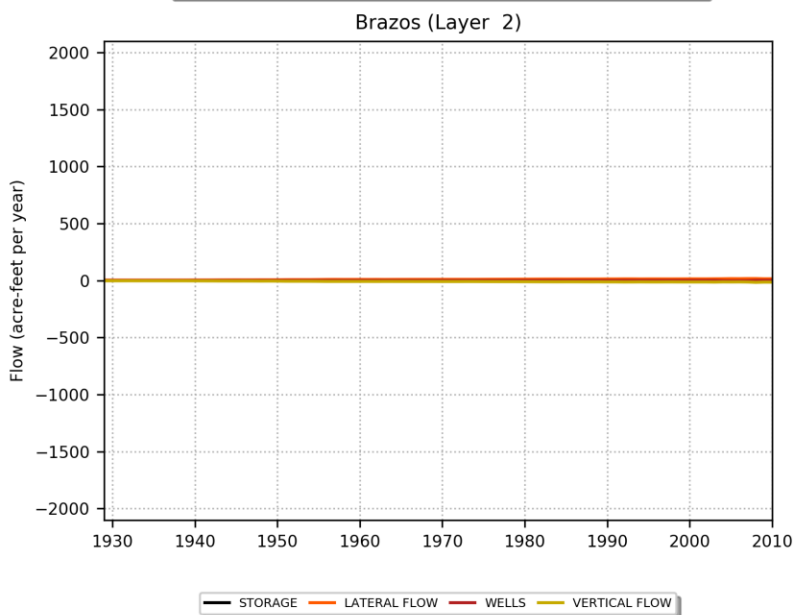
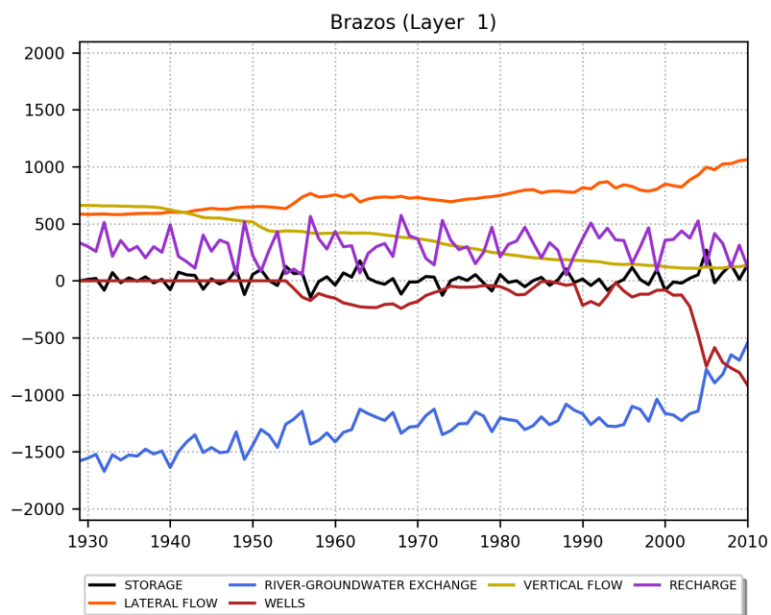
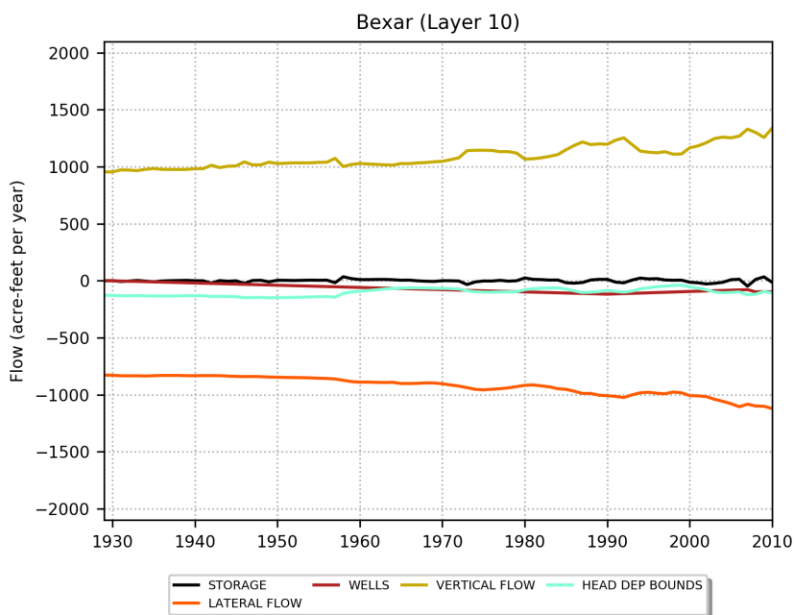


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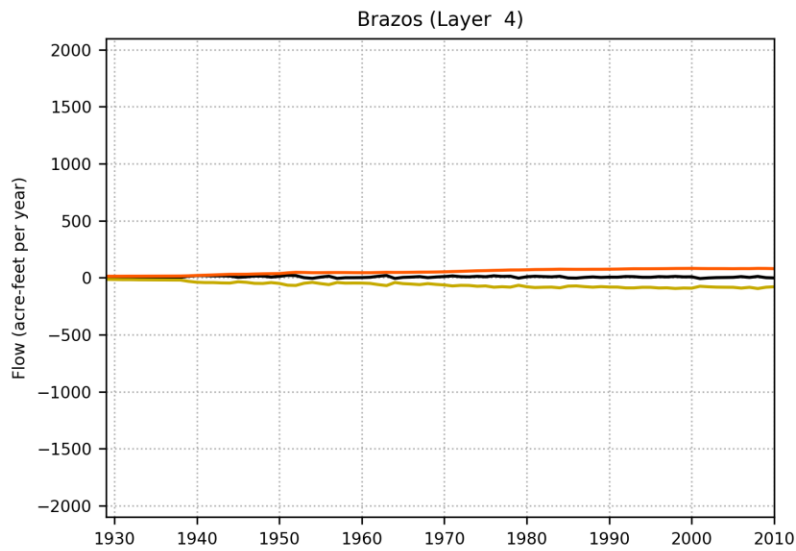
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



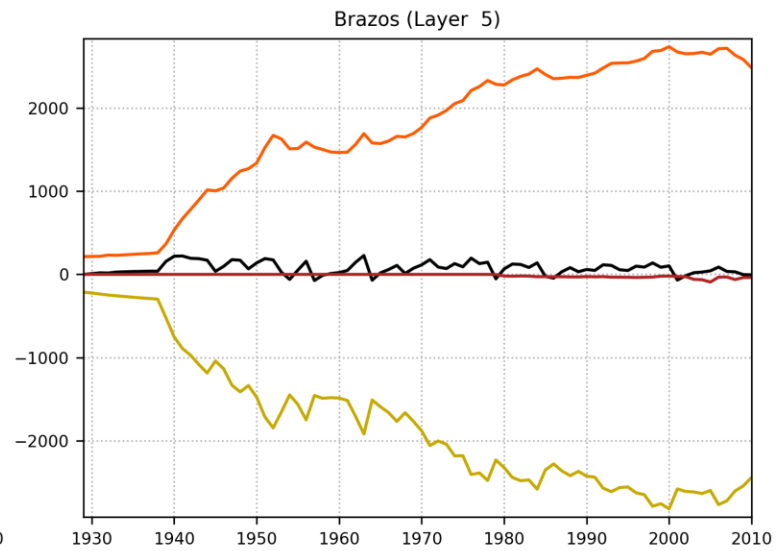
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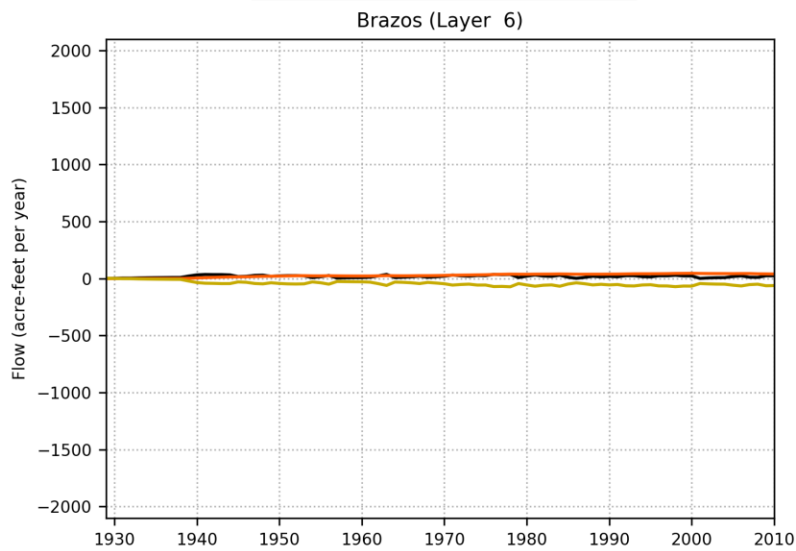
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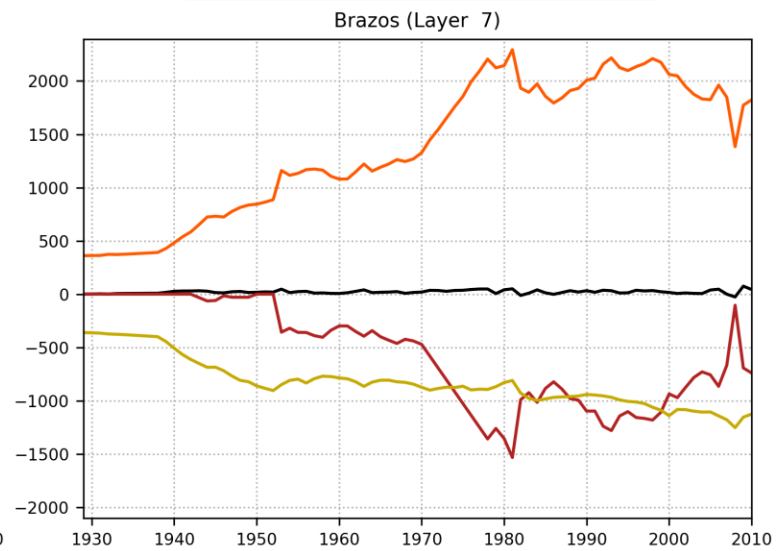
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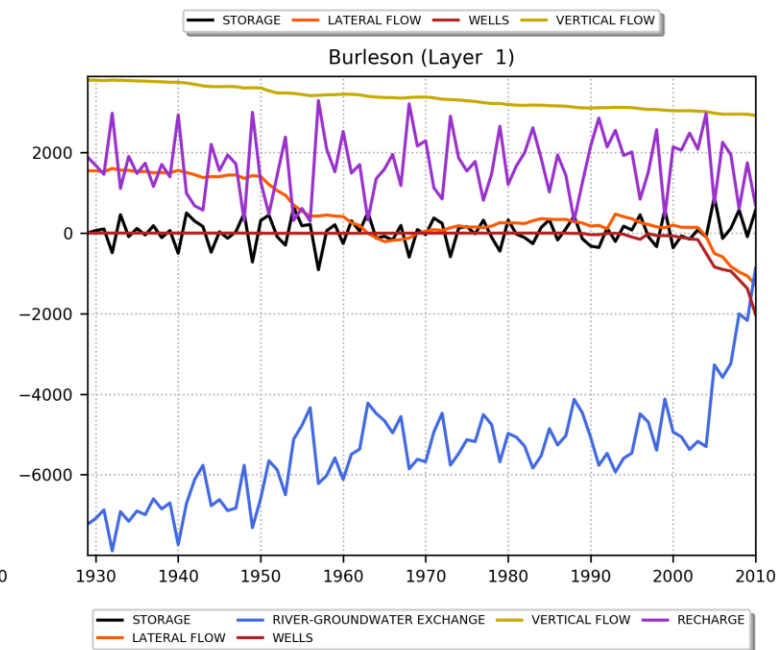
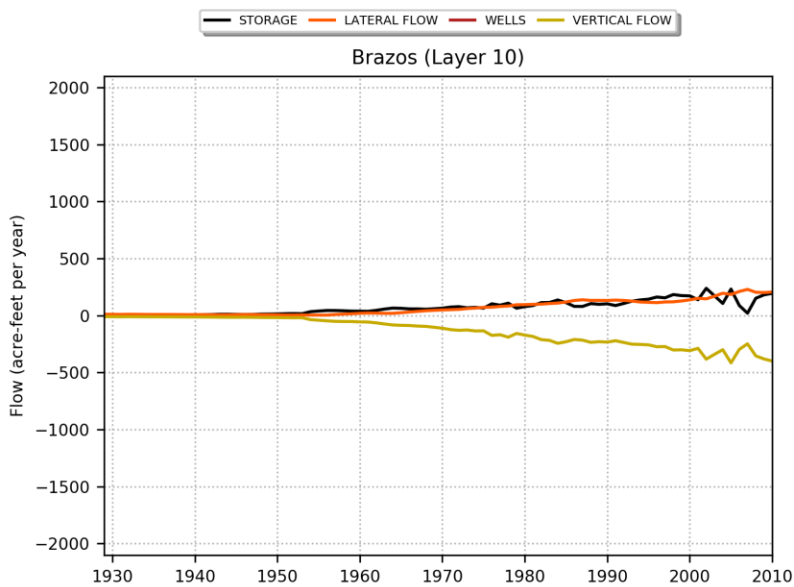
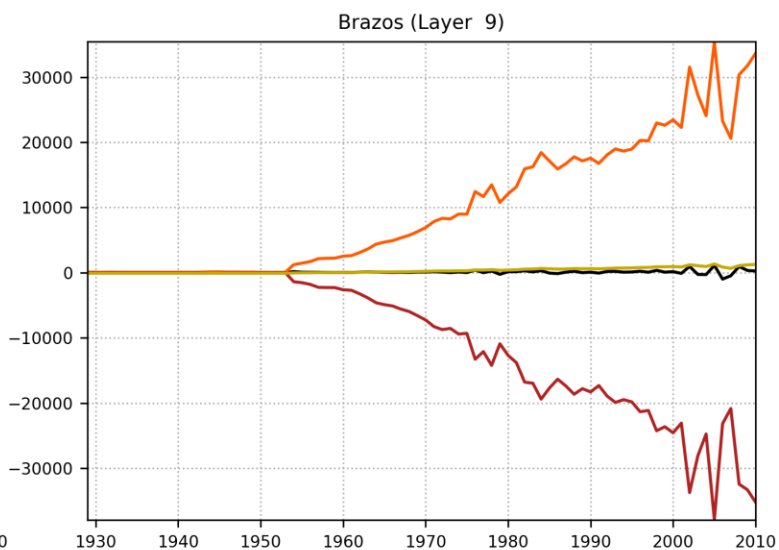
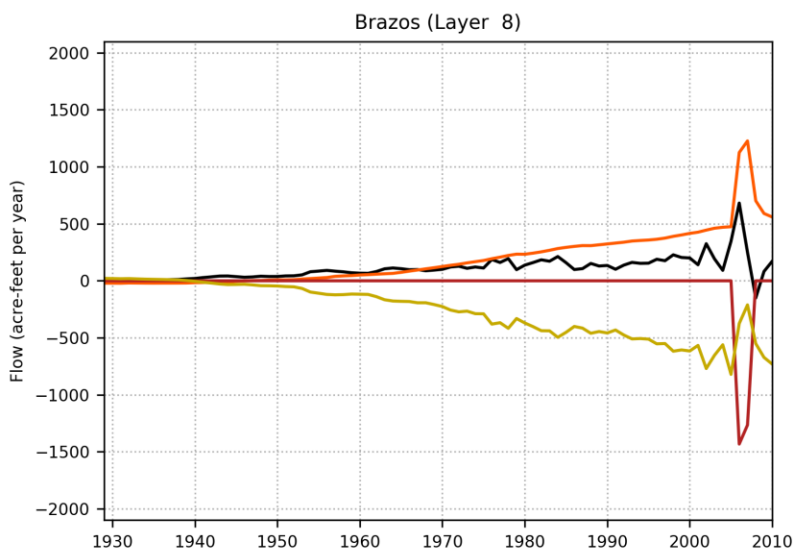


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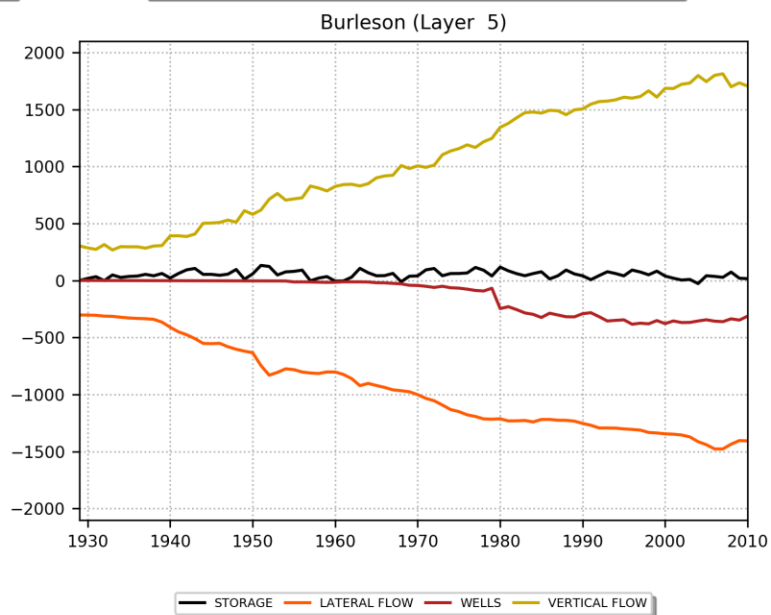
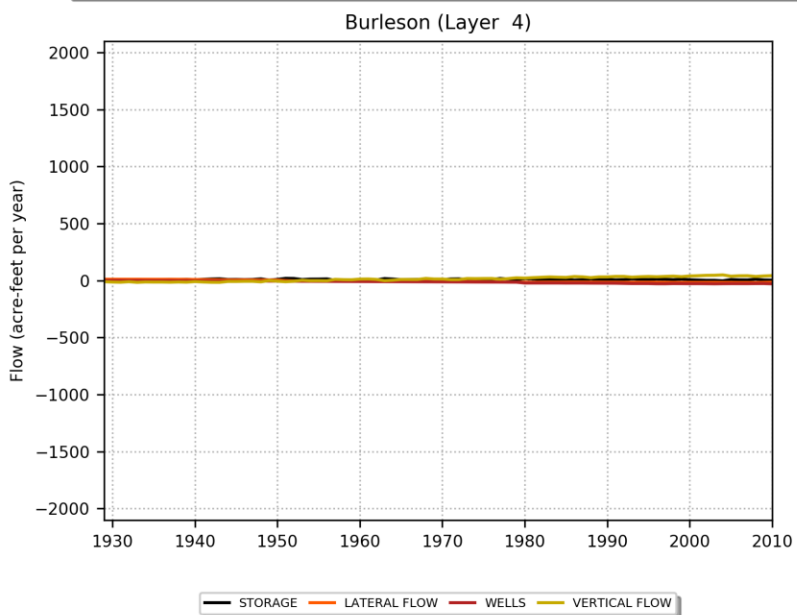
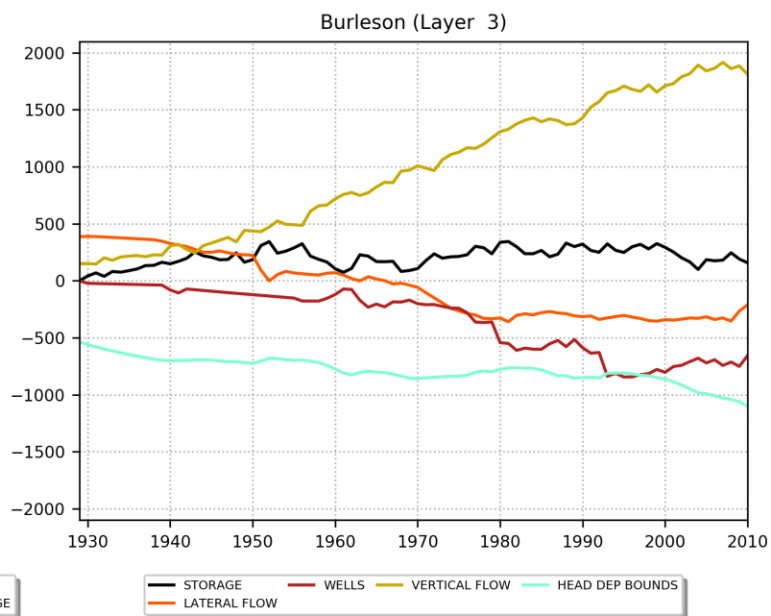
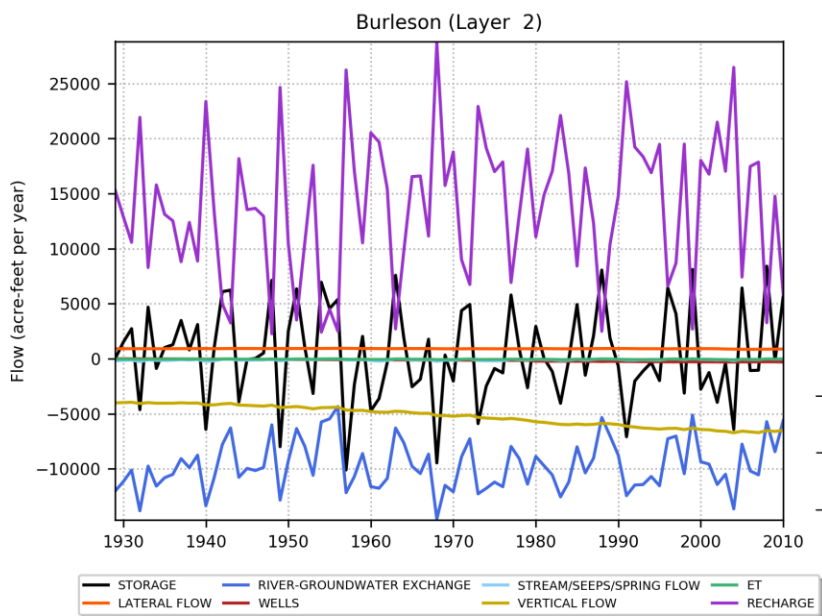


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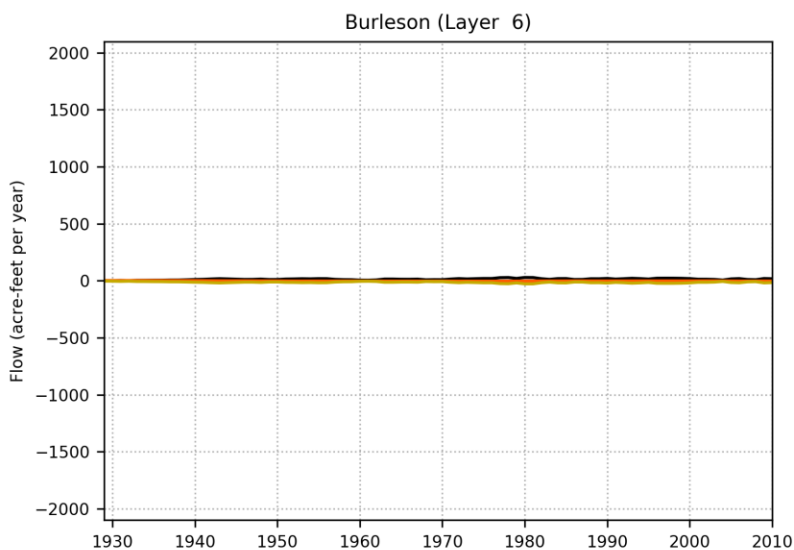
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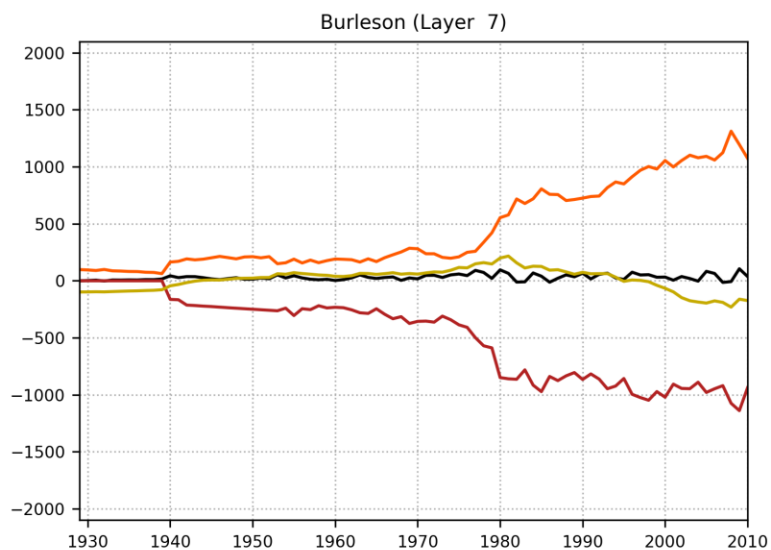
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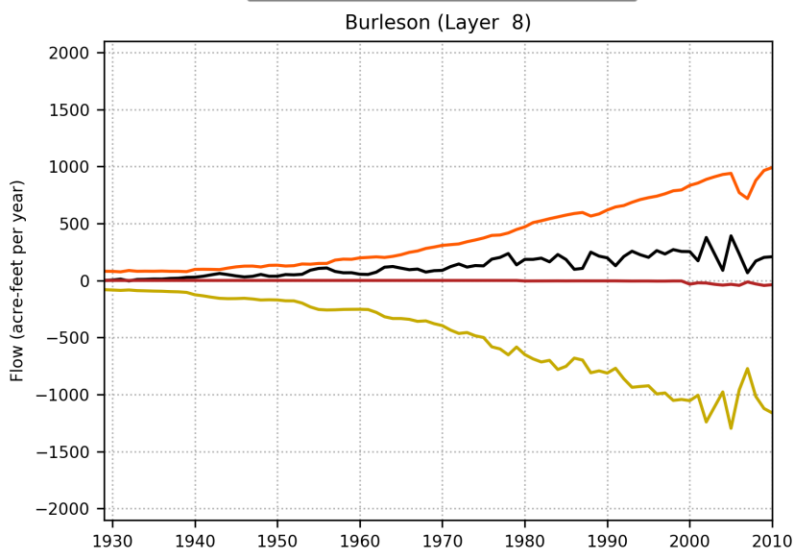
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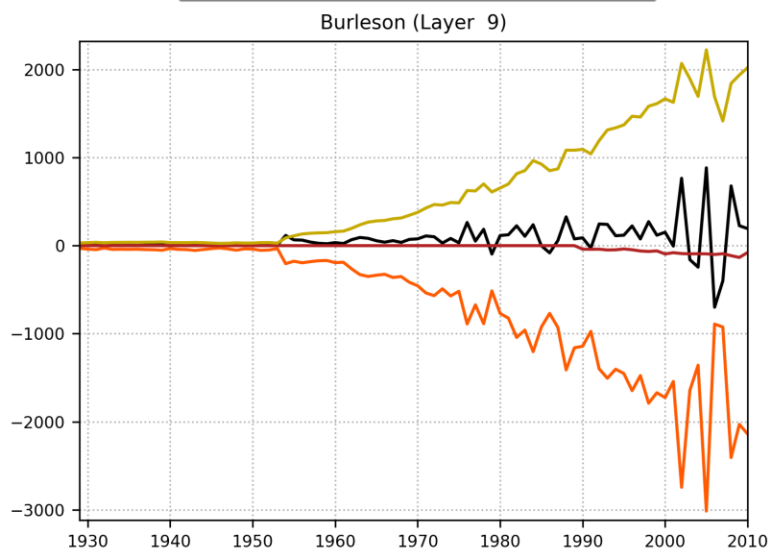
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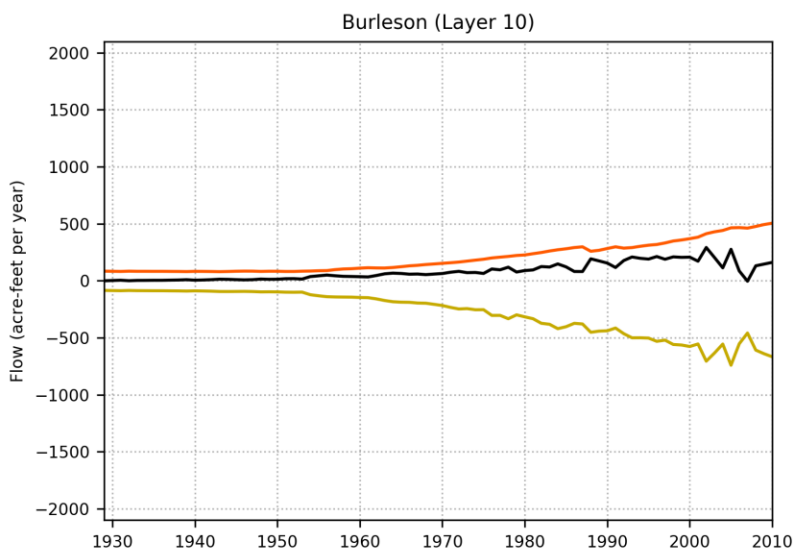


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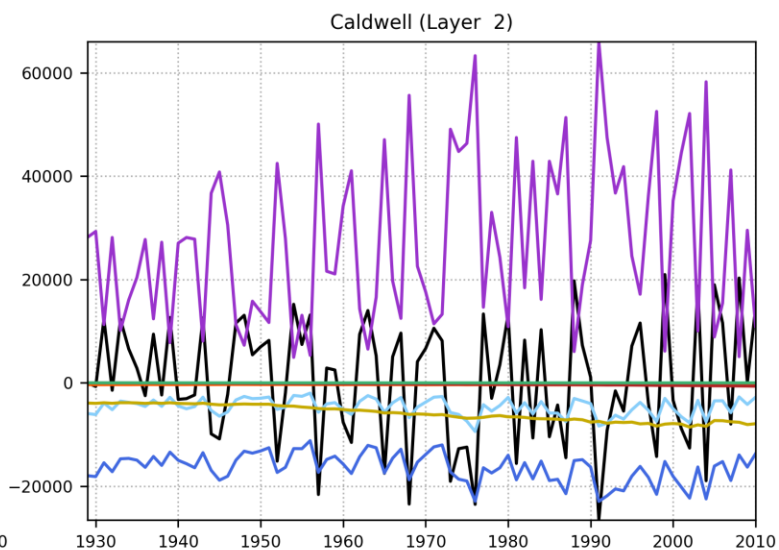


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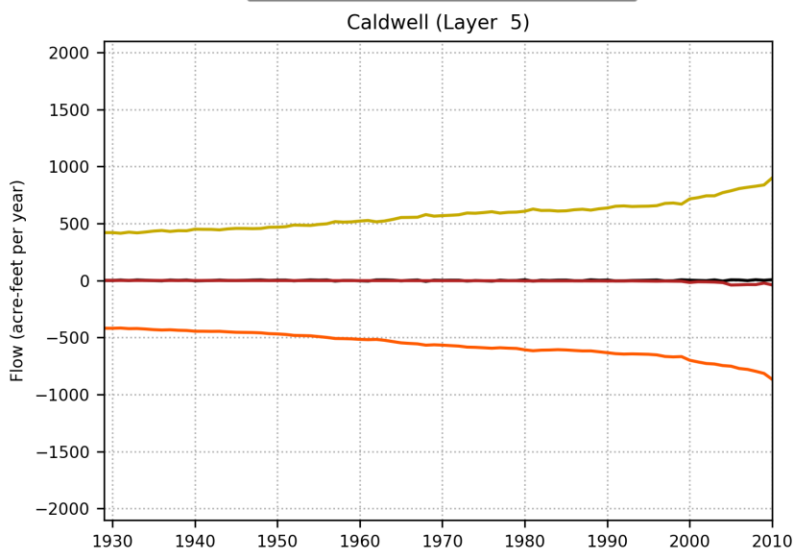
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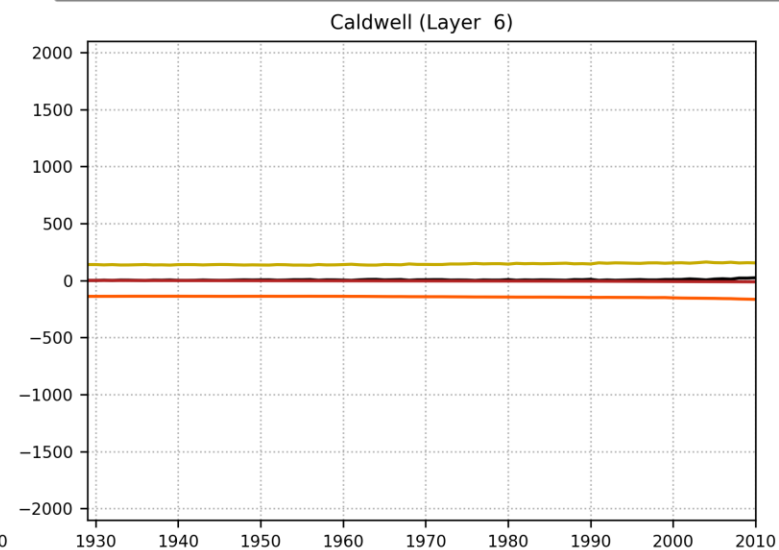
— STORAGE — LATERAL FLOW — VERTICAL FLOW



— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

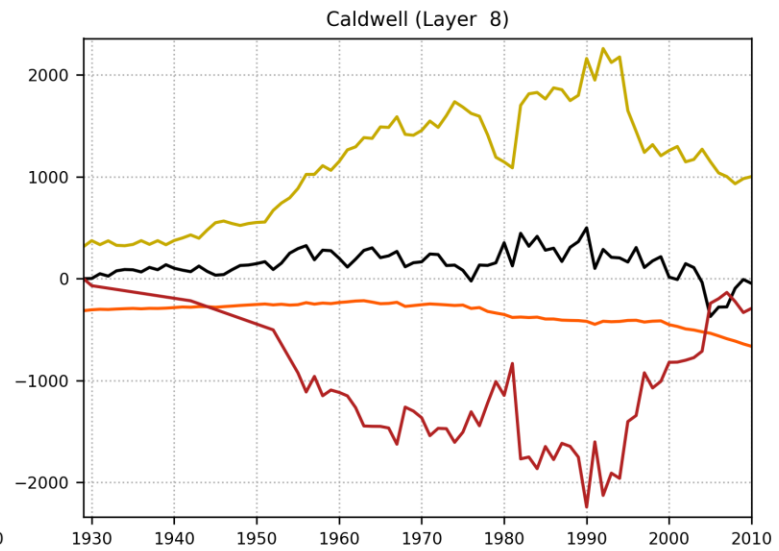
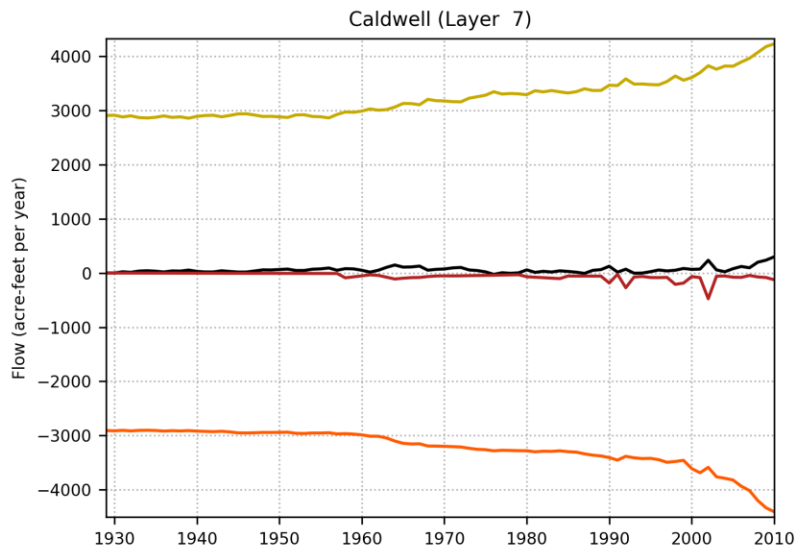


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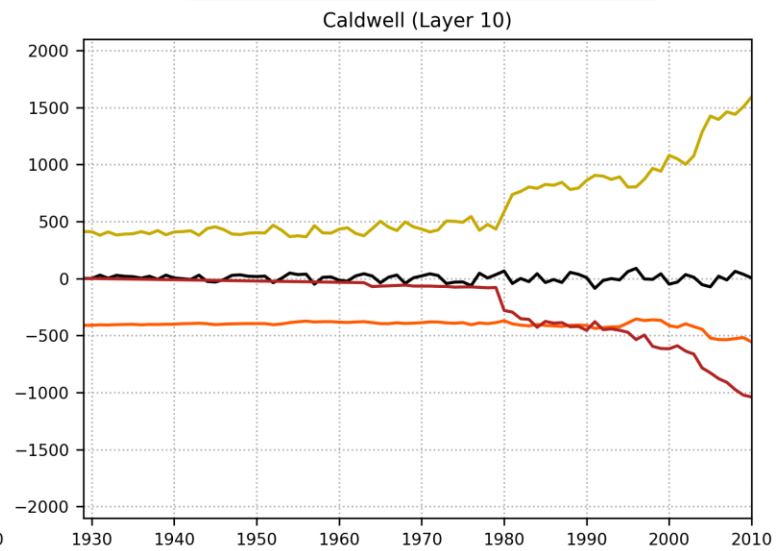
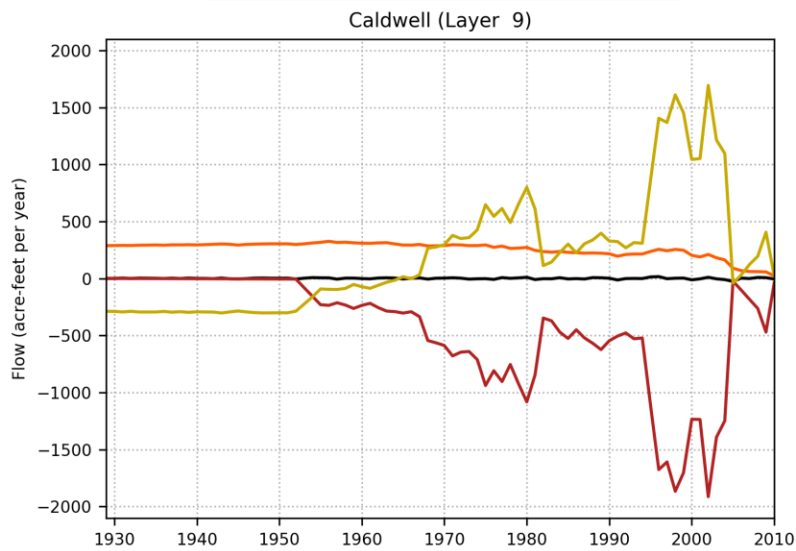
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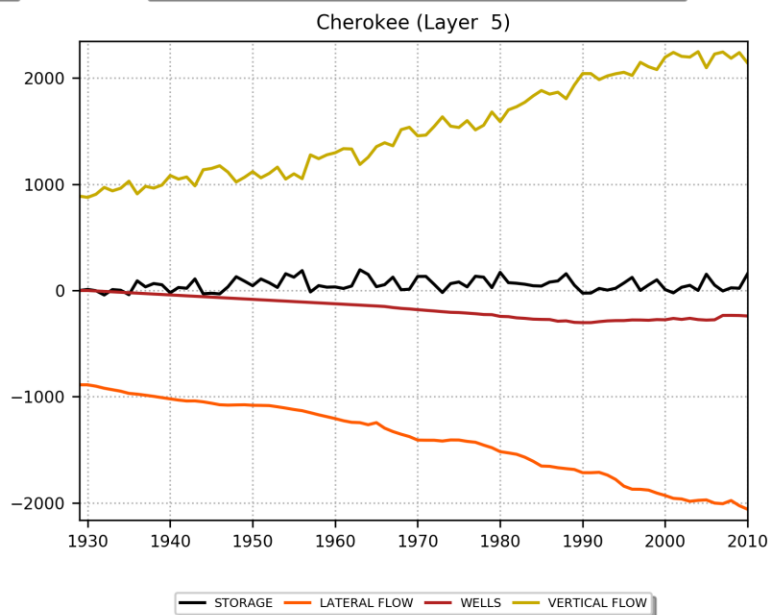
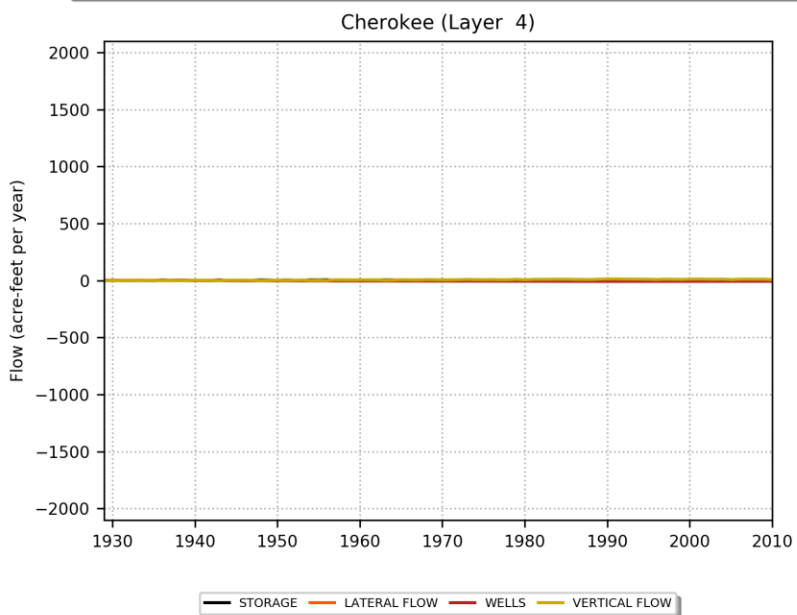
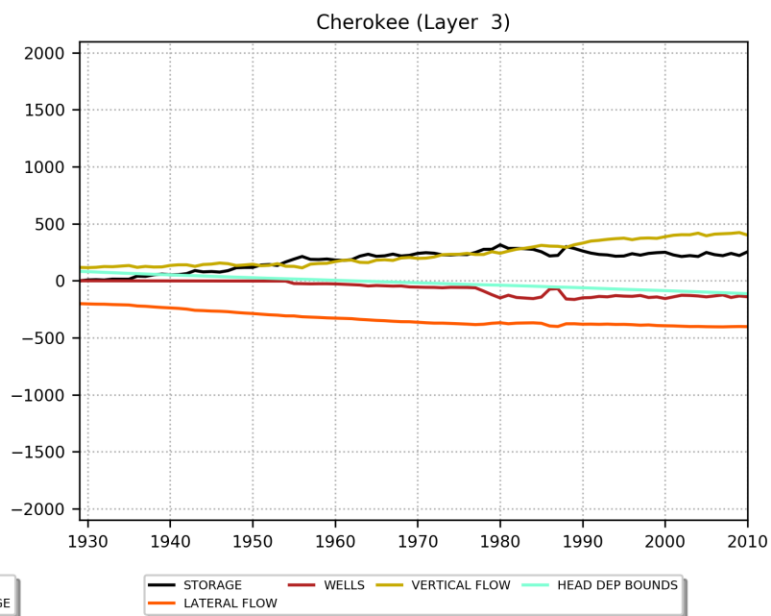
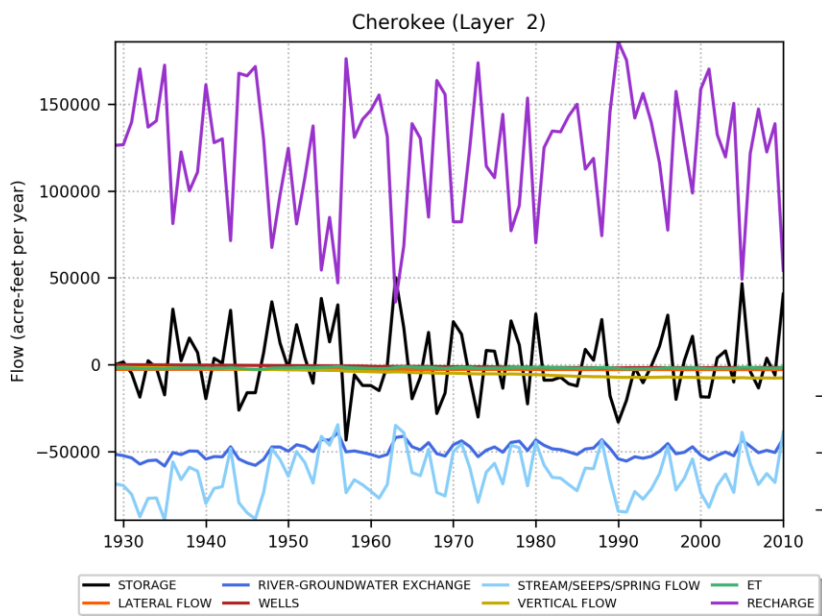
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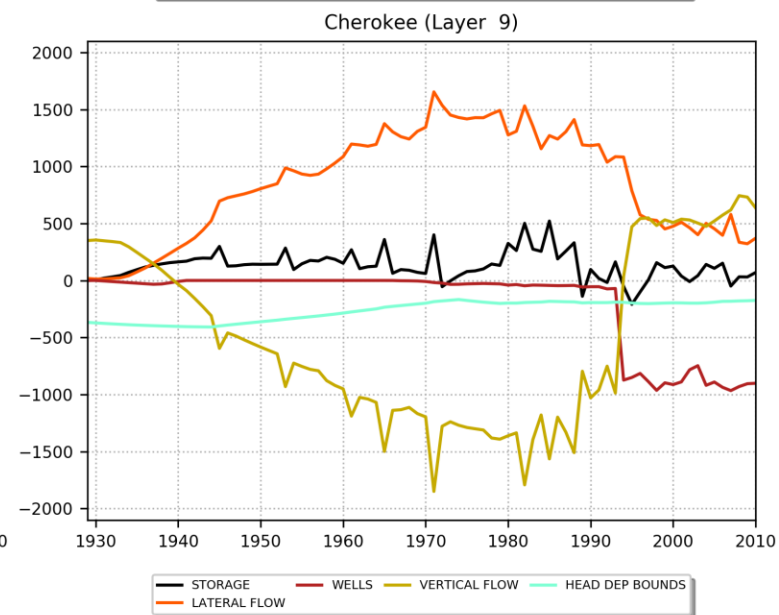
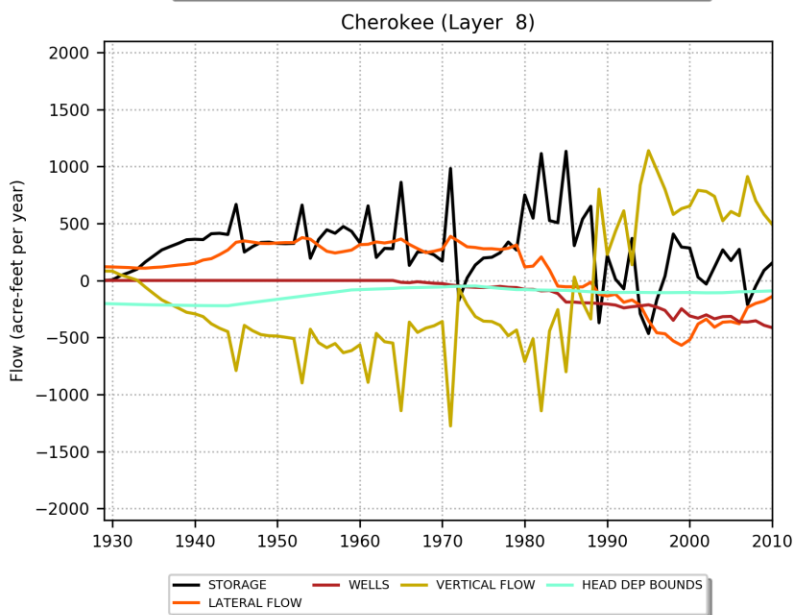
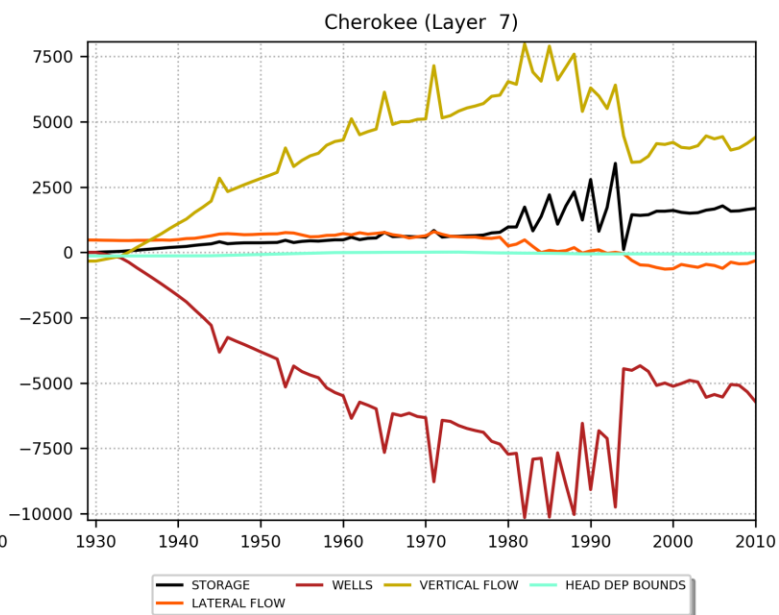
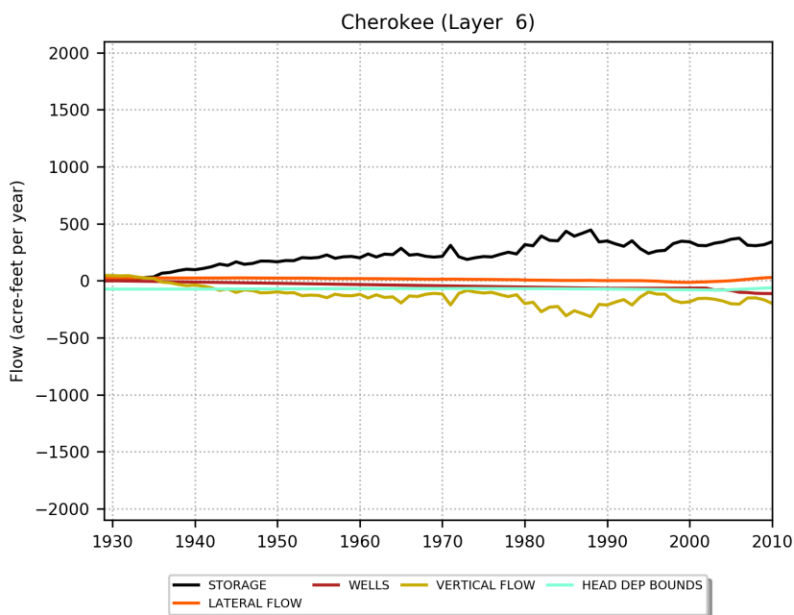
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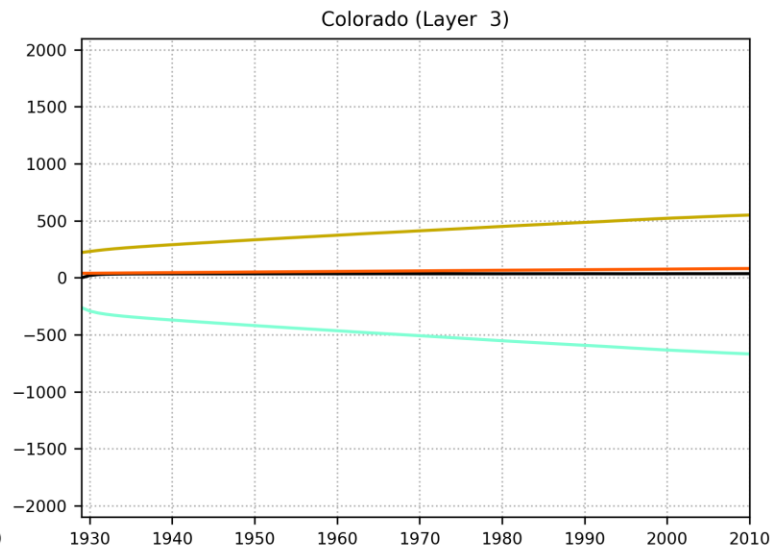
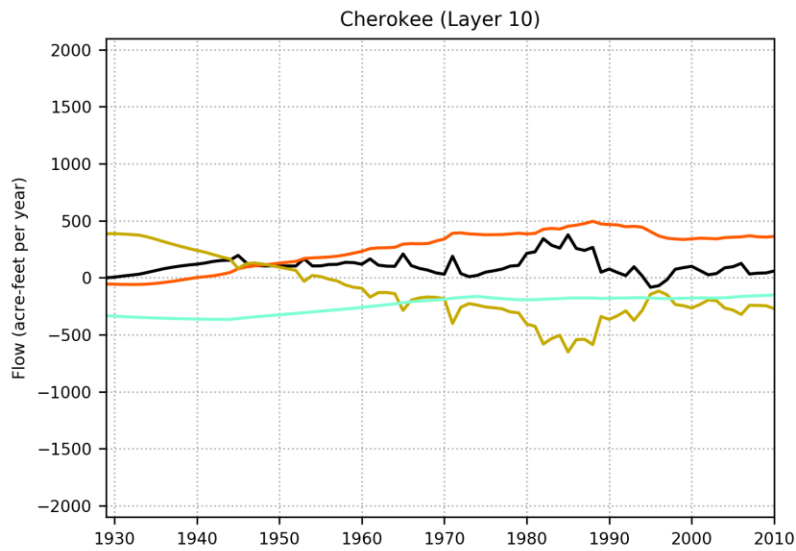
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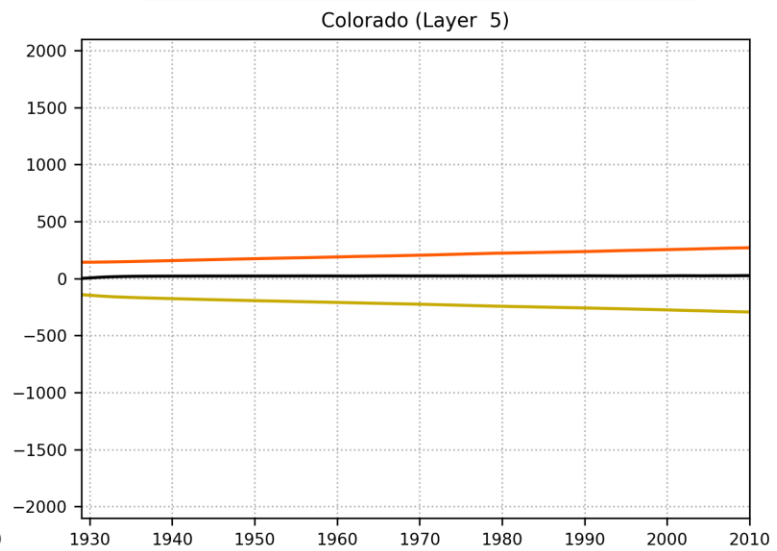
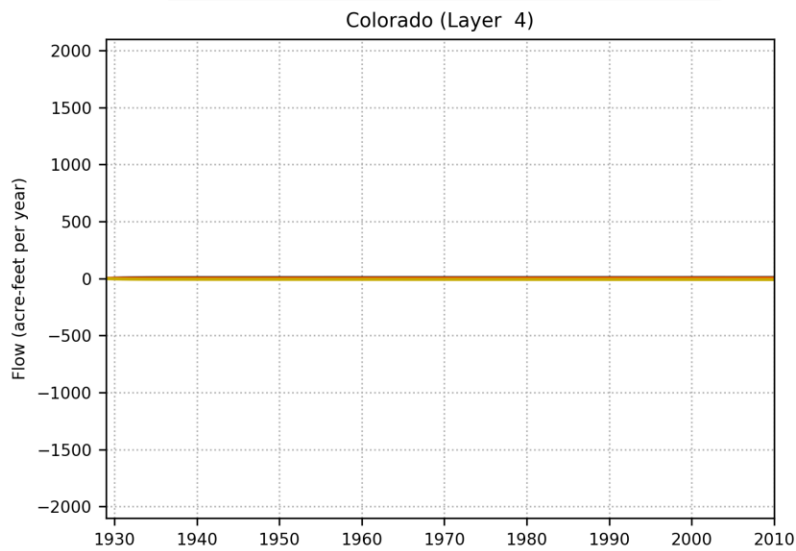


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— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

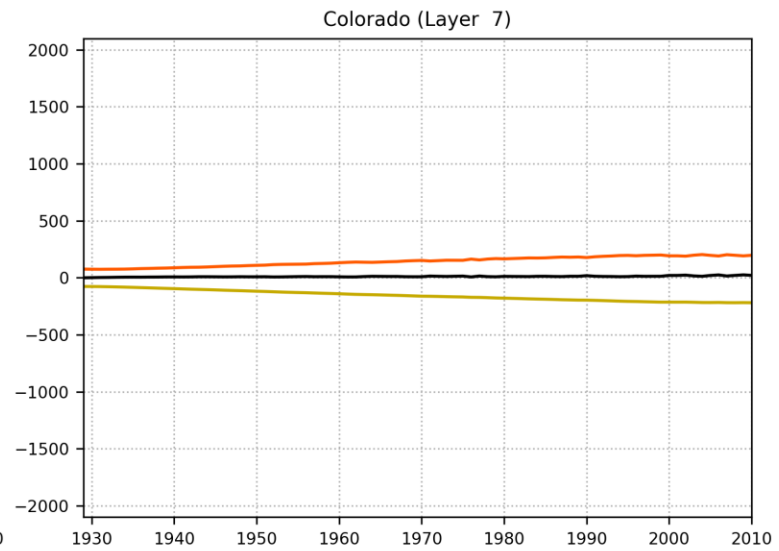
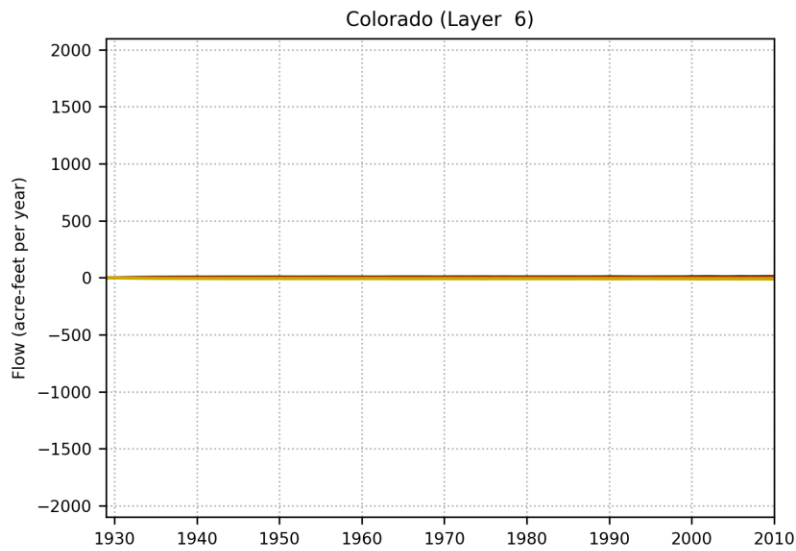
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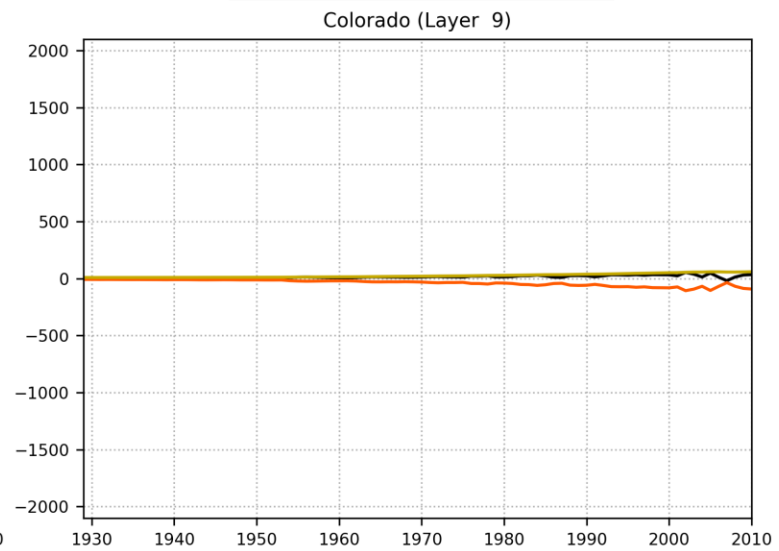
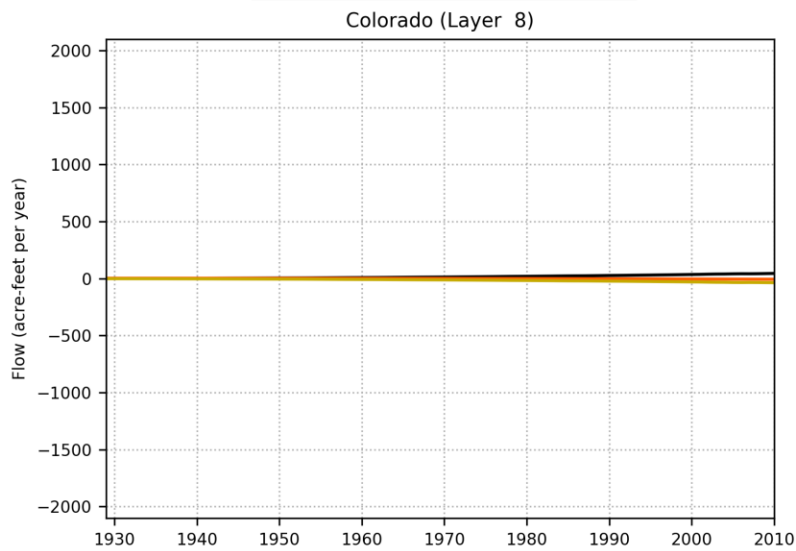
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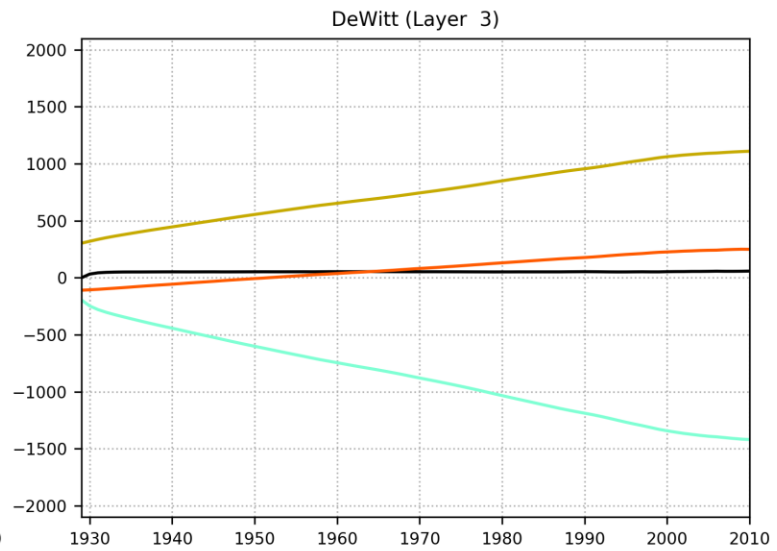
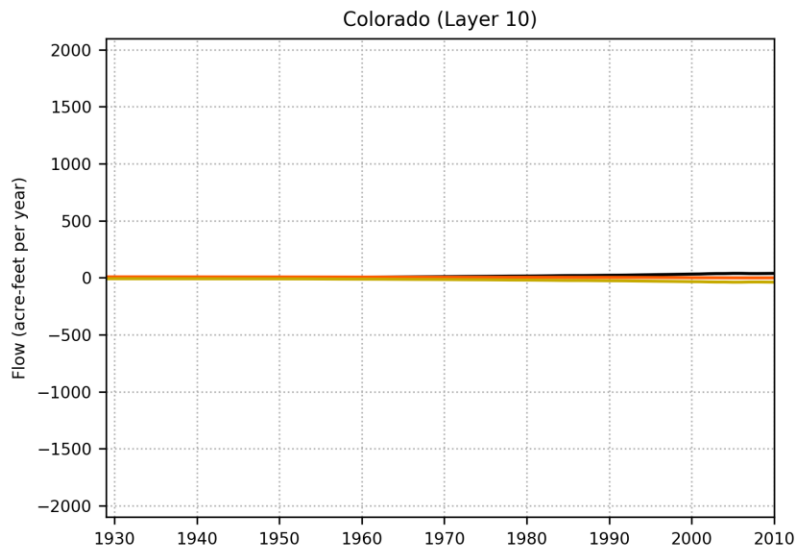
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— STORAGE — LATERAL FLOW — VERTICAL FLOW

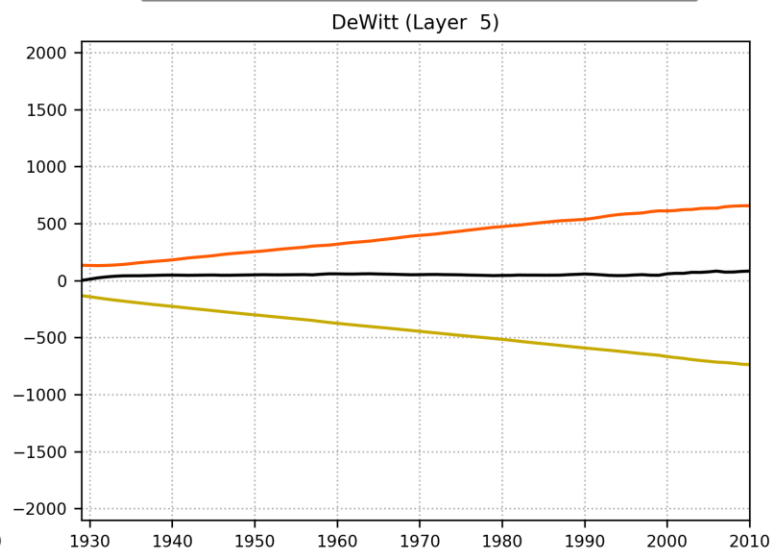
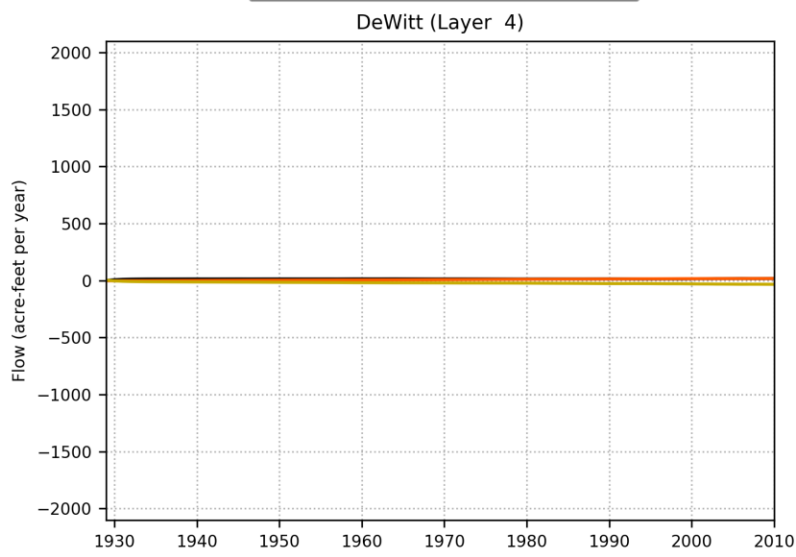
— STORAGE — LATERAL FLOW — VERTICAL FLOW

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



— STORAGE — LATERAL FLOW — VERTICAL FLOW

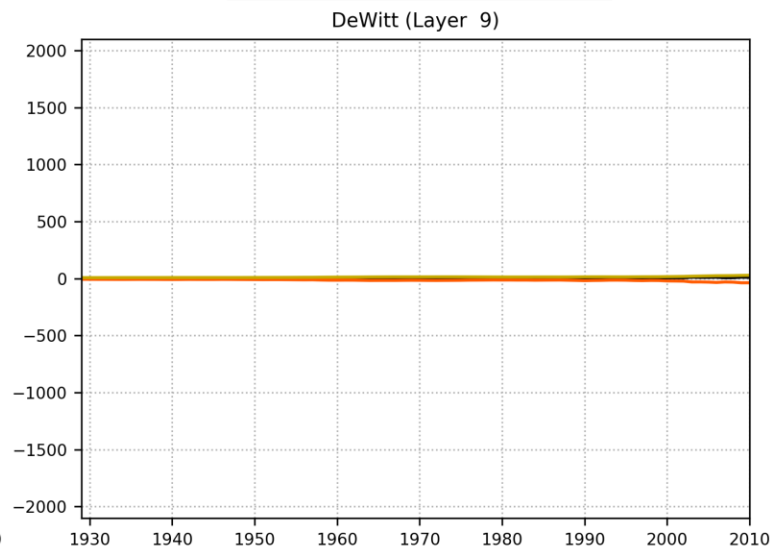
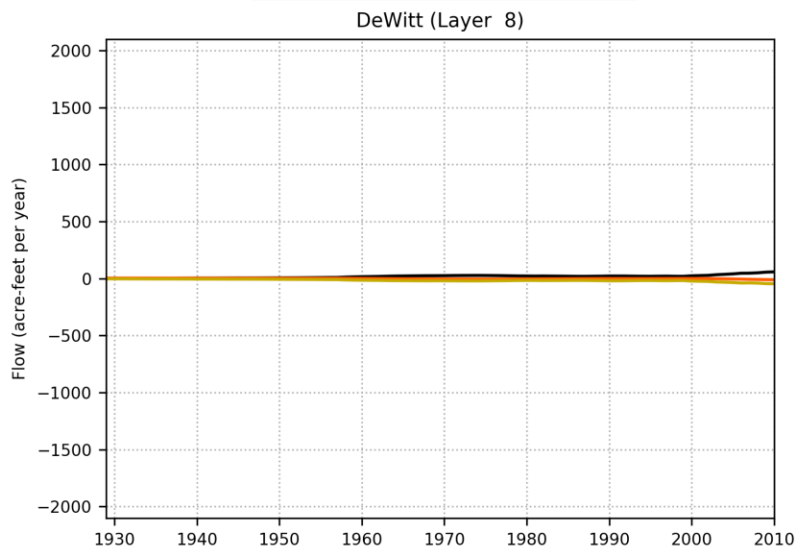
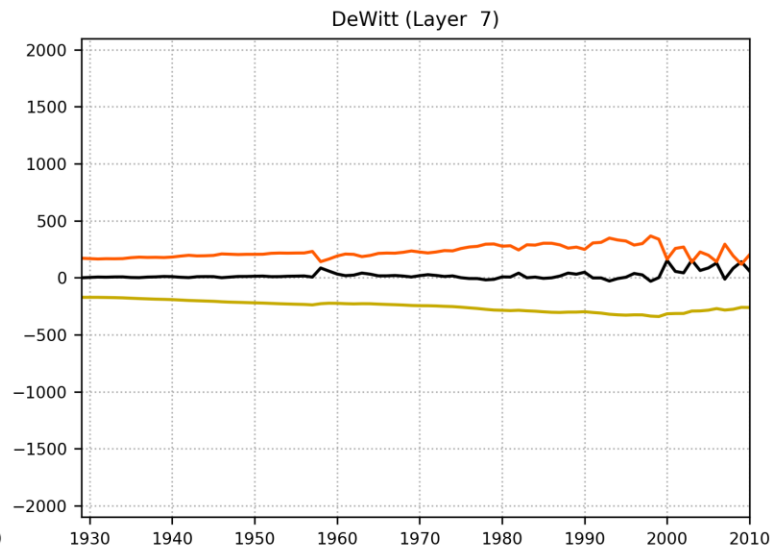
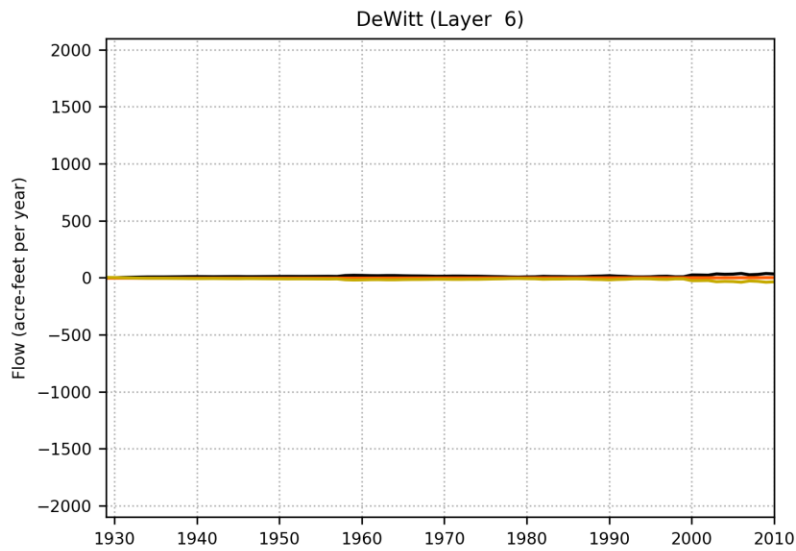
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS



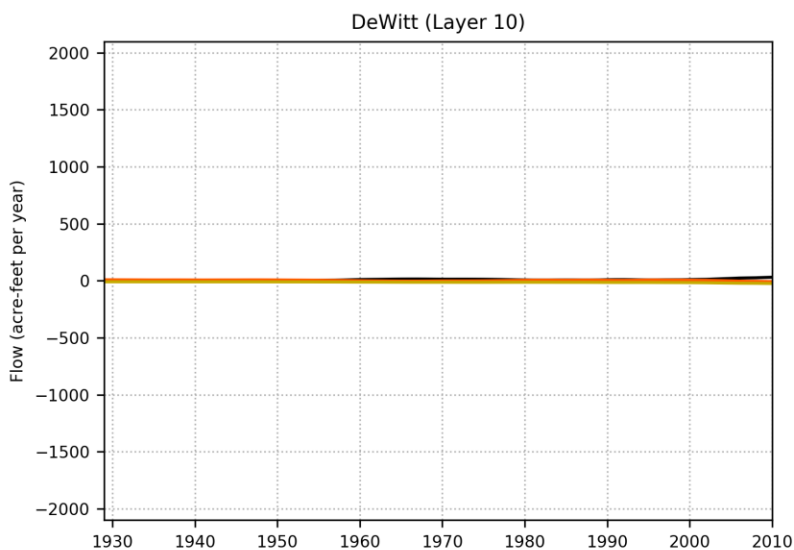
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— STORAGE — LATERAL FLOW — VERTICAL FLOW

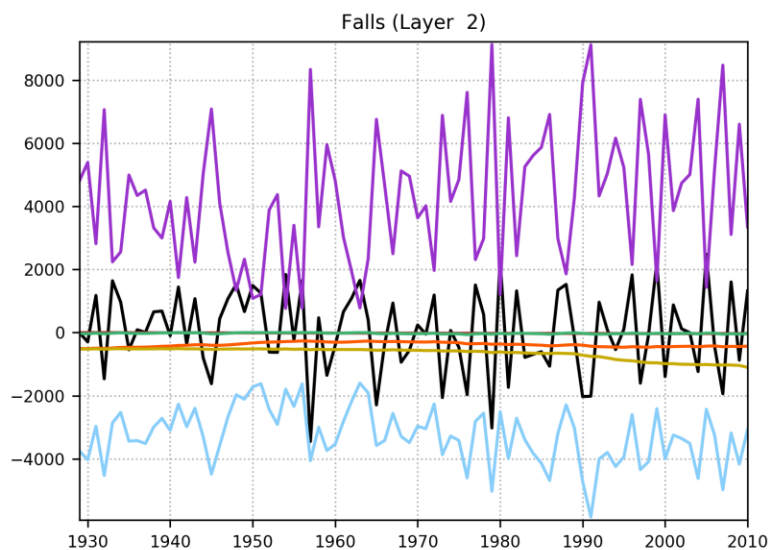
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



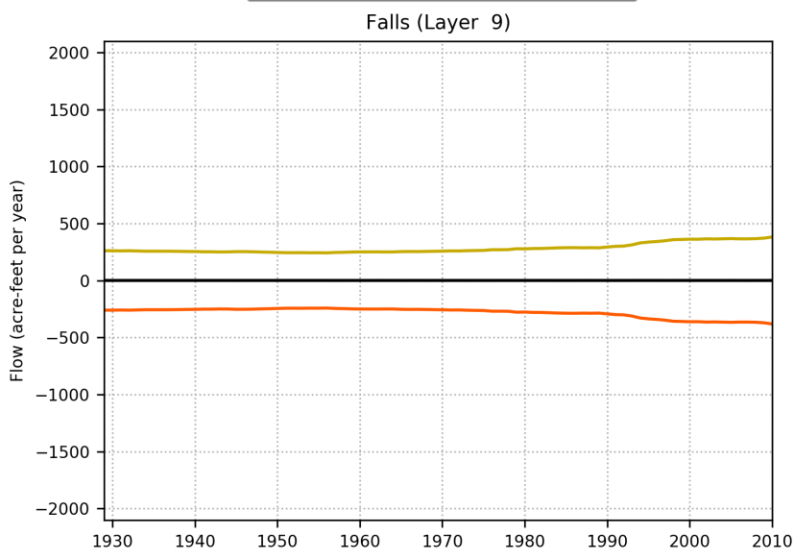
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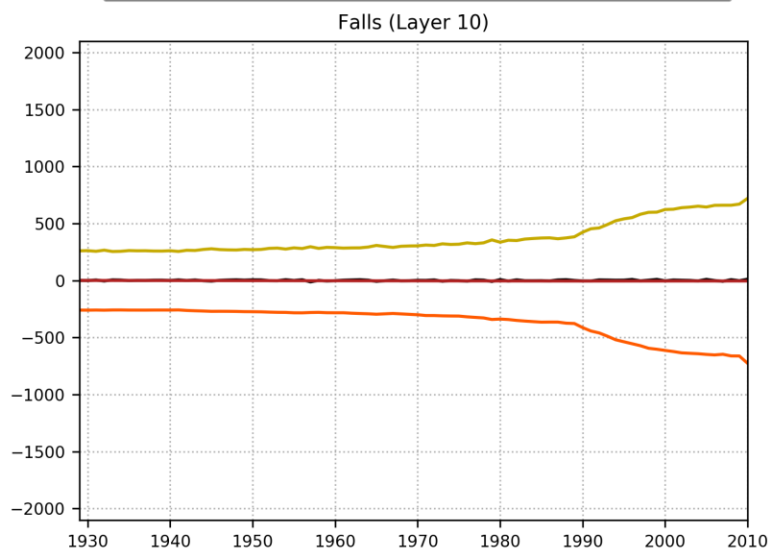
— STORAGE — LATERAL FLOW — VERTICAL FLOW



— STORAGE — WELLS — VERTICAL FLOW — RECHARGE
— LATERAL FLOW — STREAM/SEEPS/SPRING FLOW — ET

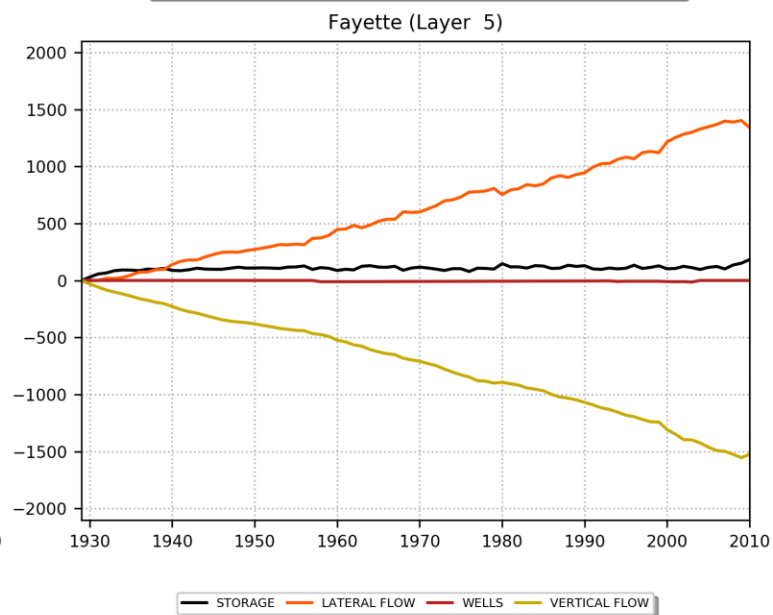
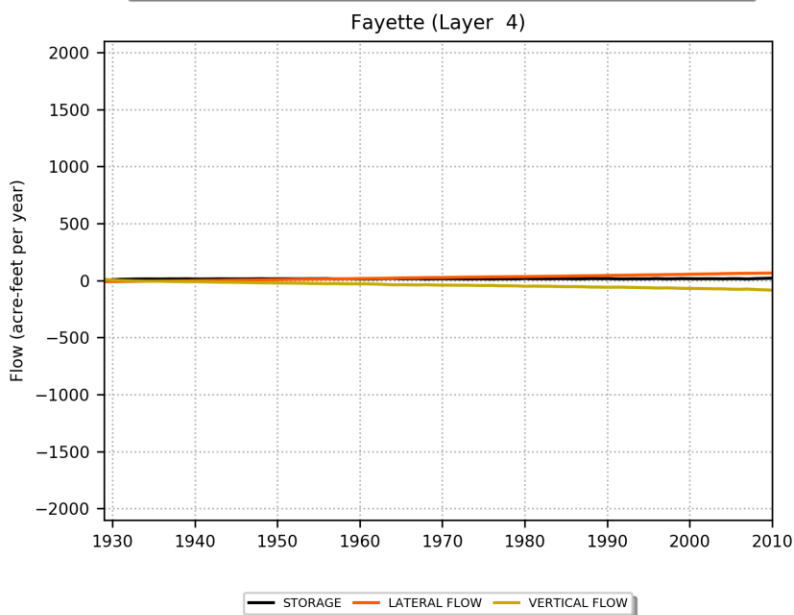
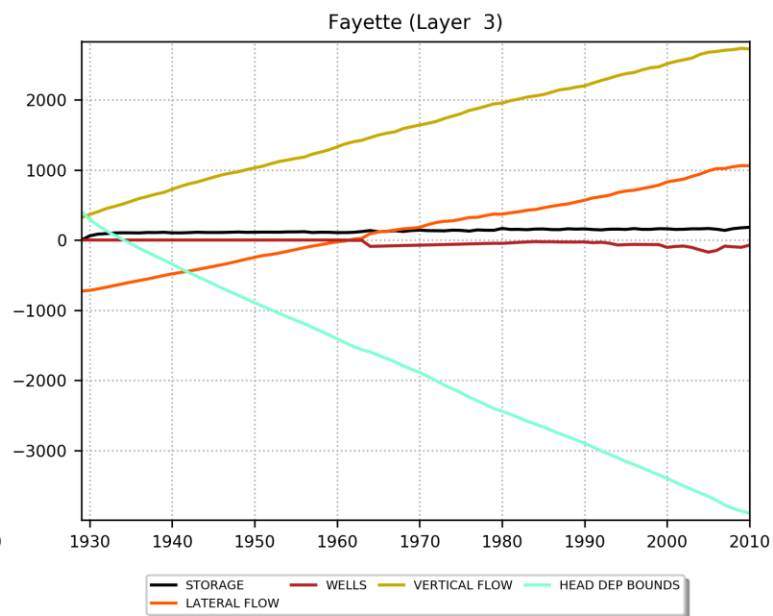
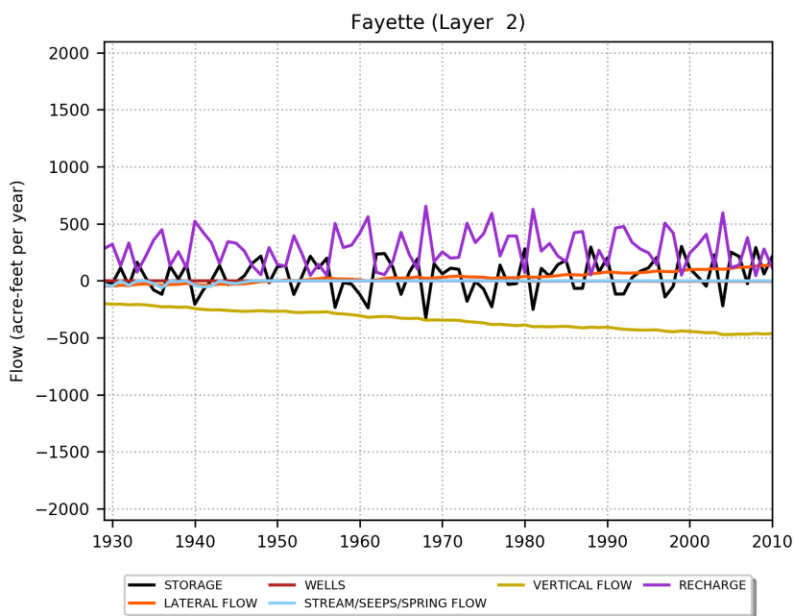


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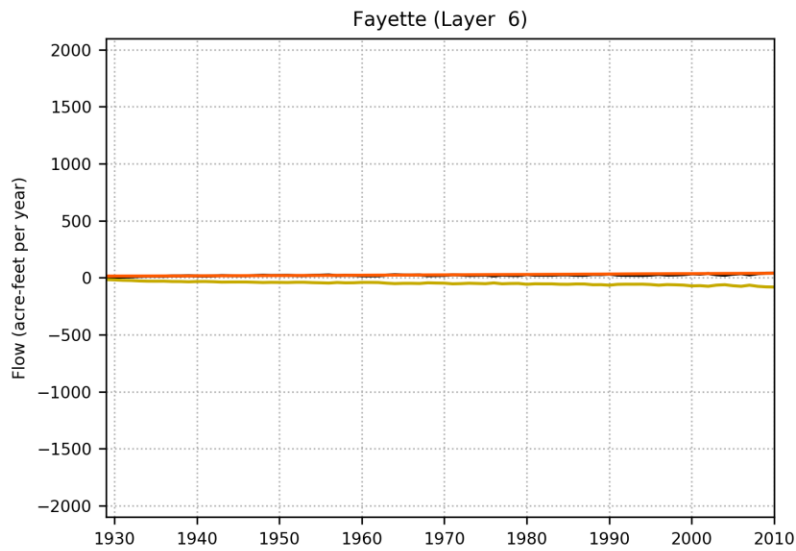


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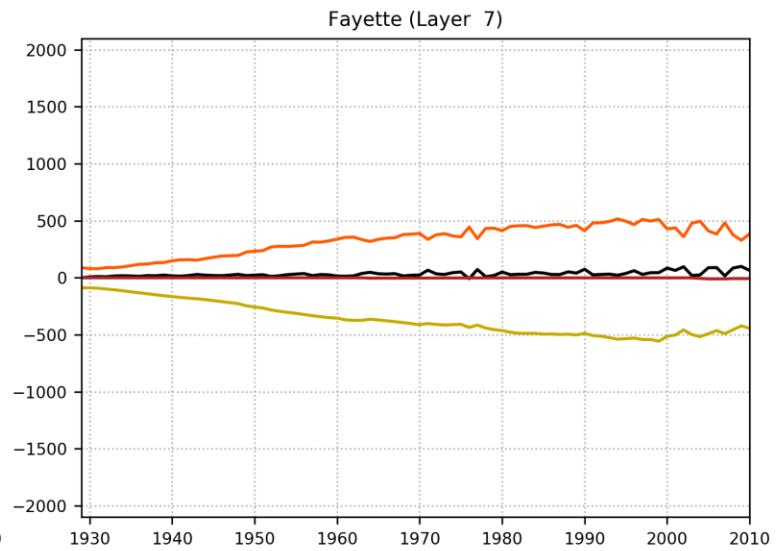
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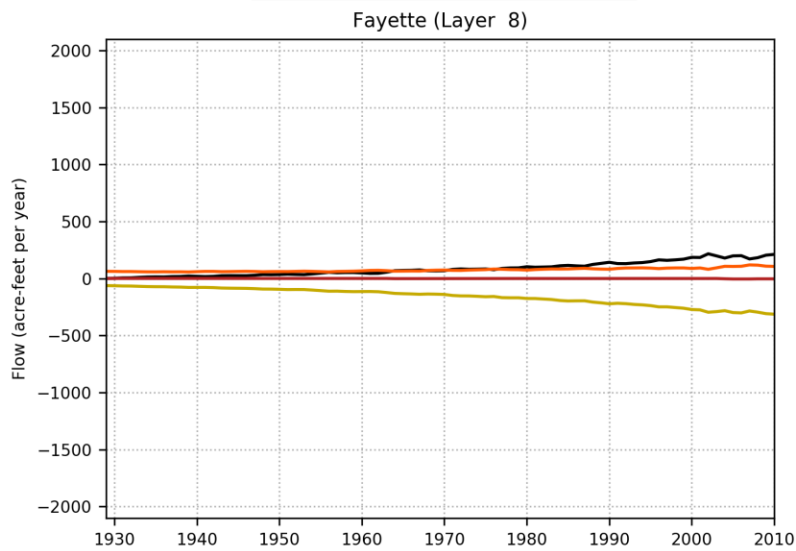
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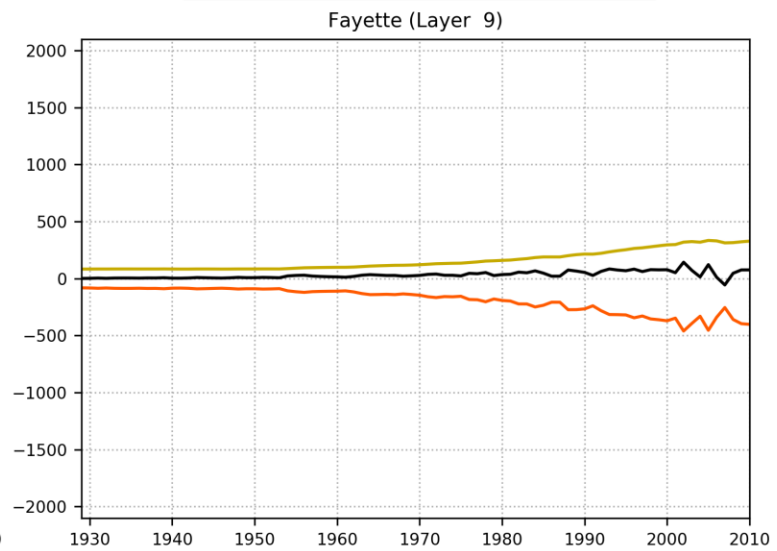
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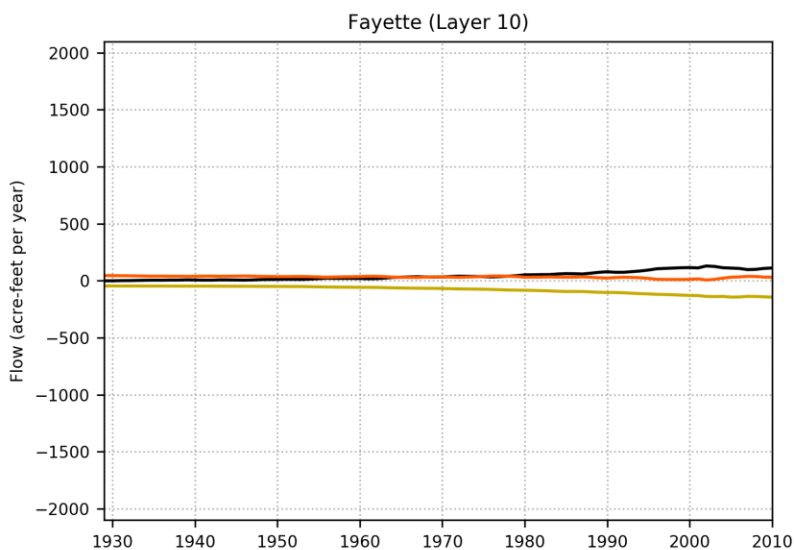


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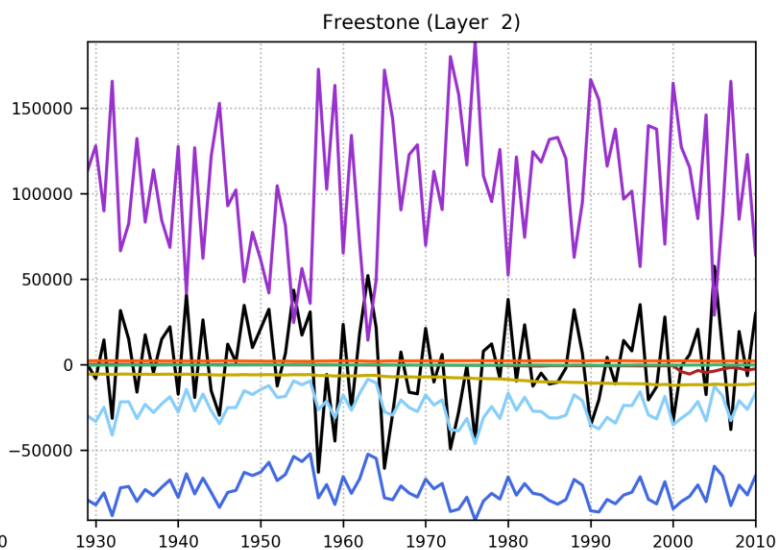


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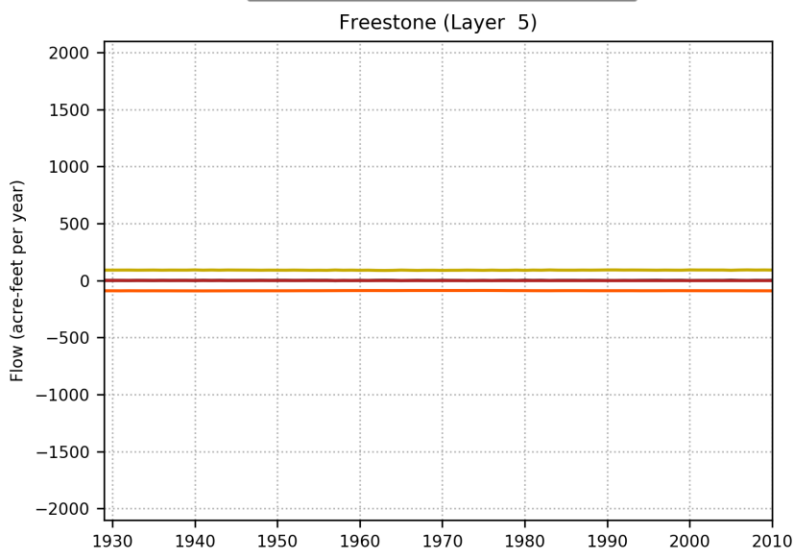
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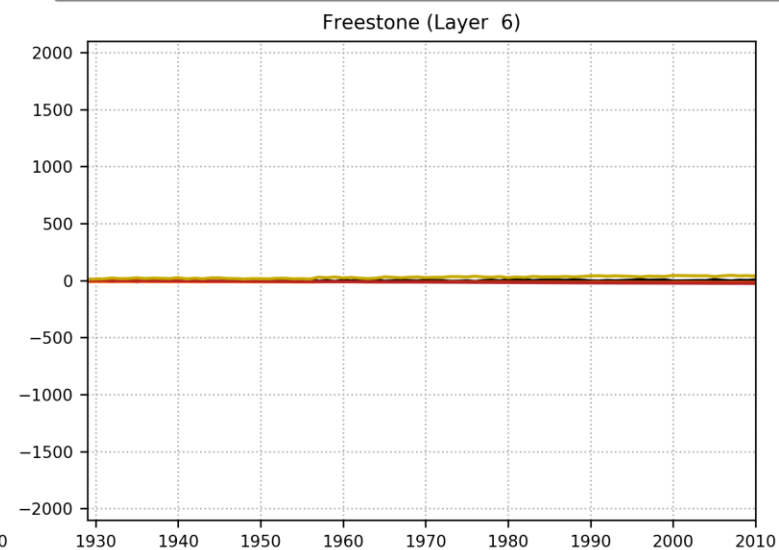
— STORAGE — LATERAL FLOW — VERTICAL FLOW



— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

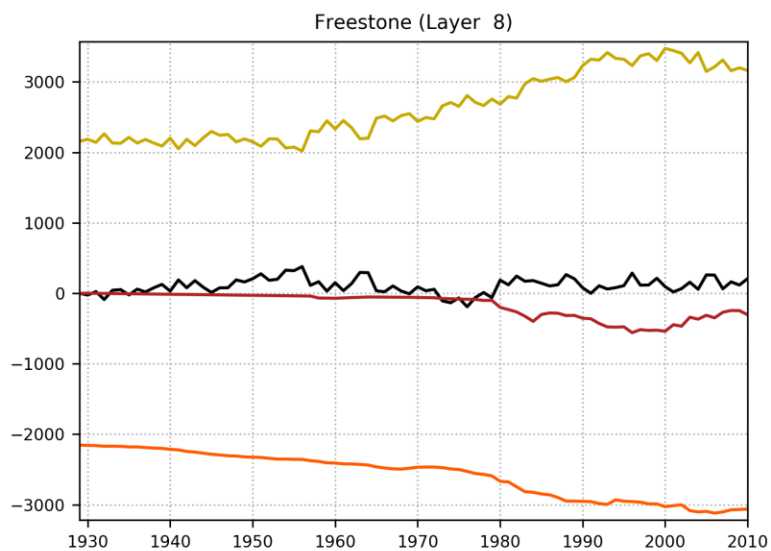
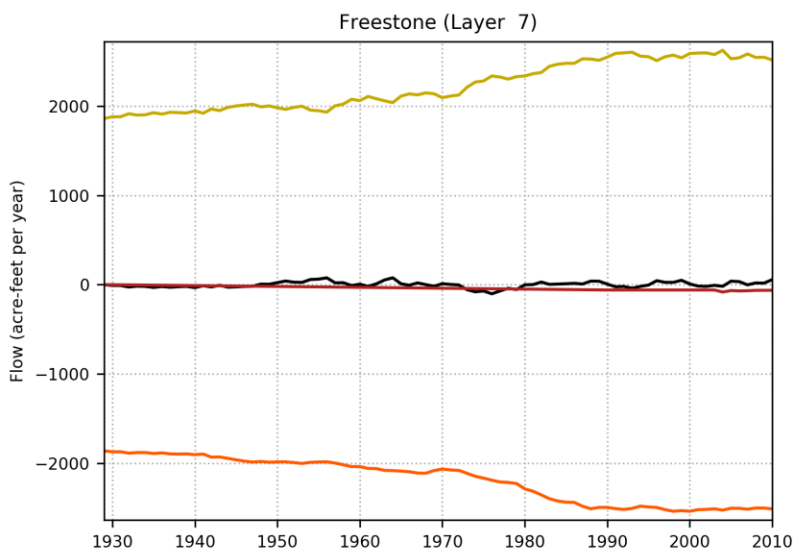


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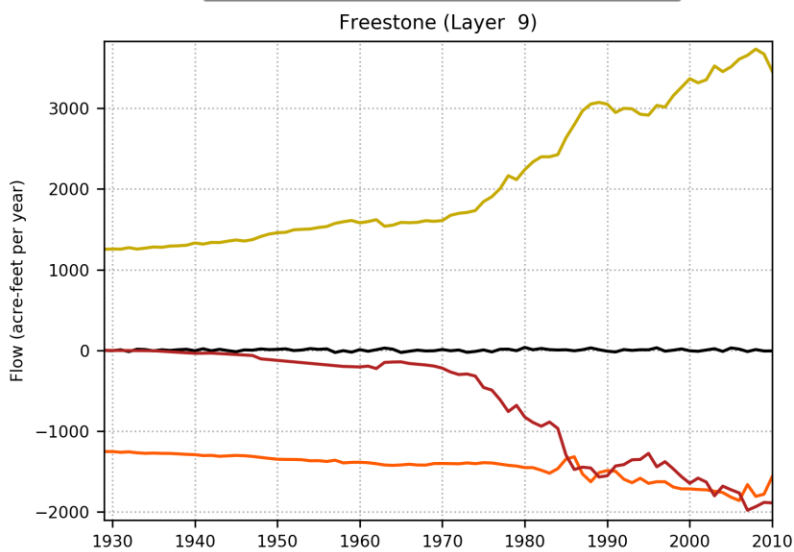
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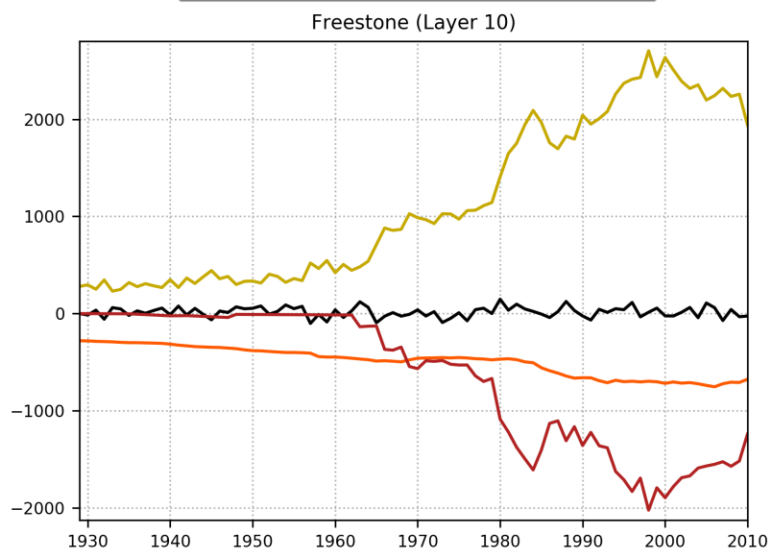


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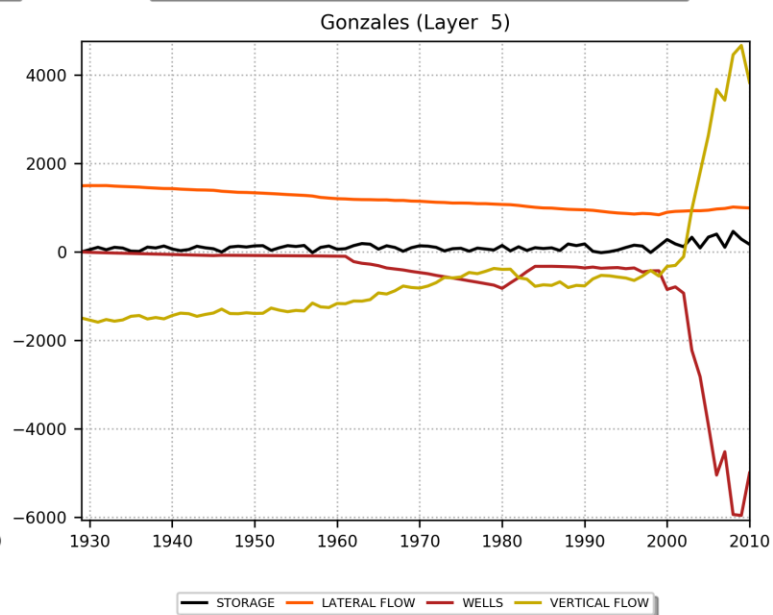
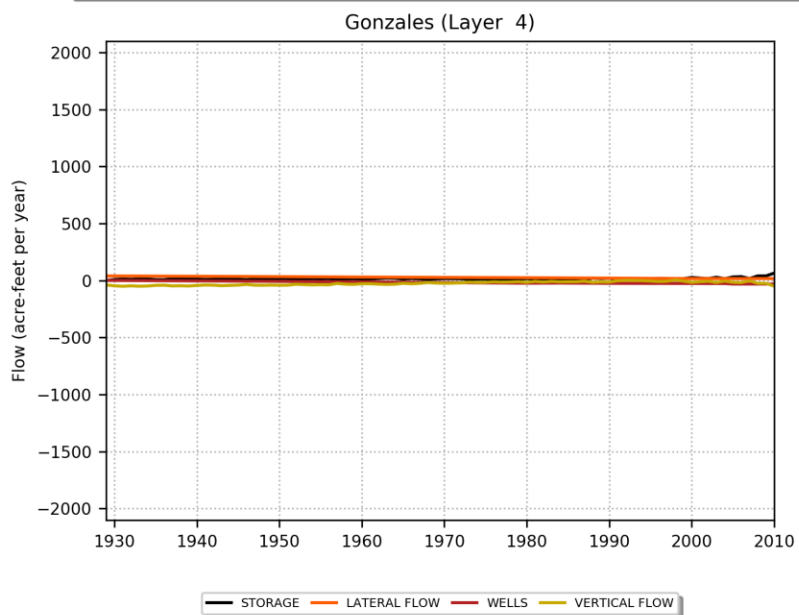
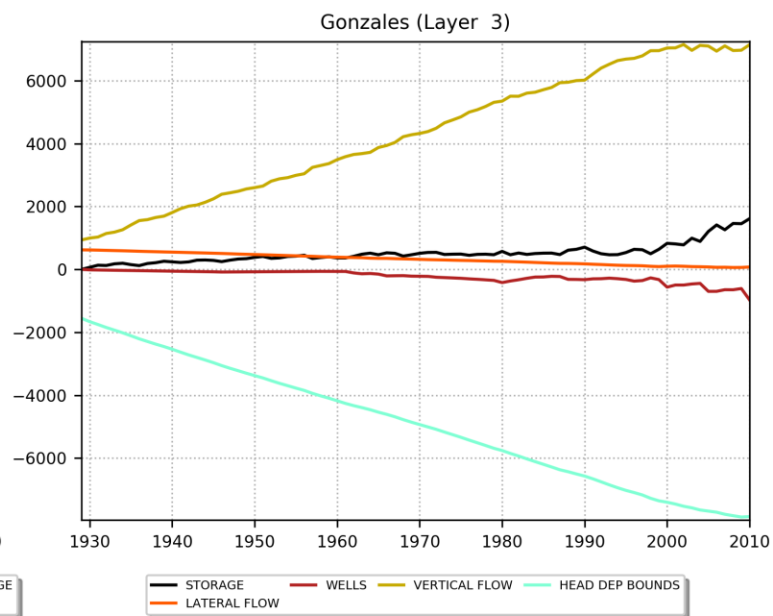
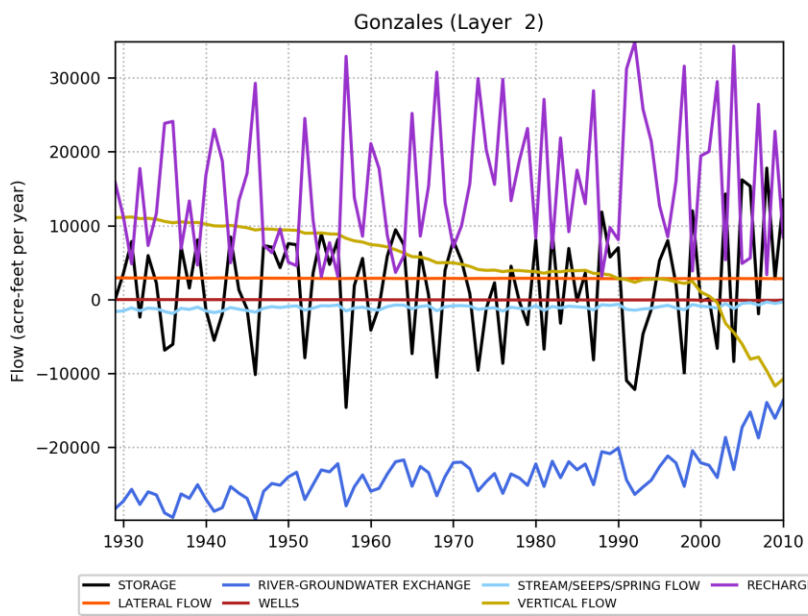


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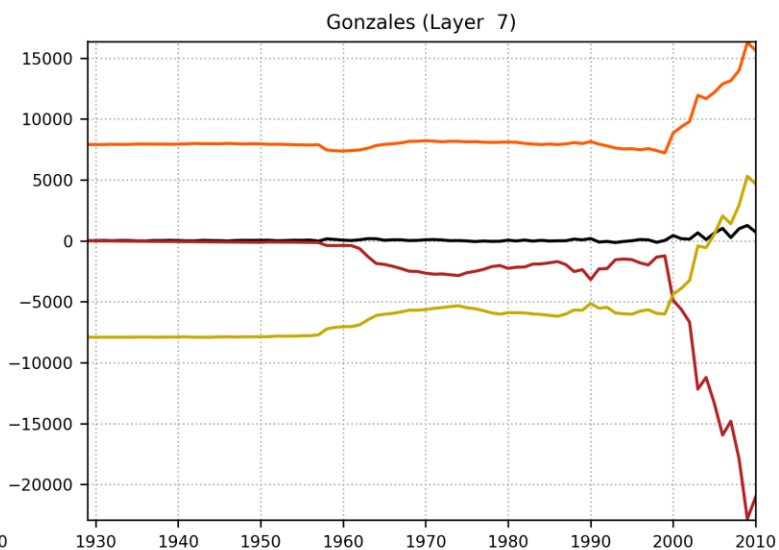
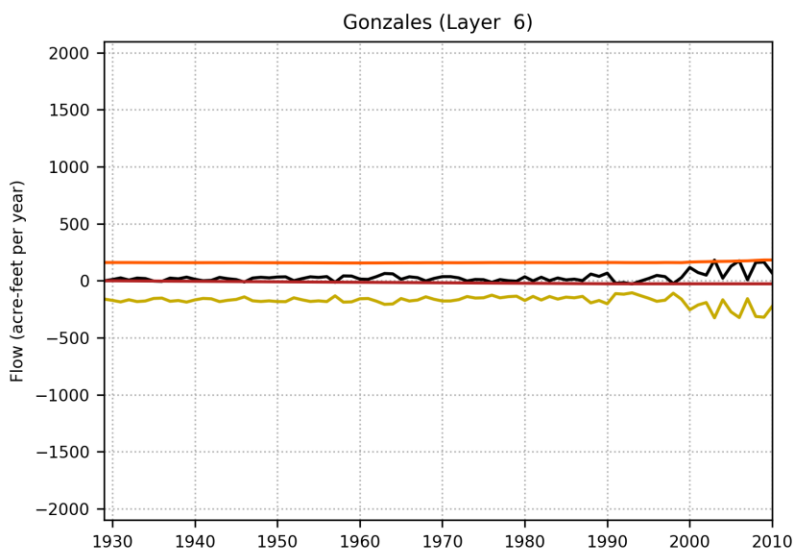


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

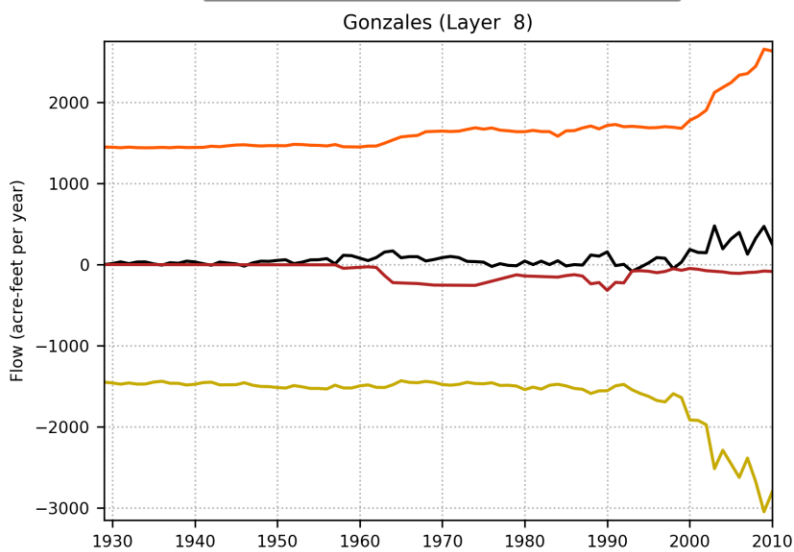


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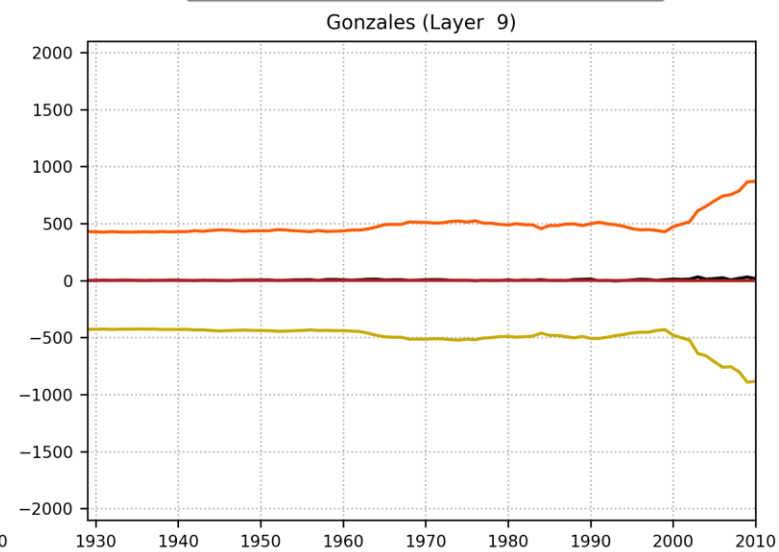


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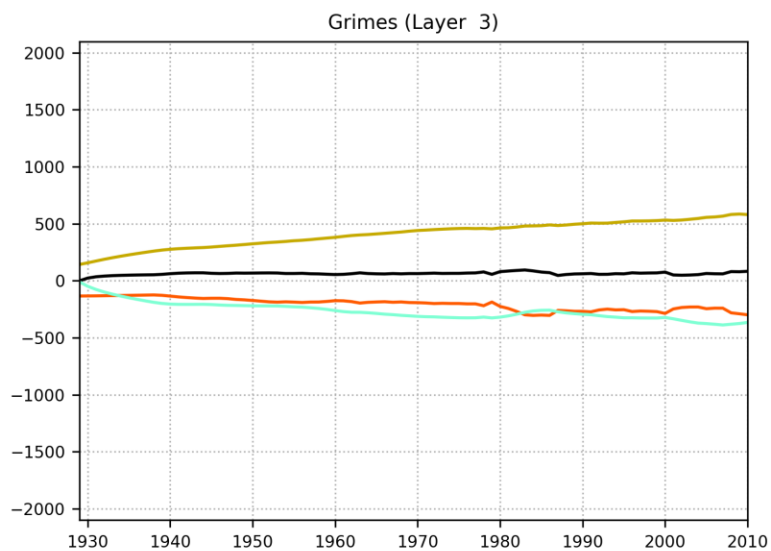
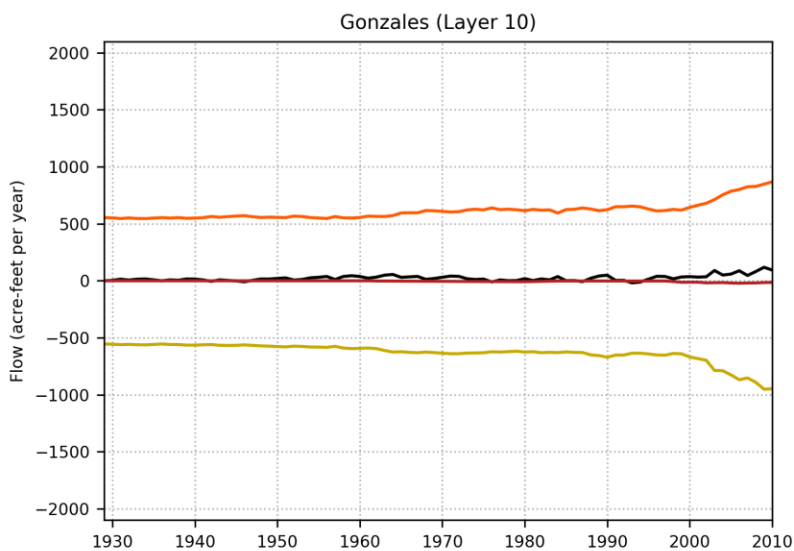


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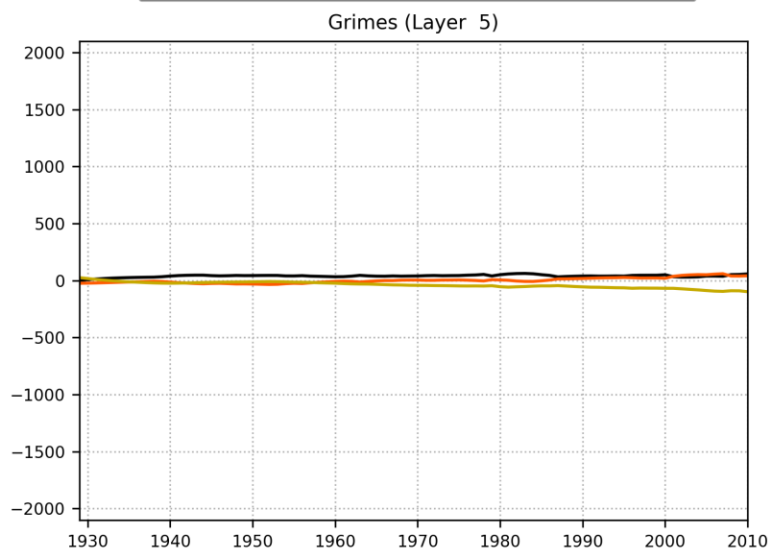
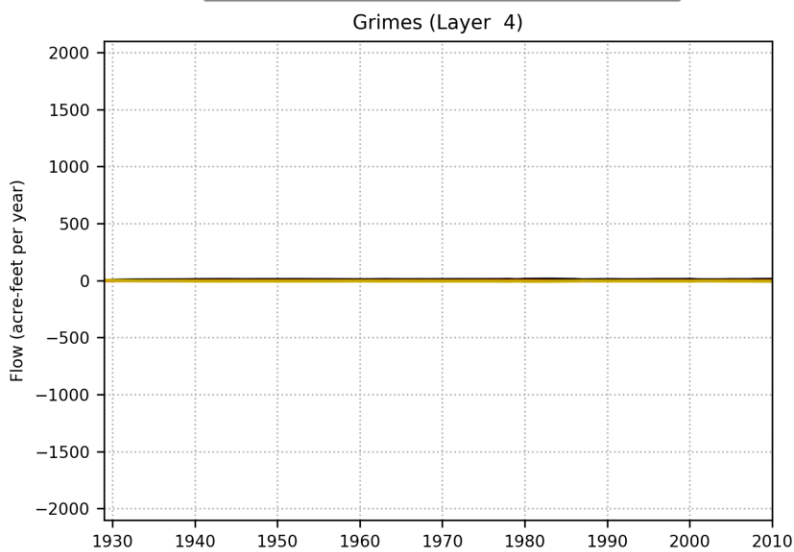
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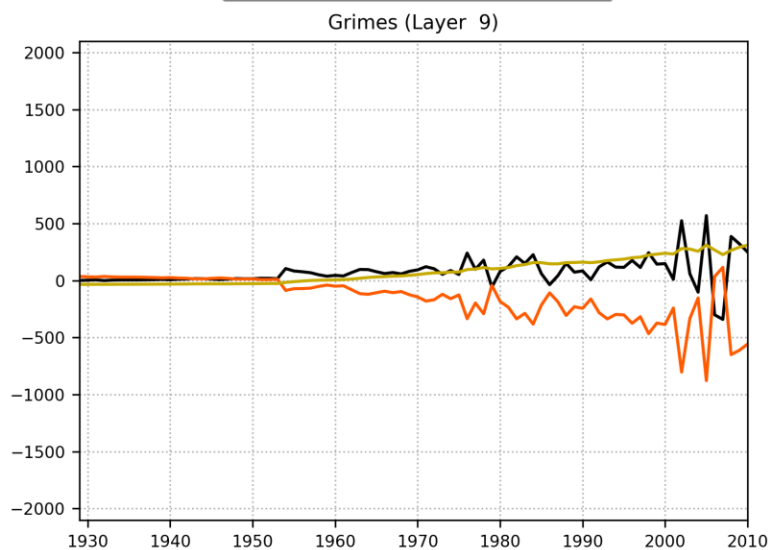
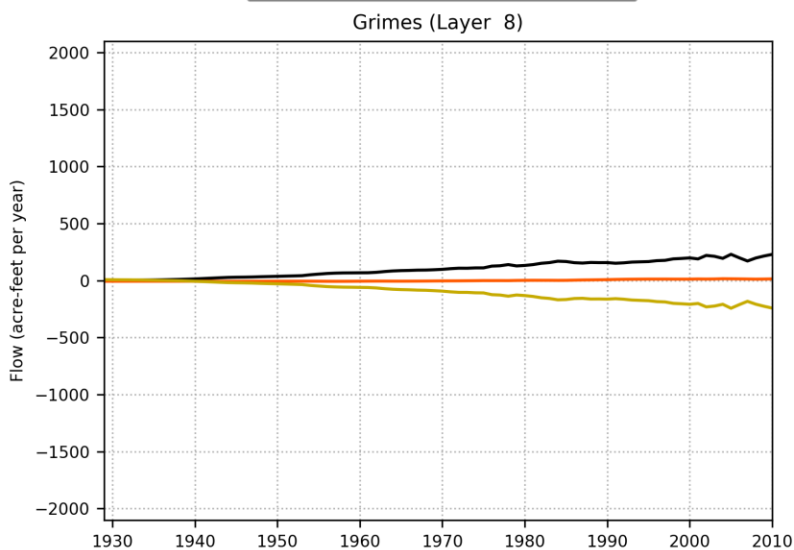
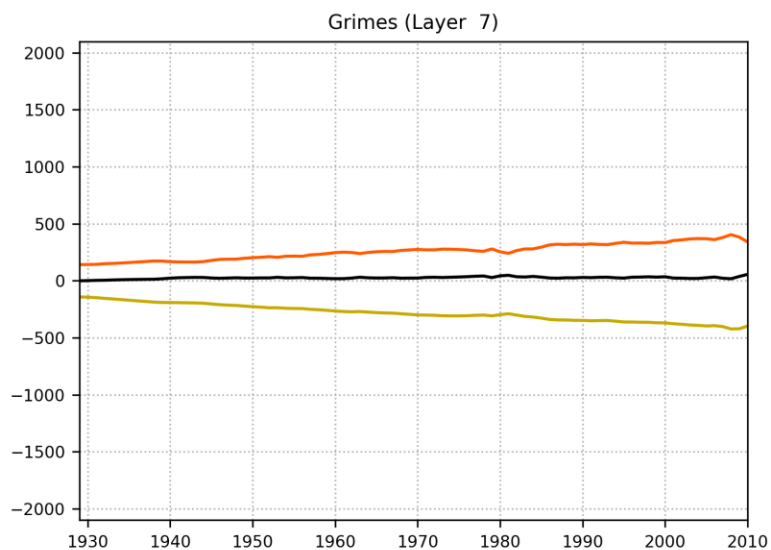
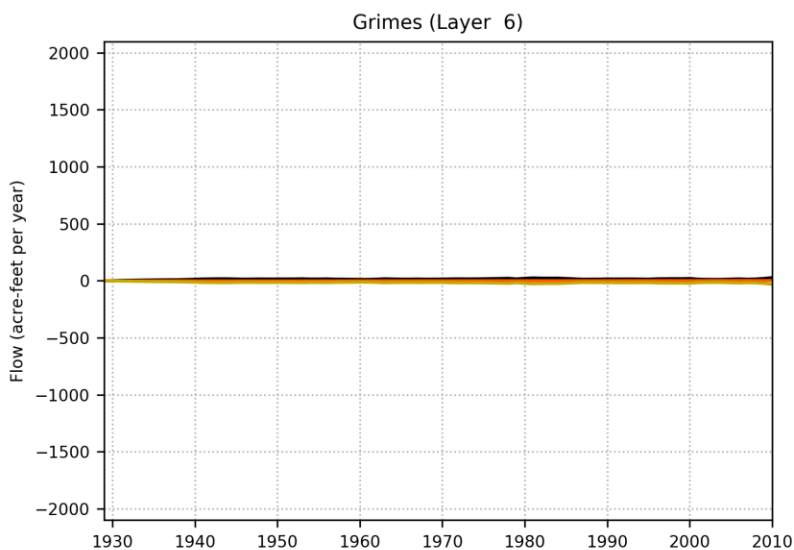
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS



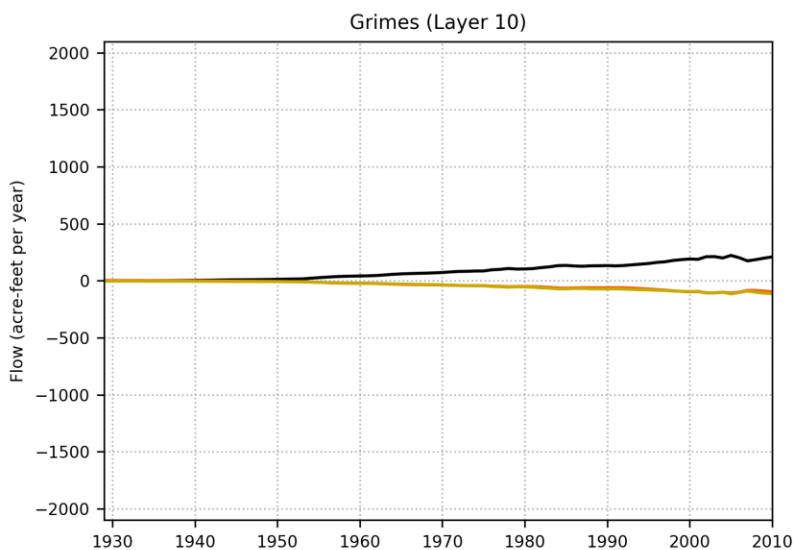
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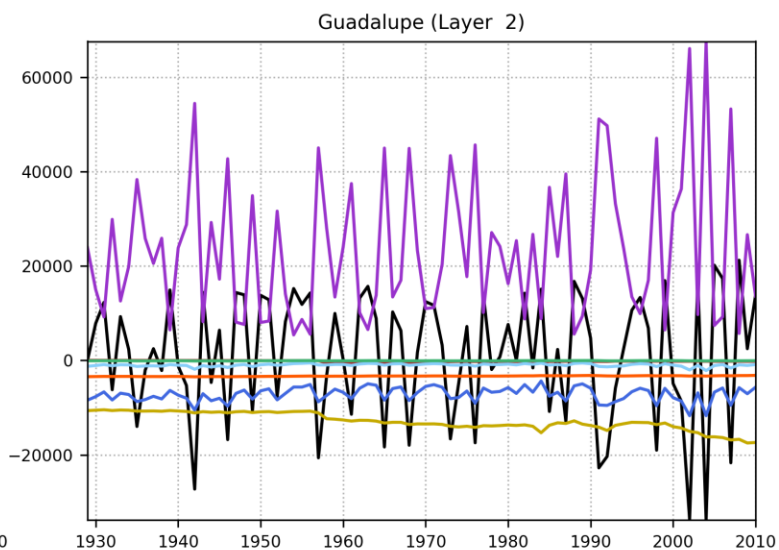
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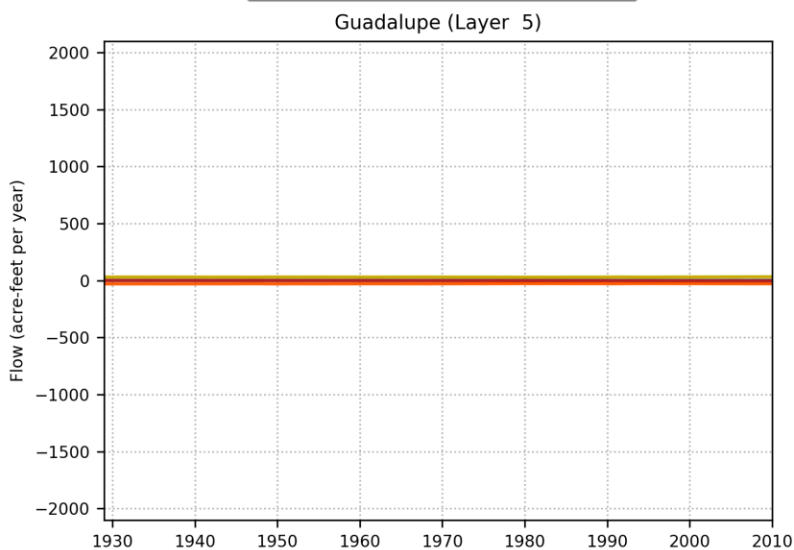
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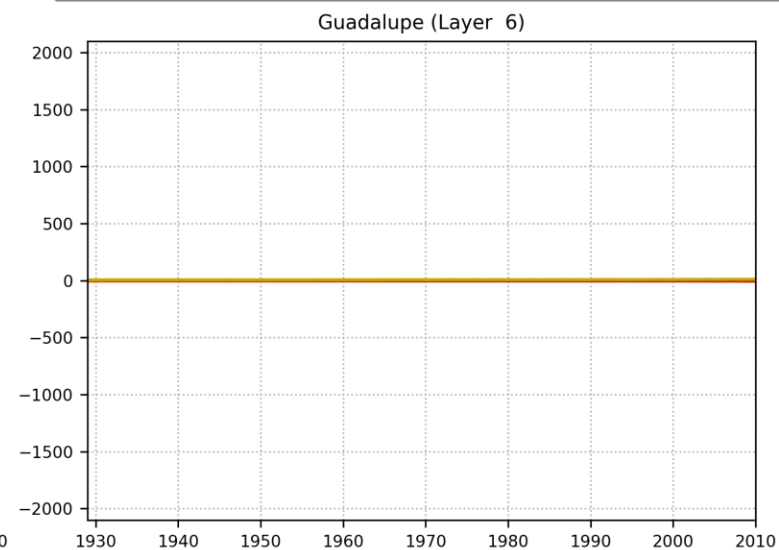
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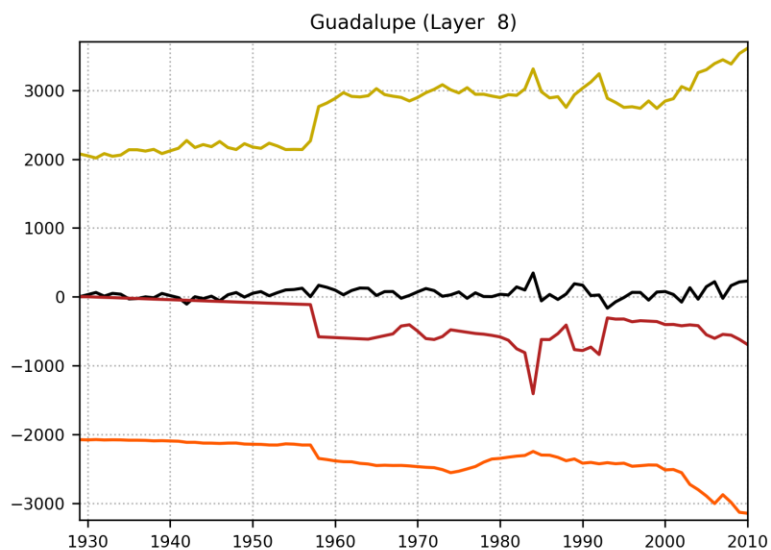
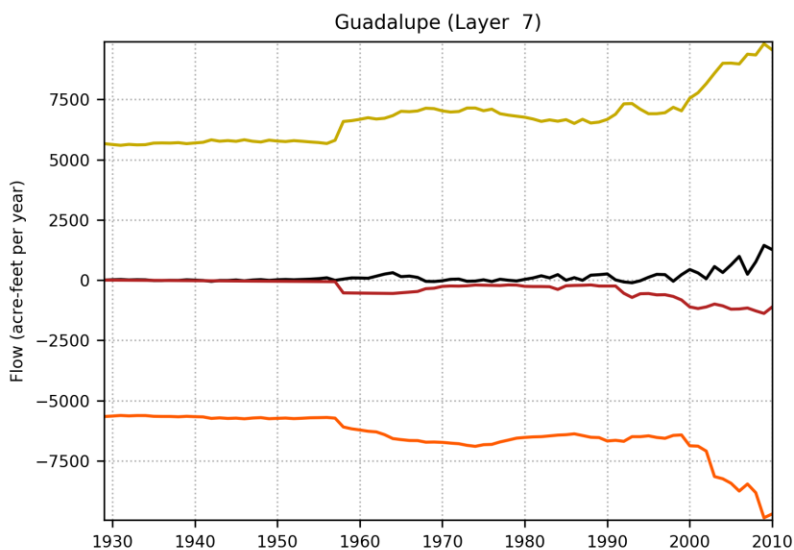


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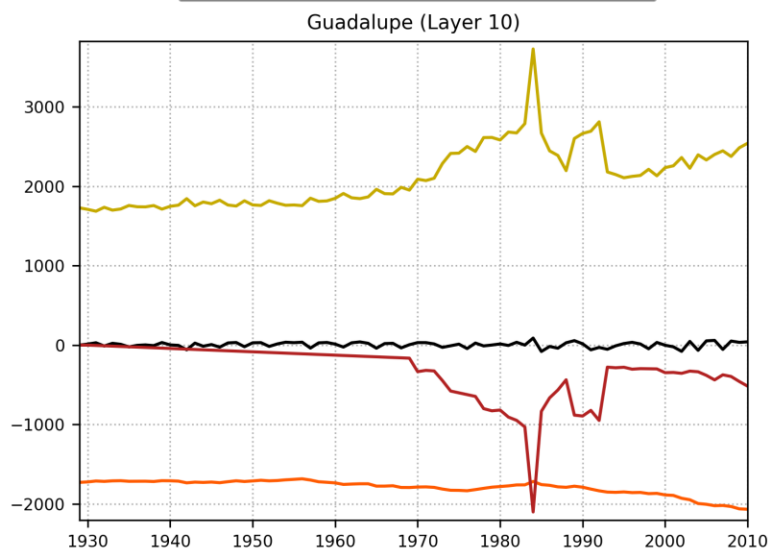
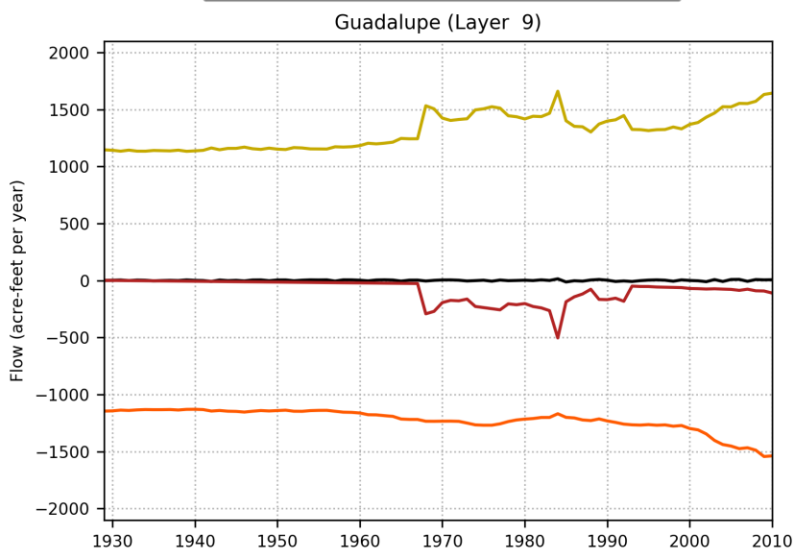
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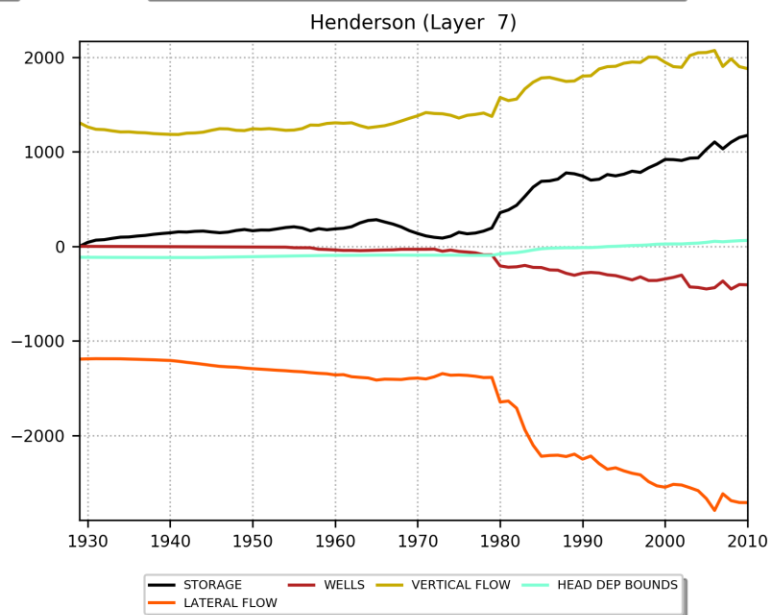
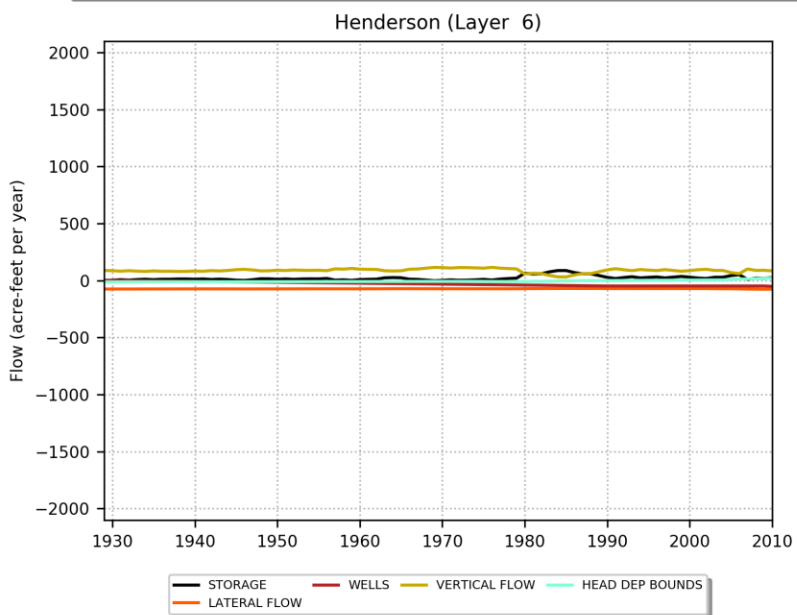
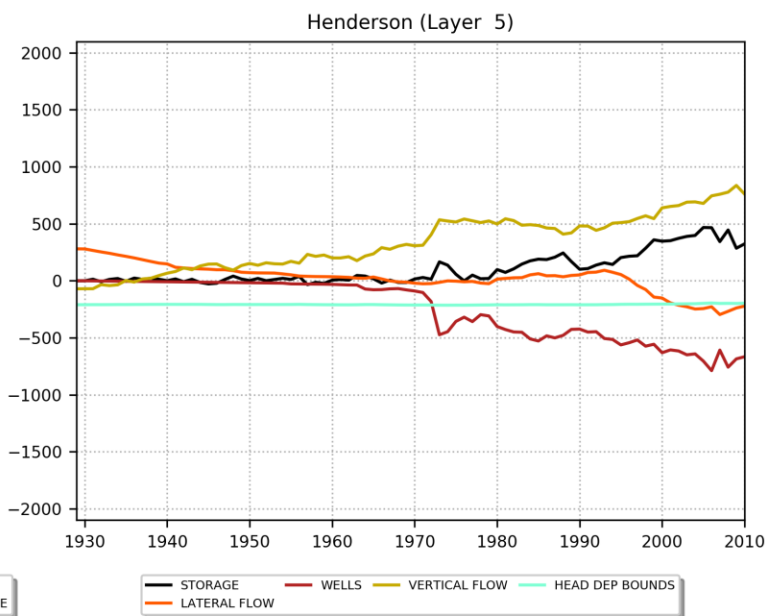
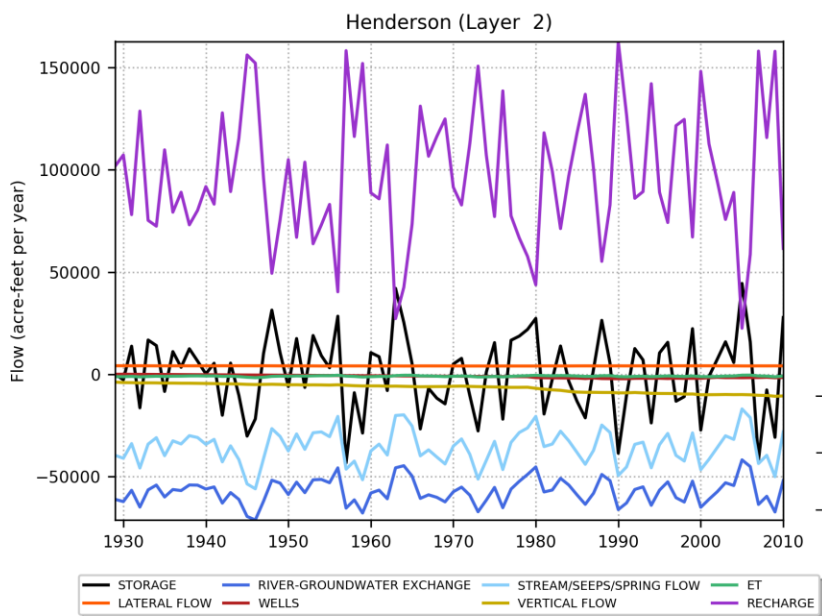
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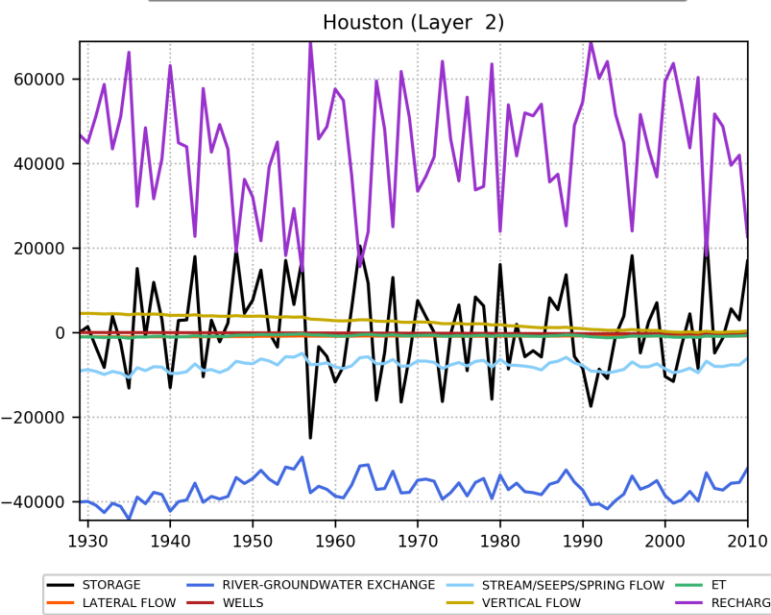
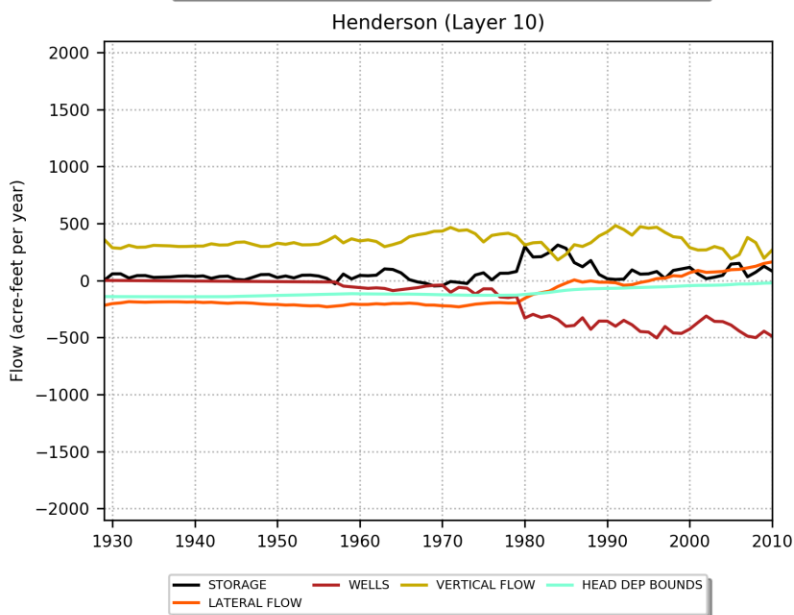
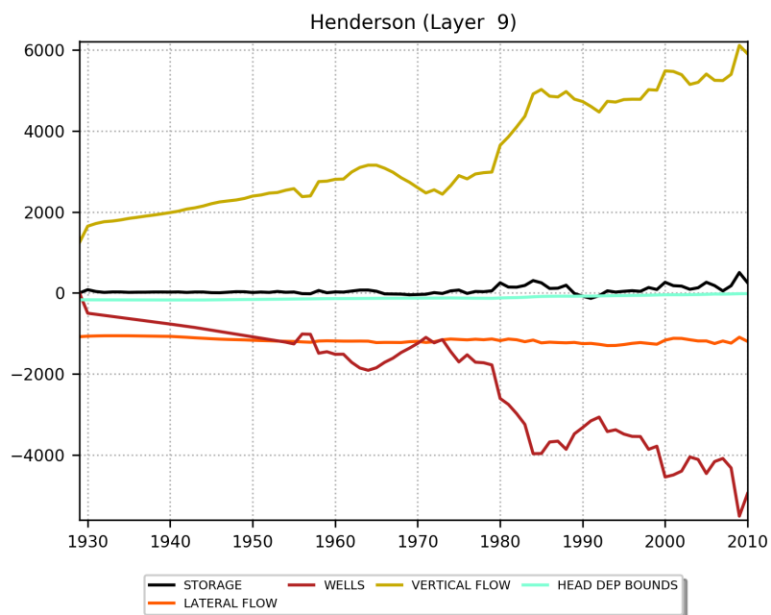
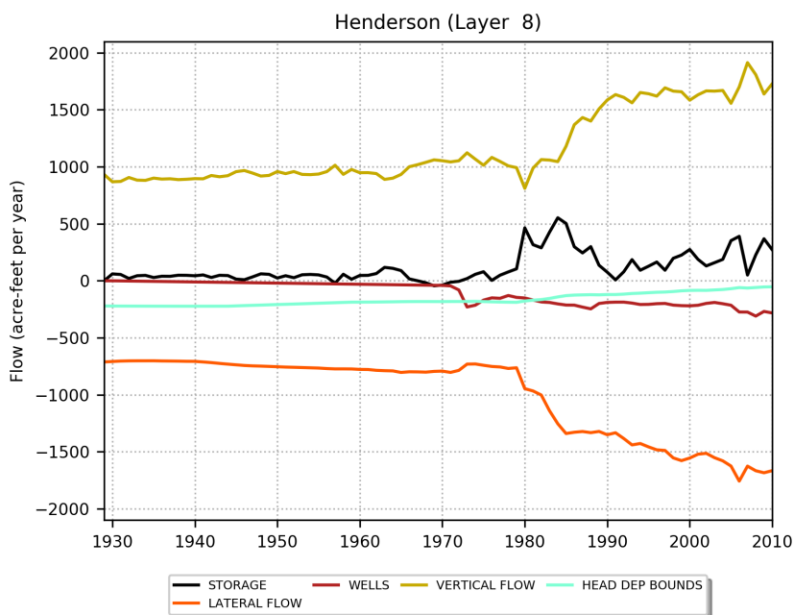
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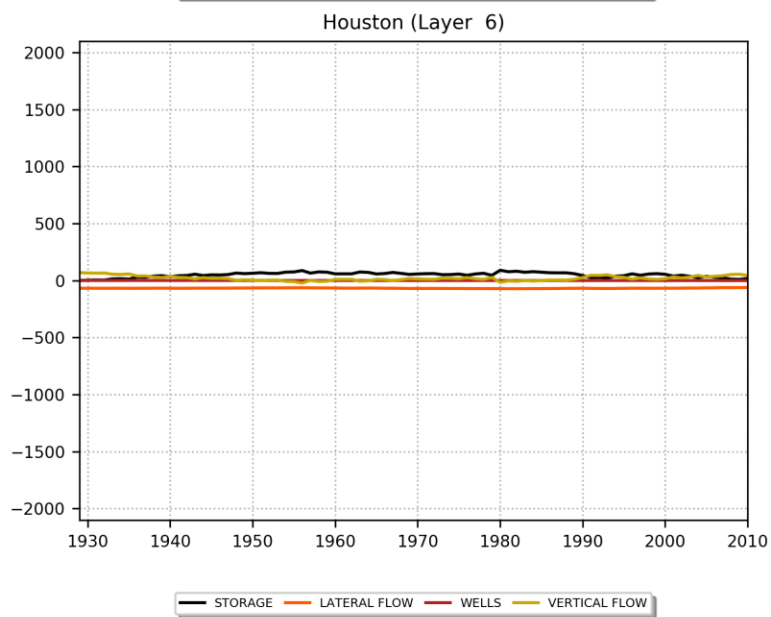
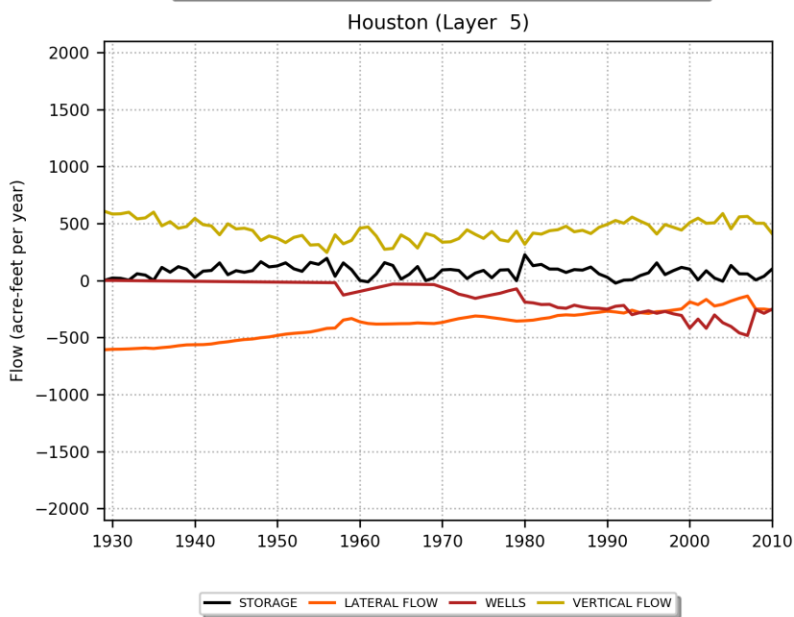
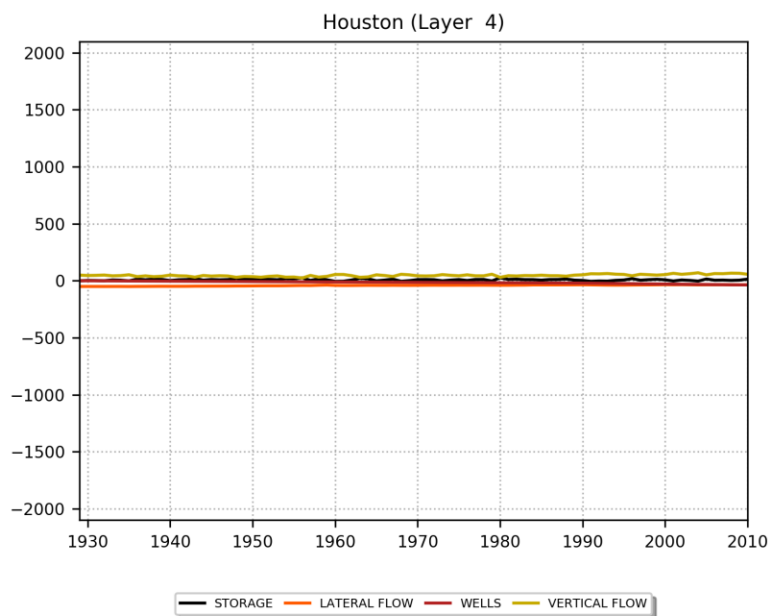
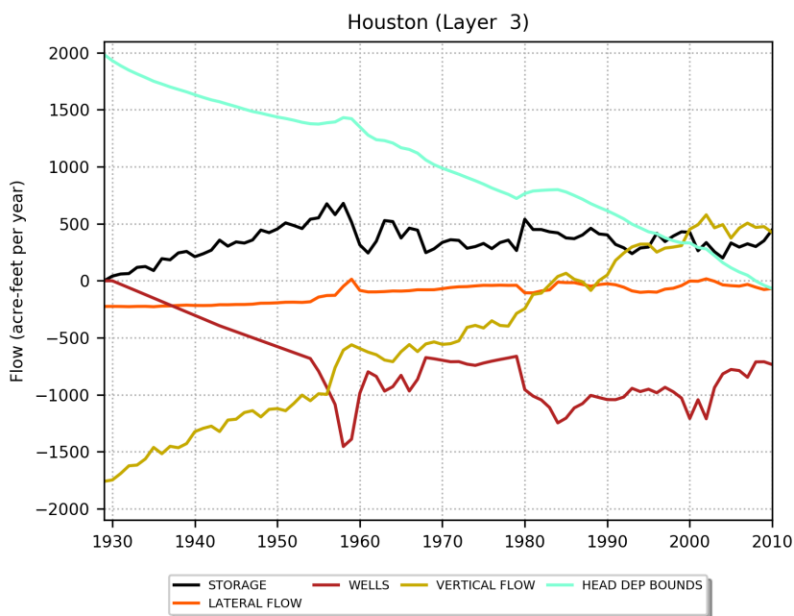
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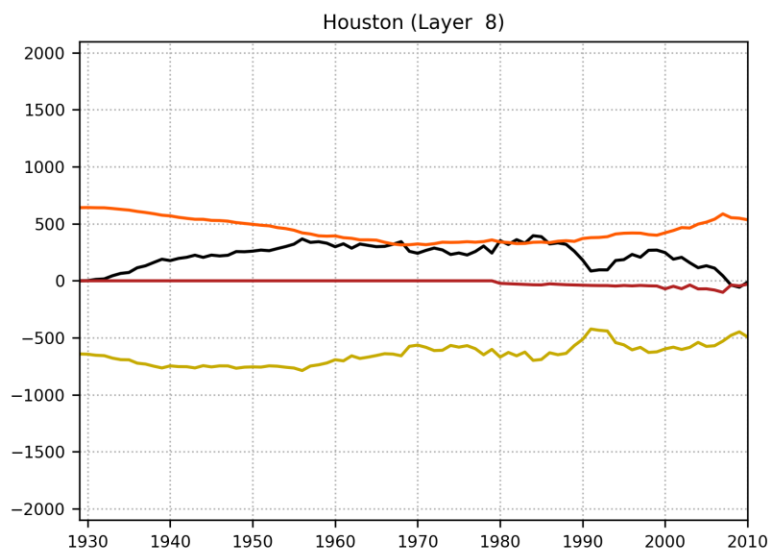
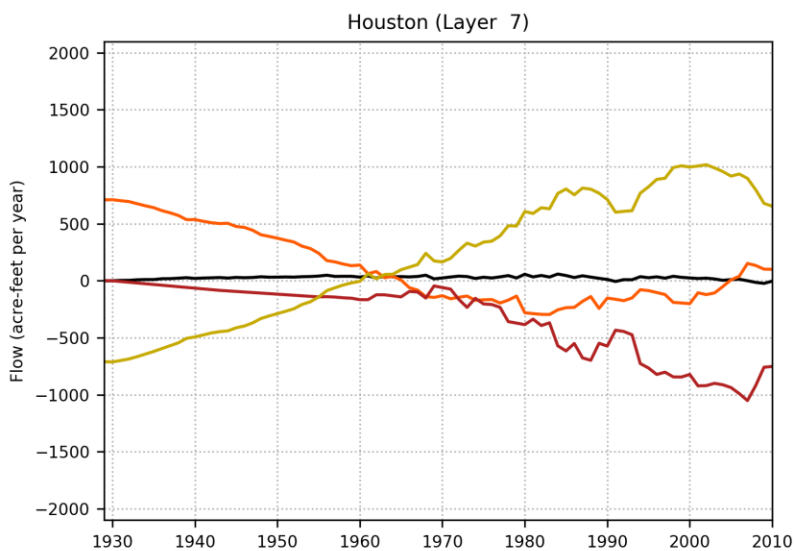
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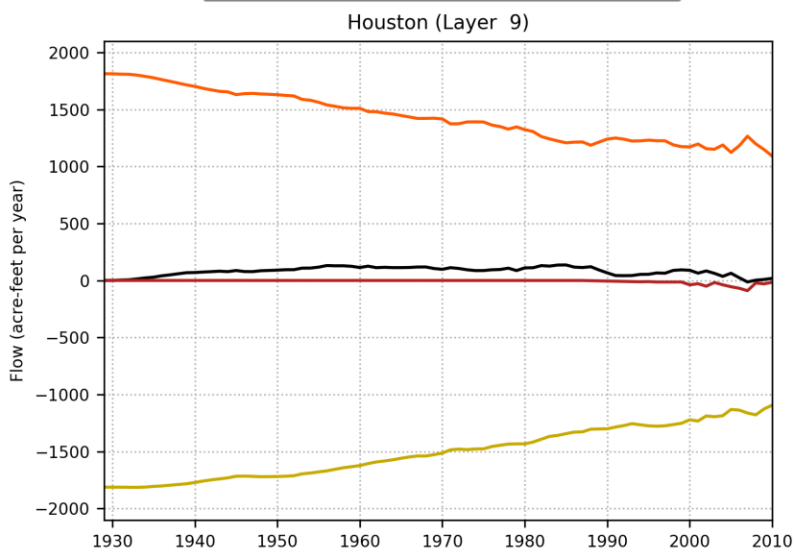


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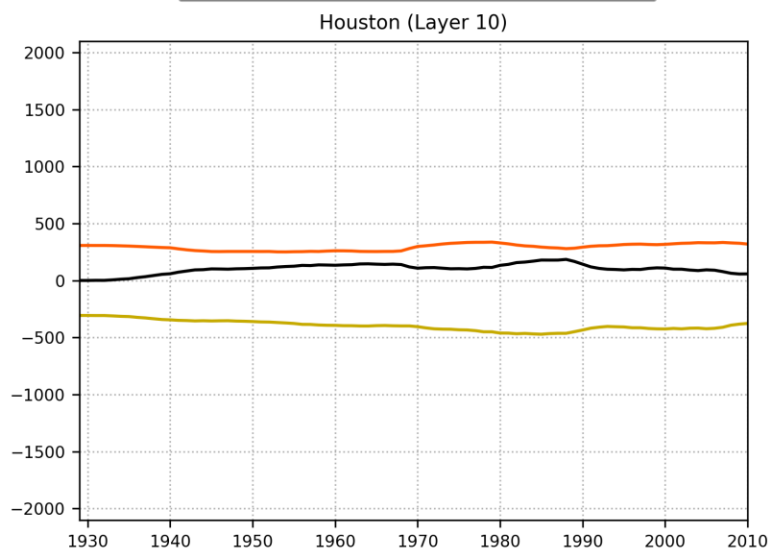


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

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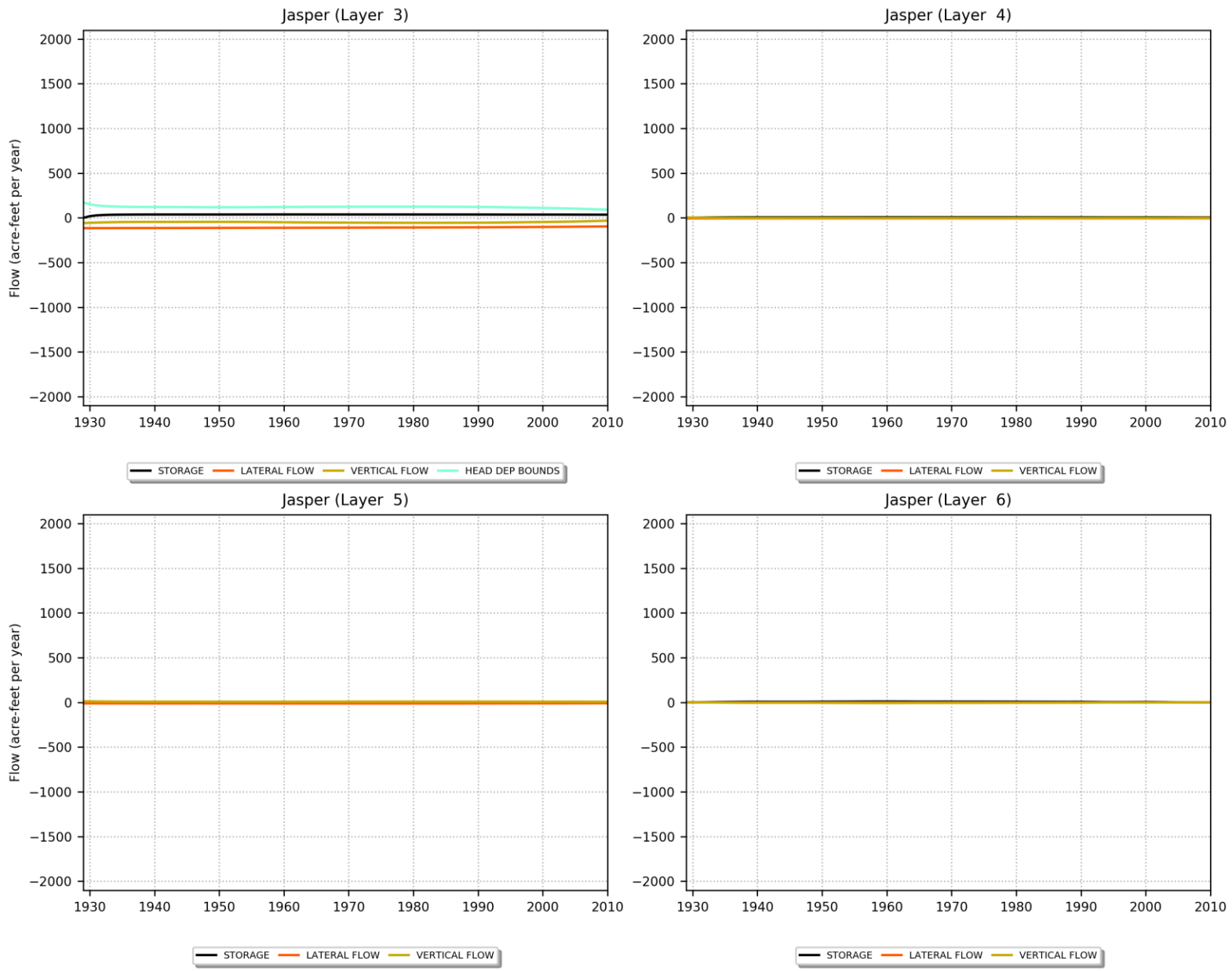


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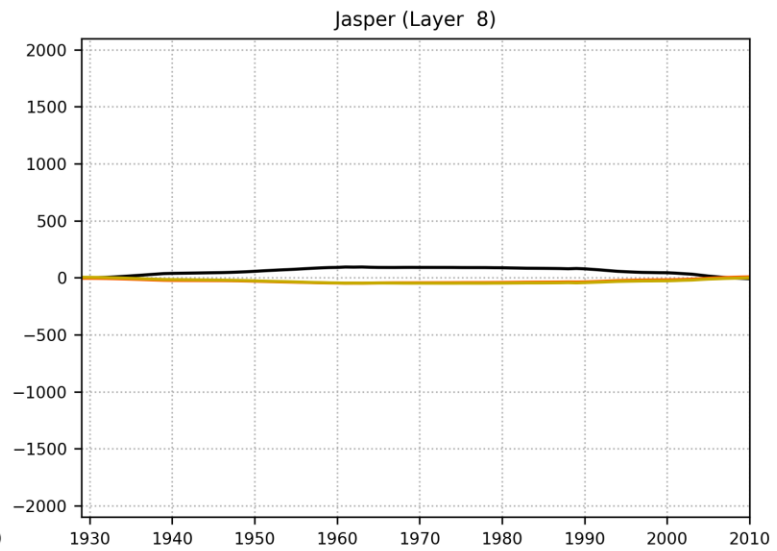
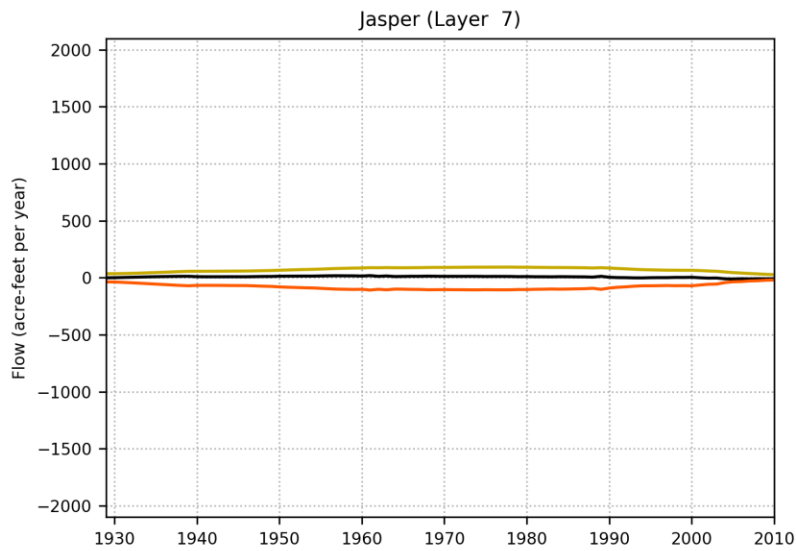


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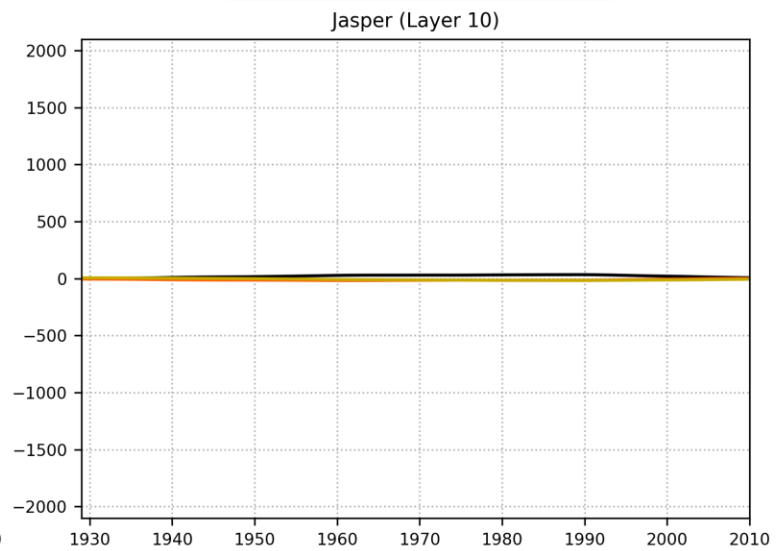
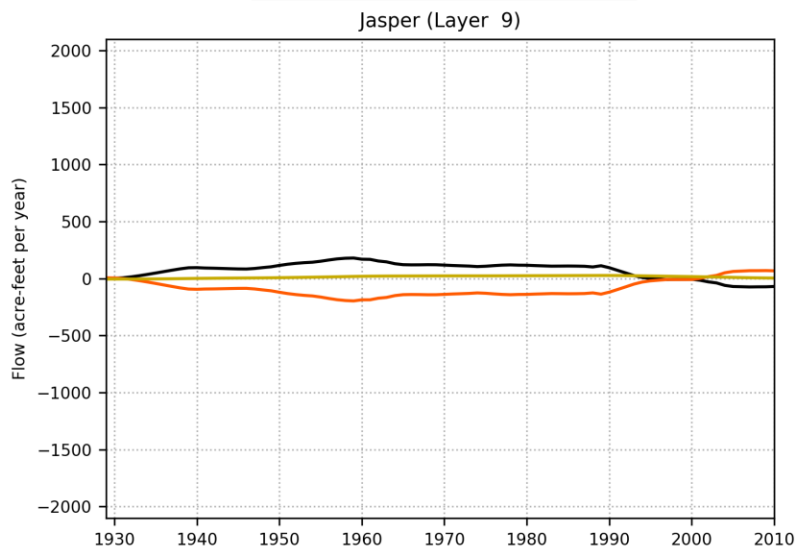


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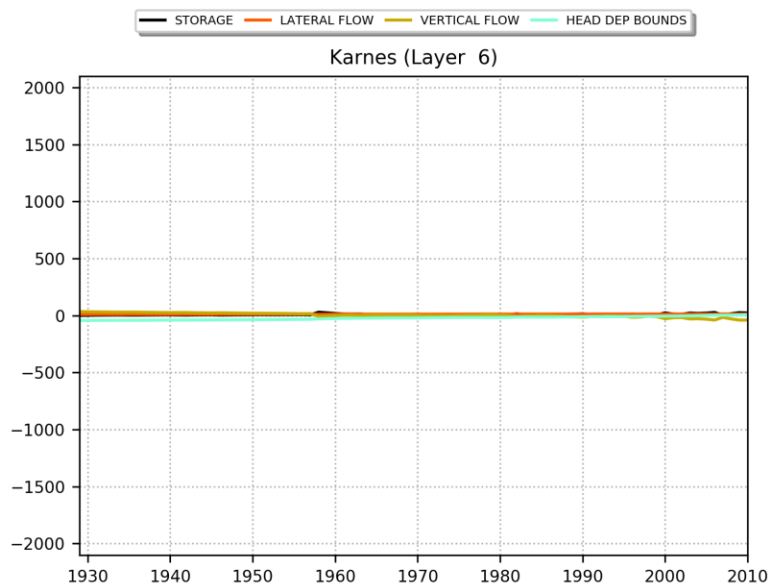
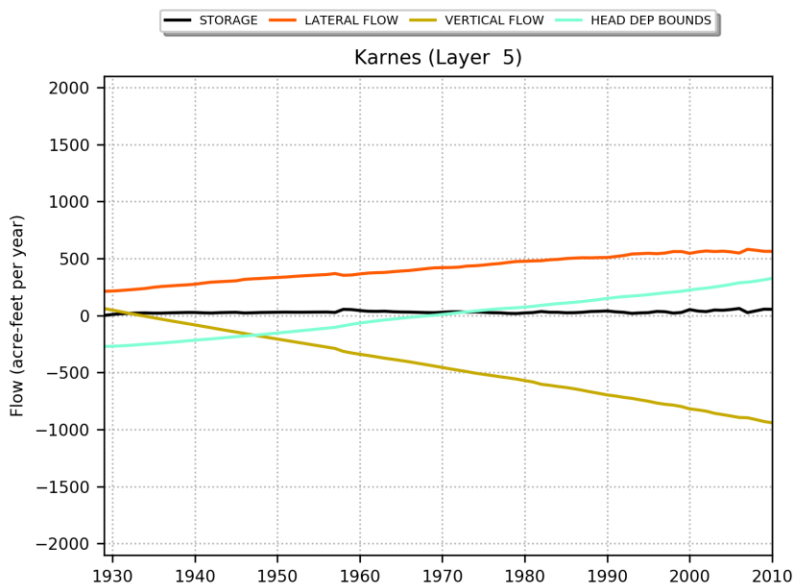
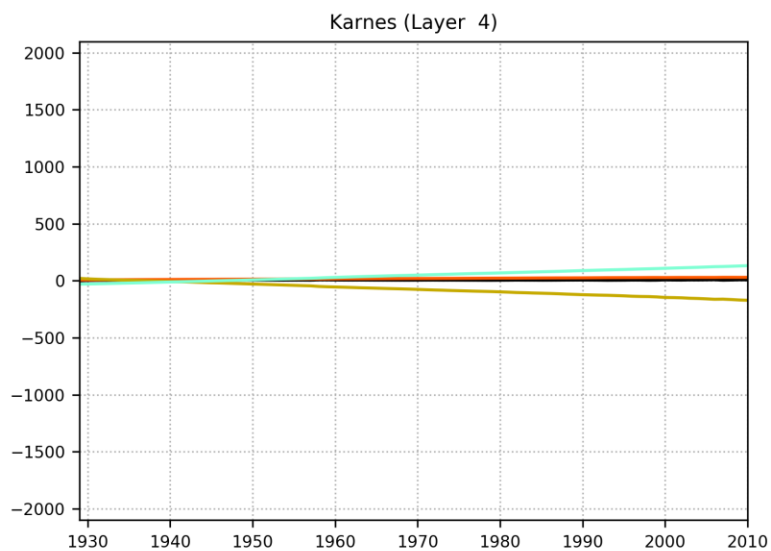
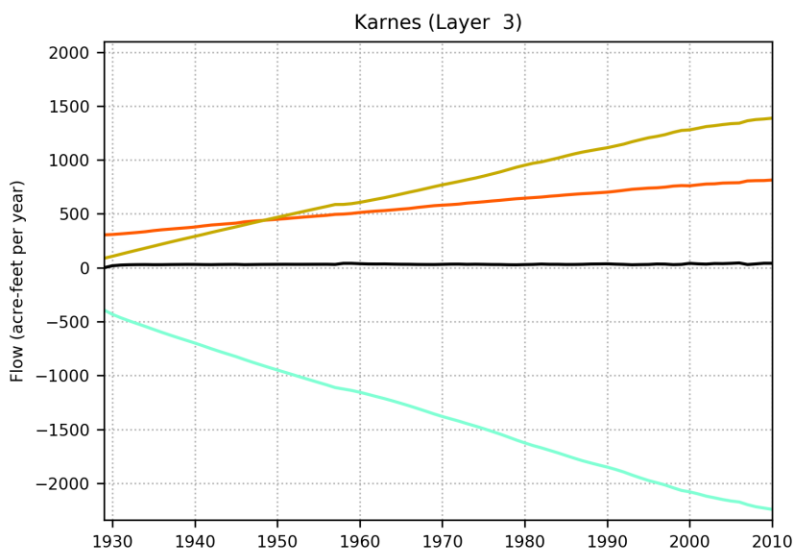
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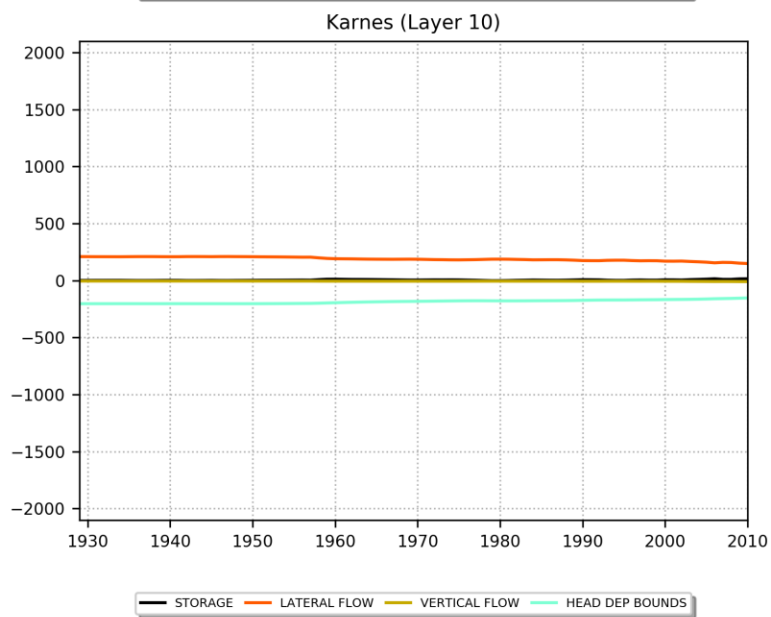
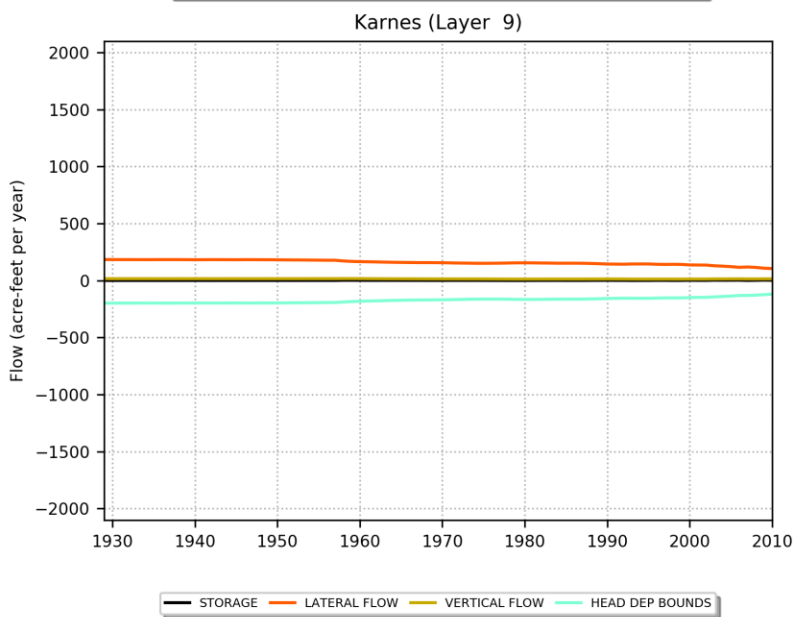
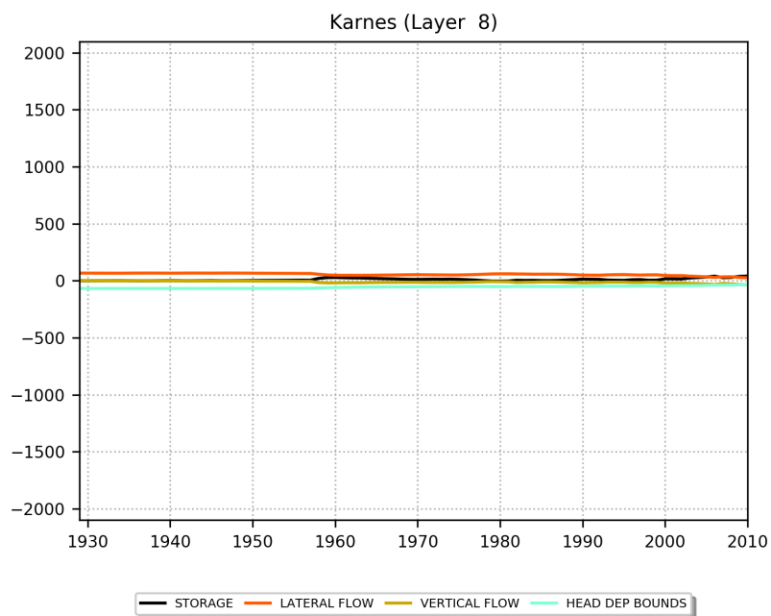
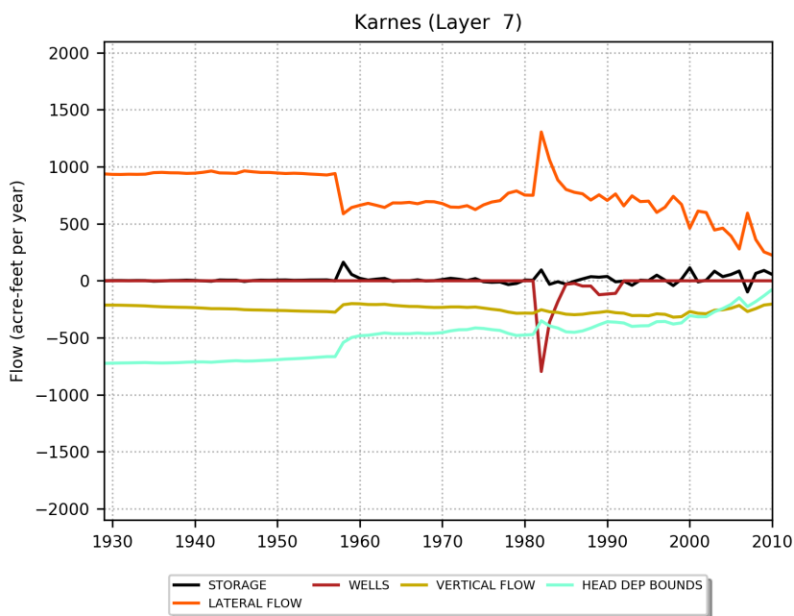
— STORAGE — LATERAL FLOW — VERTICAL FLOW

— STORAGE — LATERAL FLOW — VERTICAL FLOW

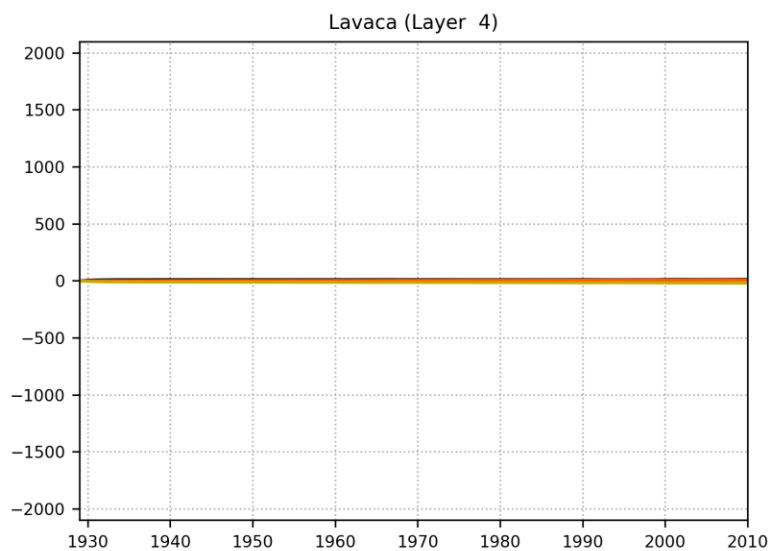
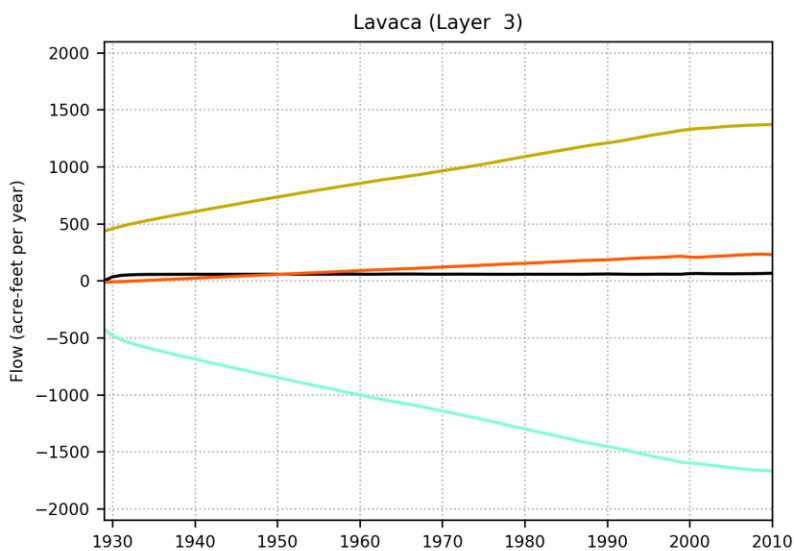
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



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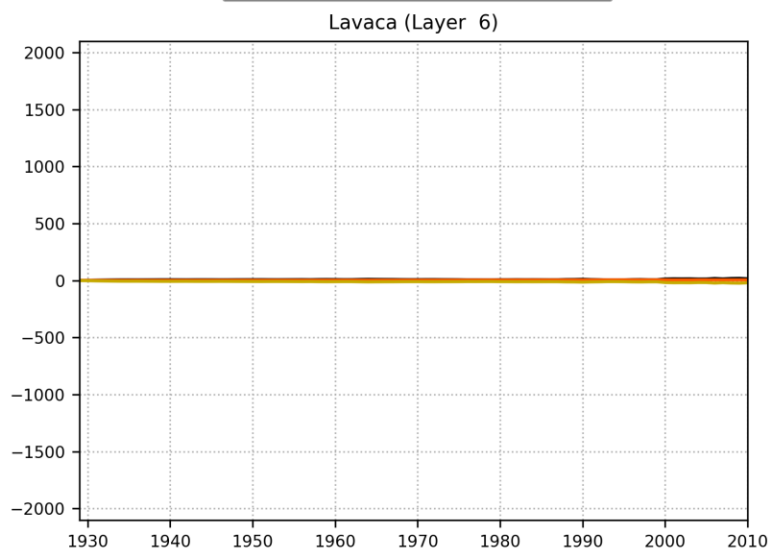
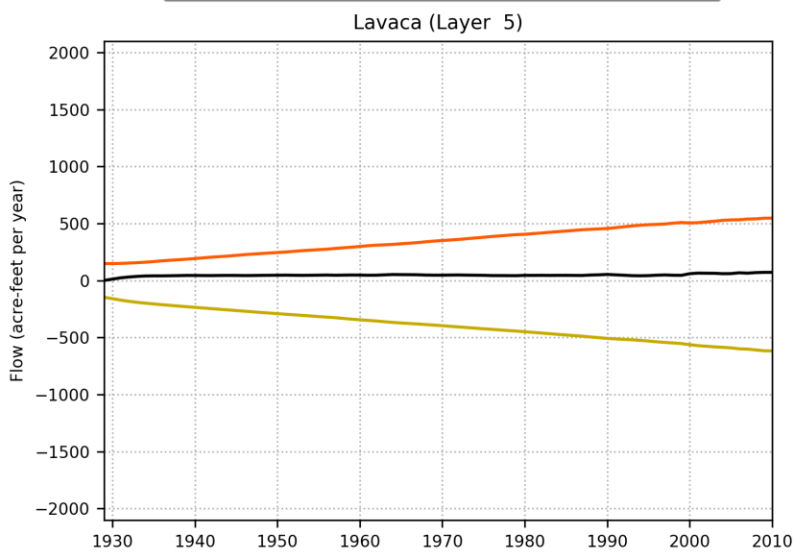


Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

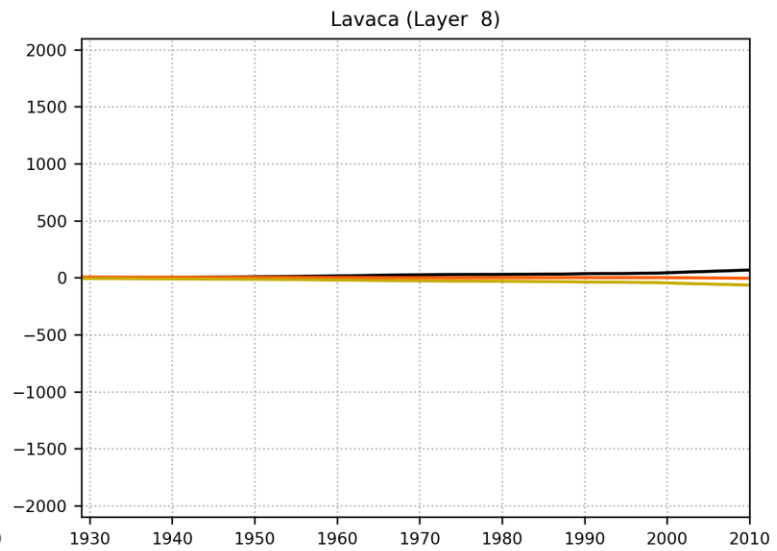
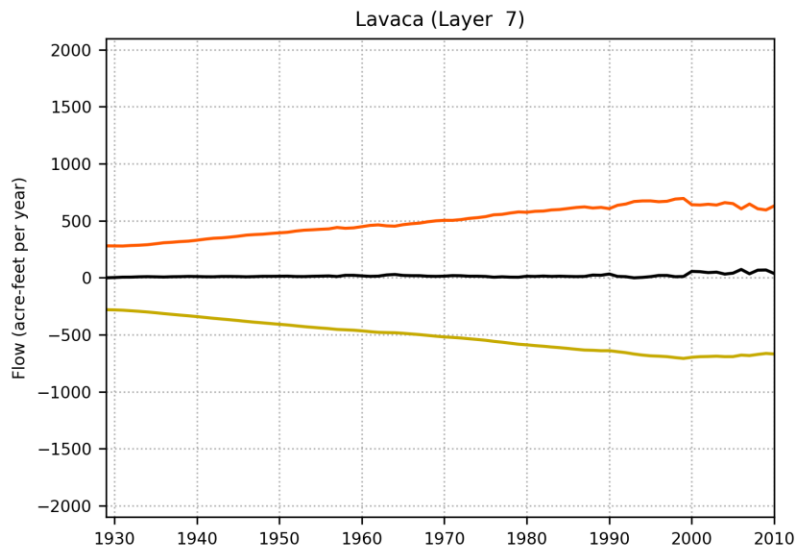
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— STORAGE — LATERAL FLOW — VERTICAL FLOW

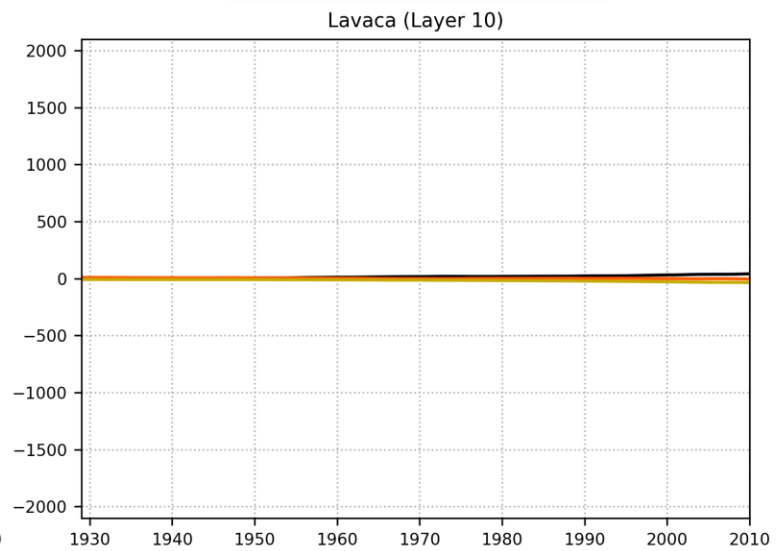
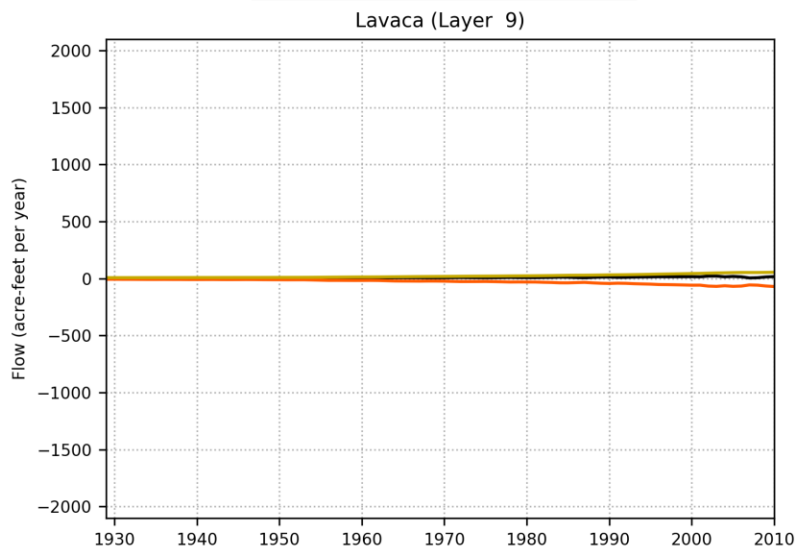
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Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



— STORAGE — LATERAL FLOW — VERTICAL FLOW

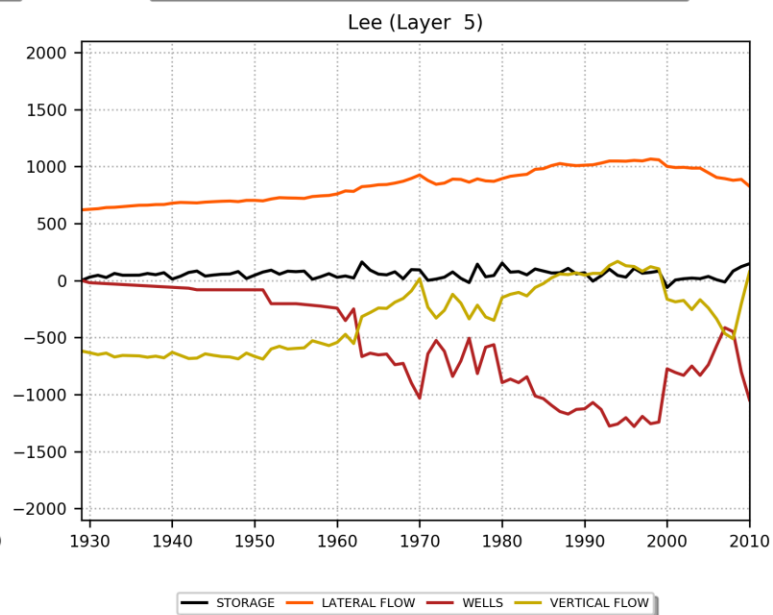
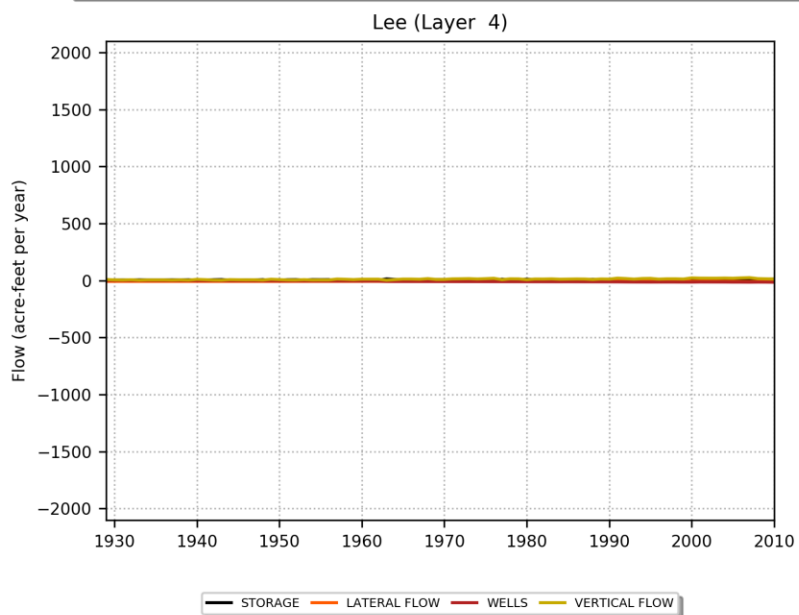
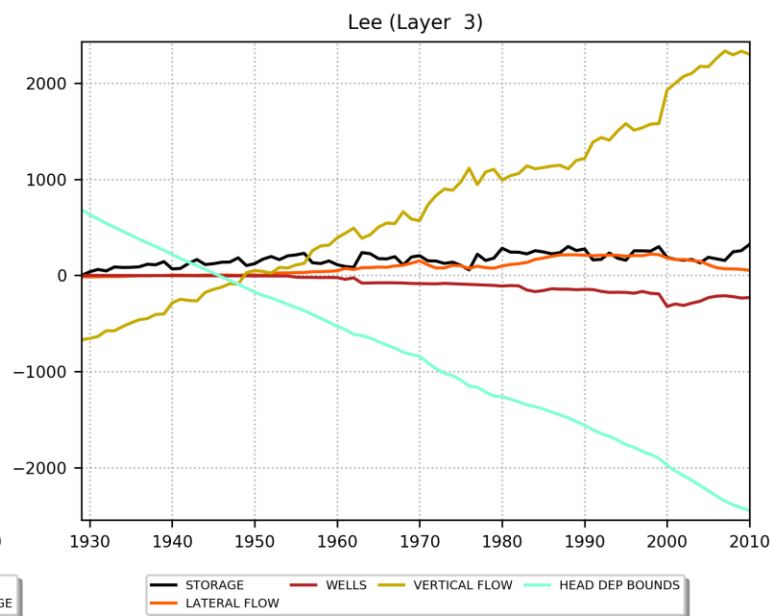
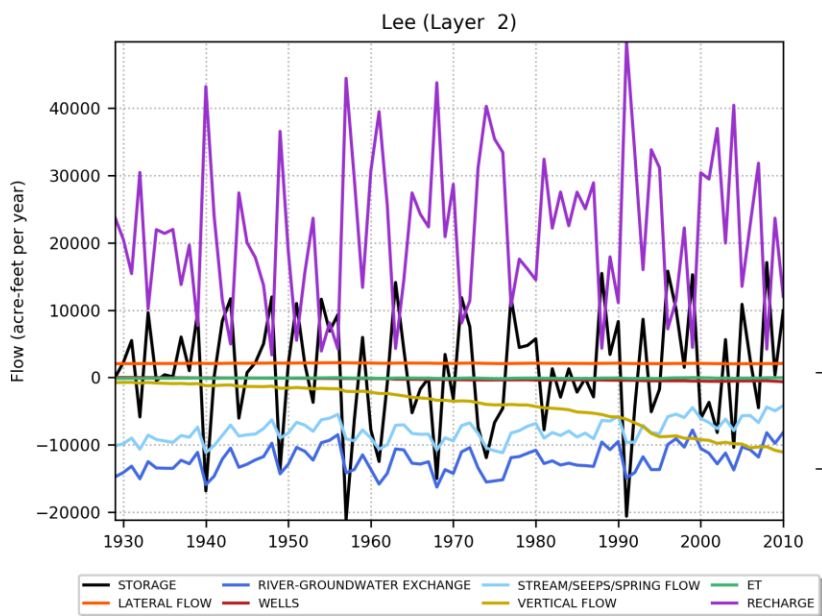
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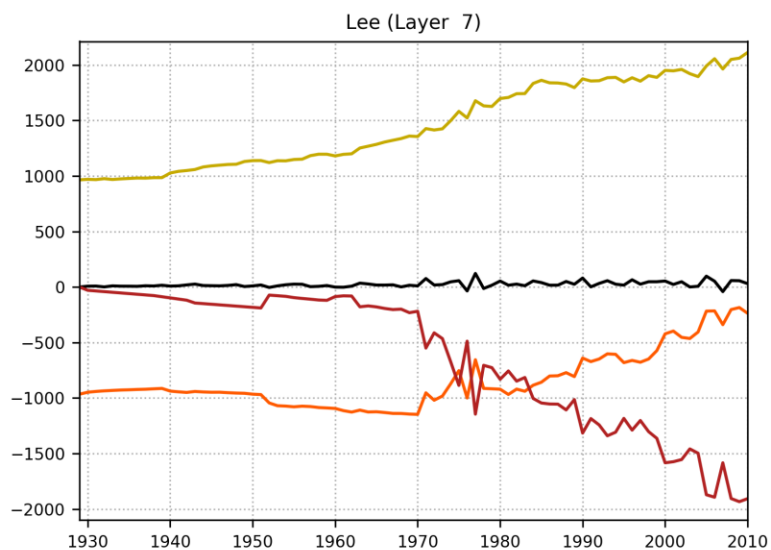
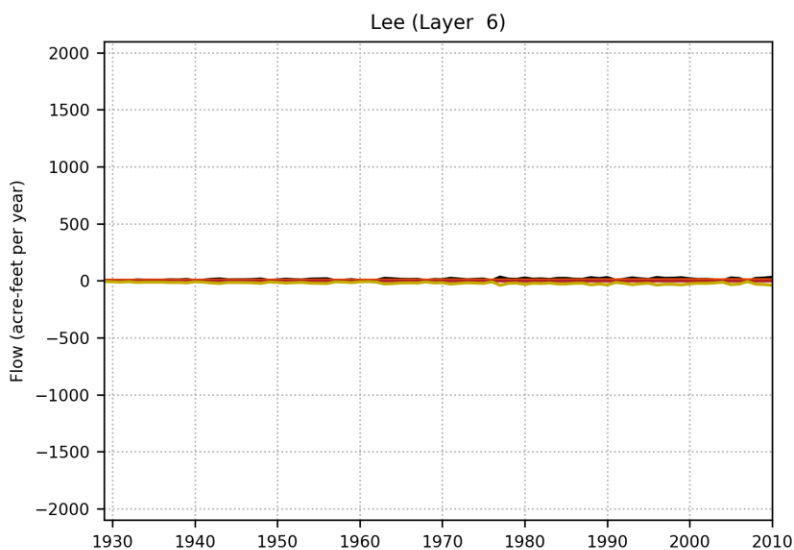
— STORAGE — LATERAL FLOW — VERTICAL FLOW

— STORAGE — LATERAL FLOW — VERTICAL FLOW

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

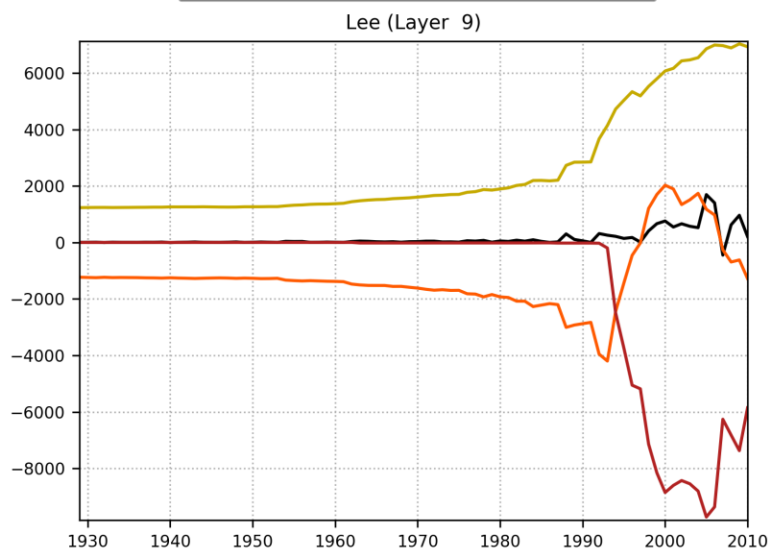
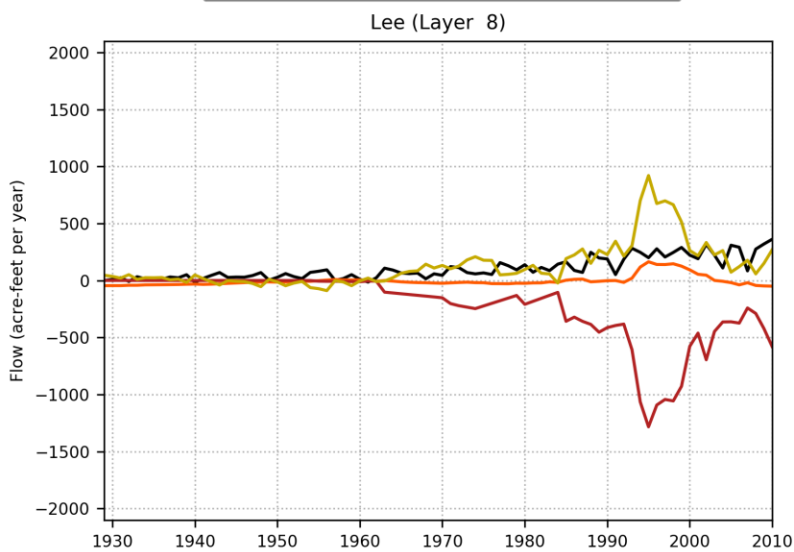


Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

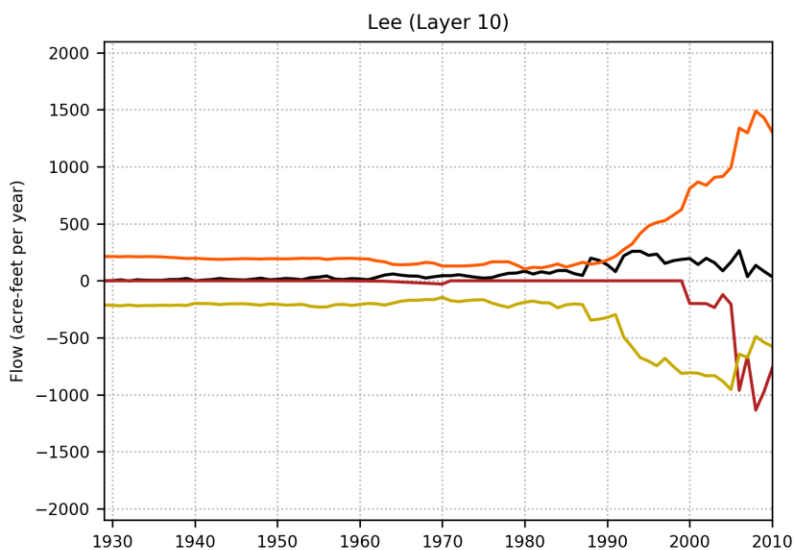
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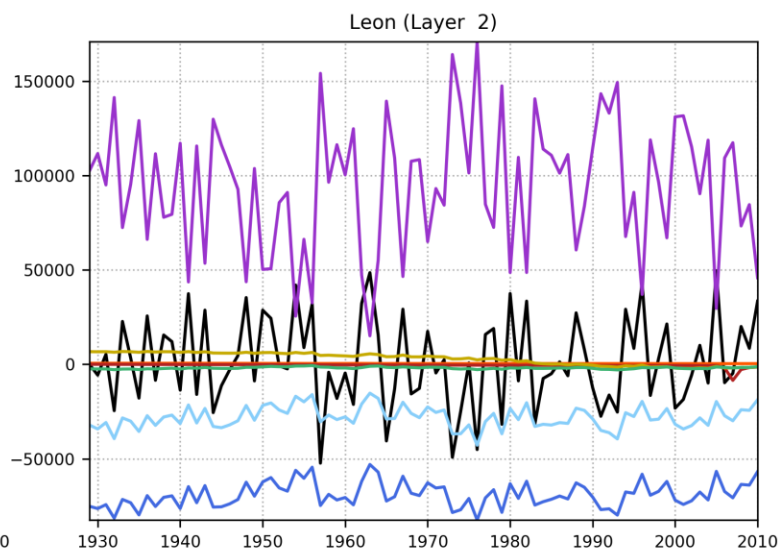
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— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

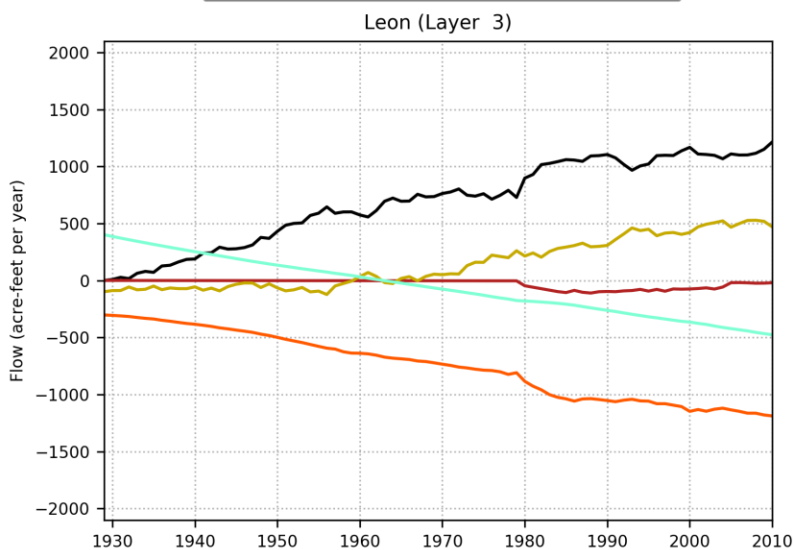
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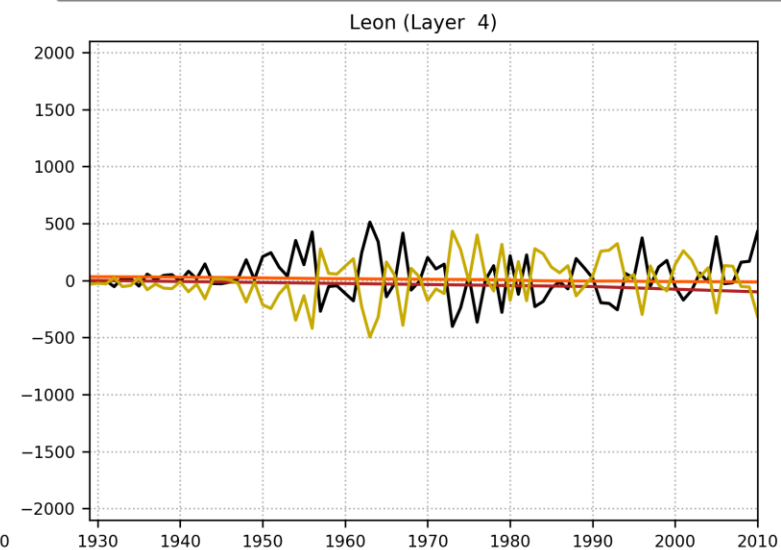
— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW



— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

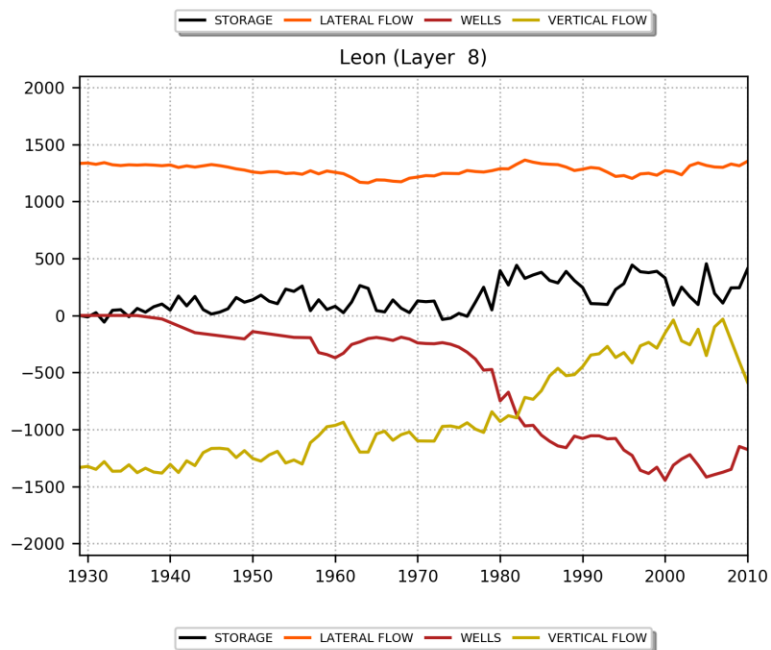
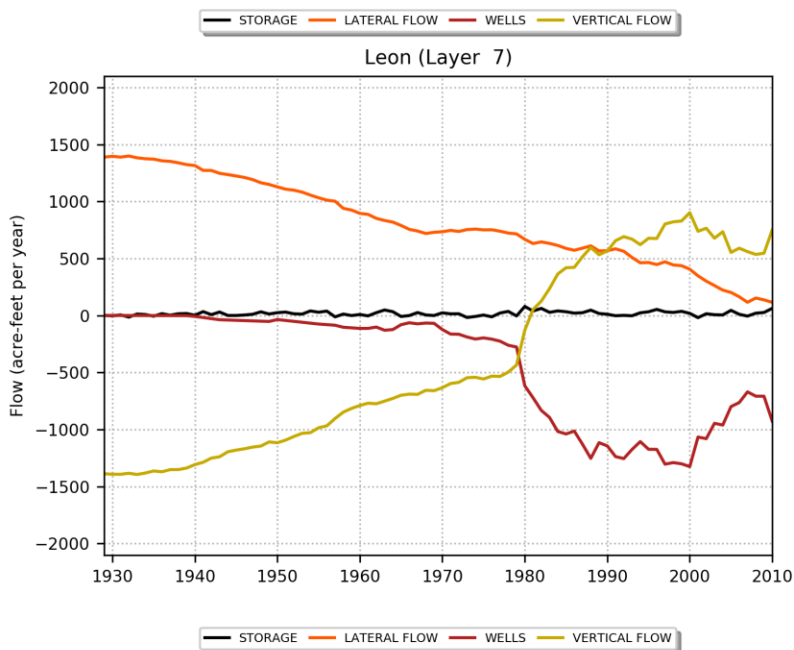
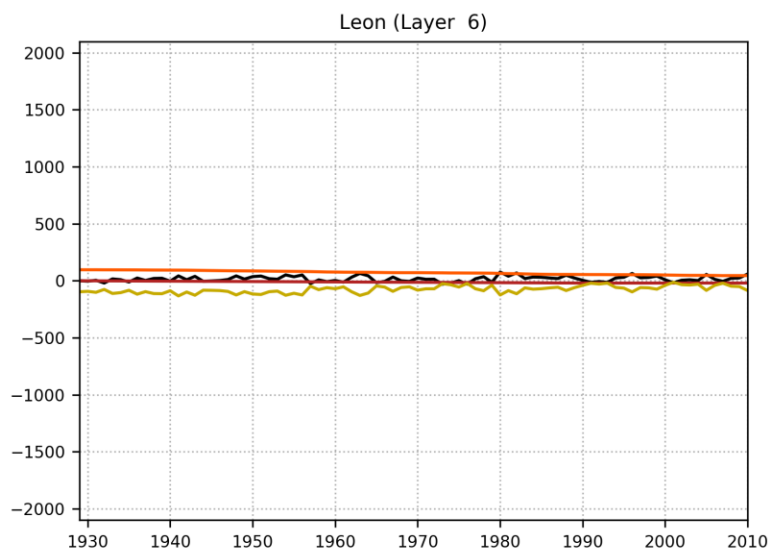
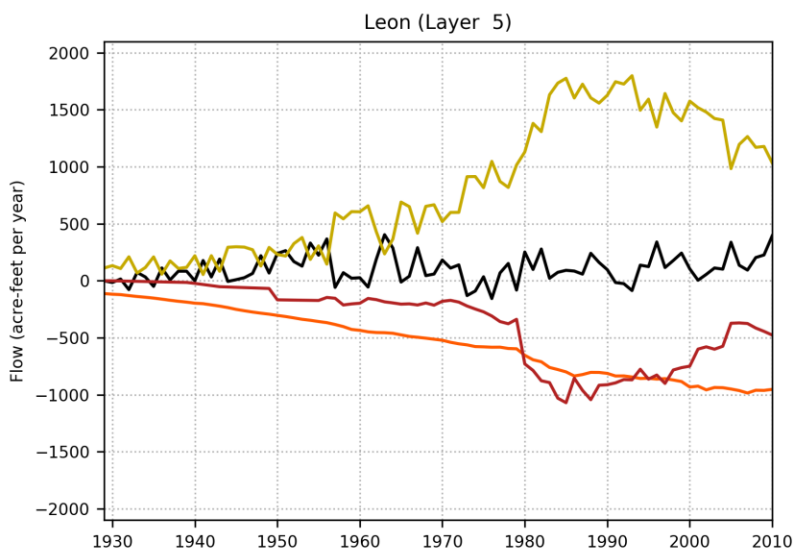


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS

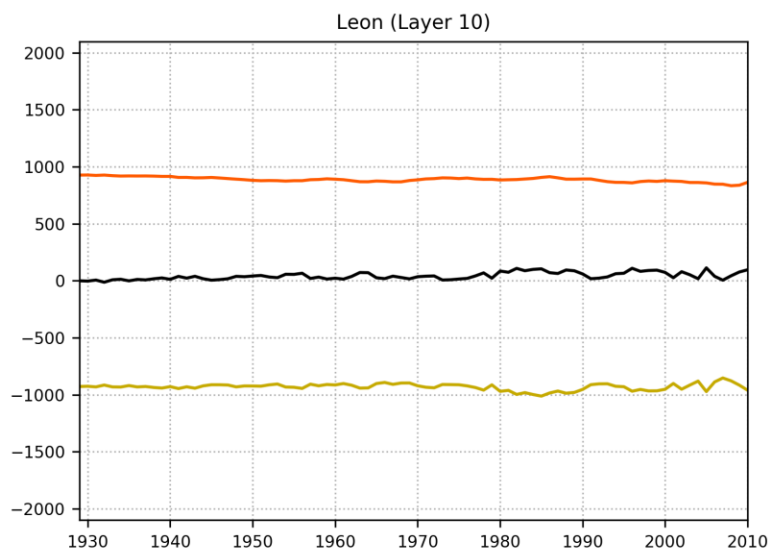
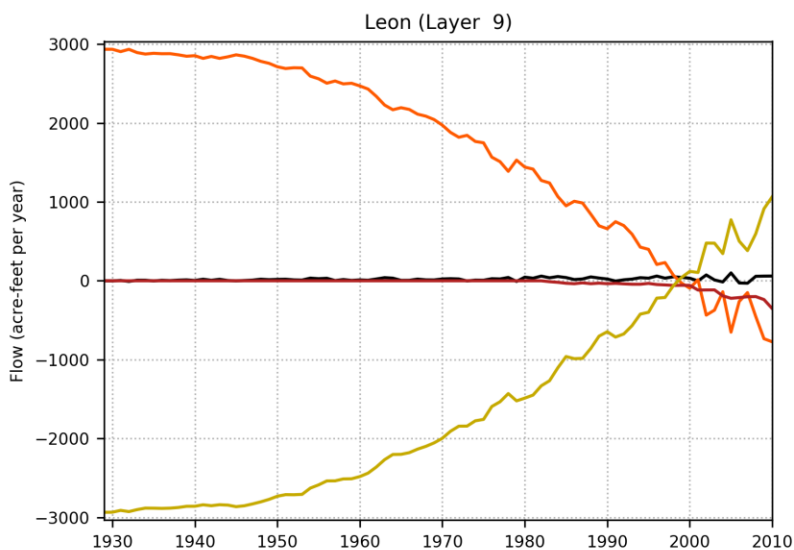


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

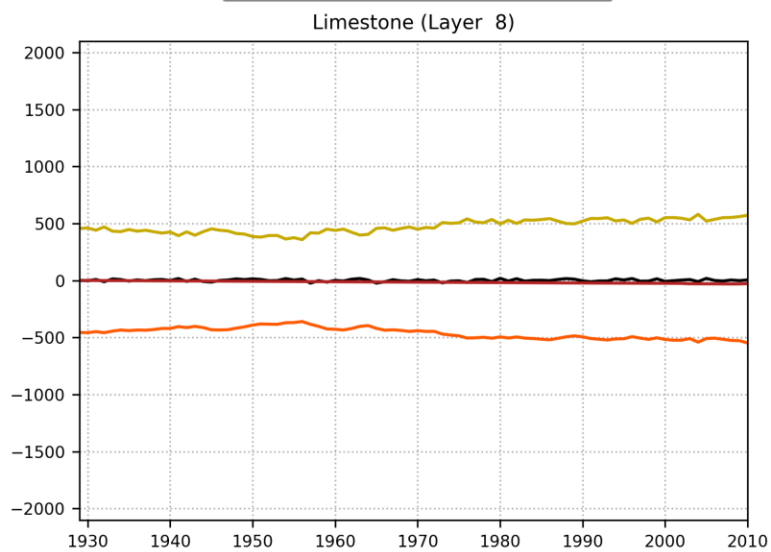
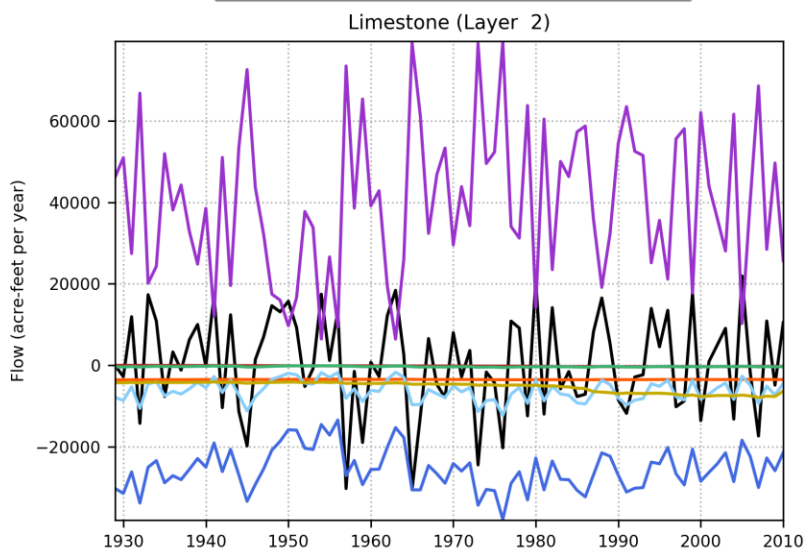


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— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

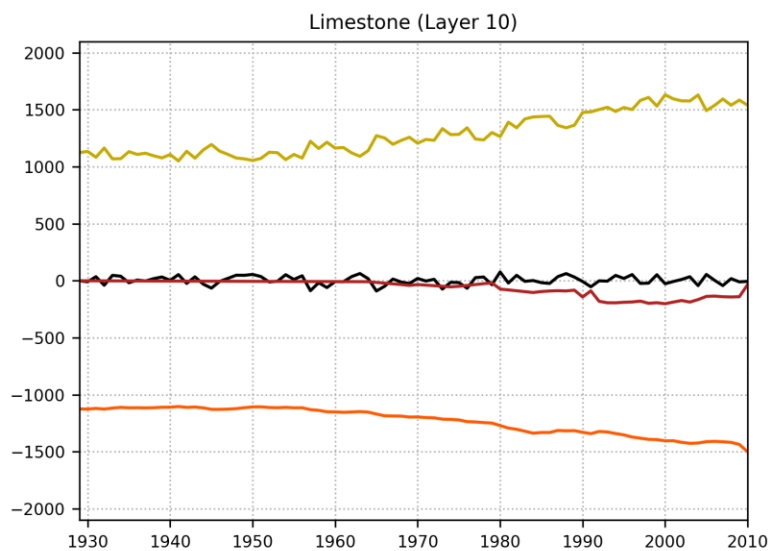
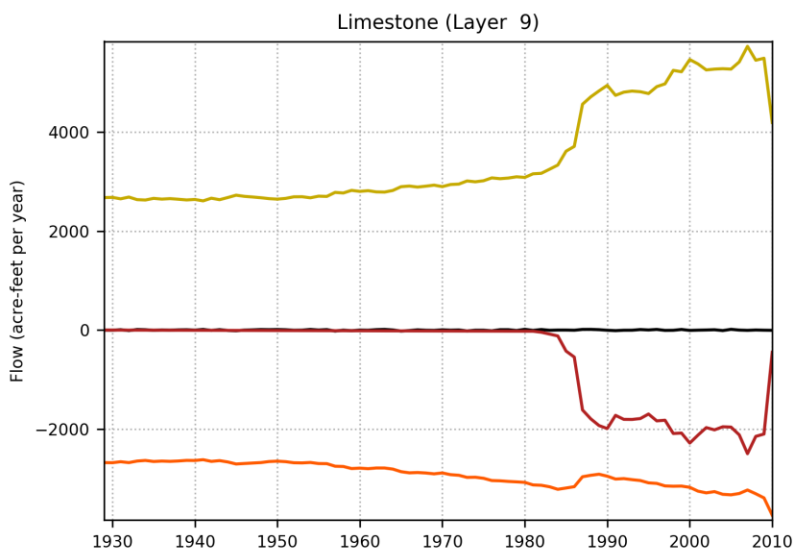
— STORAGE — LATERAL FLOW — VERTICAL FLOW



— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

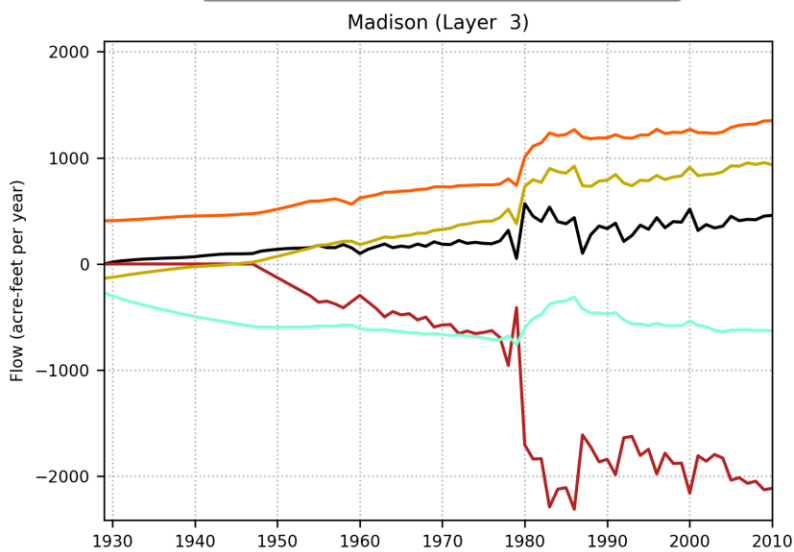
— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

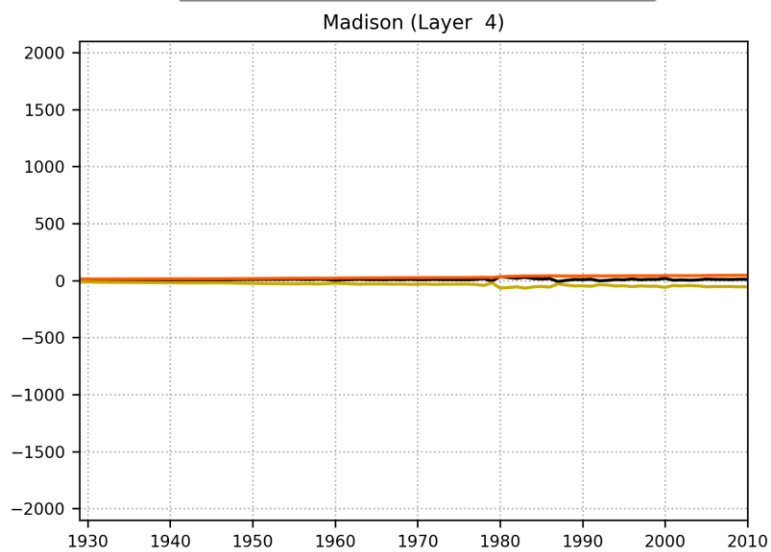


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

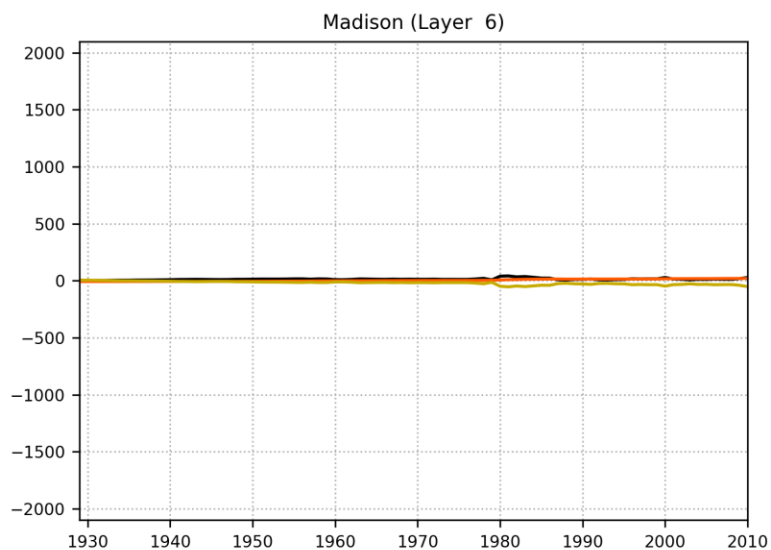
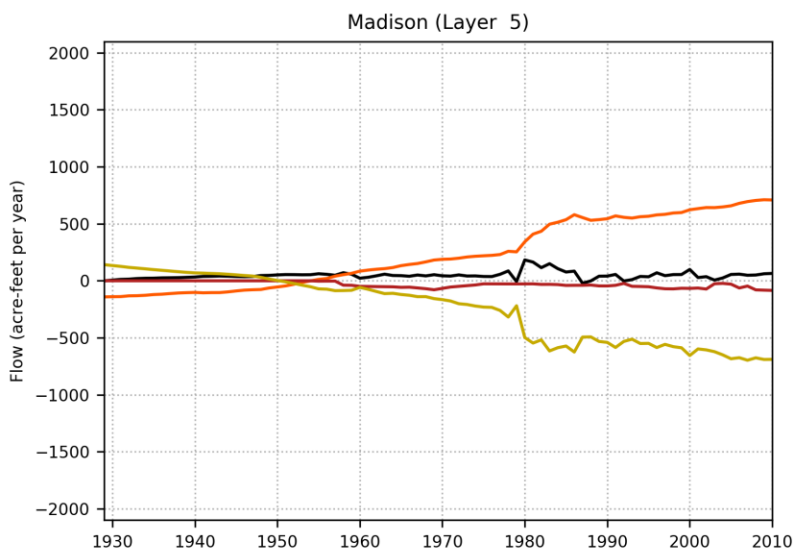


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS



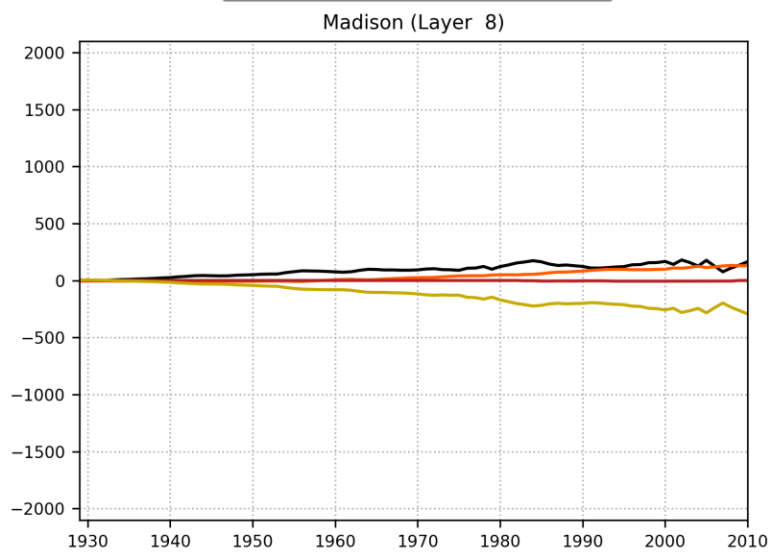
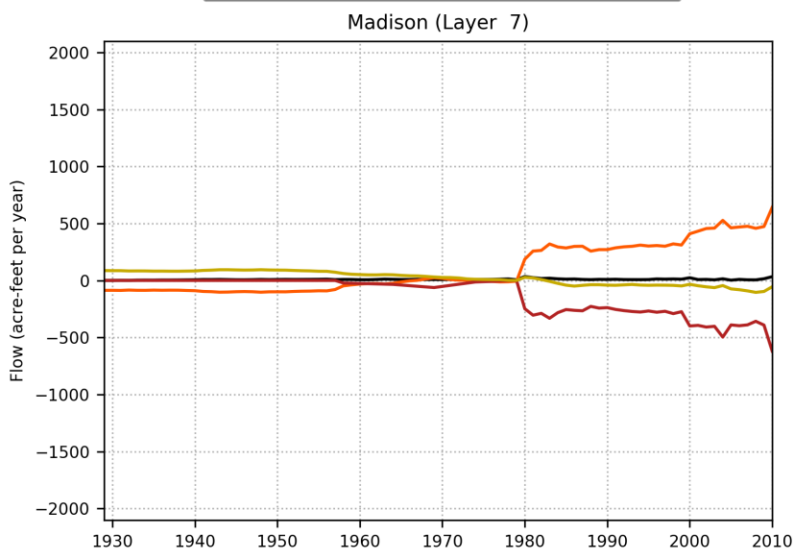
— STORAGE — LATERAL FLOW — VERTICAL FLOW

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

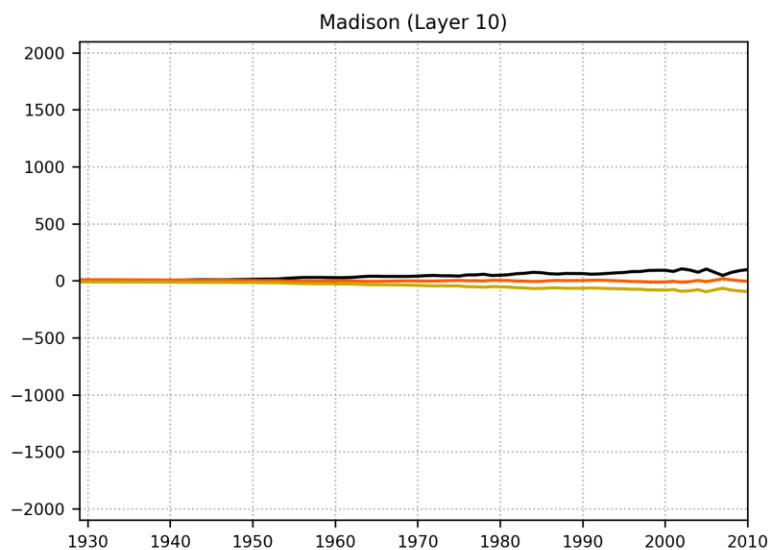
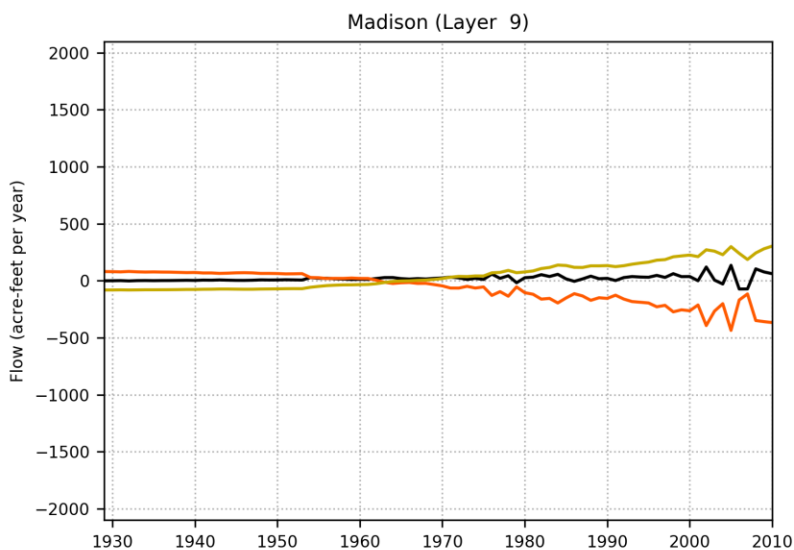
— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW



— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

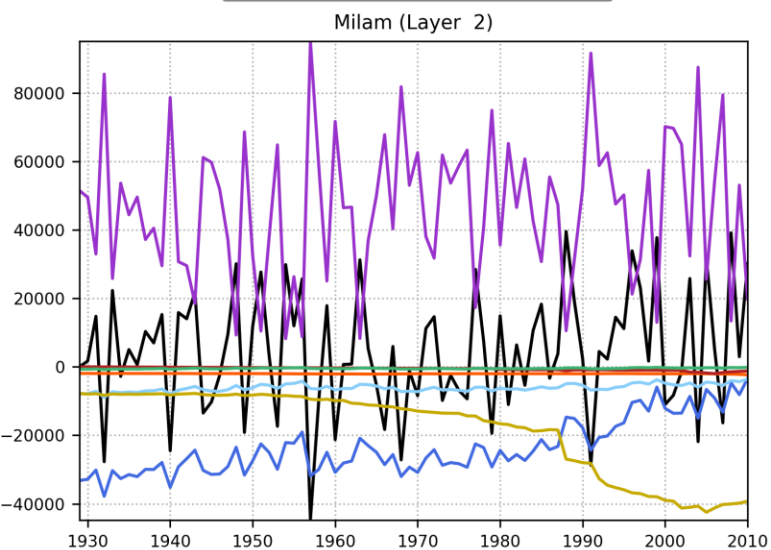
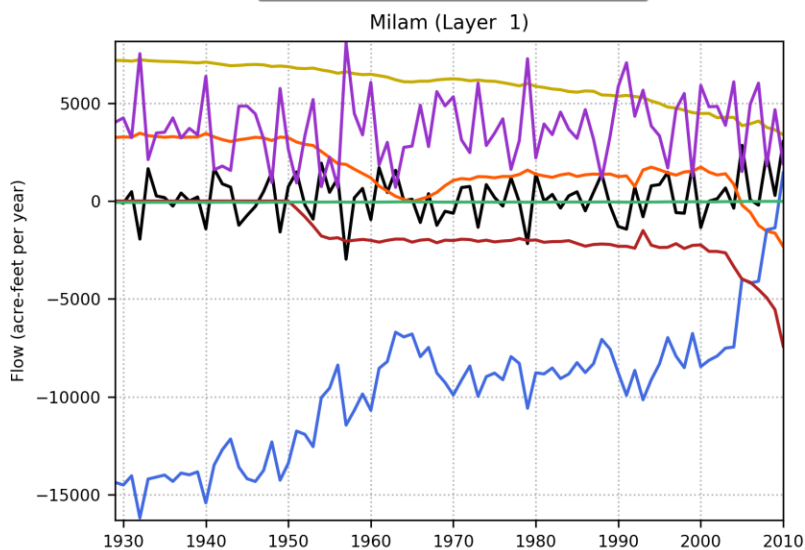
— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



— STORAGE — LATERAL FLOW — VERTICAL FLOW

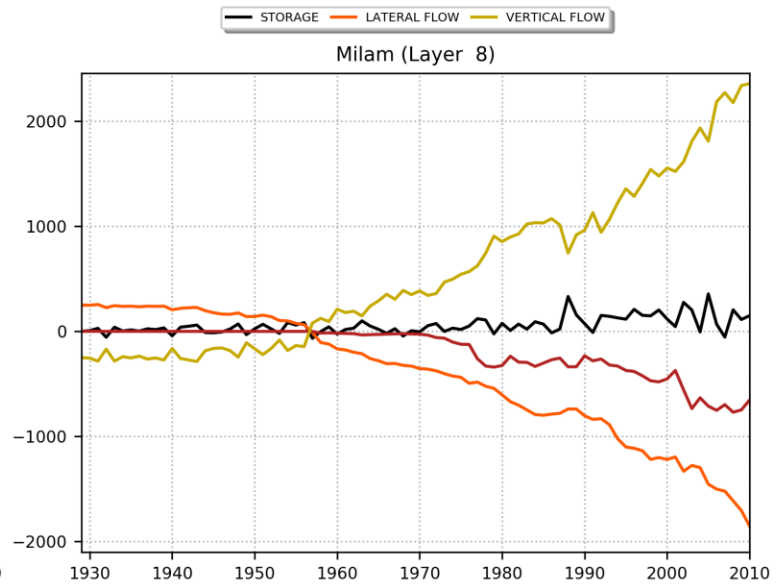
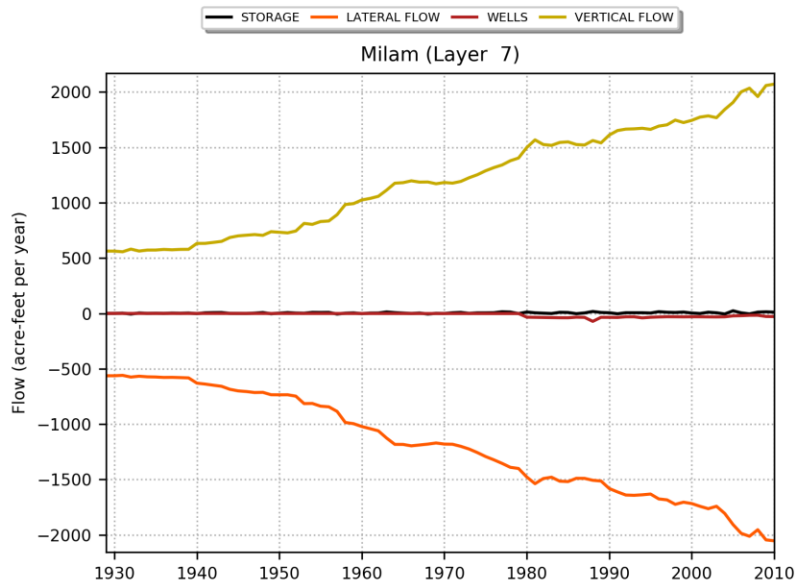
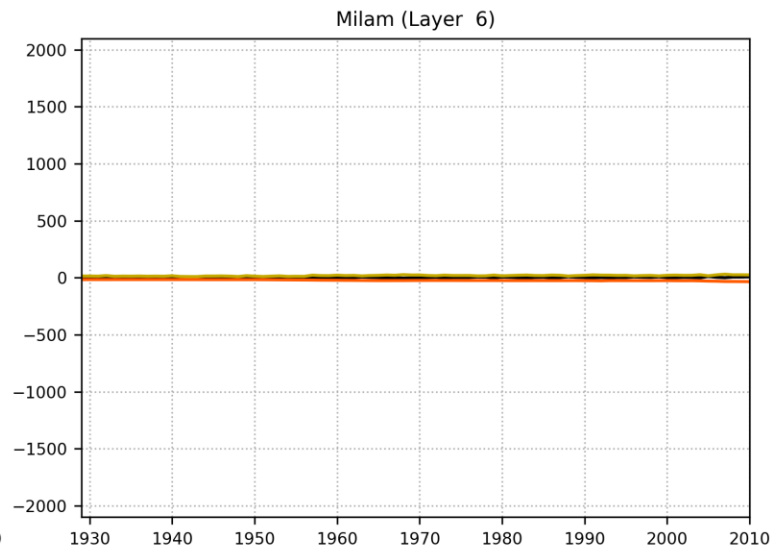
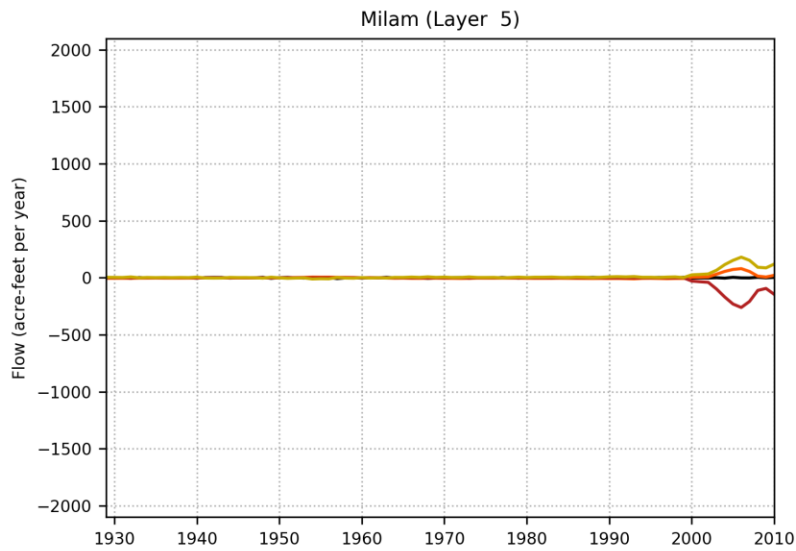
— STORAGE — LATERAL FLOW — VERTICAL FLOW



— STORAGE — RIVER-GROUNDWATER EXCHANGE — VERTICAL FLOW — RECHARGE
— LATERAL FLOW — WELLS — ET

— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



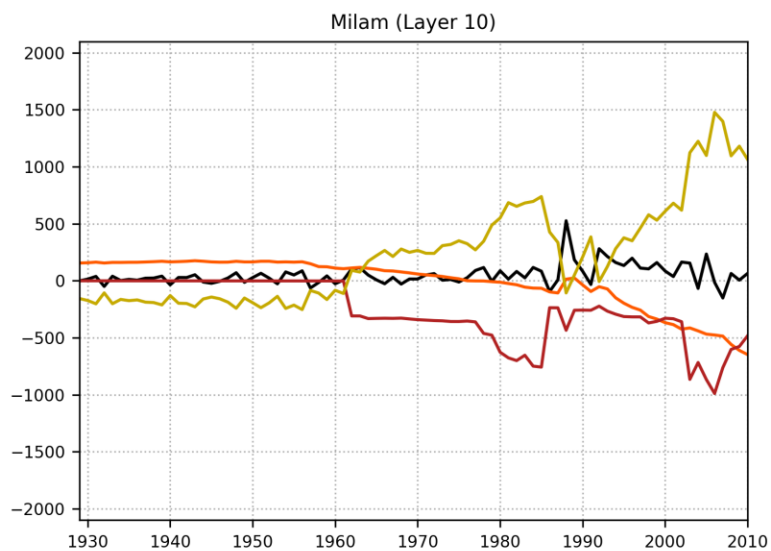
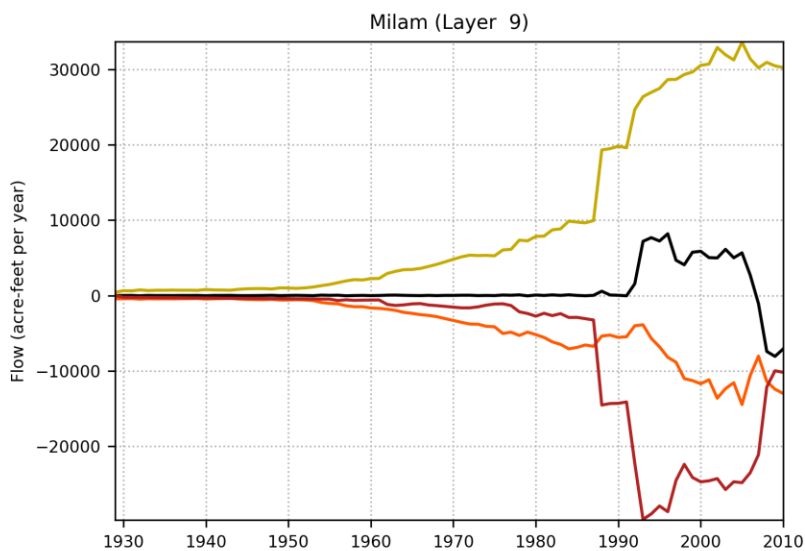
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— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

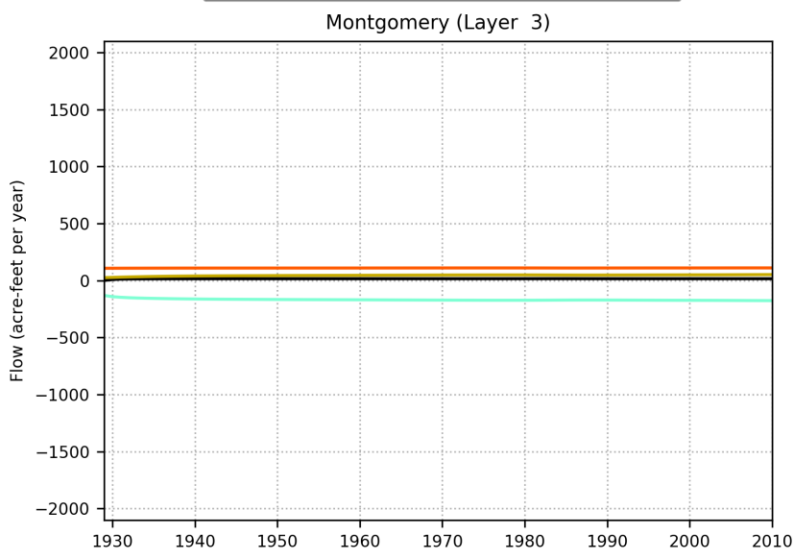
— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

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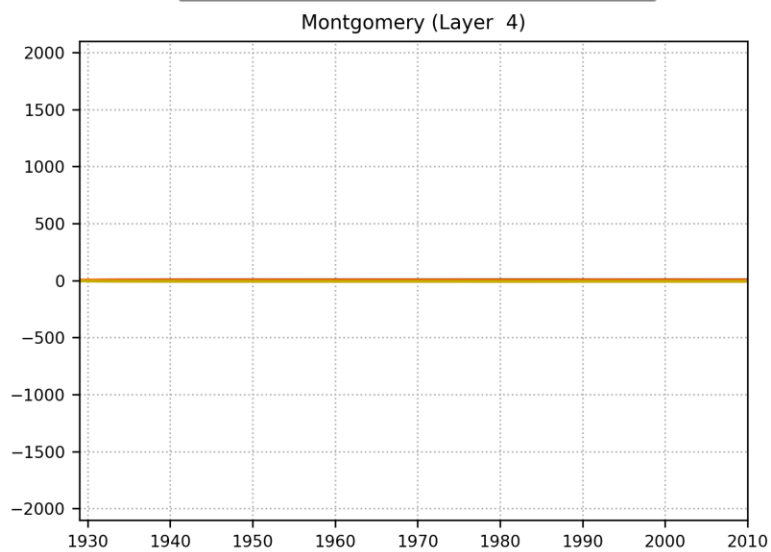


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

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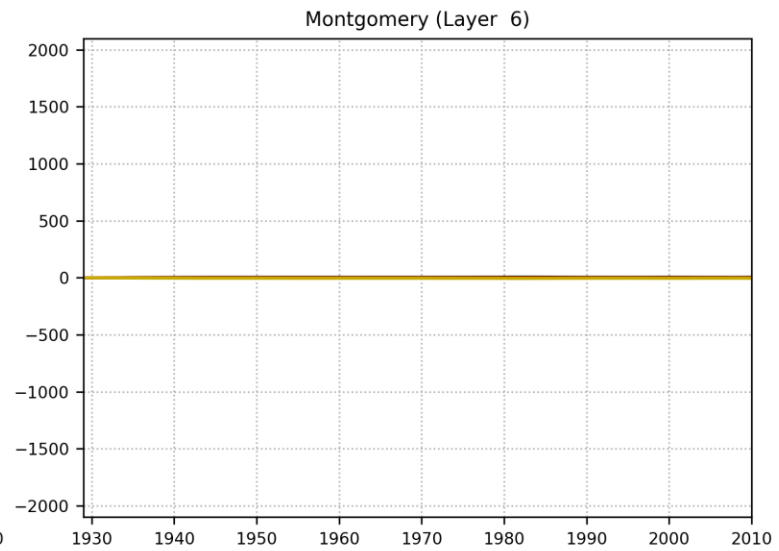
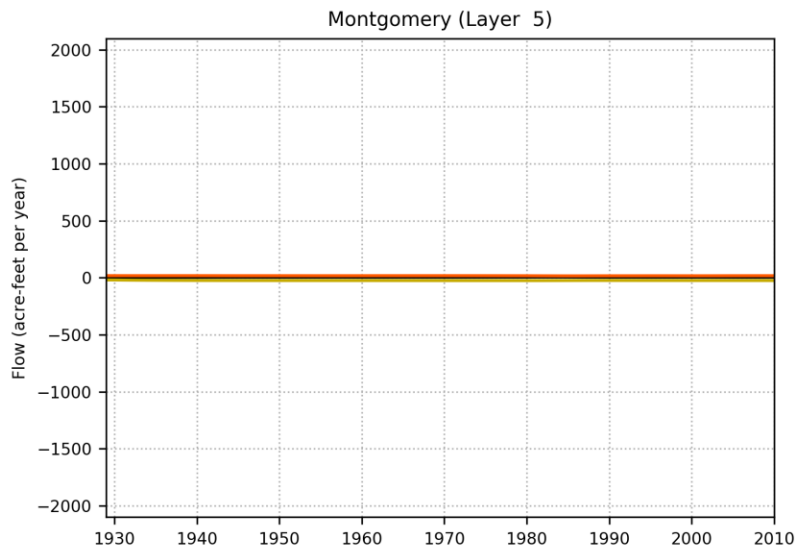


— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS



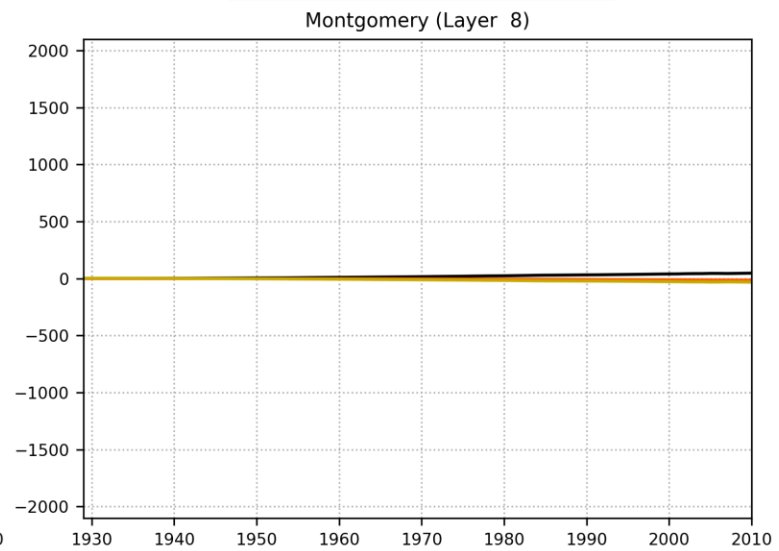
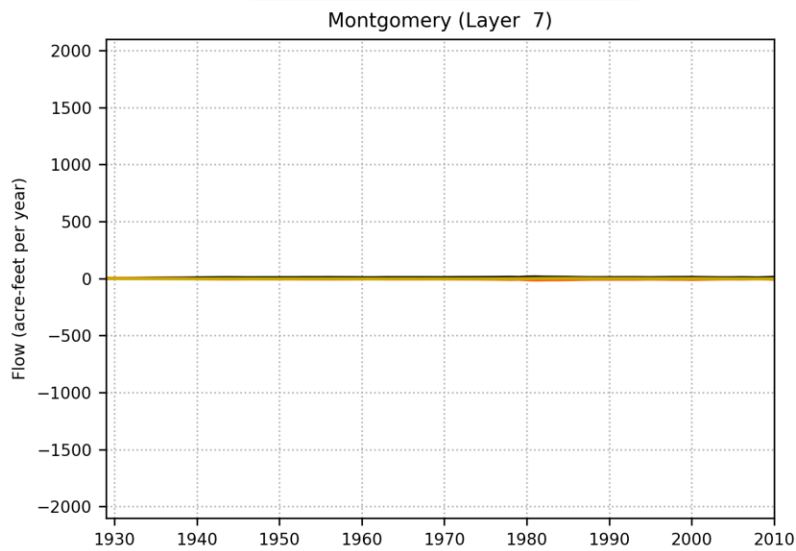
— STORAGE — LATERAL FLOW — VERTICAL FLOW

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— STORAGE — LATERAL FLOW — VERTICAL FLOW

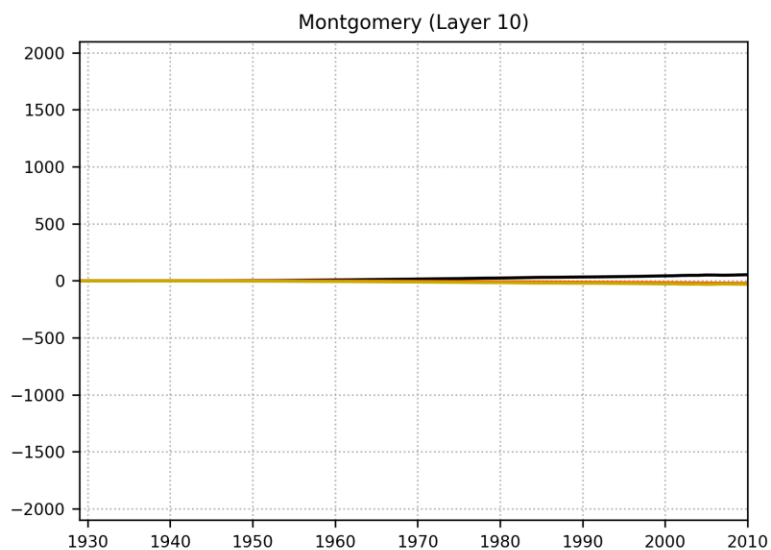
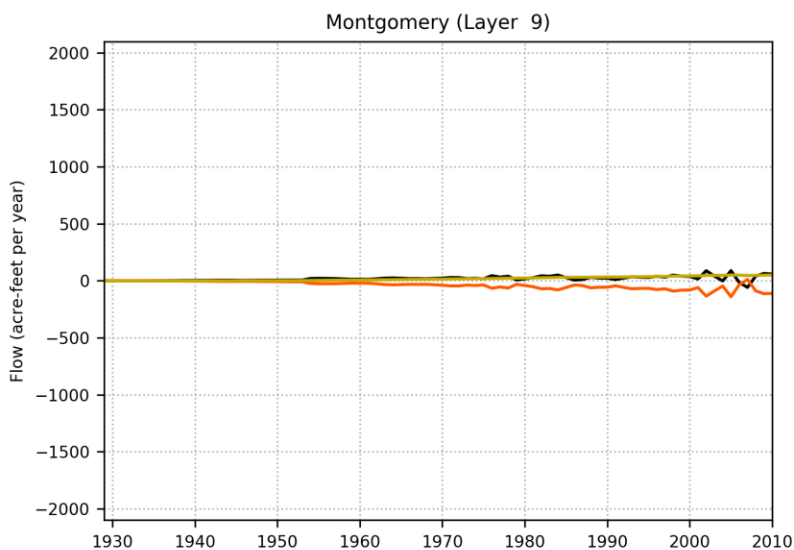
— STORAGE — LATERAL FLOW — VERTICAL FLOW



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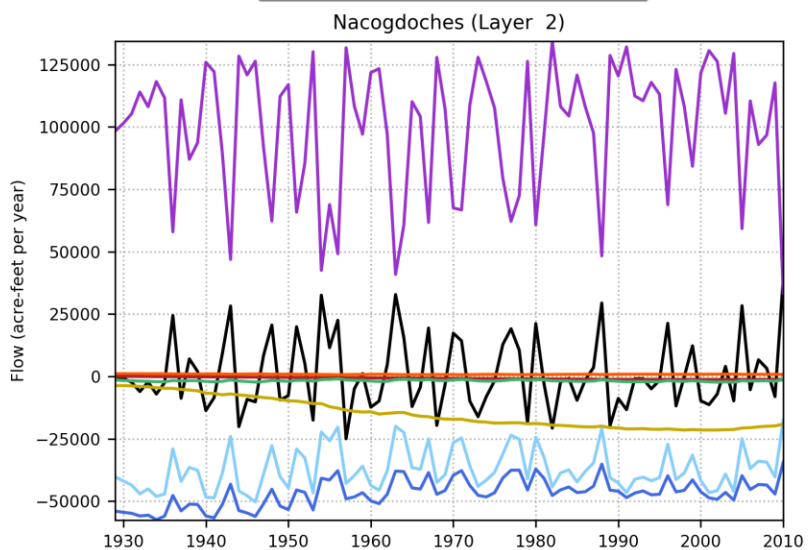
— STORAGE — LATERAL FLOW — VERTICAL FLOW

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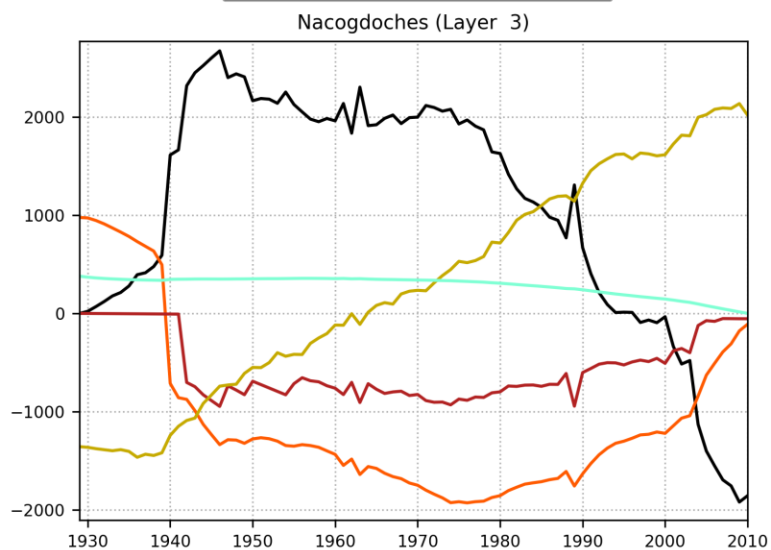


— STORAGE — LATERAL FLOW — VERTICAL FLOW

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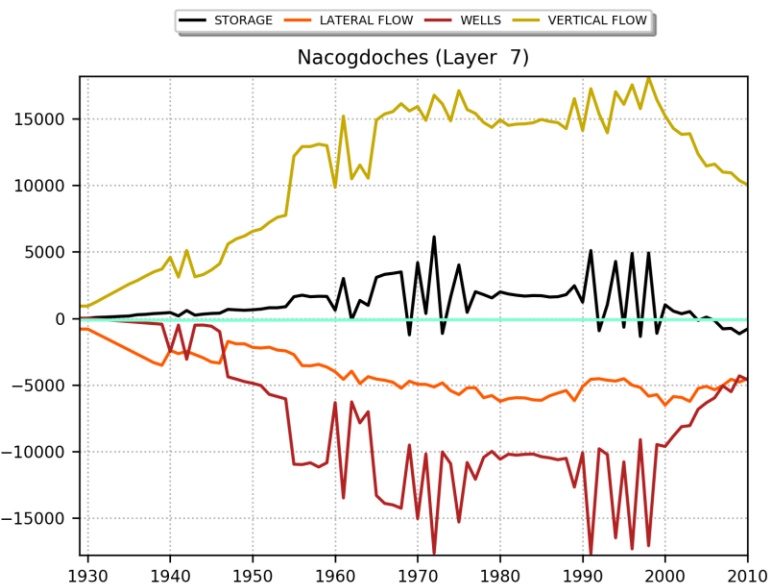
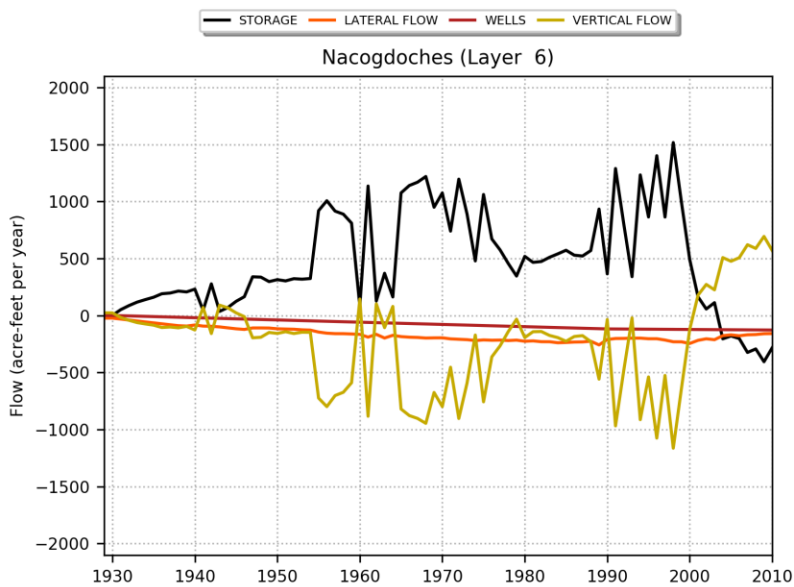
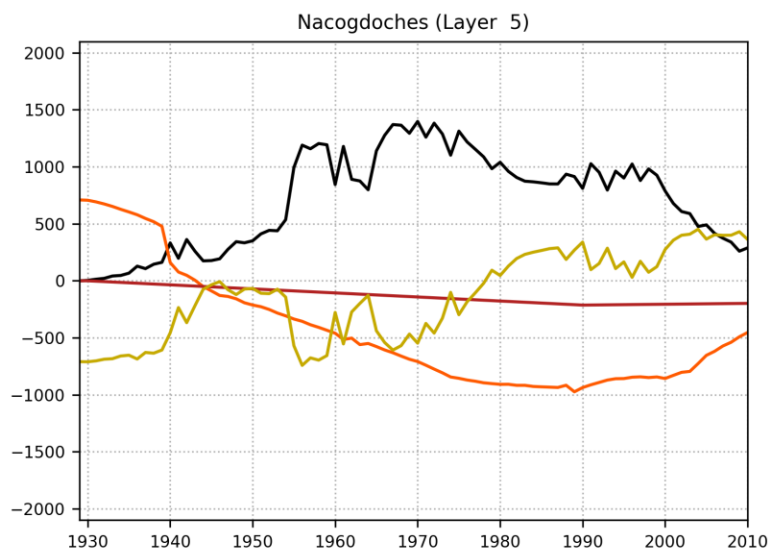
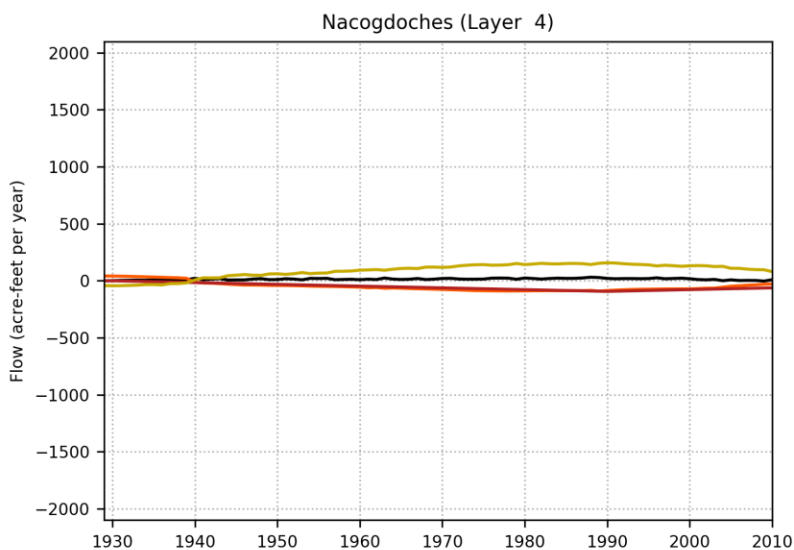


— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SRING FLOW — ET — RECHARGE
— LATERAL FLOW — WELLS — VERTICAL FLOW



— STORAGE — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS
— LATERAL FLOW

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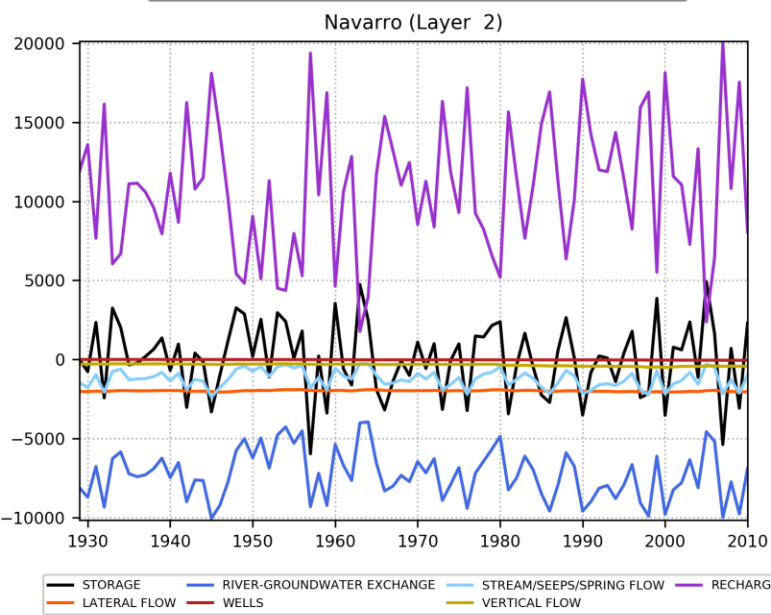
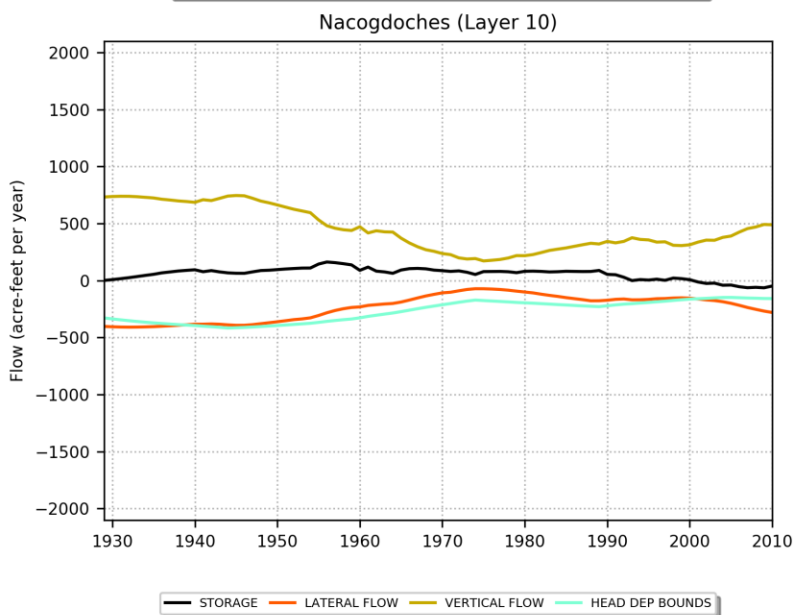
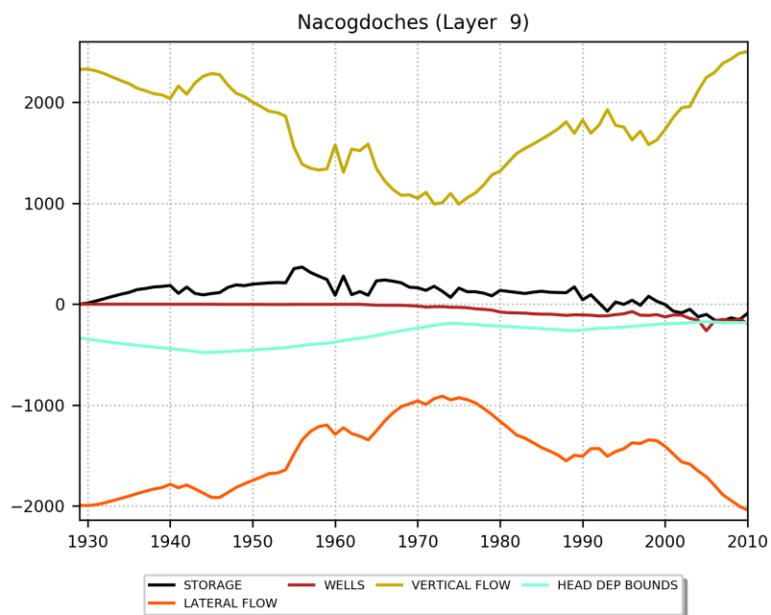
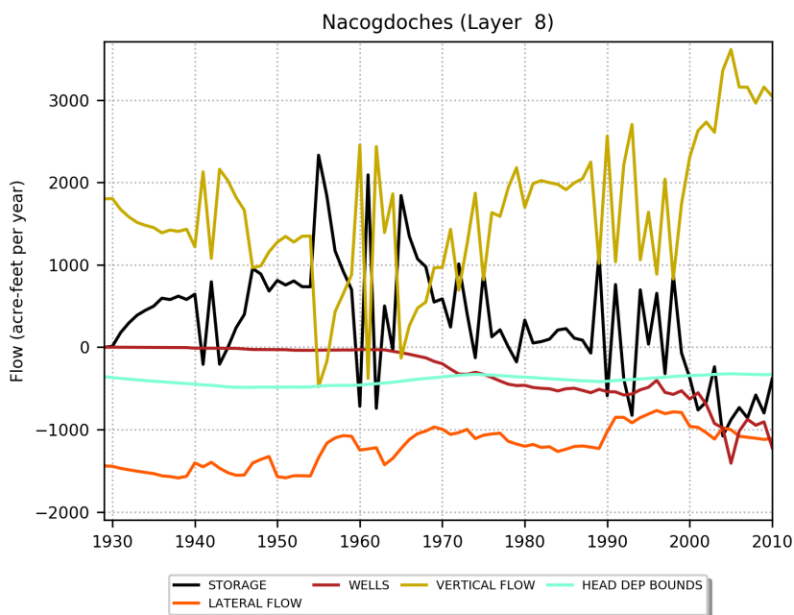
— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

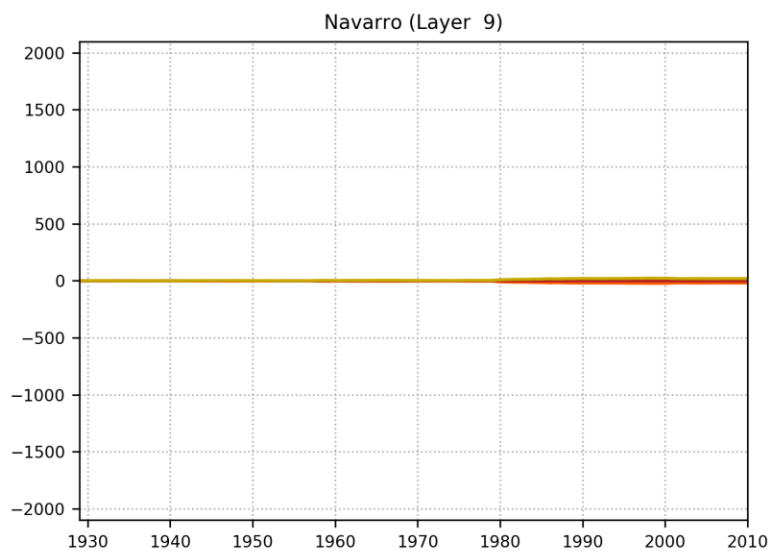
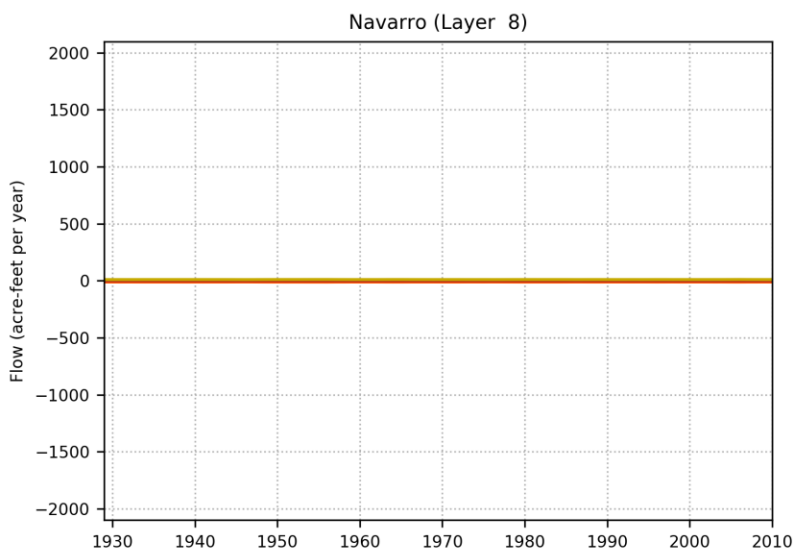
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— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS

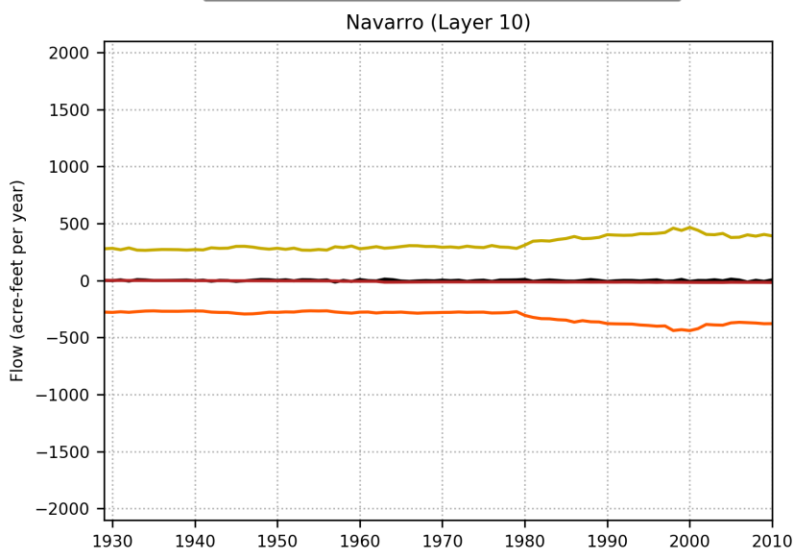
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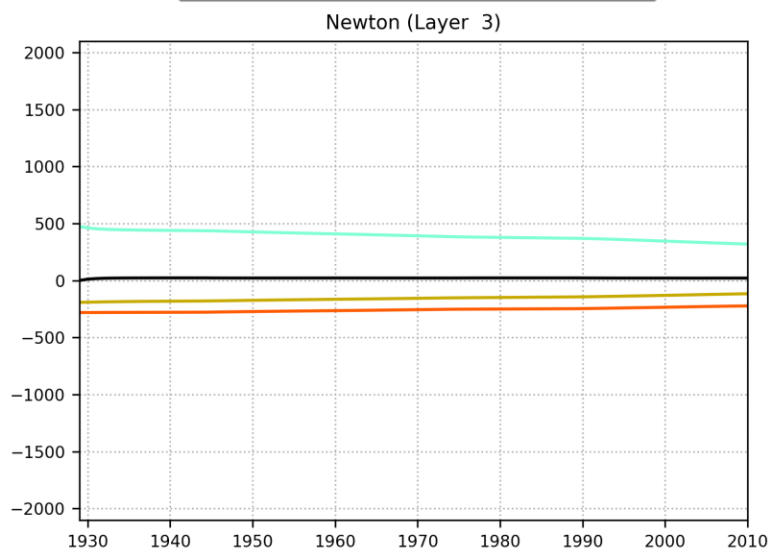


— STORAGE
 — LATERAL FLOW
 — WELLS
 — VERTICAL FLOW



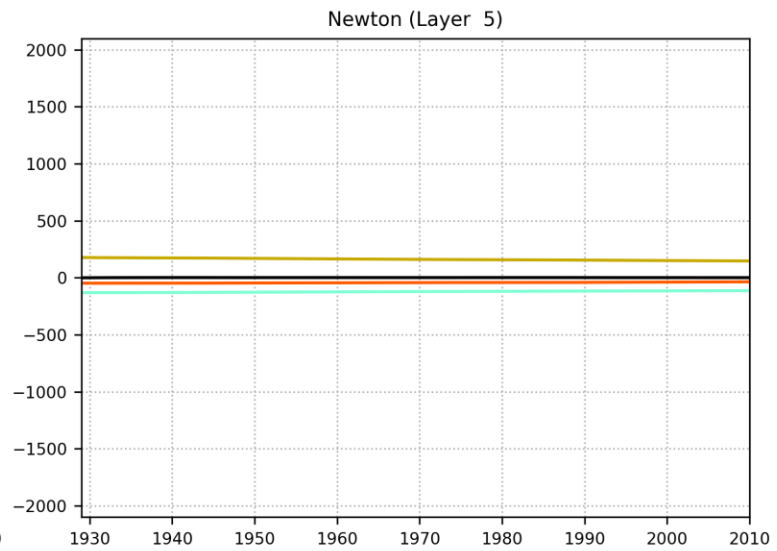
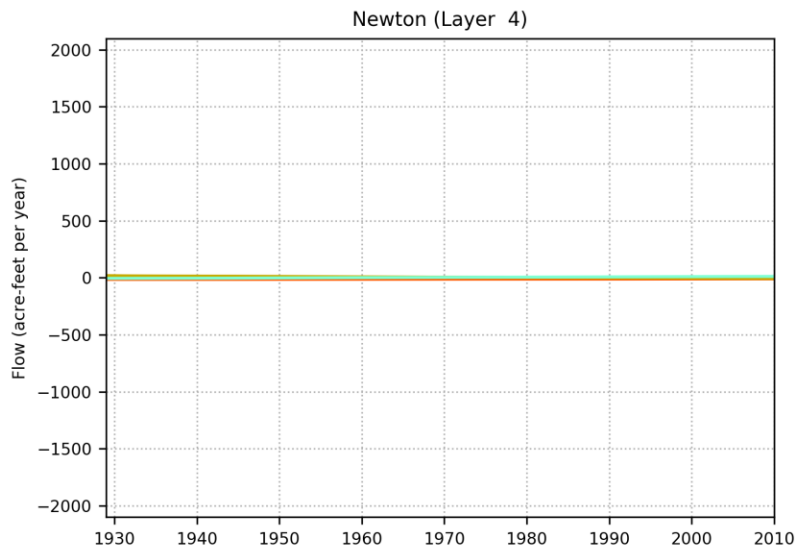
— STORAGE
 — LATERAL FLOW
 — WELLS
 — VERTICAL FLOW

— STORAGE
 — LATERAL FLOW
 — WELLS
 — VERTICAL FLOW



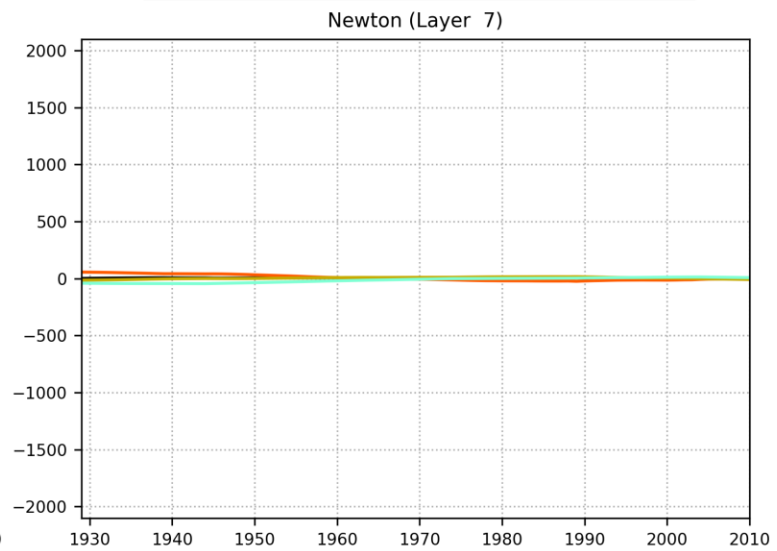
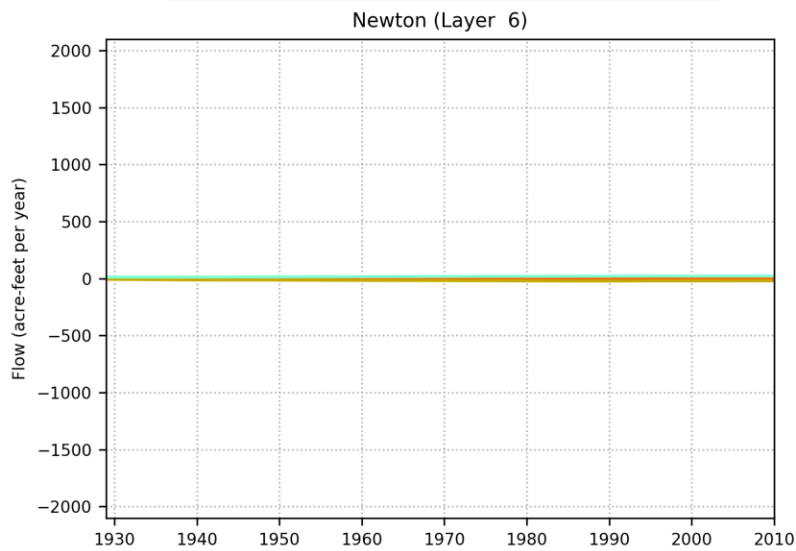
— STORAGE
 — LATERAL FLOW
 — VERTICAL FLOW
 — HEAD DEP BOUNDS

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

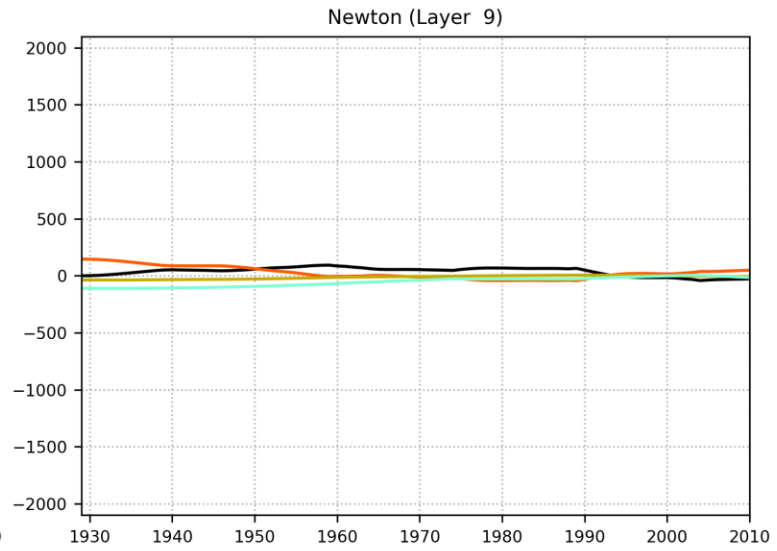
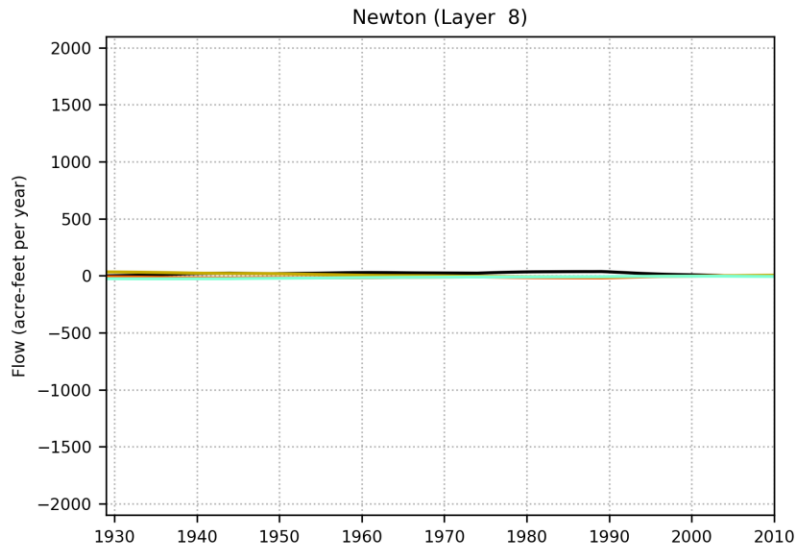
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS



— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

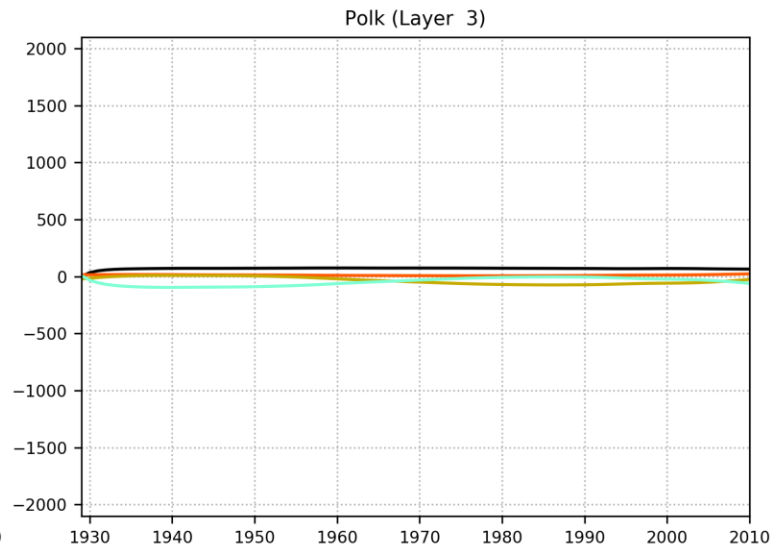
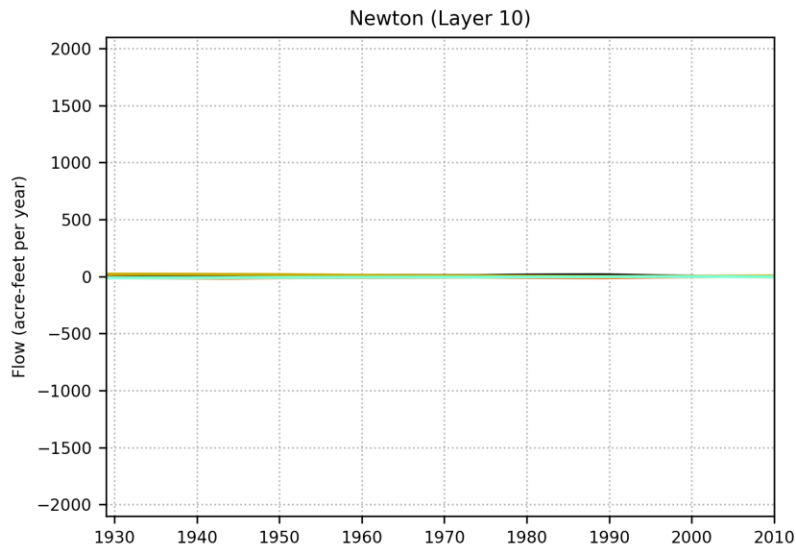
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

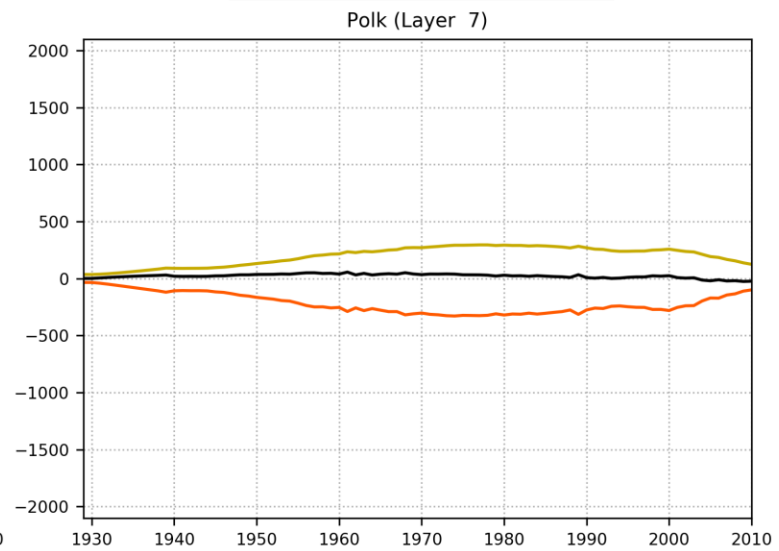
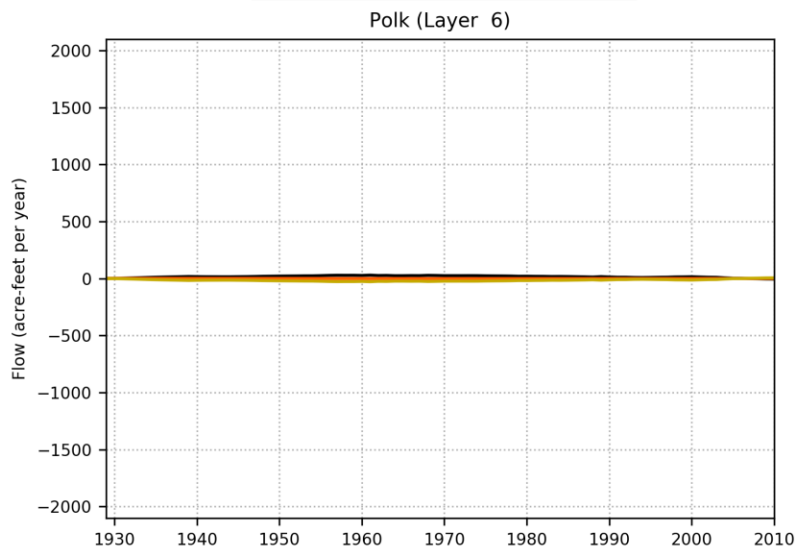
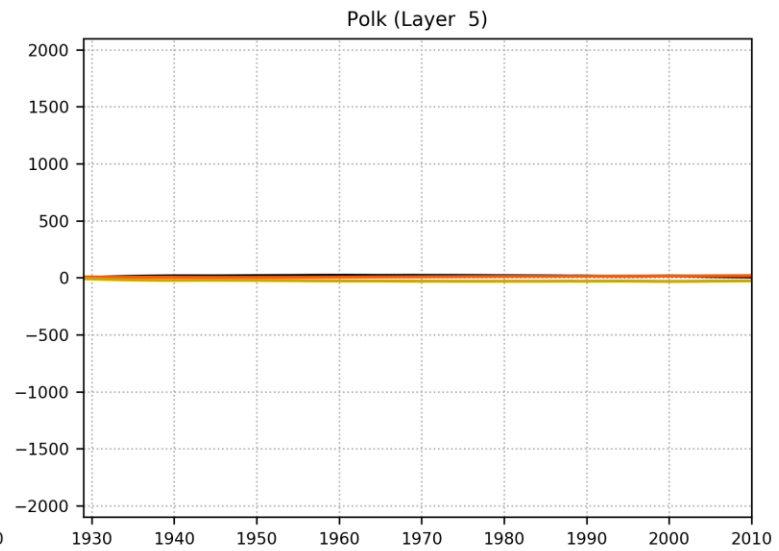
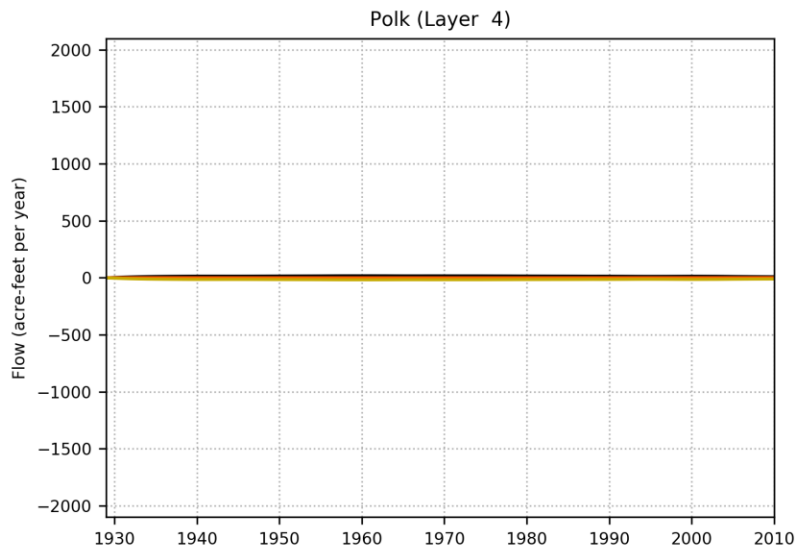
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS



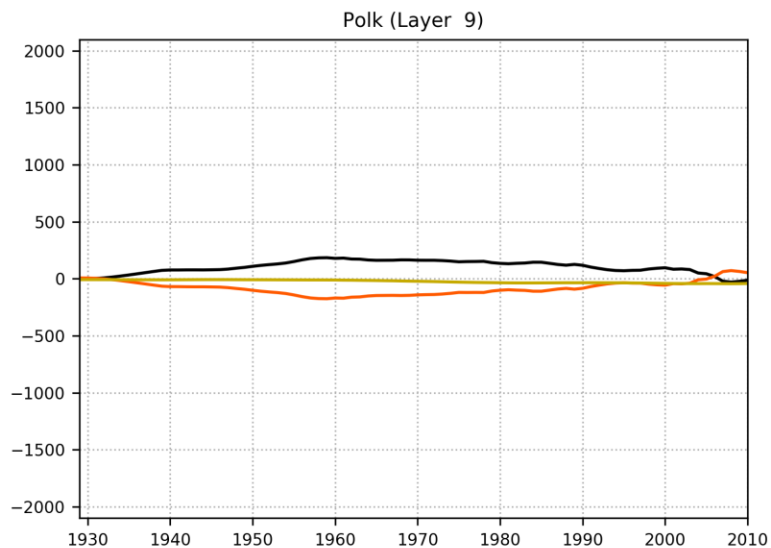
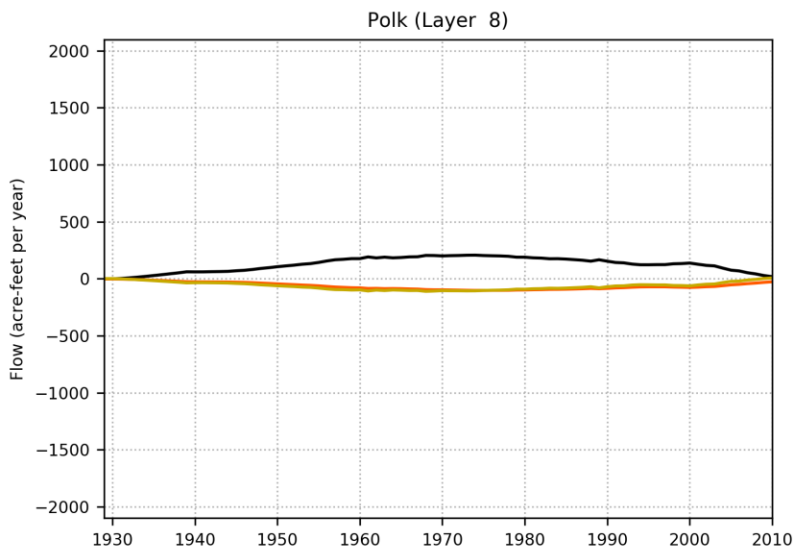
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

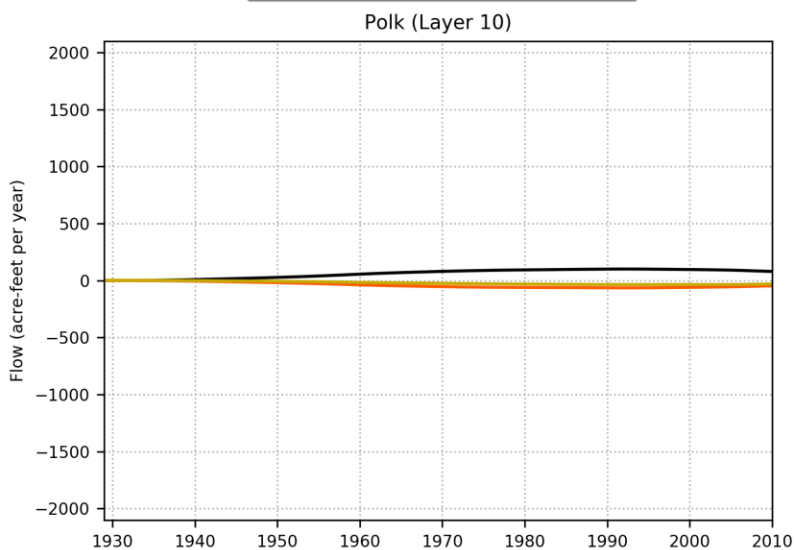


Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

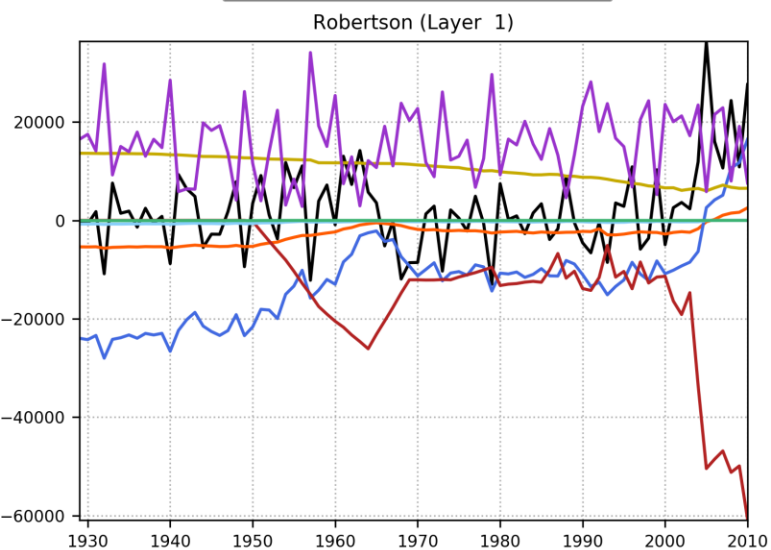


— STORAGE — LATERAL FLOW — VERTICAL FLOW

— STORAGE — LATERAL FLOW — VERTICAL FLOW

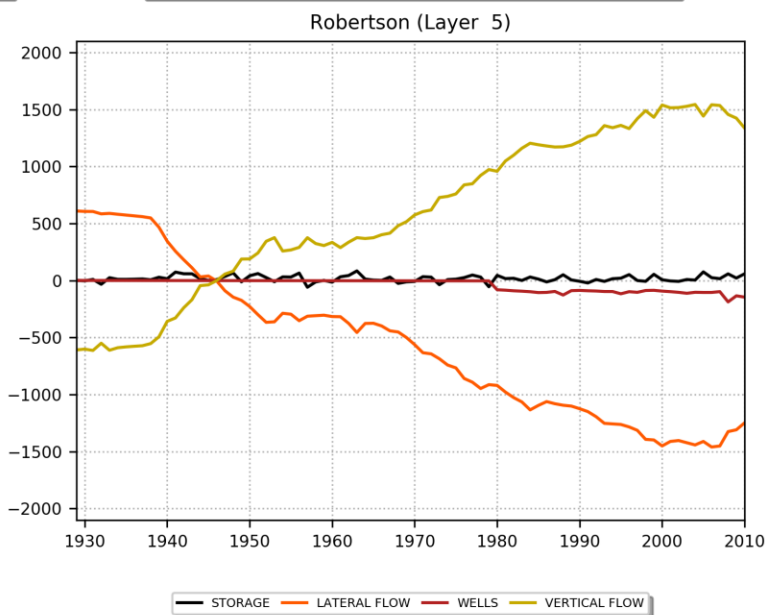
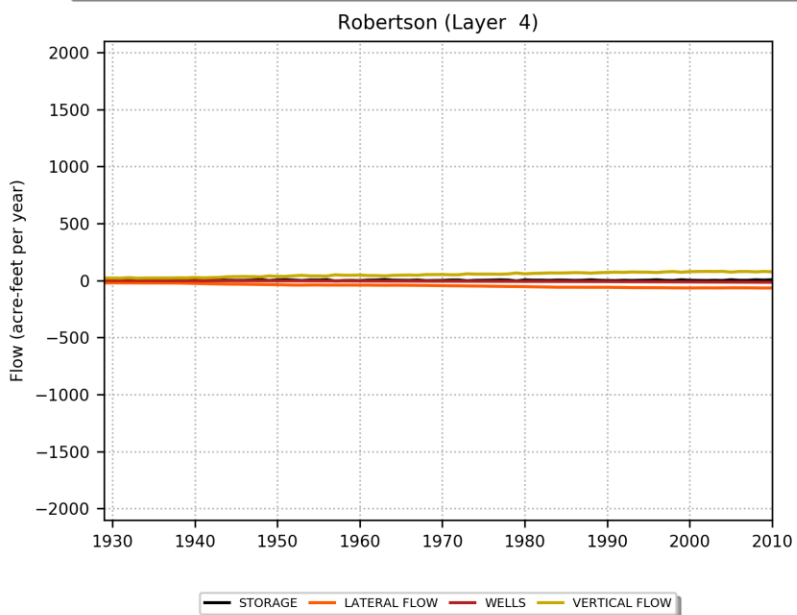
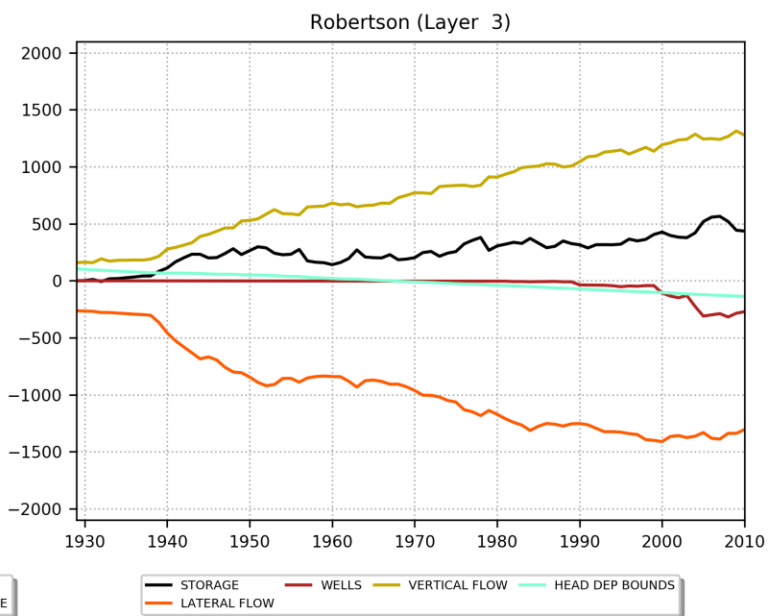
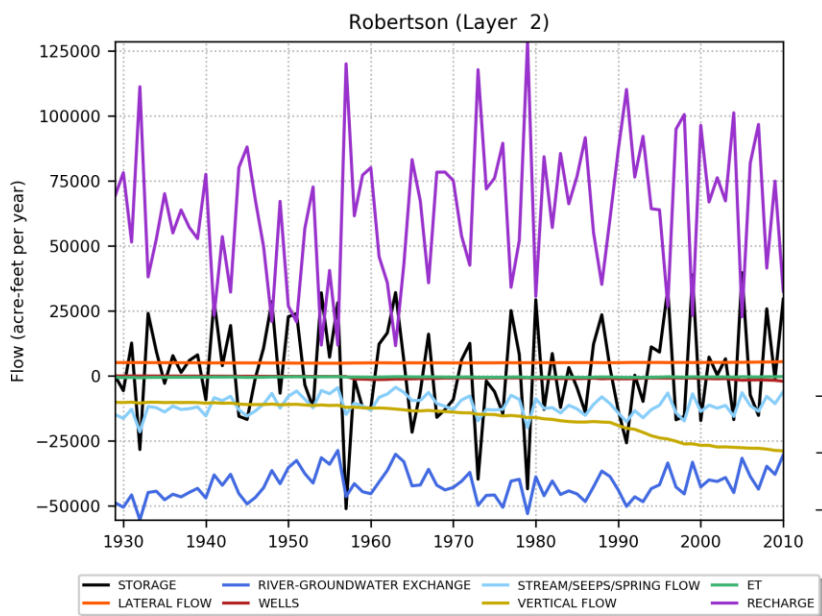


— STORAGE — LATERAL FLOW — VERTICAL FLOW

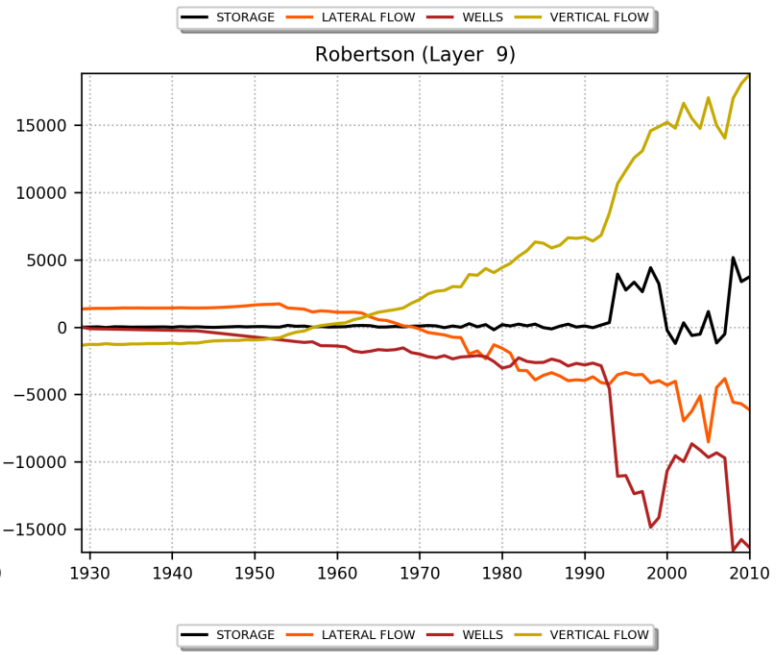
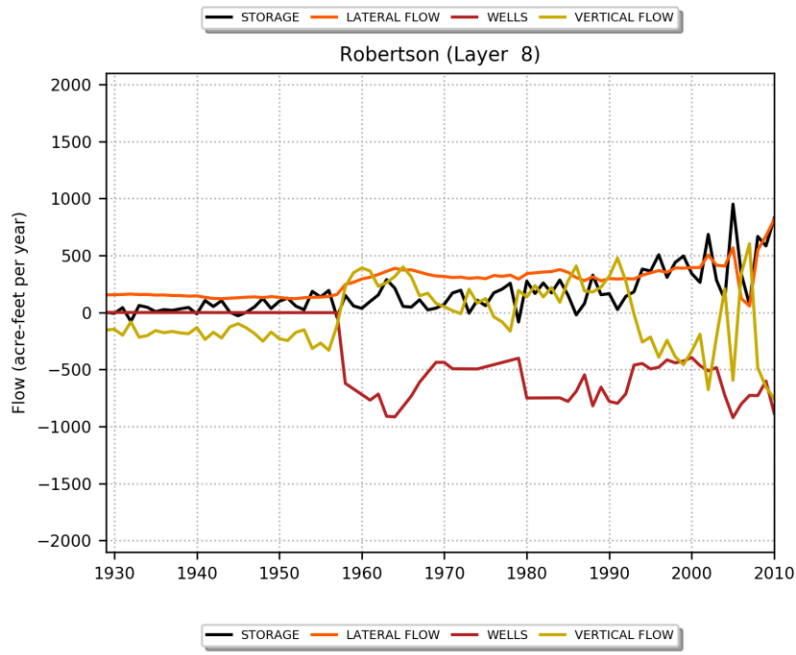
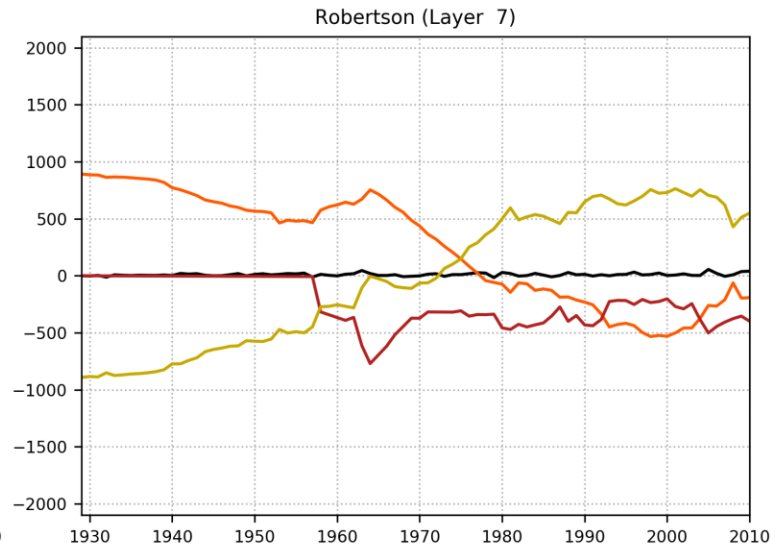
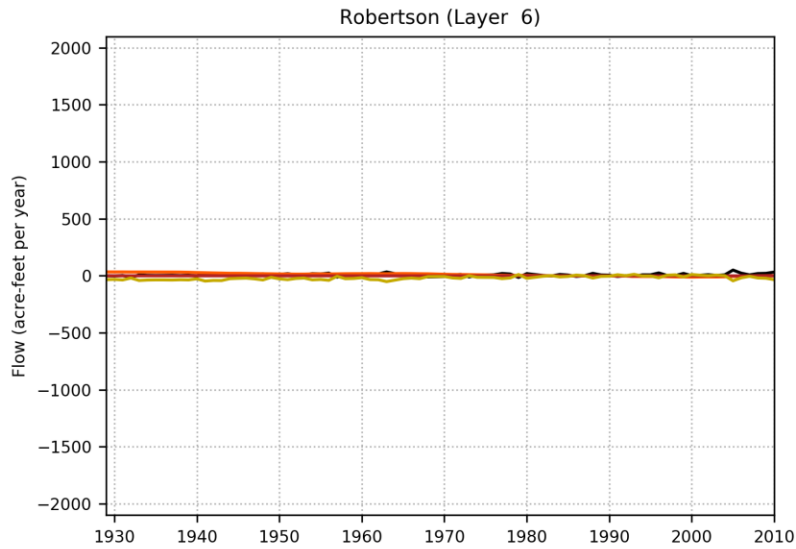


— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

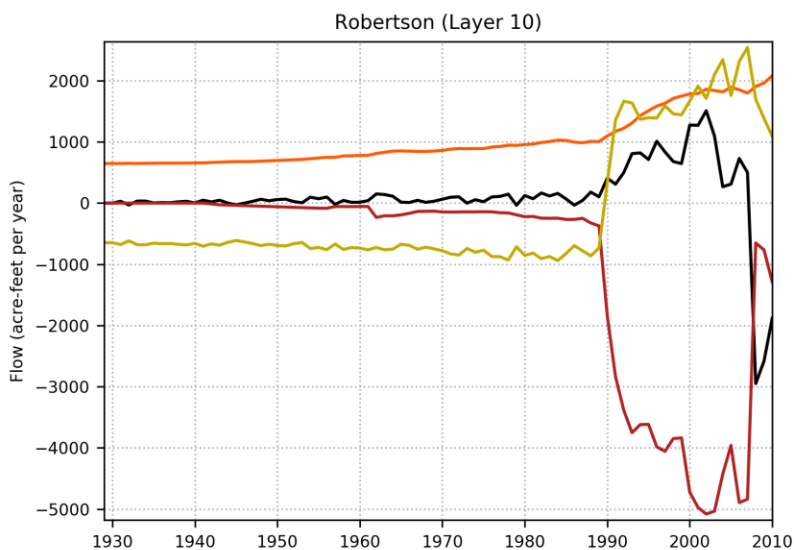
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



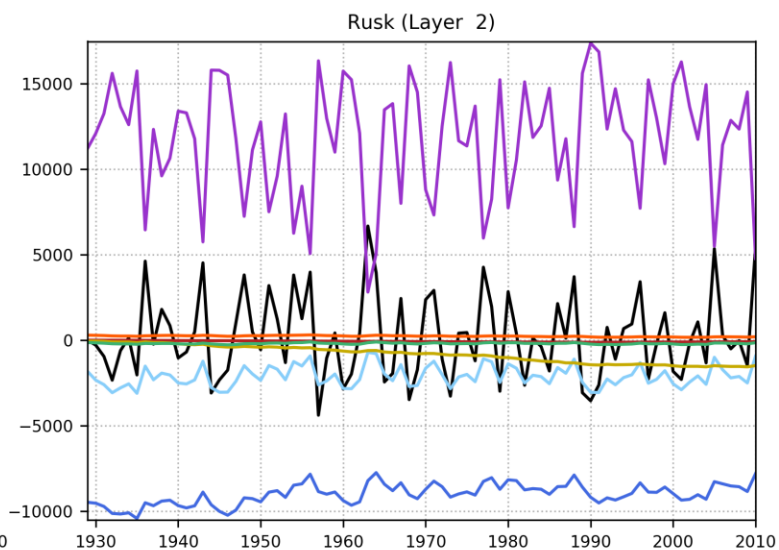
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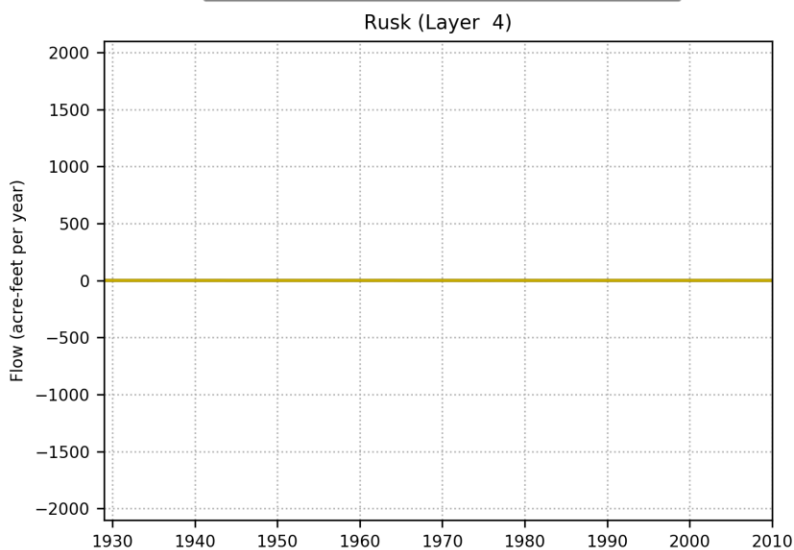
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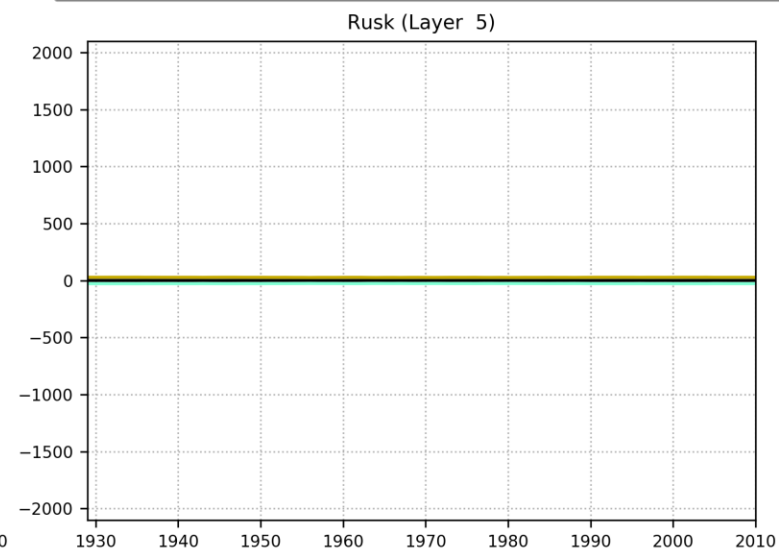
— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW



— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

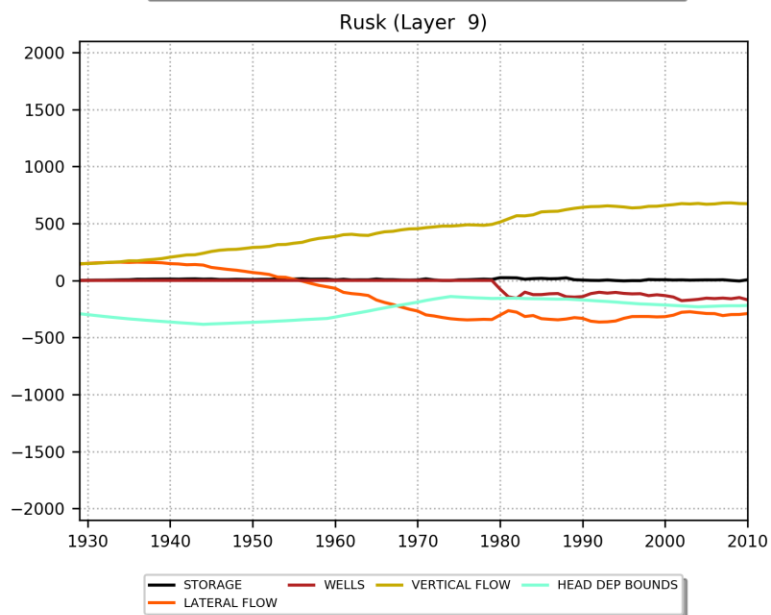
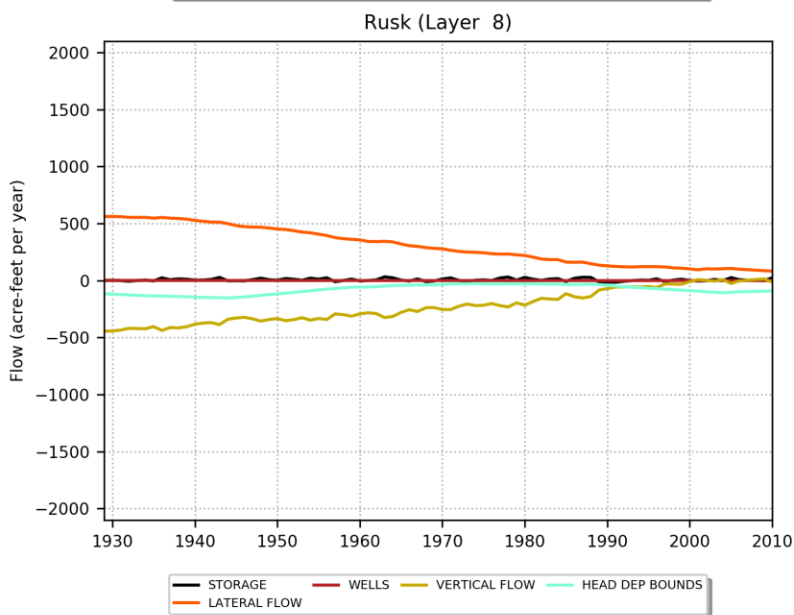
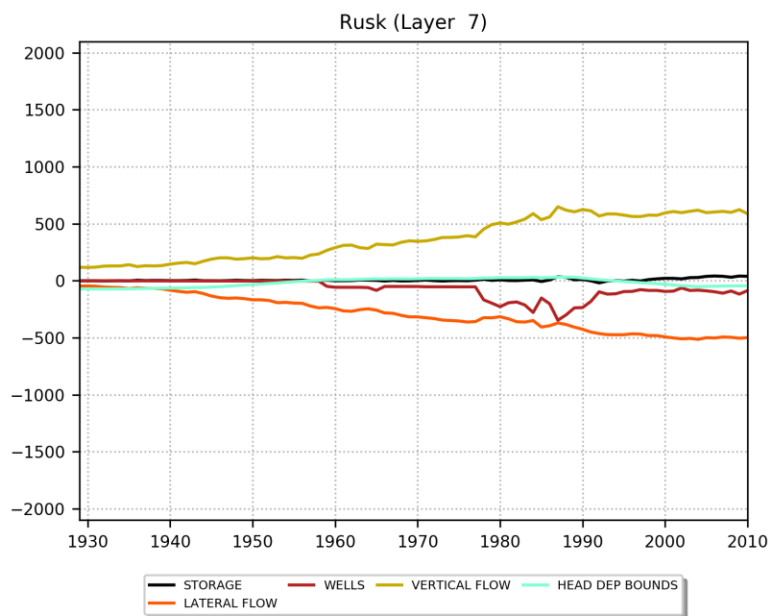
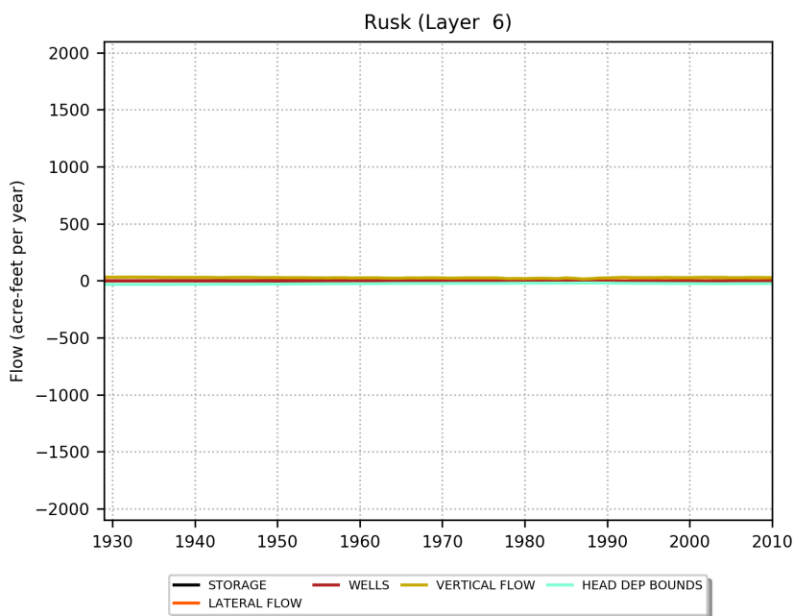


— STORAGE — VERTICAL FLOW

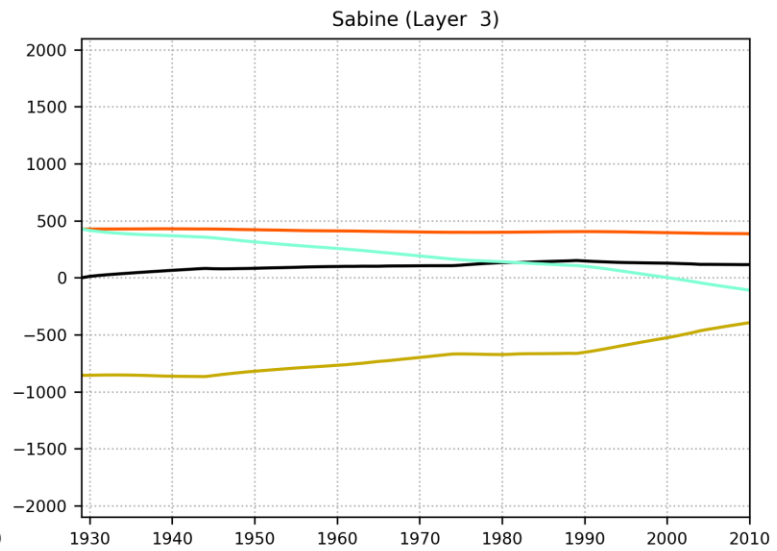
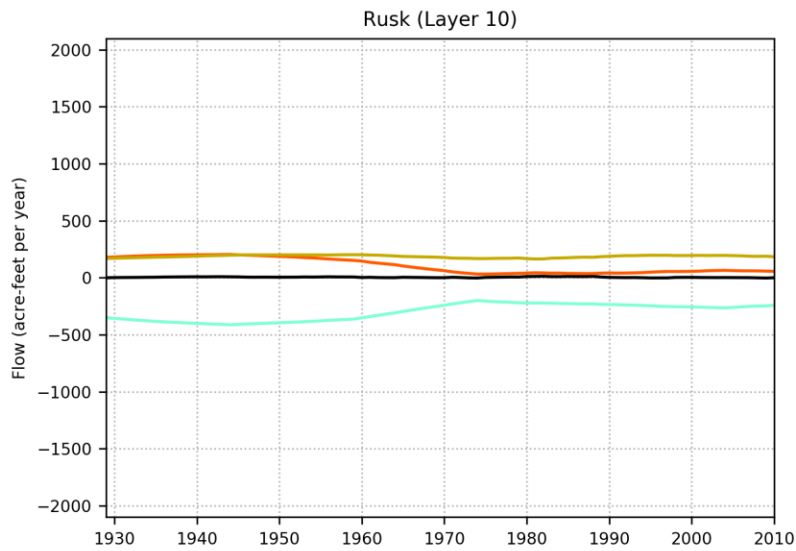


— STORAGE — VERTICAL FLOW — HEAD DEP BOUNDS

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

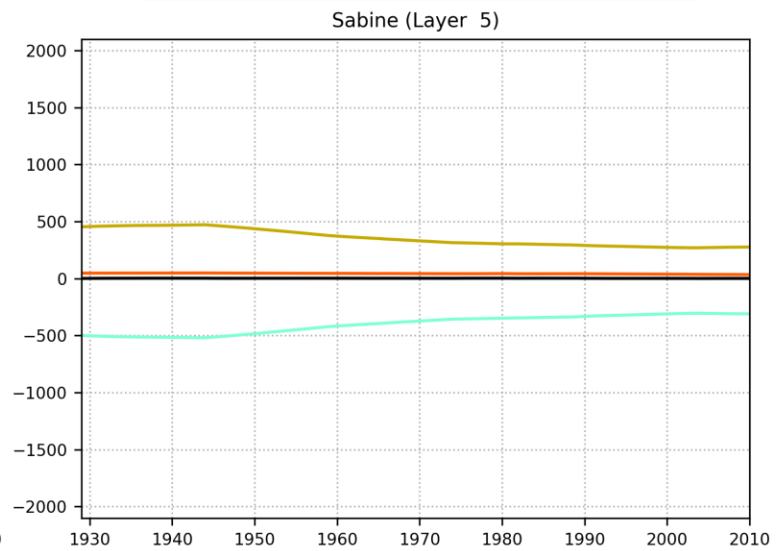
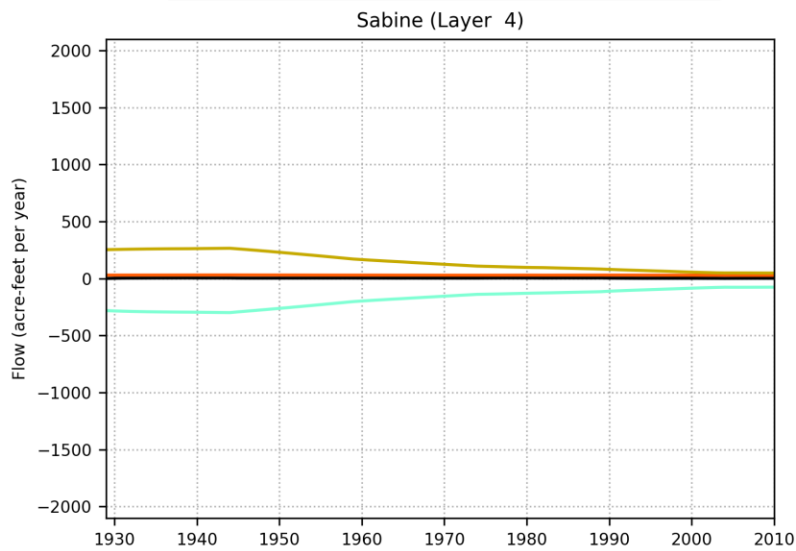


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— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

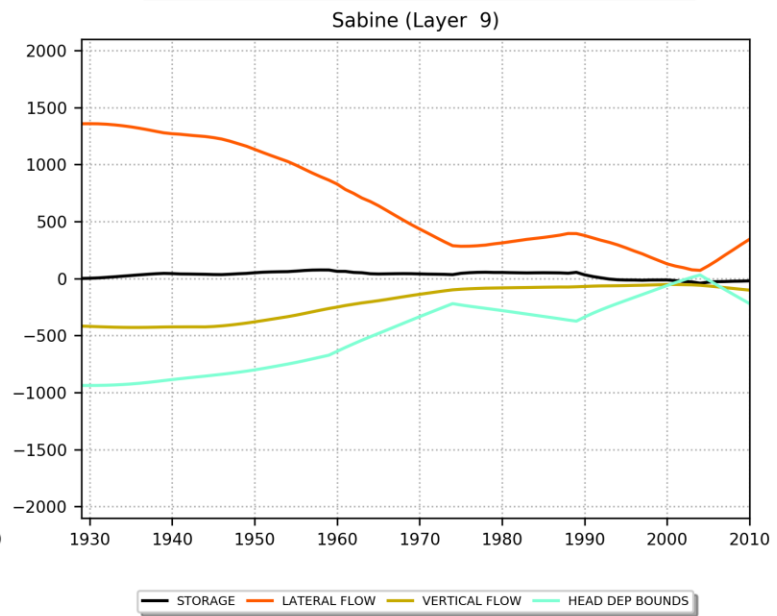
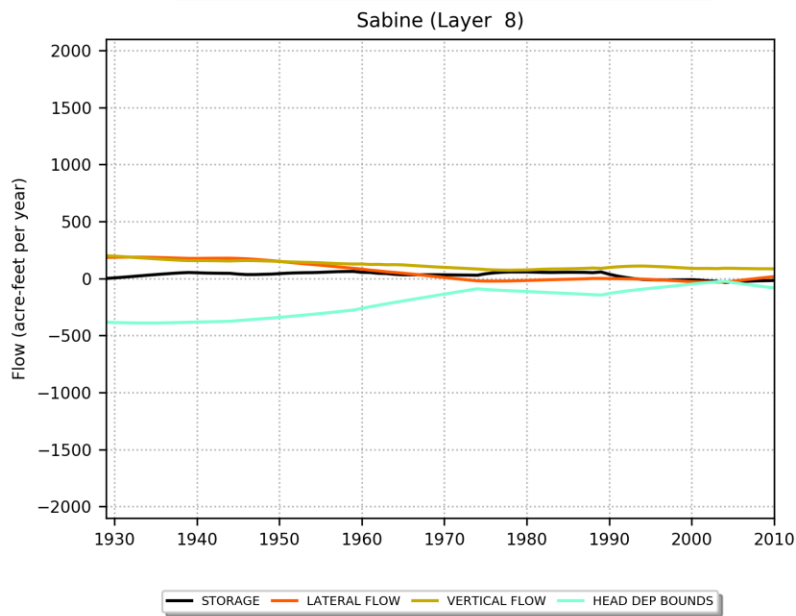
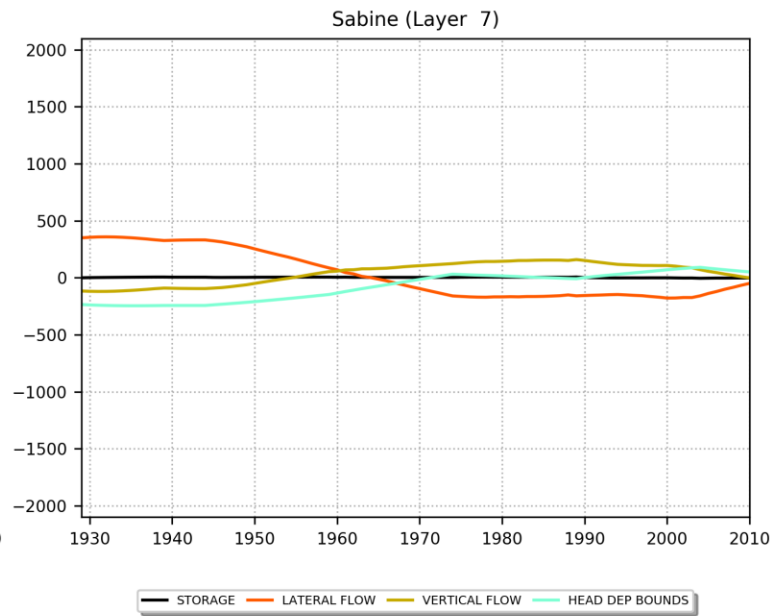
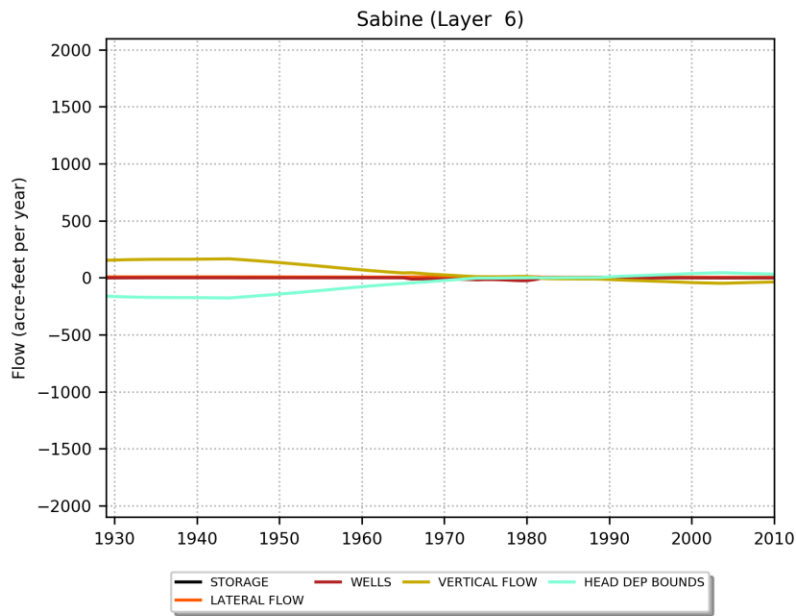
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS



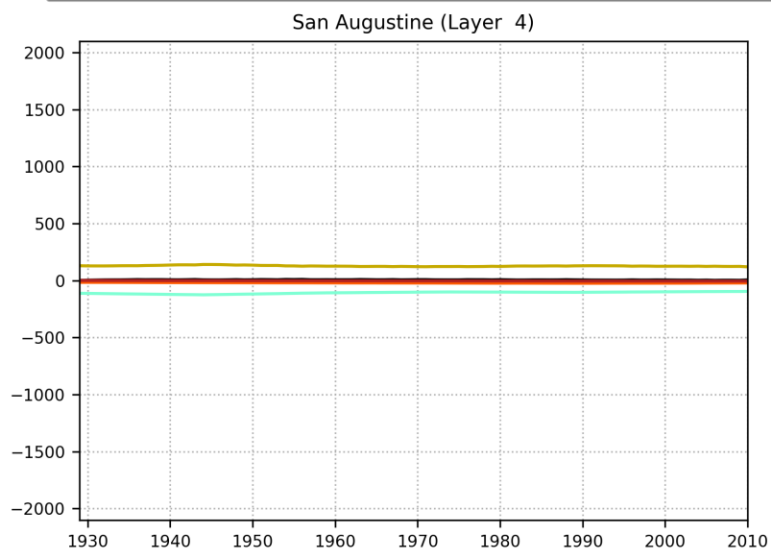
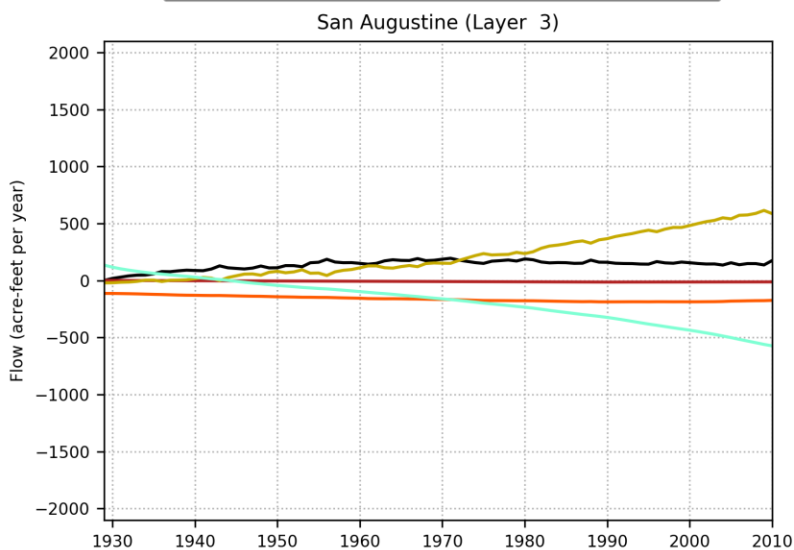
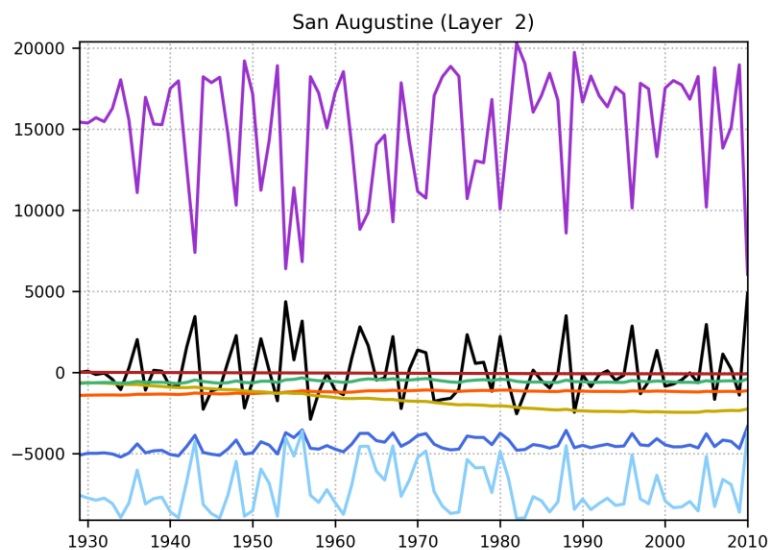
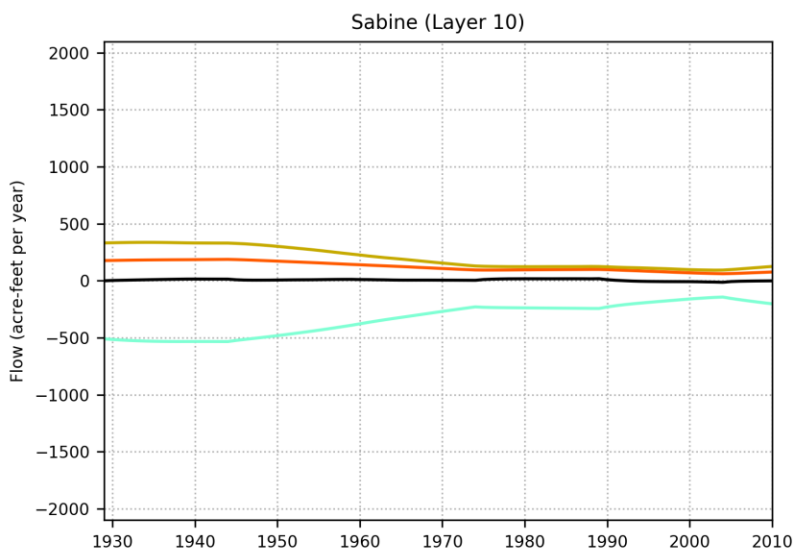
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

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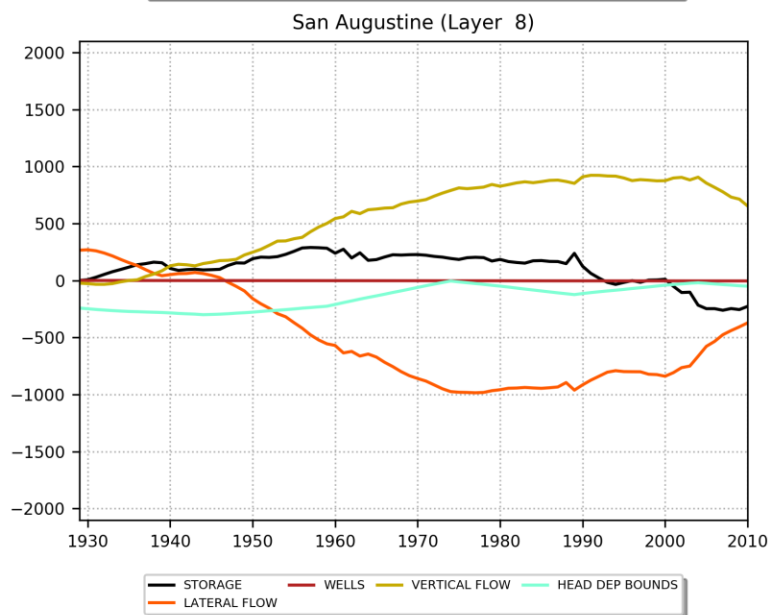
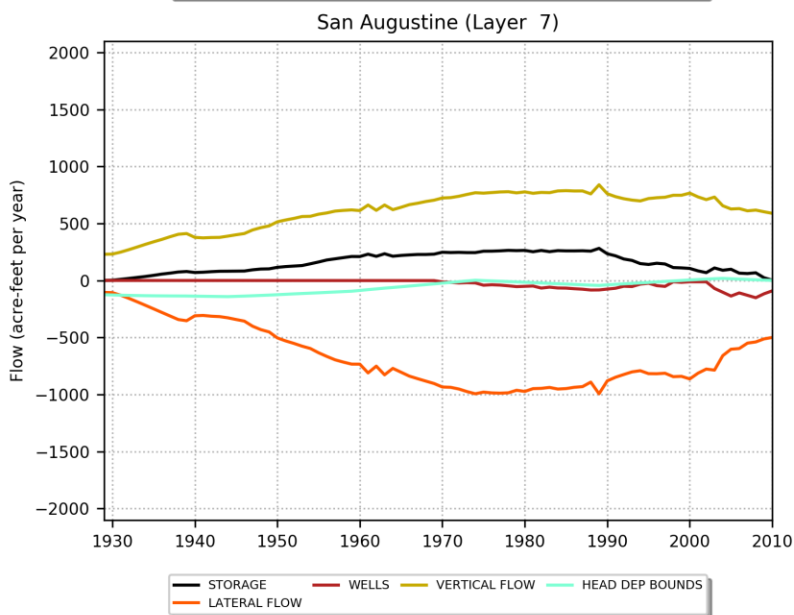
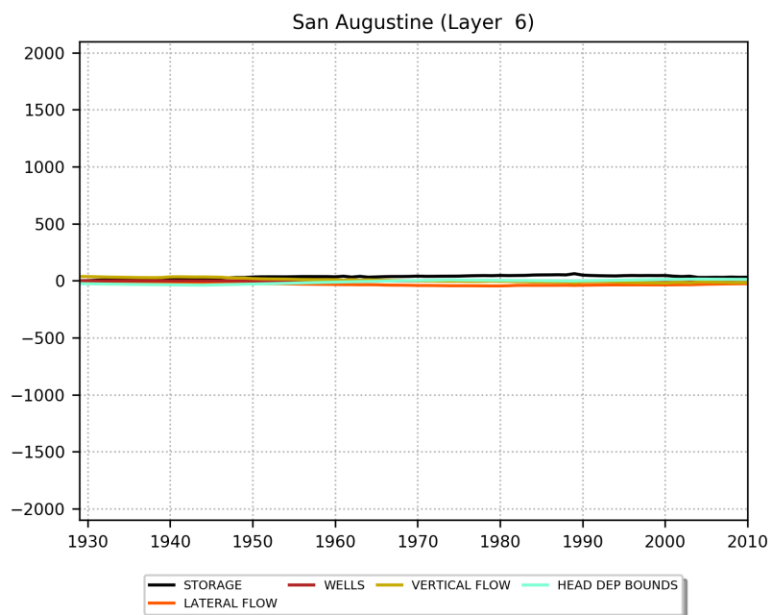
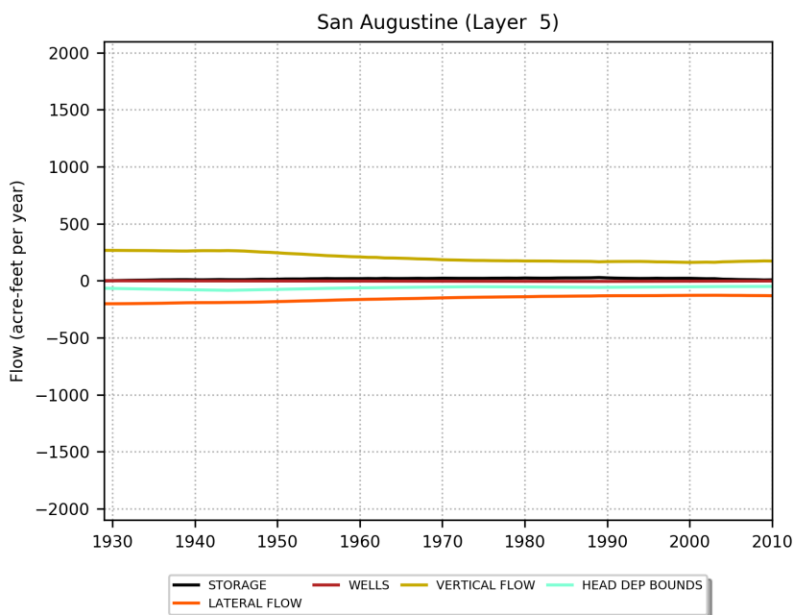
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



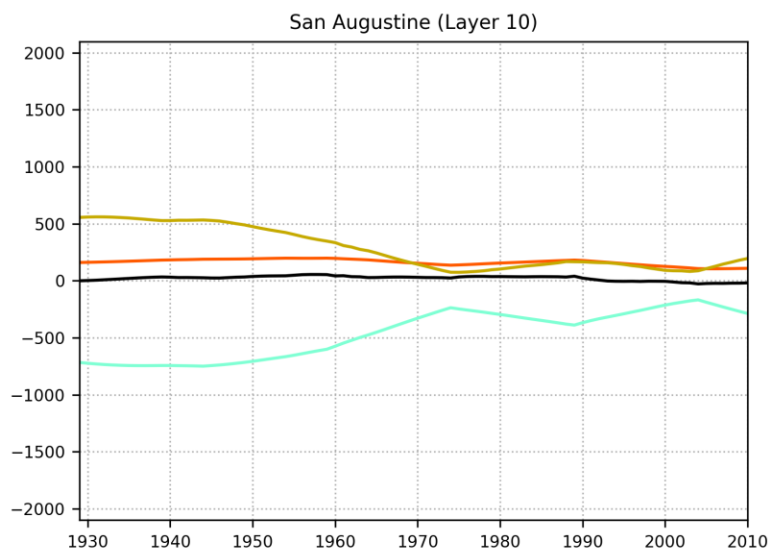
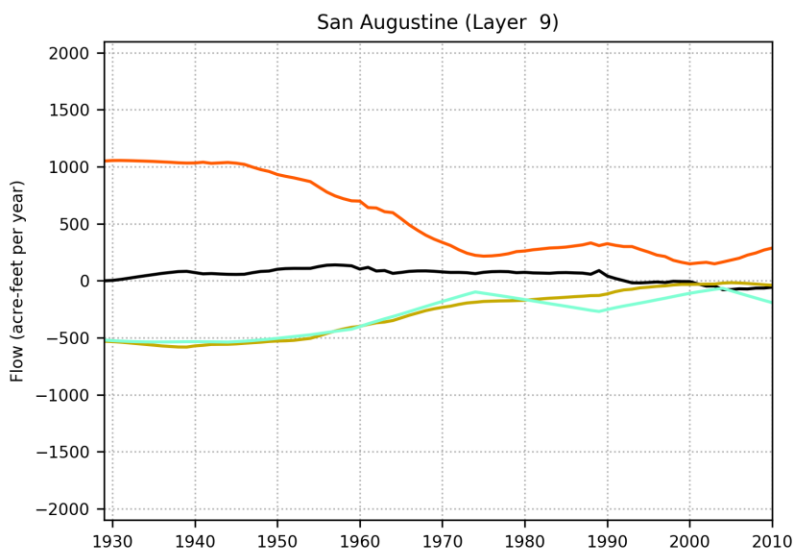
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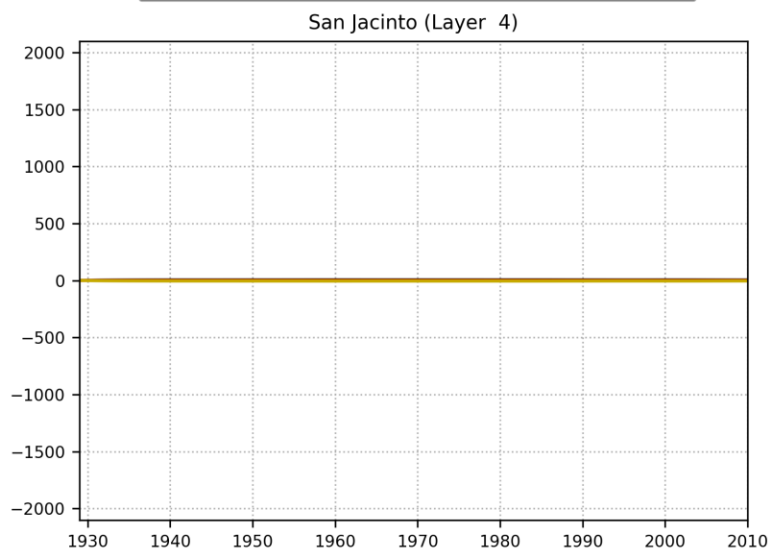
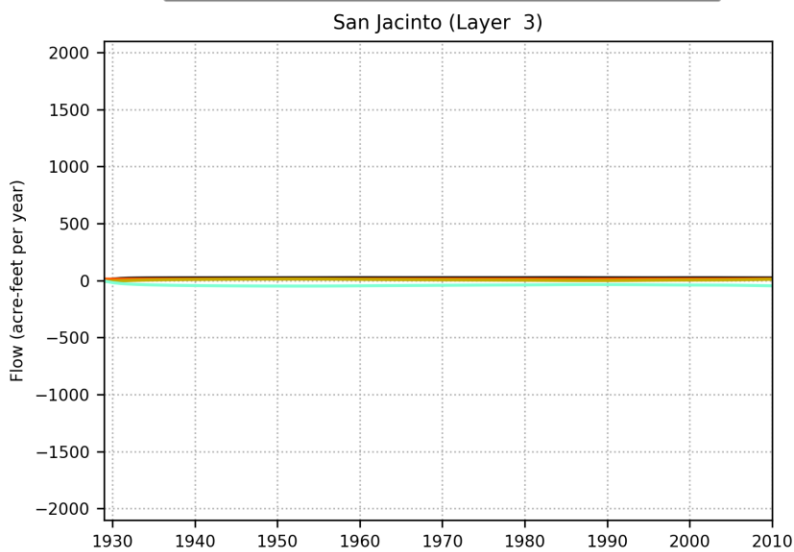


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— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

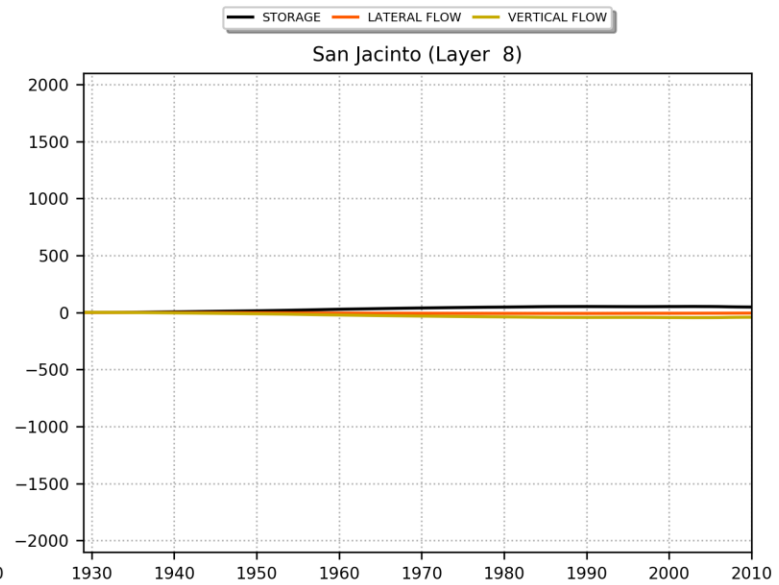
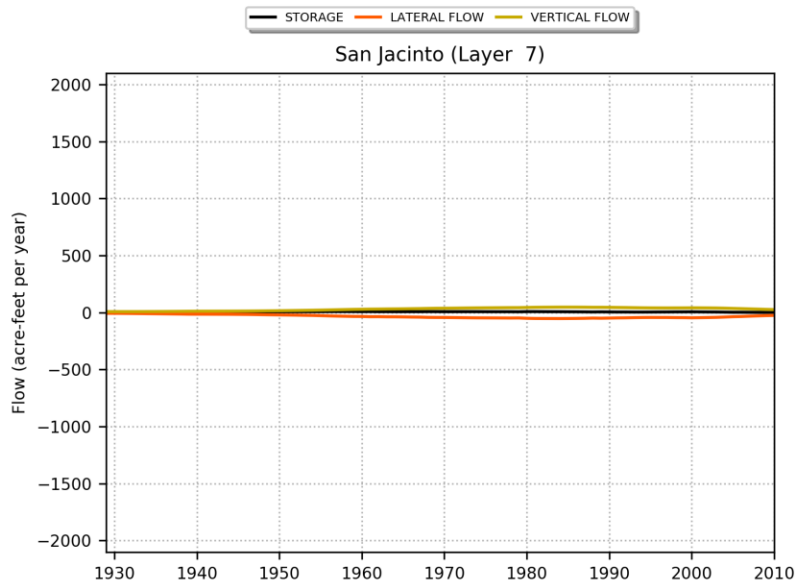
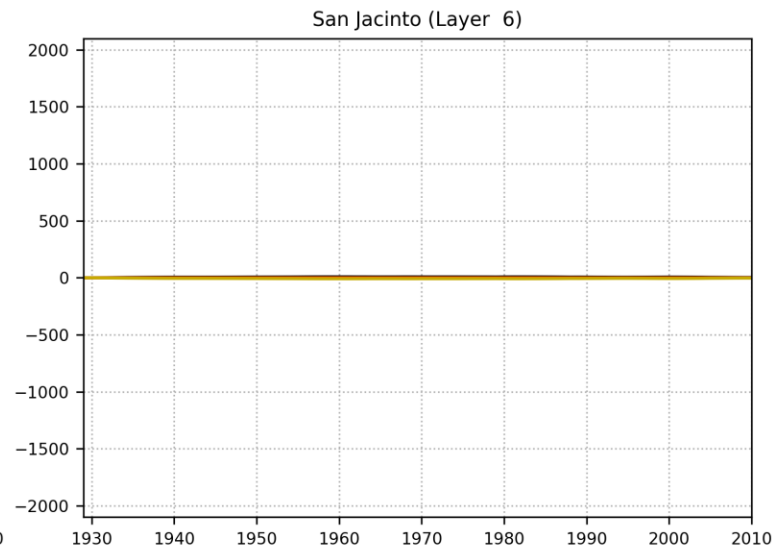
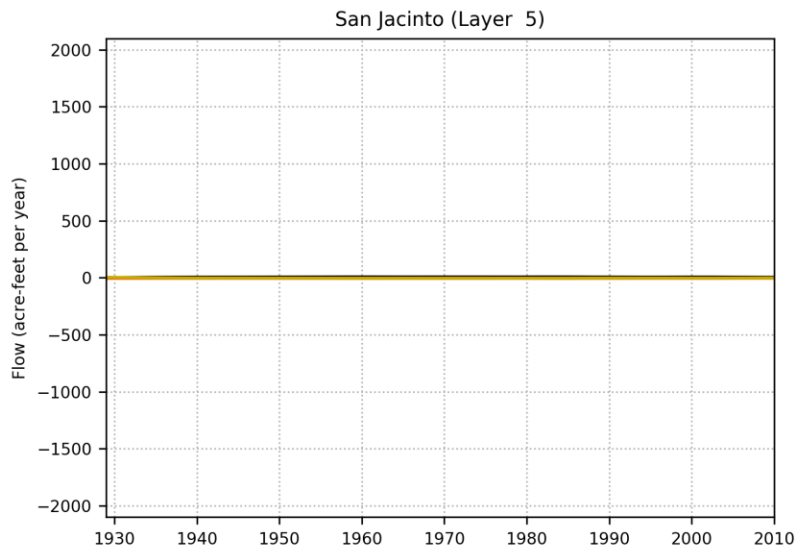
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS



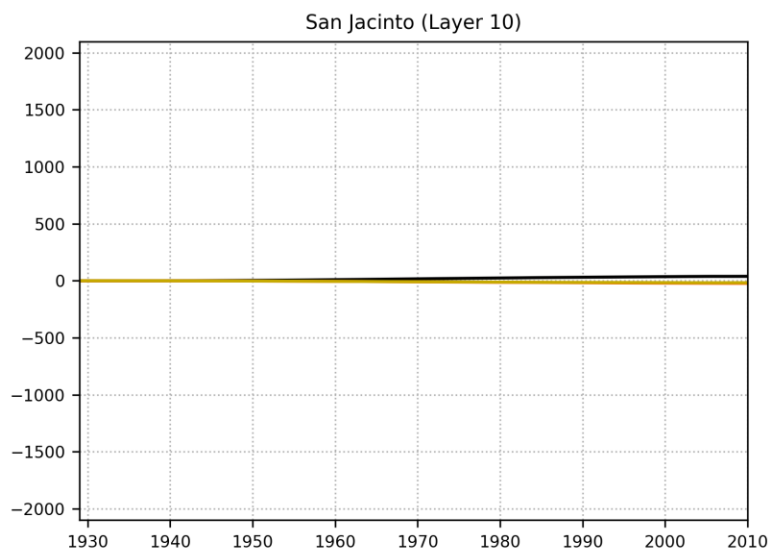
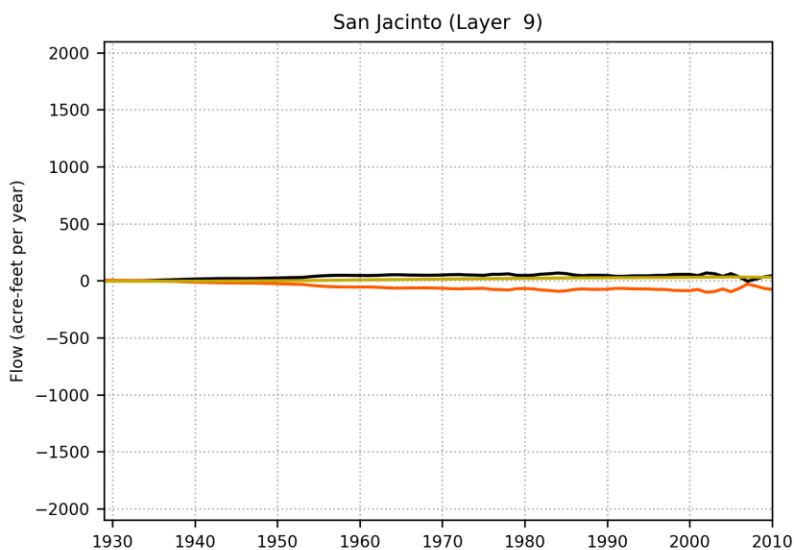
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

— STORAGE — LATERAL FLOW — VERTICAL FLOW

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

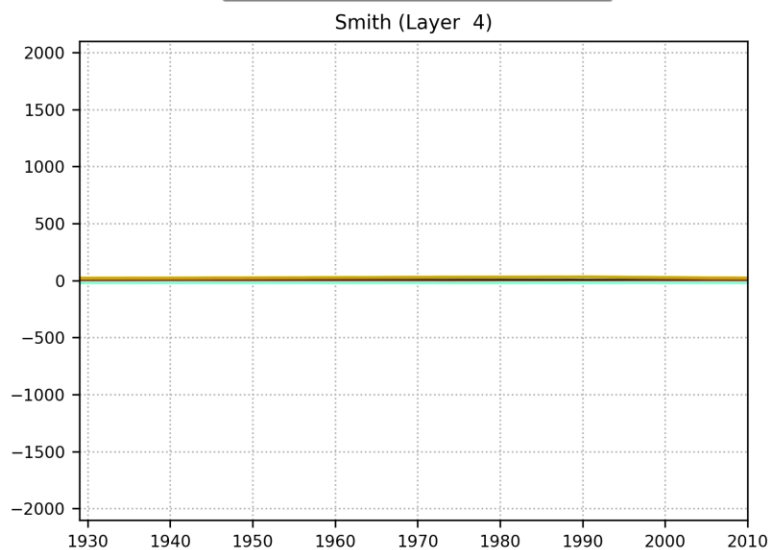
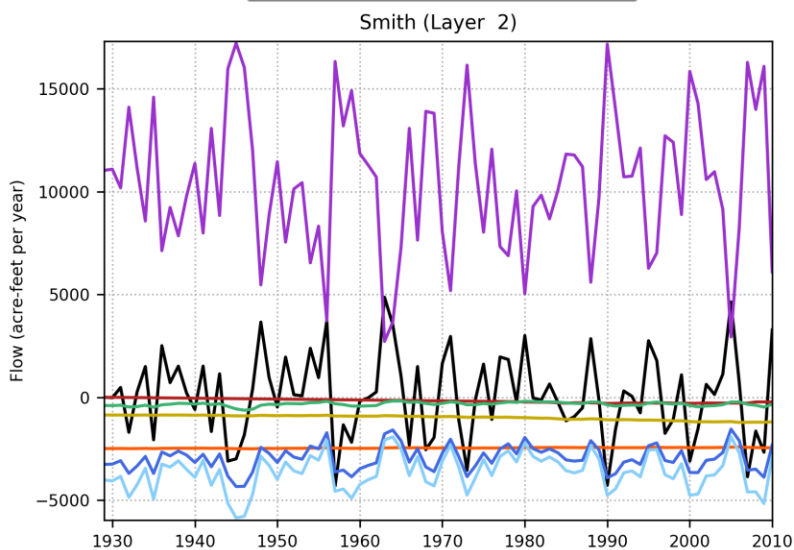


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— STORAGE — LATERAL FLOW — VERTICAL FLOW

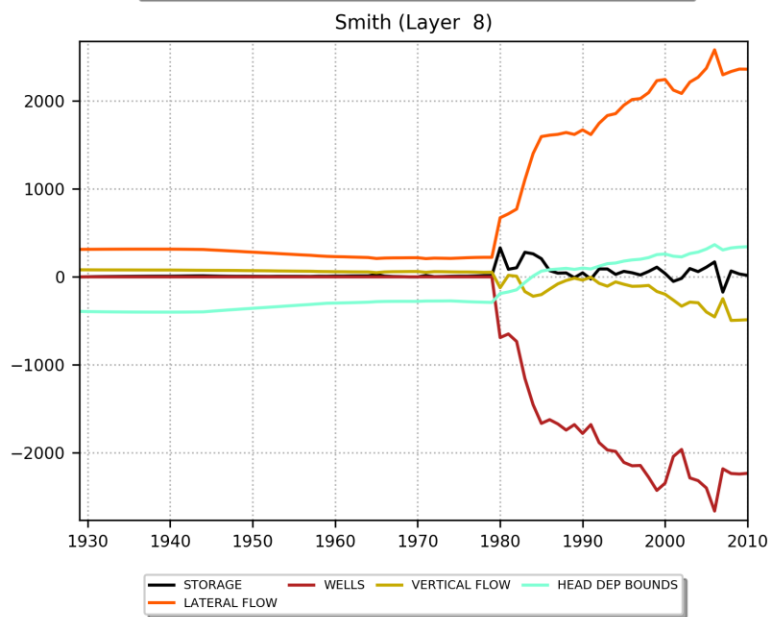
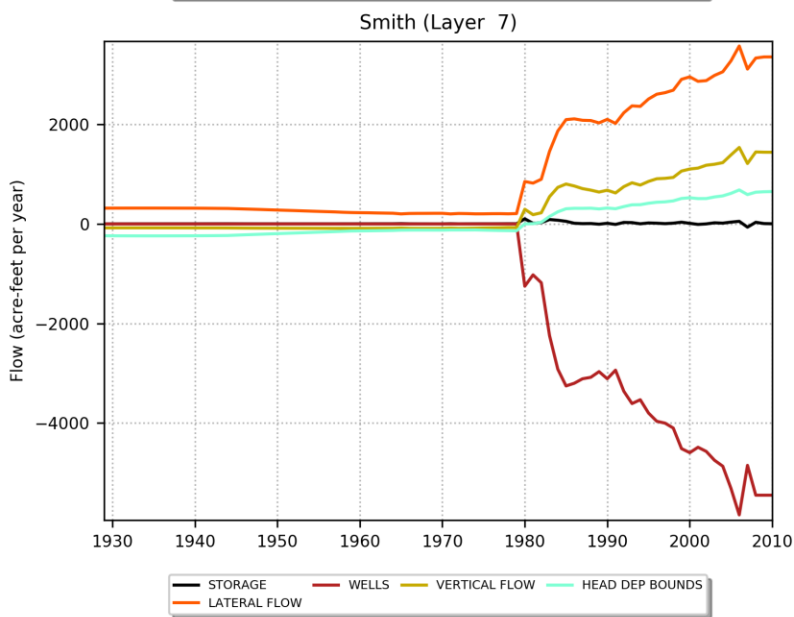
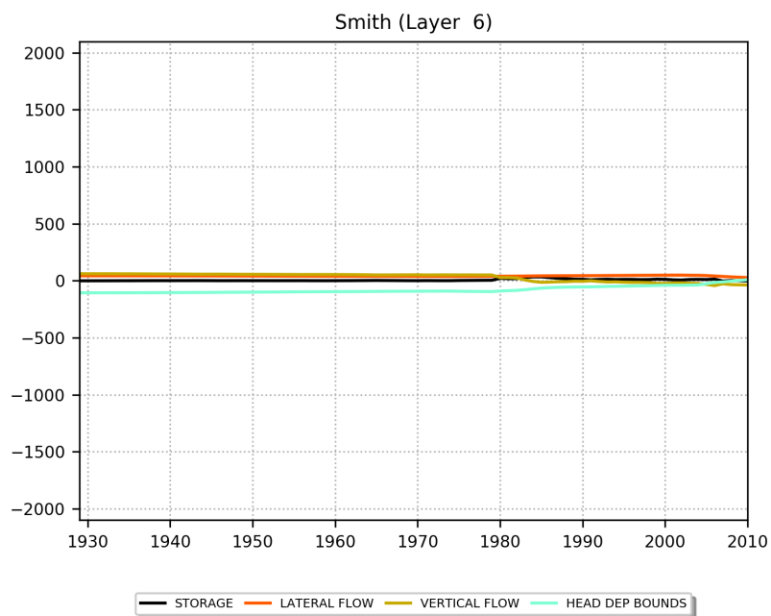
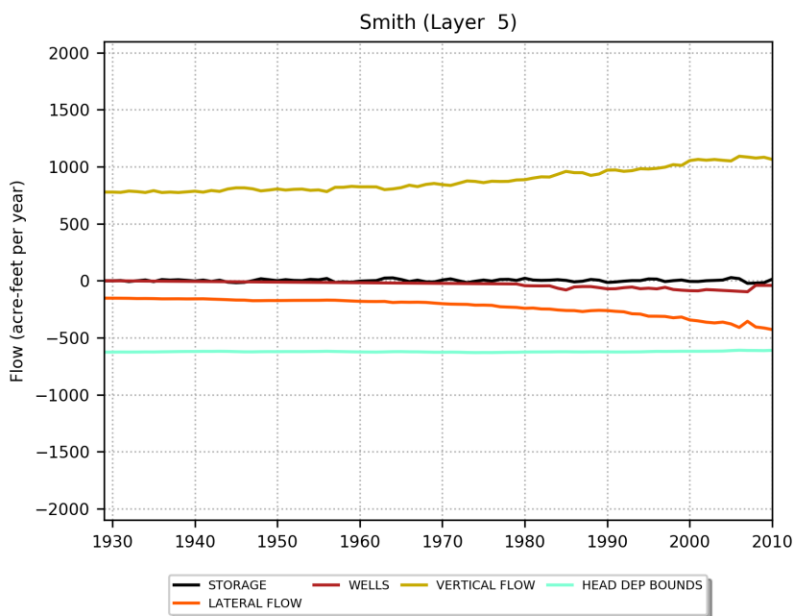
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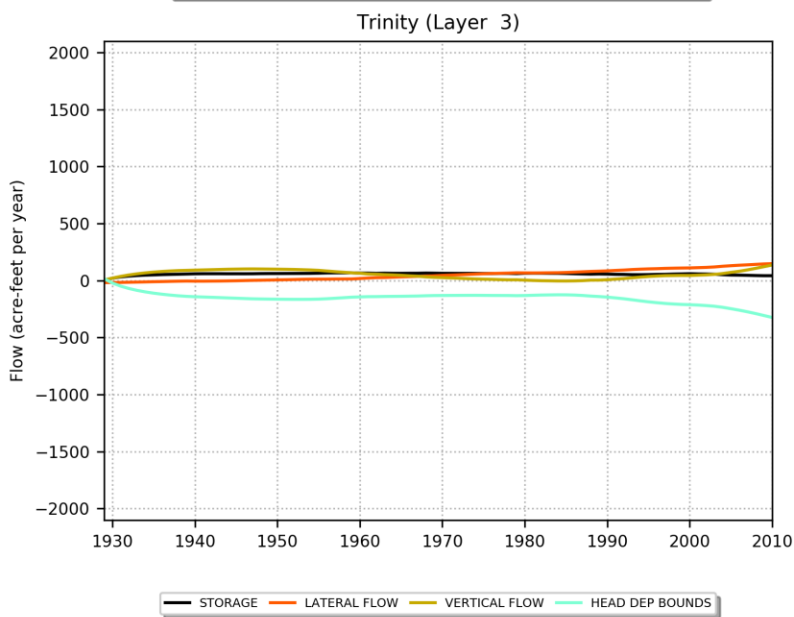
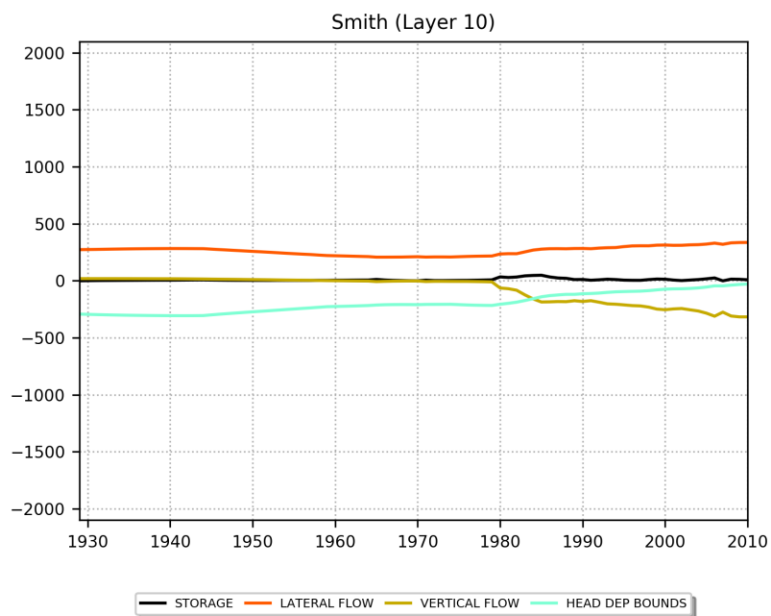
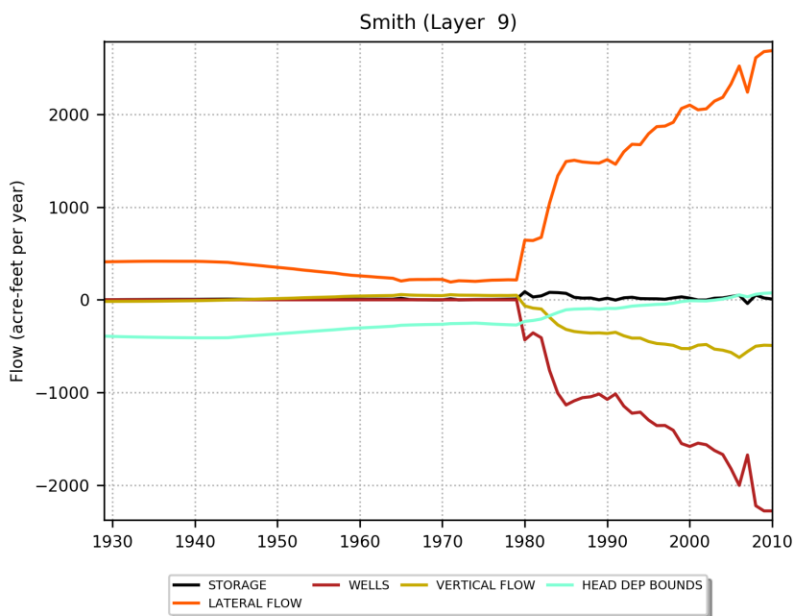
— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

— STORAGE — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS

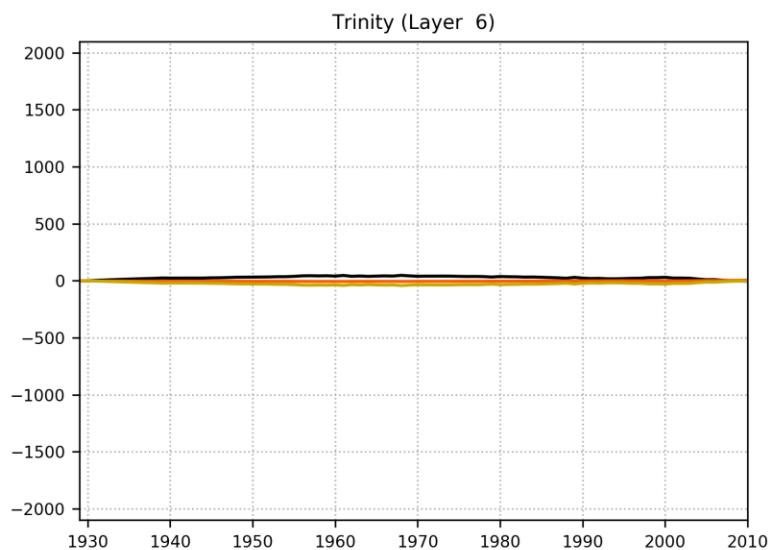
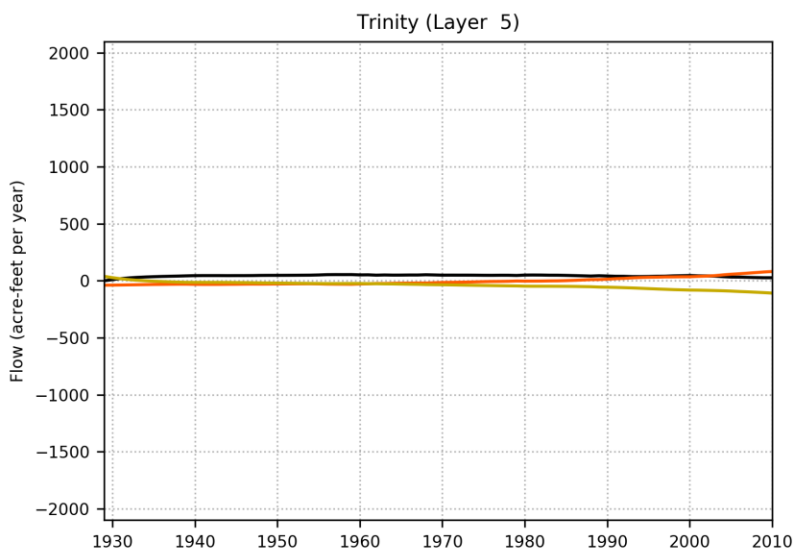
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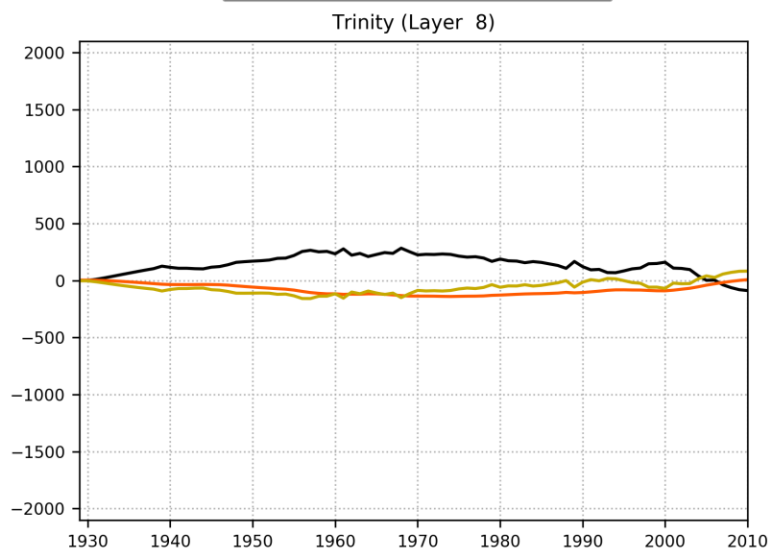
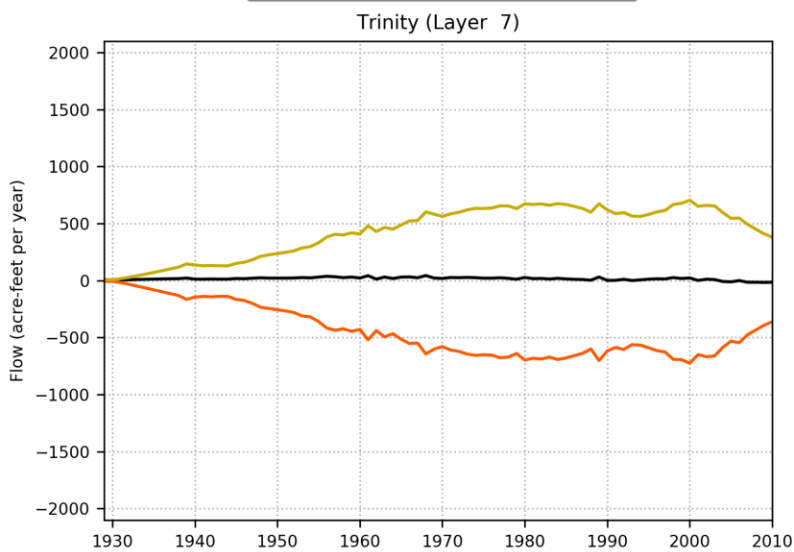


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— STORAGE — LATERAL FLOW — VERTICAL FLOW

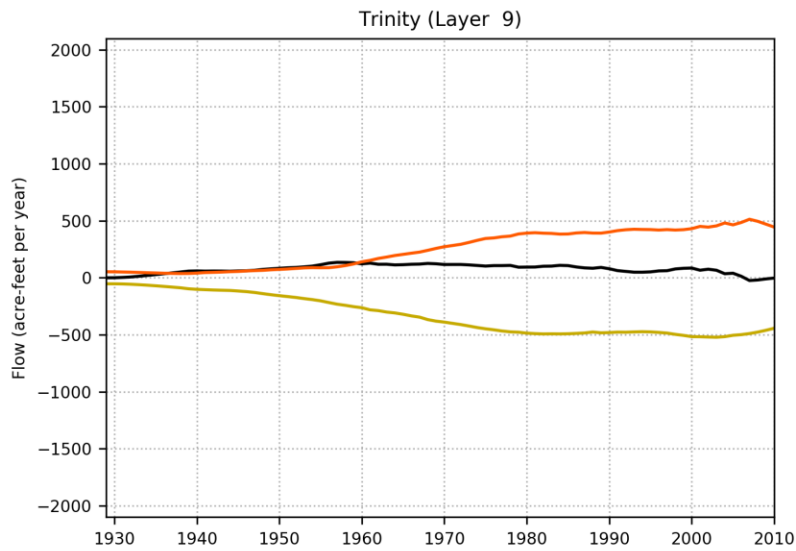
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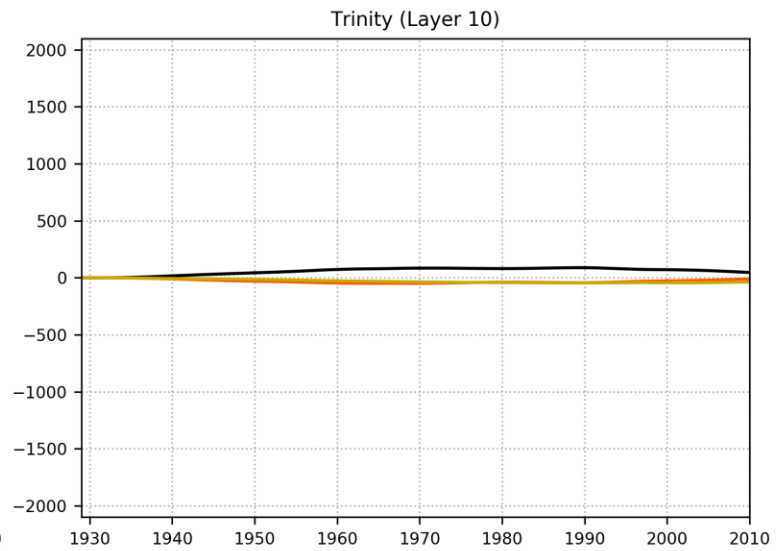
— STORAGE — LATERAL FLOW — VERTICAL FLOW

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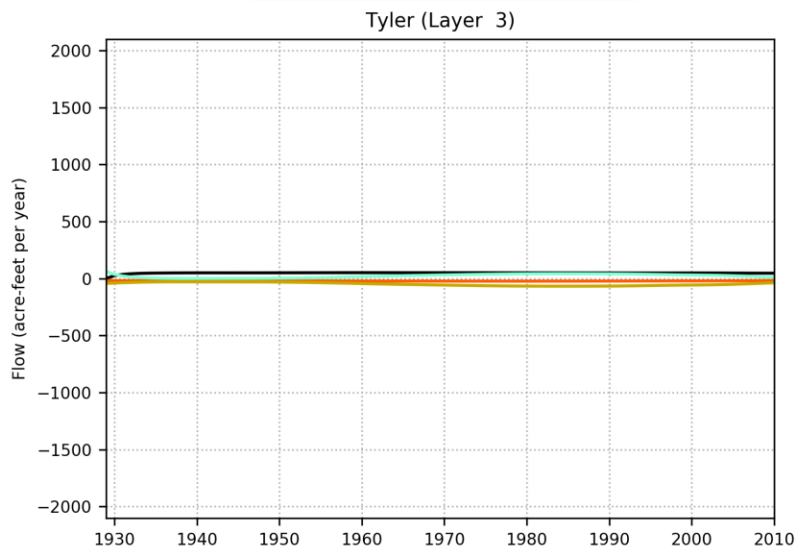
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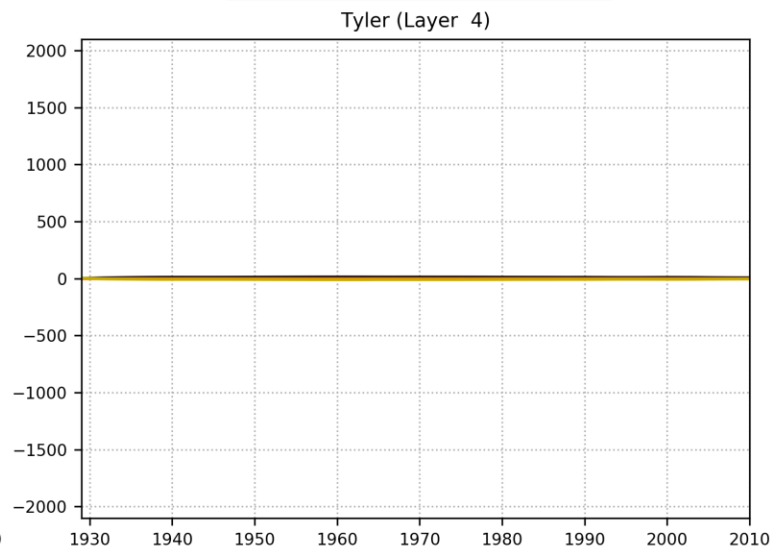
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— STORAGE — LATERAL FLOW — VERTICAL FLOW

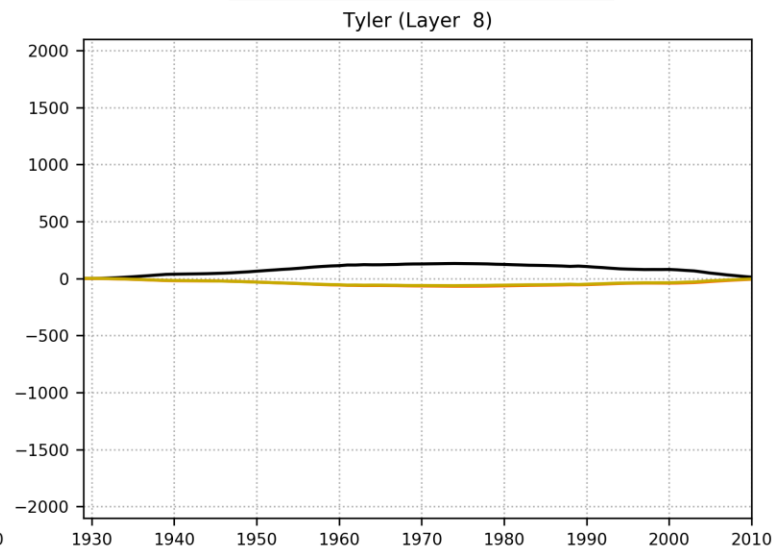
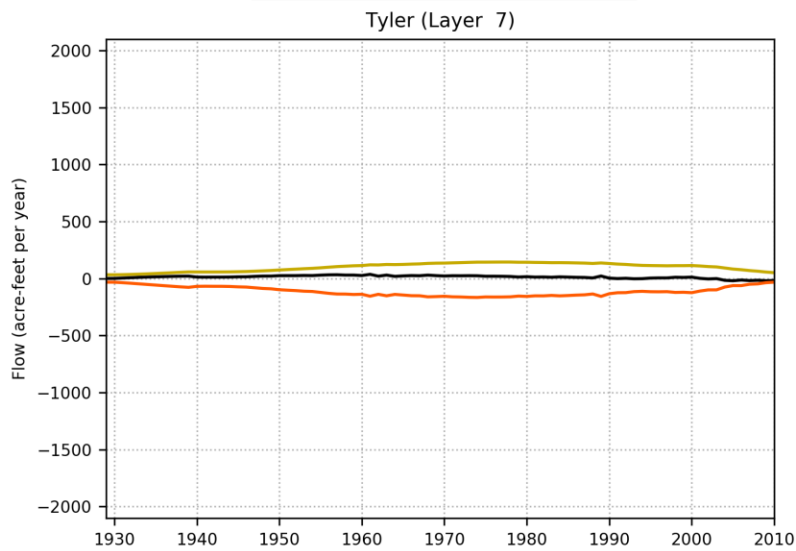
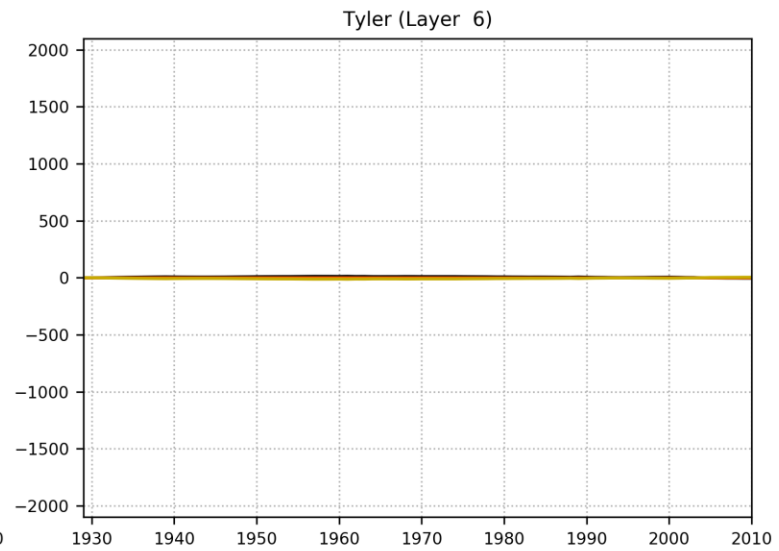
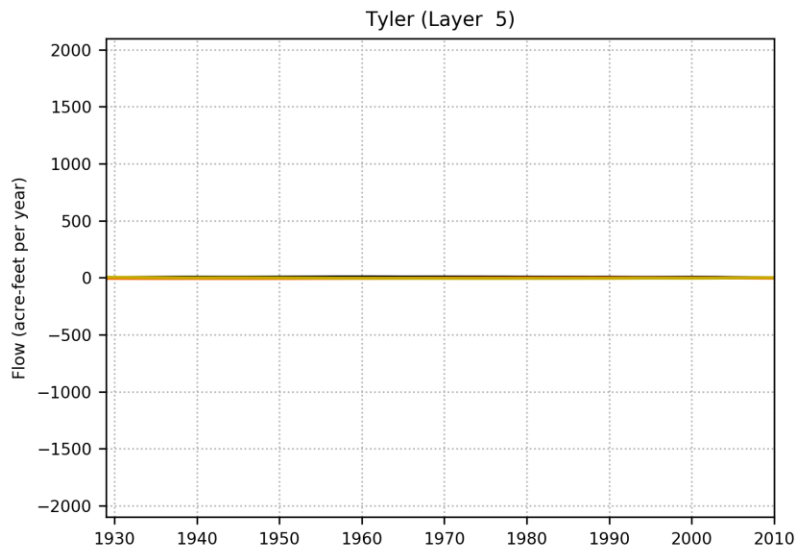


— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

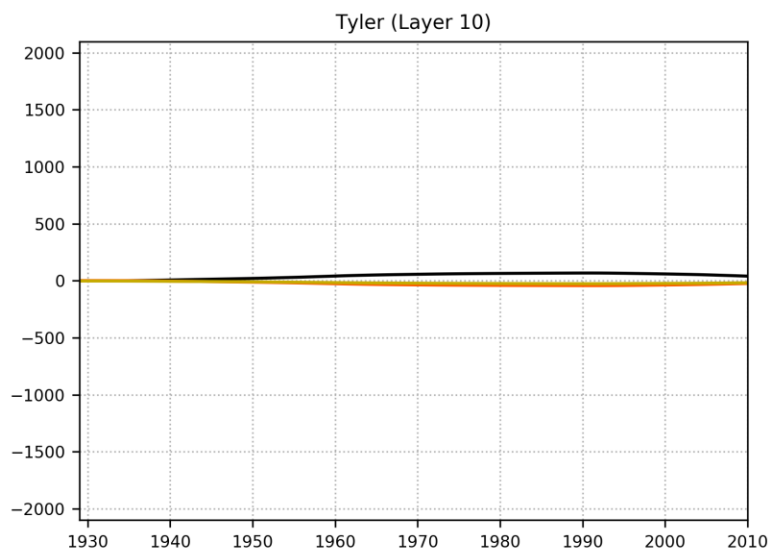
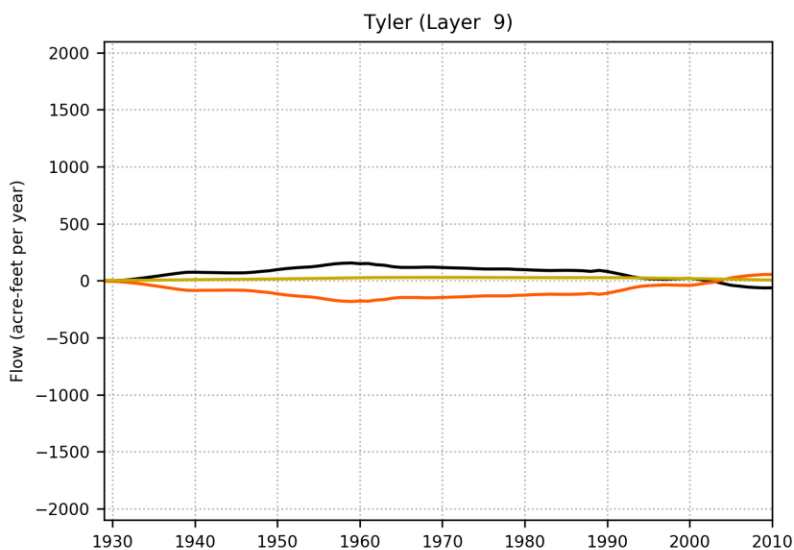


— STORAGE — LATERAL FLOW — VERTICAL FLOW

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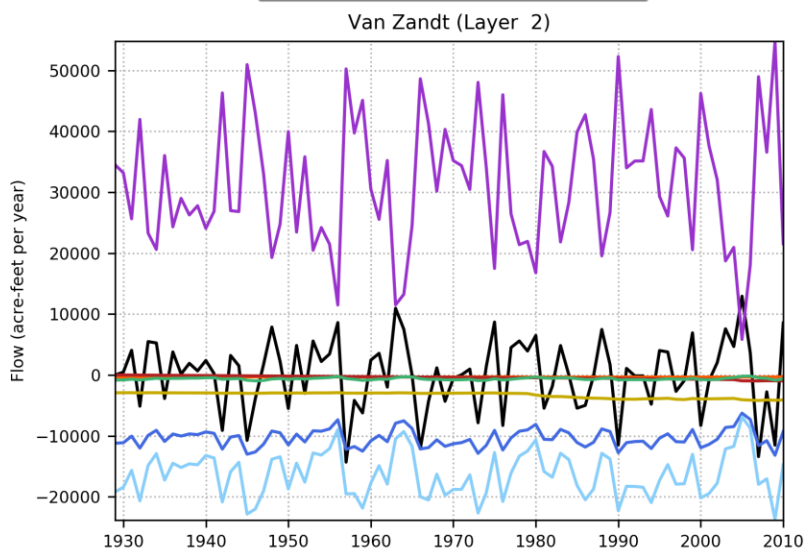


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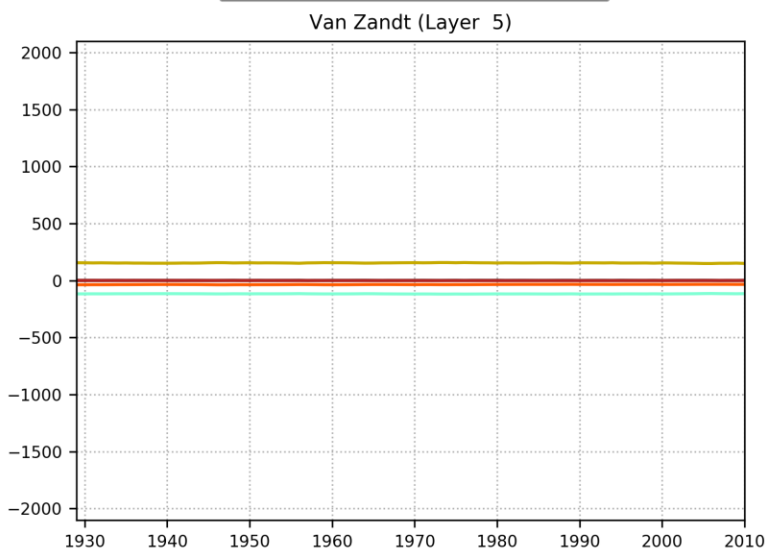


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— STORAGE — LATERAL FLOW — VERTICAL FLOW

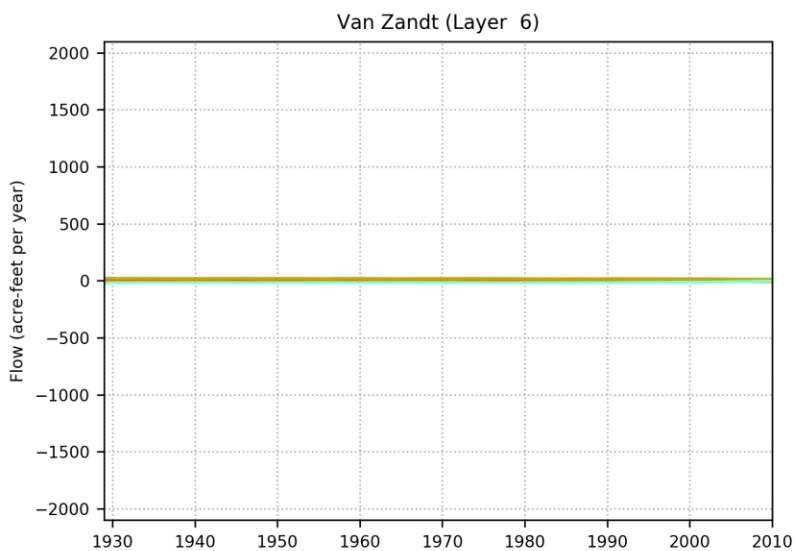


— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET — LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

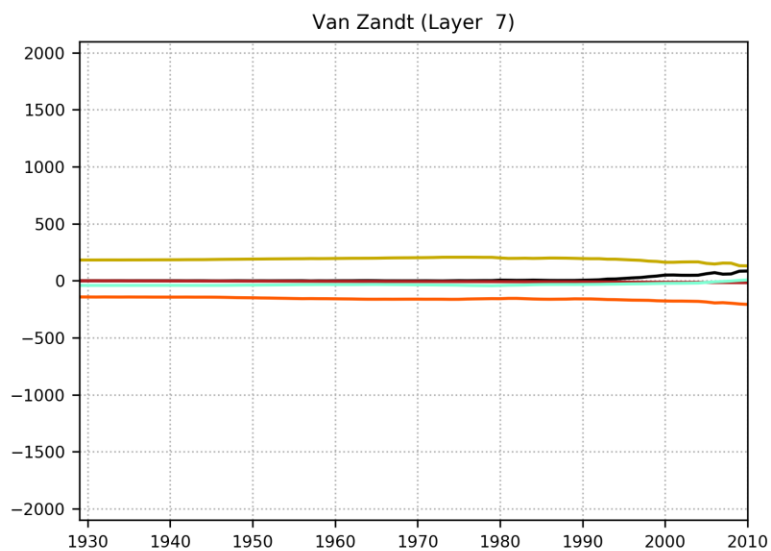


— STORAGE — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS — LATERAL FLOW

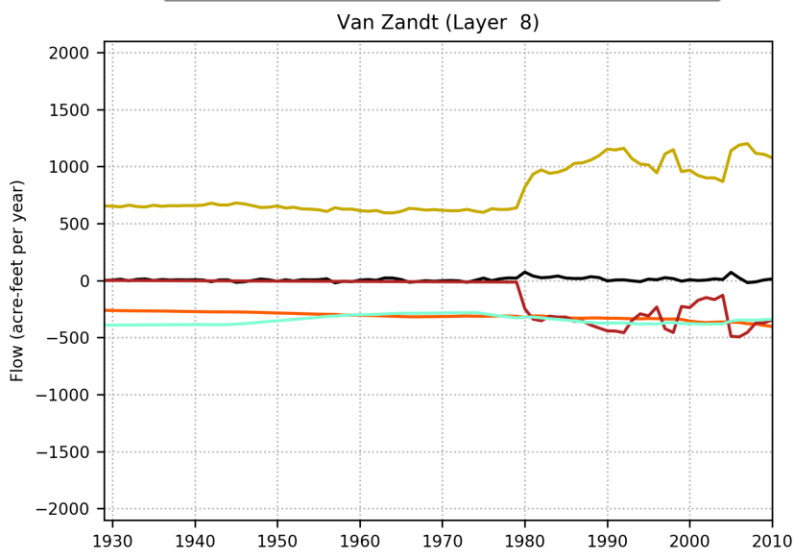
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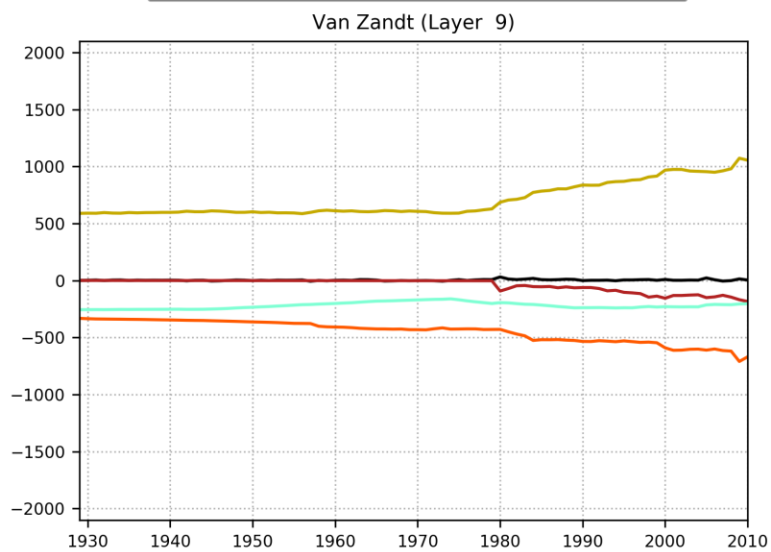
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— STORAGE — WELLS — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

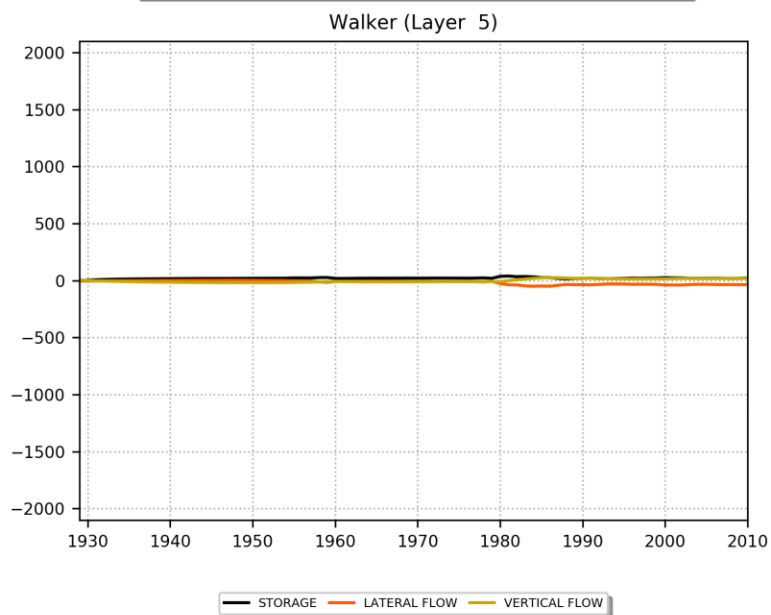
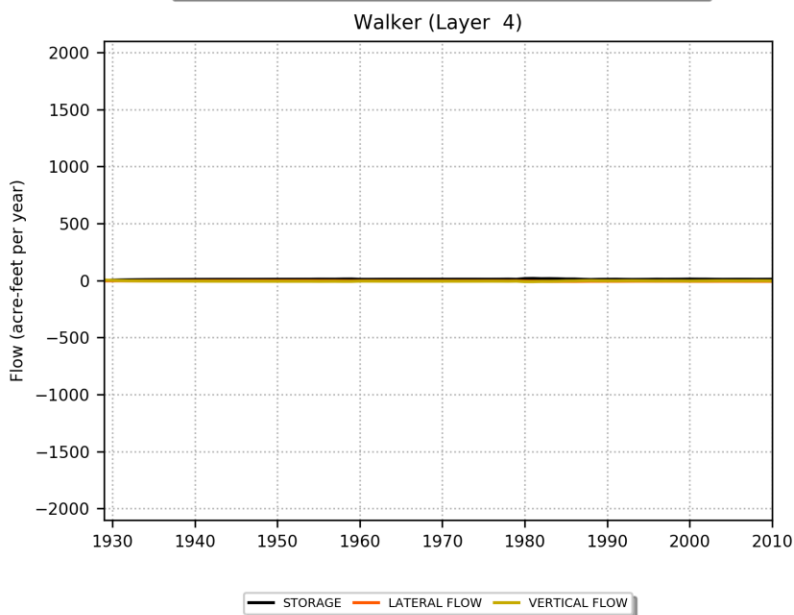
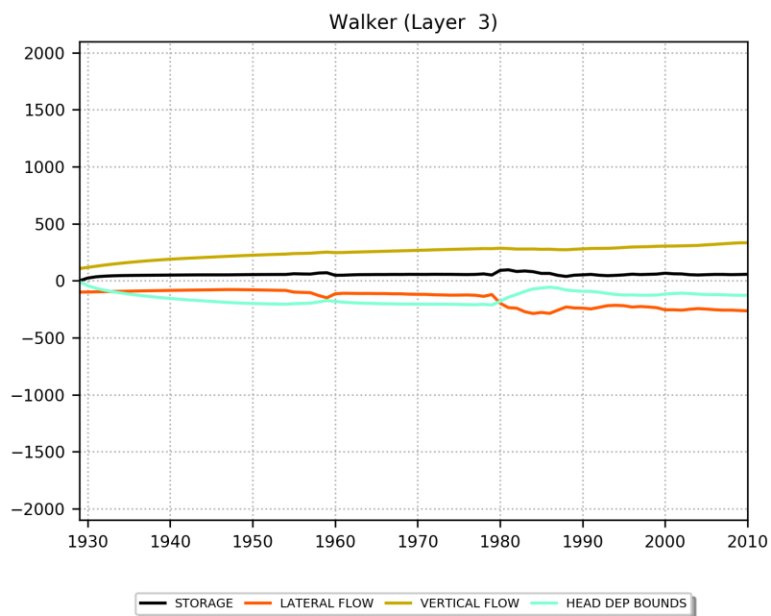
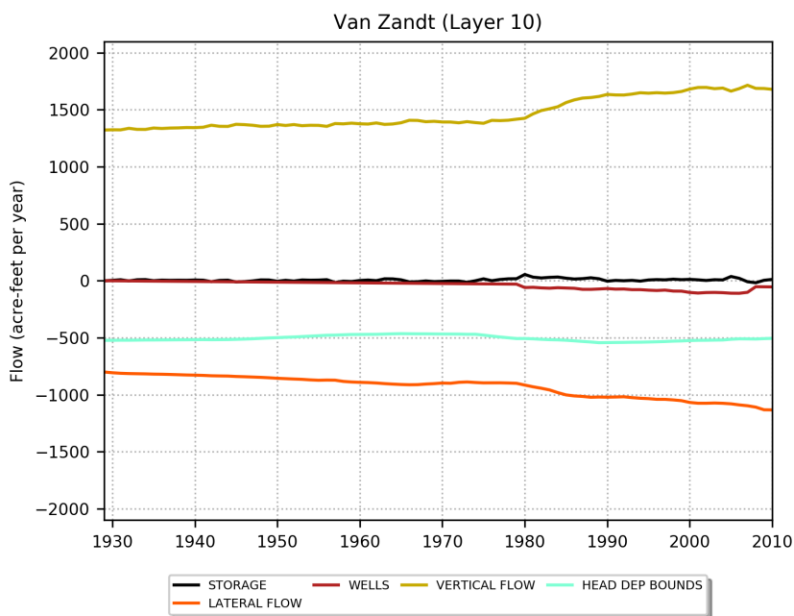


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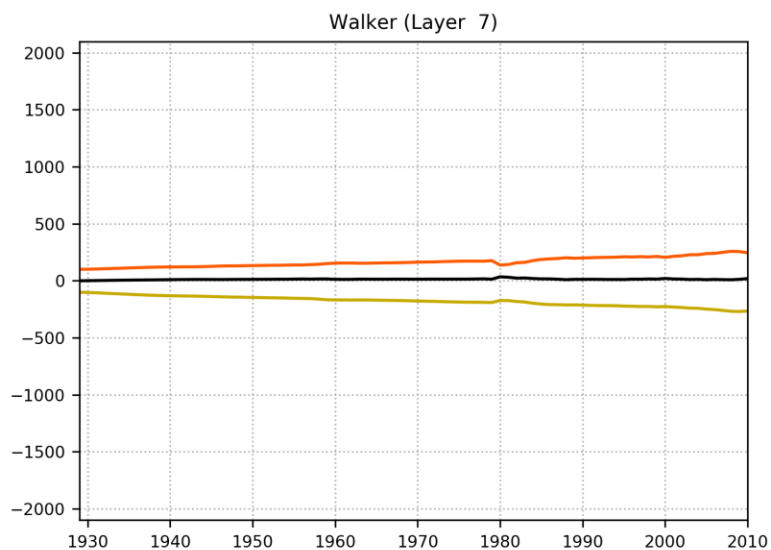
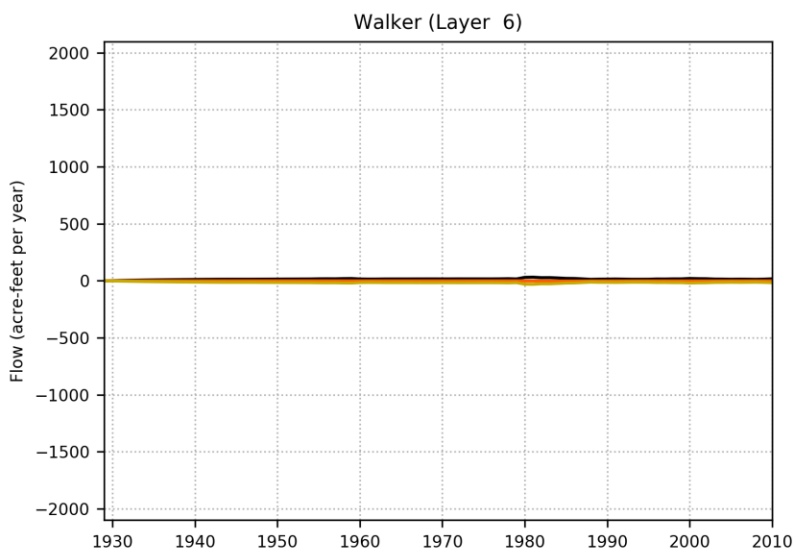


— STORAGE — WELLS — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

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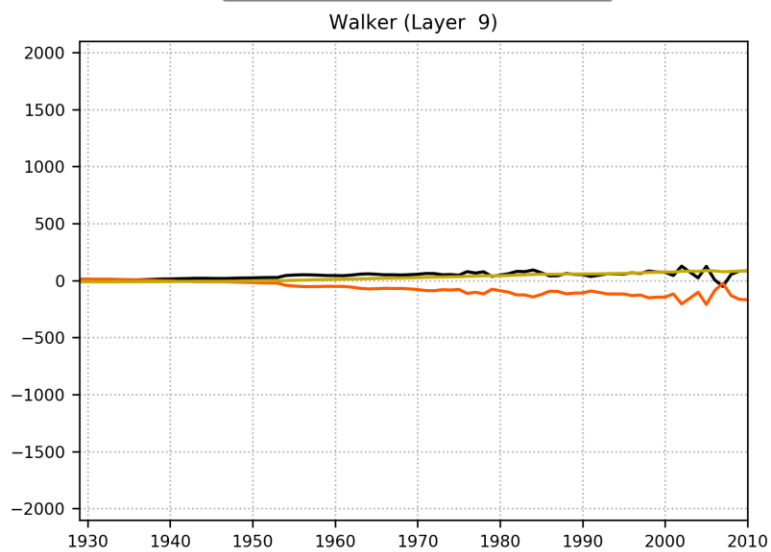
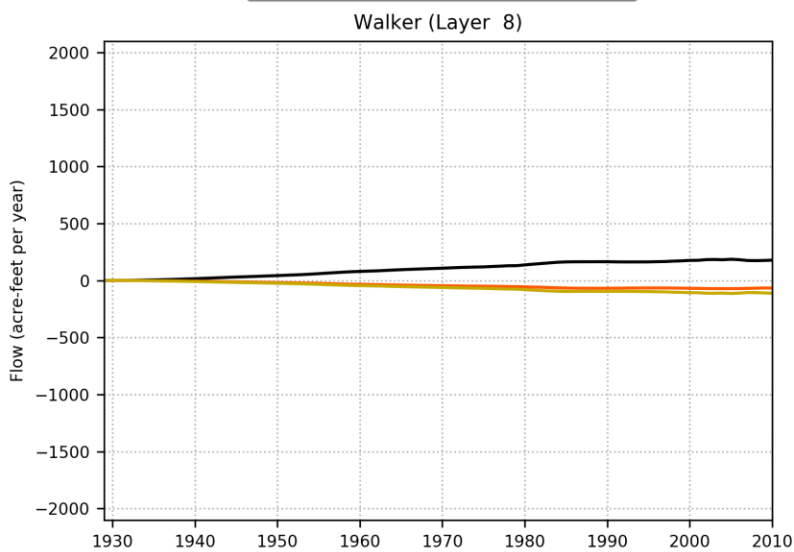


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— STORAGE — LATERAL FLOW — VERTICAL FLOW

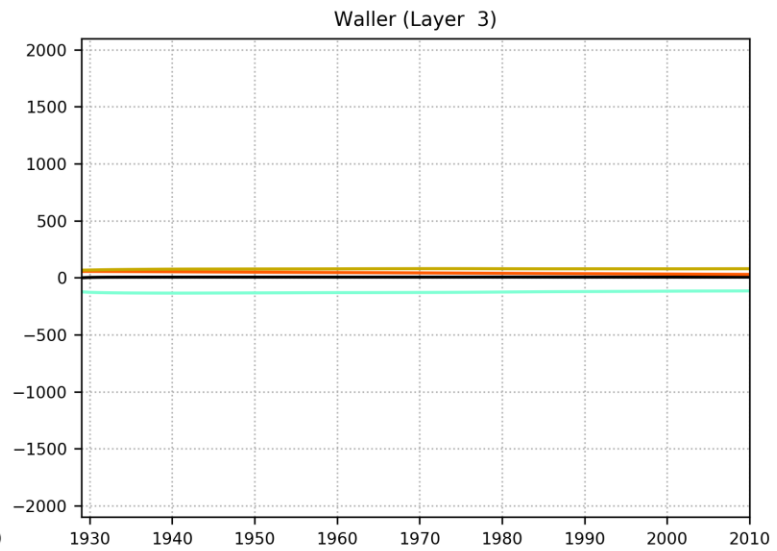
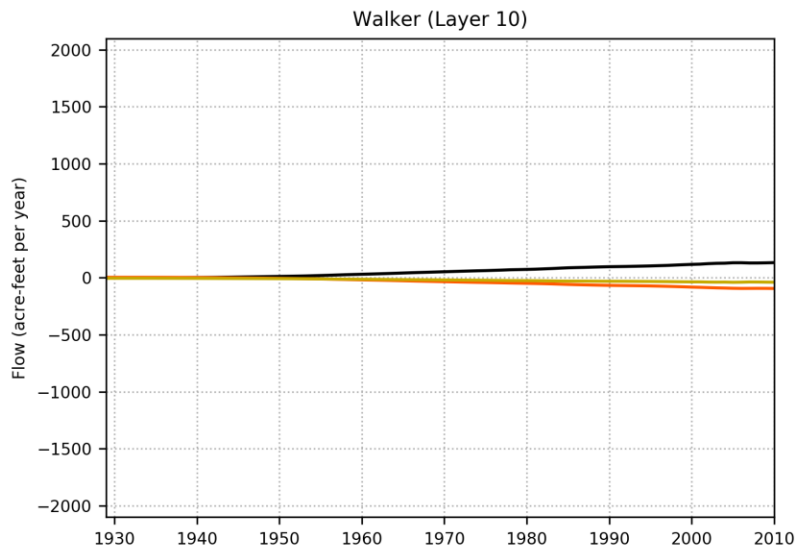
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— STORAGE — LATERAL FLOW — VERTICAL FLOW

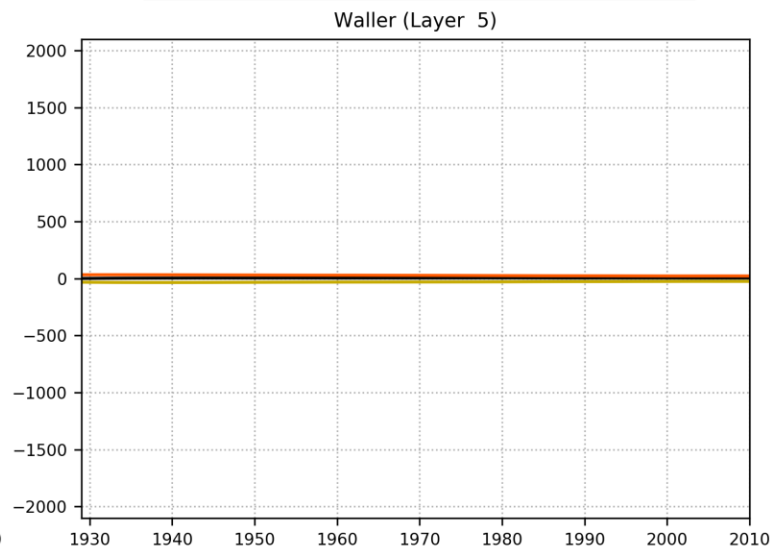
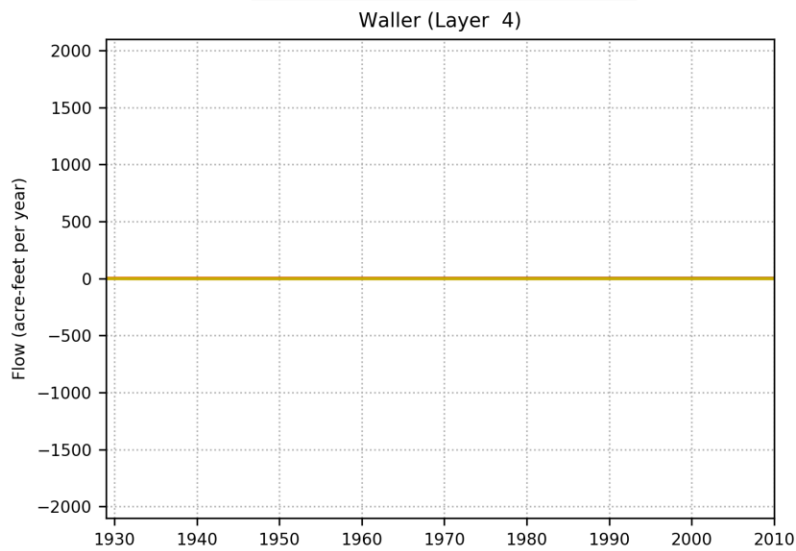
— STORAGE — LATERAL FLOW — VERTICAL FLOW

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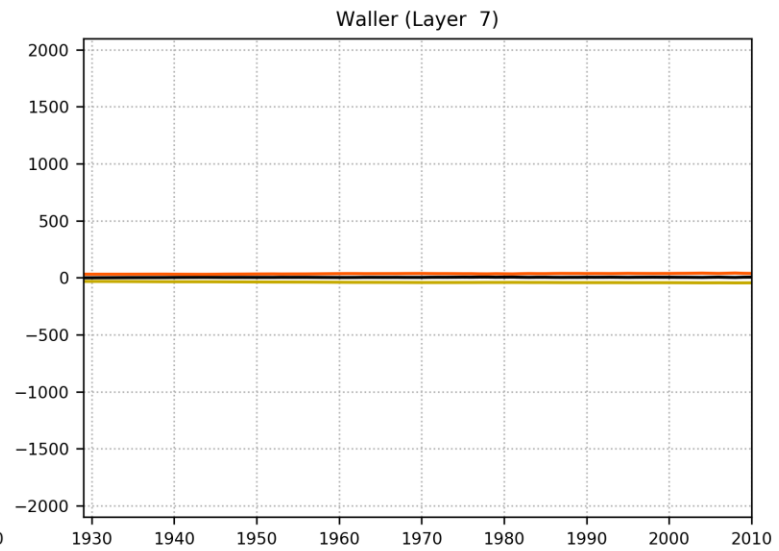
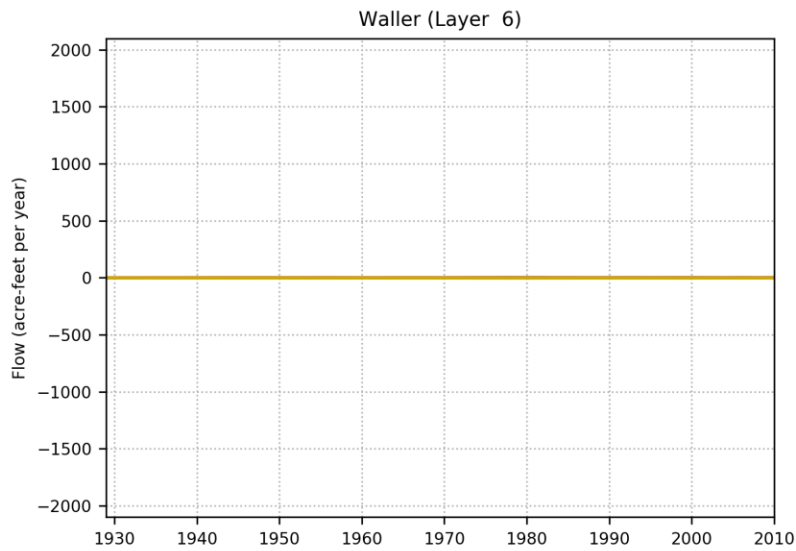
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS



— STORAGE — LATERAL FLOW — VERTICAL FLOW

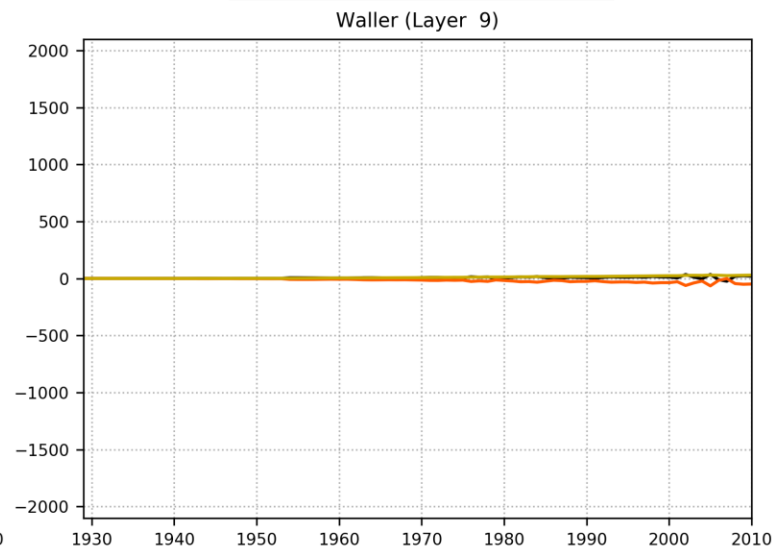
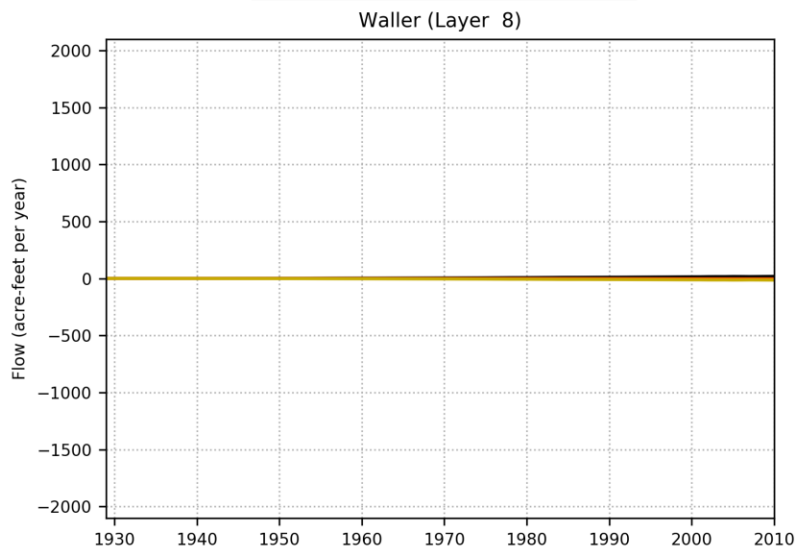
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— STORAGE — LATERAL FLOW — VERTICAL FLOW

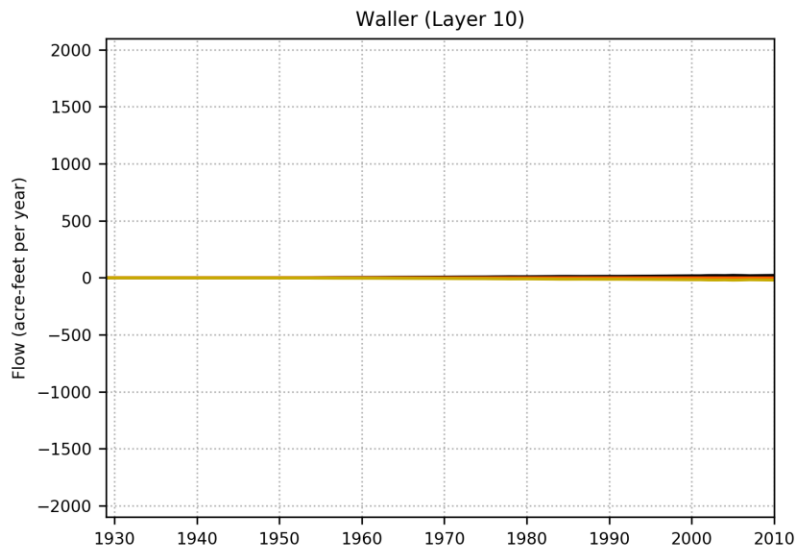
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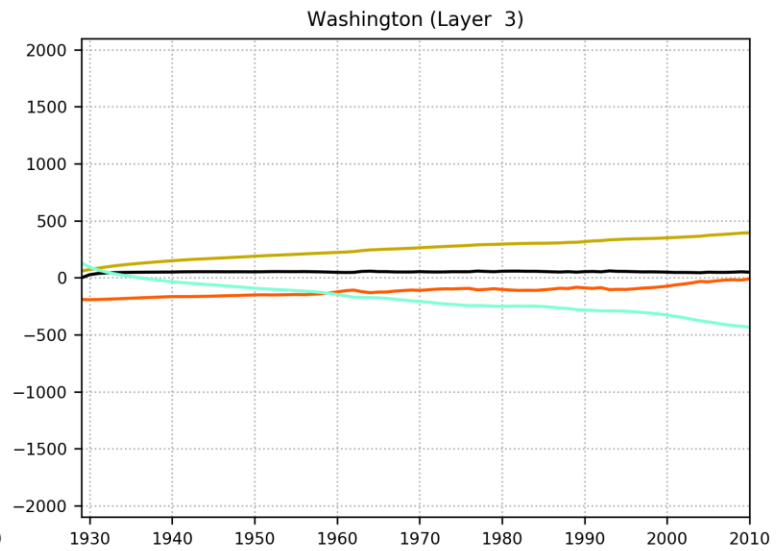
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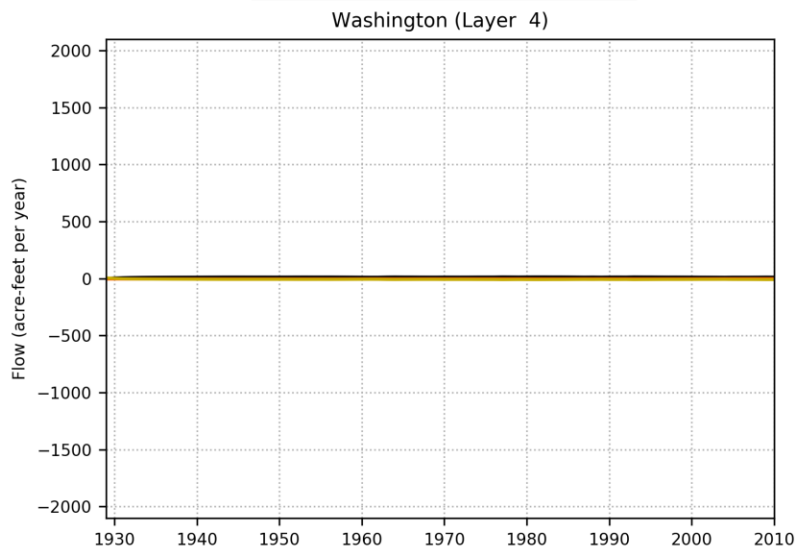
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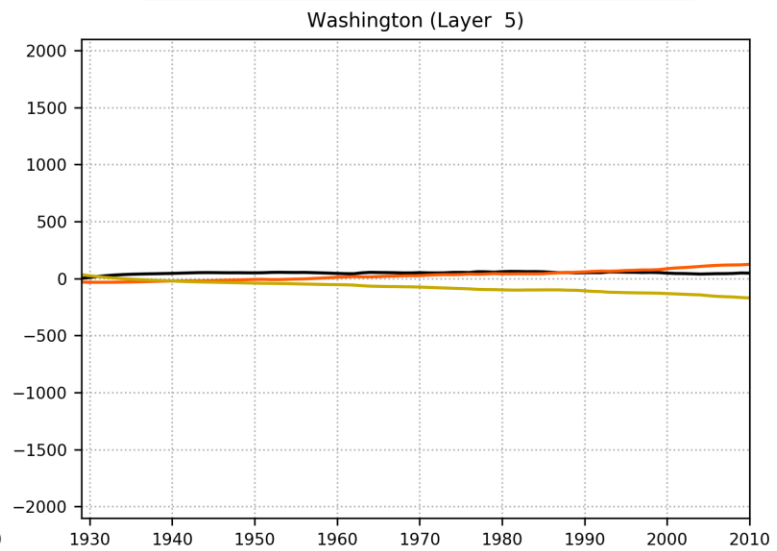
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— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

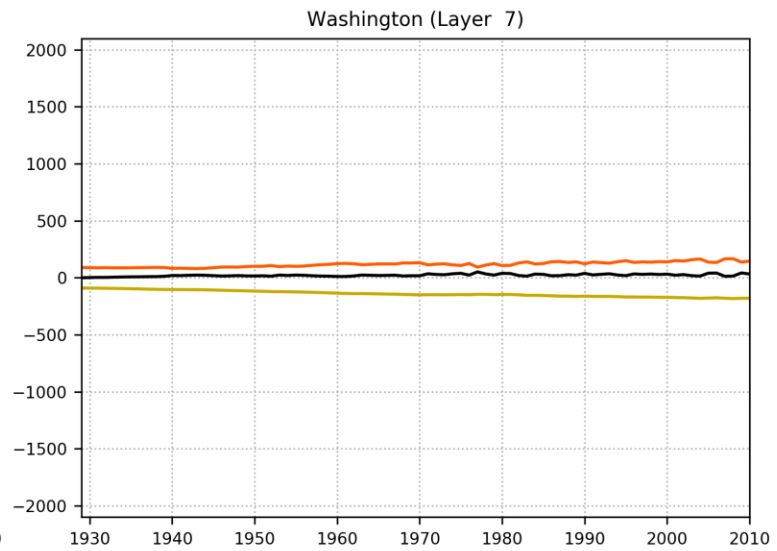
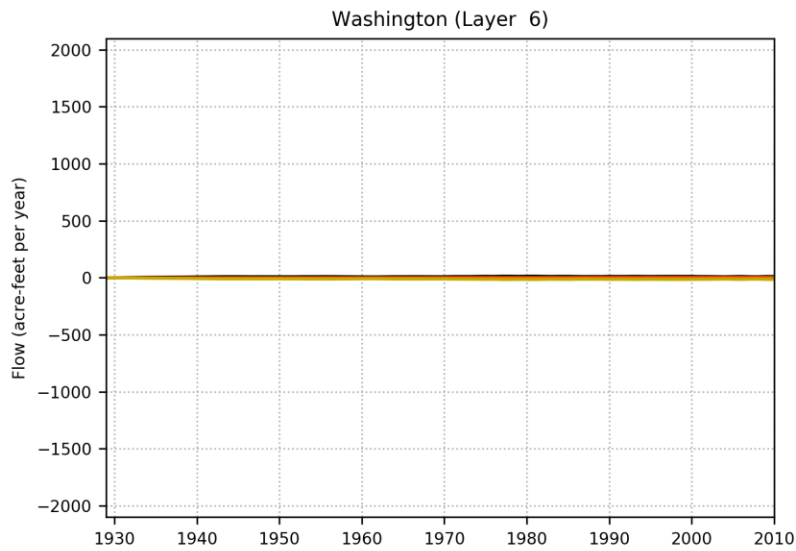


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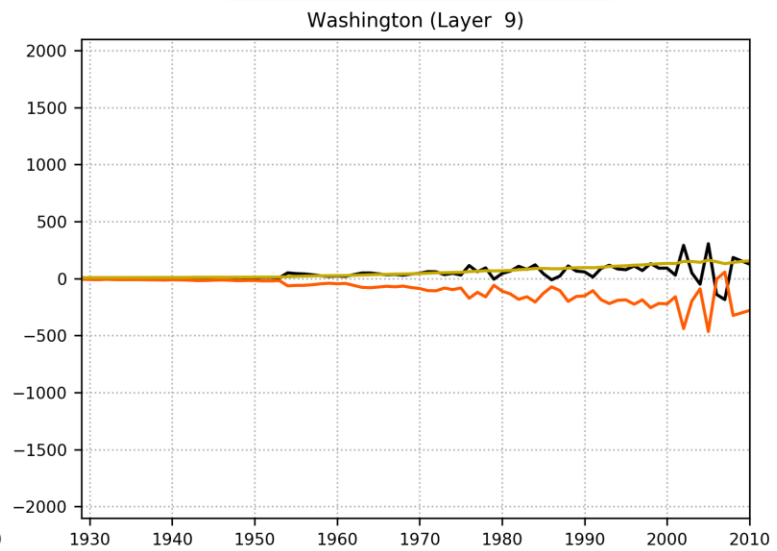
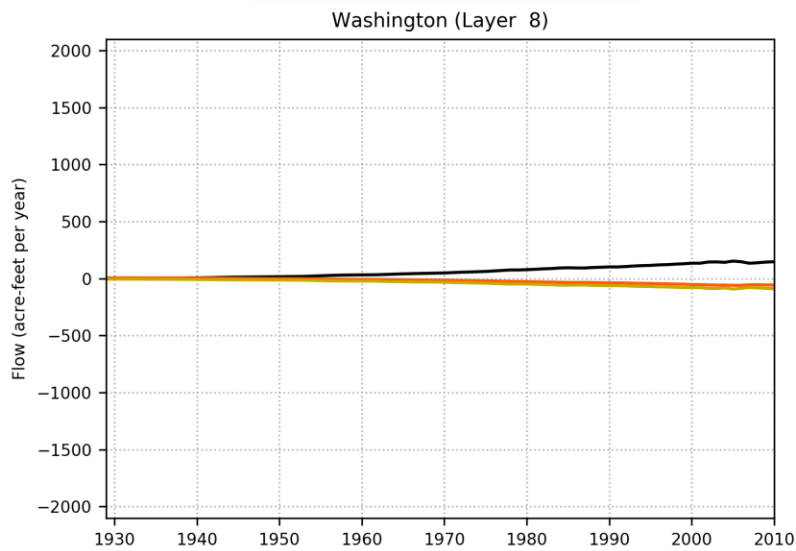
— STORAGE — LATERAL FLOW — VERTICAL FLOW

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— STORAGE — LATERAL FLOW — VERTICAL FLOW

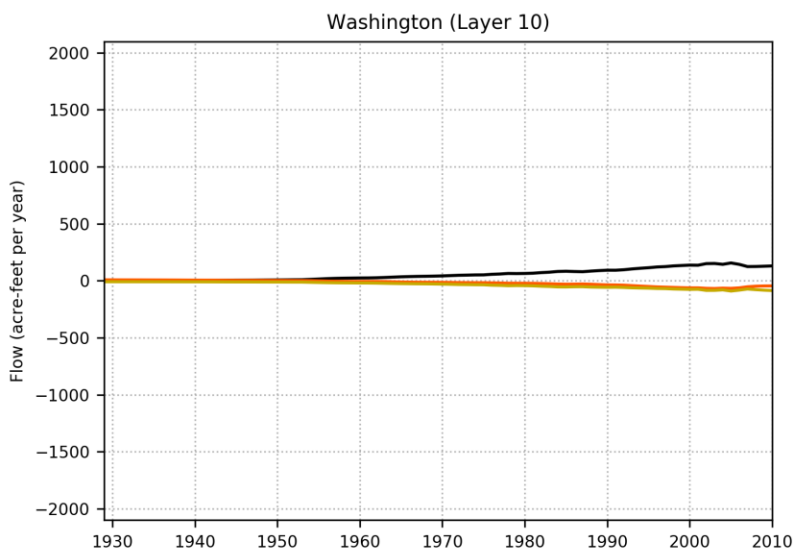
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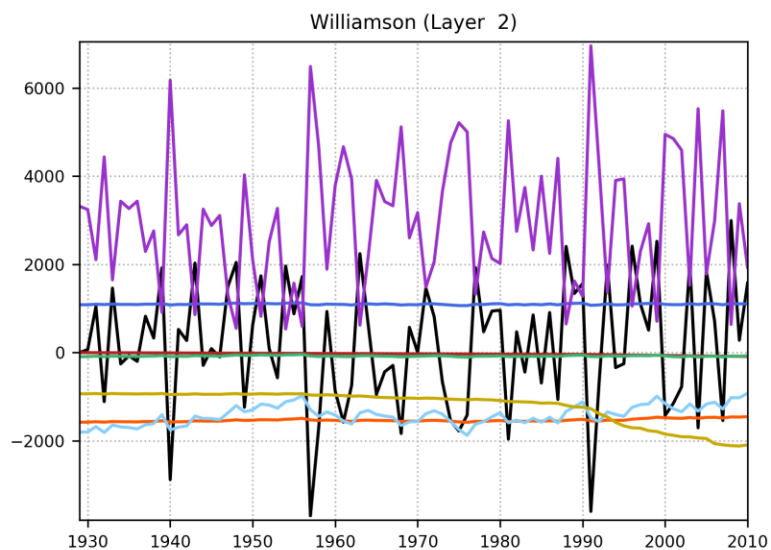
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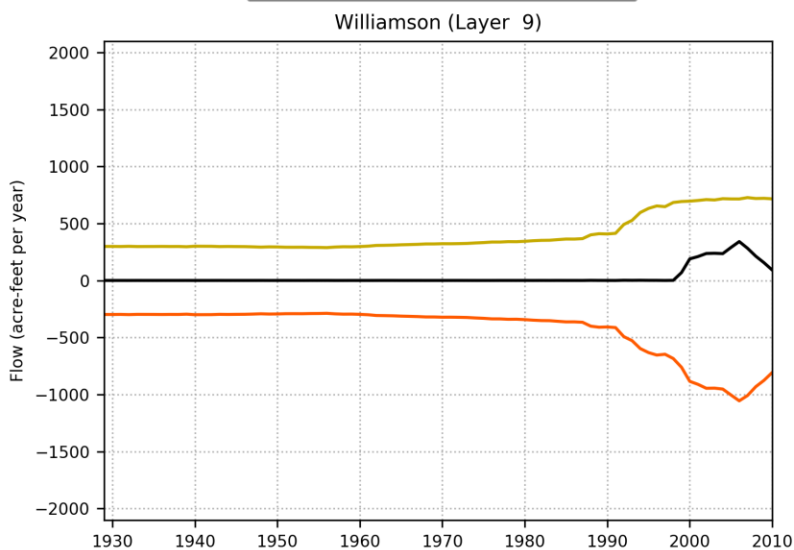
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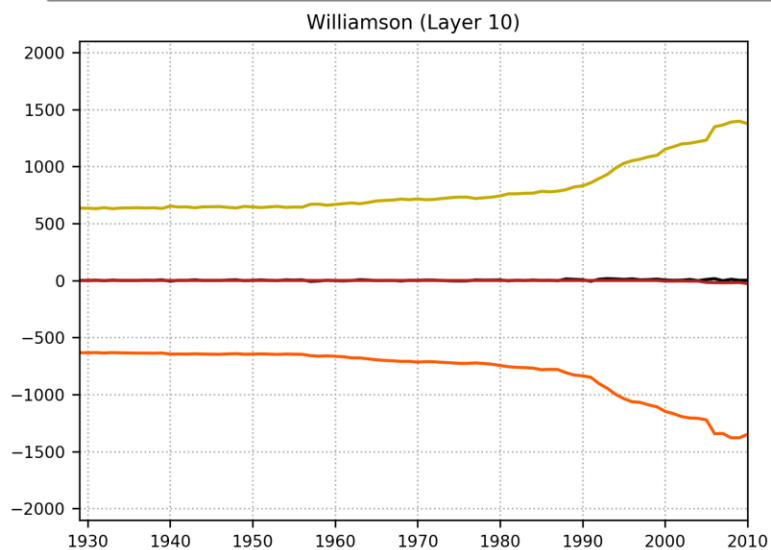
— STORAGE — LATERAL FLOW — VERTICAL FLOW



— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

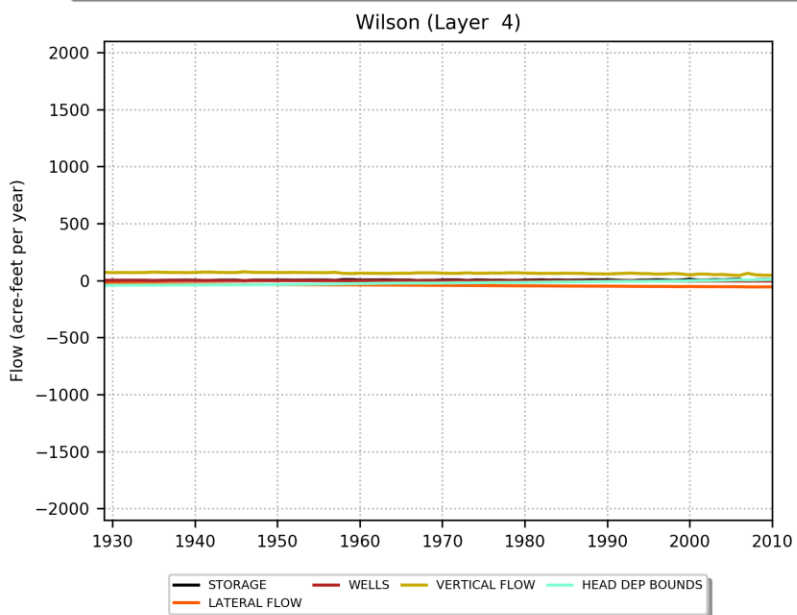
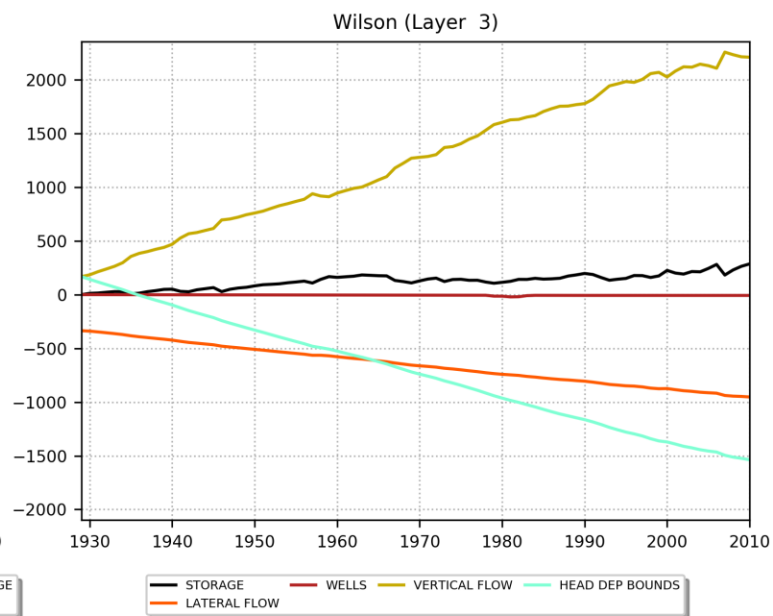
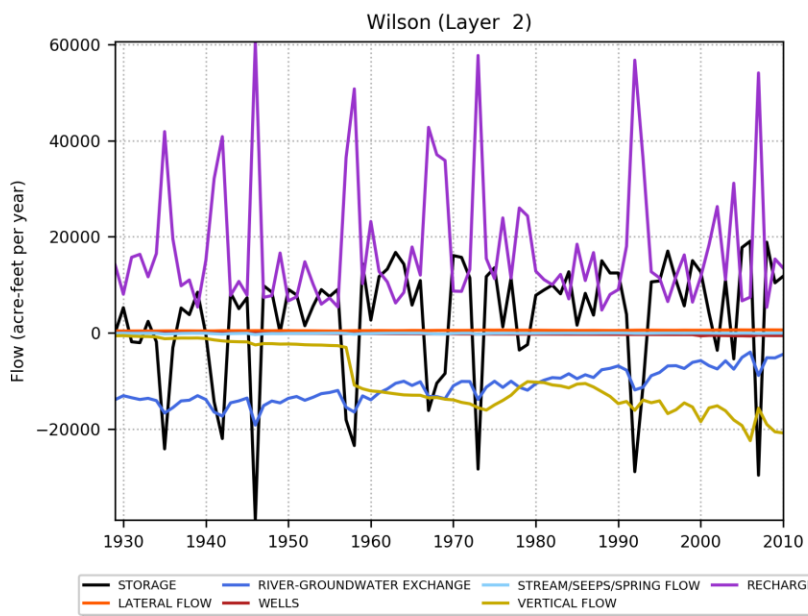


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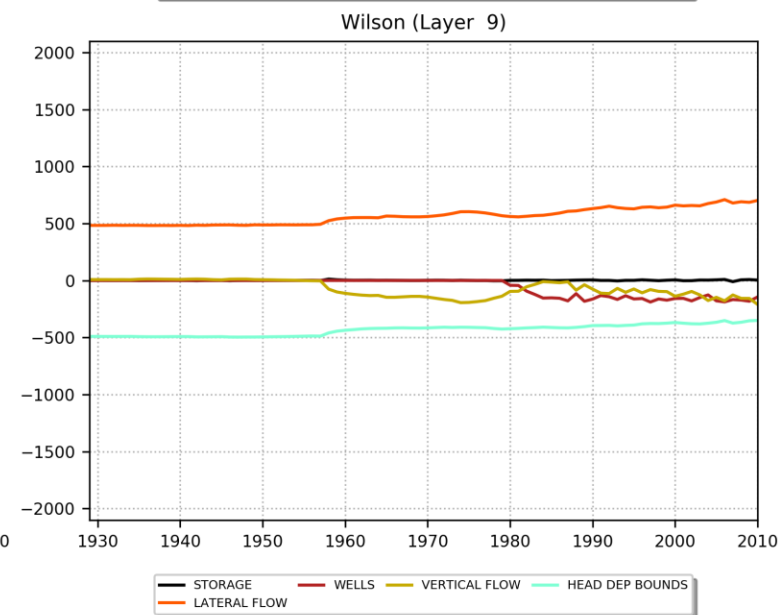
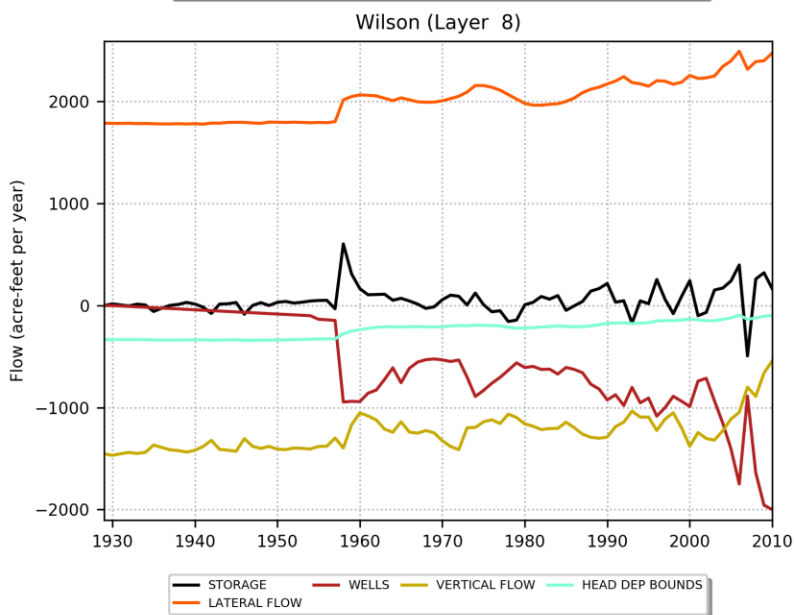
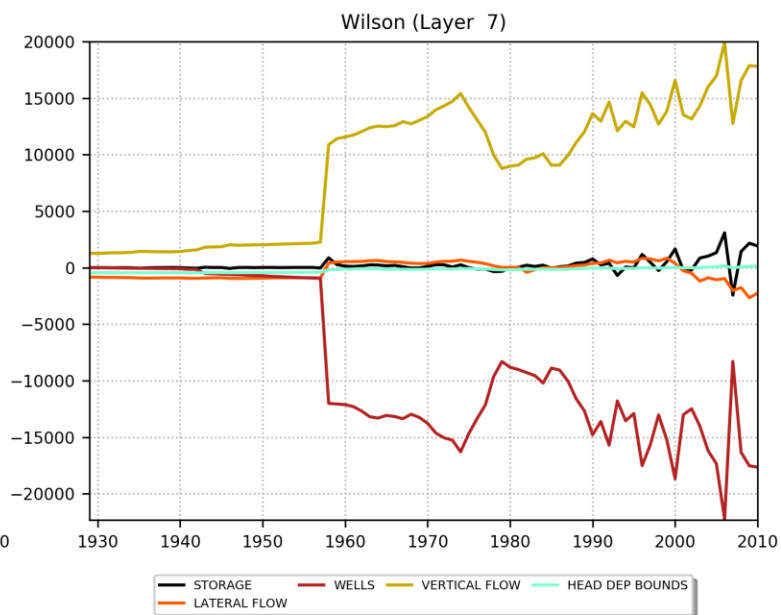
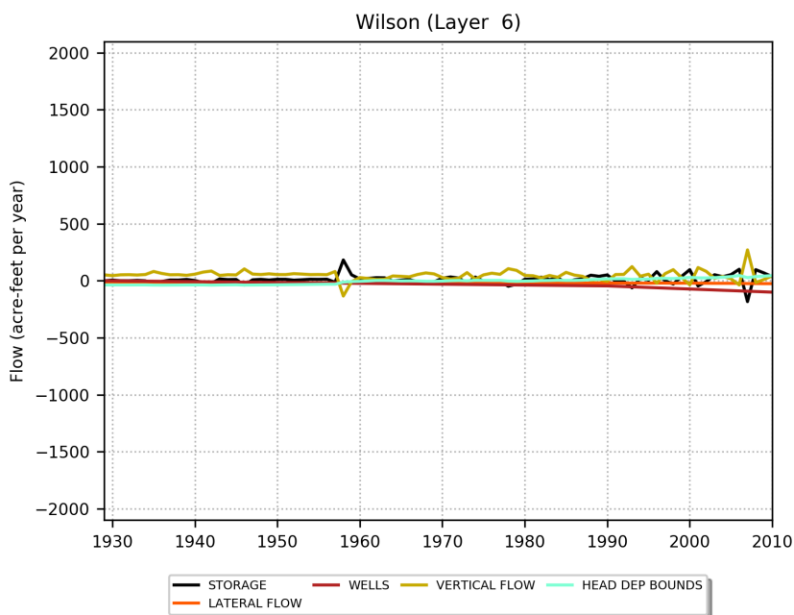


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

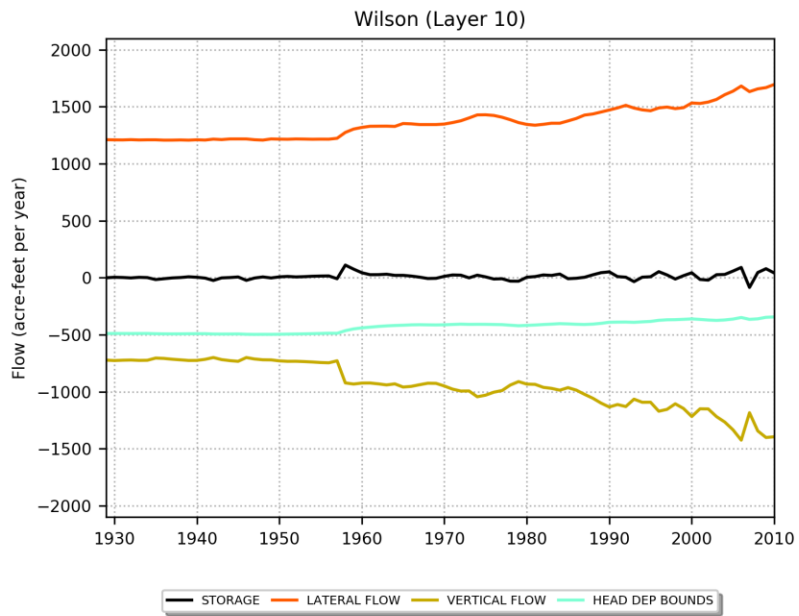
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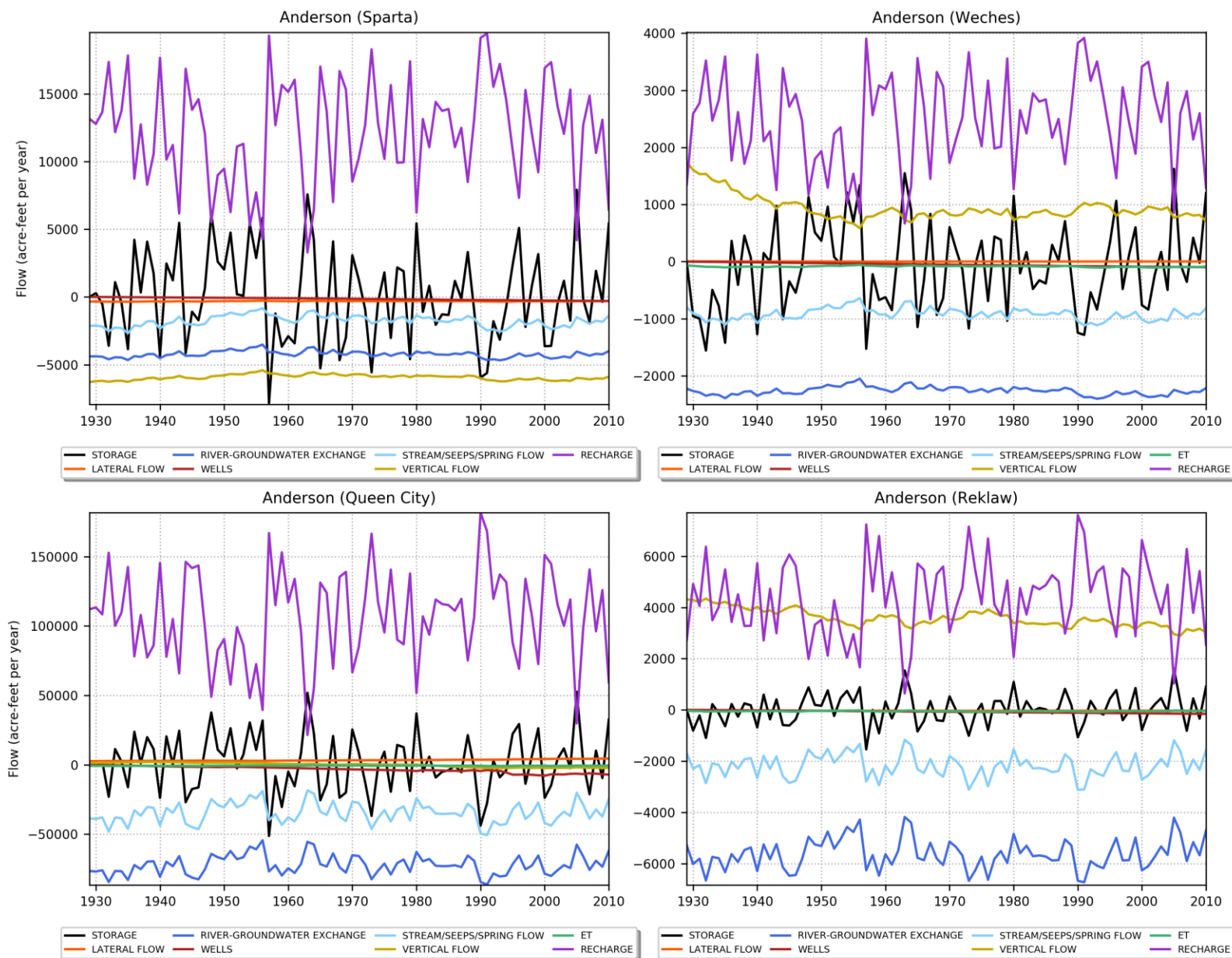
30 Appendix S: Transient Water Budgets by County and Hydrogeologic Unit

Figures showing the transient water budget by county and hydrogeologic unit are presented in this appendix. The figures are ordered alphabetically by county then hydrogeologic unit.

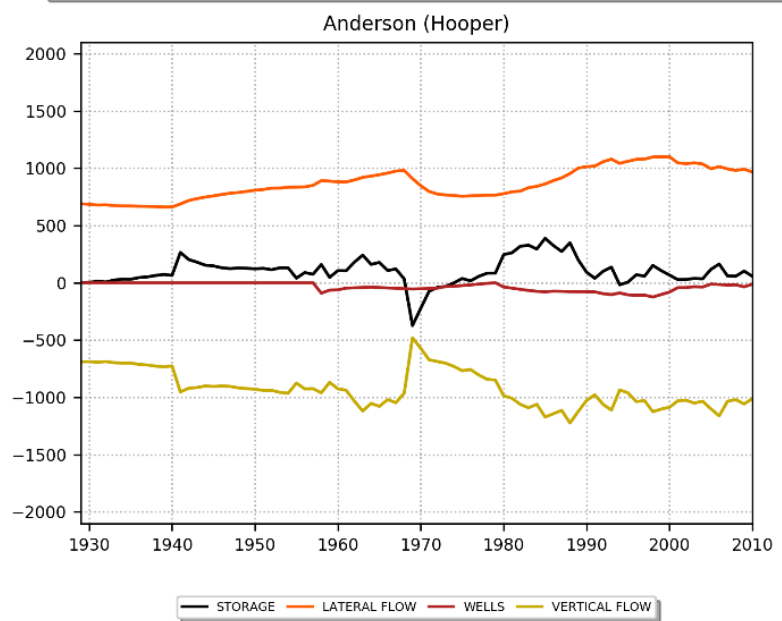
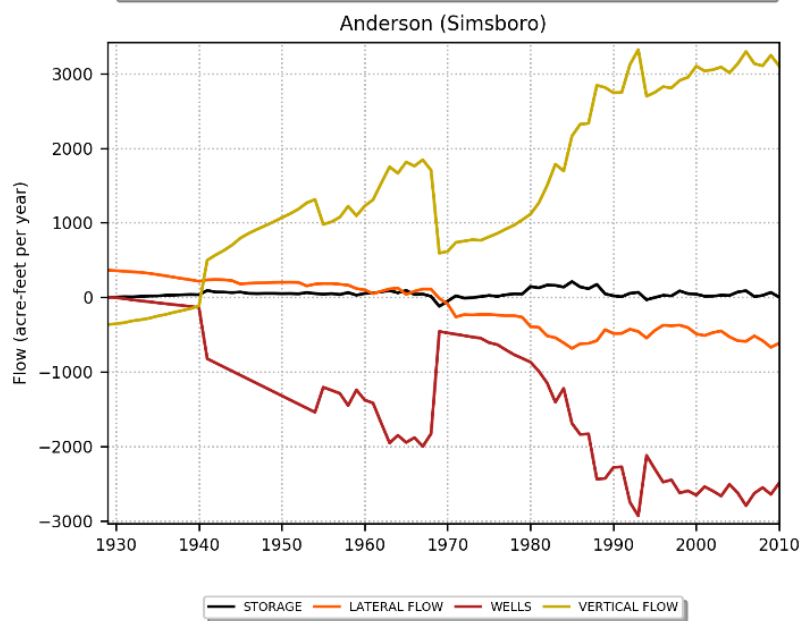
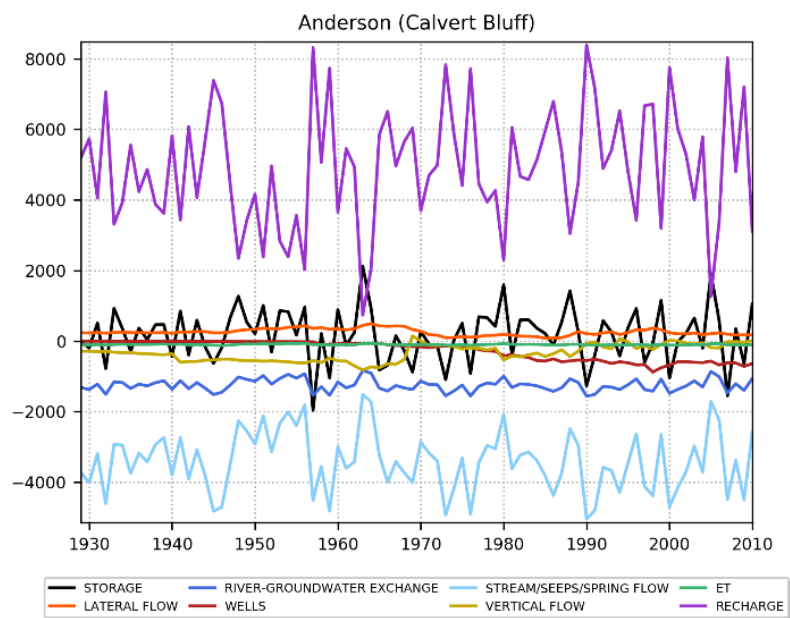
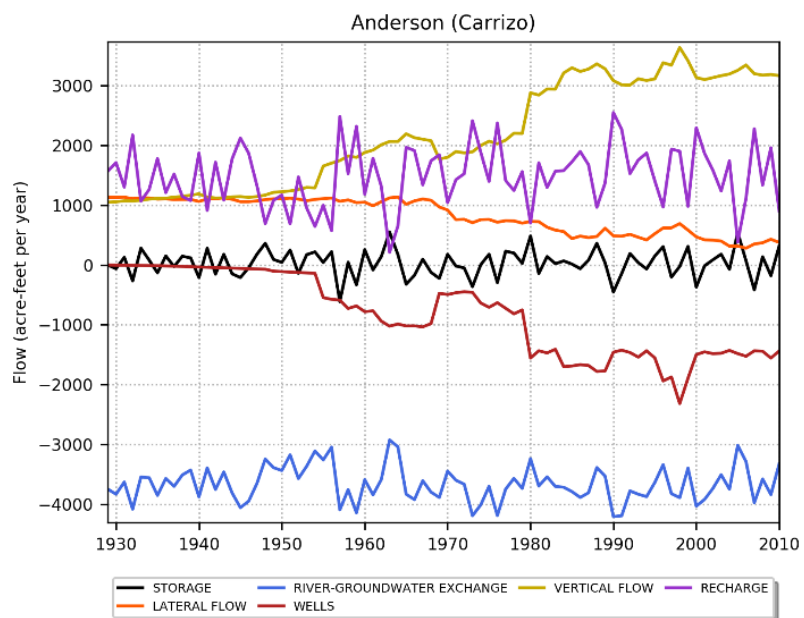
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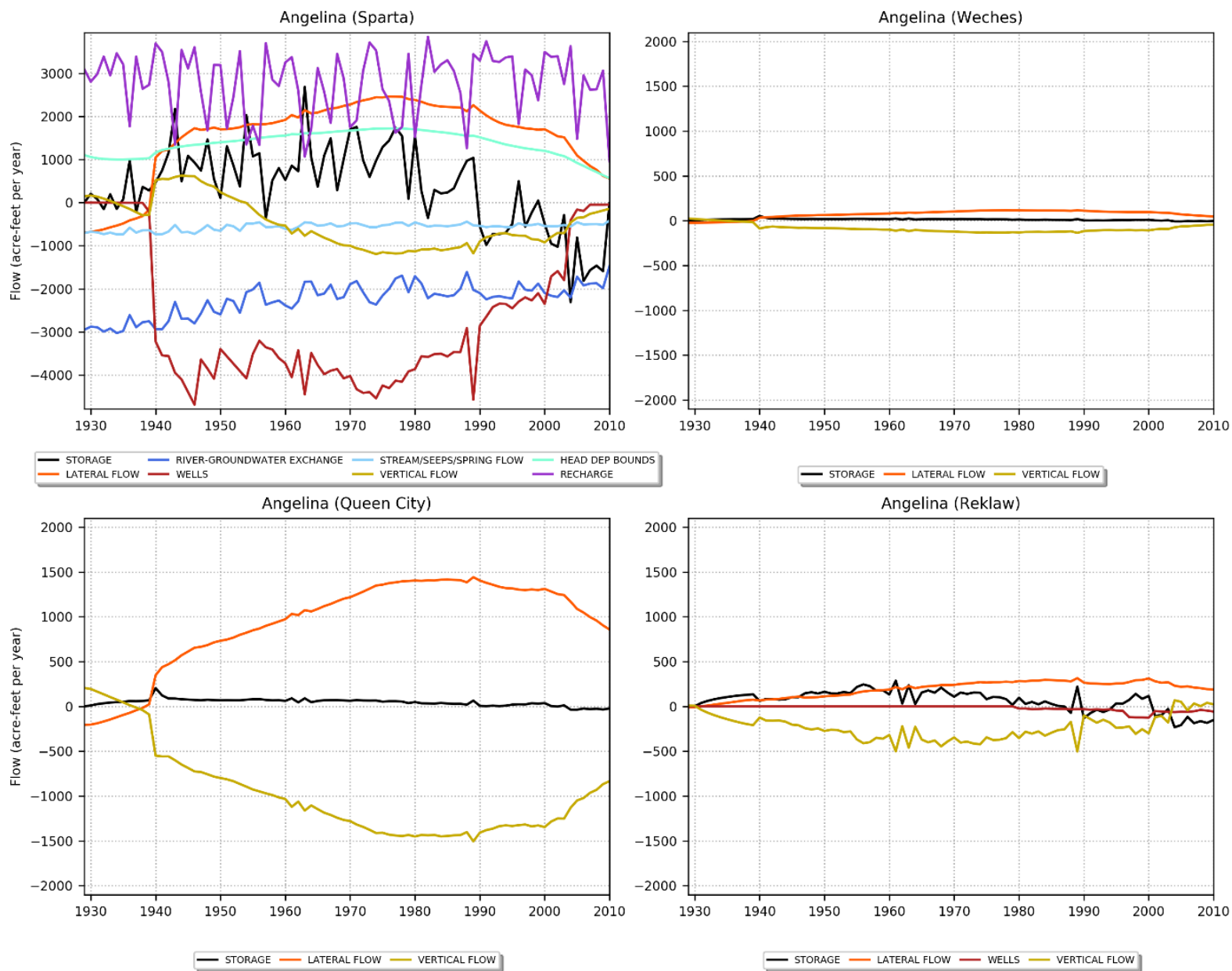
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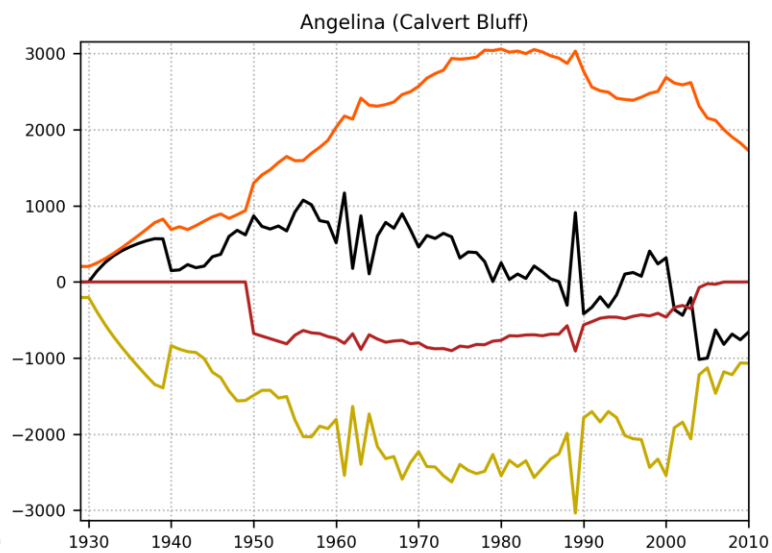
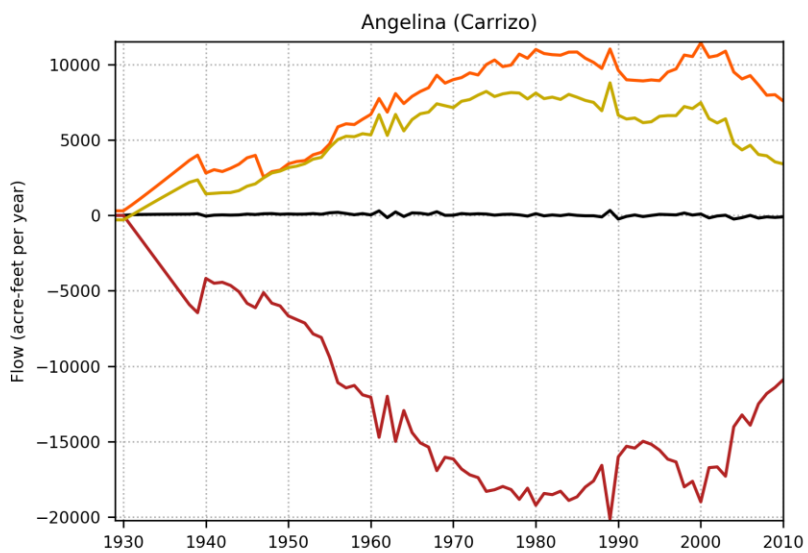
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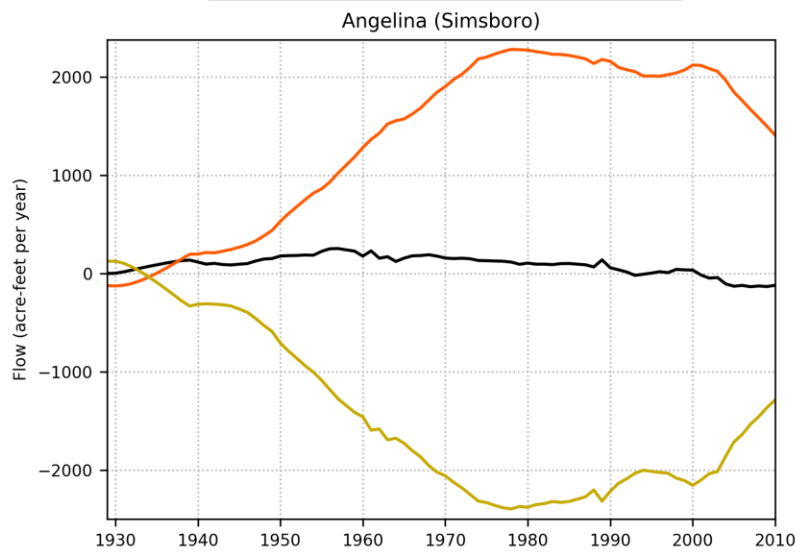


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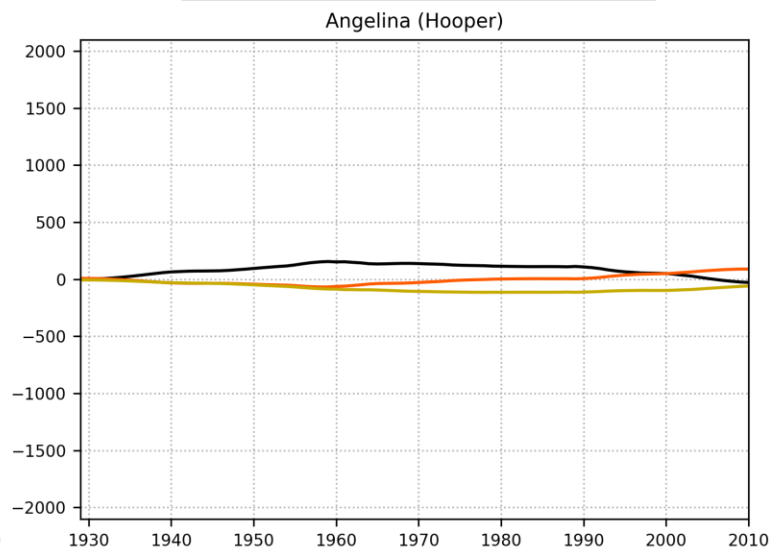


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

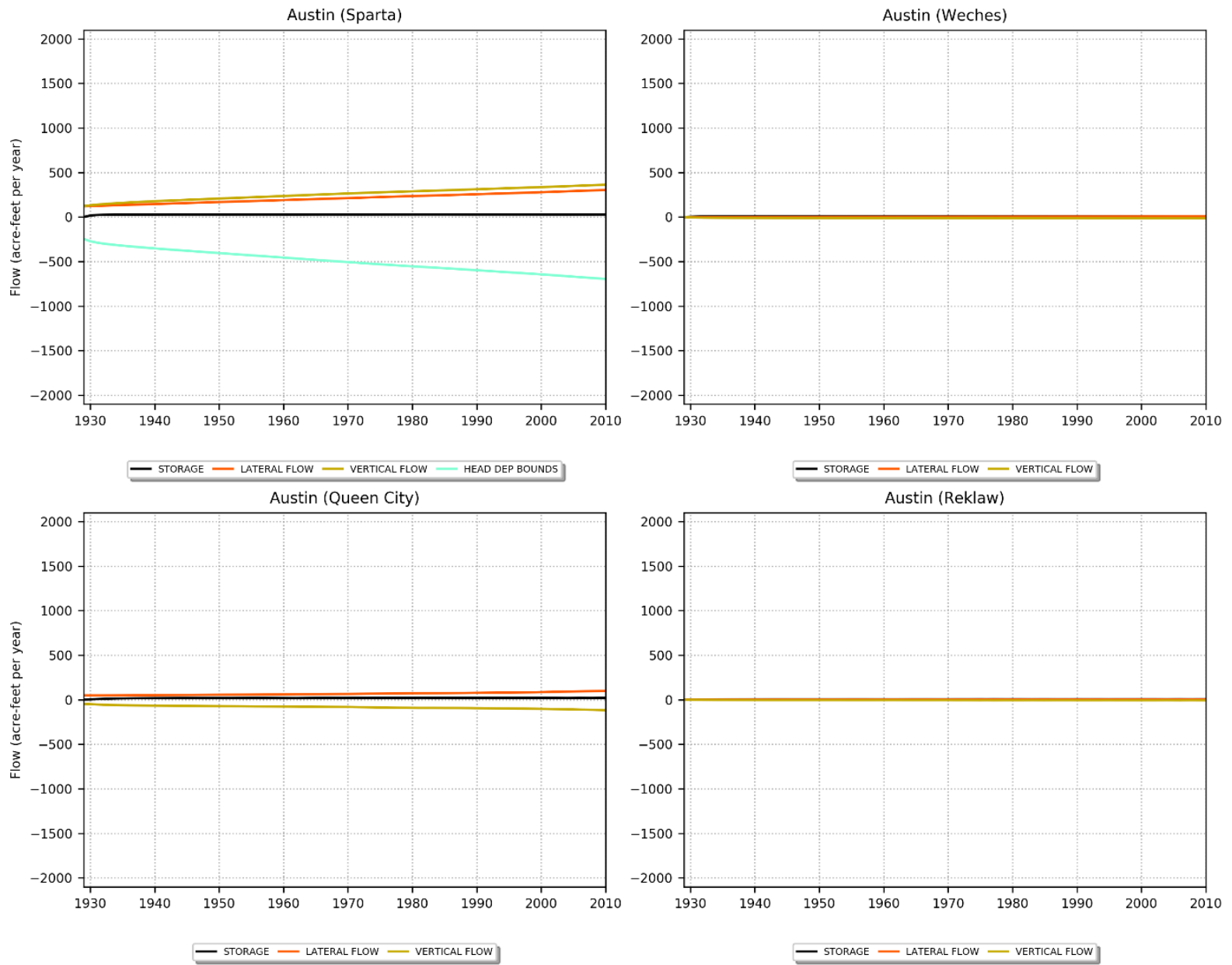


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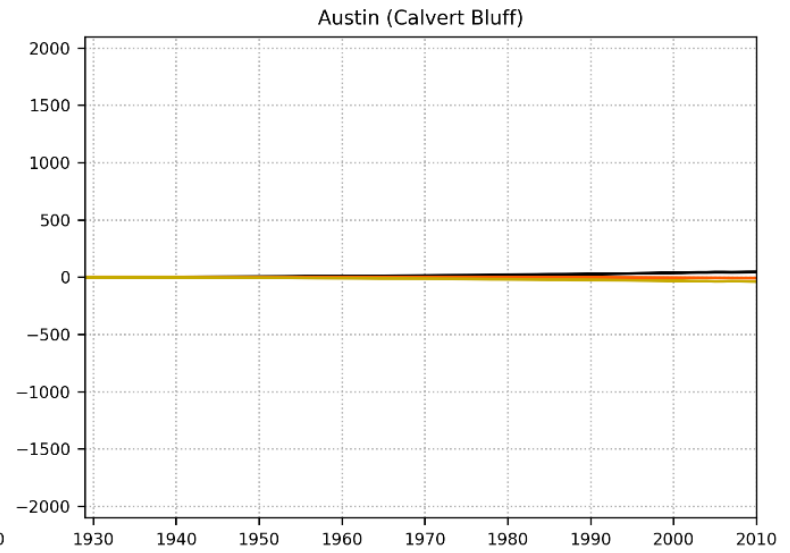
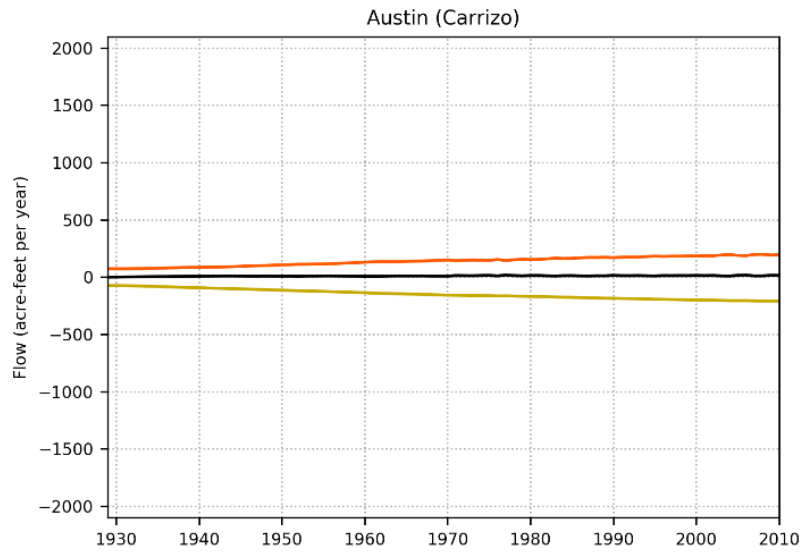


— STORAGE — LATERAL FLOW — VERTICAL FLOW

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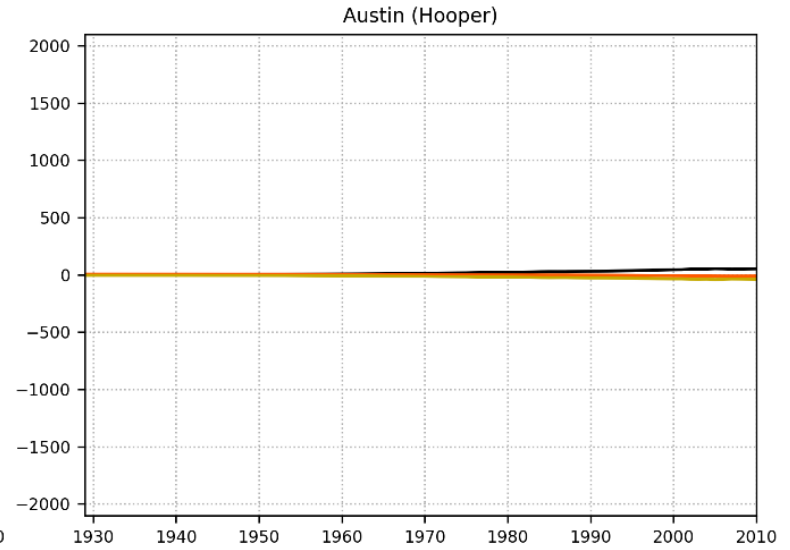
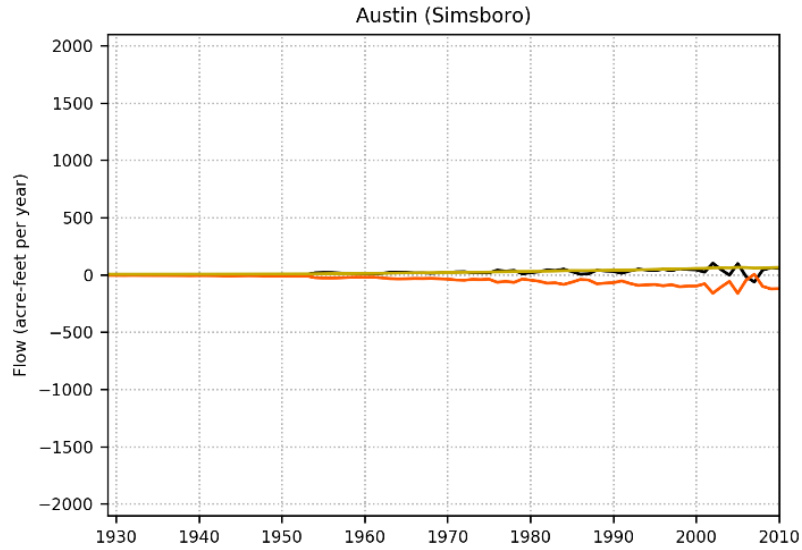


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— STORAGE — LATERAL FLOW — VERTICAL FLOW

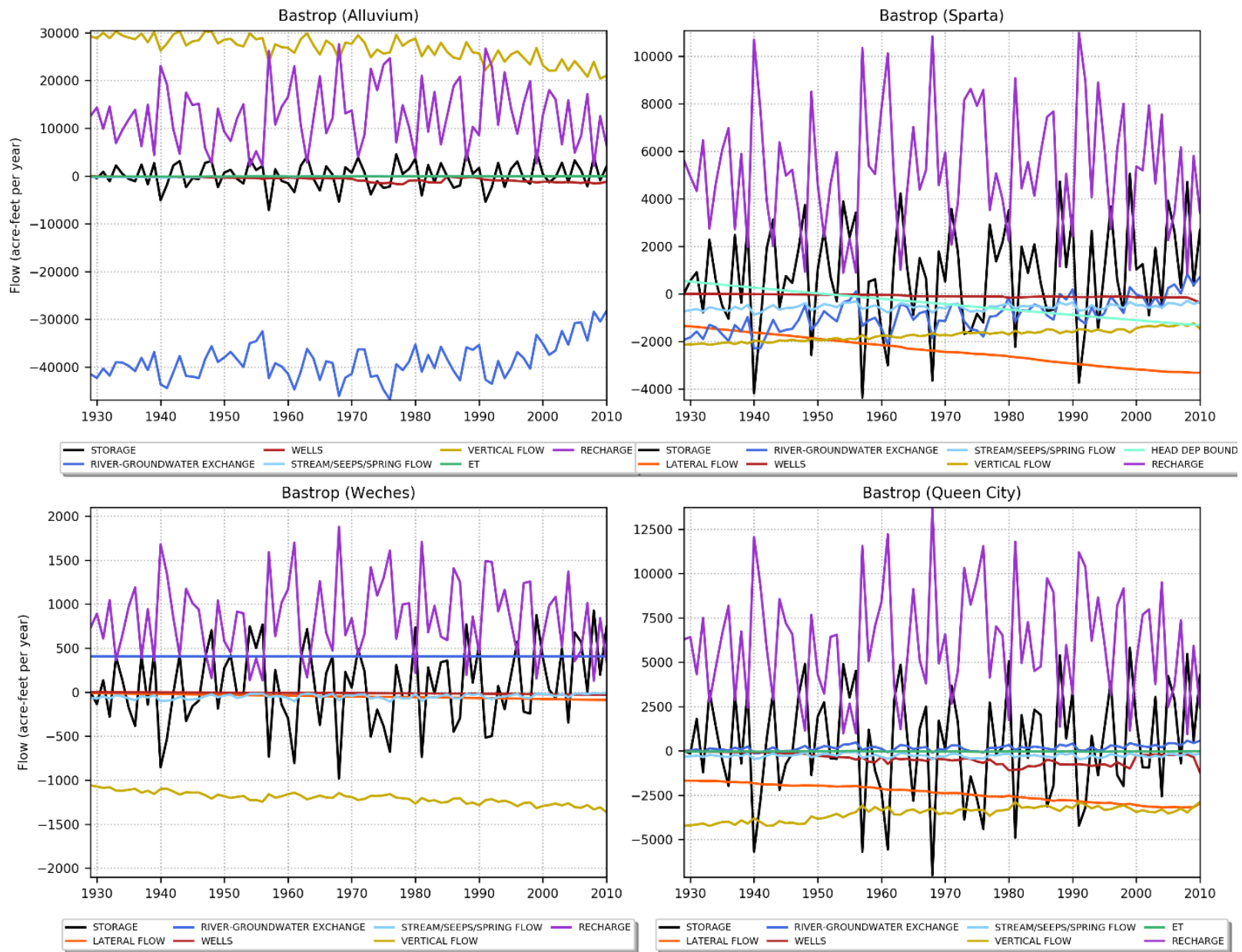
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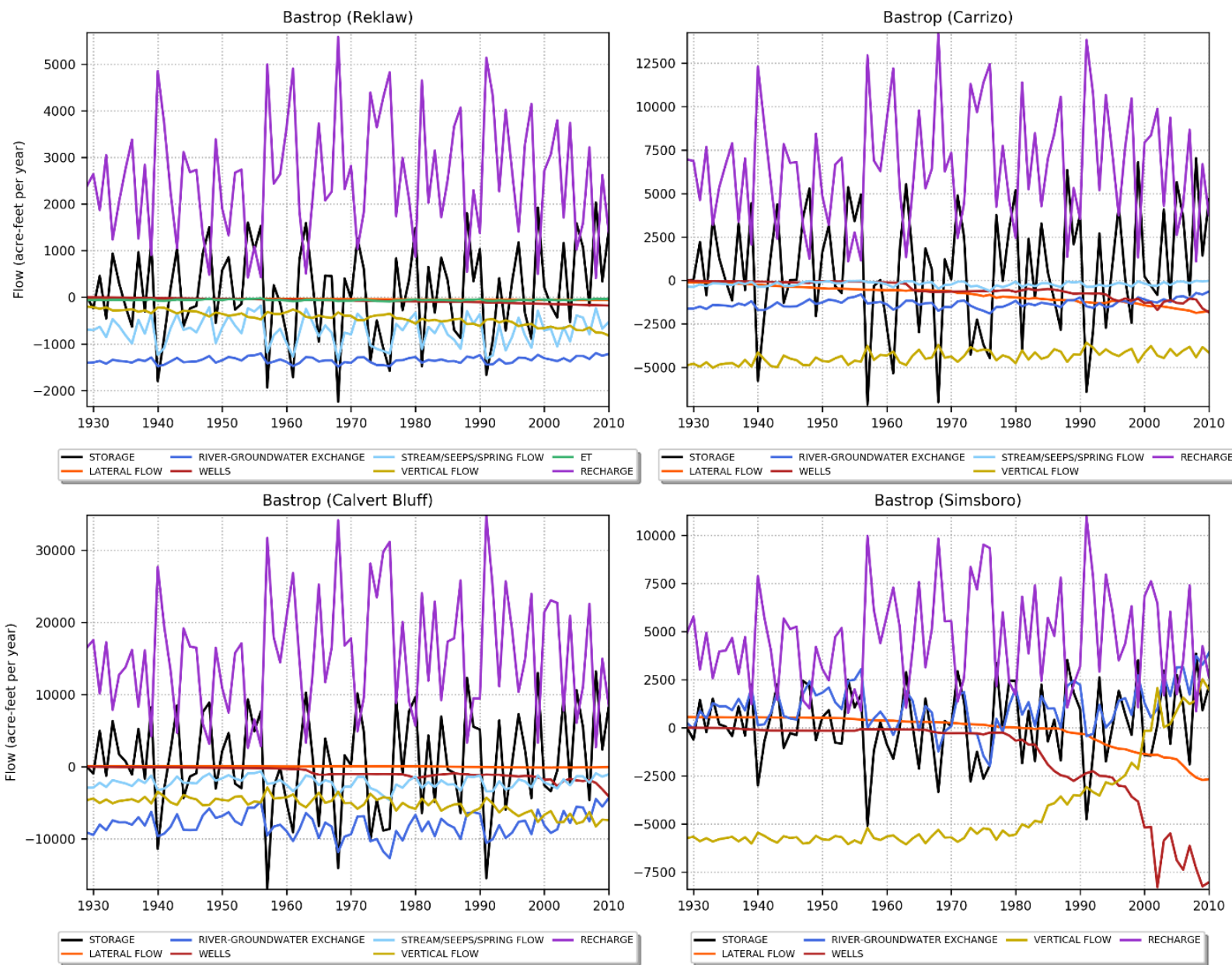
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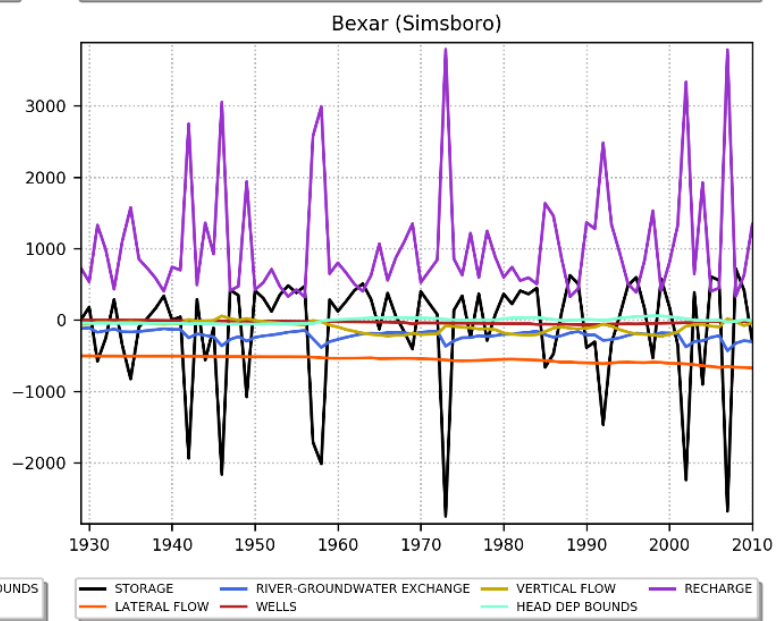
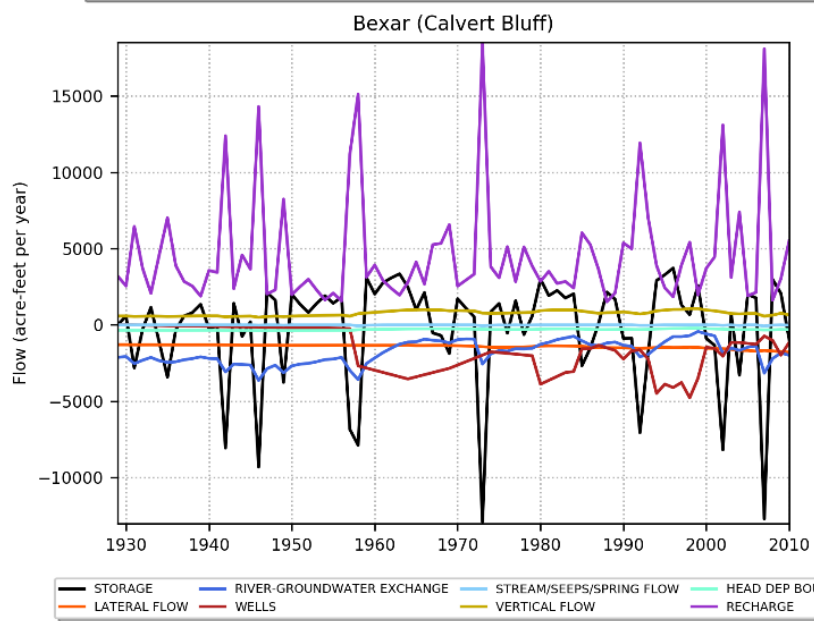
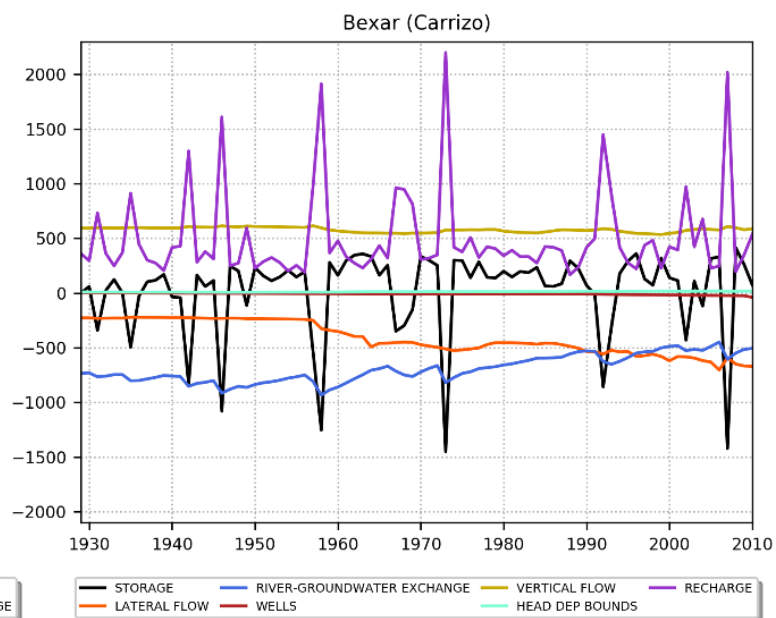
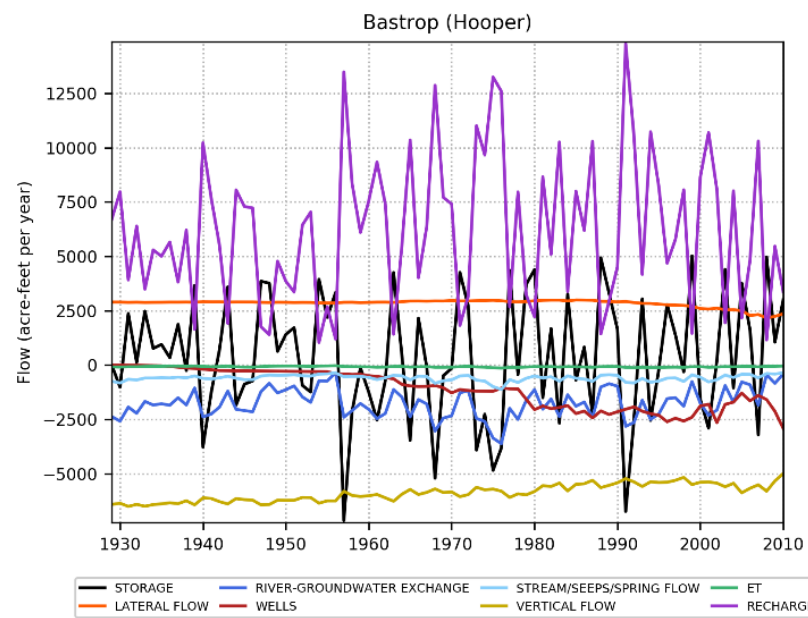
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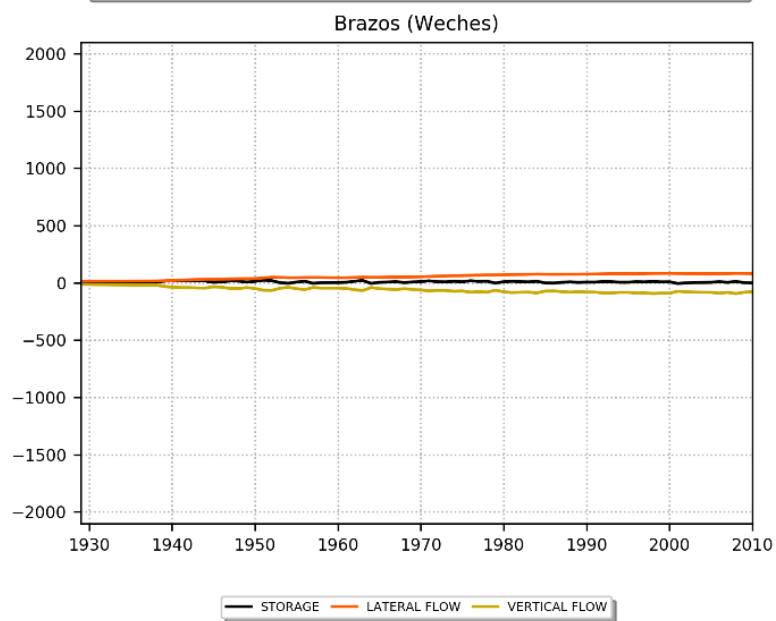
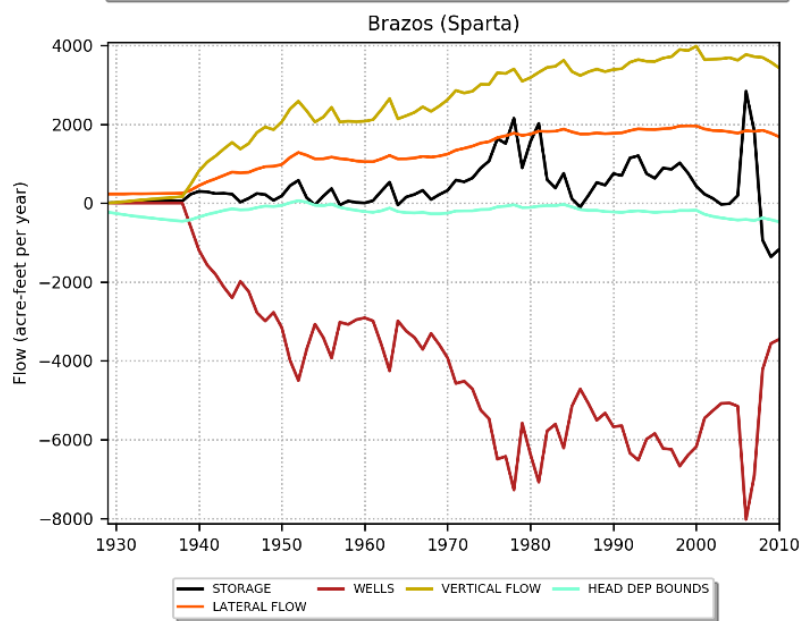
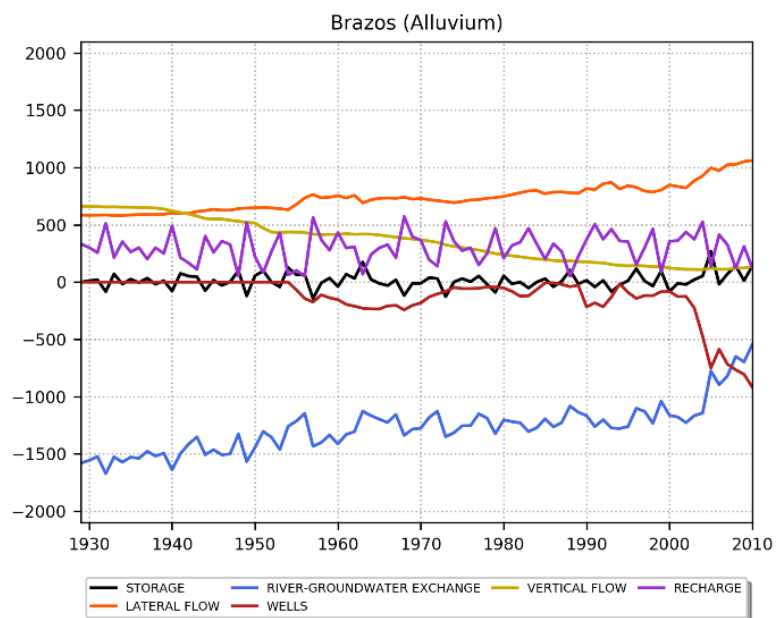
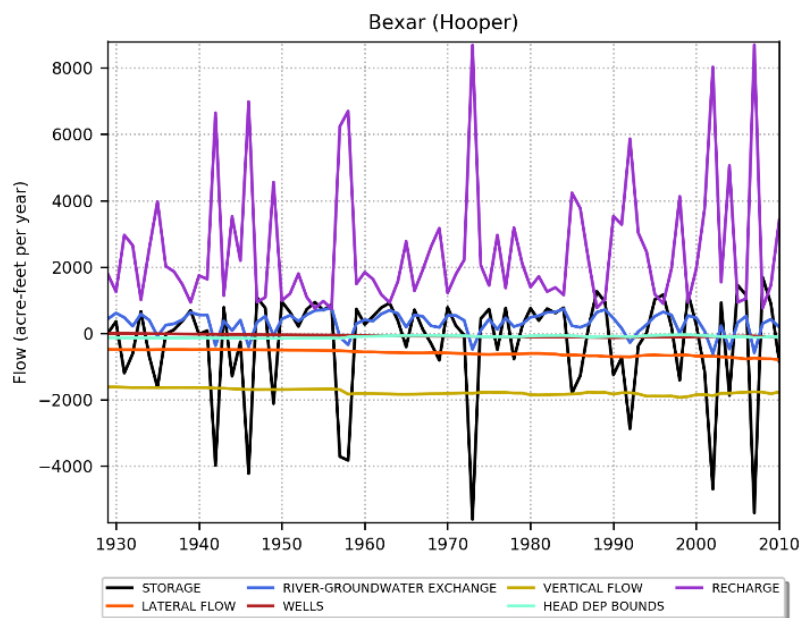
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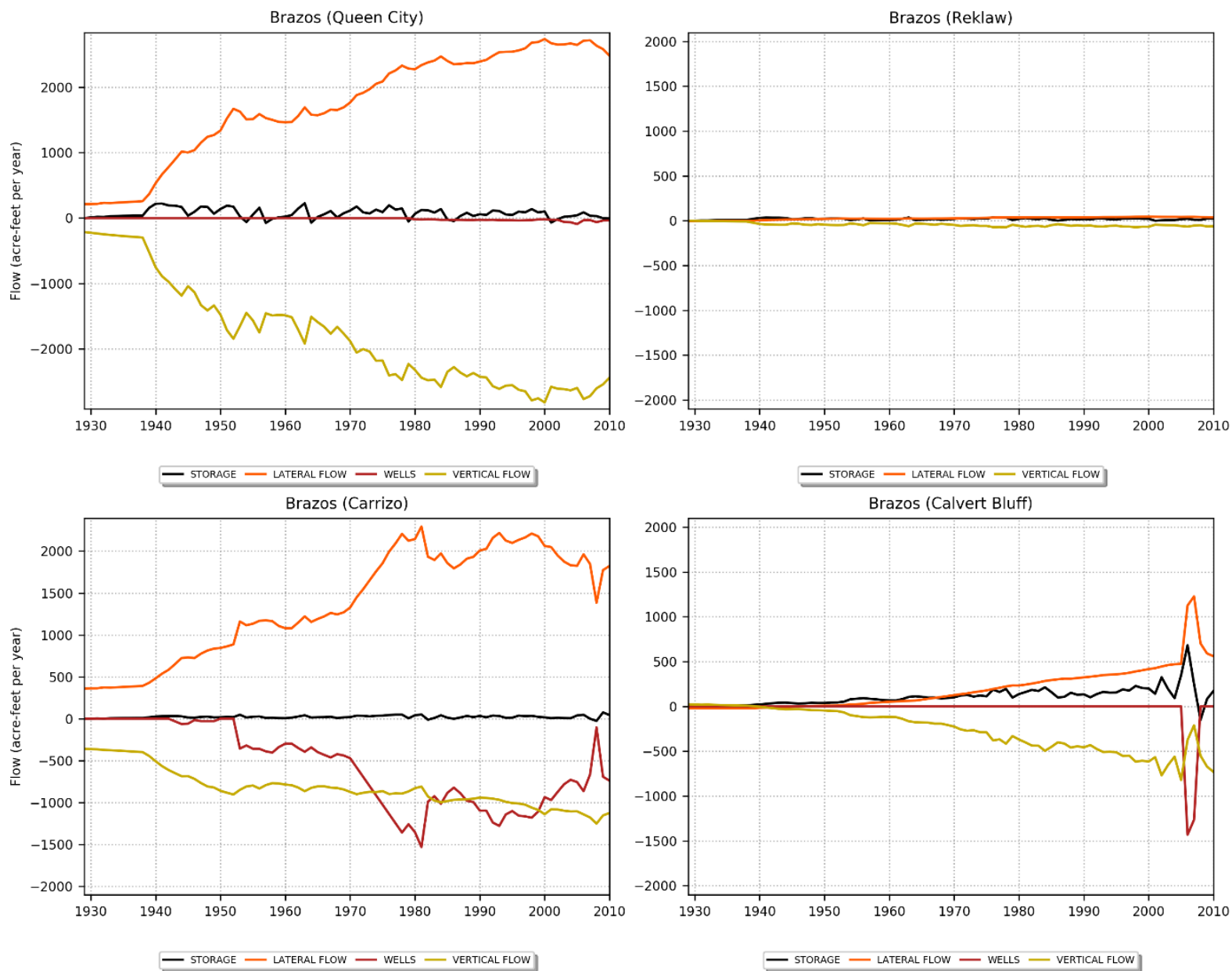
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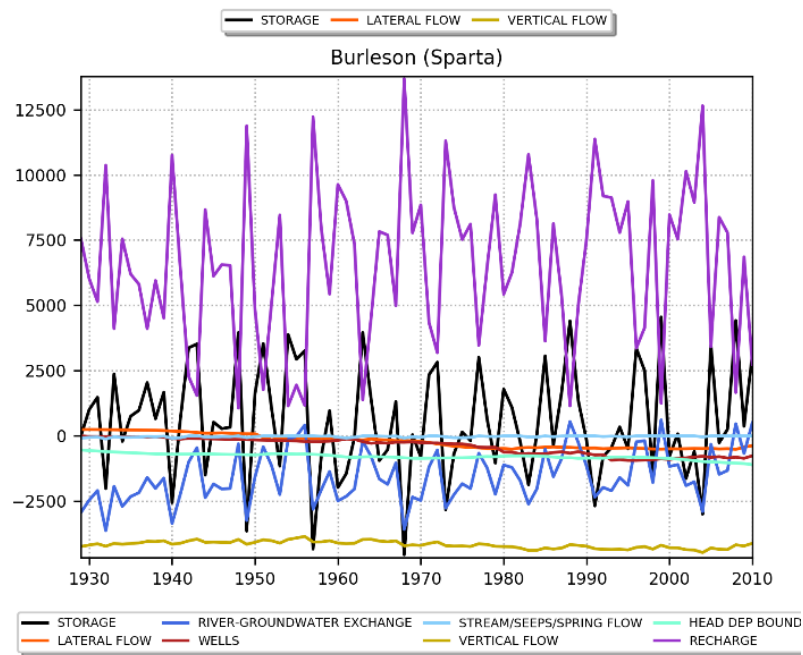
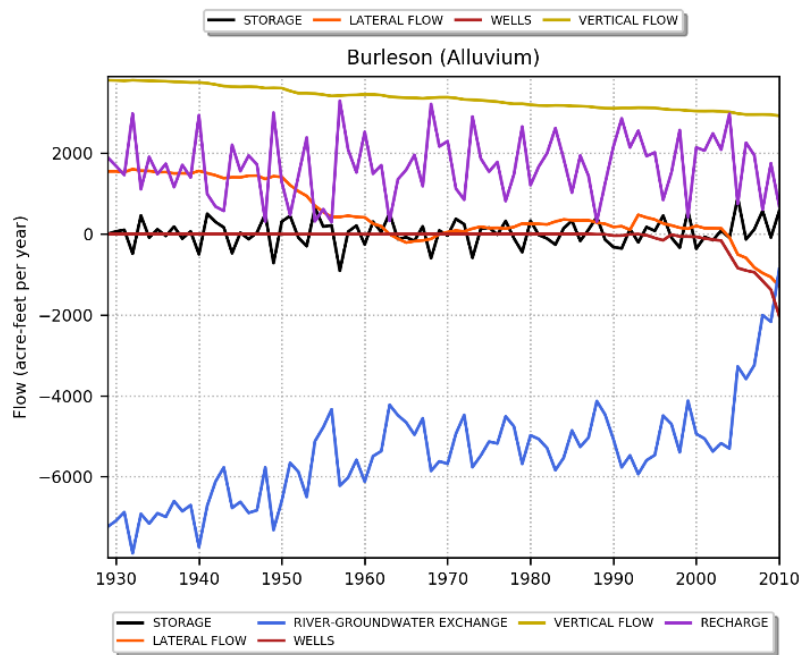
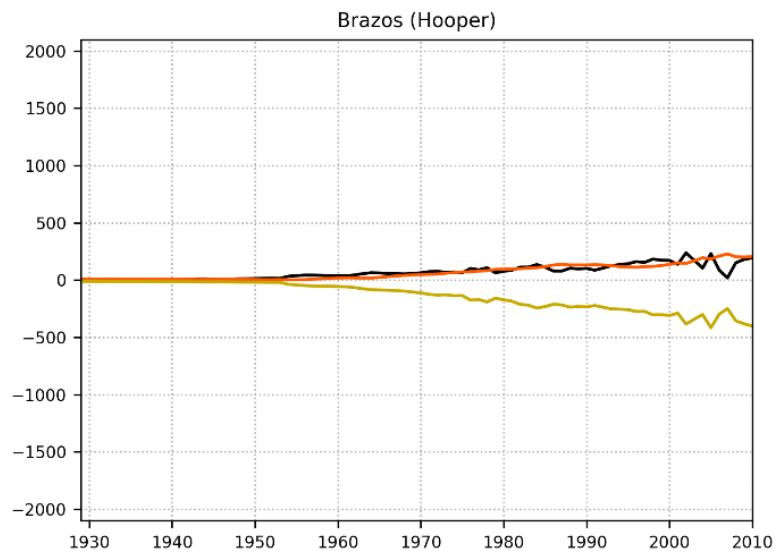
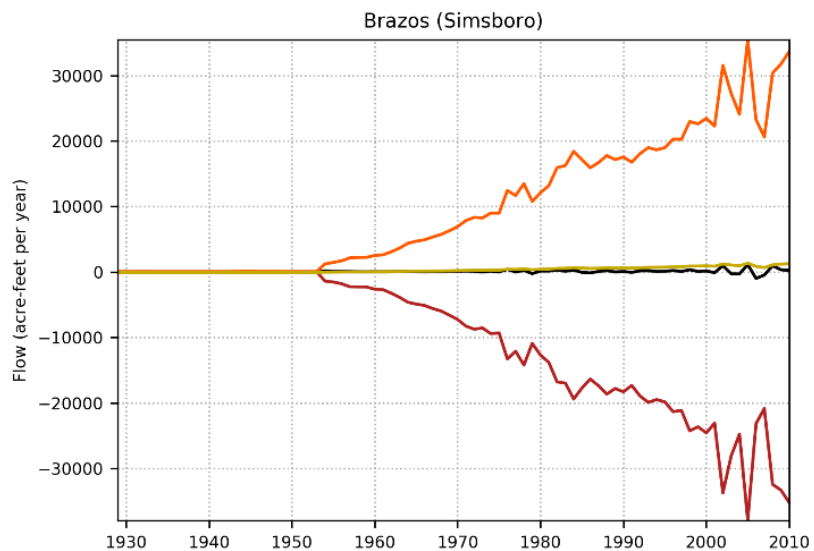
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



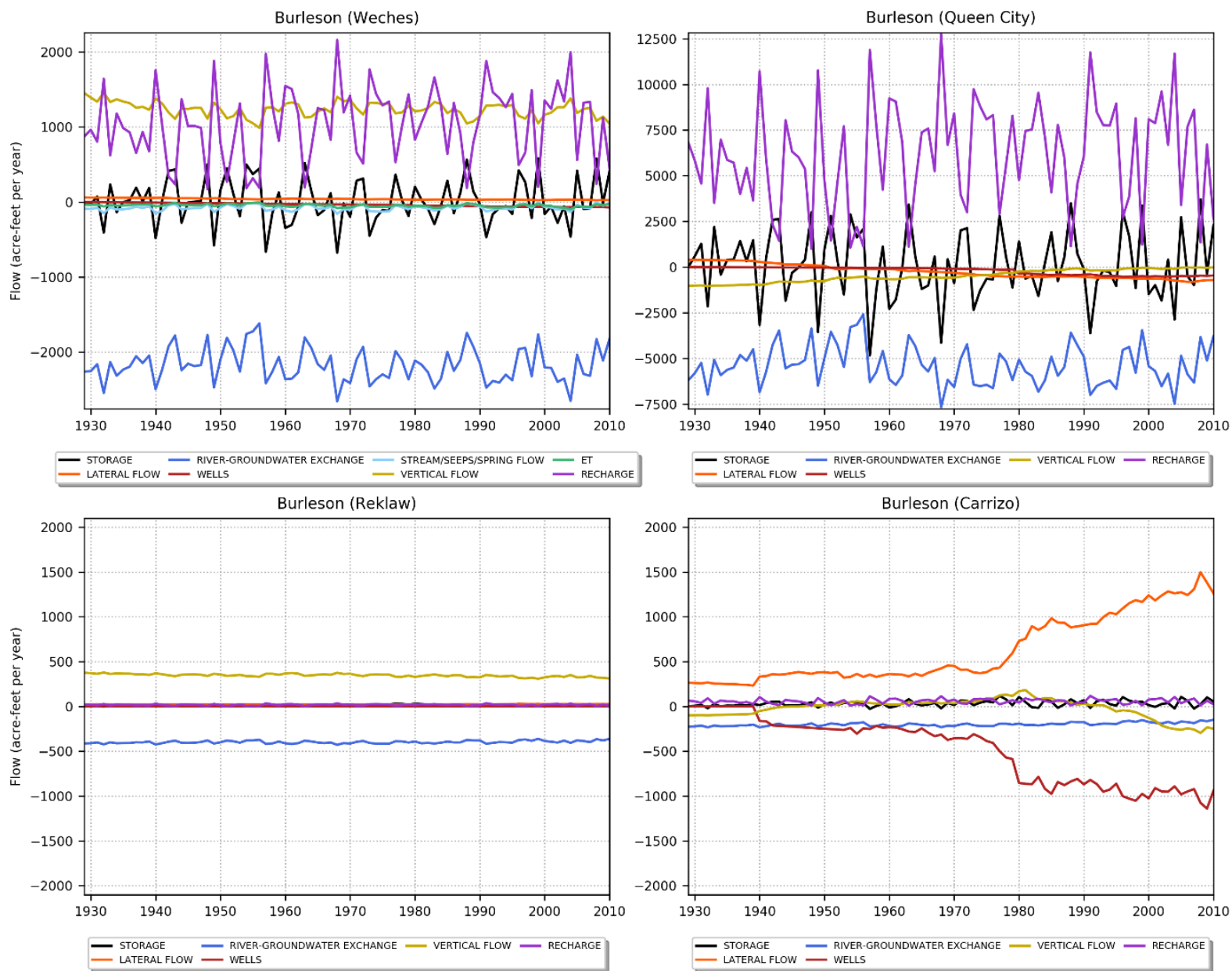
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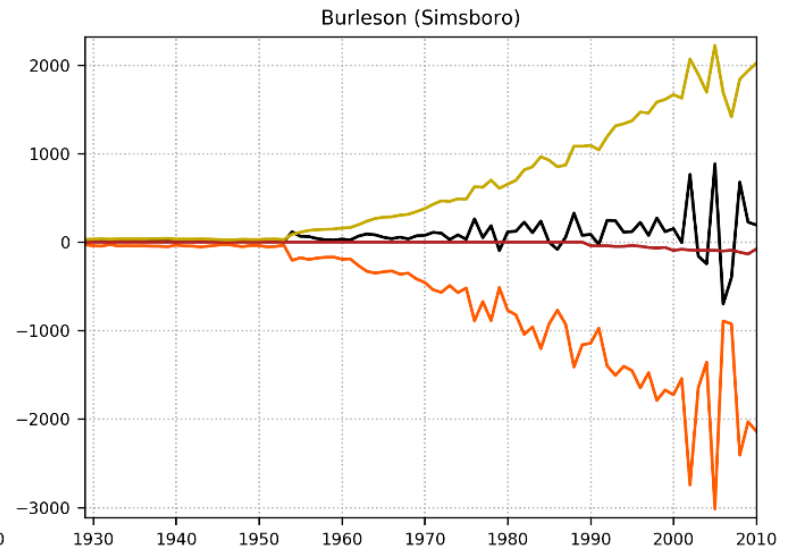
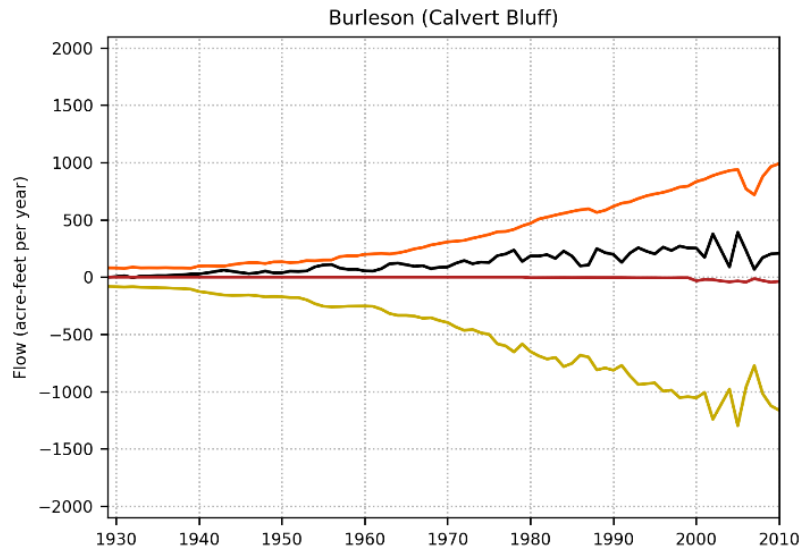
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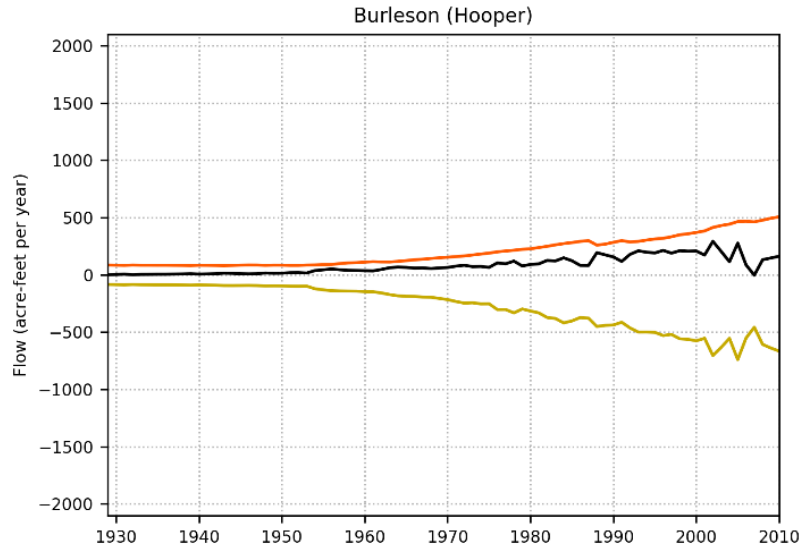


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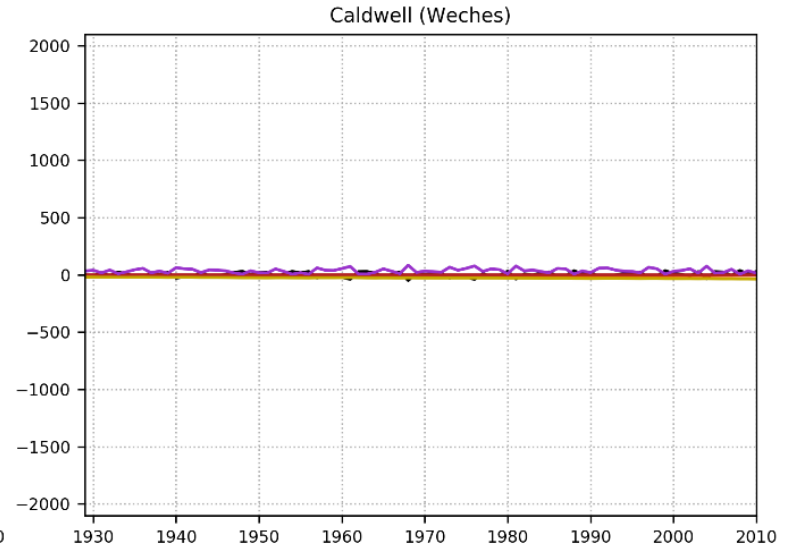


— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

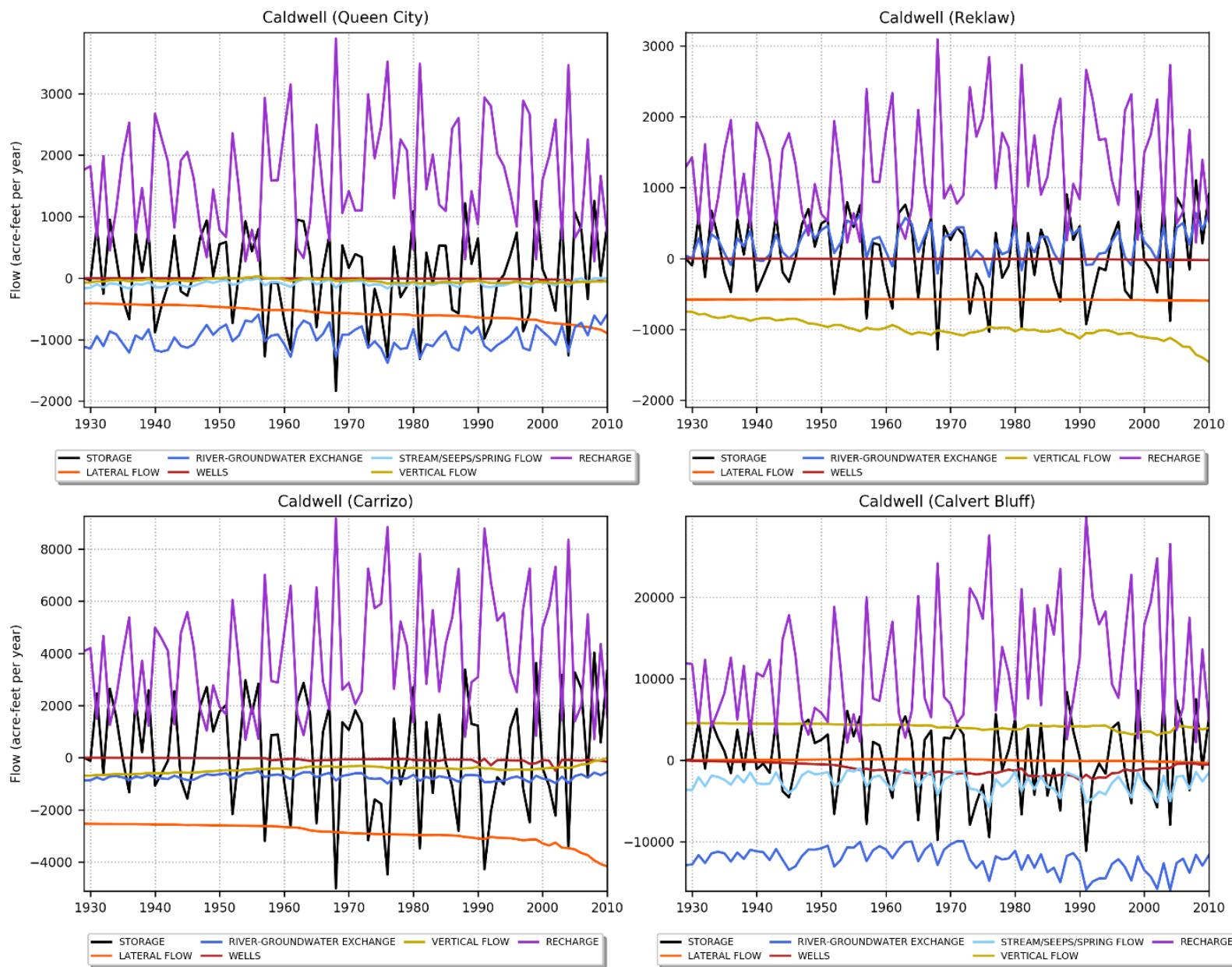


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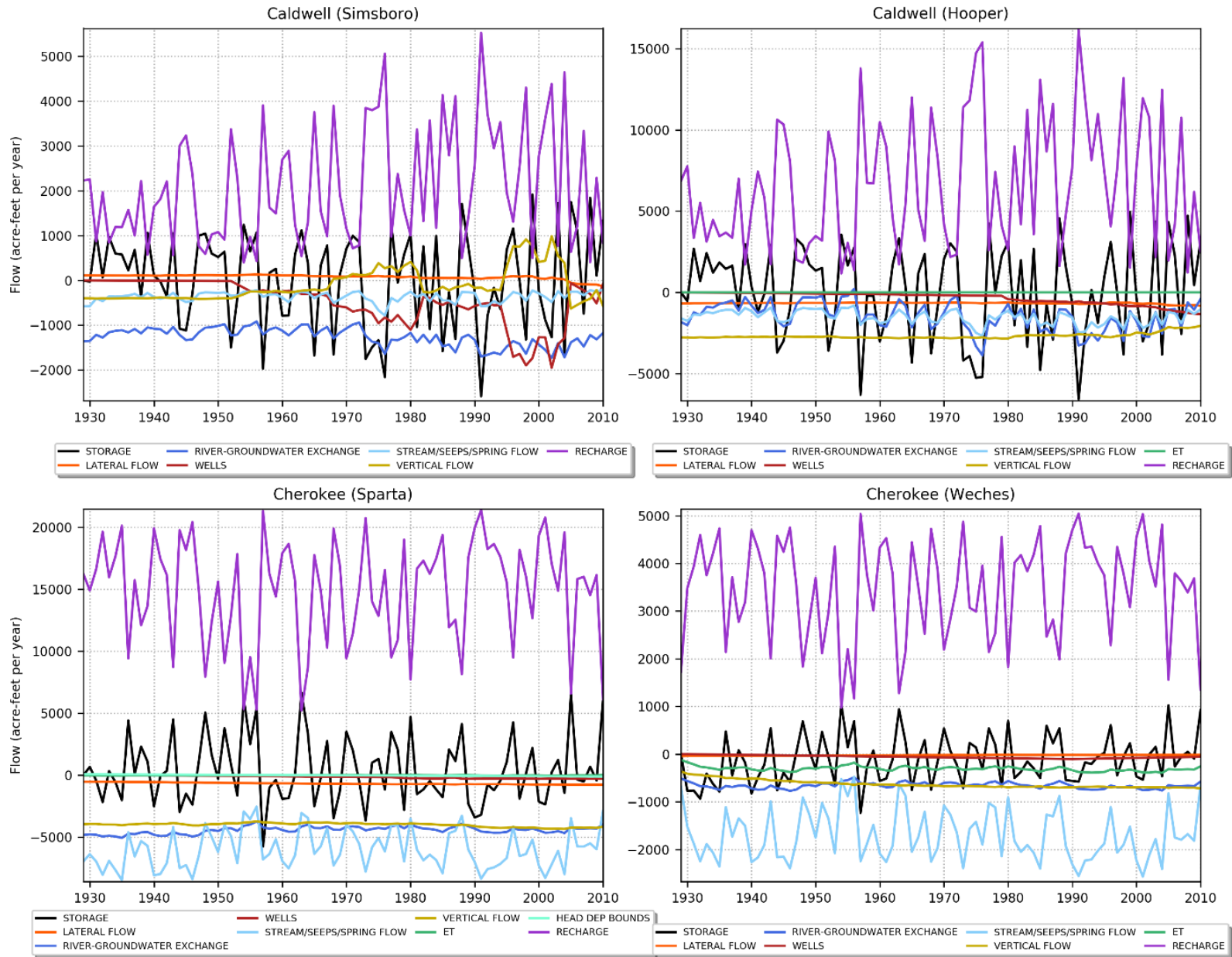


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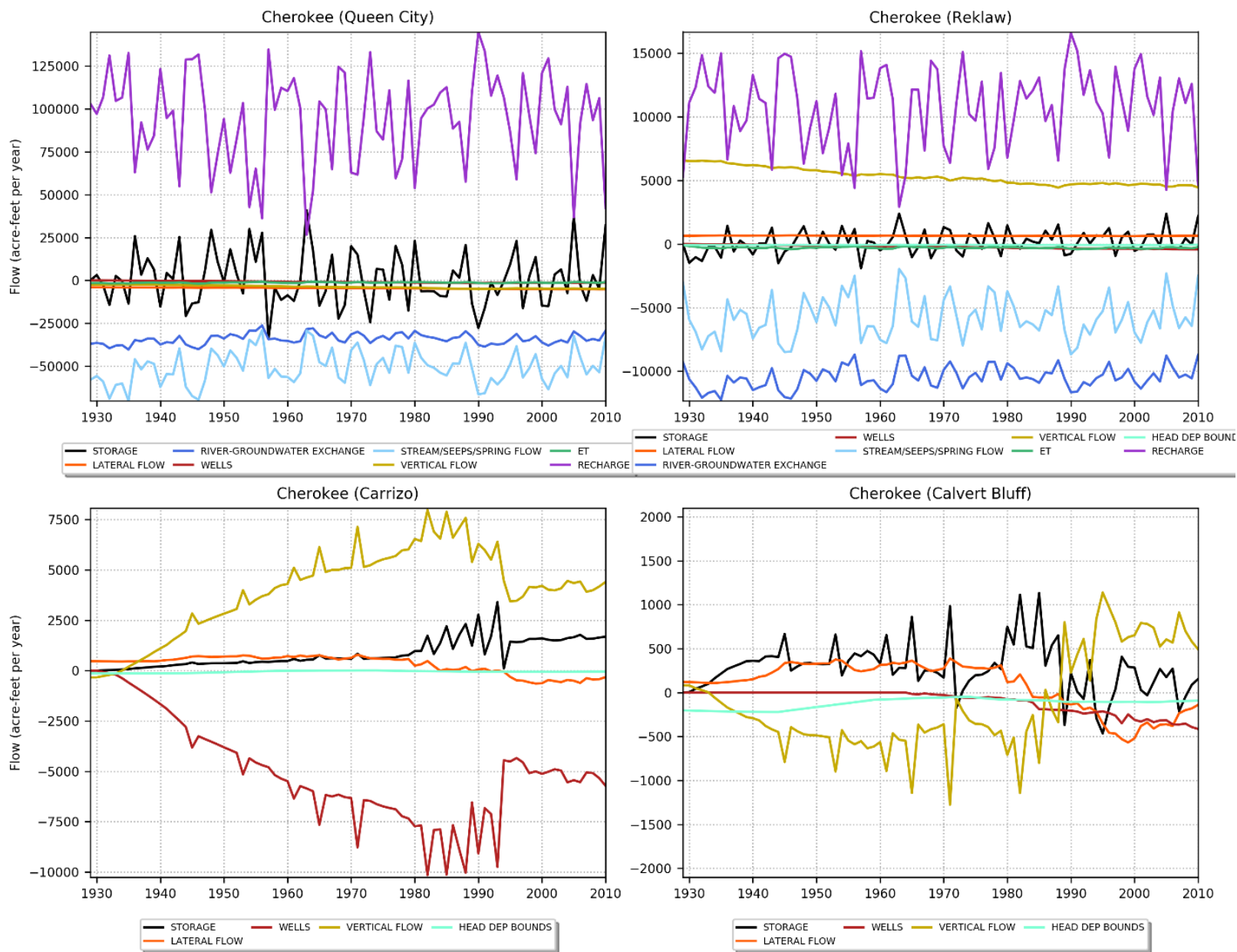
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



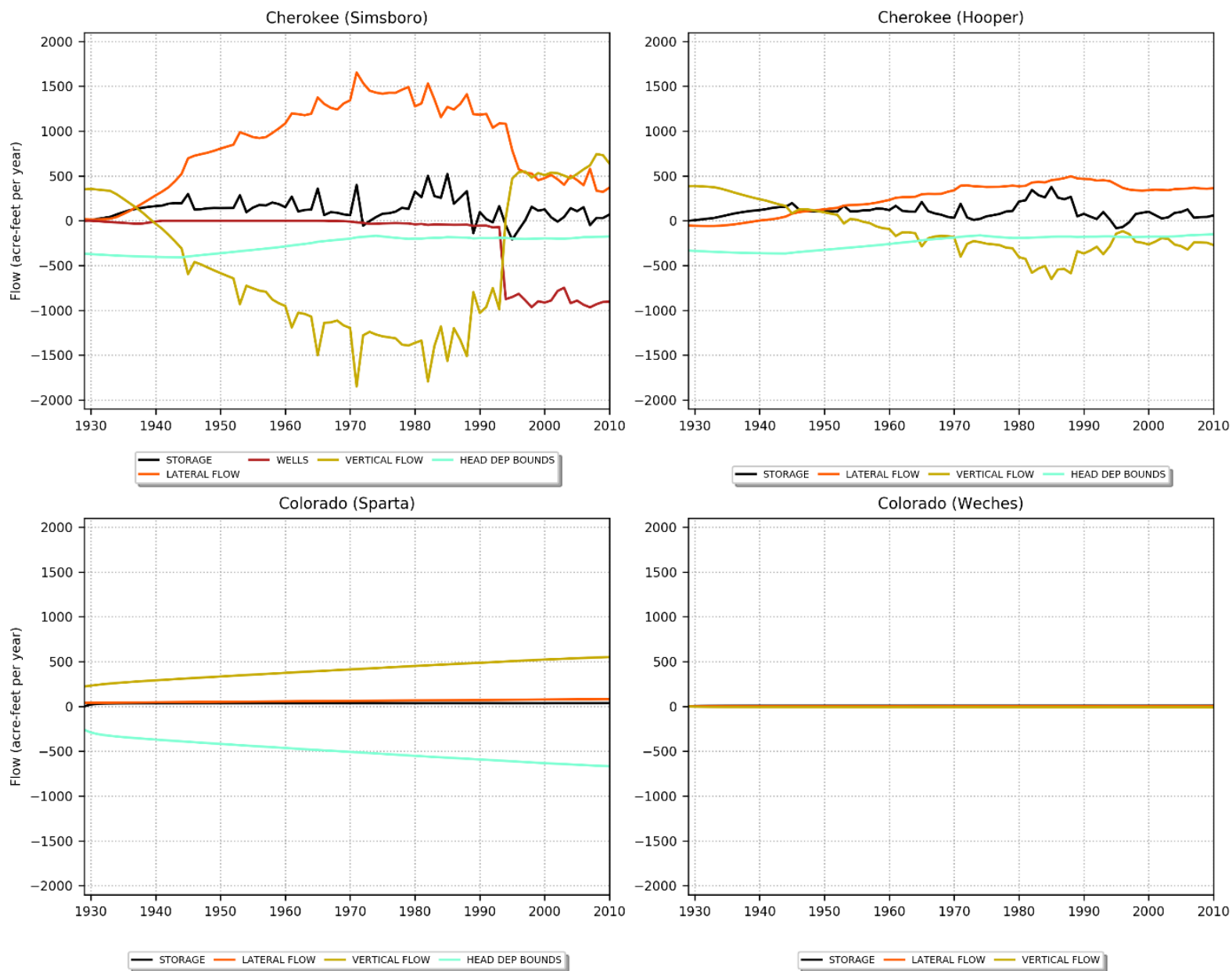
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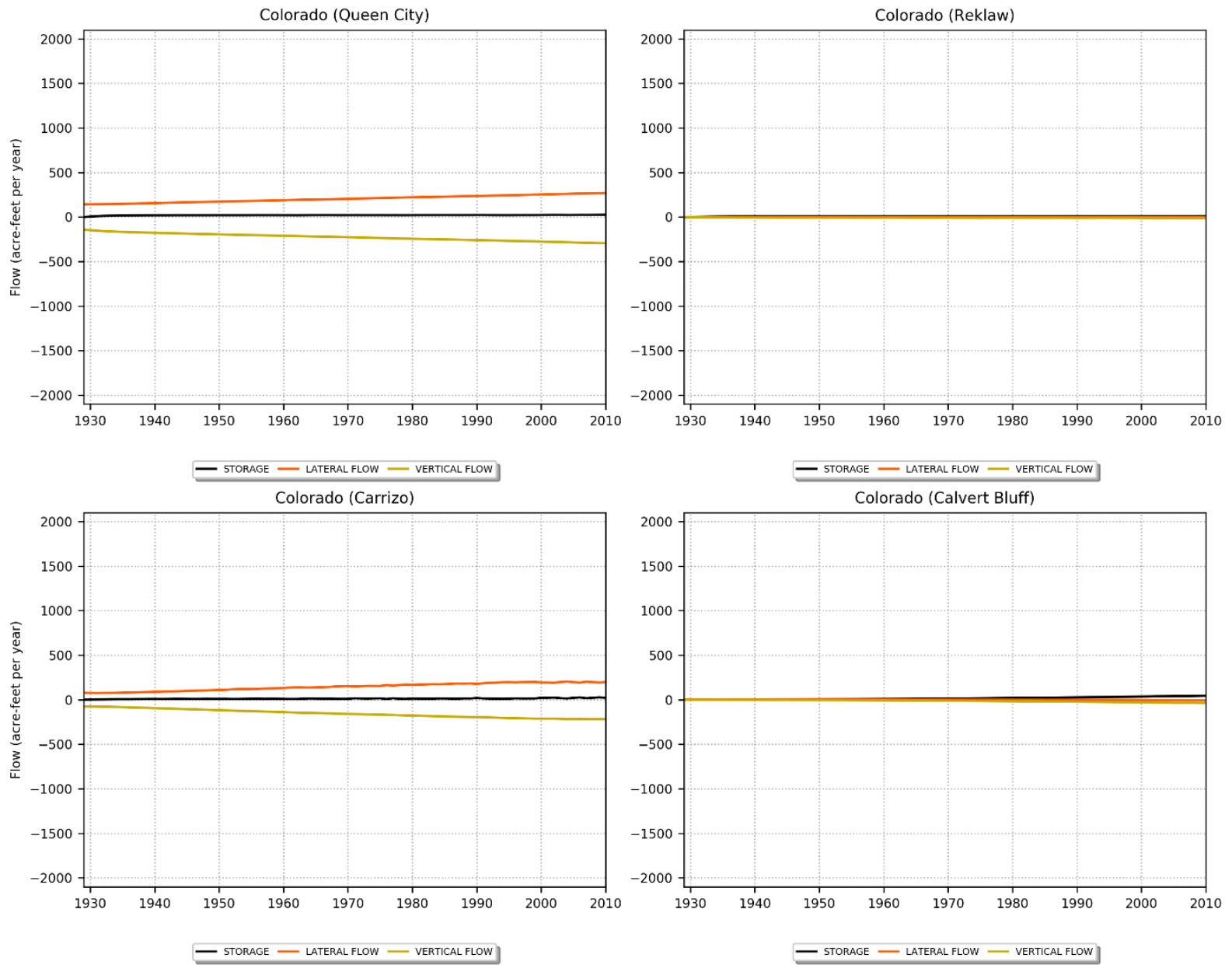
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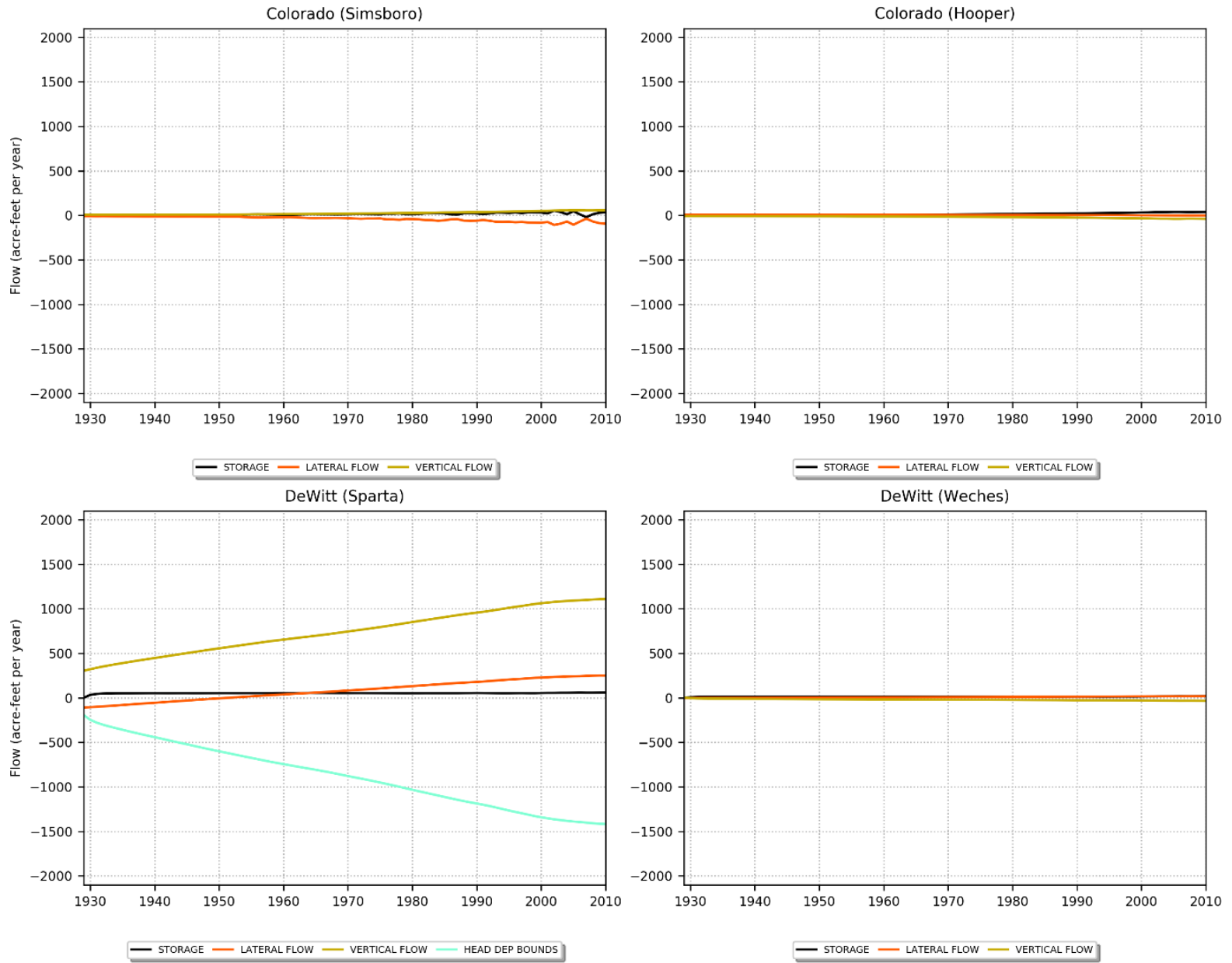
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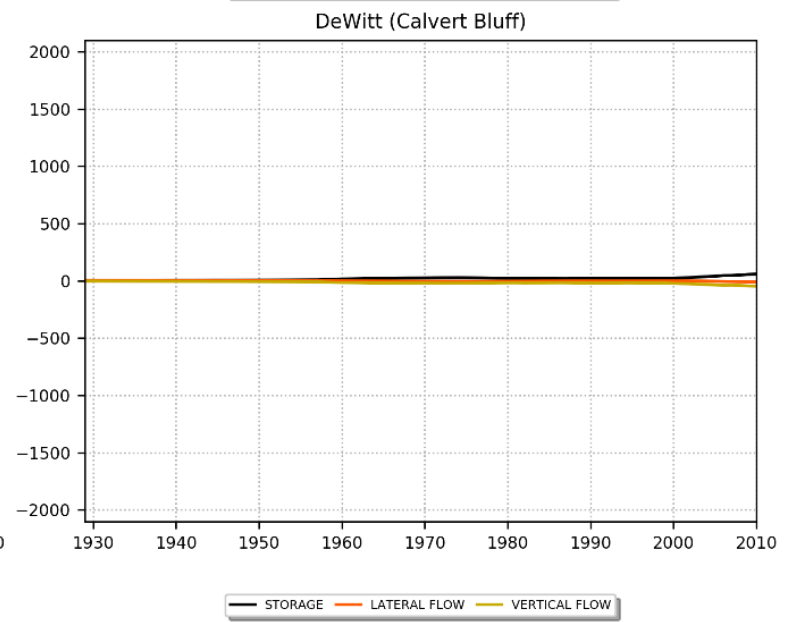
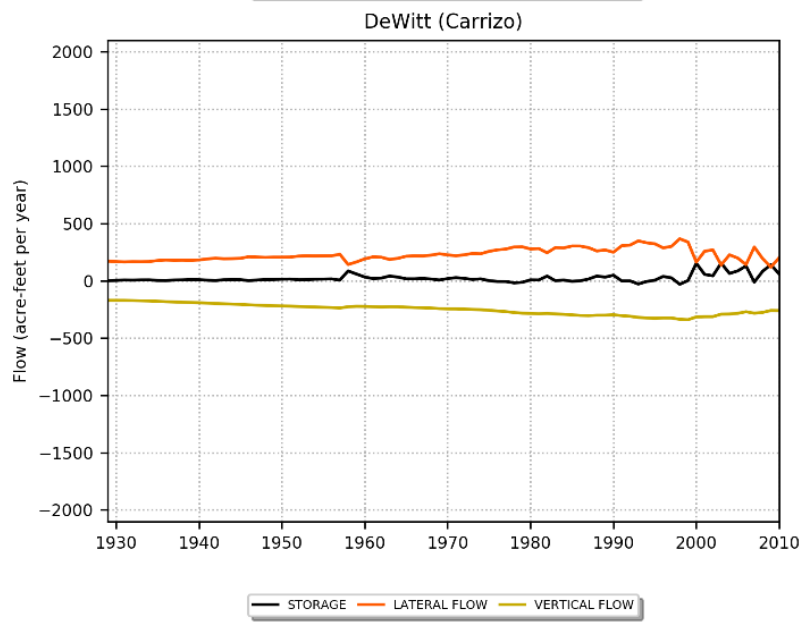
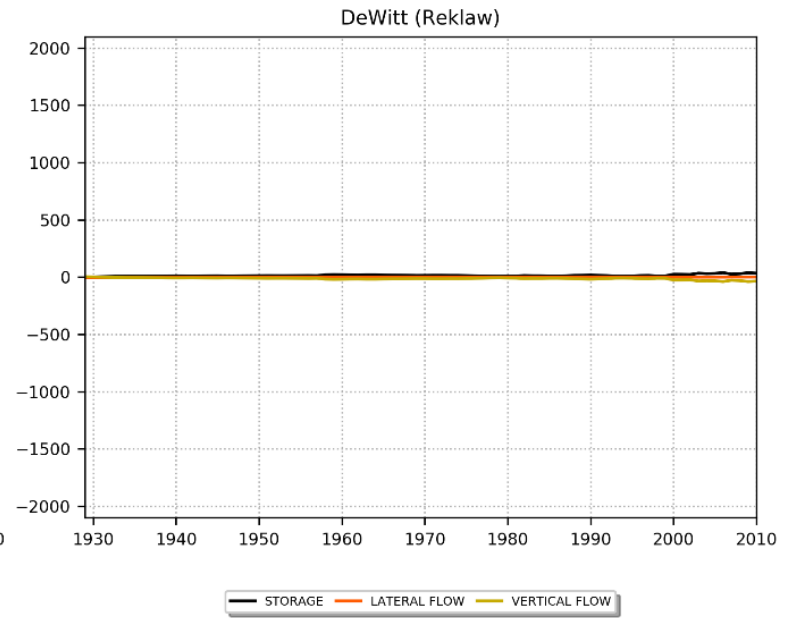
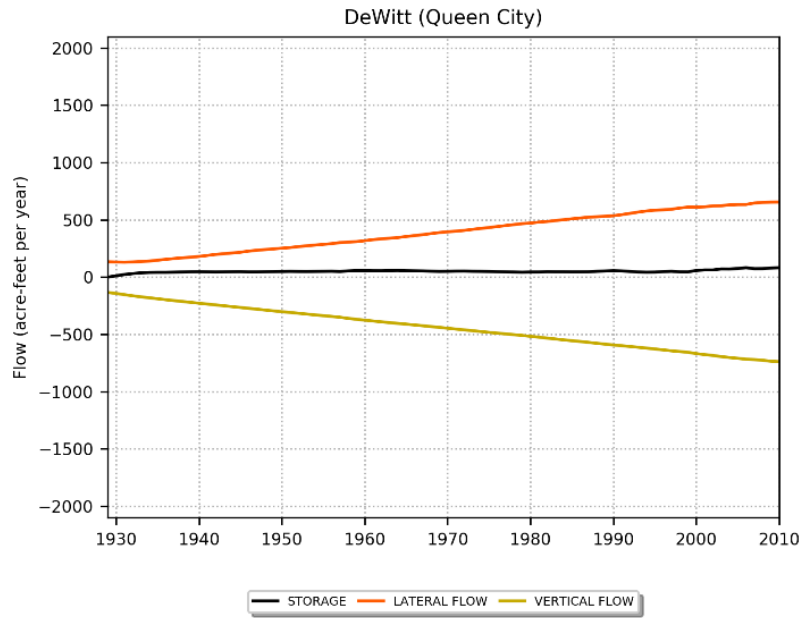
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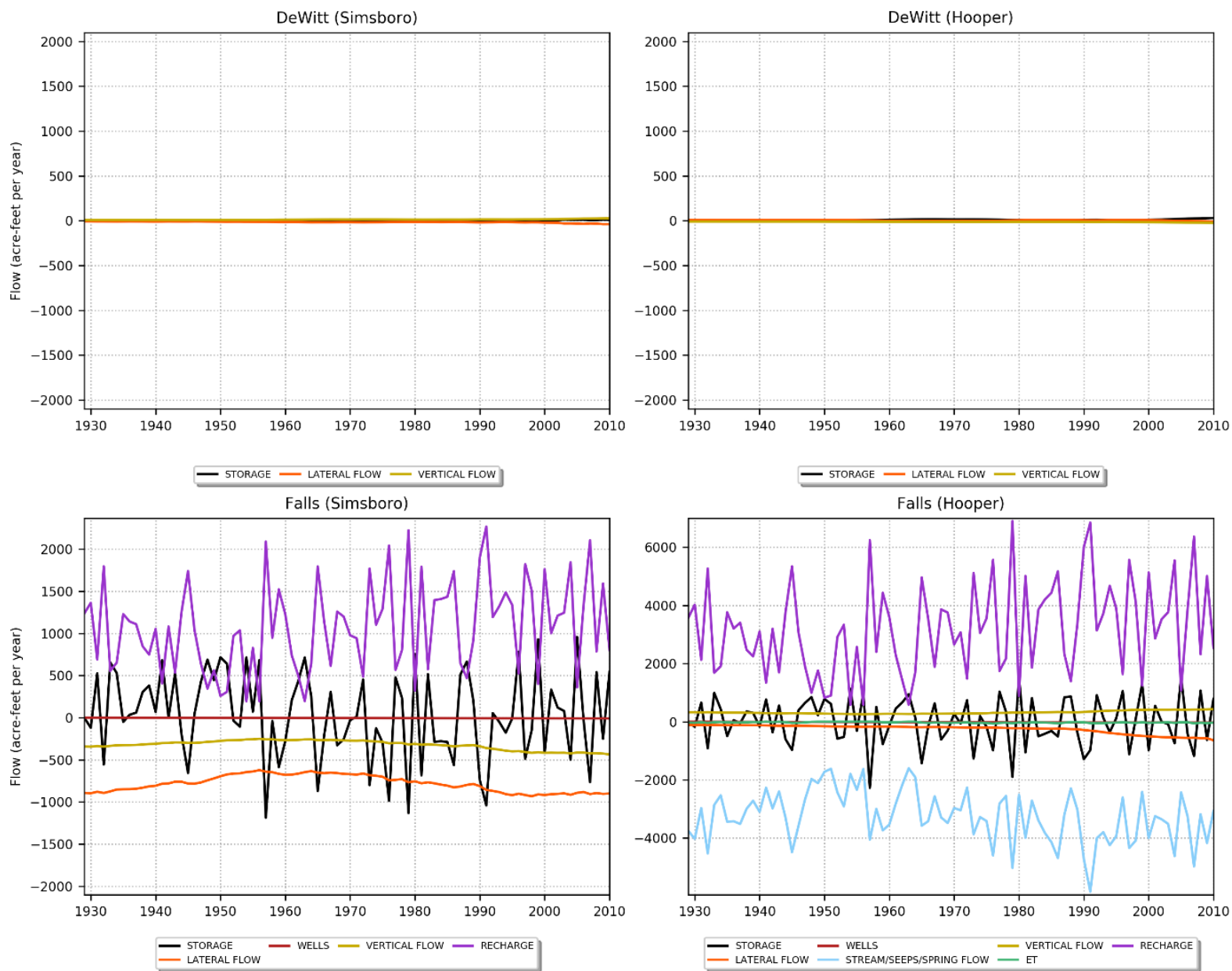
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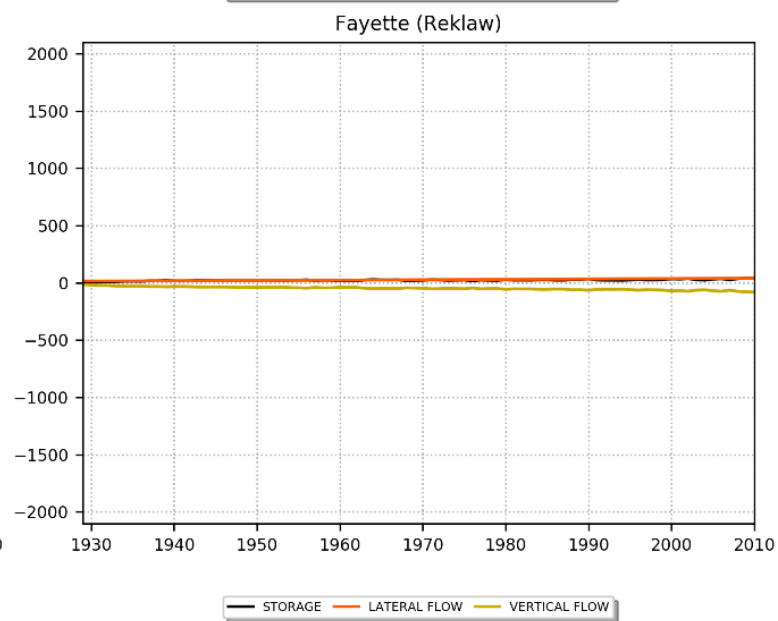
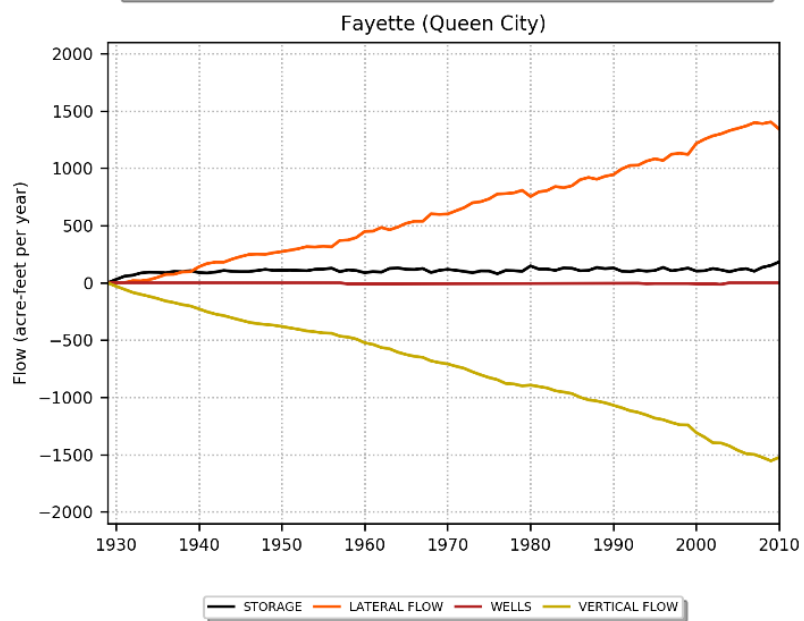
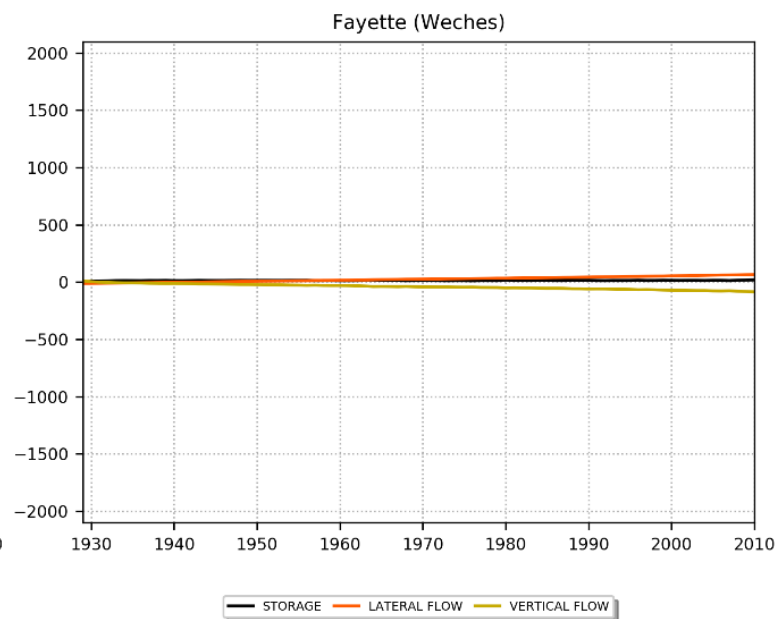
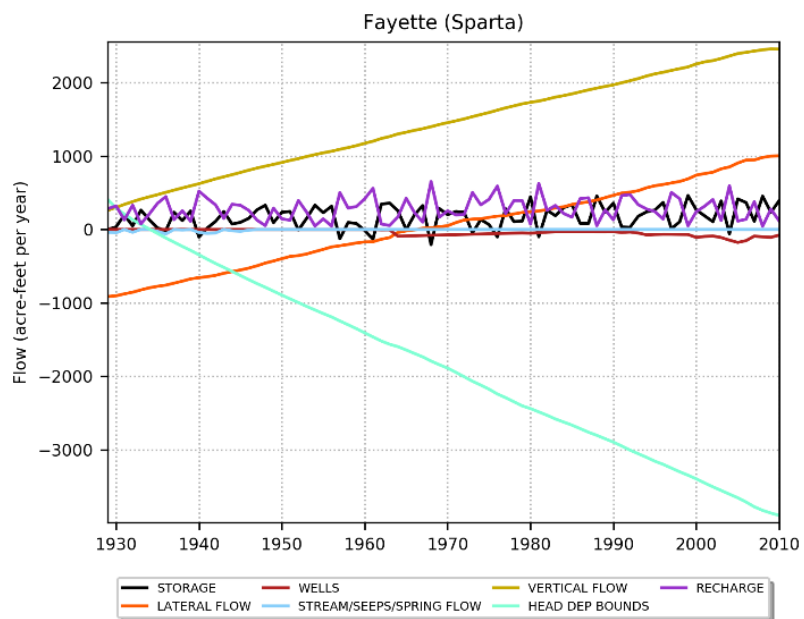
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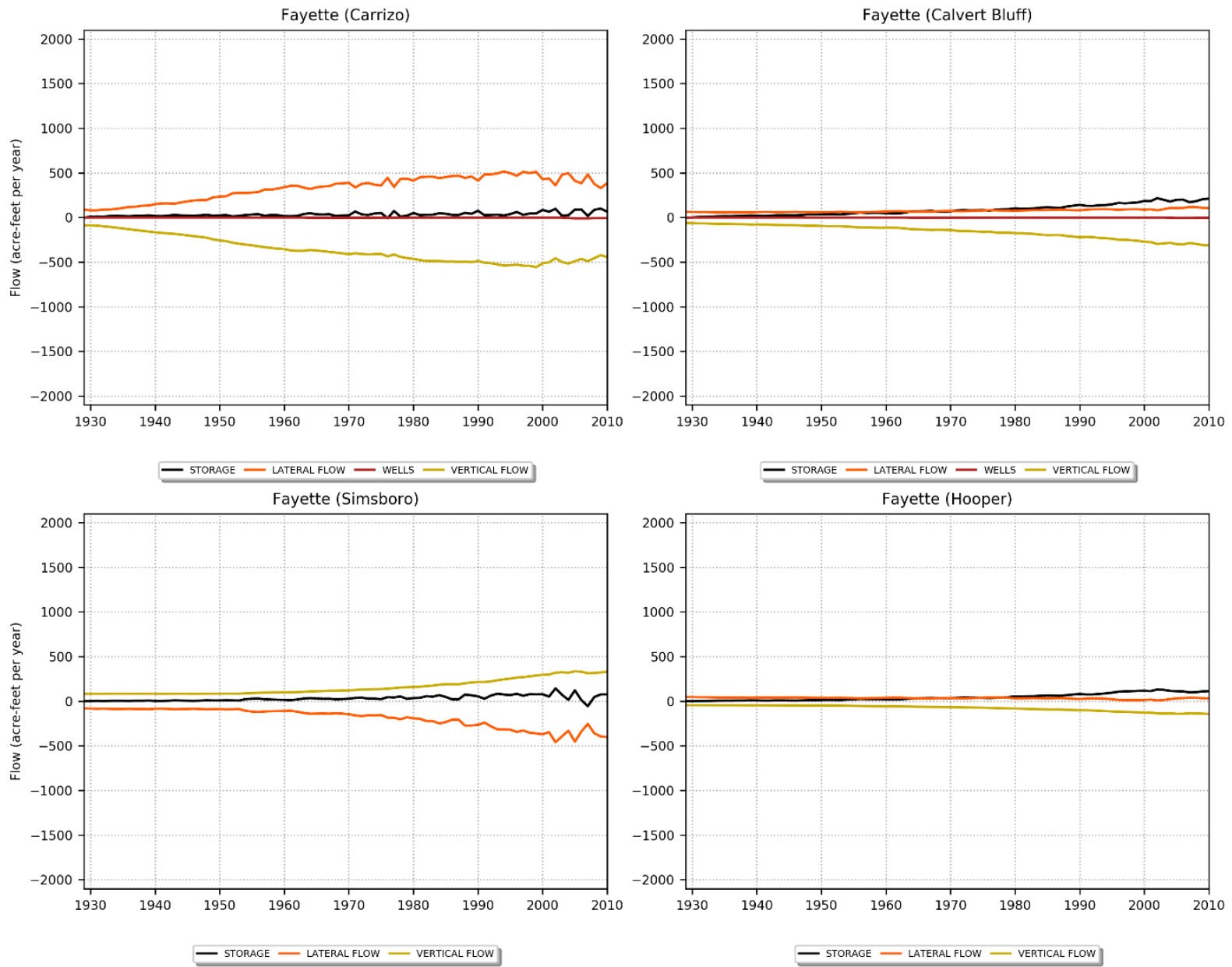
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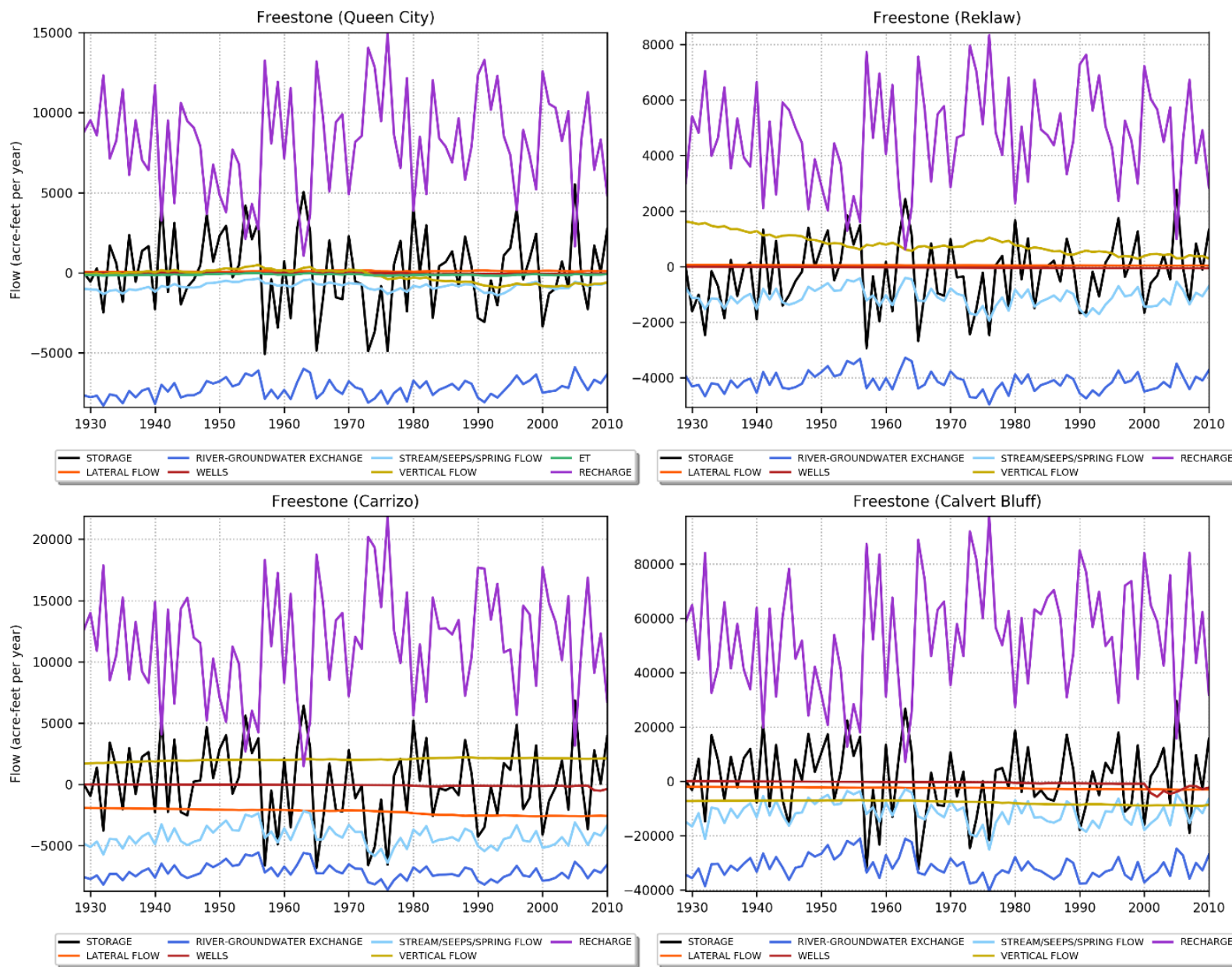
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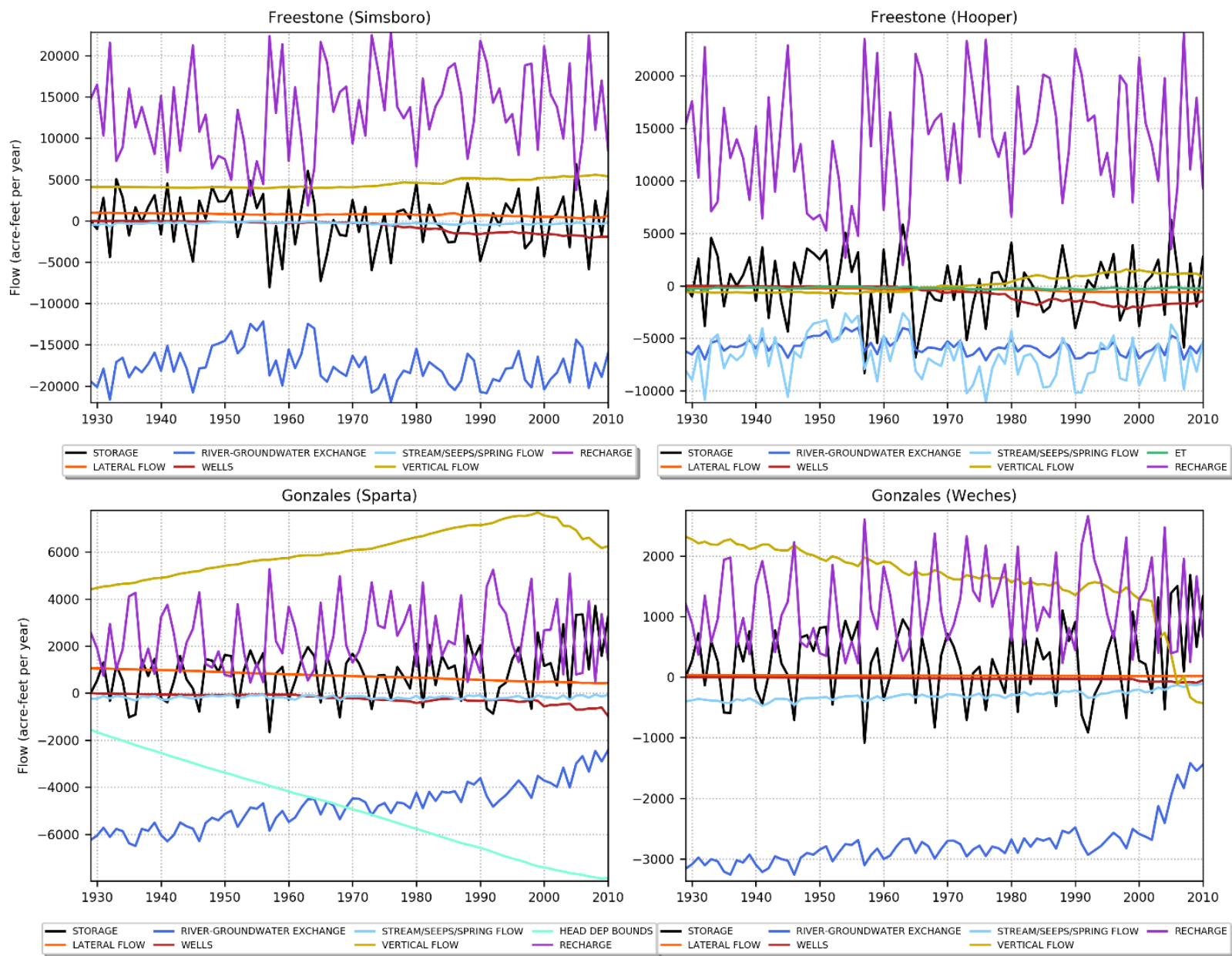
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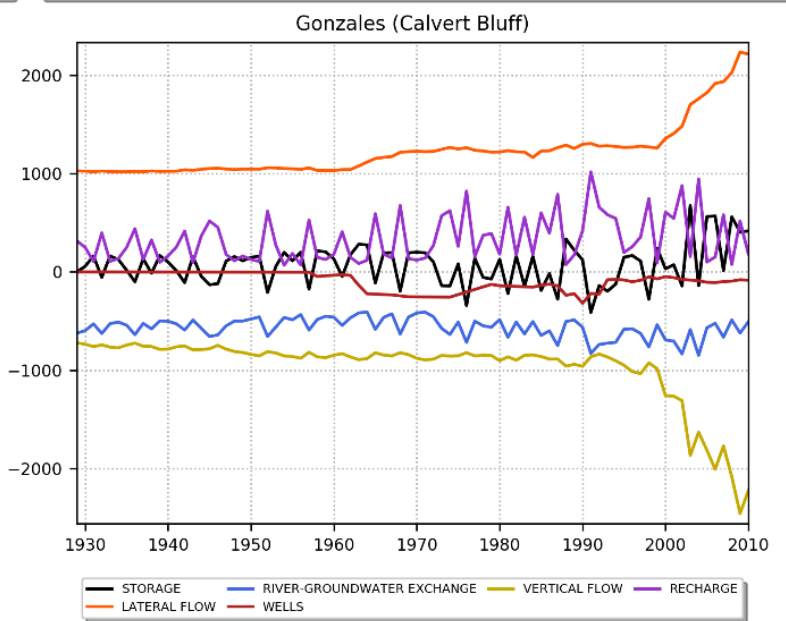
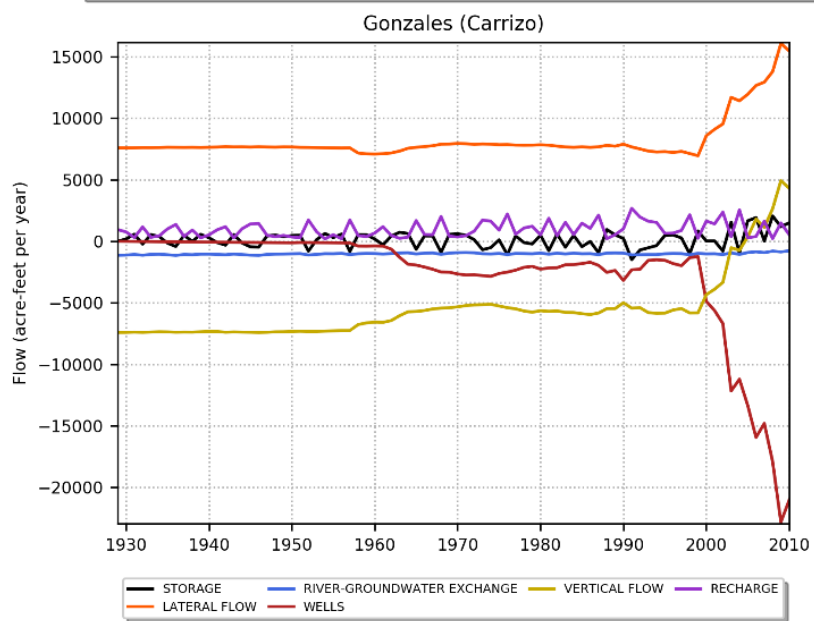
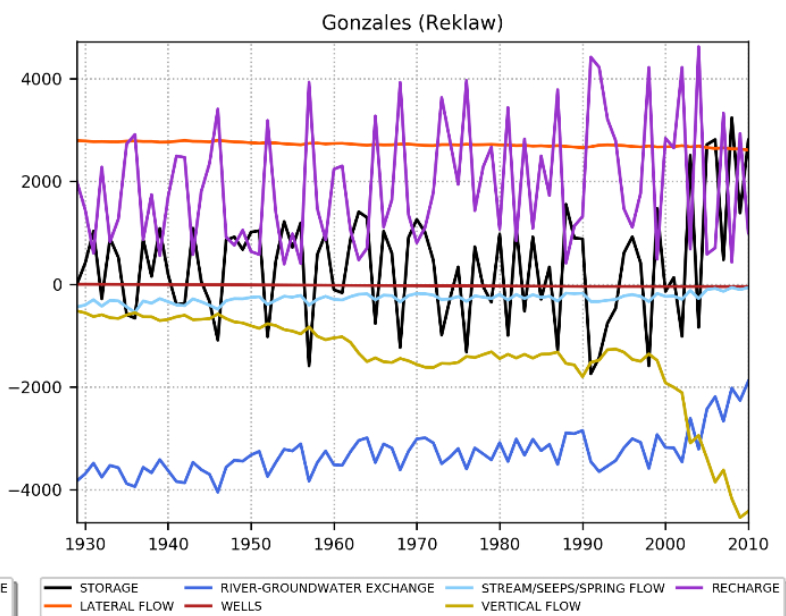
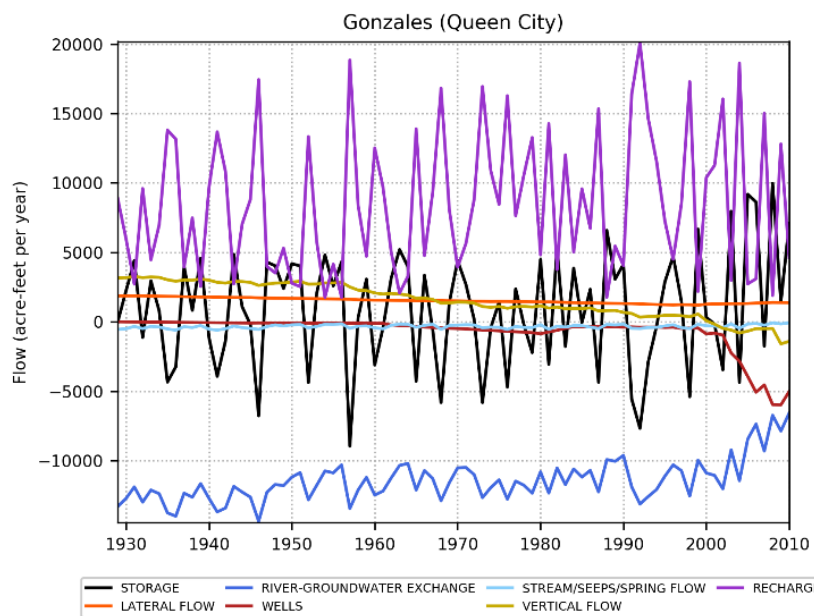
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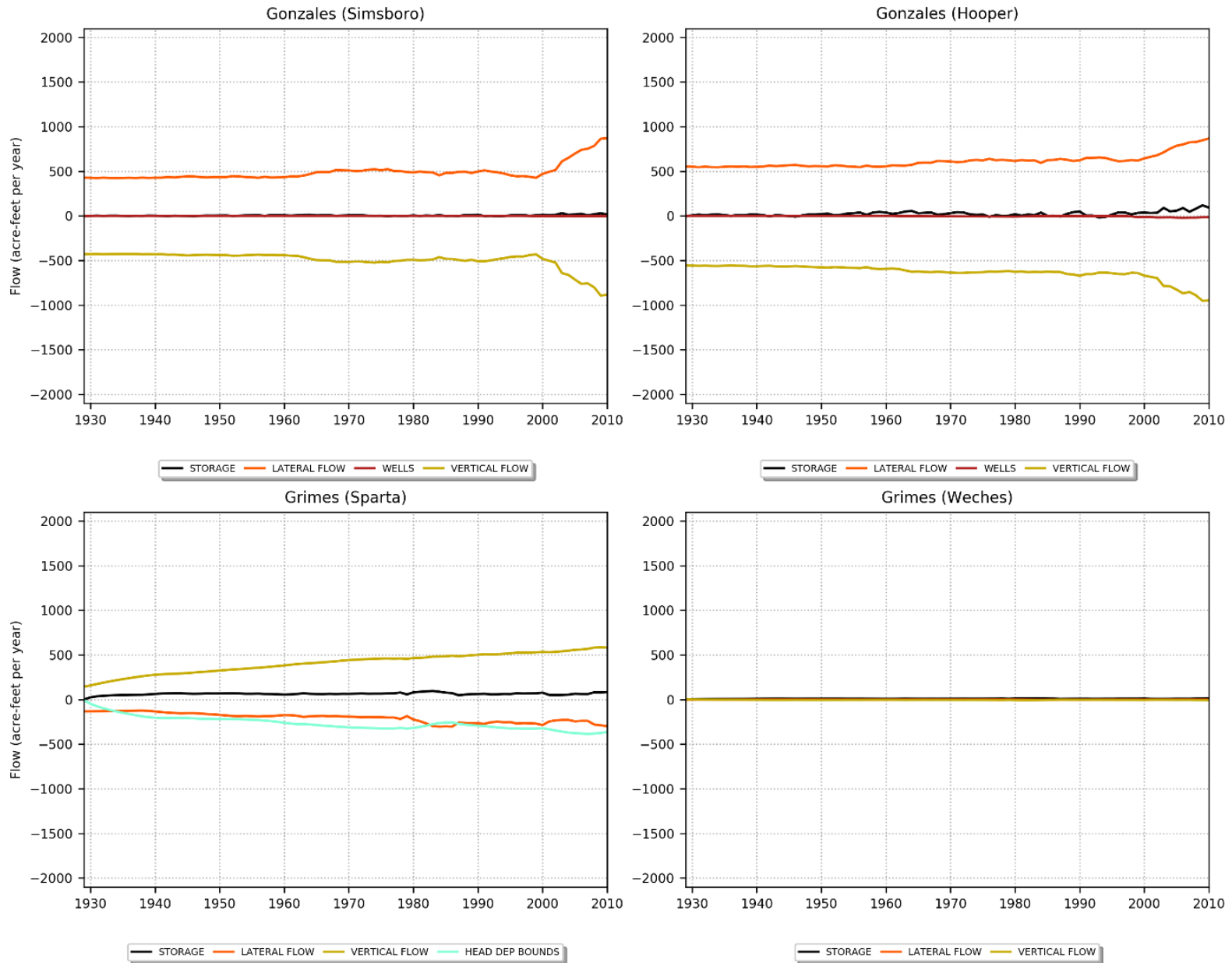
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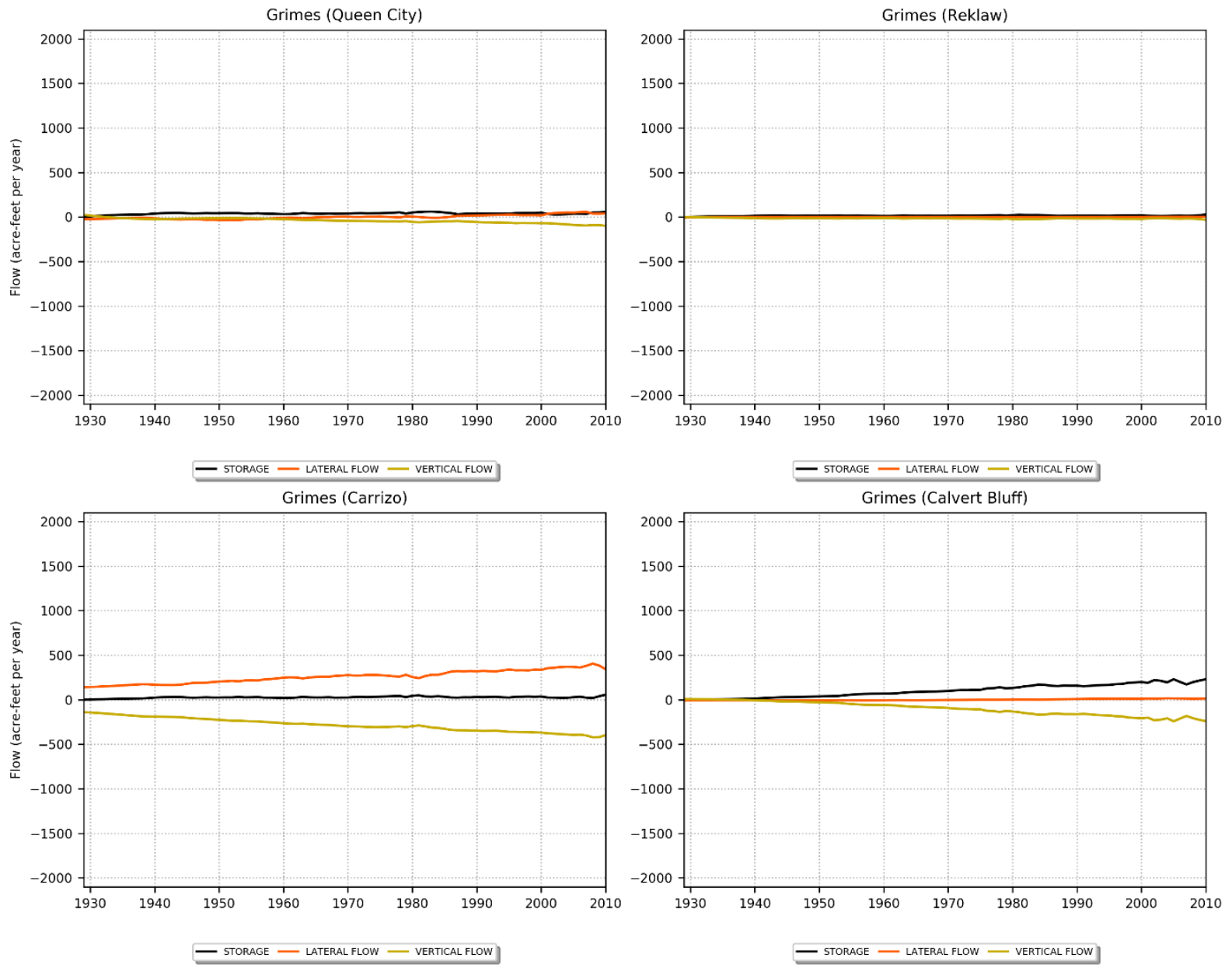
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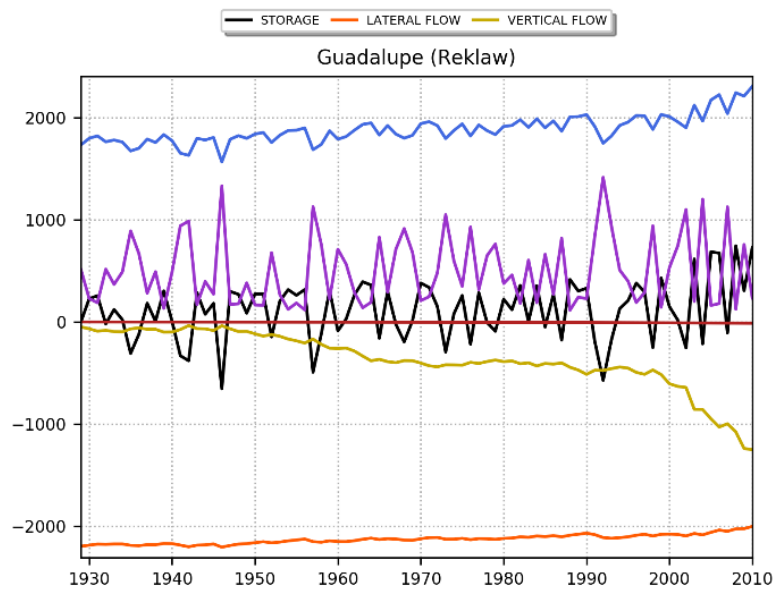
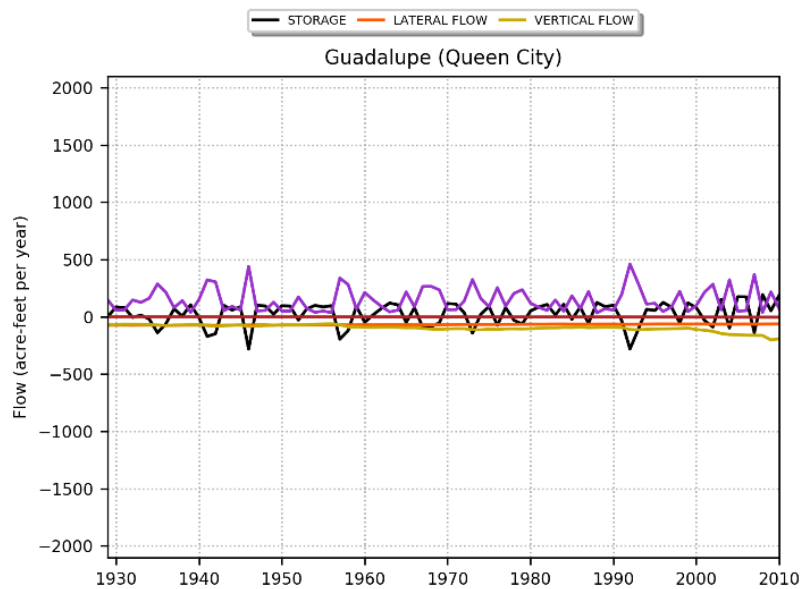
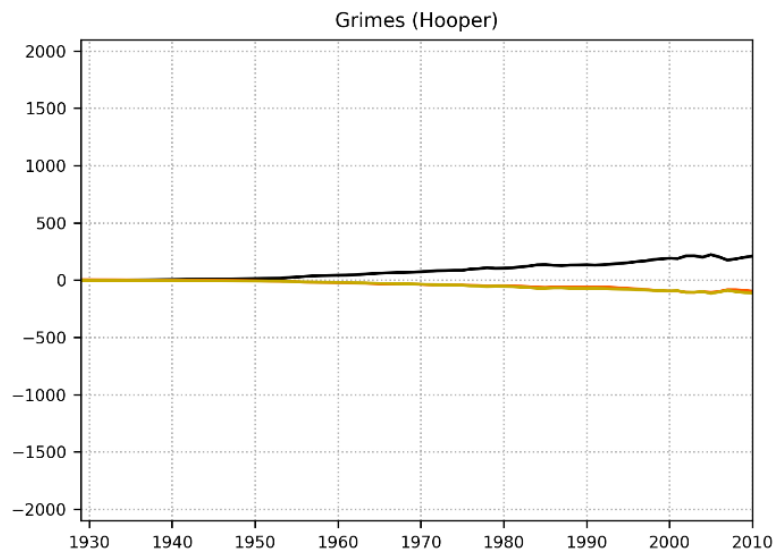
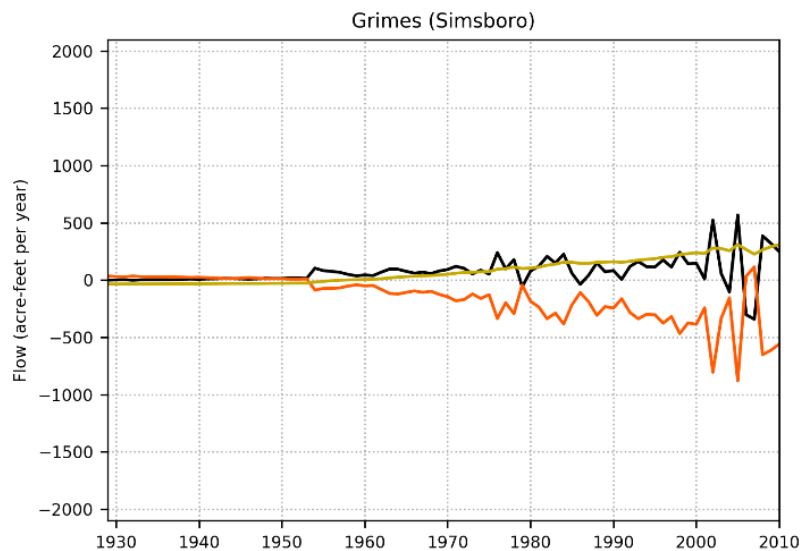
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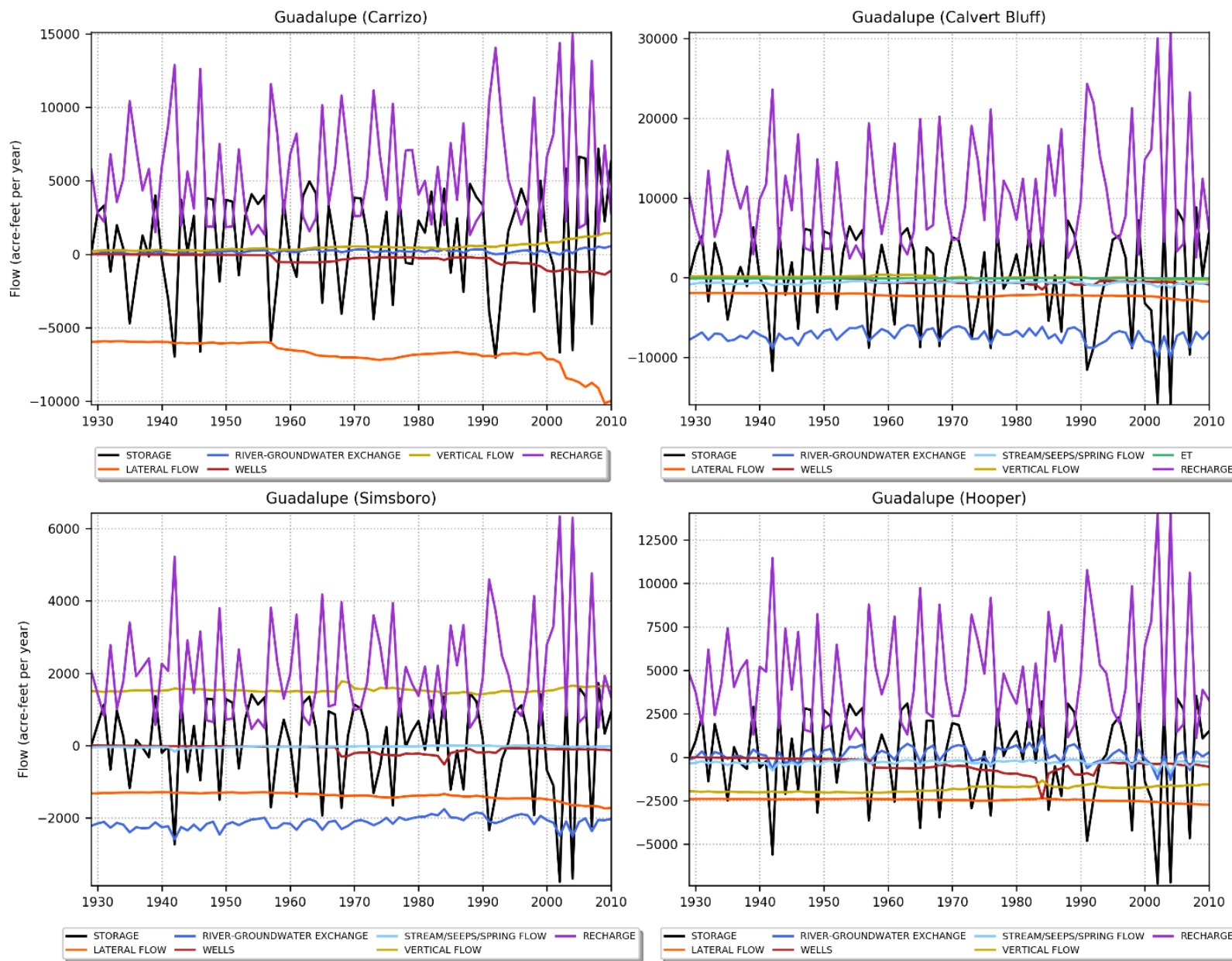
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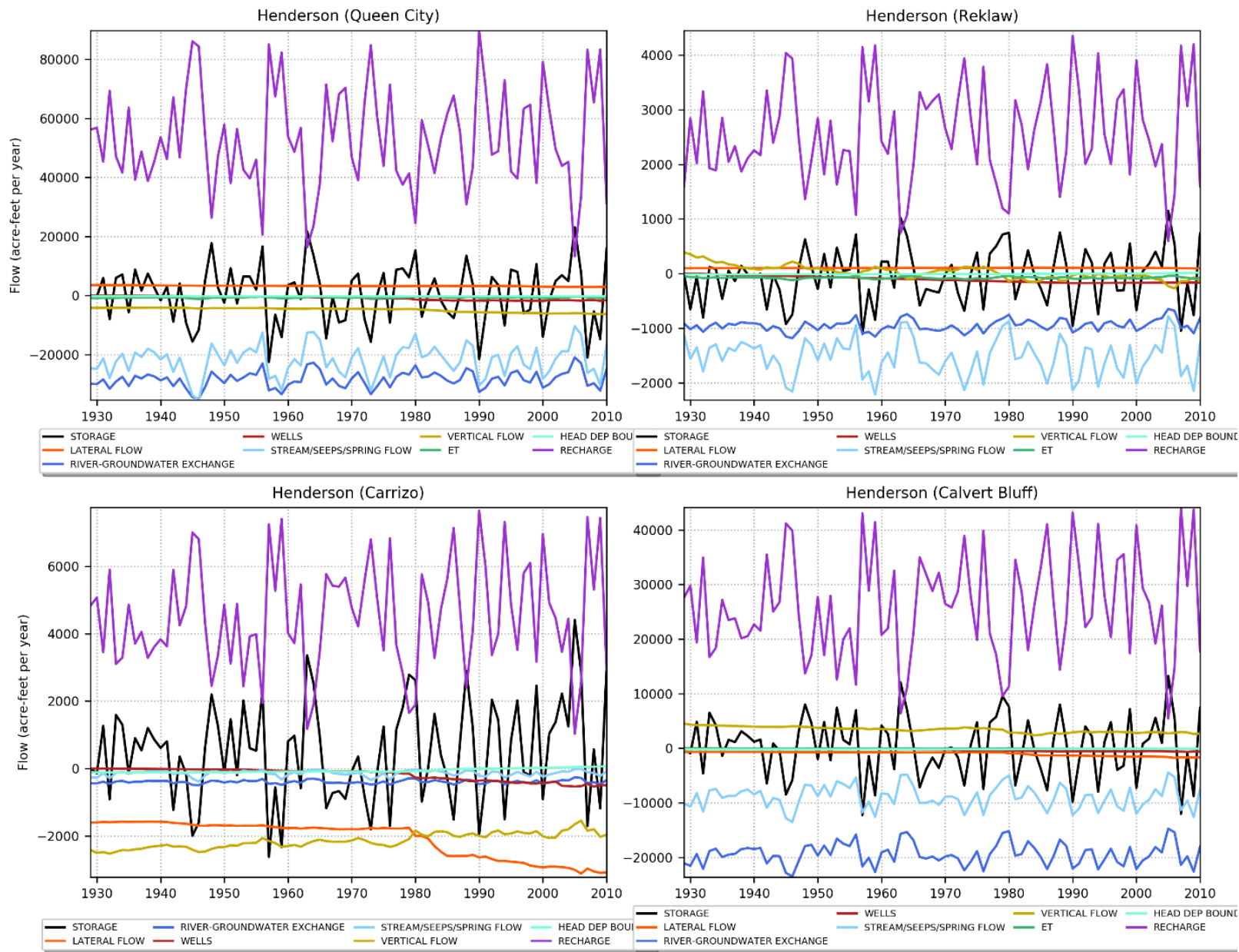
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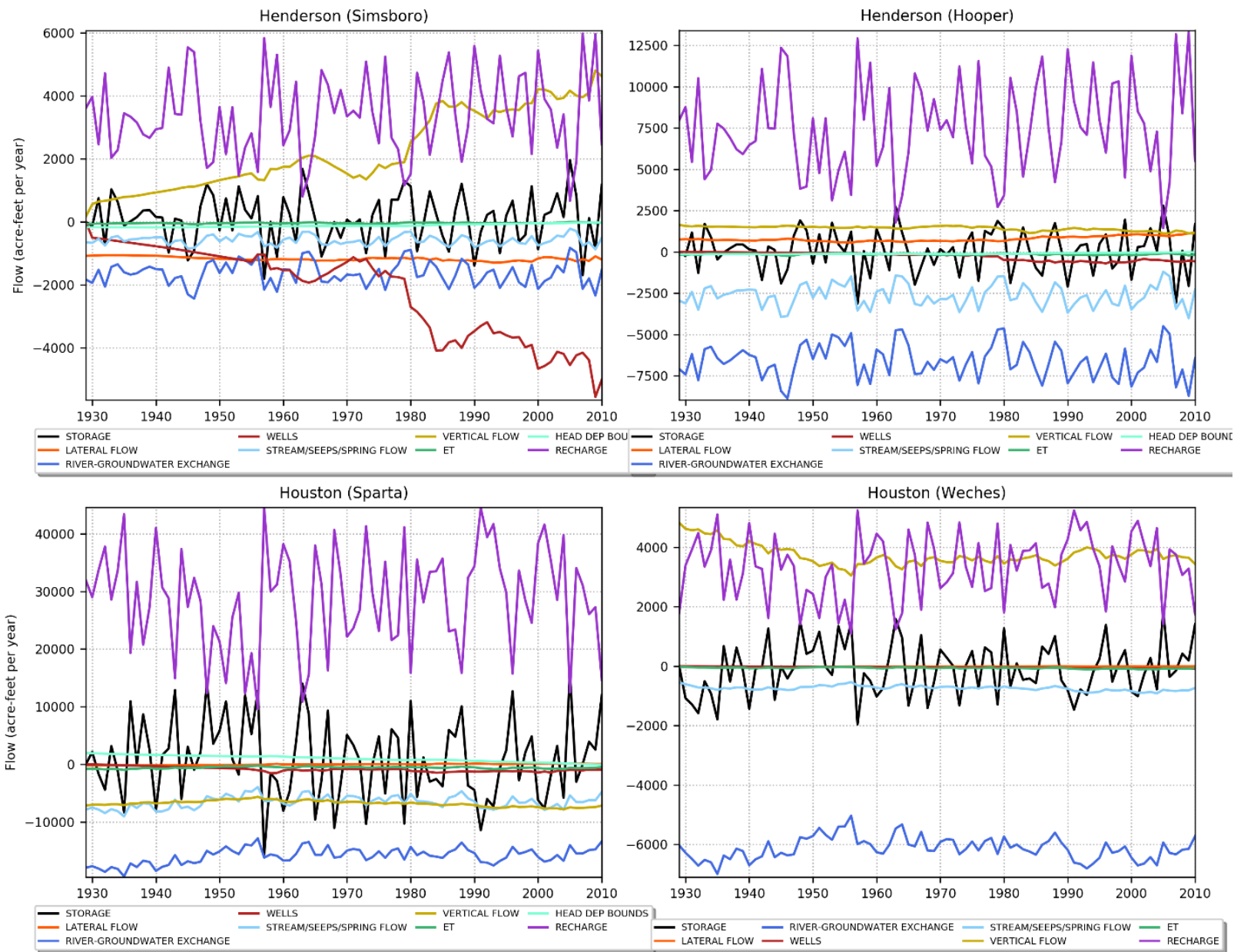
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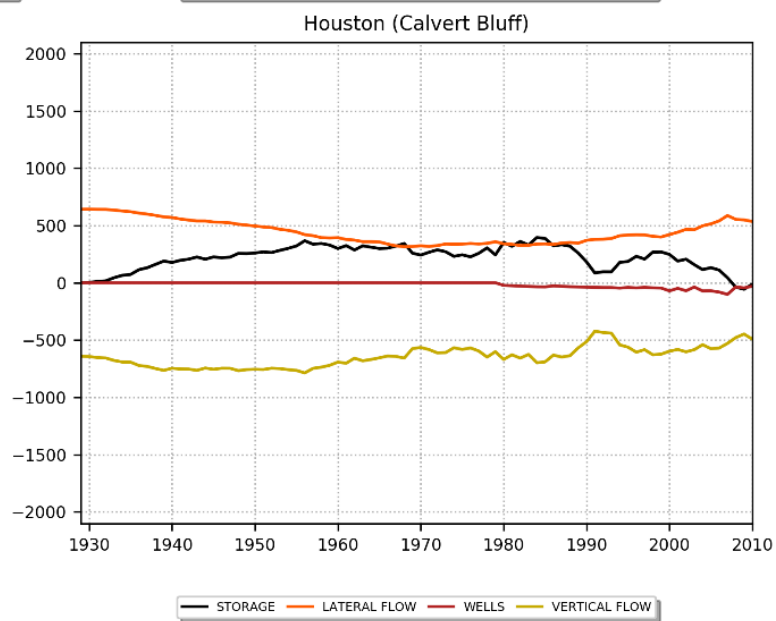
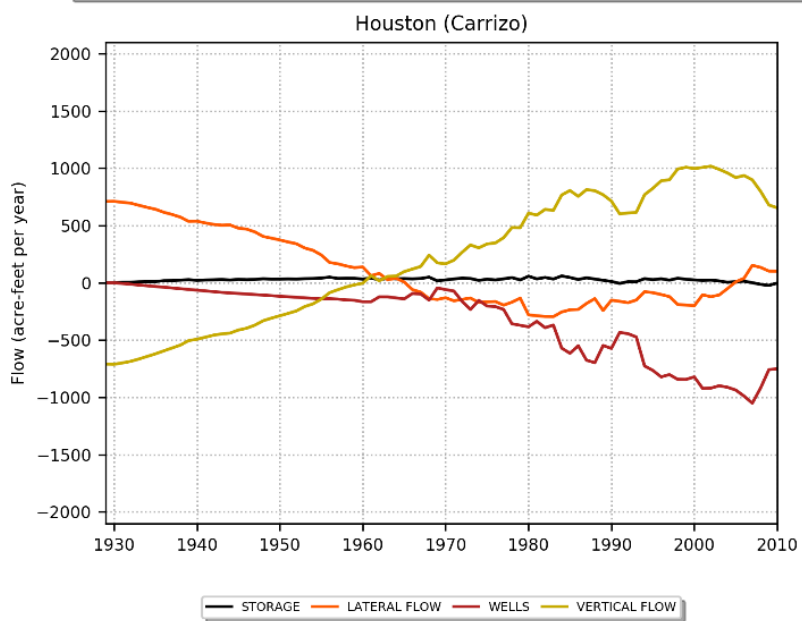
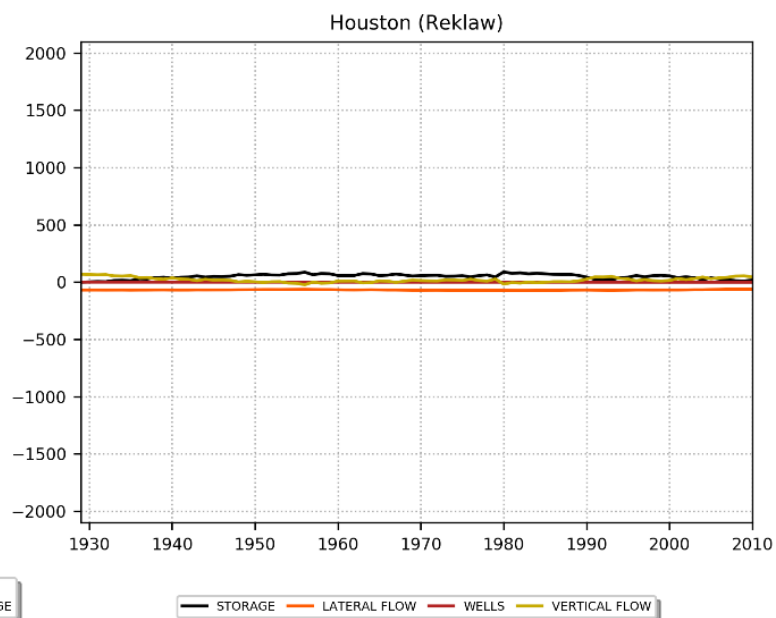
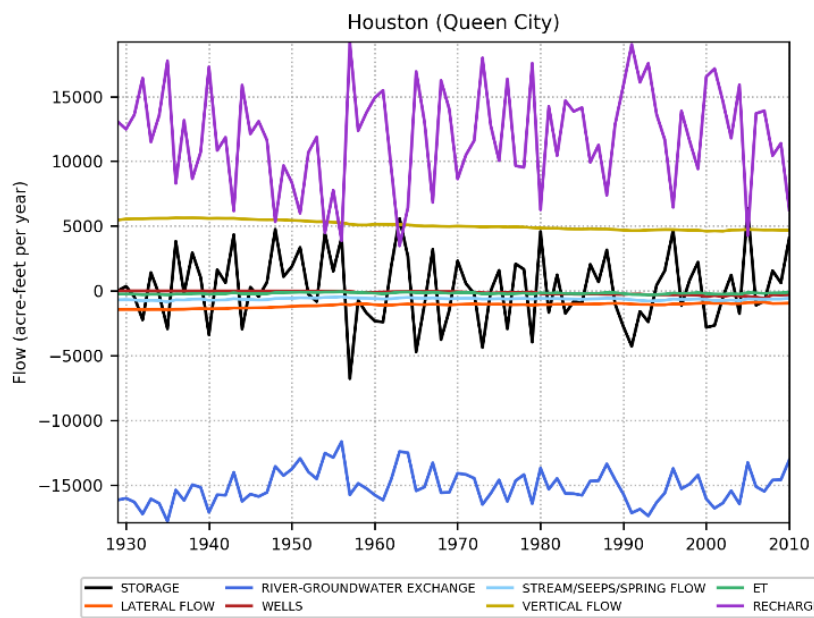
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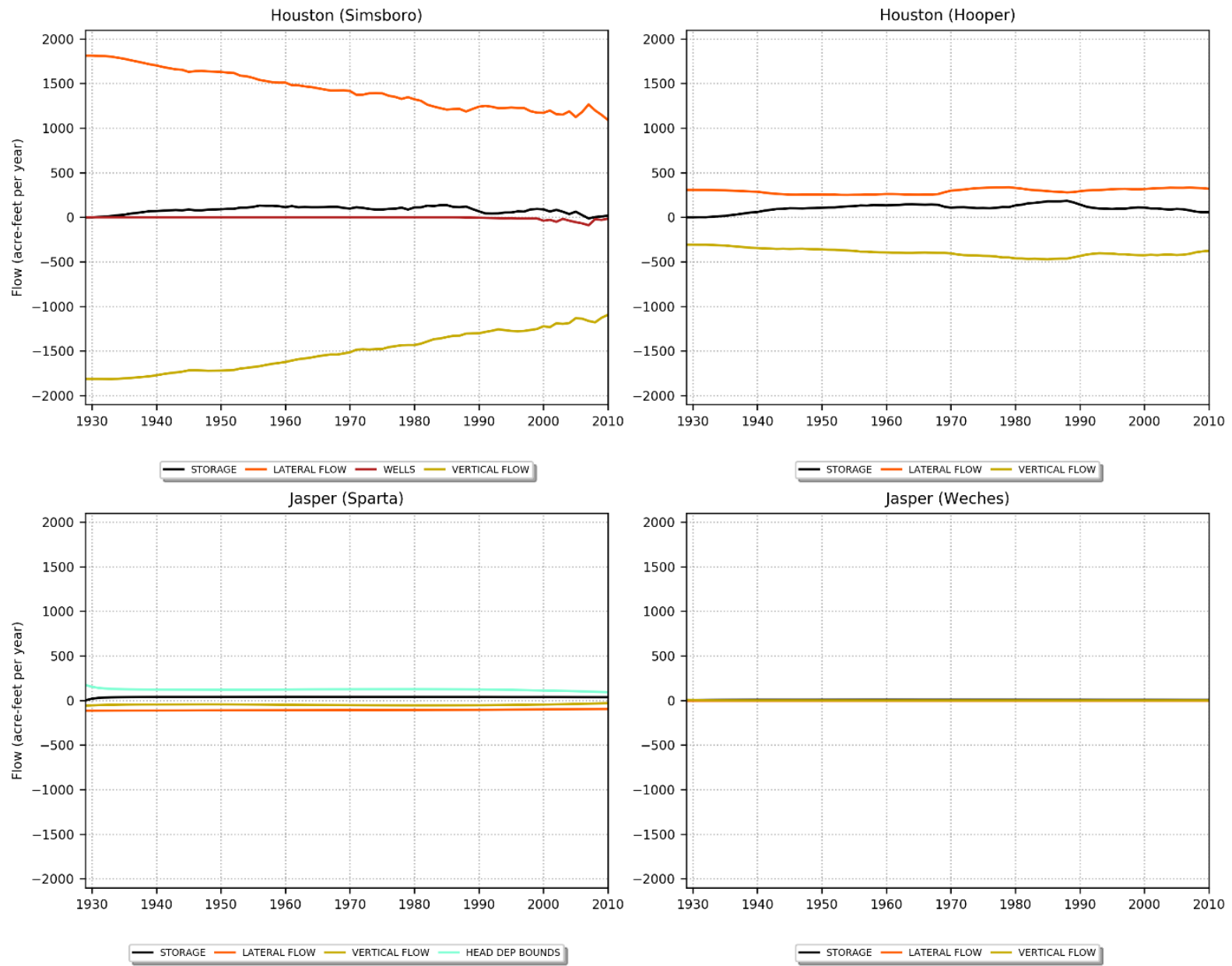
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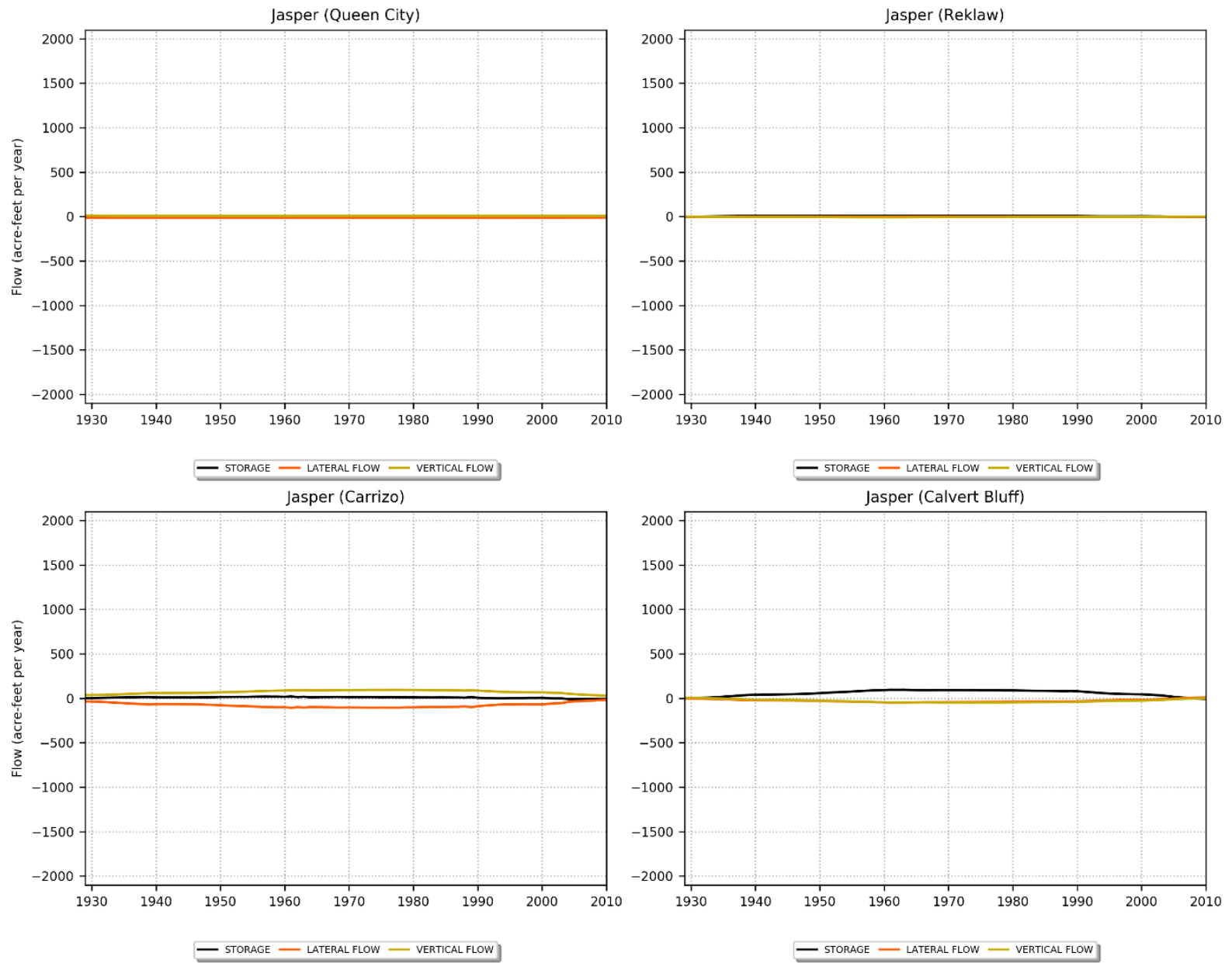
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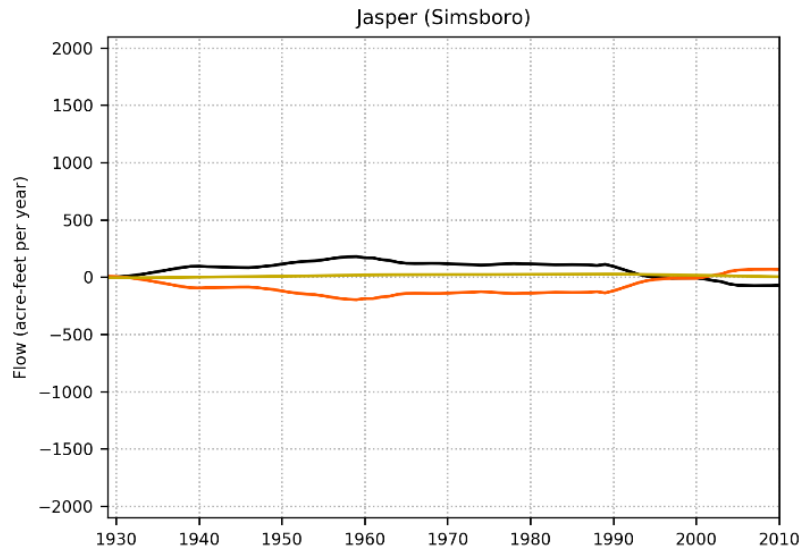
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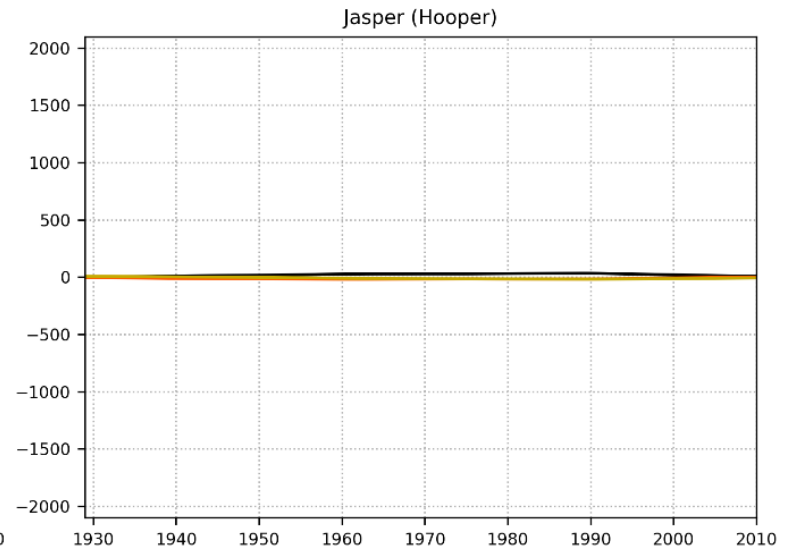
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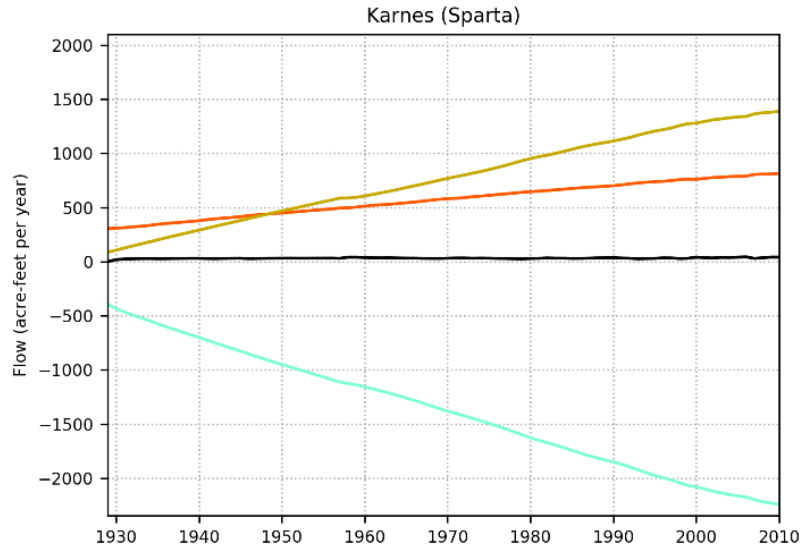
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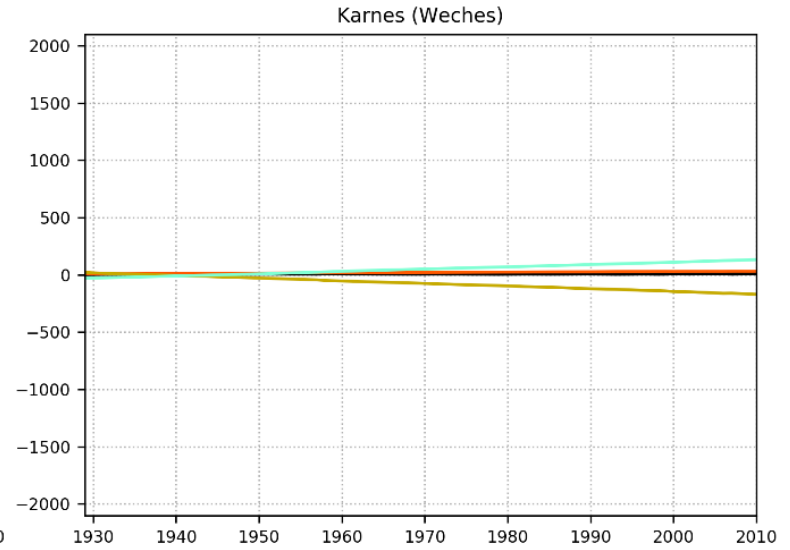
— STORAGE — LATERAL FLOW — VERTICAL FLOW



— STORAGE — LATERAL FLOW — VERTICAL FLOW

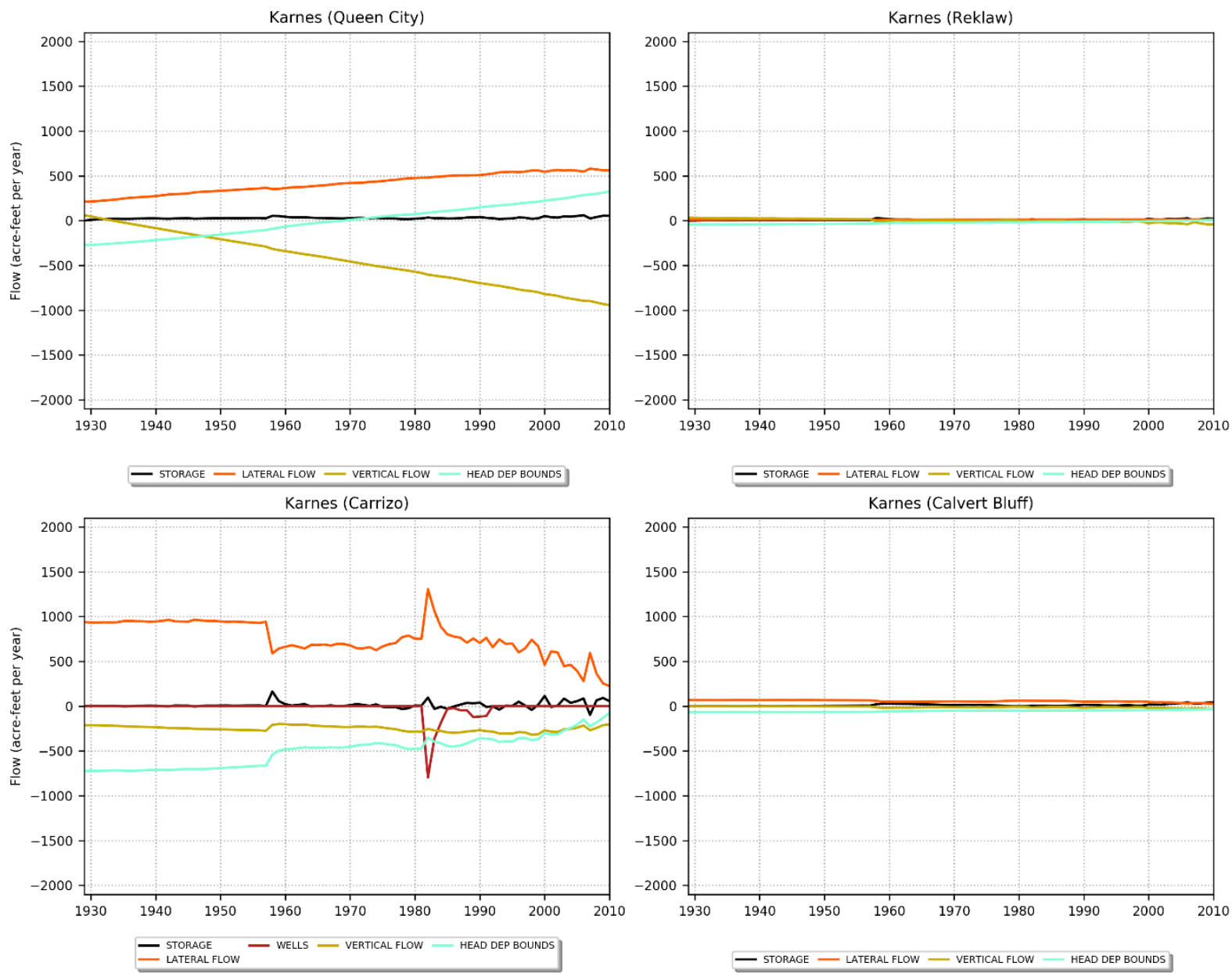


— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

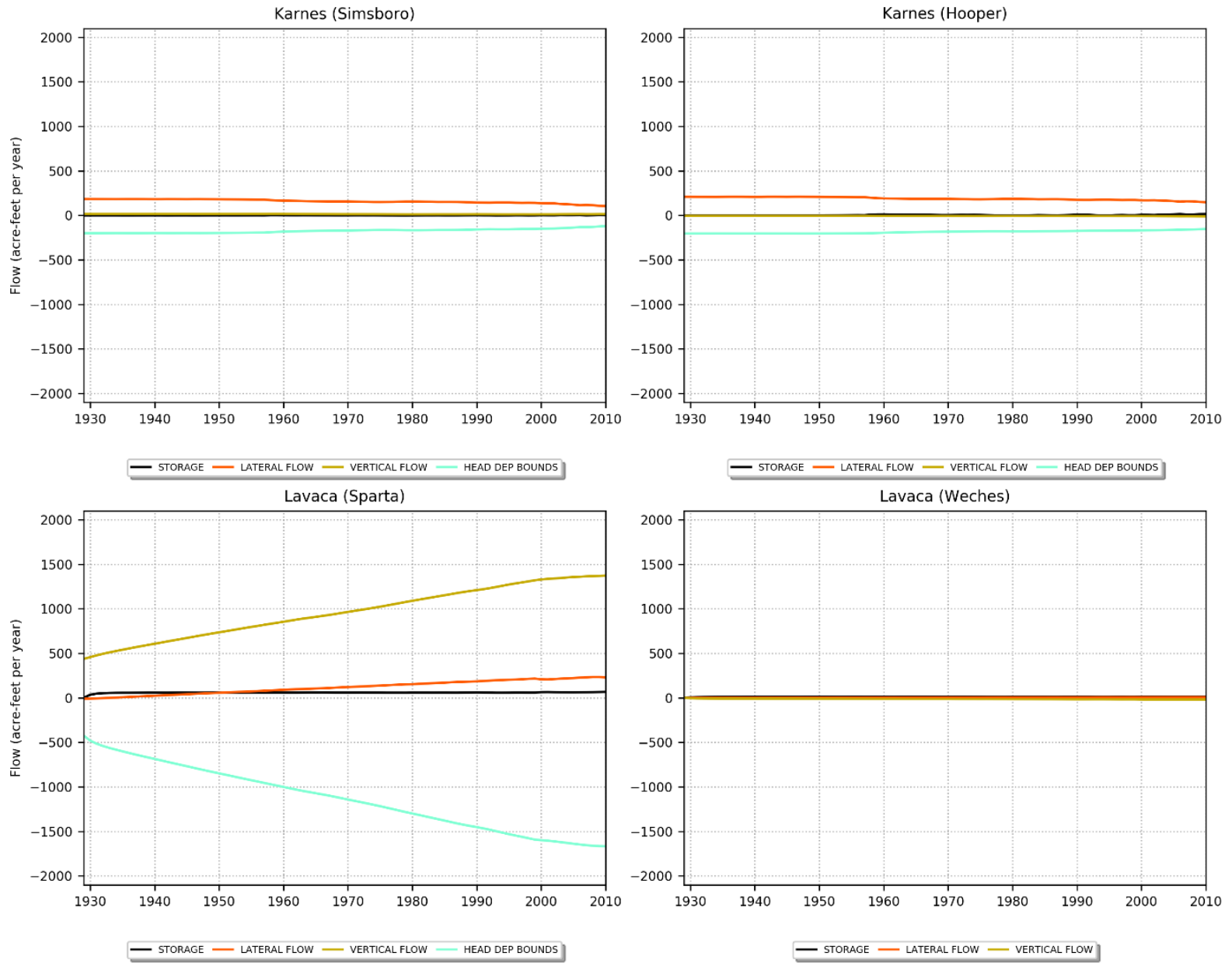


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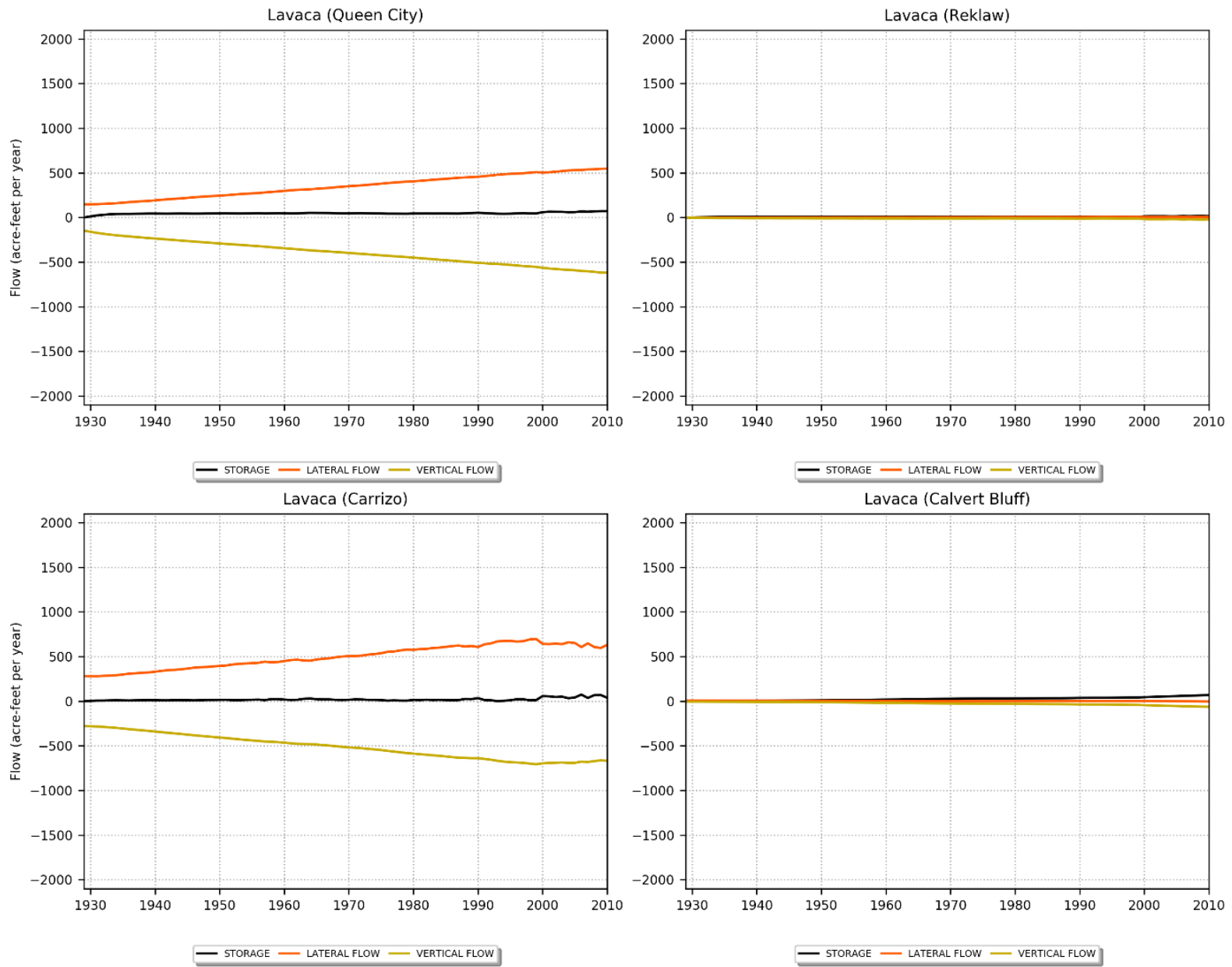
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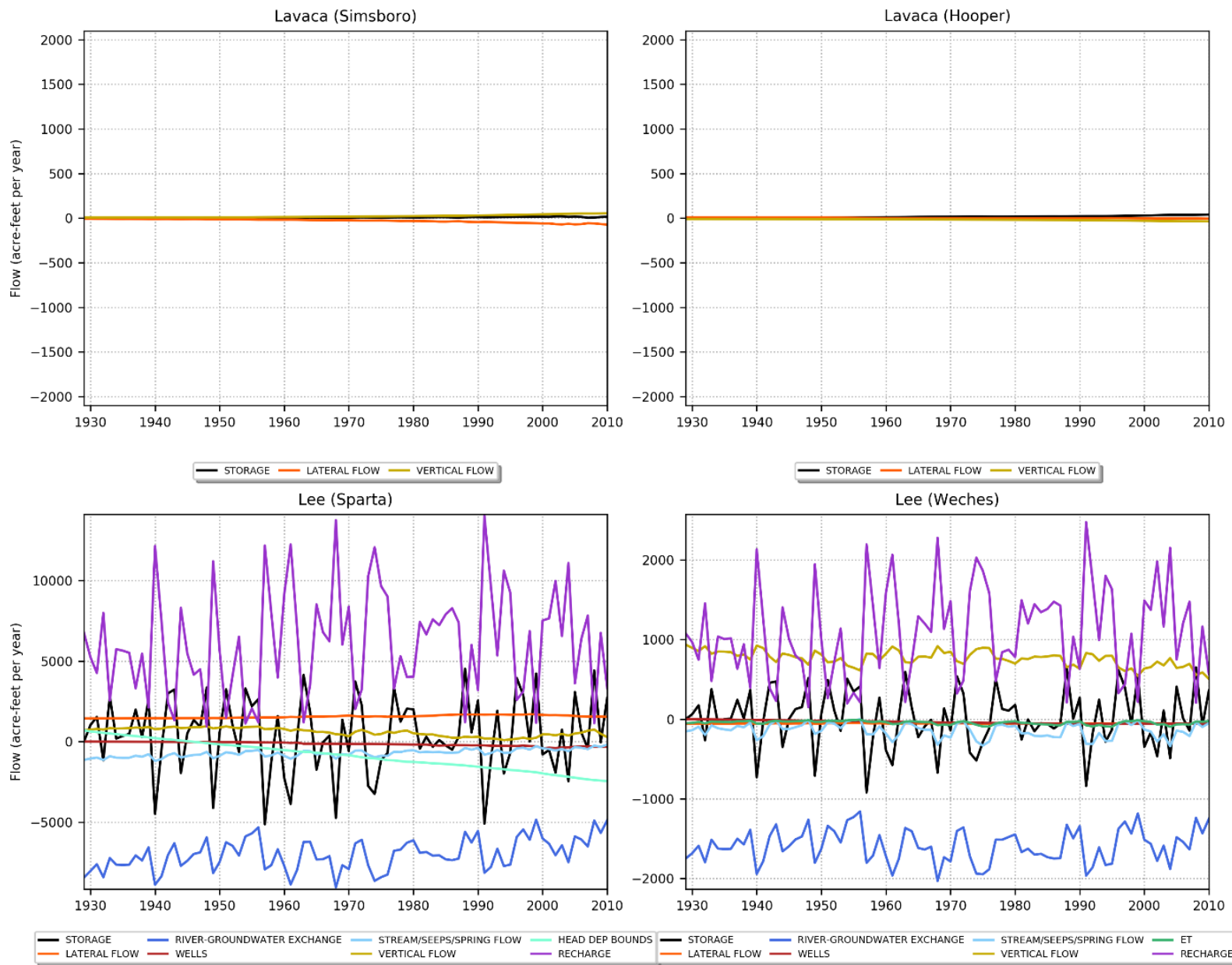
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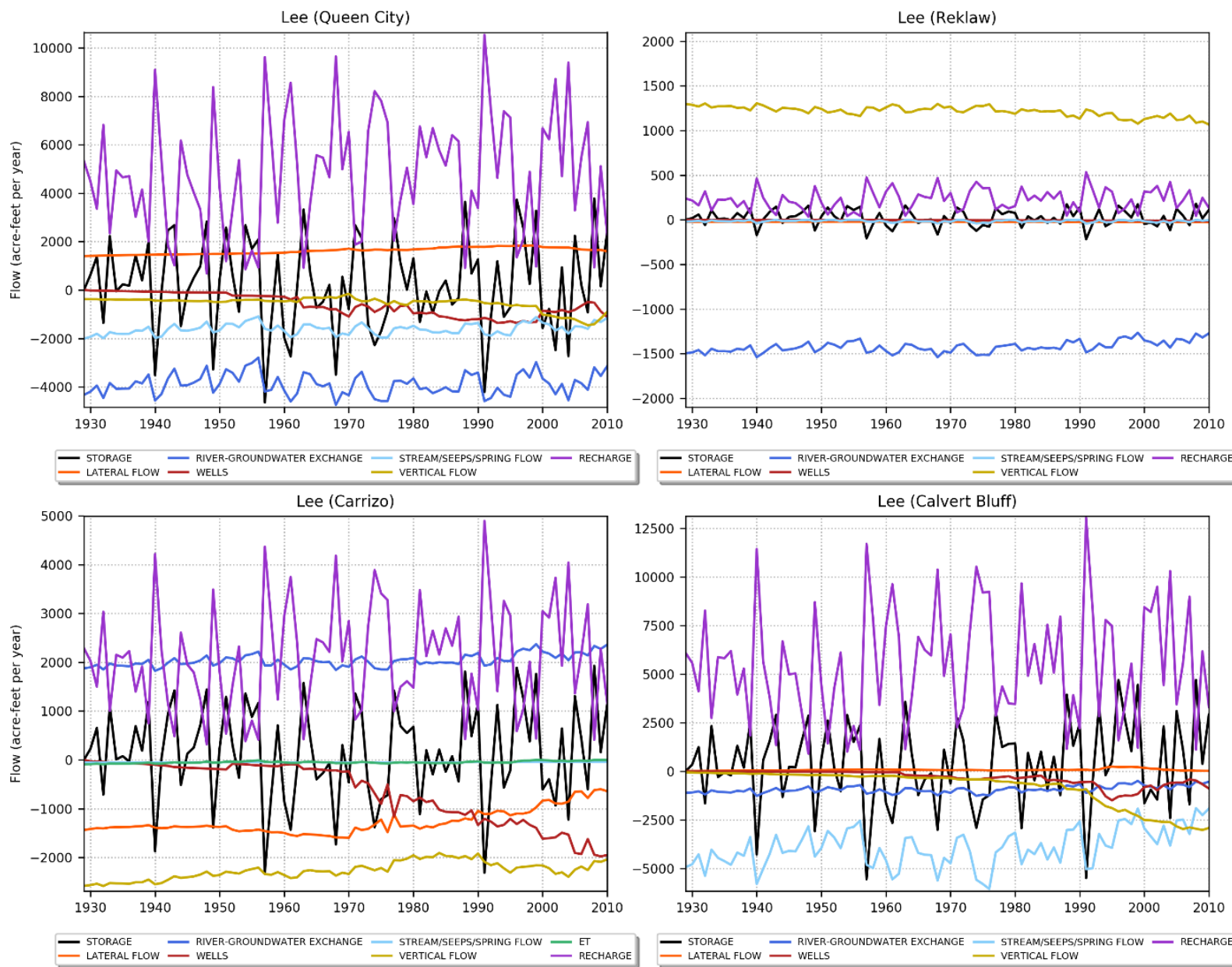
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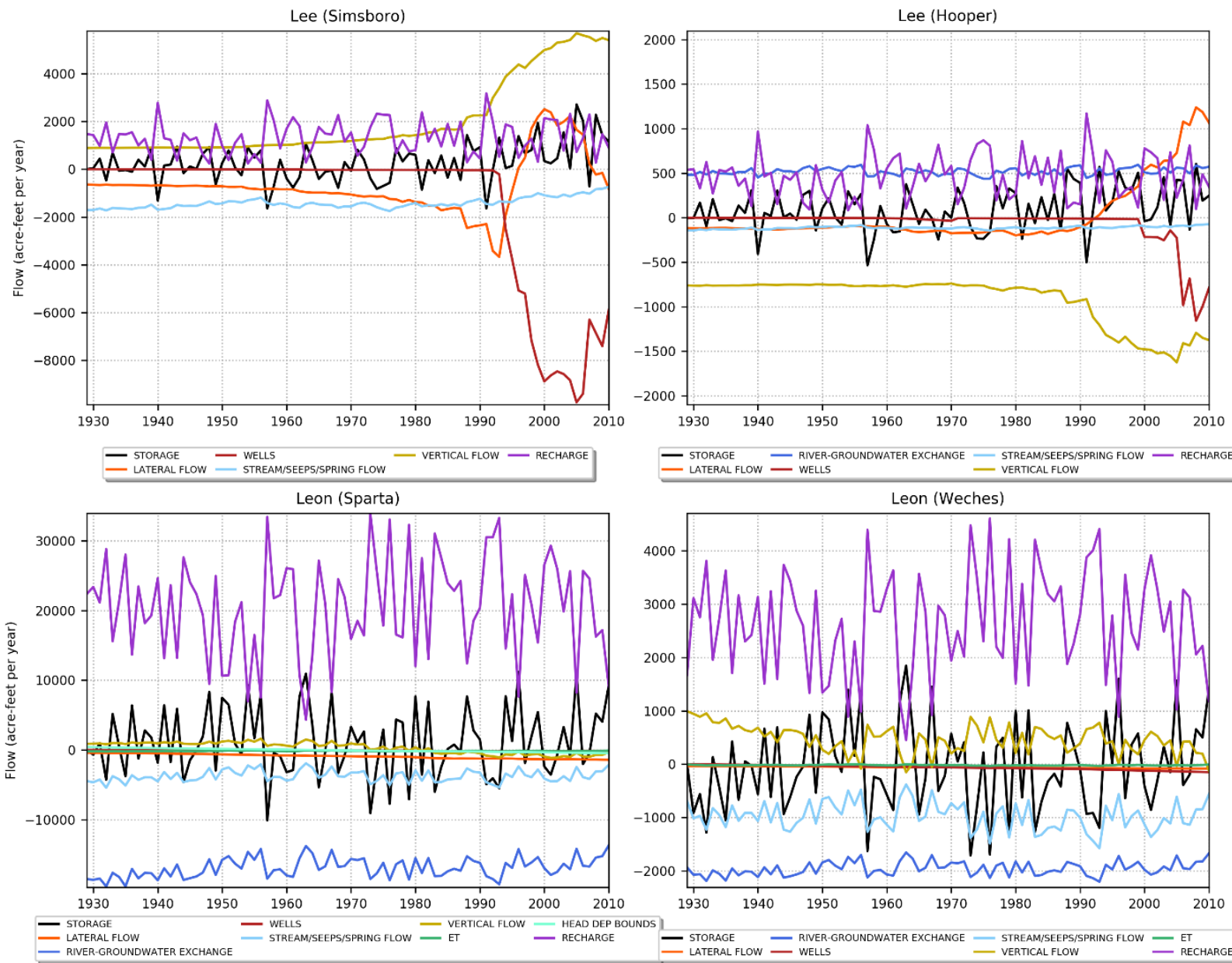
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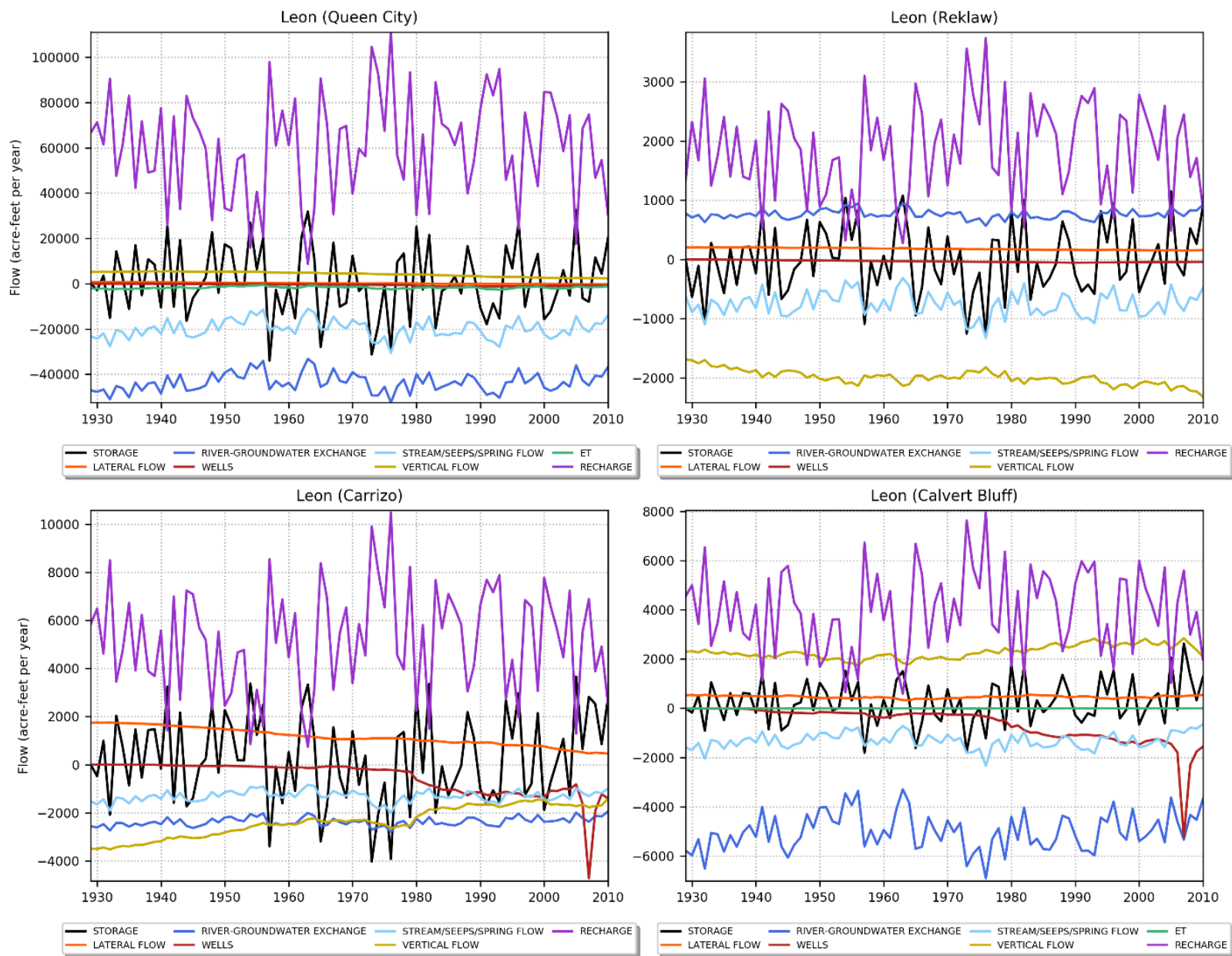
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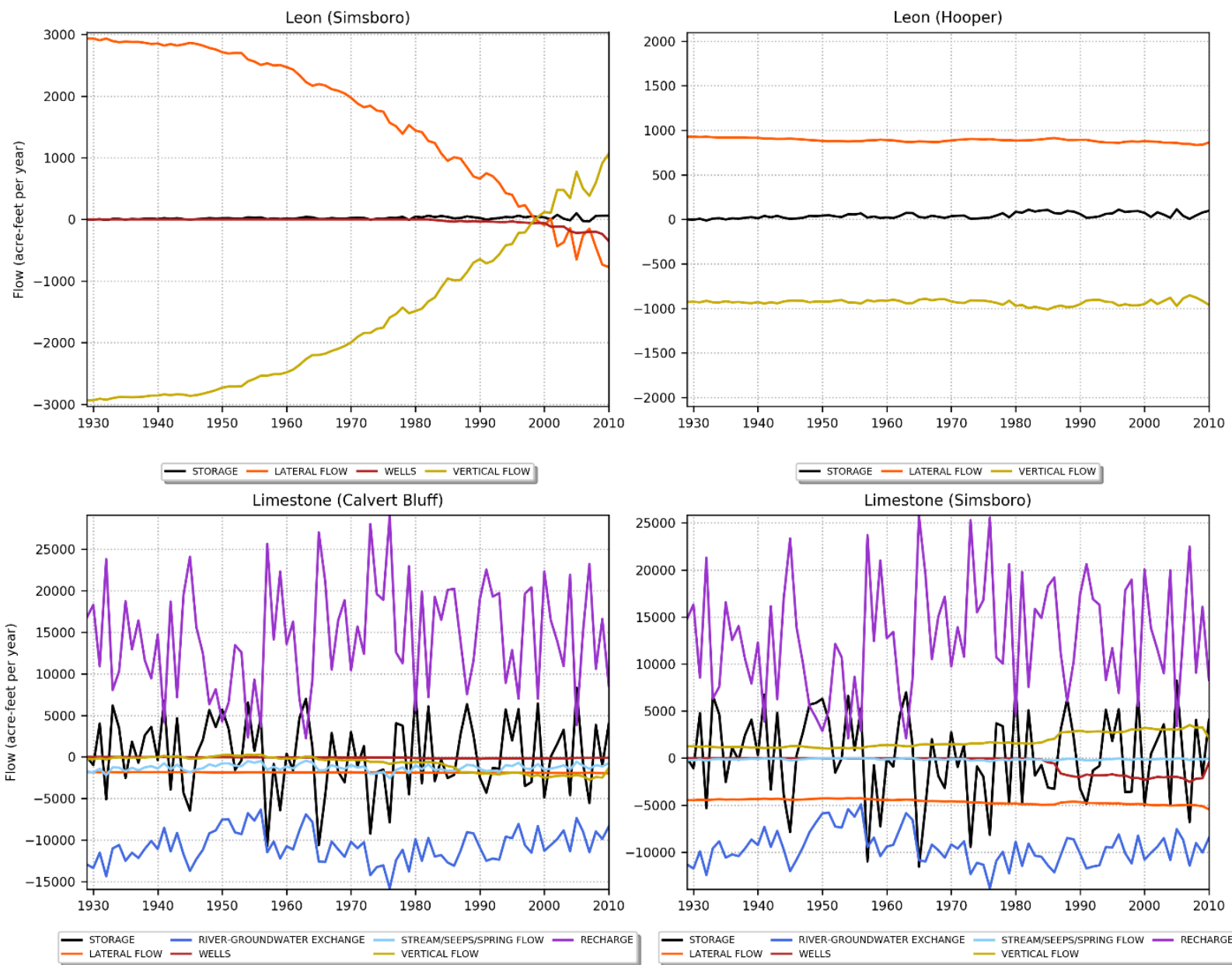
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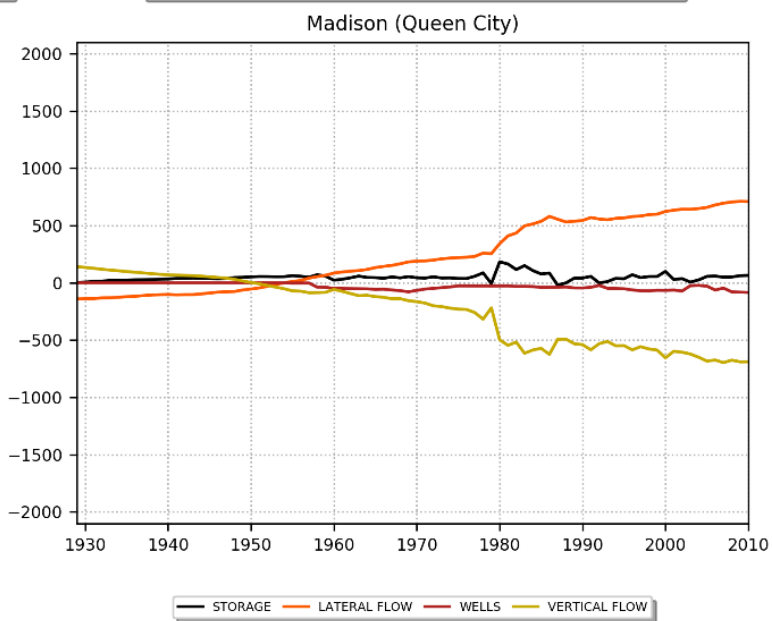
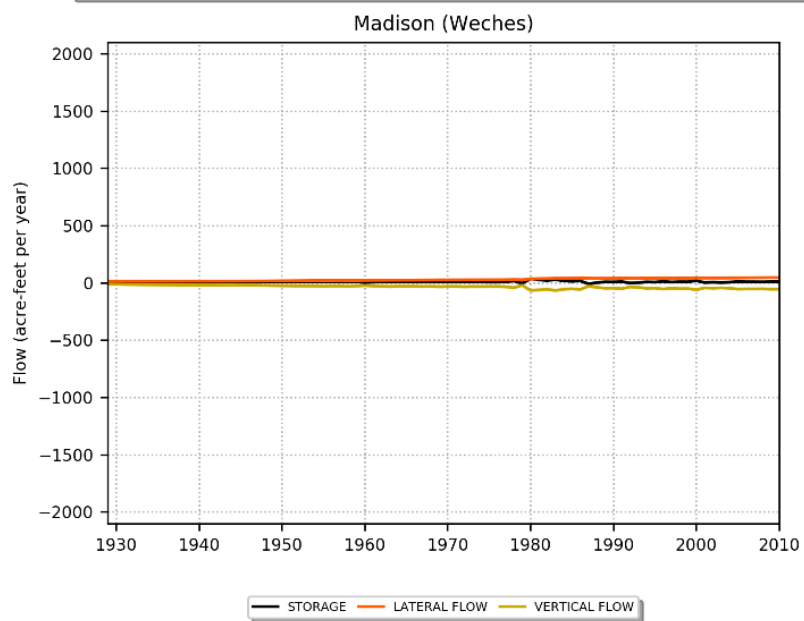
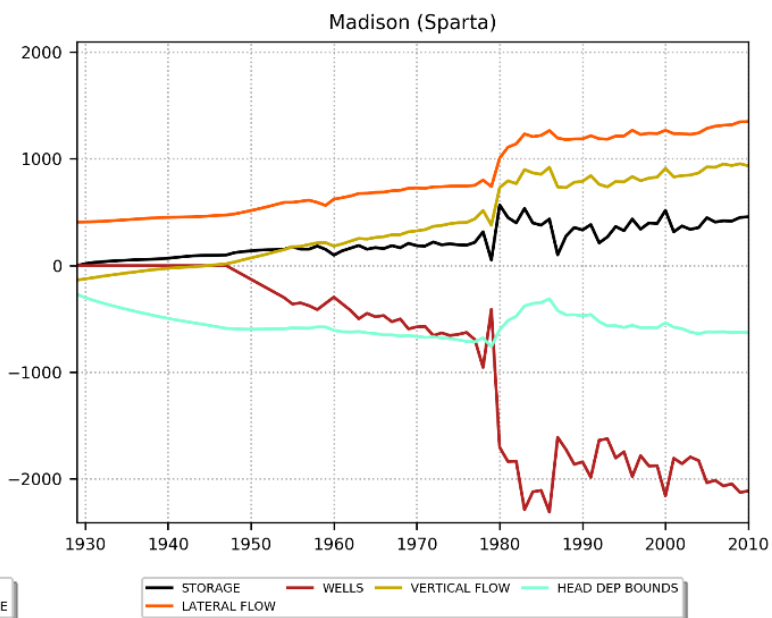
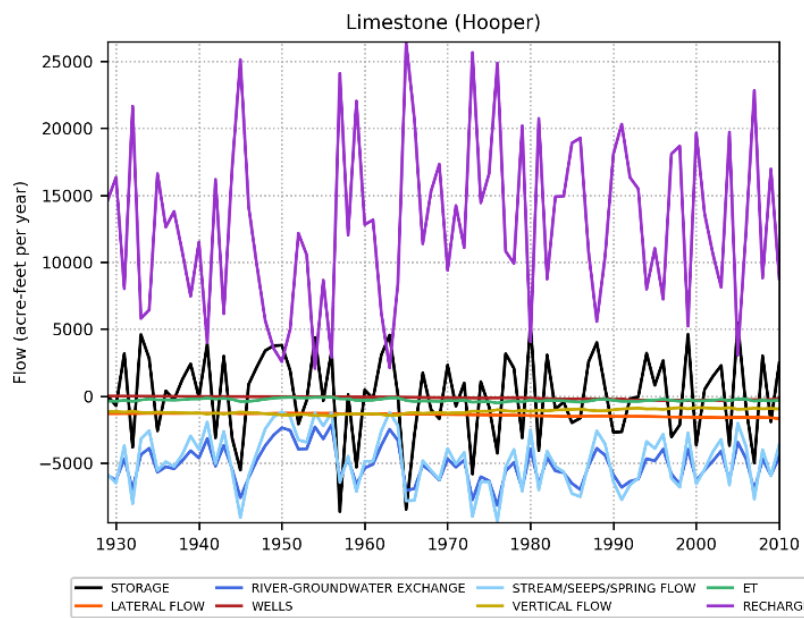
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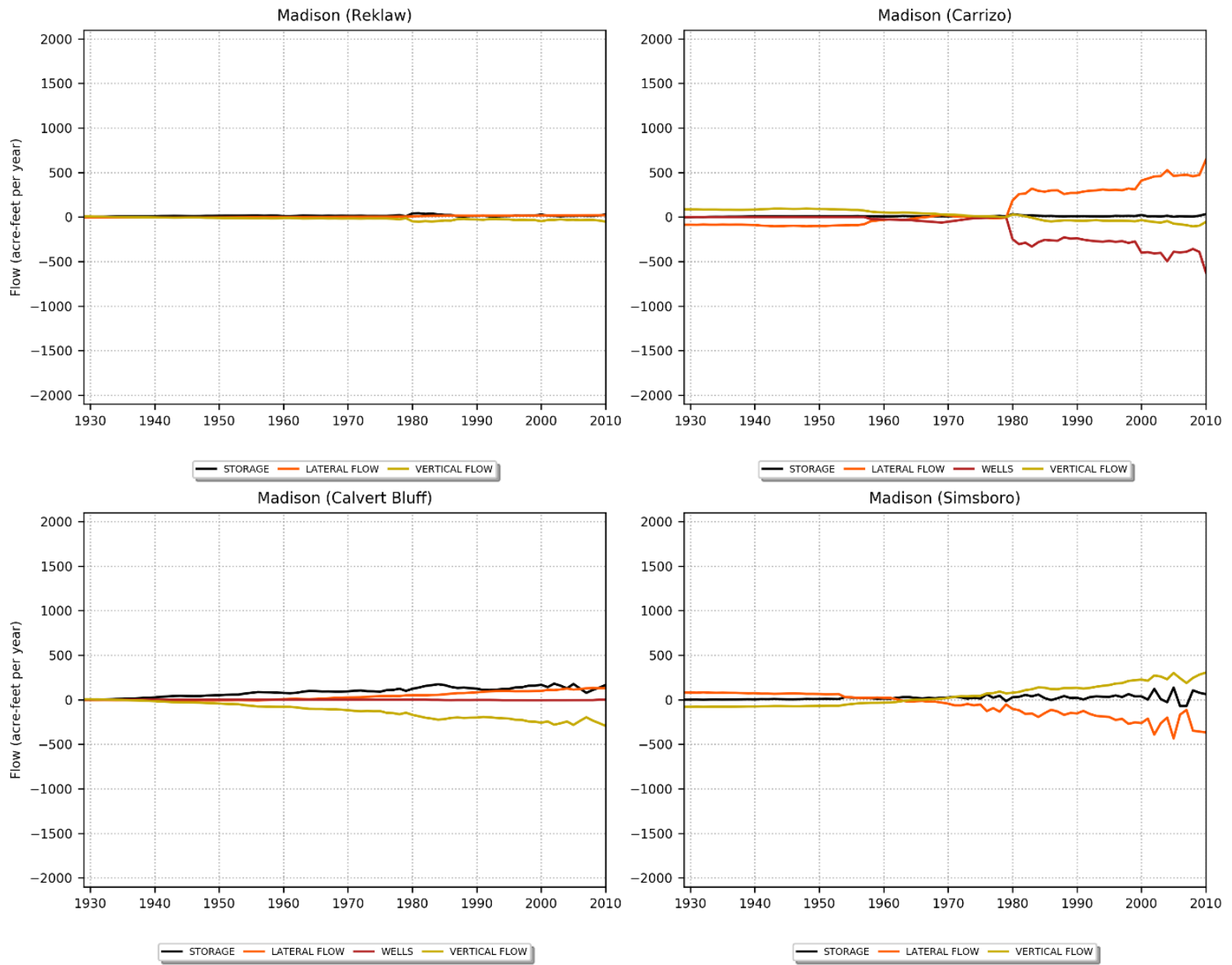
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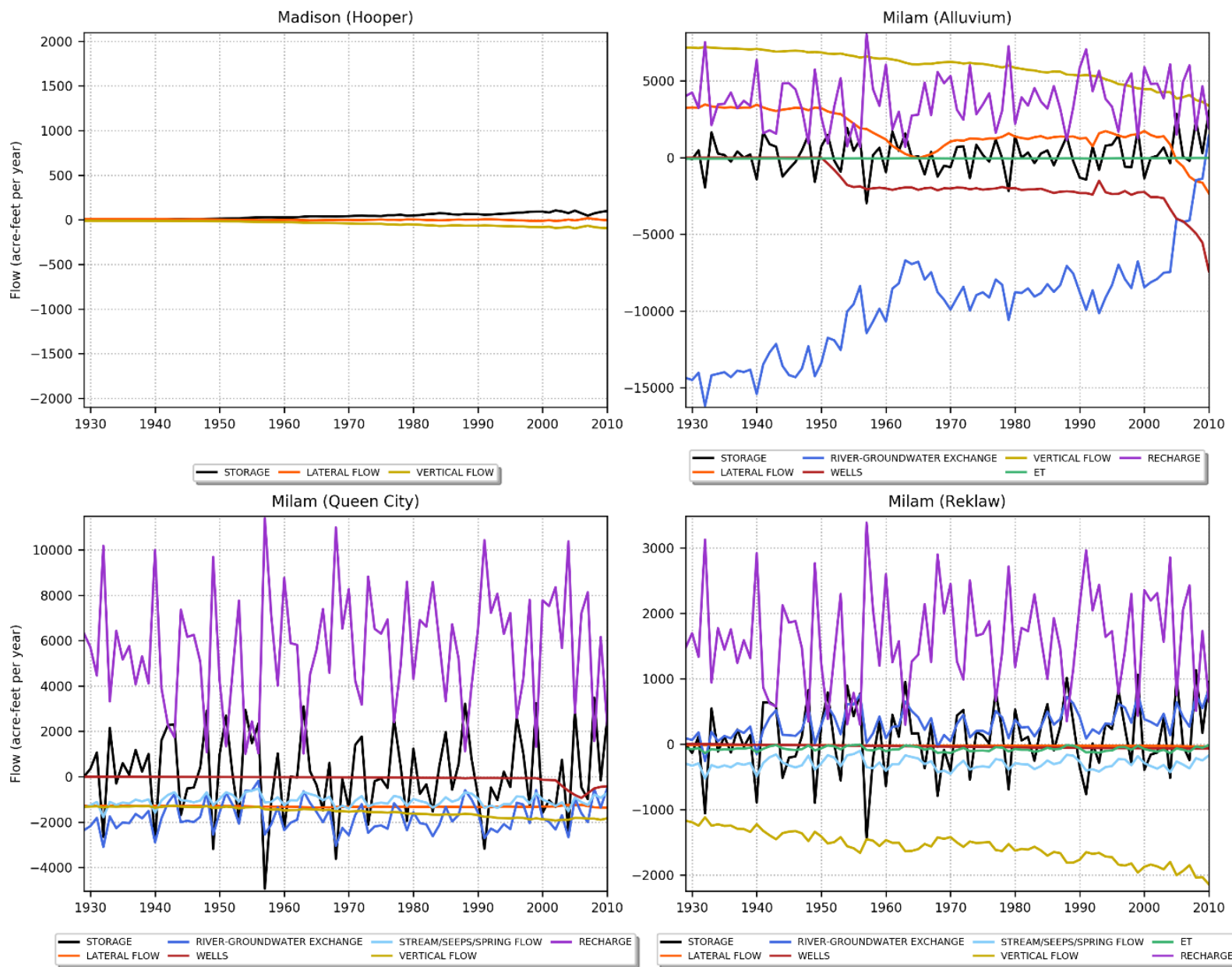
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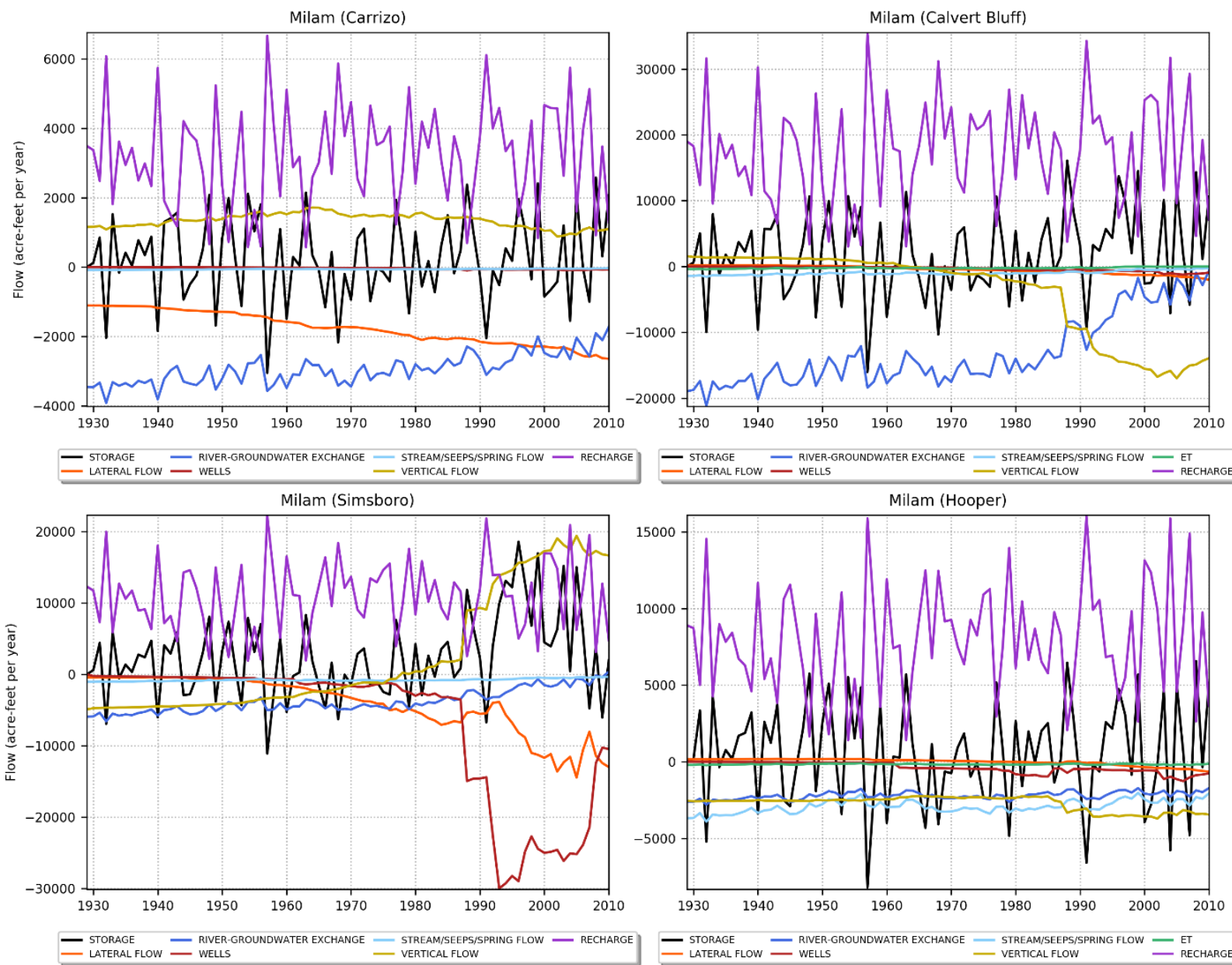
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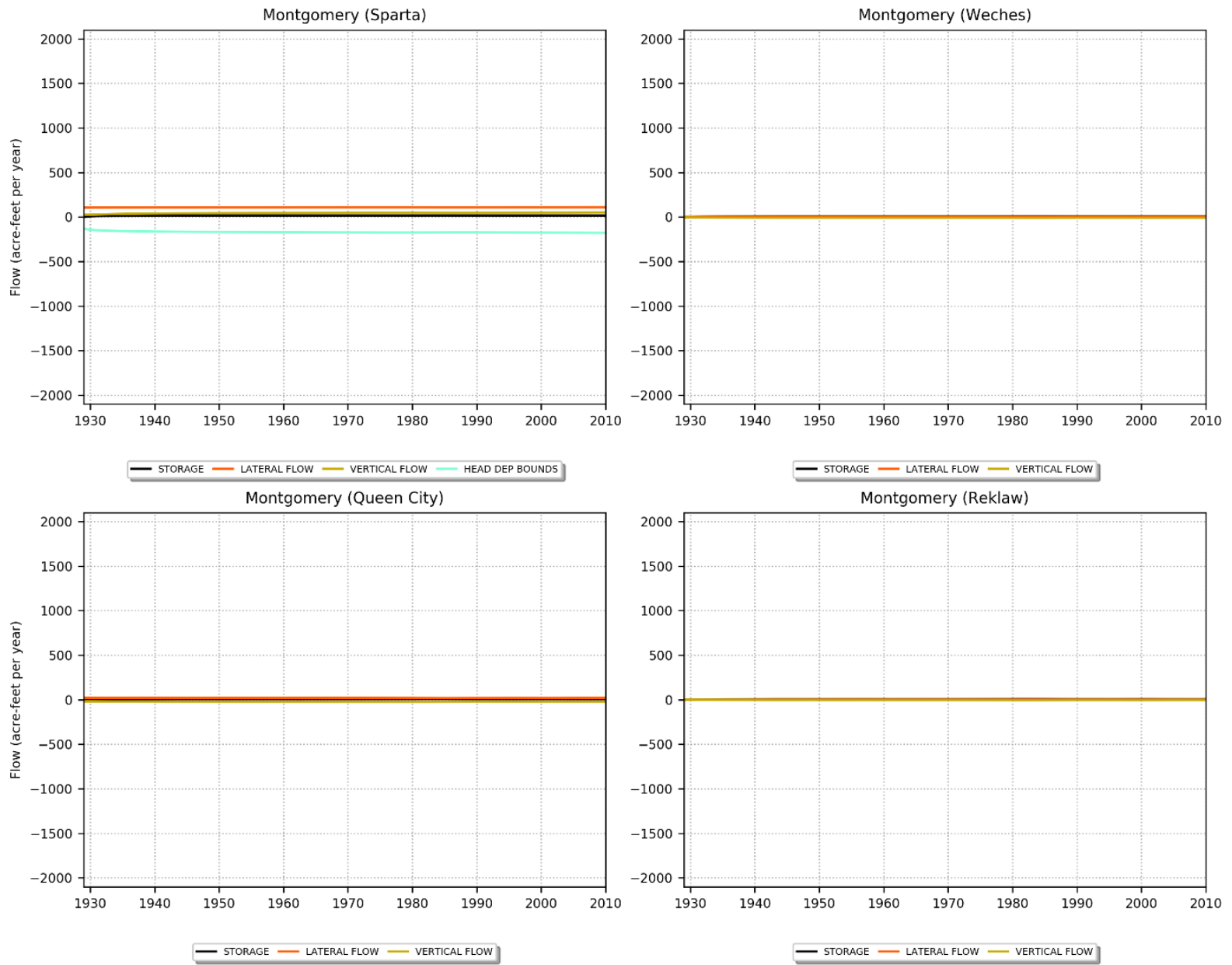
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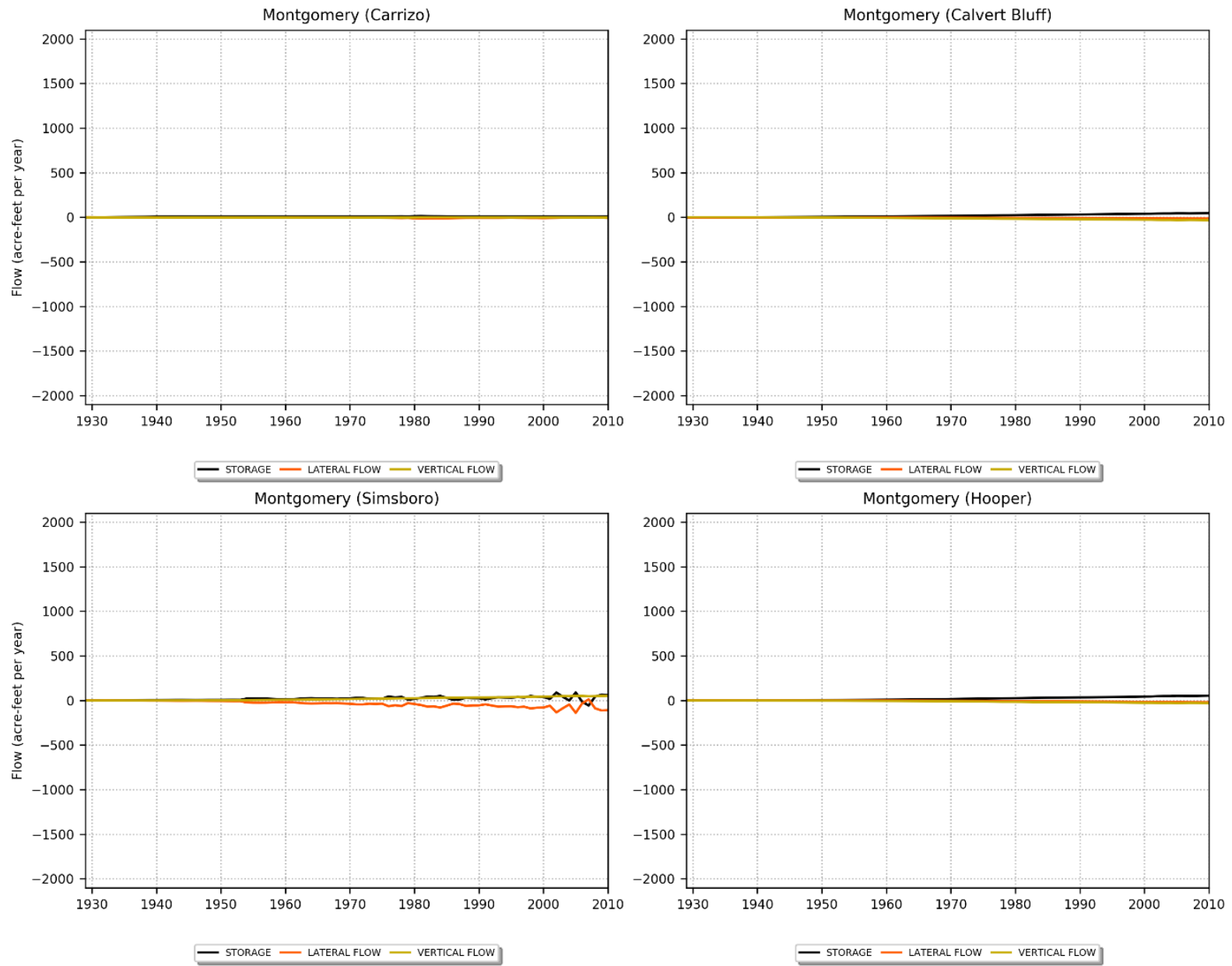
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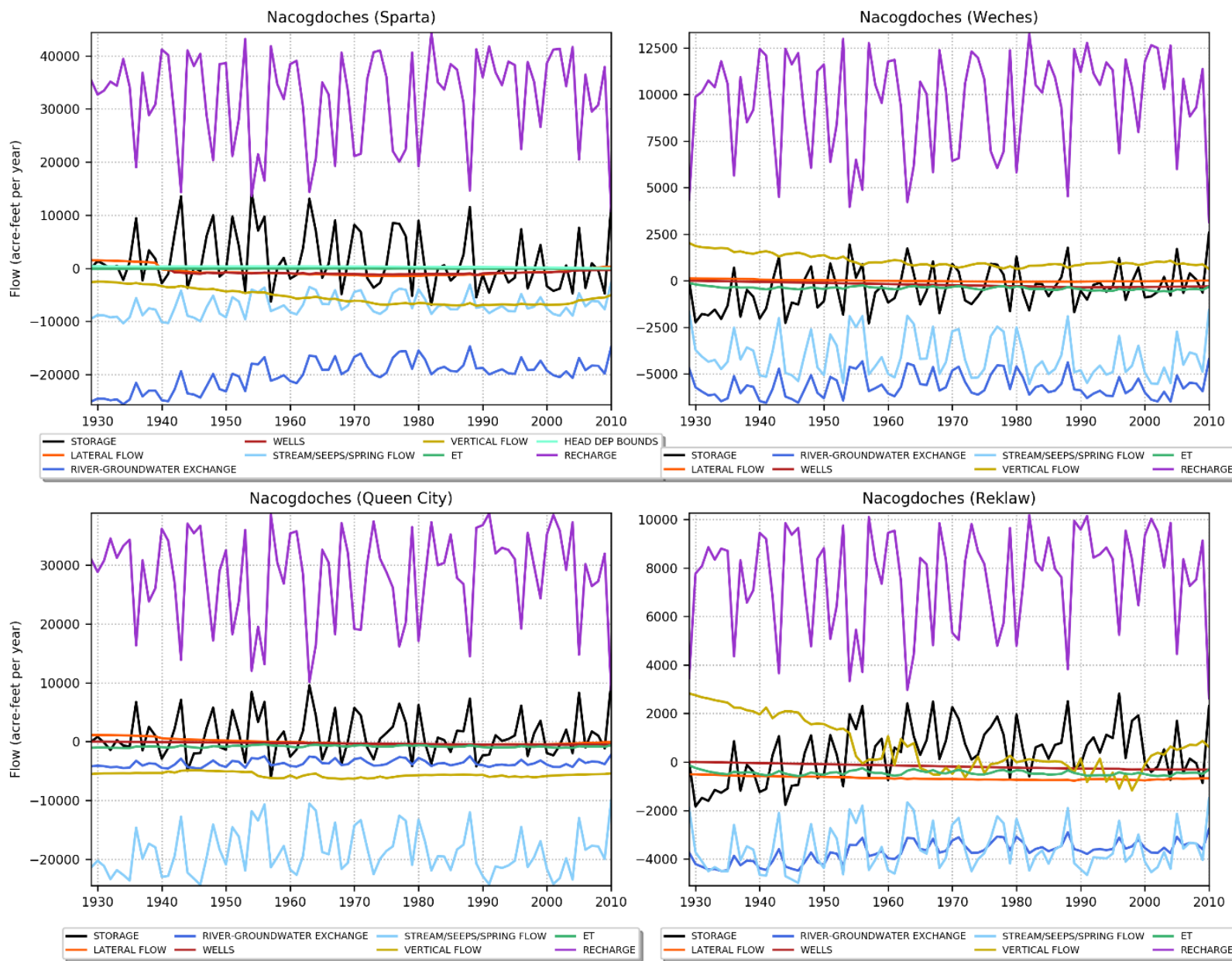
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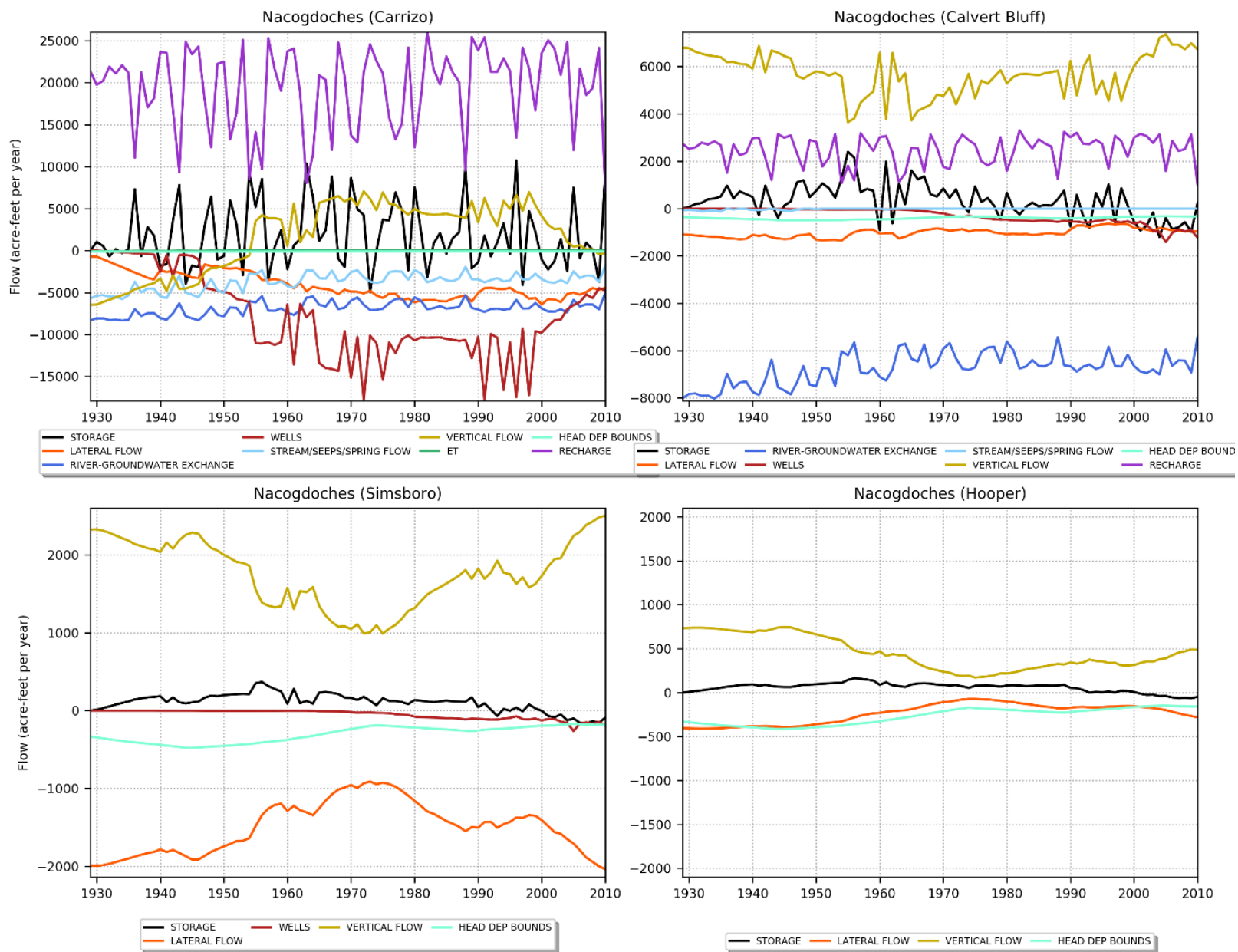
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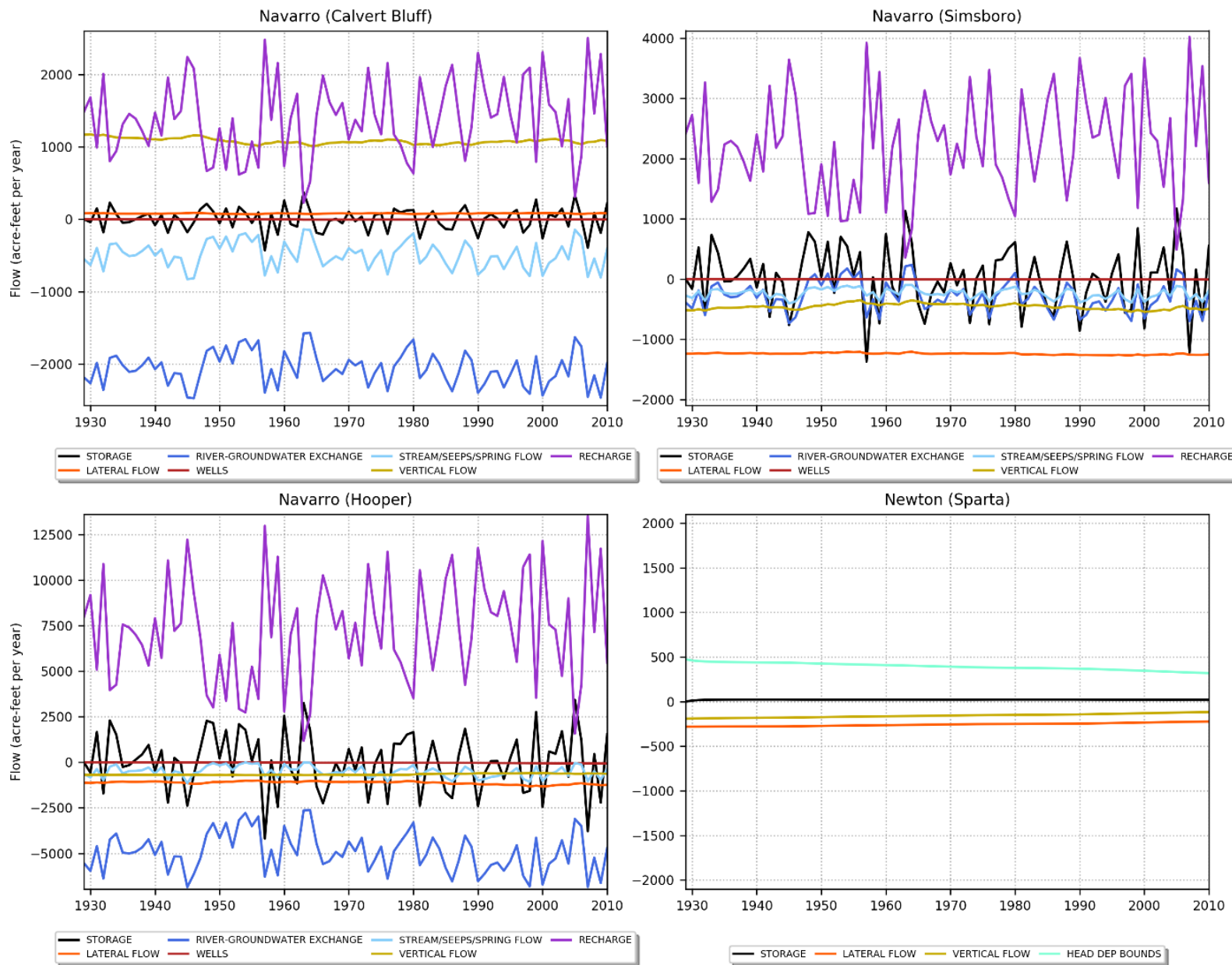
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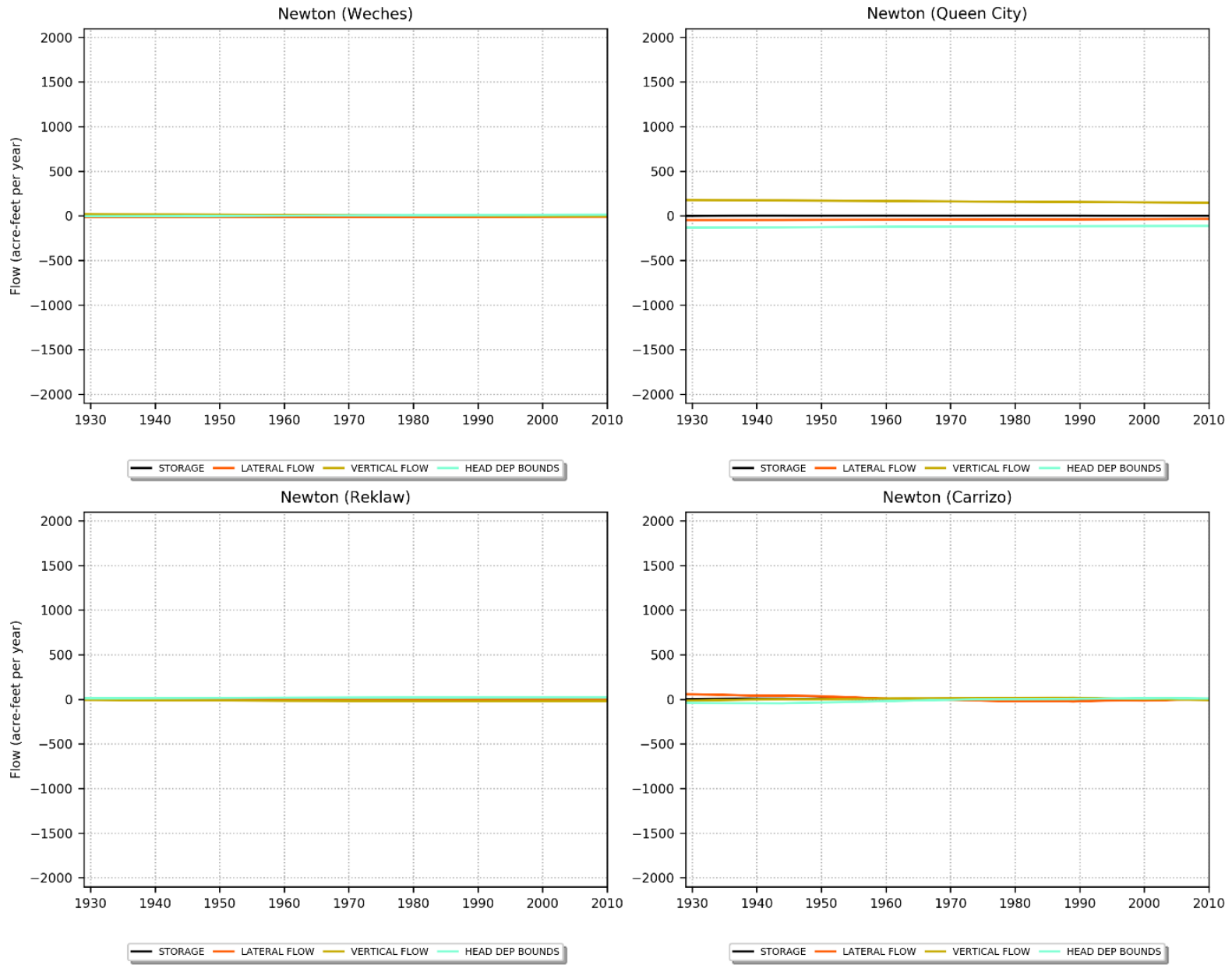
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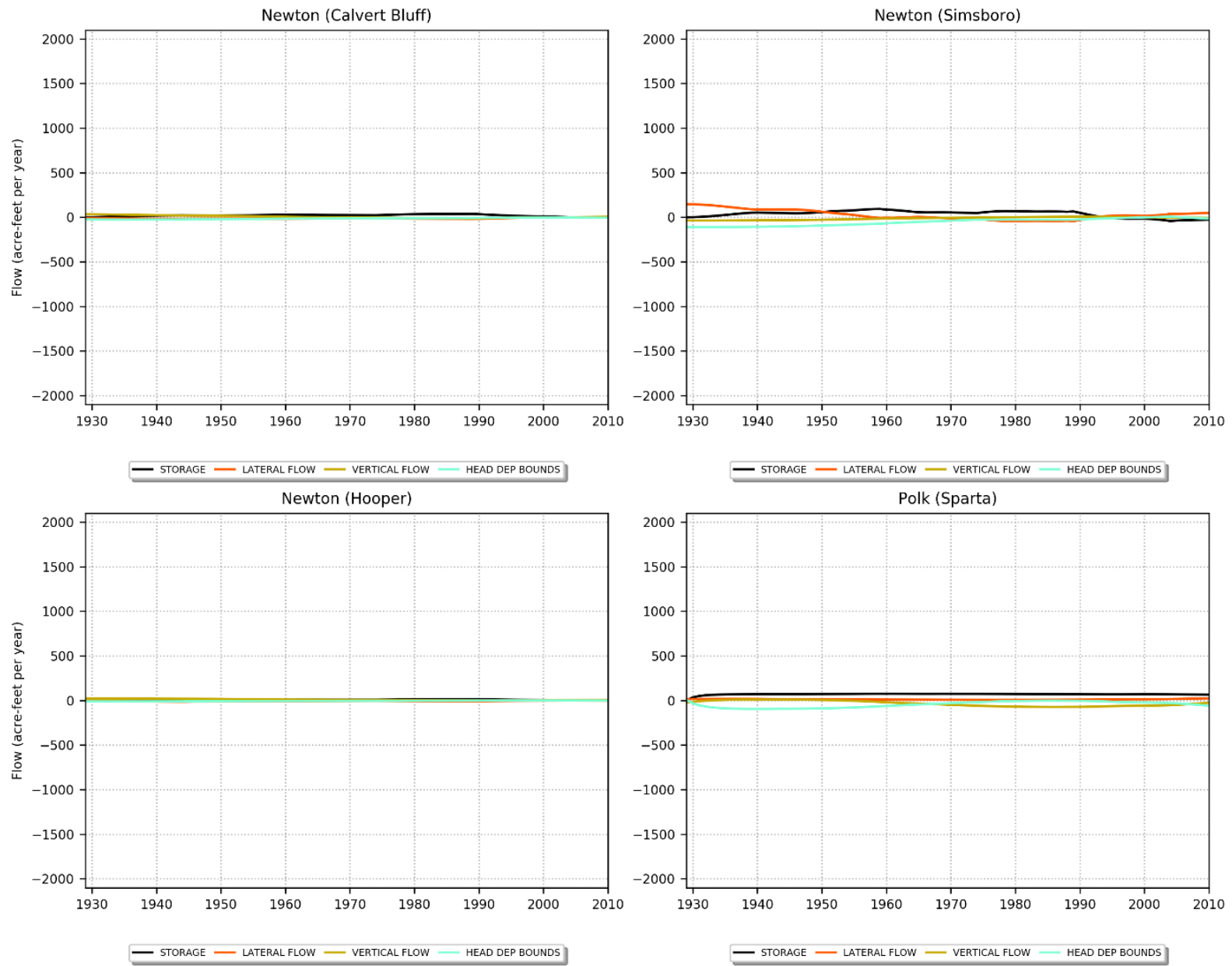
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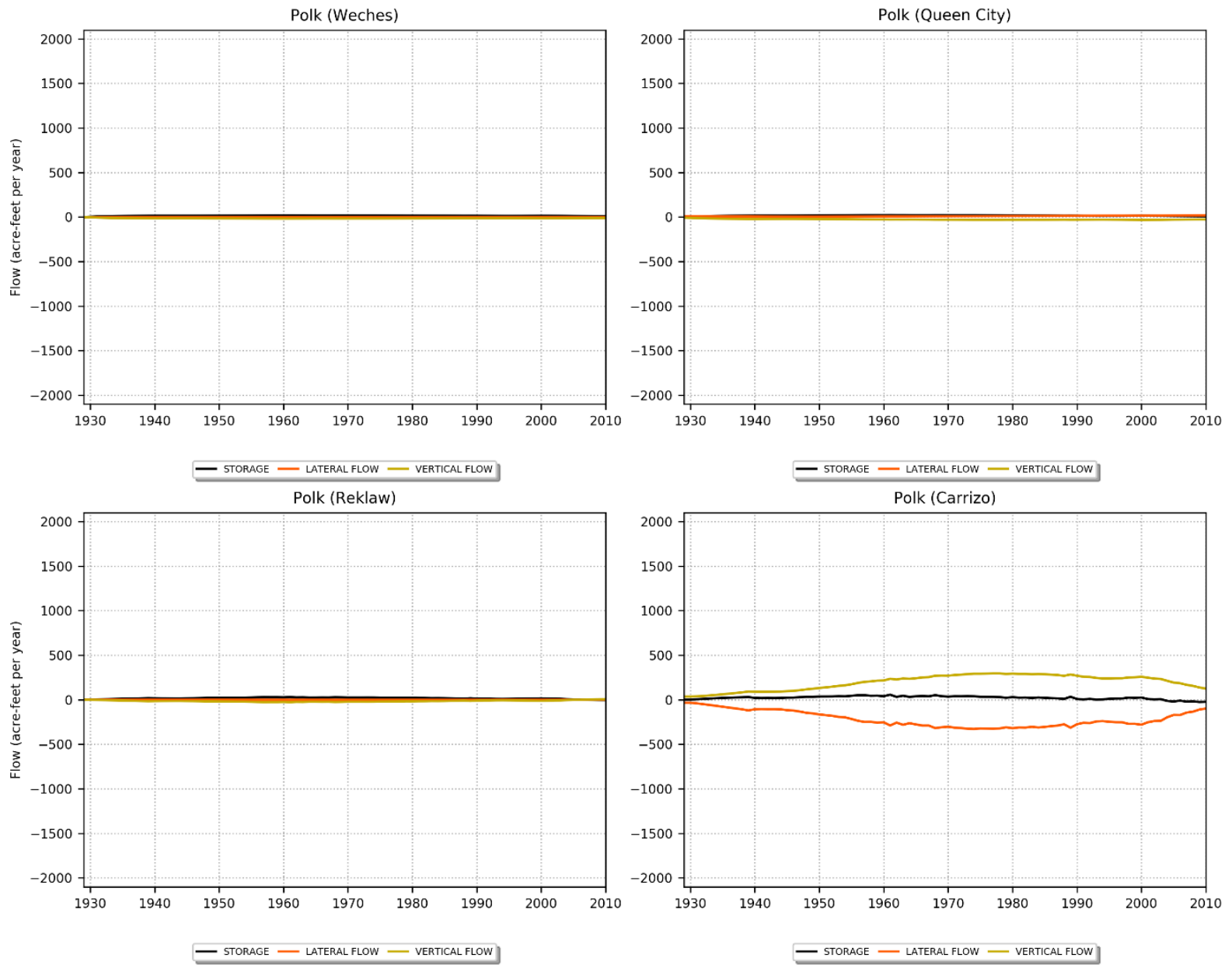
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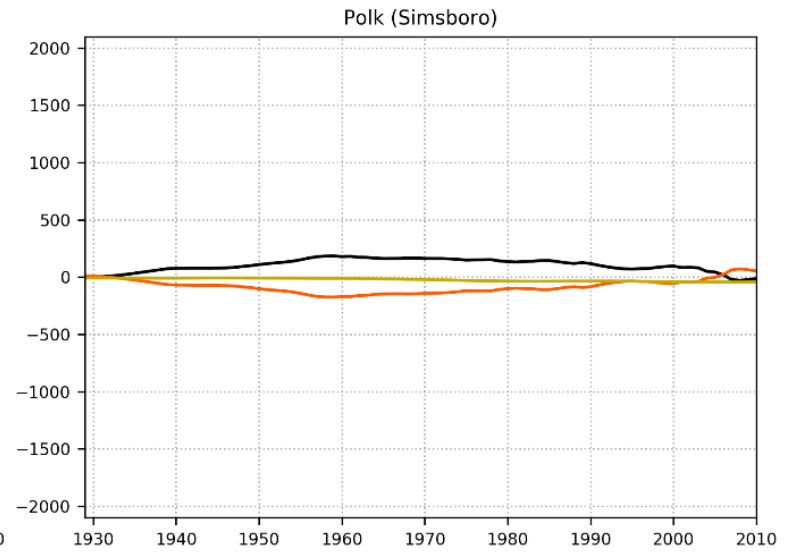
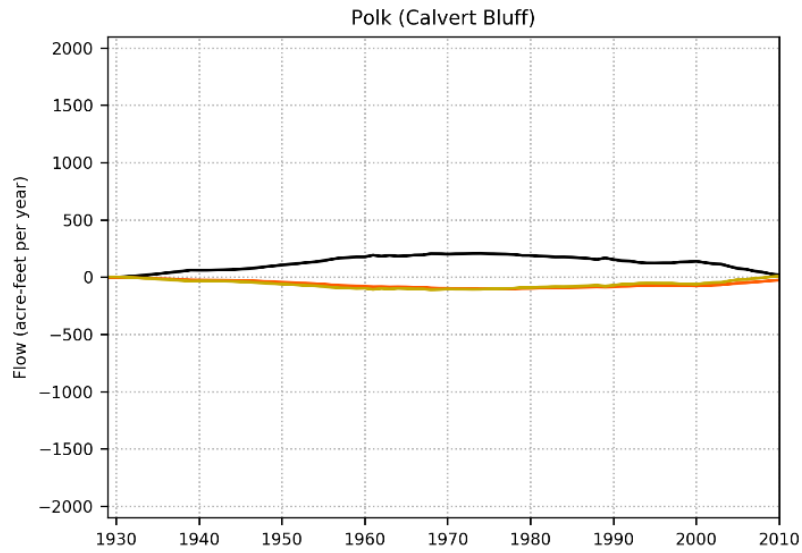
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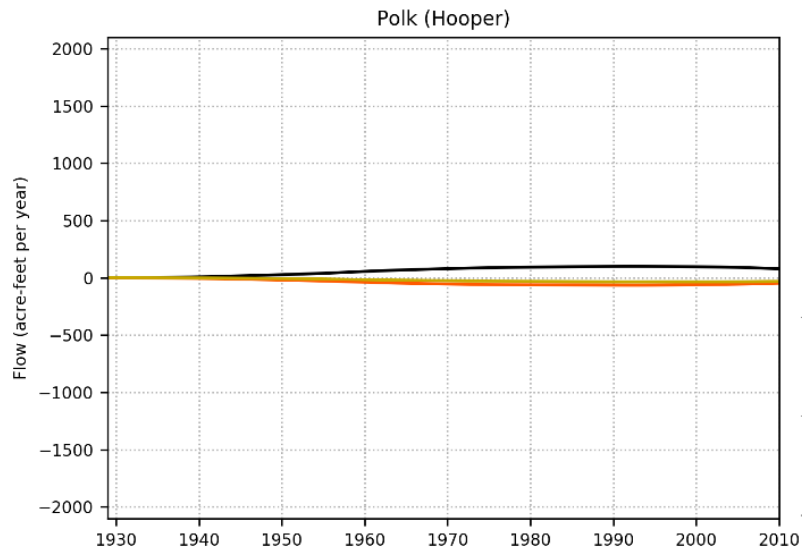


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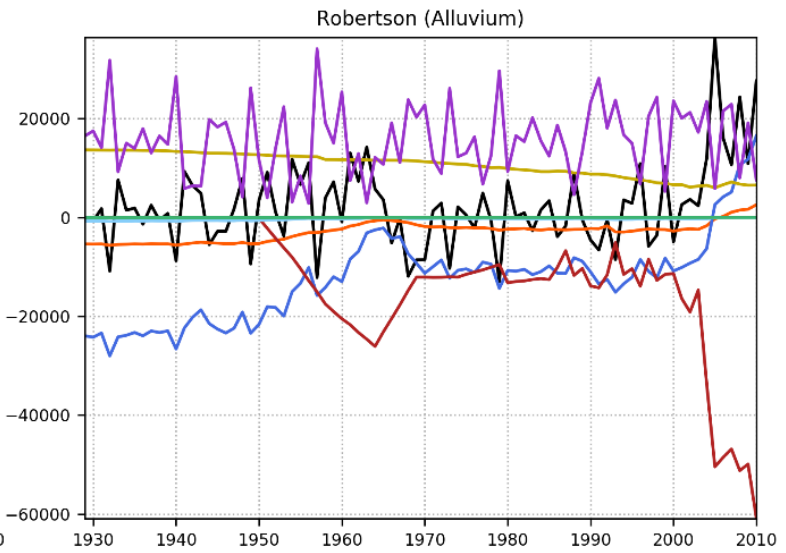


— STORAGE — LATERAL FLOW — VERTICAL FLOW

— STORAGE — LATERAL FLOW — VERTICAL FLOW

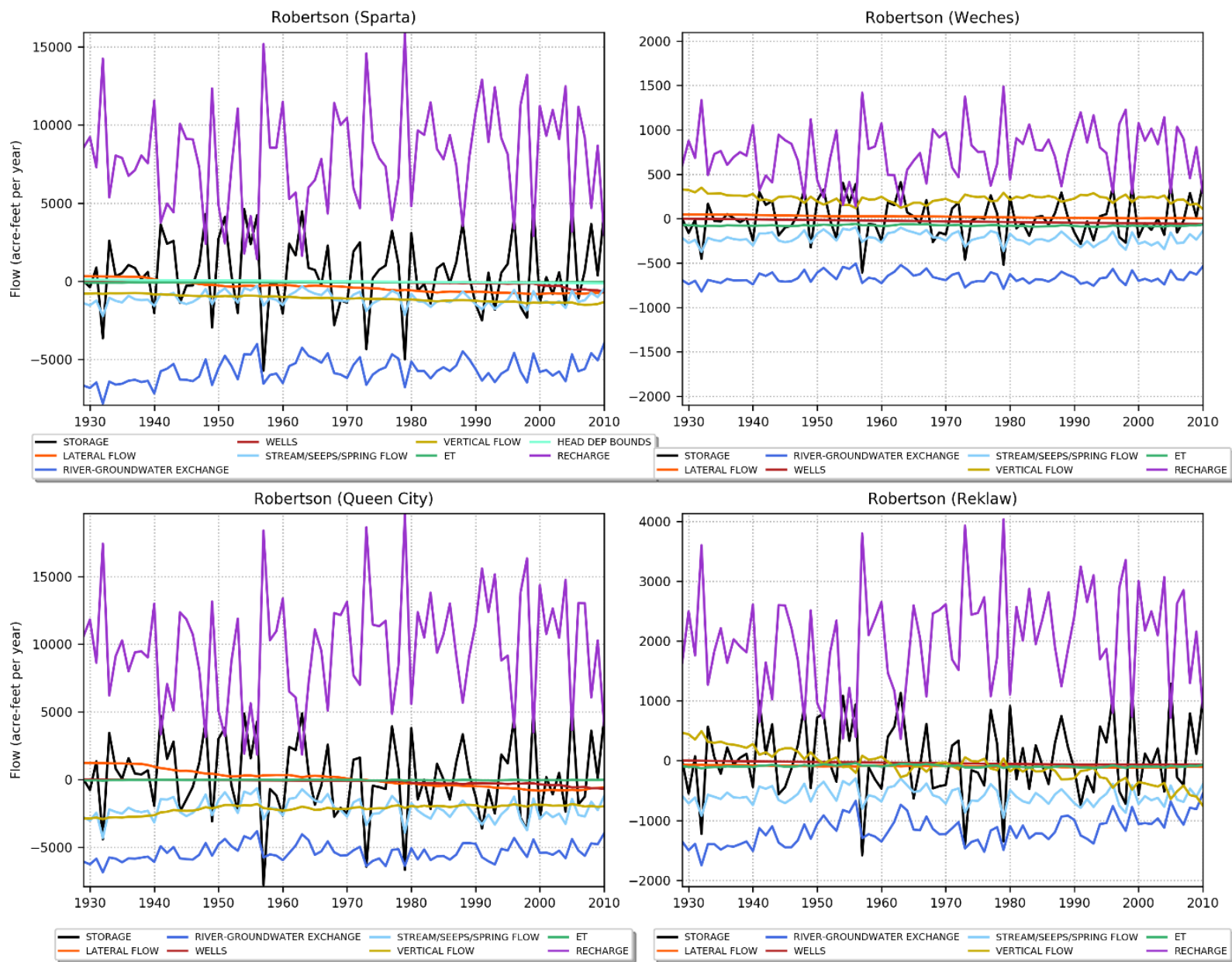


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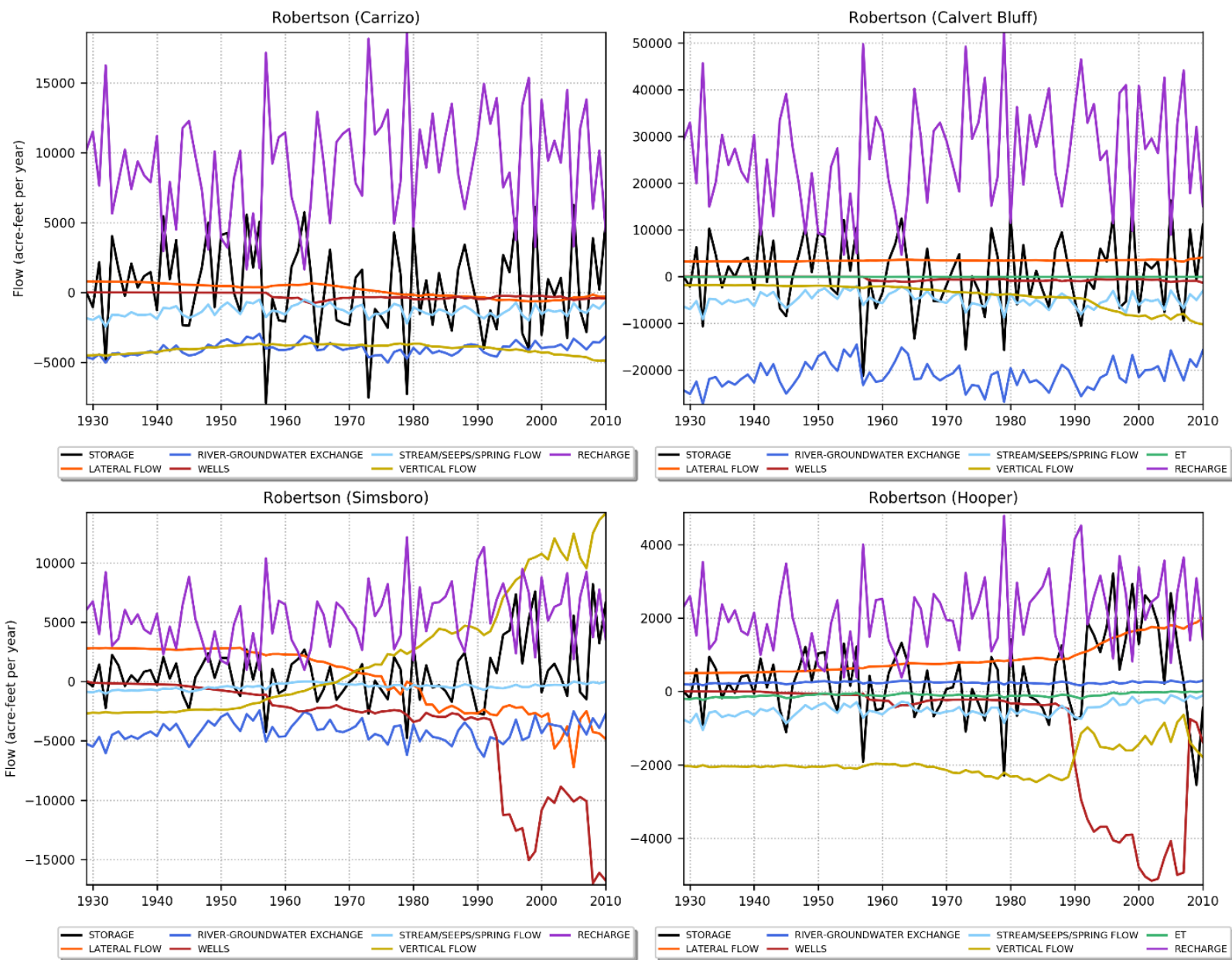


— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



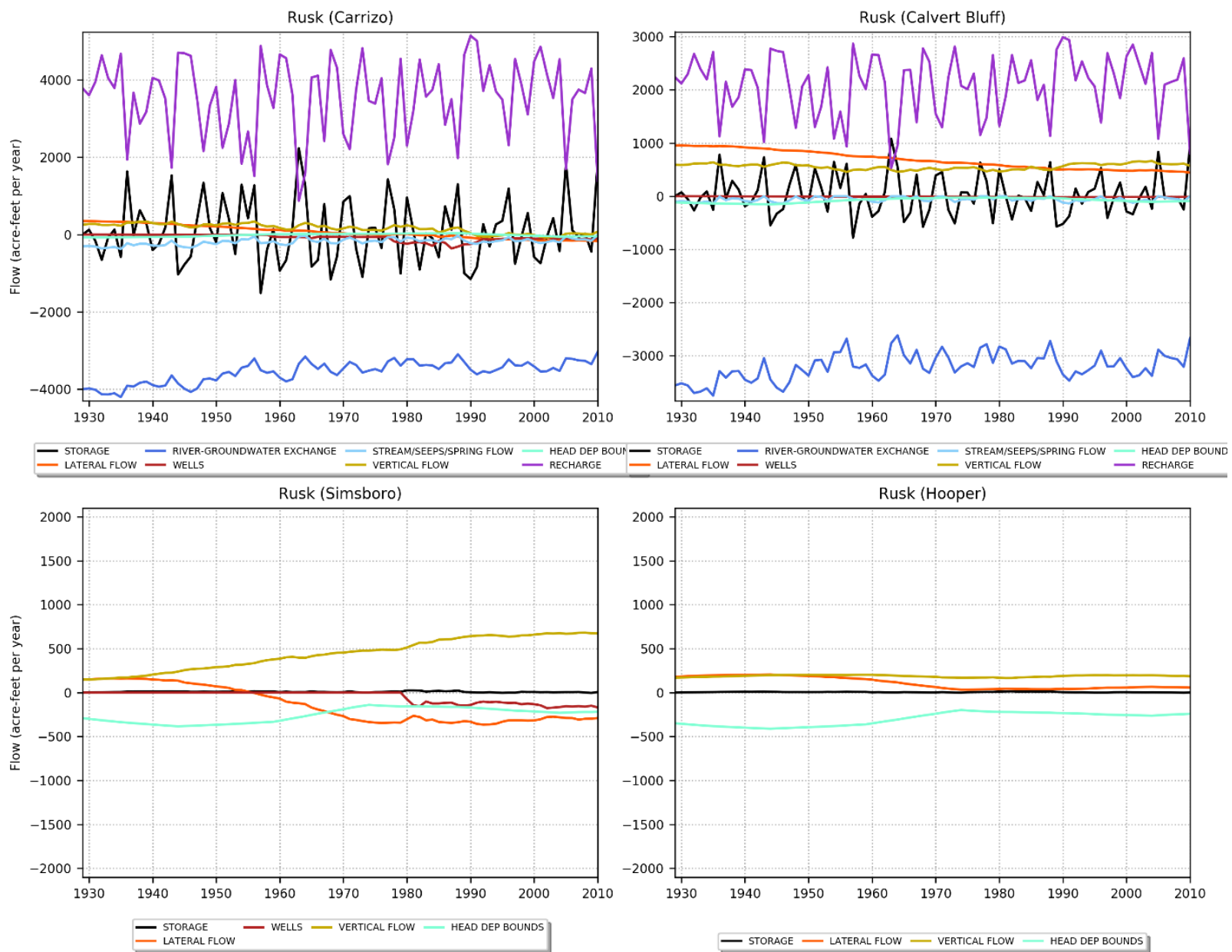
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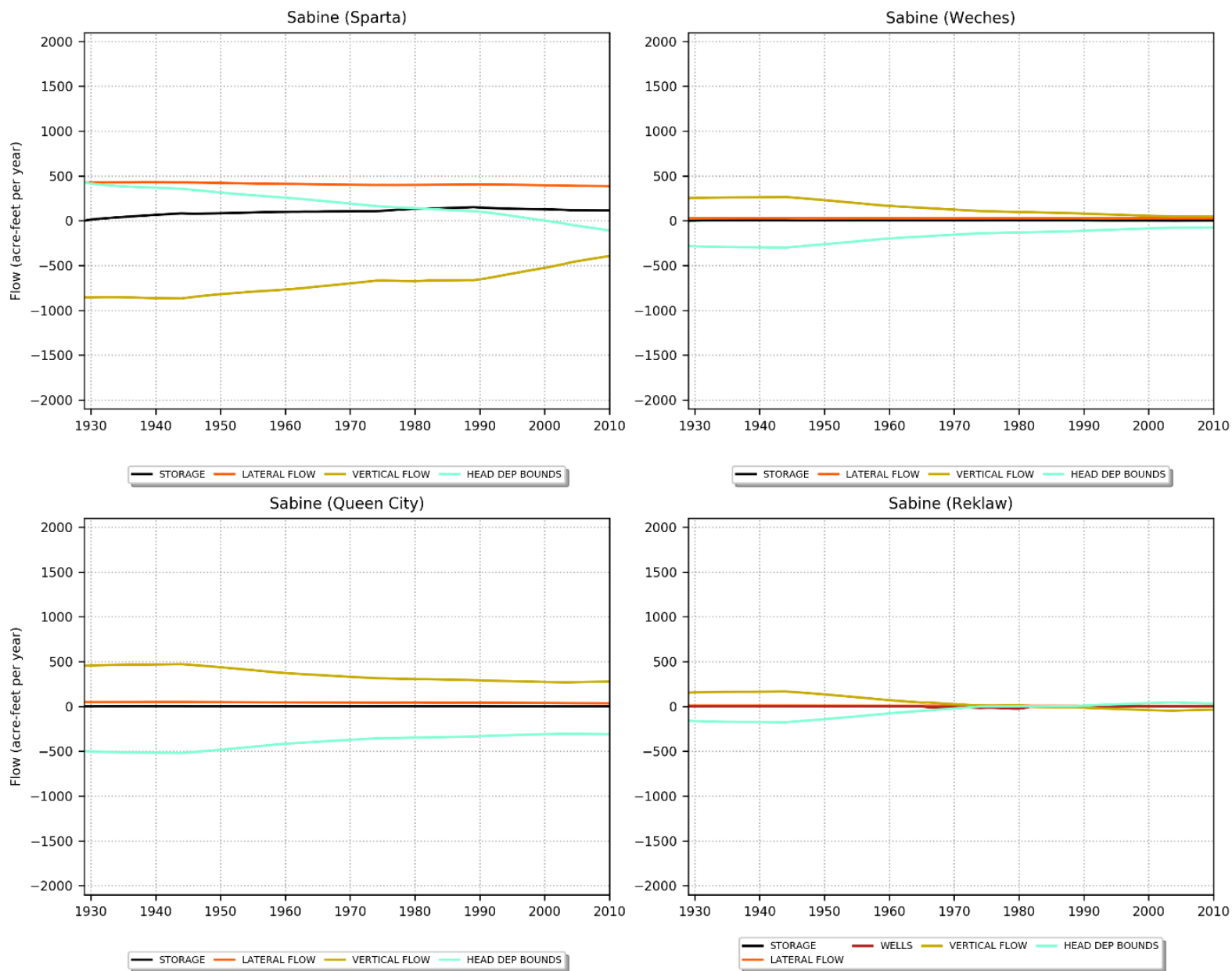
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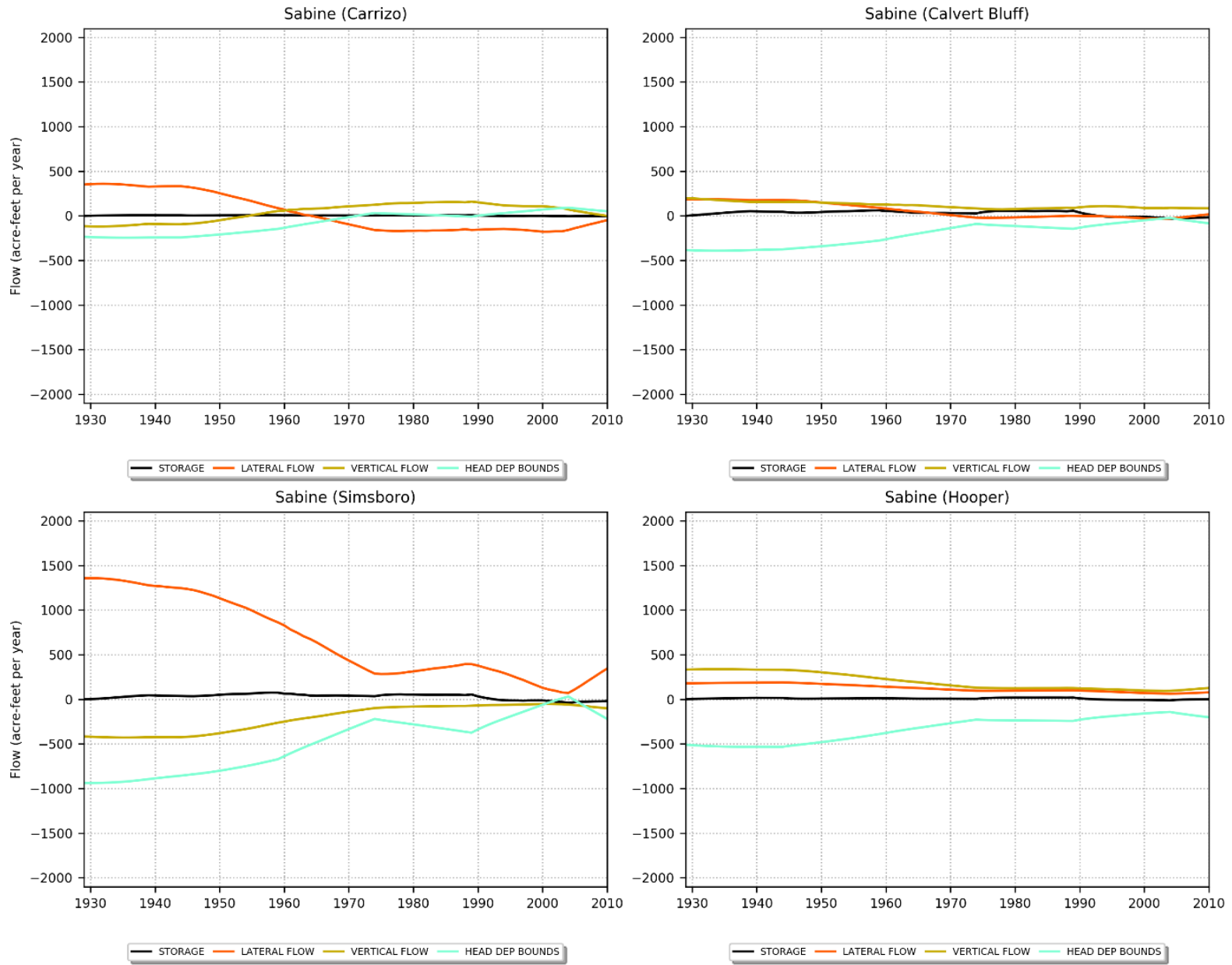
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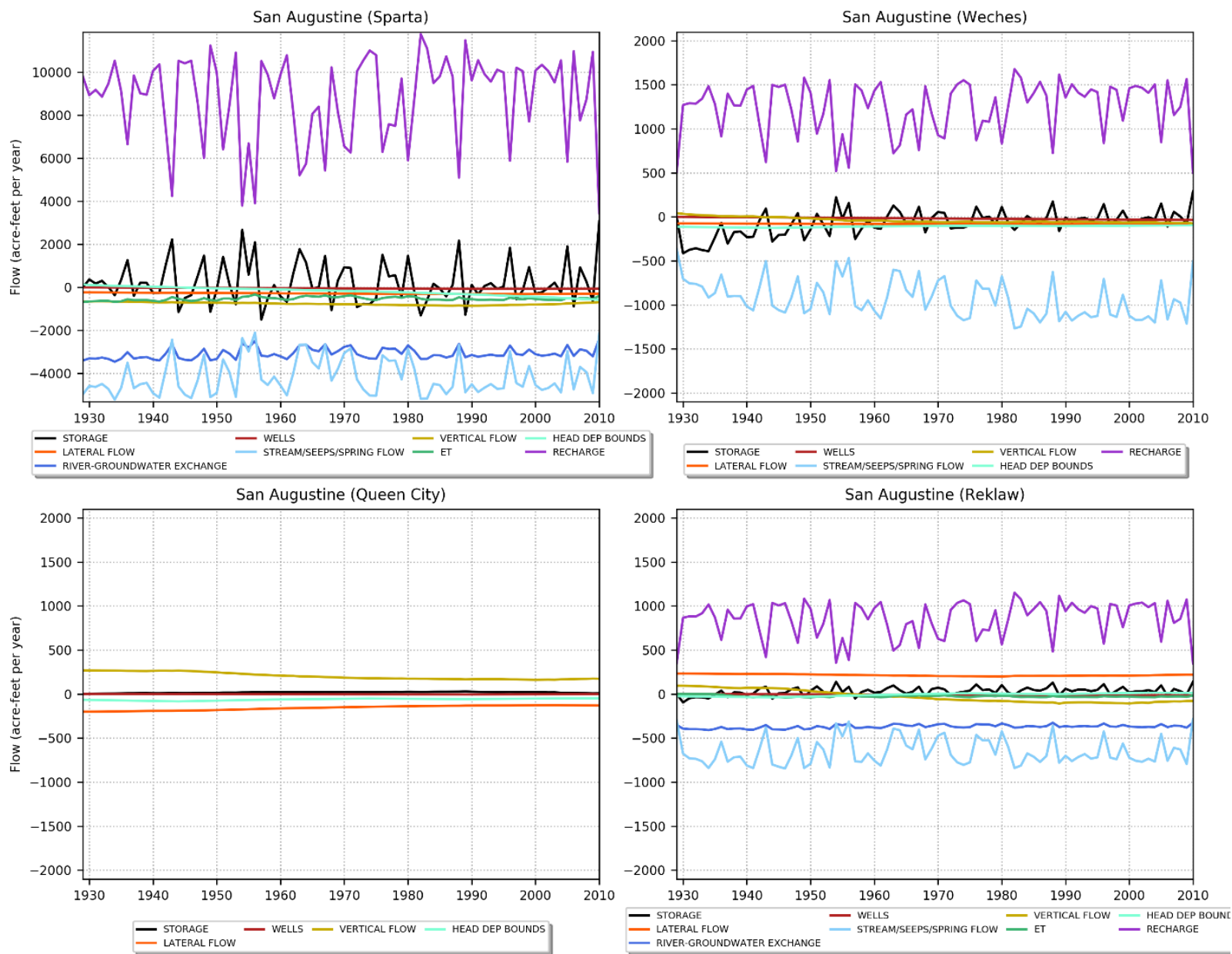
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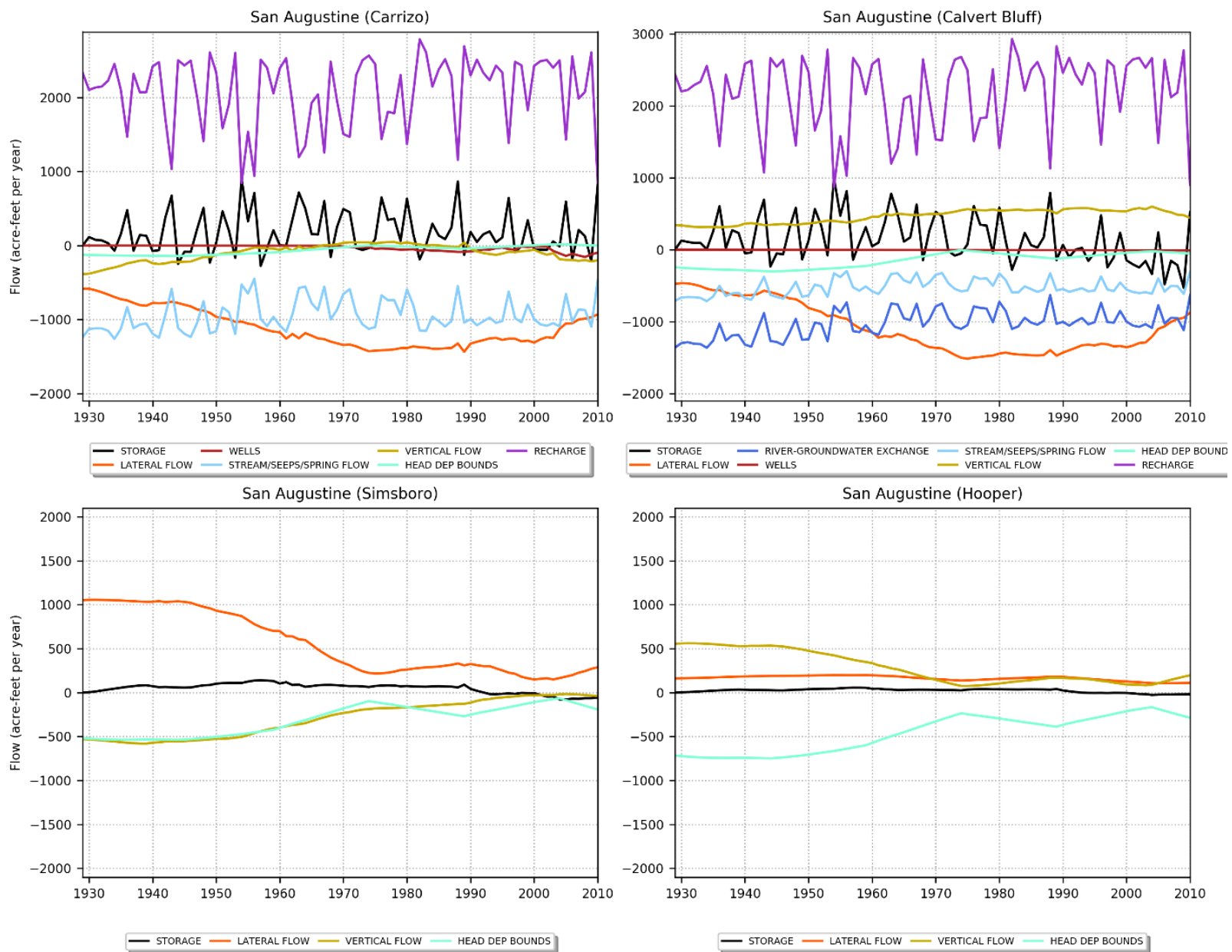
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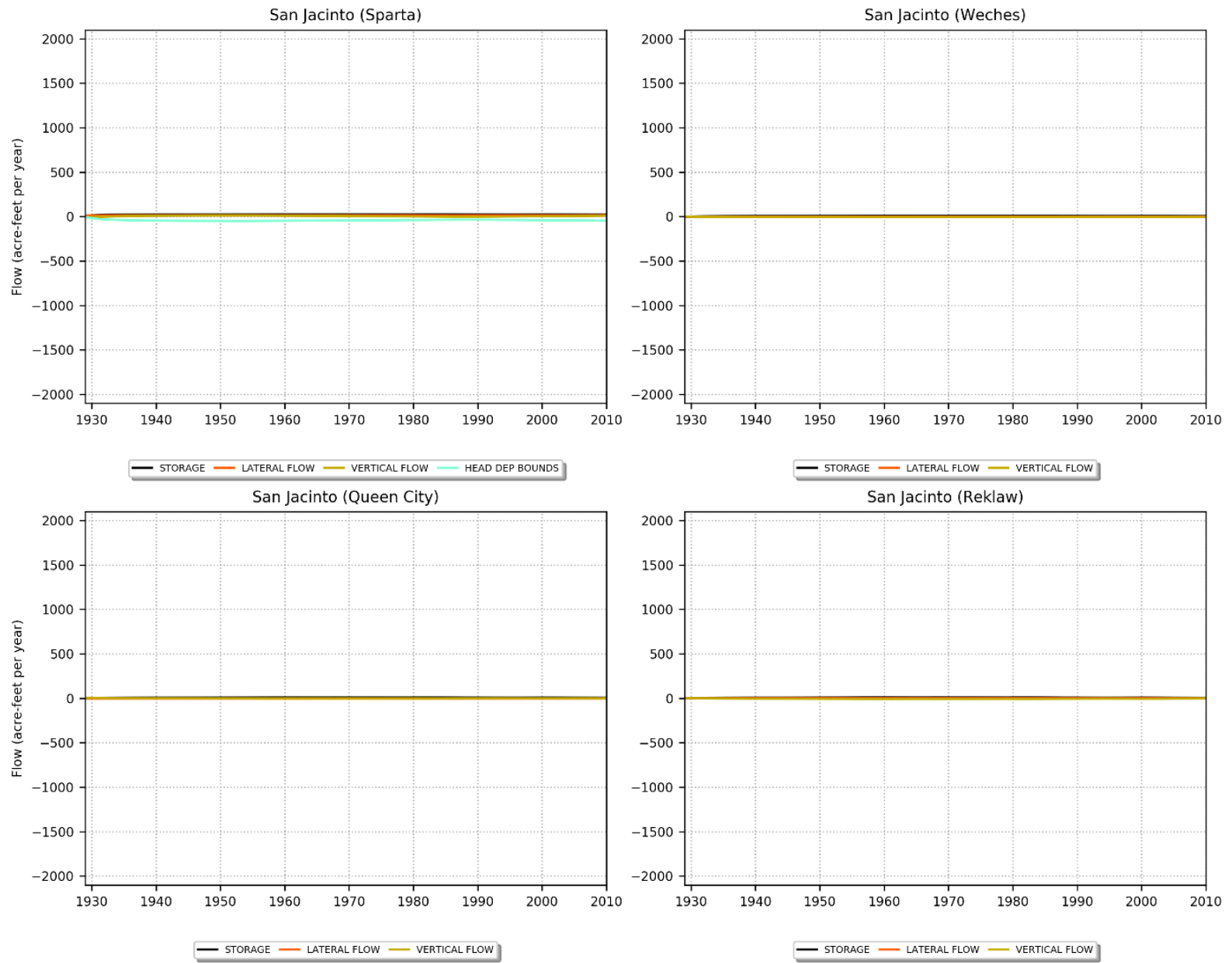
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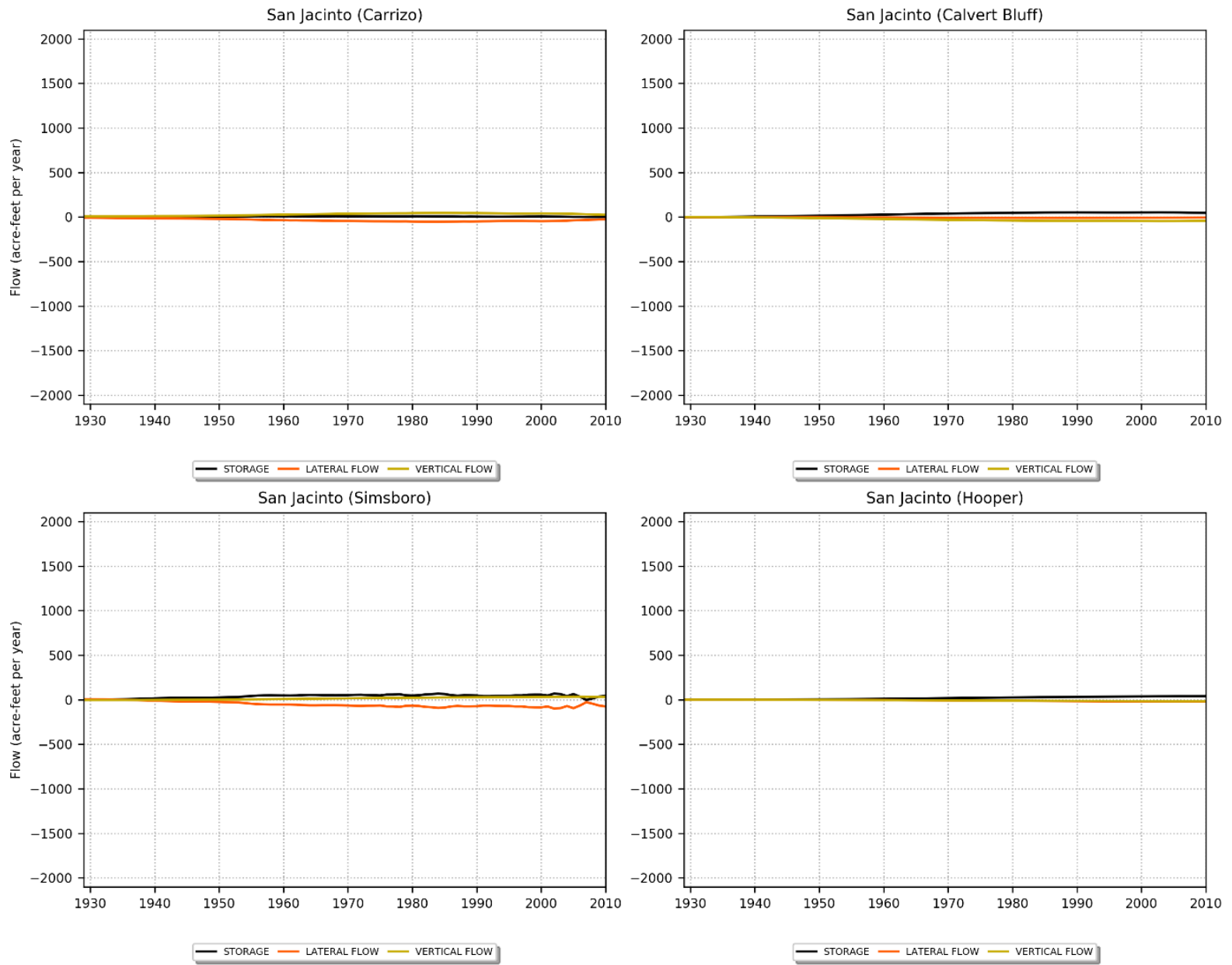
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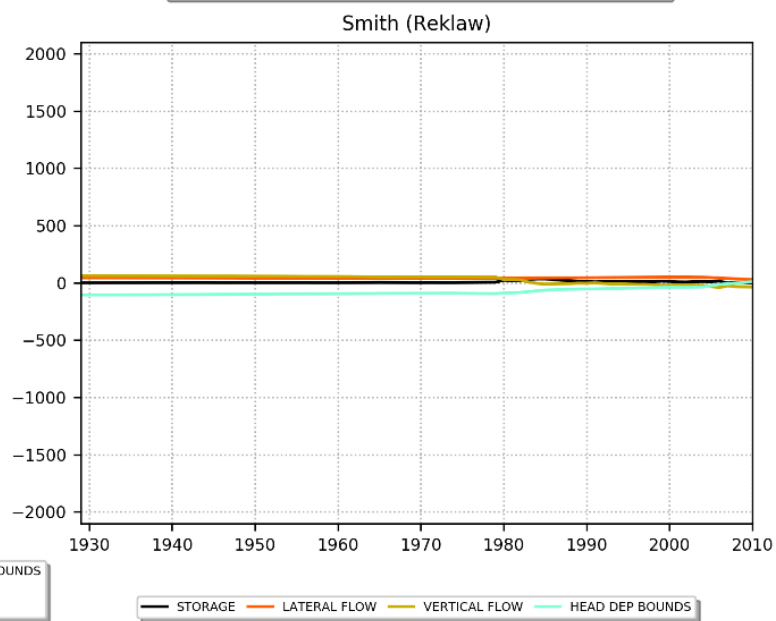
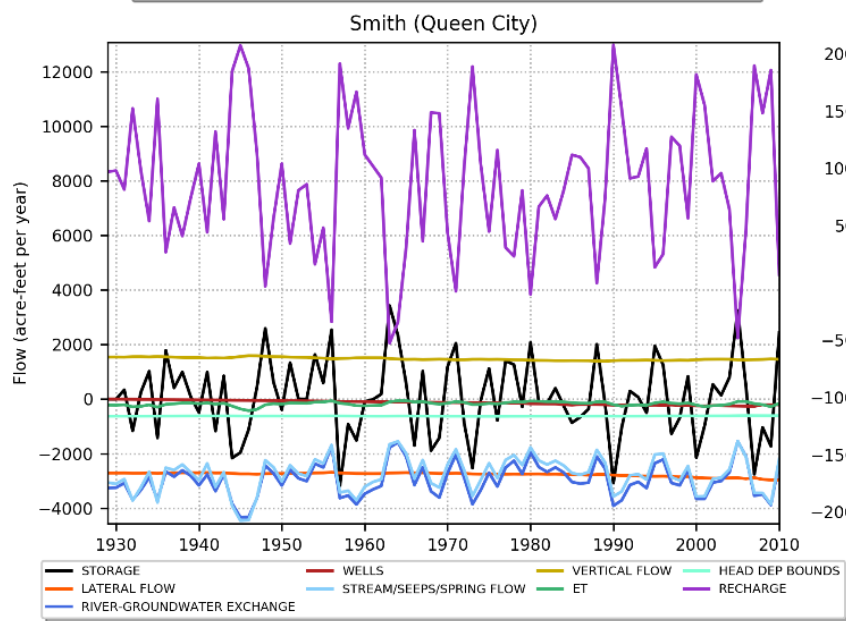
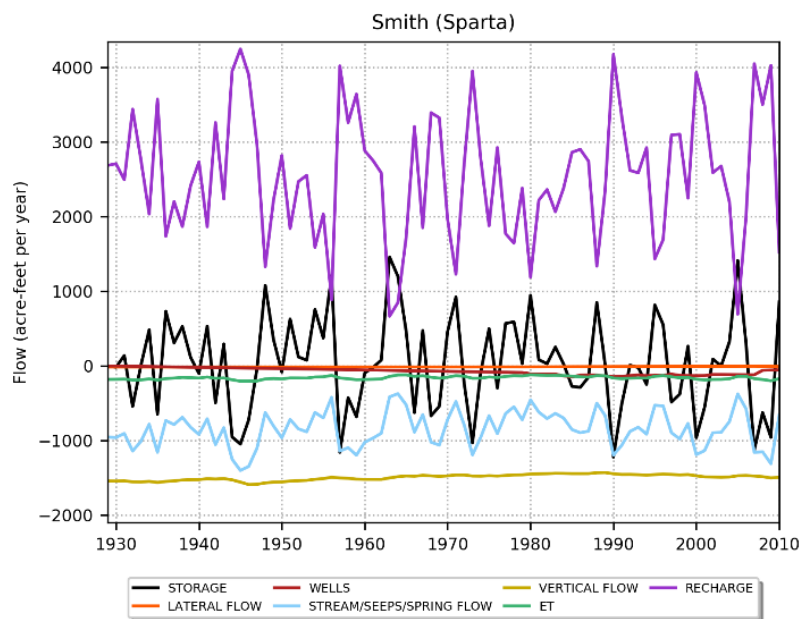
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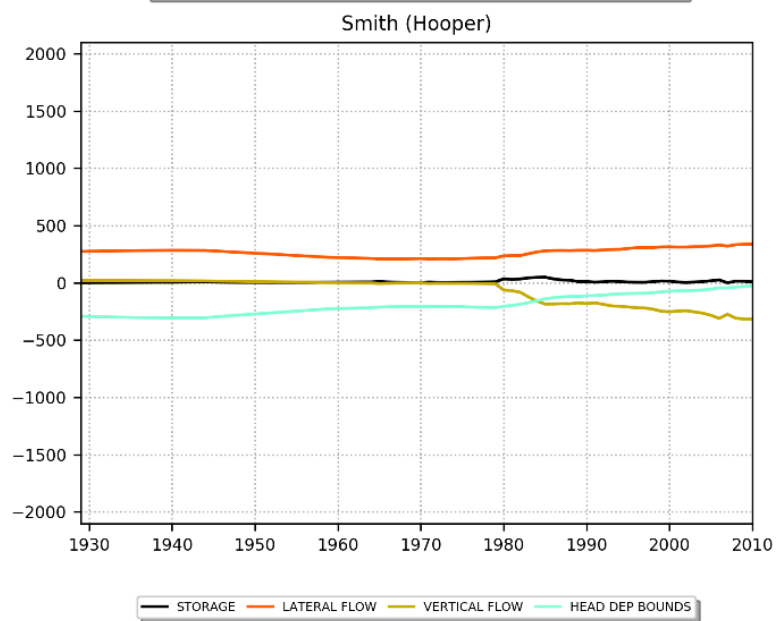
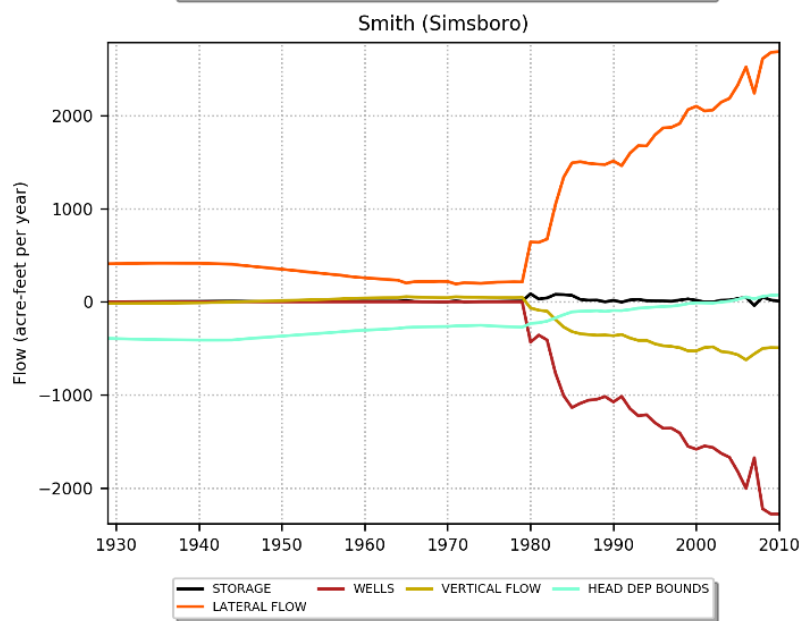
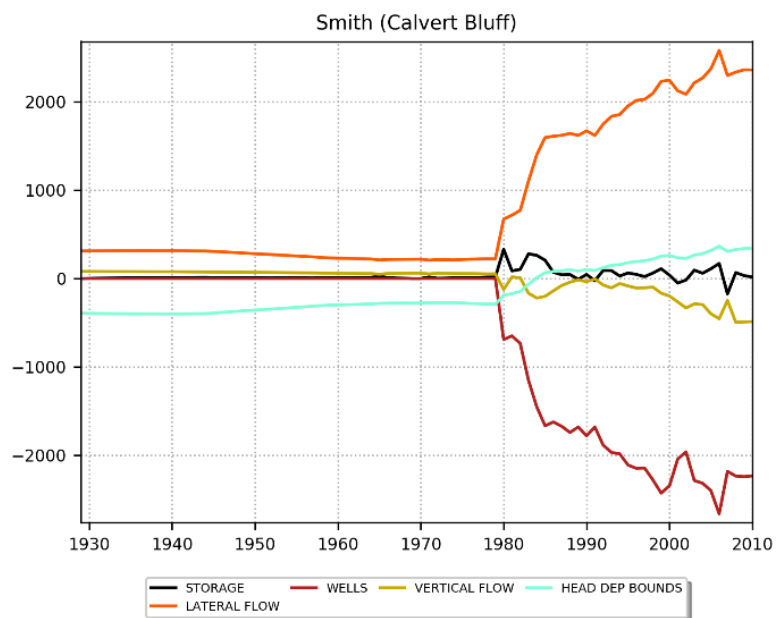
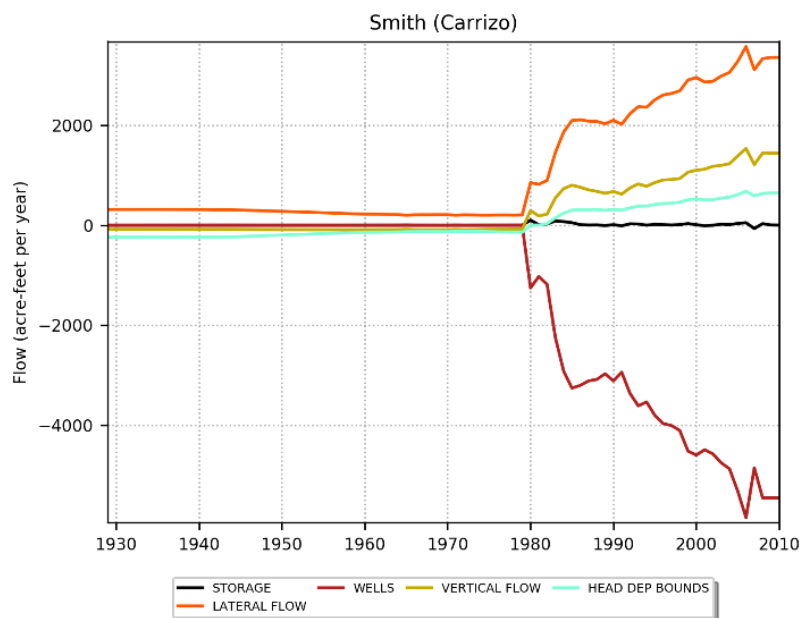
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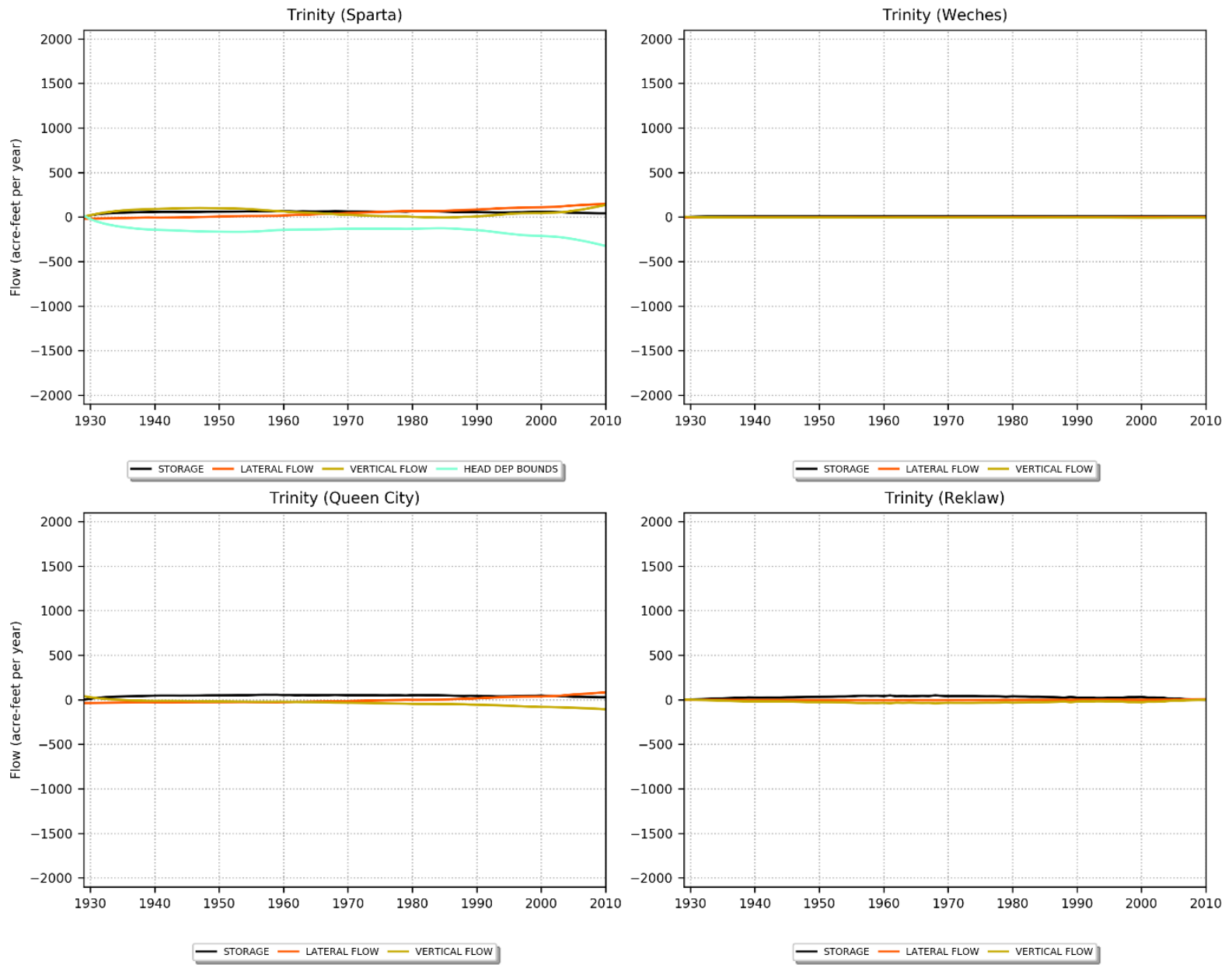
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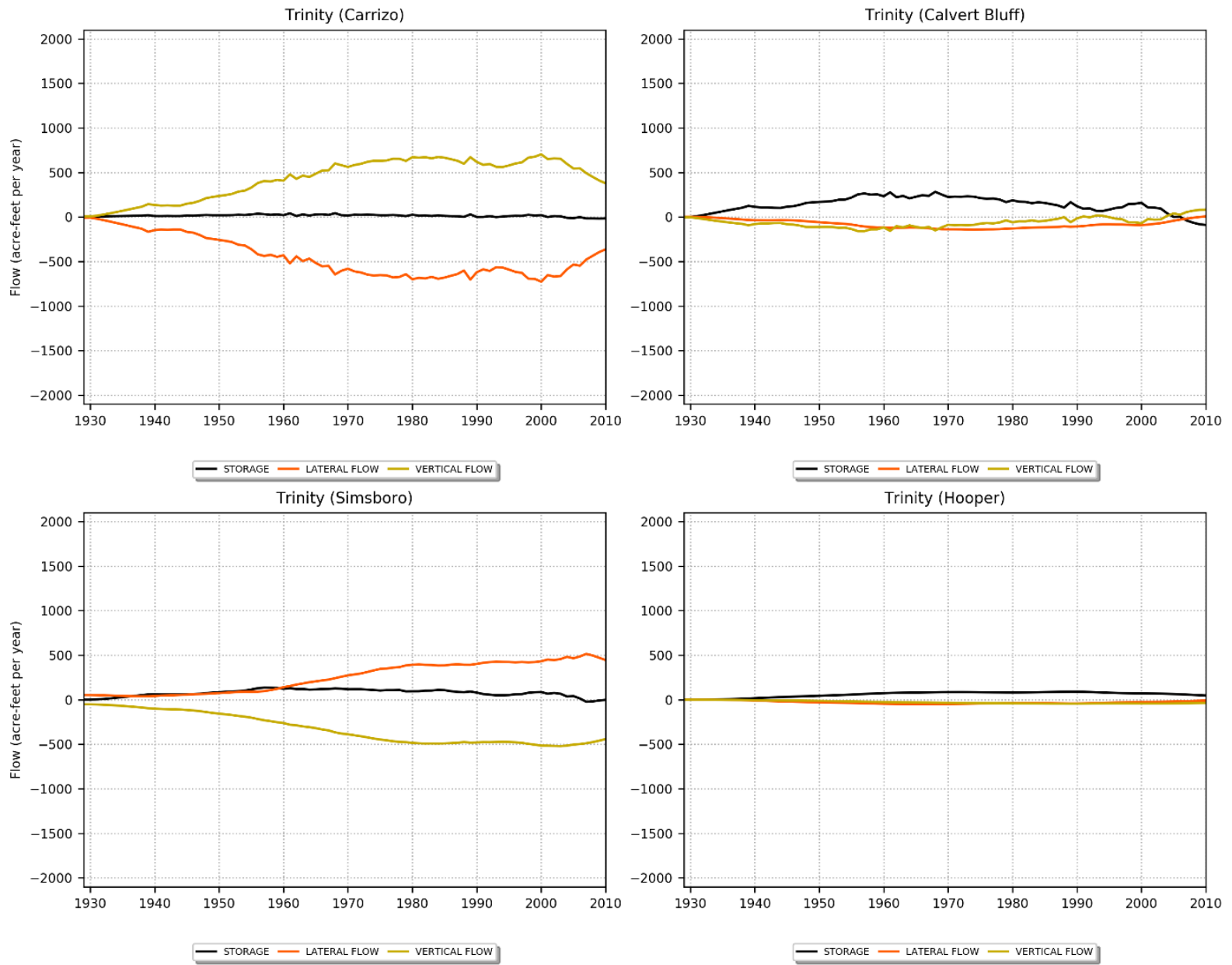
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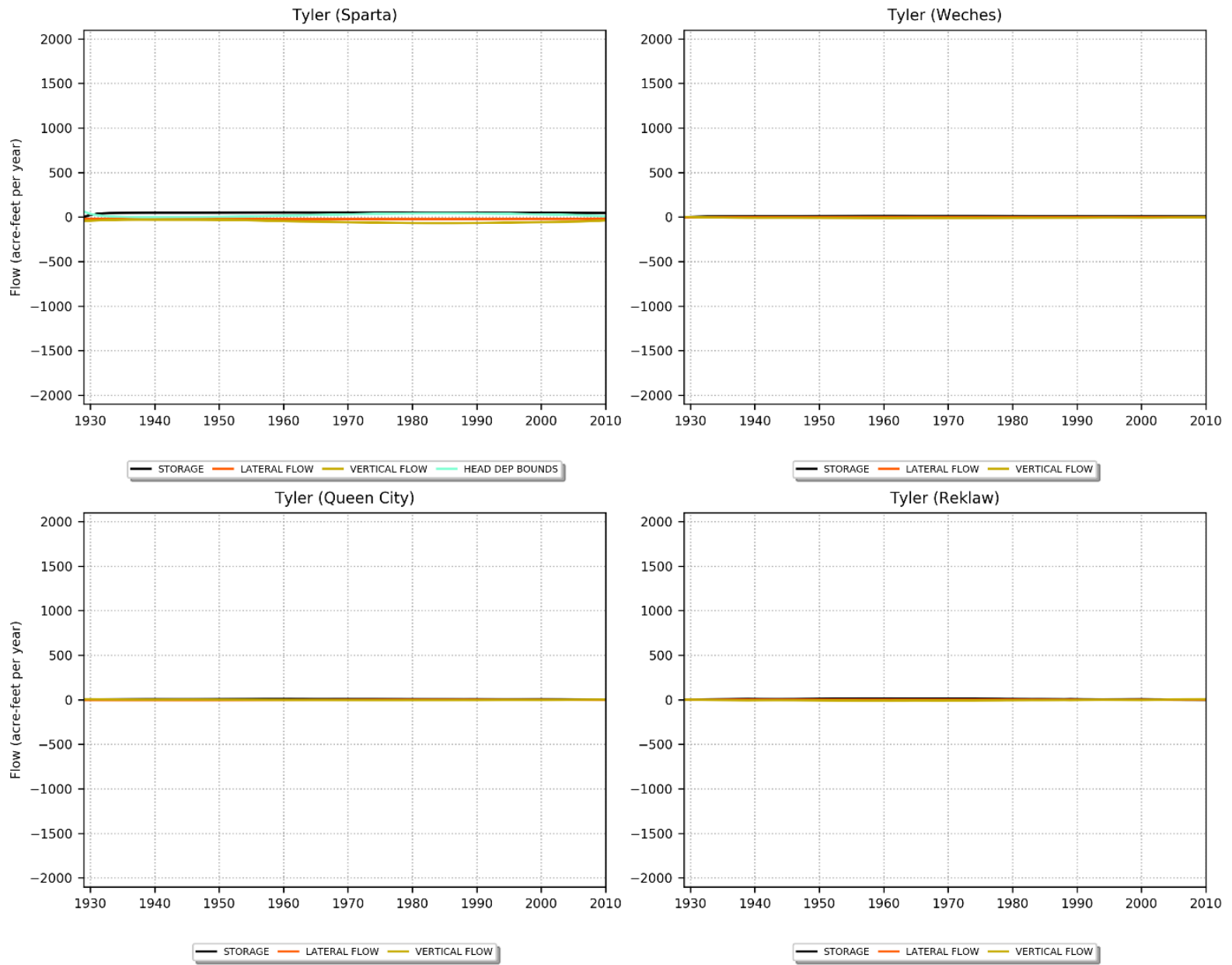
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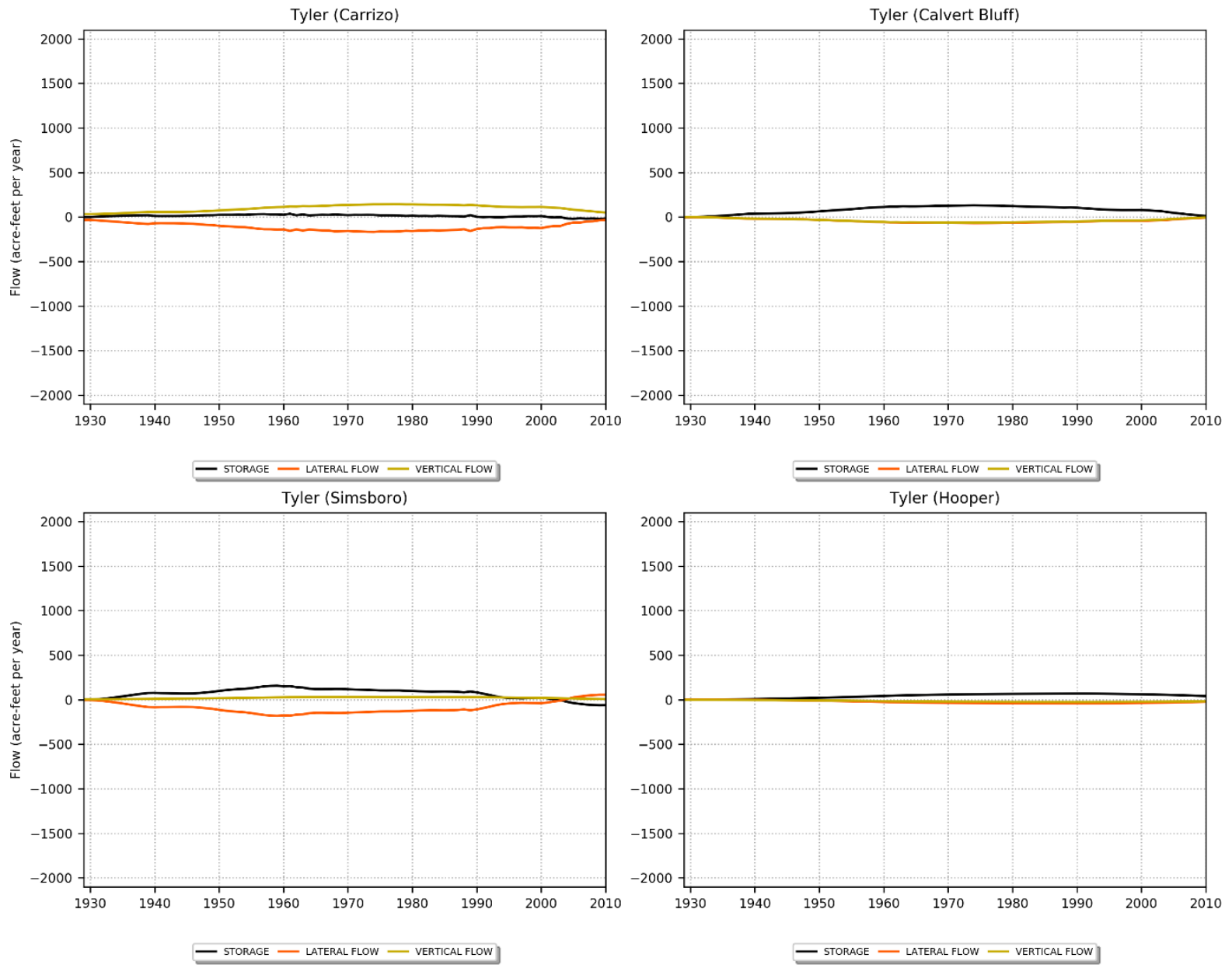
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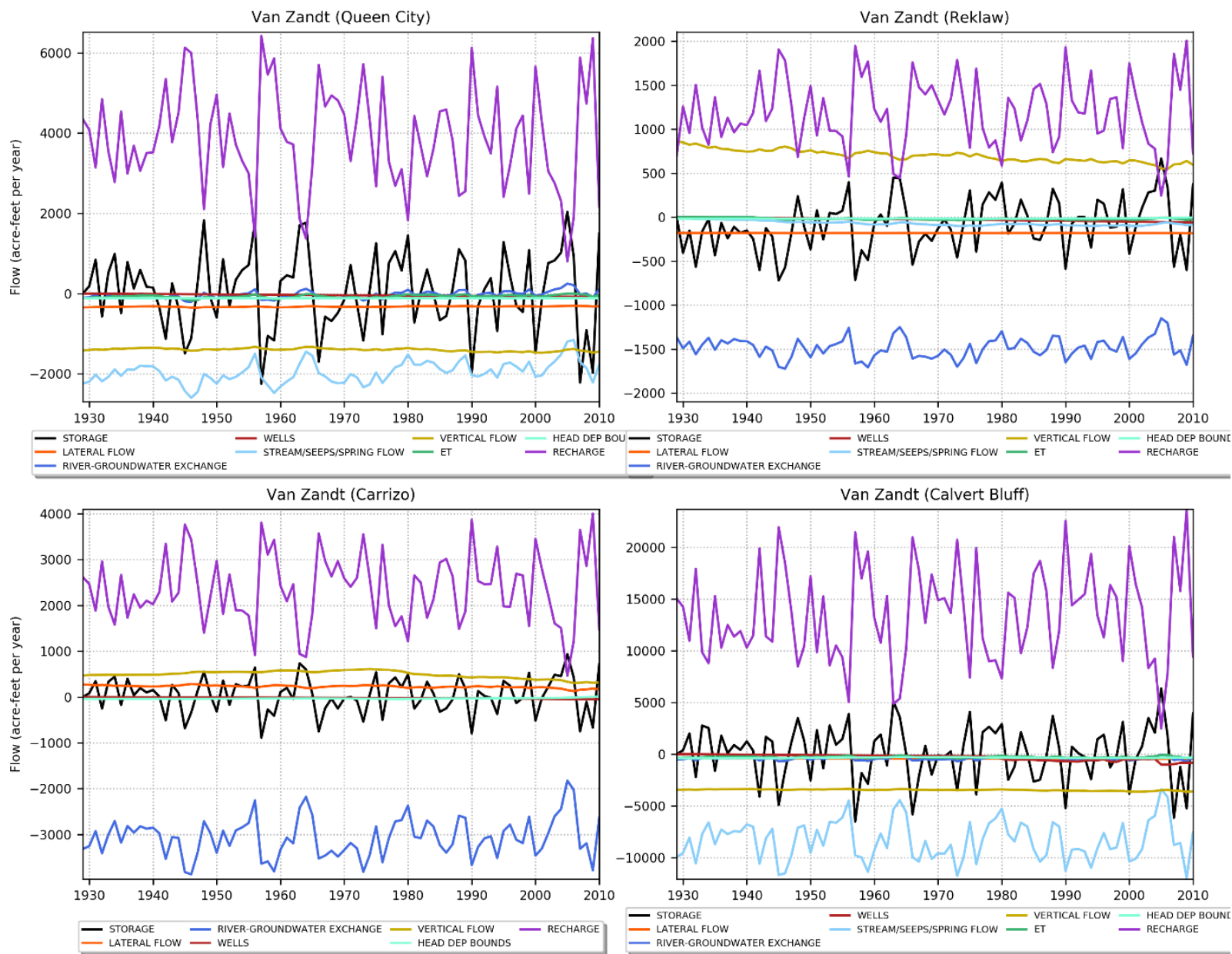
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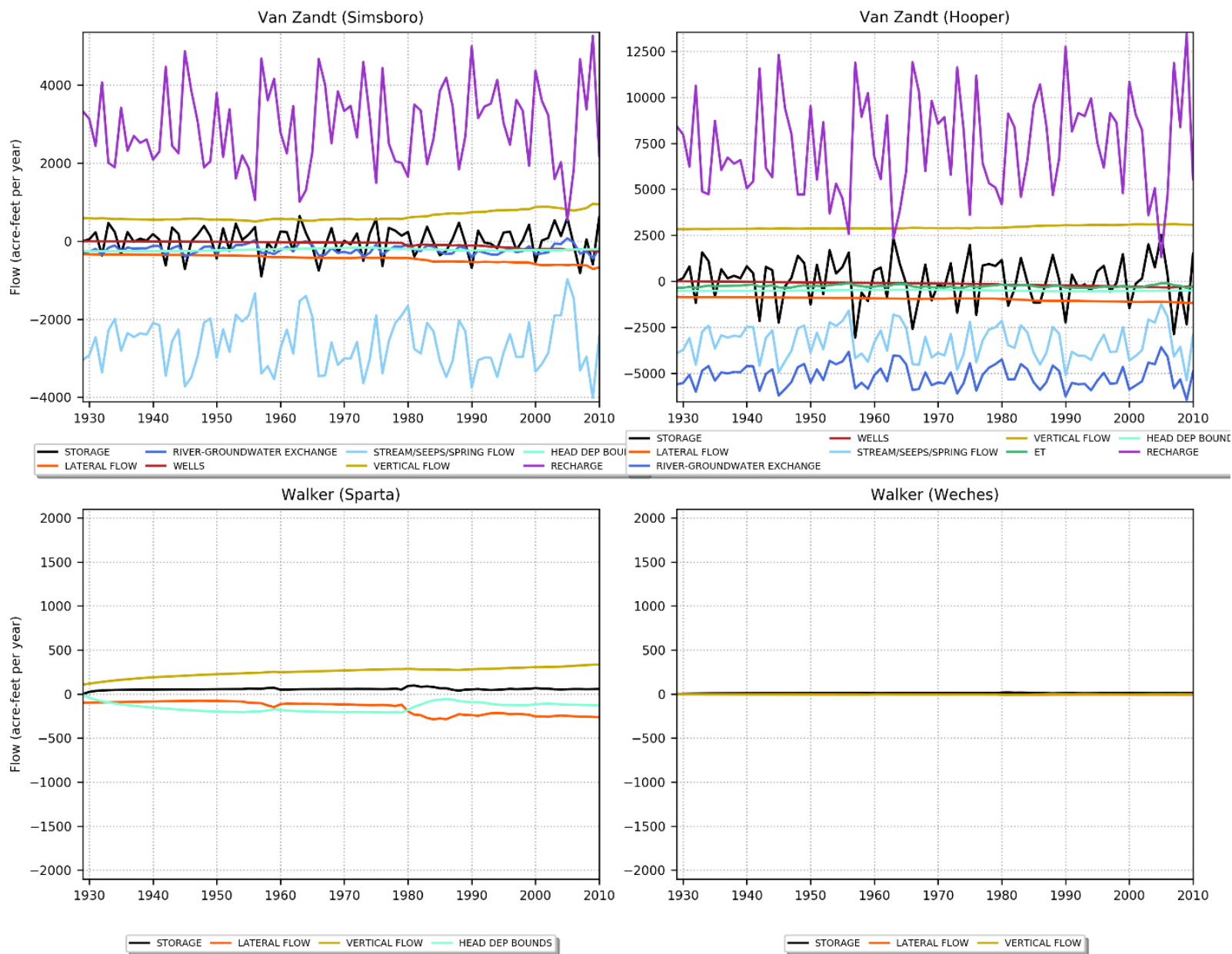
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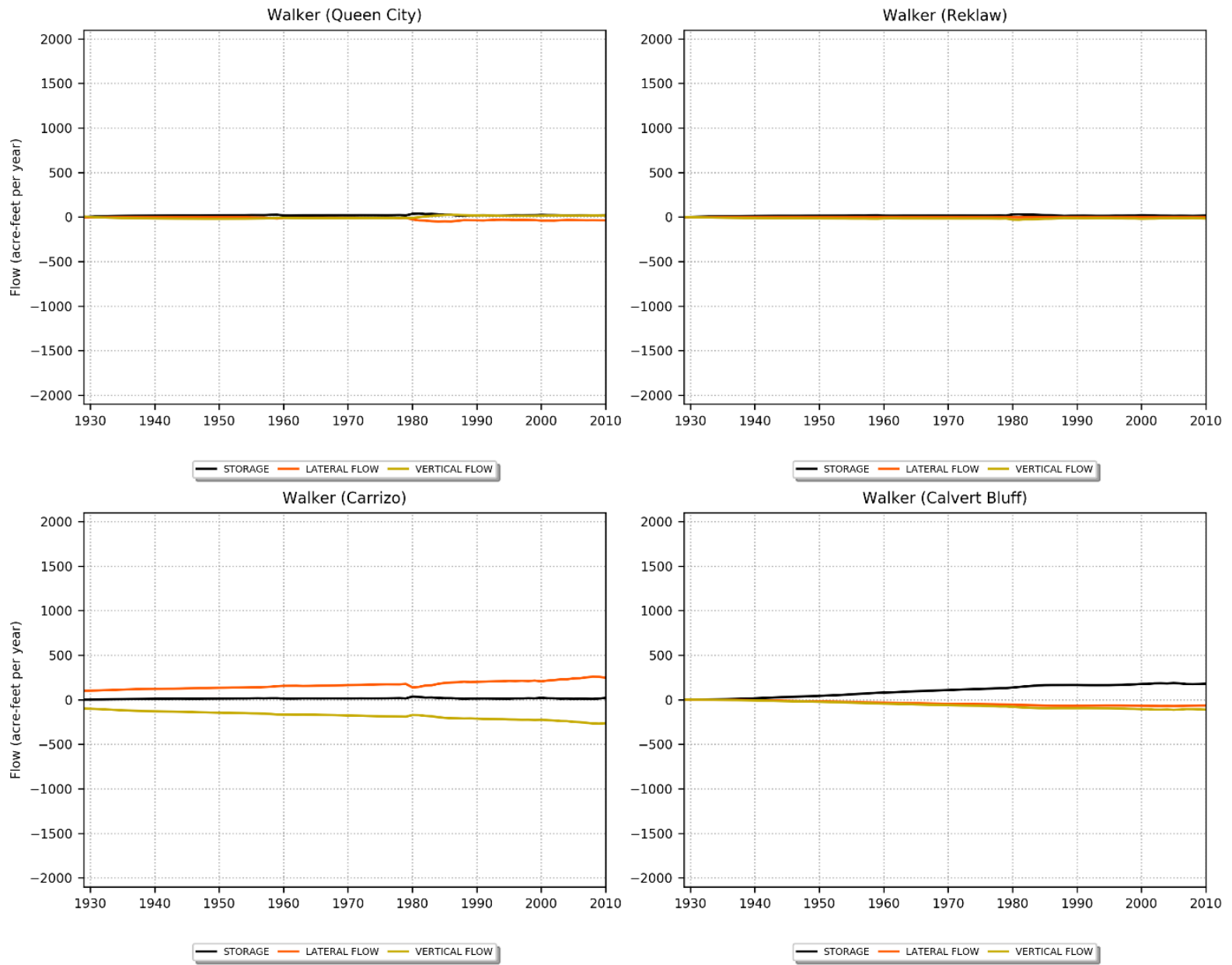
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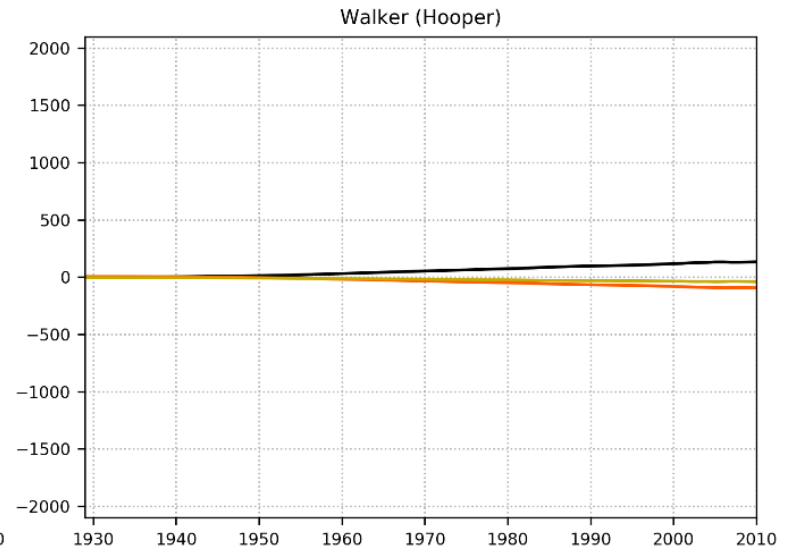
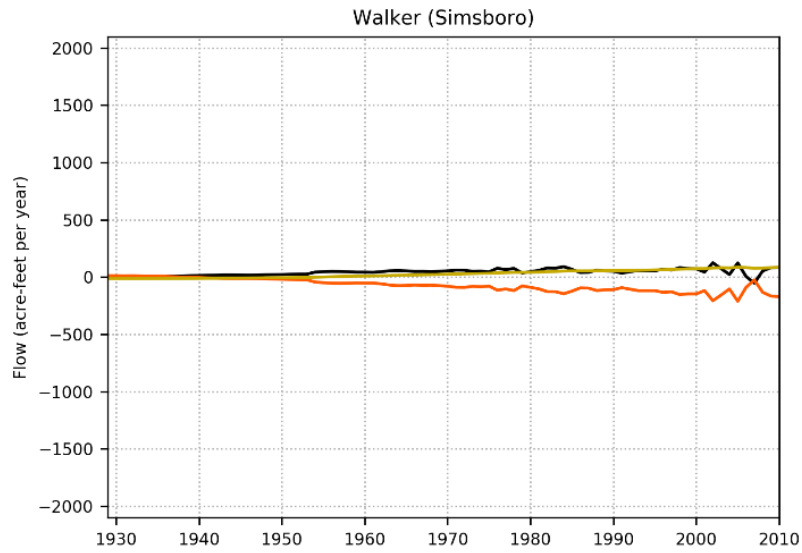
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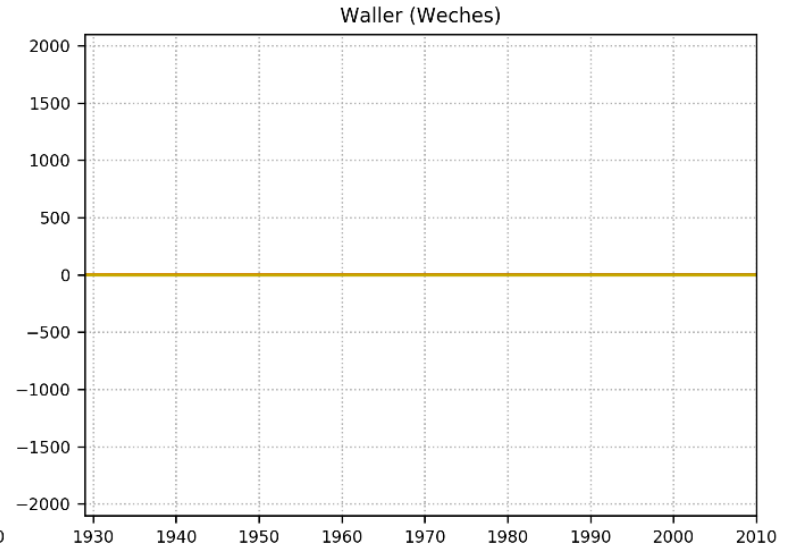
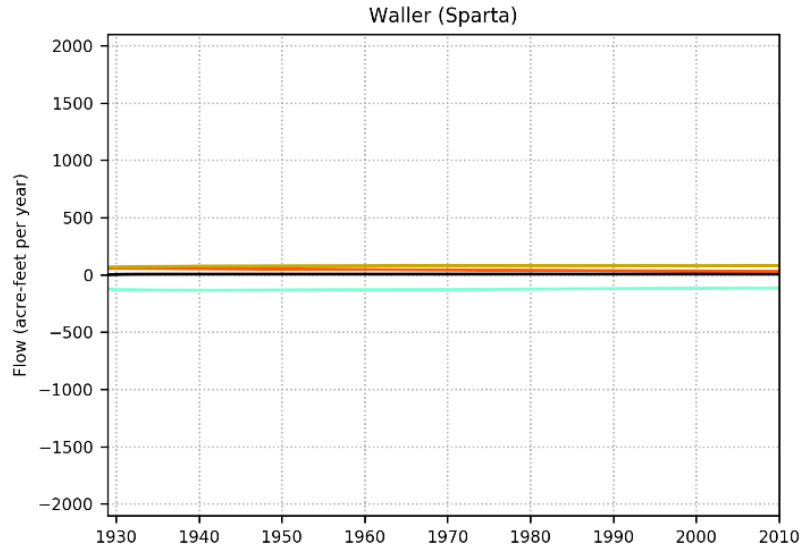


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— STORAGE — LATERAL FLOW — VERTICAL FLOW

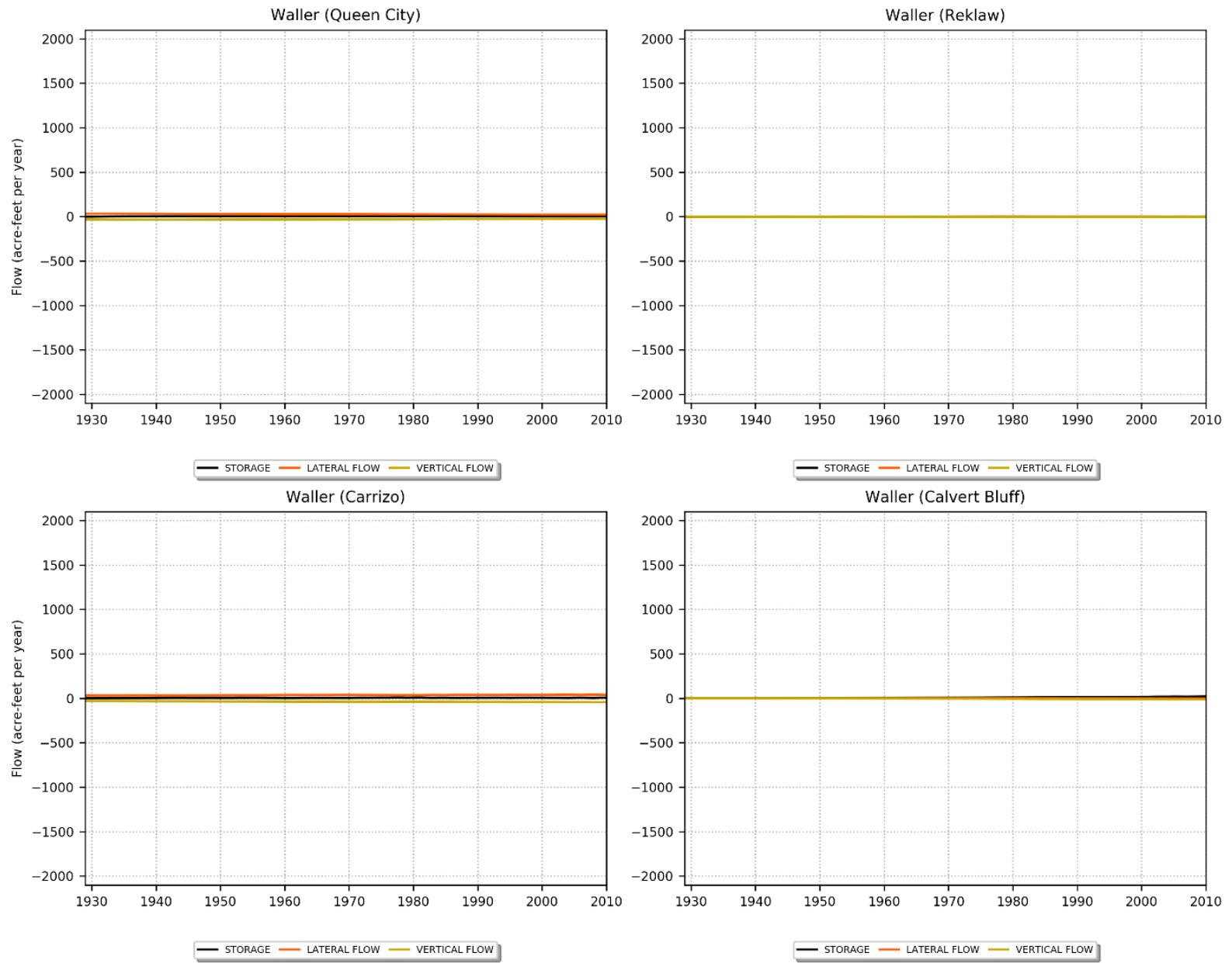
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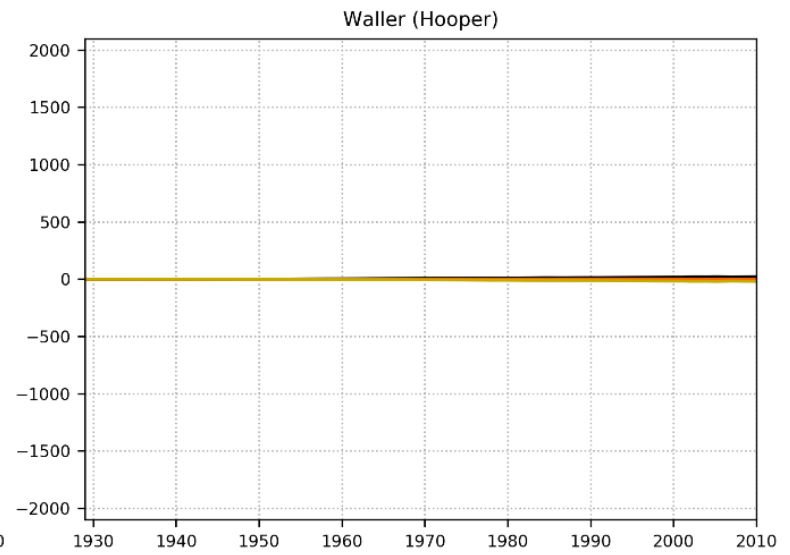
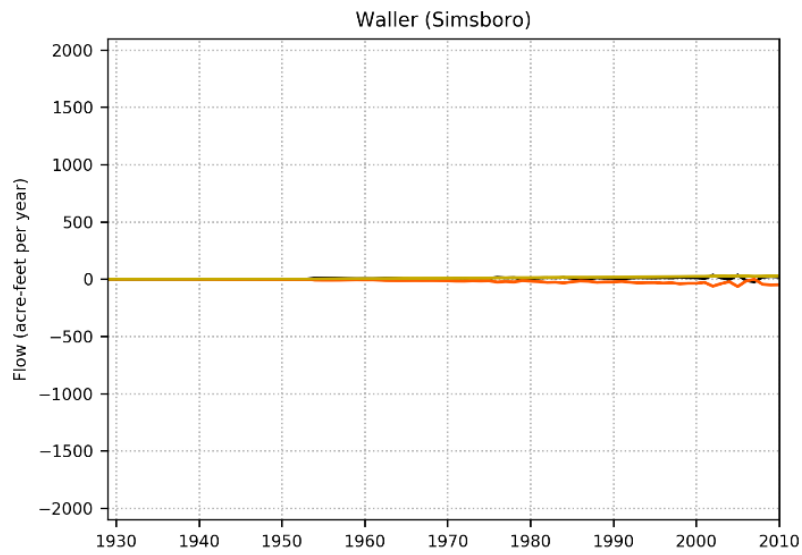
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS

— STORAGE — LATERAL FLOW — VERTICAL FLOW

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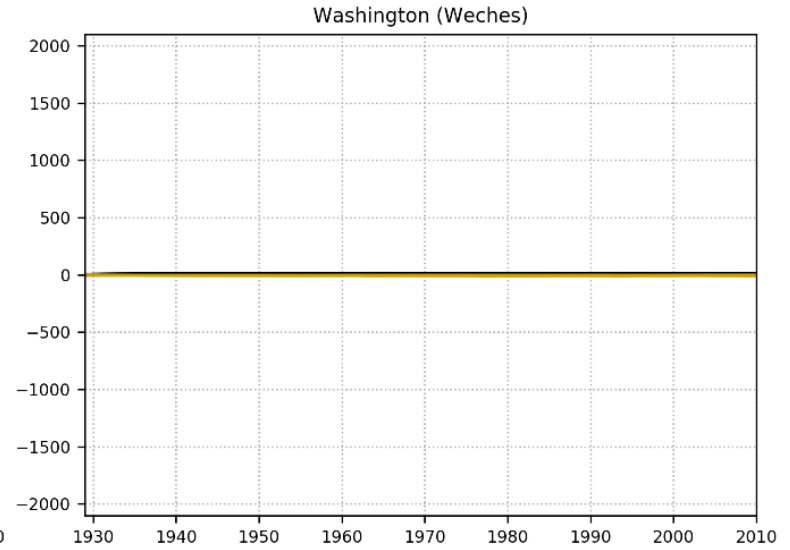
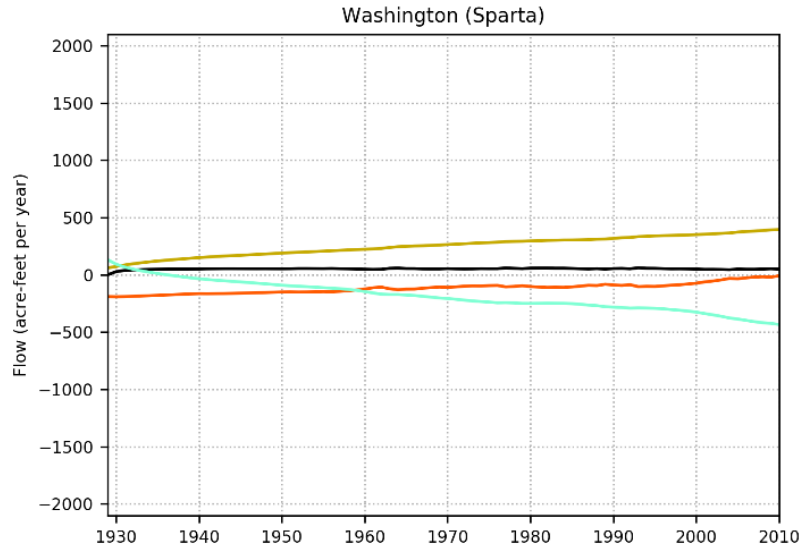


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— STORAGE — LATERAL FLOW — VERTICAL FLOW

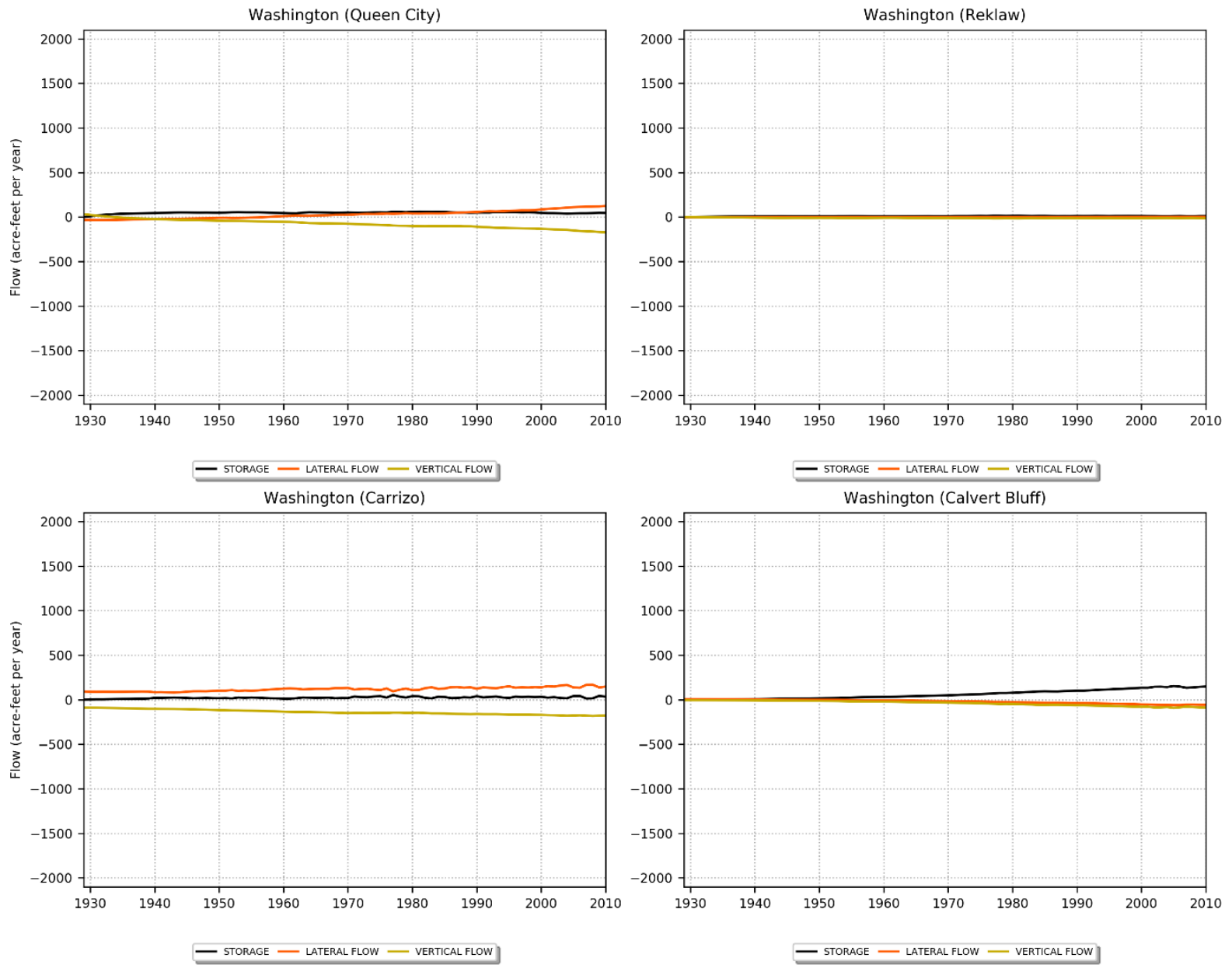
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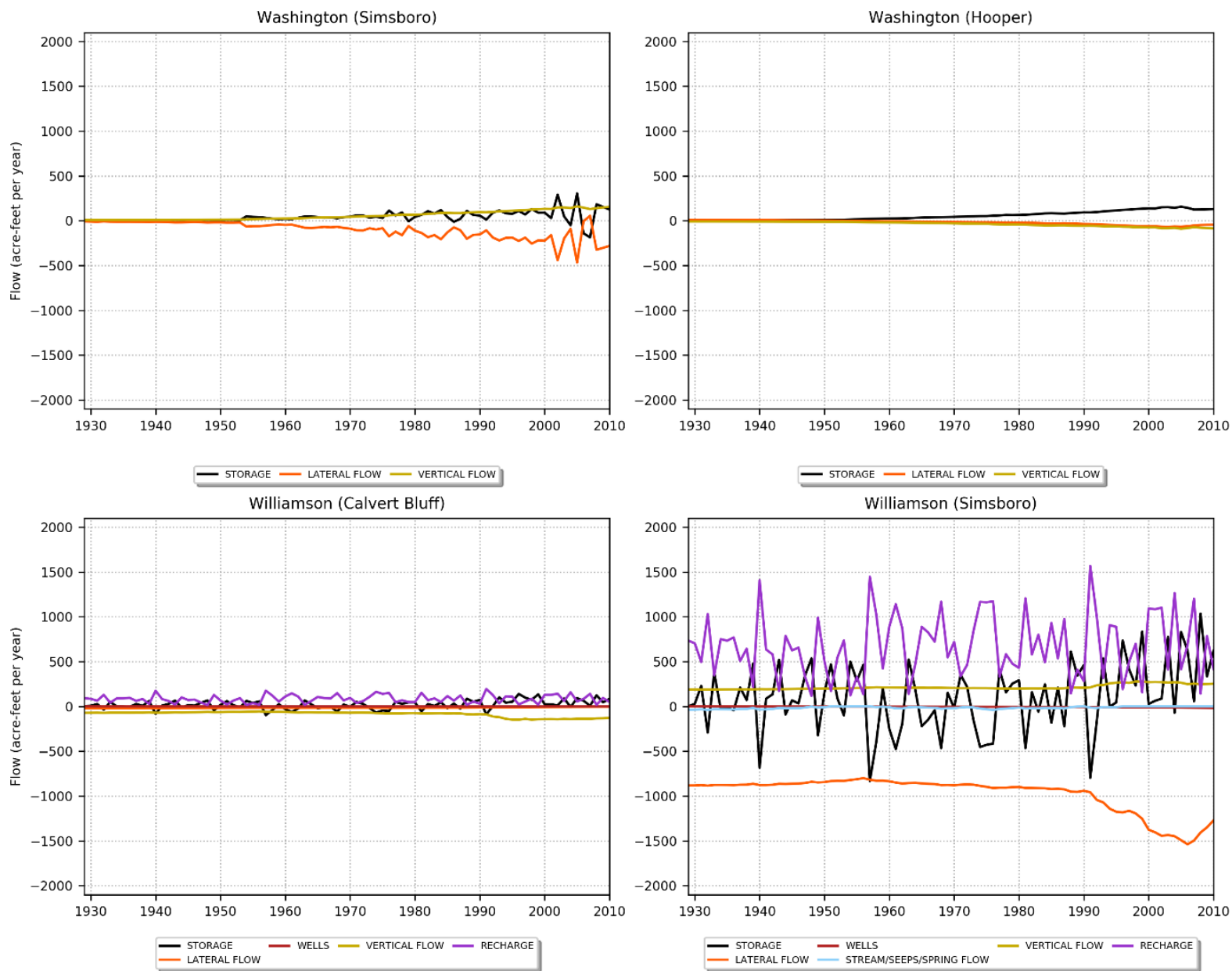
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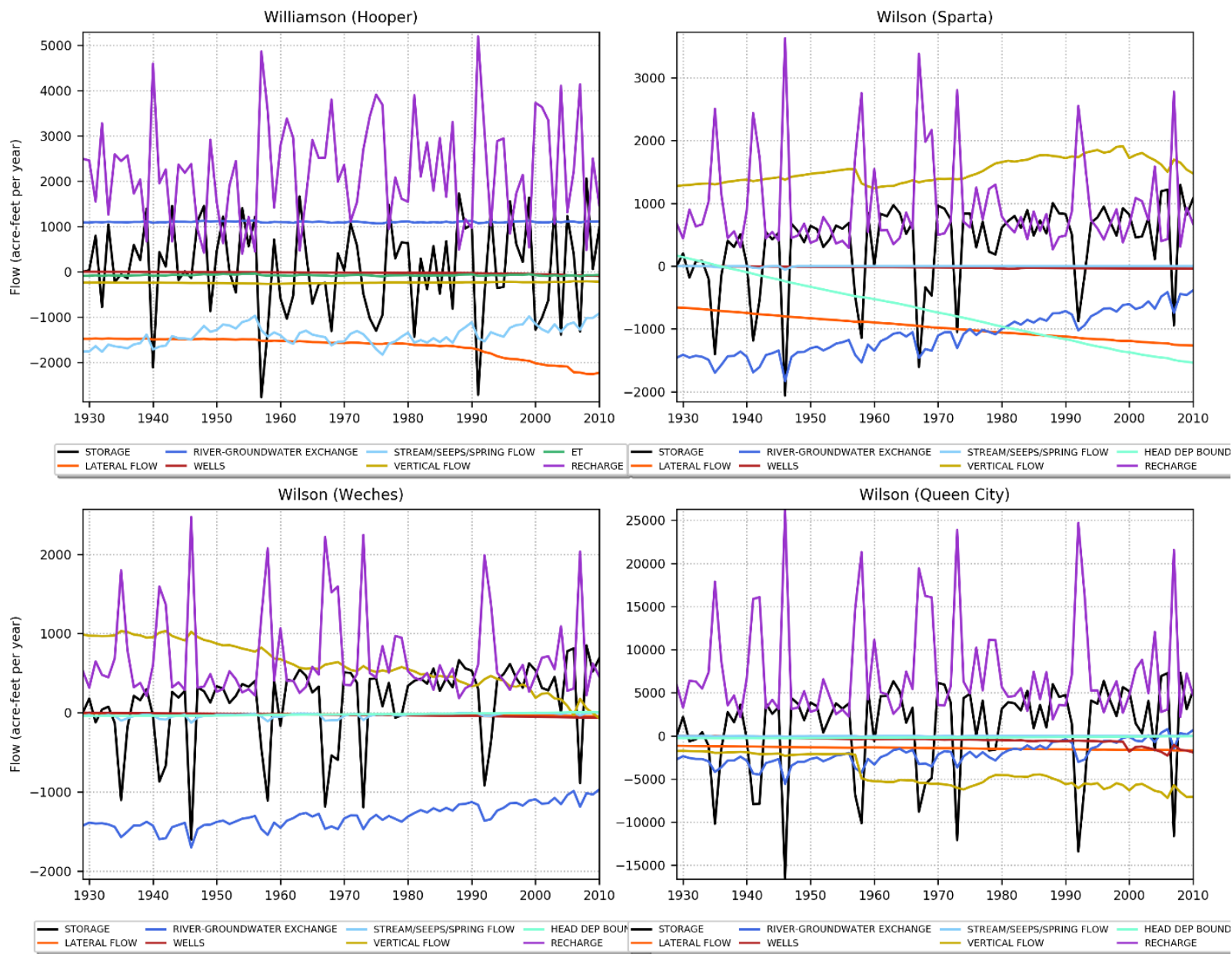
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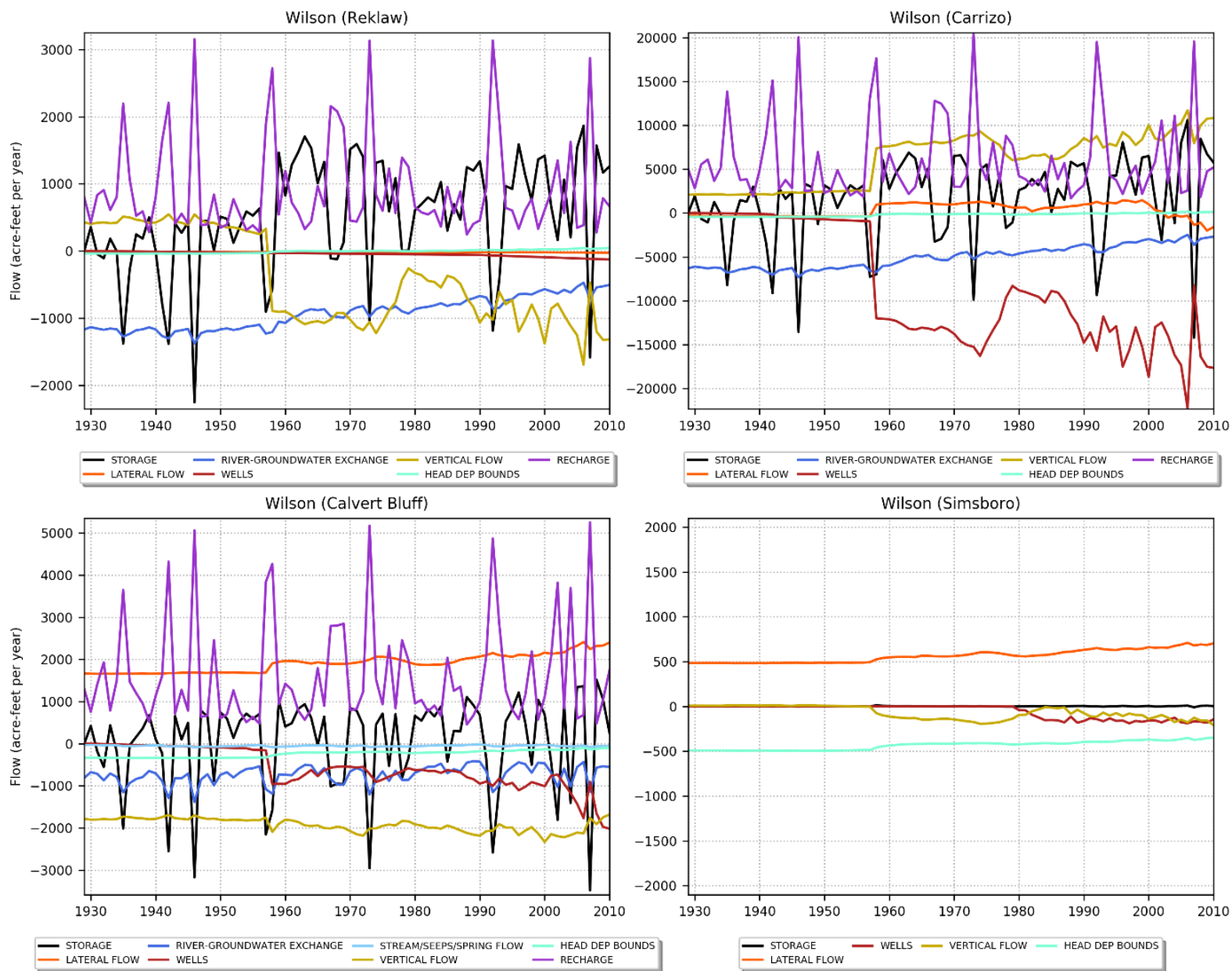
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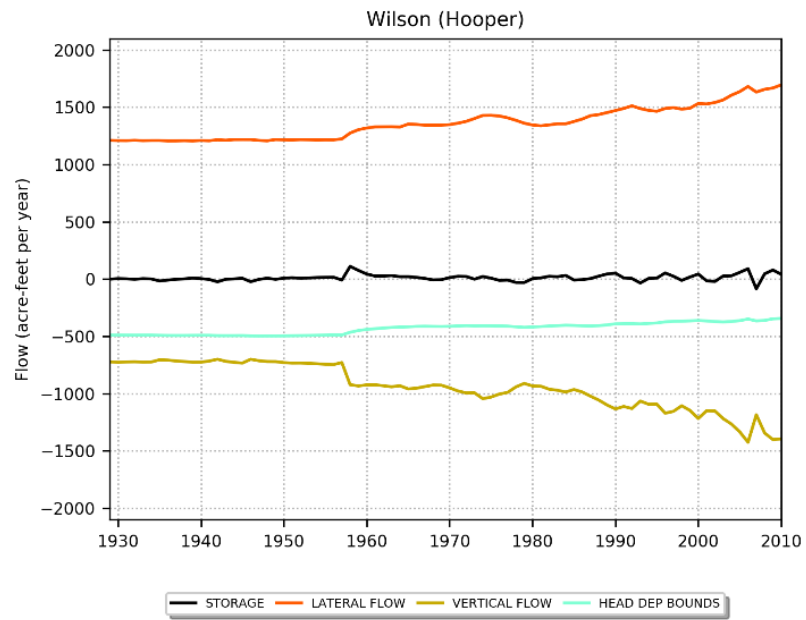
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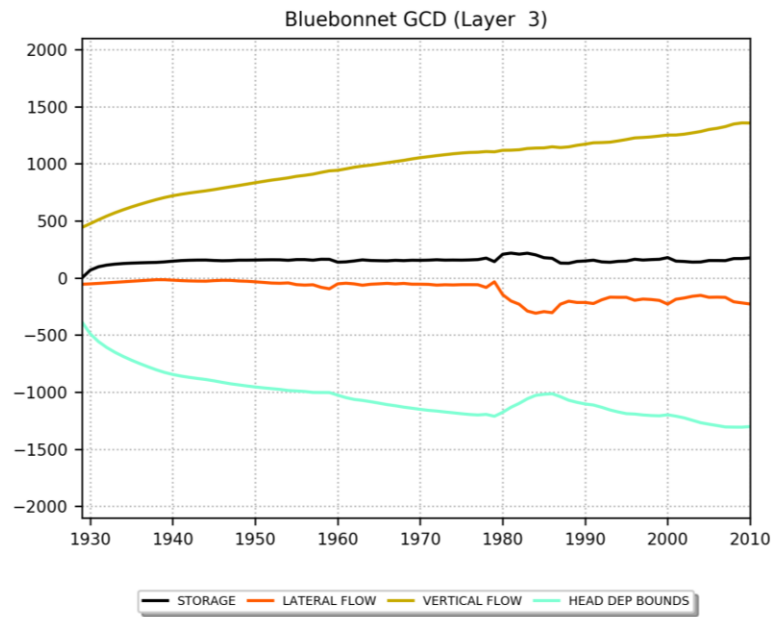
31 Appendix T: Transient Water Budgets by Groundwater Conservation District and Layer

Figures showing the transient water budget by groundwater conservation district and model layer are presented in this appendix. The figures are ordered alphabetically by groundwater conservation district then layer.

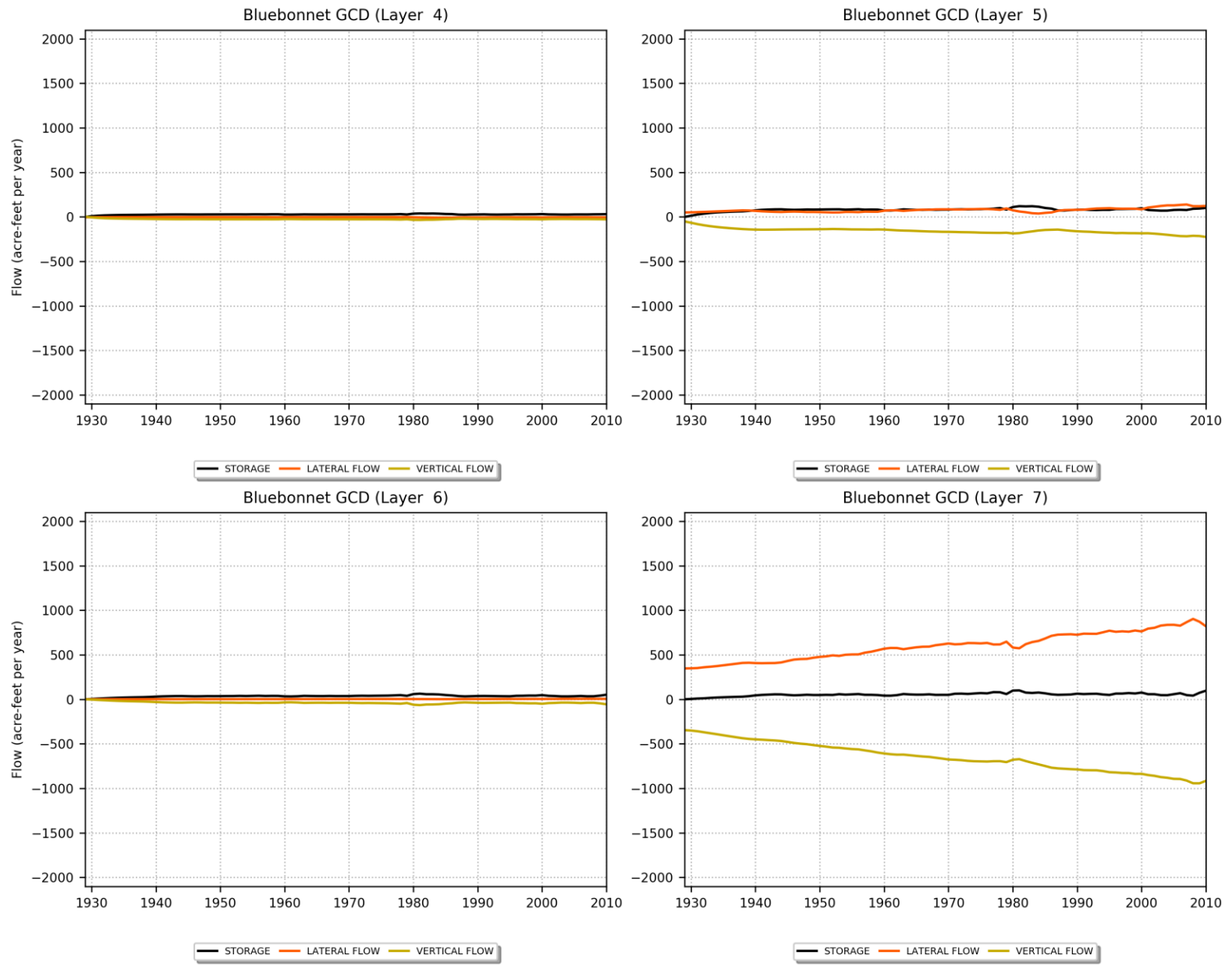
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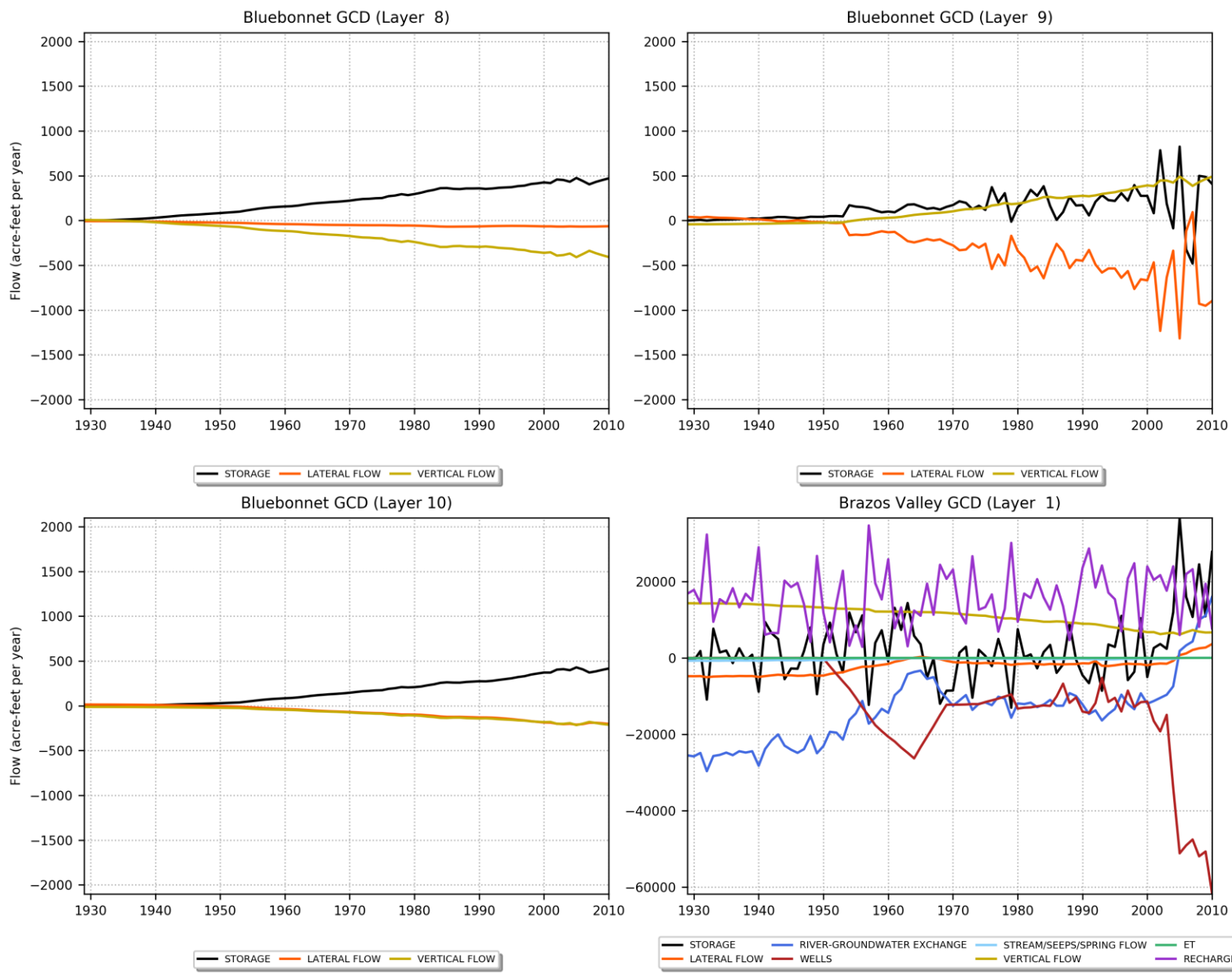
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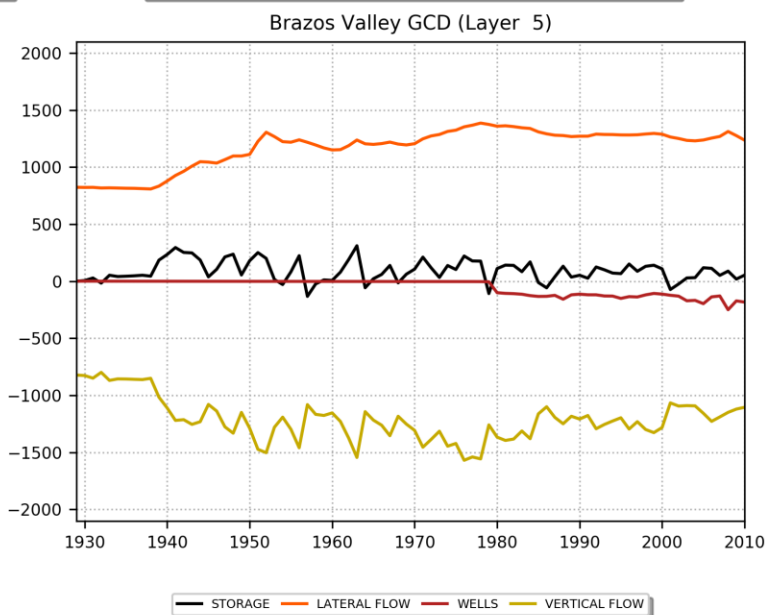
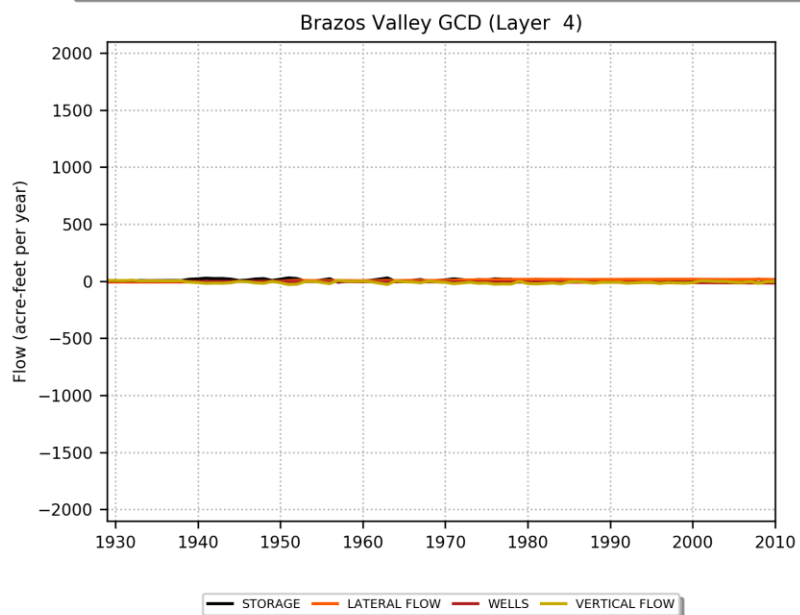
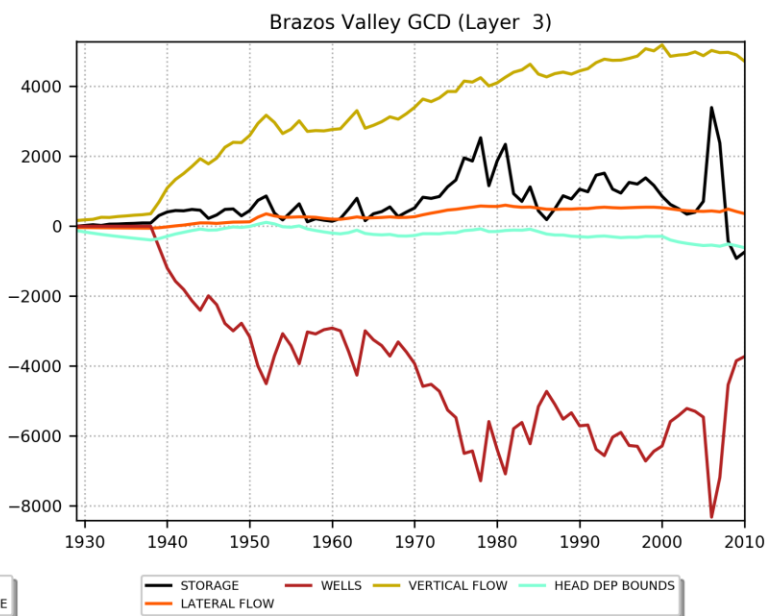
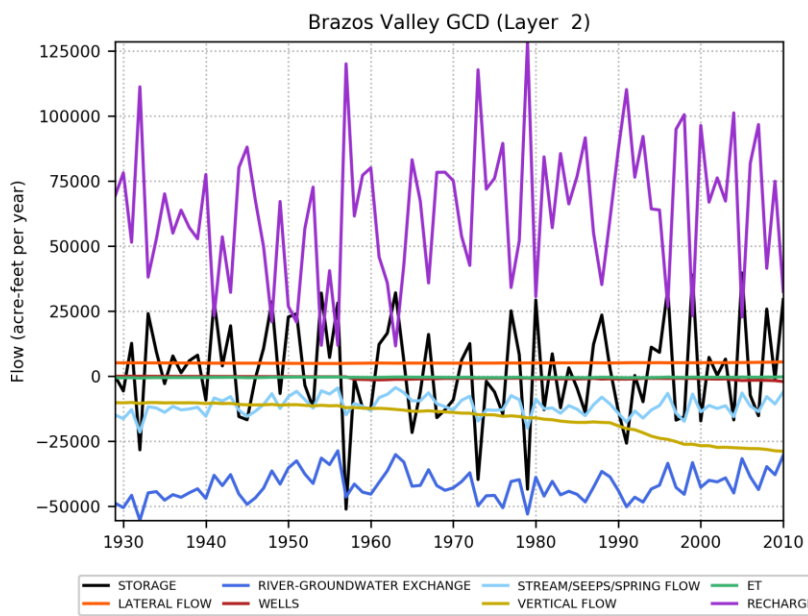
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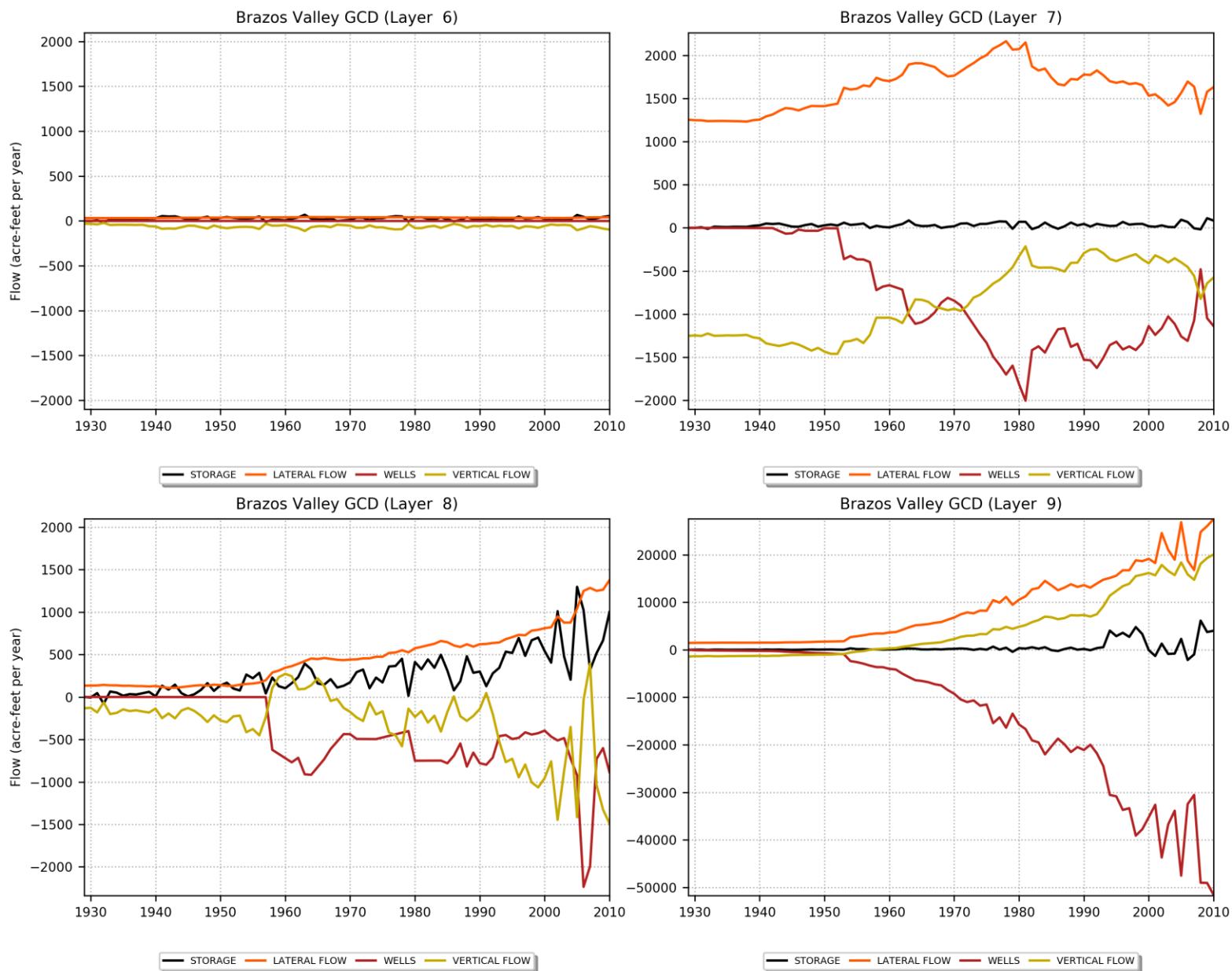
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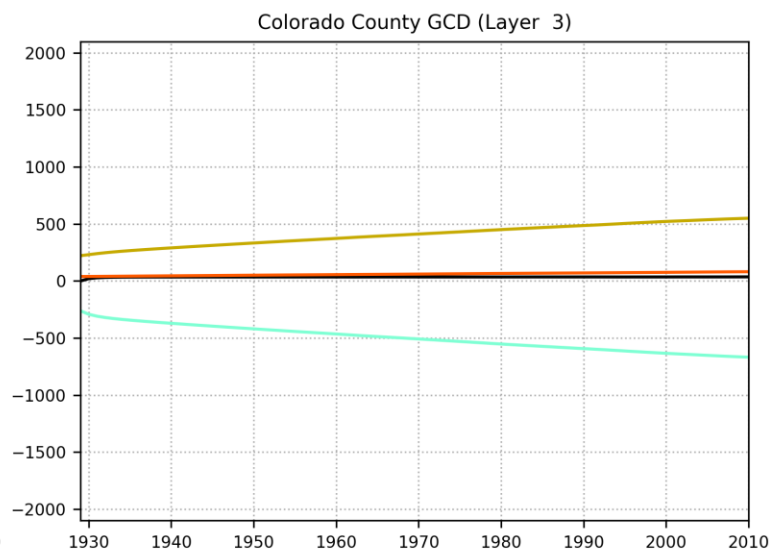
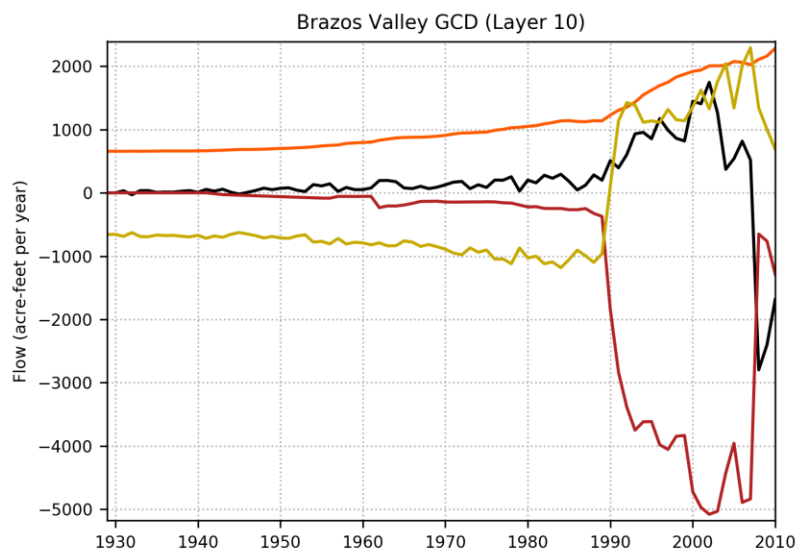
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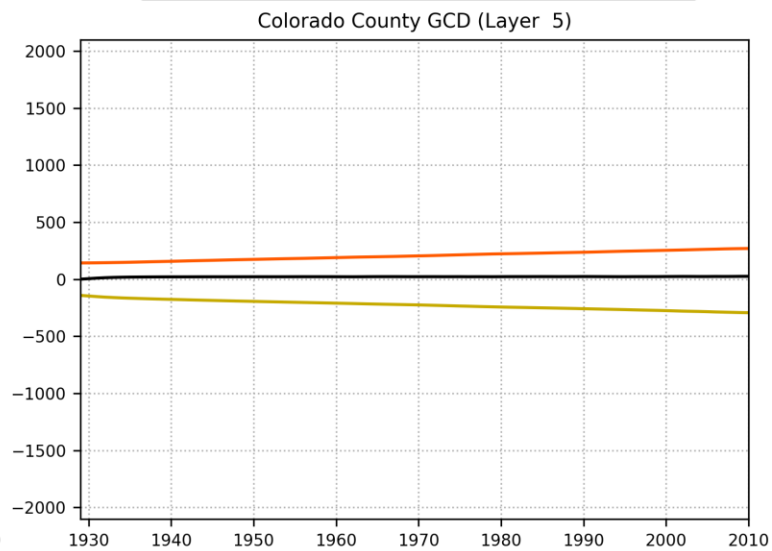
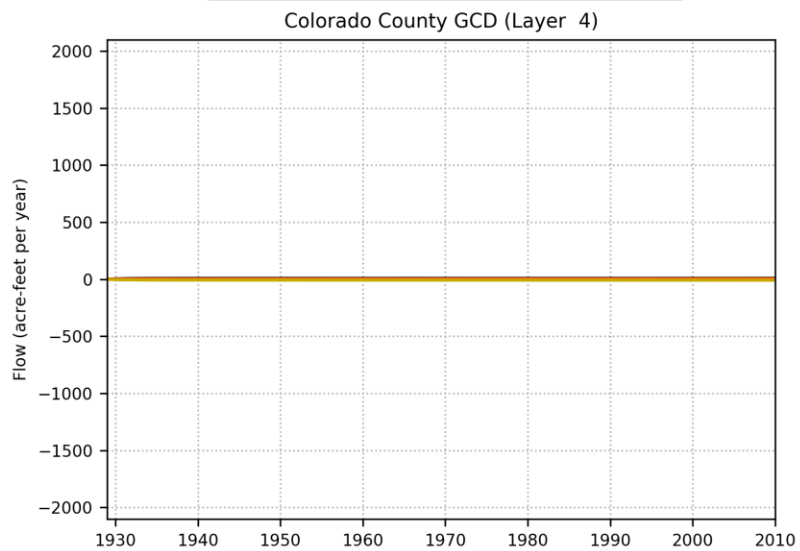


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— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

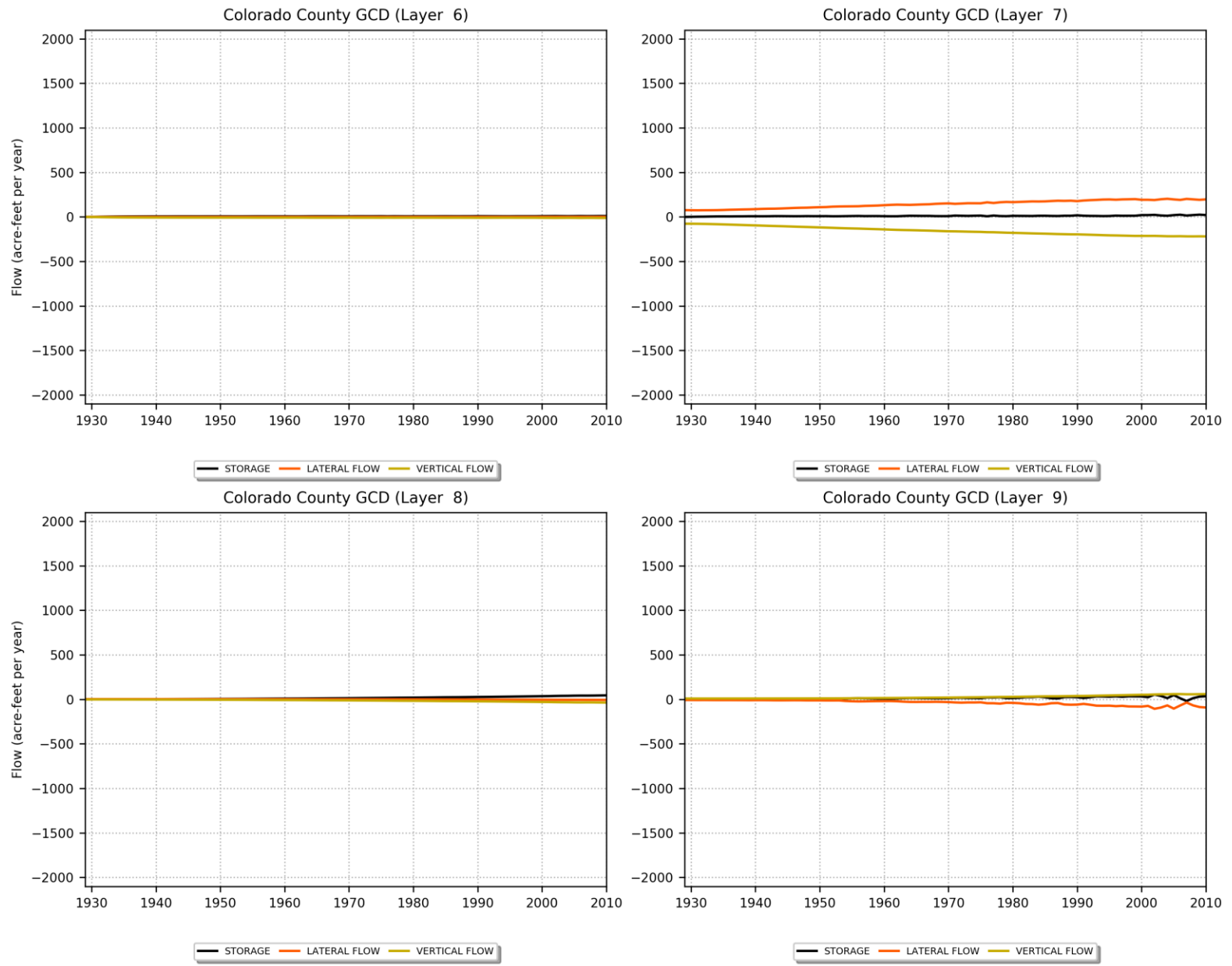
— STORAGE — LATERAL FLOW — VERTICAL FLOW — HEAD DEP BOUNDS



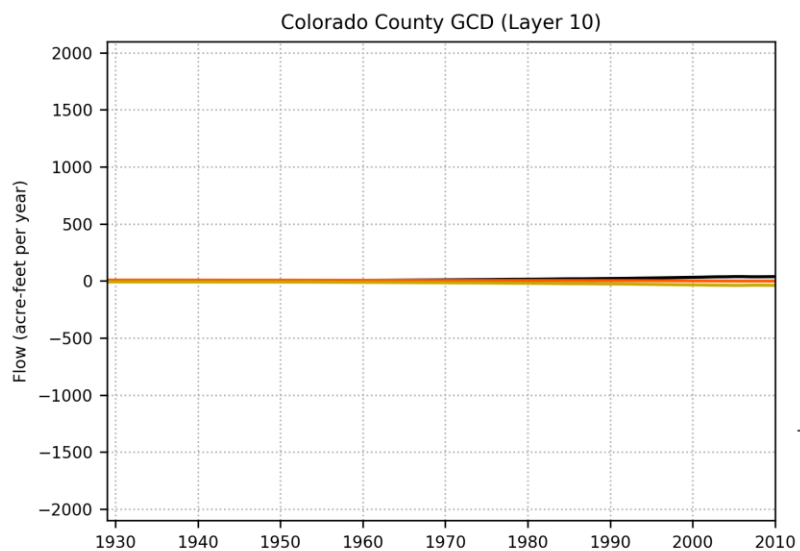
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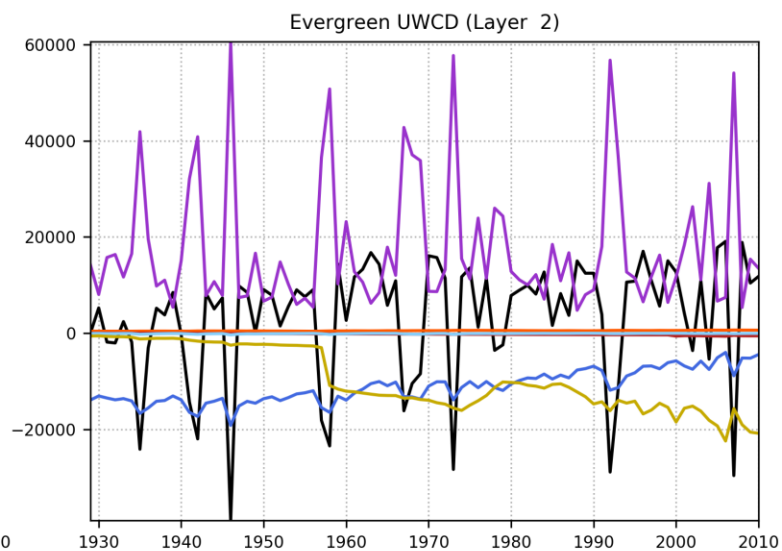
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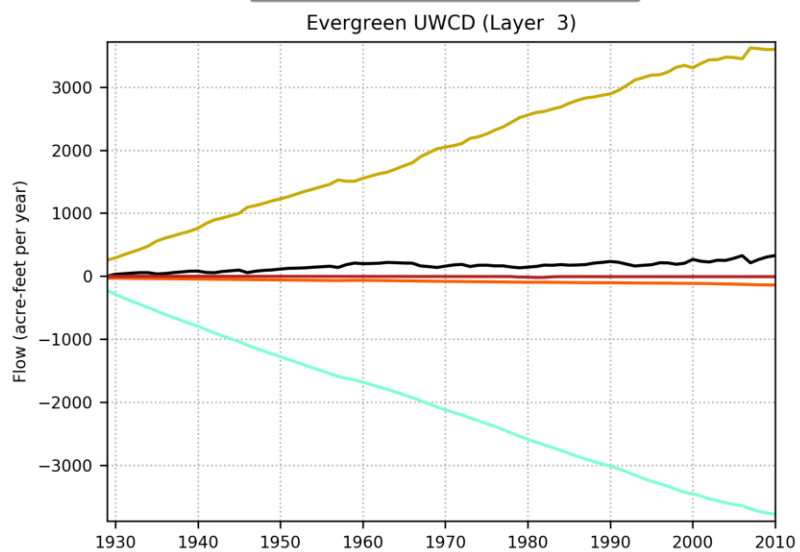
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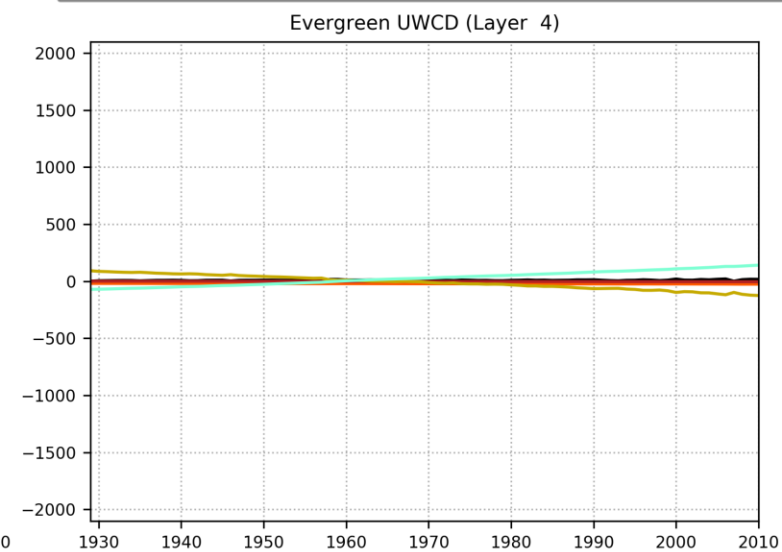
— STORAGE — LATERAL FLOW — VERTICAL FLOW



— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — RECHARGE
— LATERAL FLOW — WELLS — VERTICAL FLOW

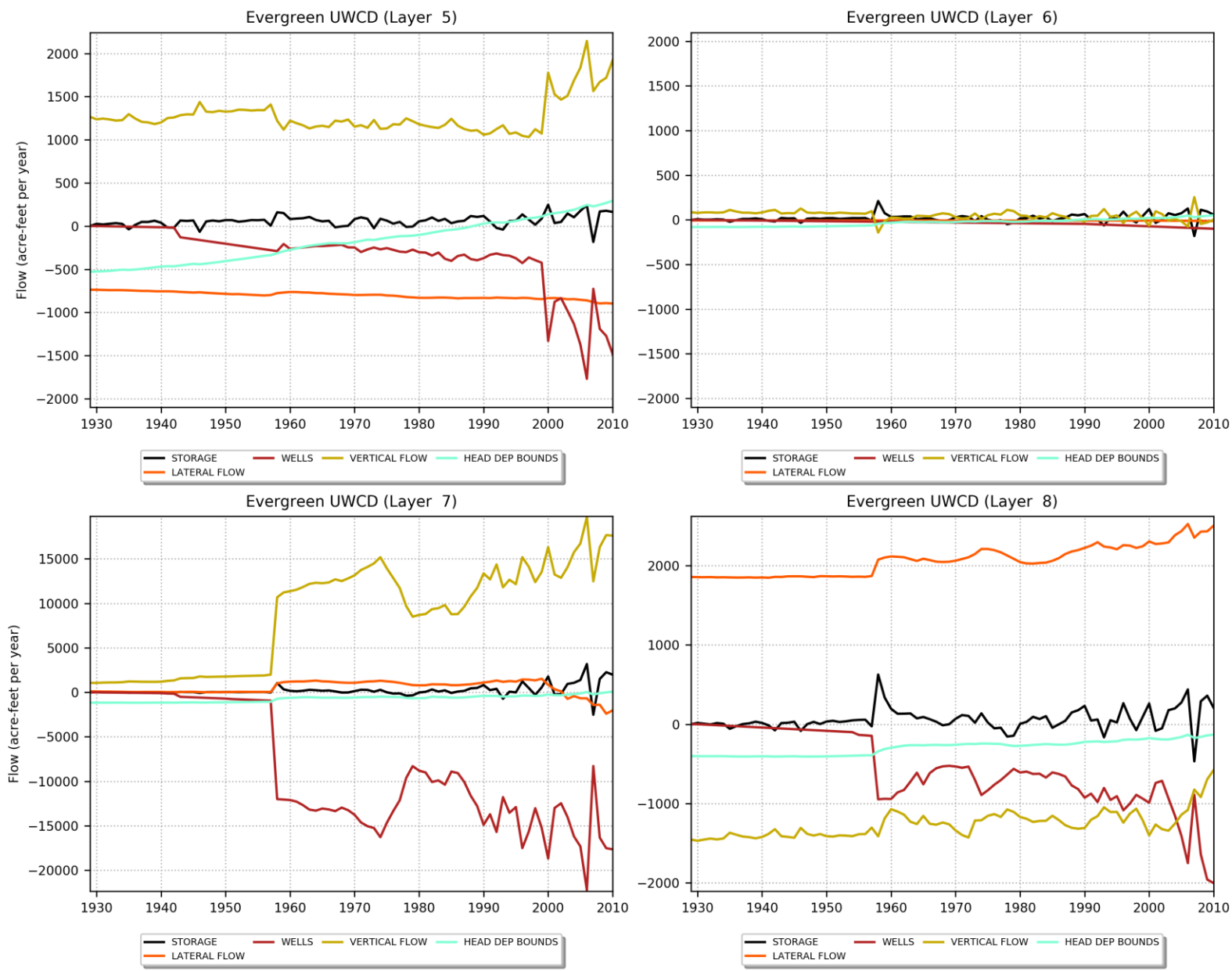


— STORAGE — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS
— LATERAL FLOW

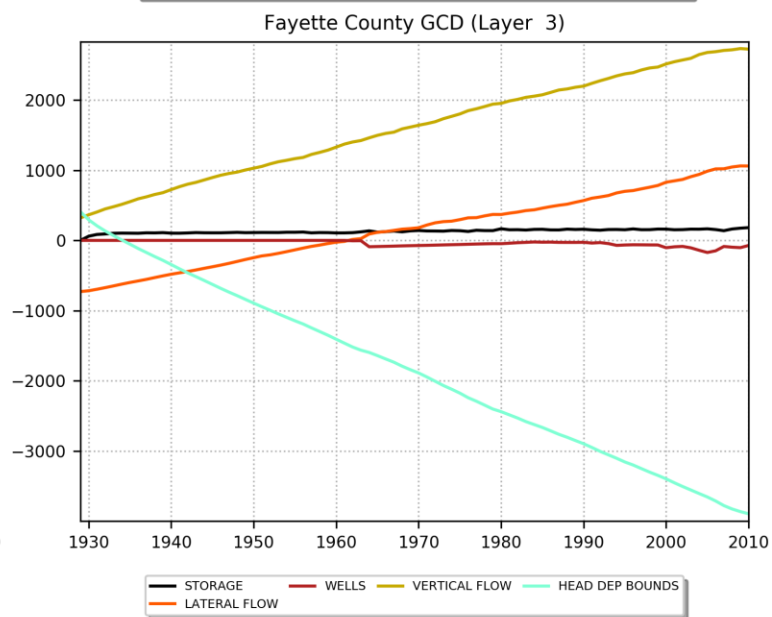
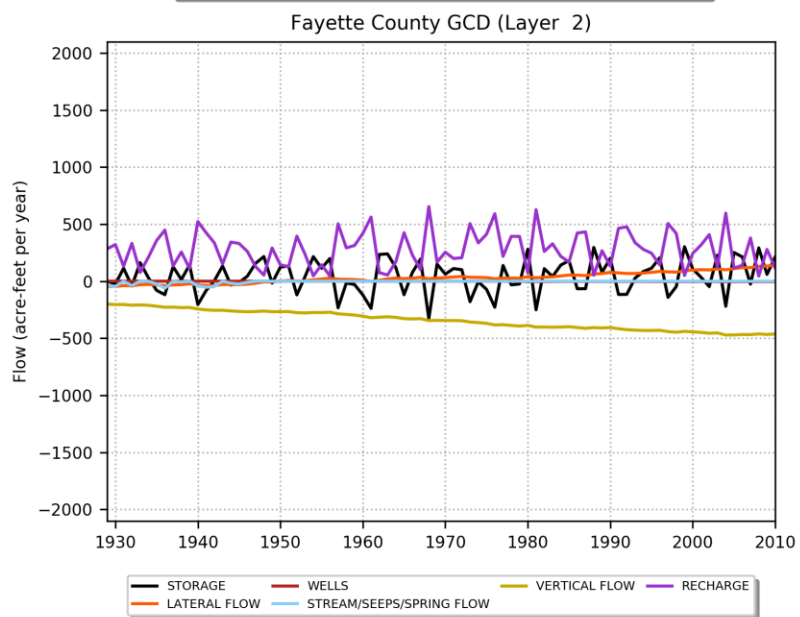
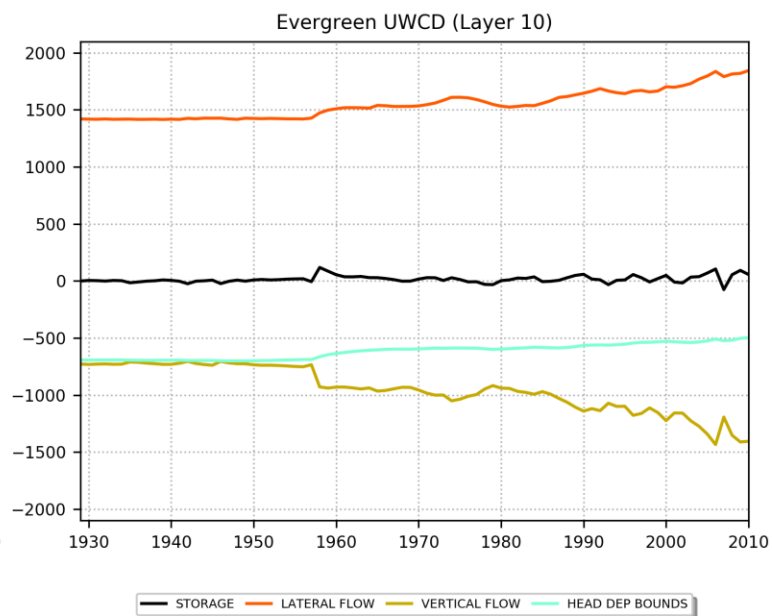
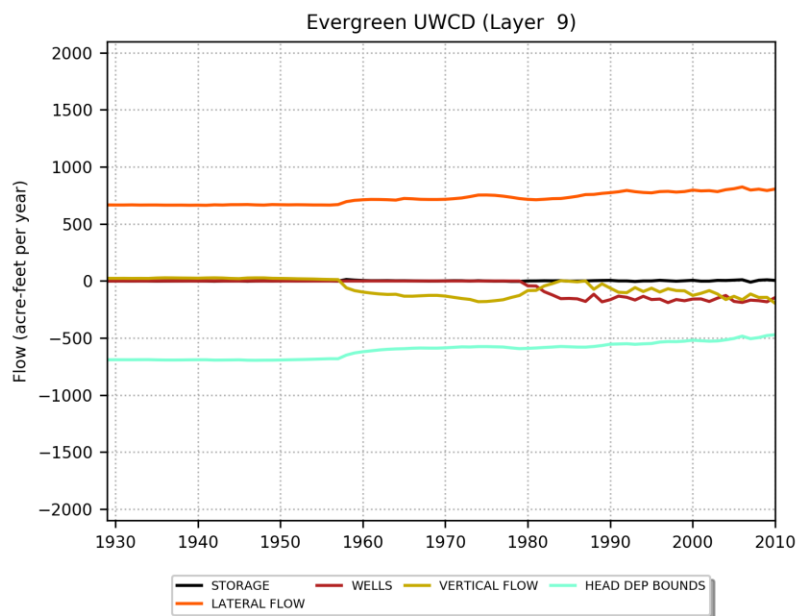


— STORAGE — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS
— LATERAL FLOW

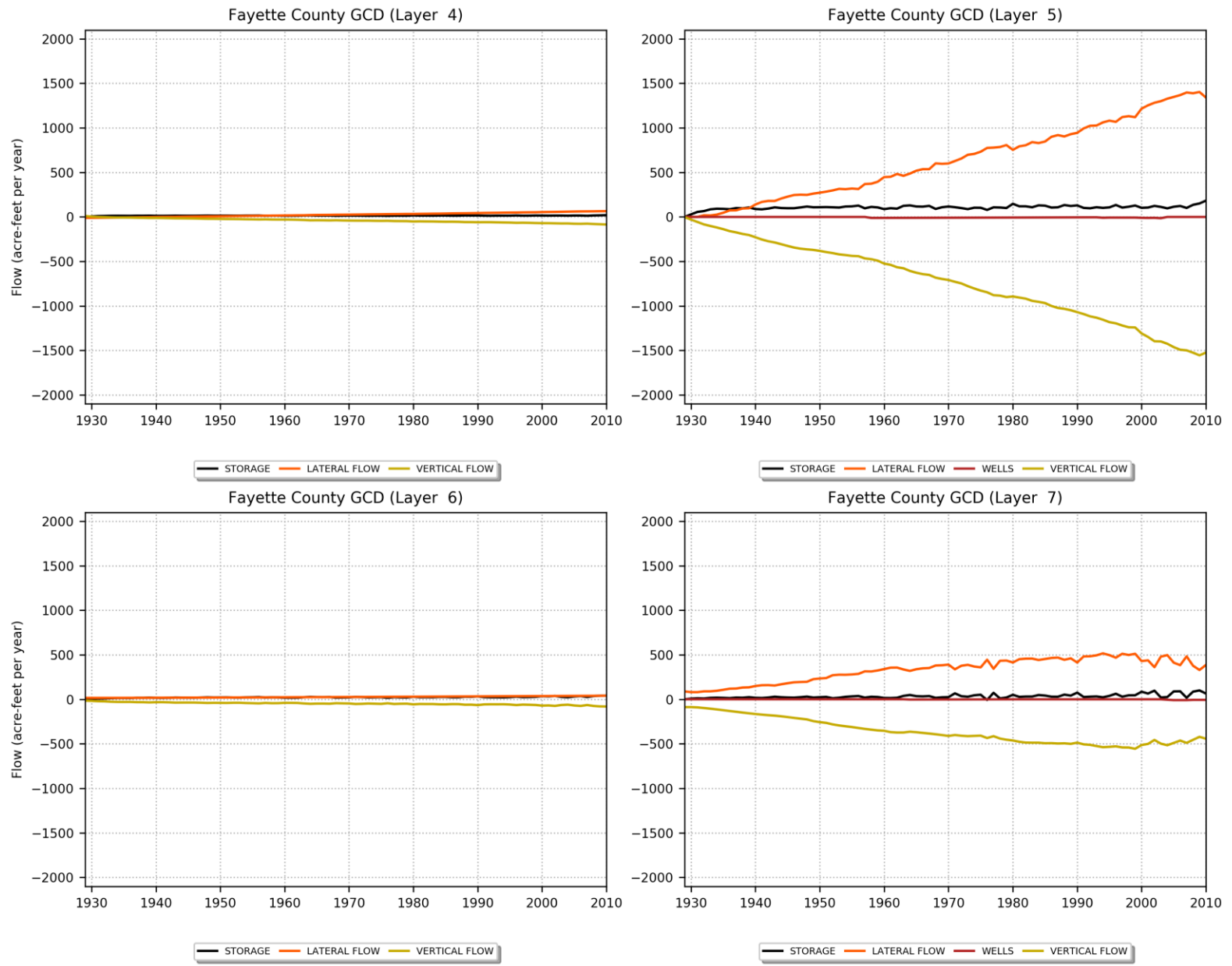
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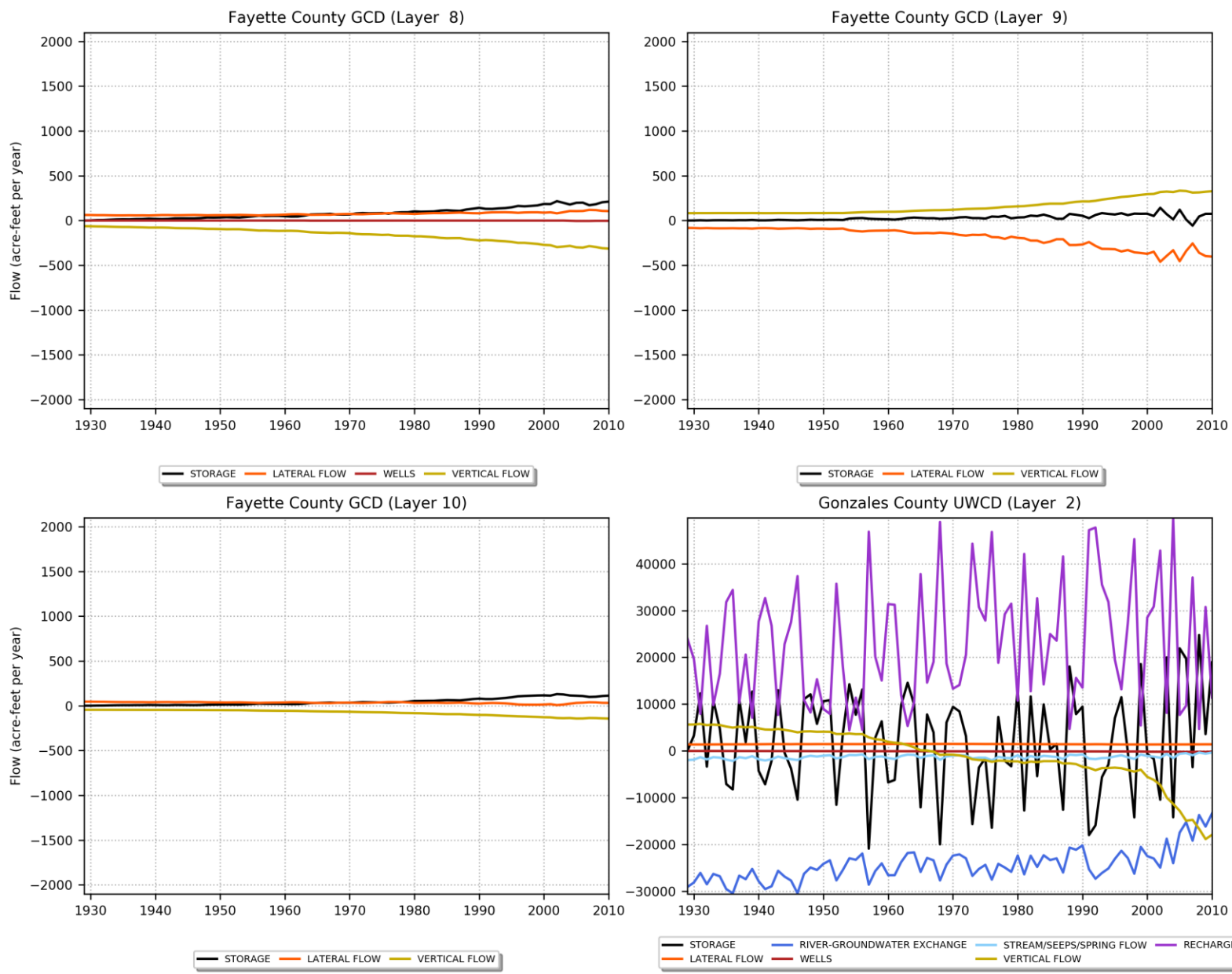
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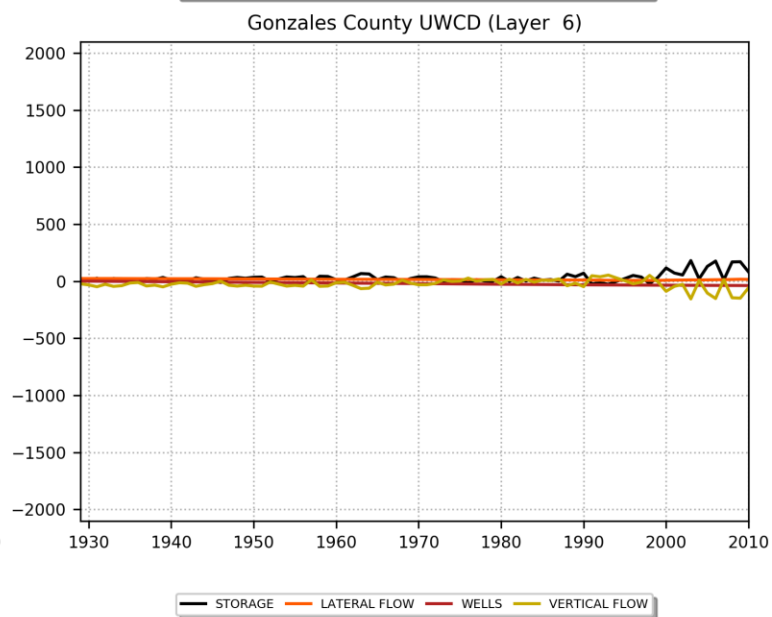
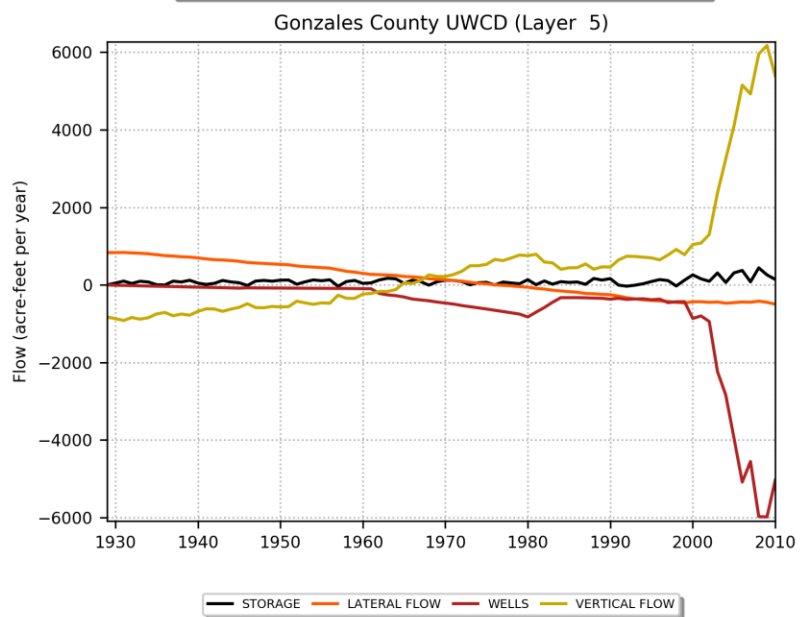
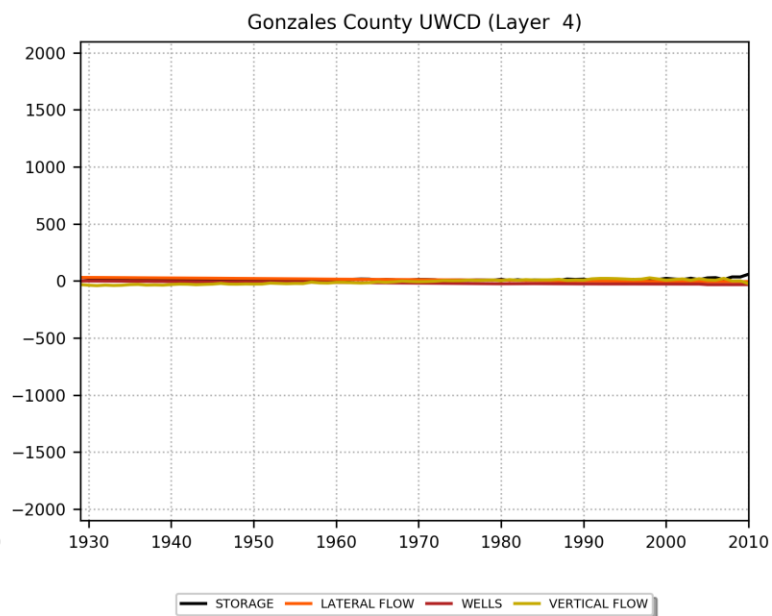
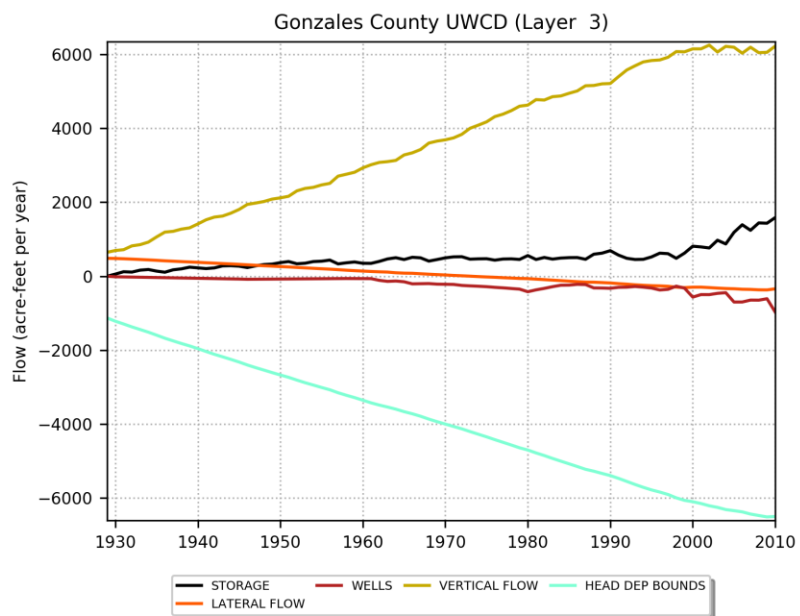
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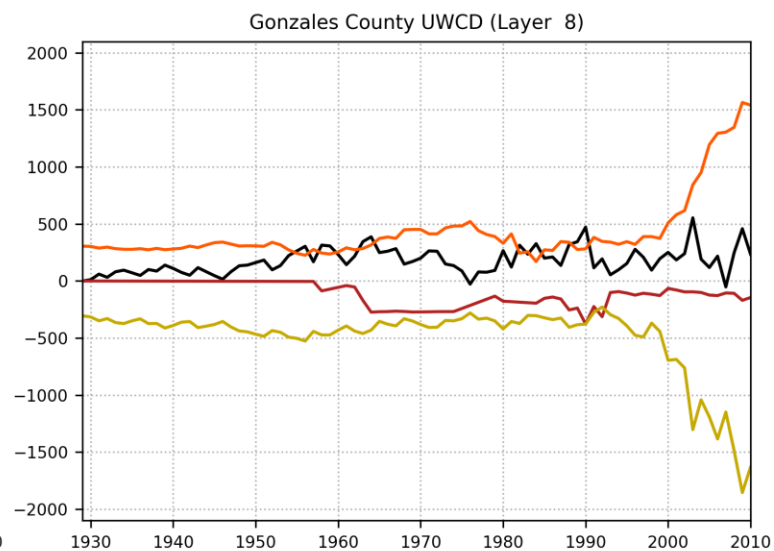
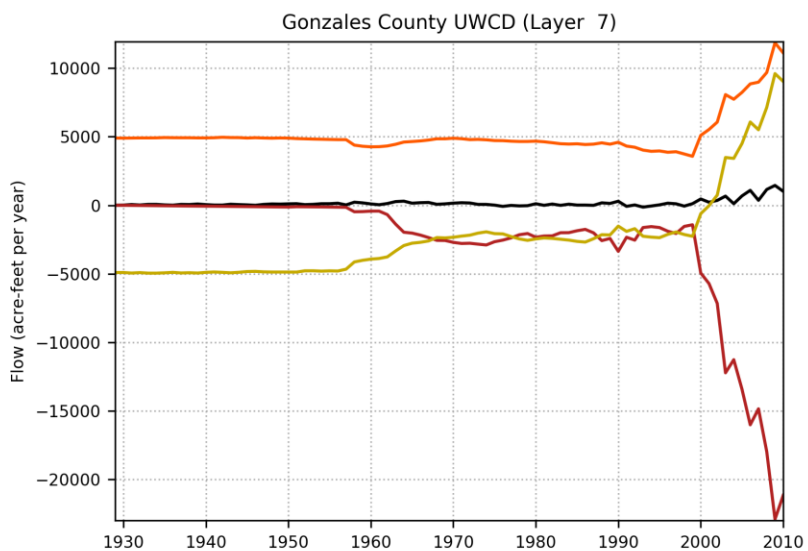
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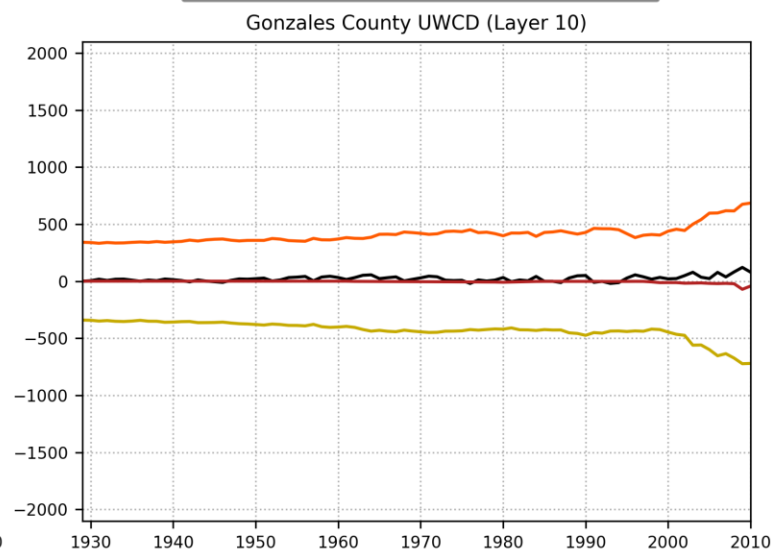
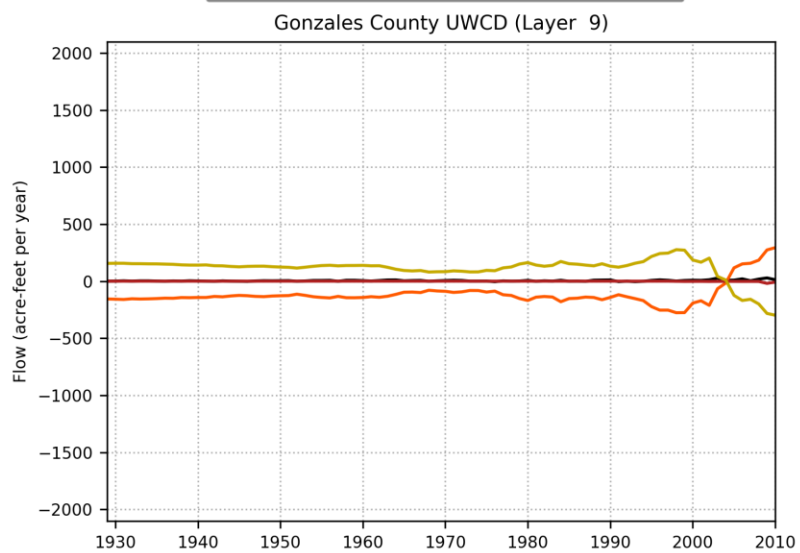


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— STORAGE — LATERAL FLOW — WELLS — VERTICAL FLOW

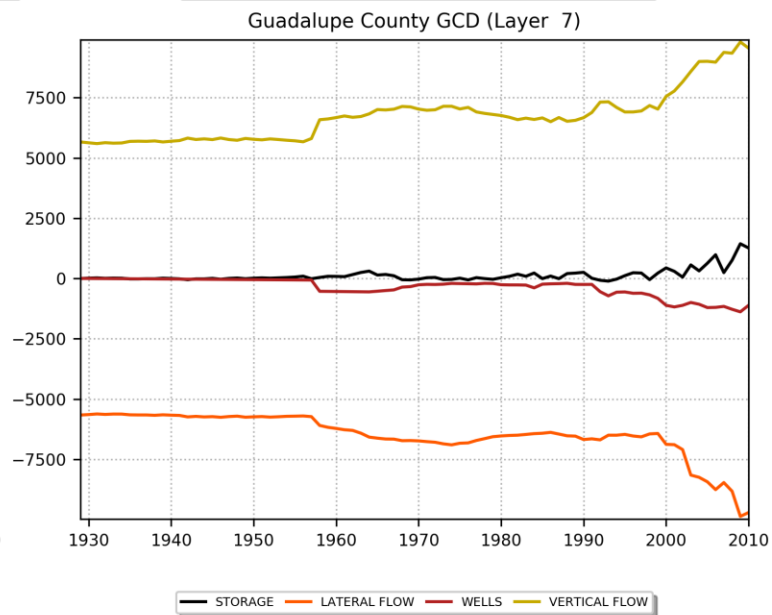
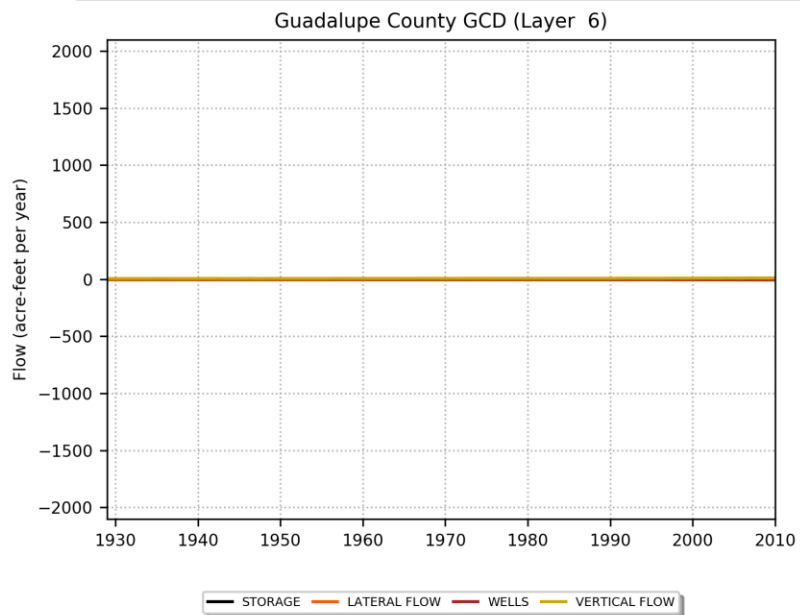
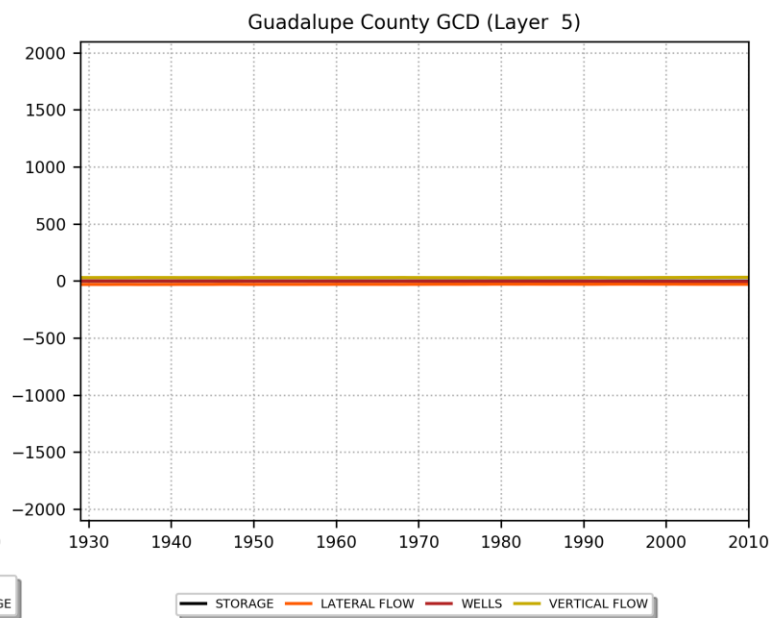
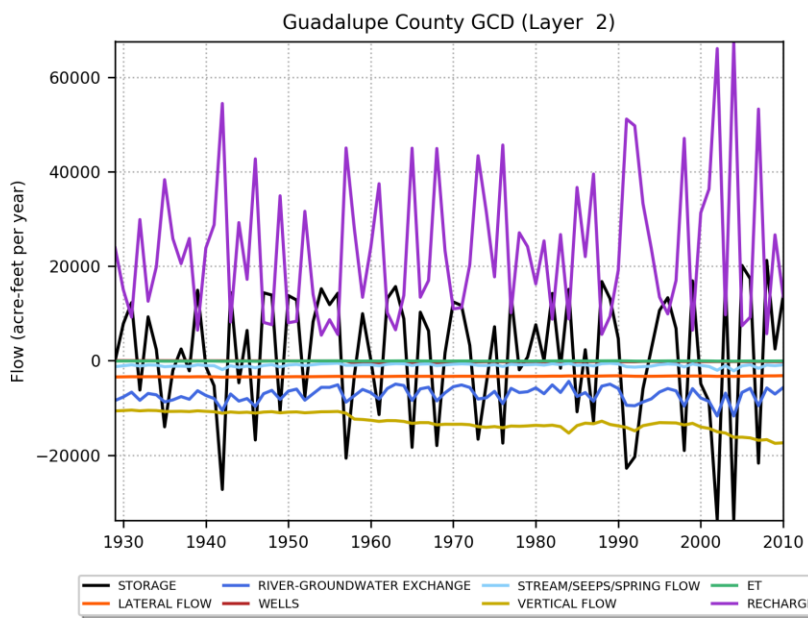
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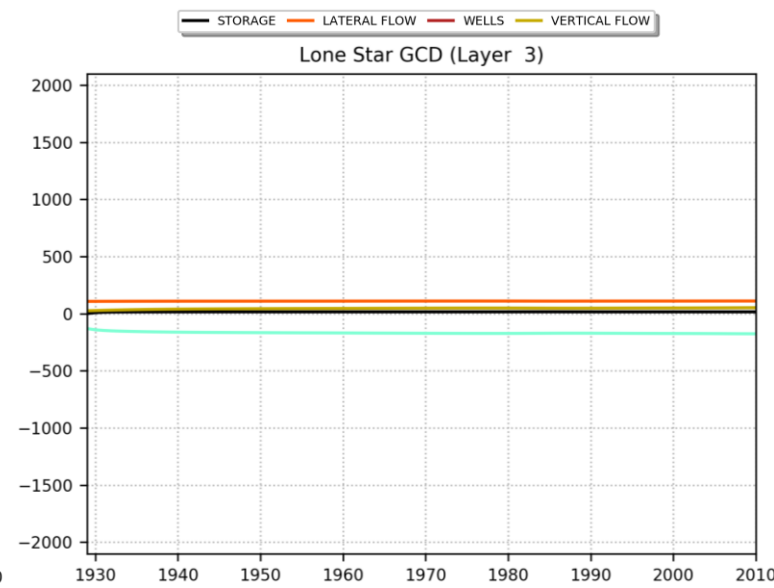
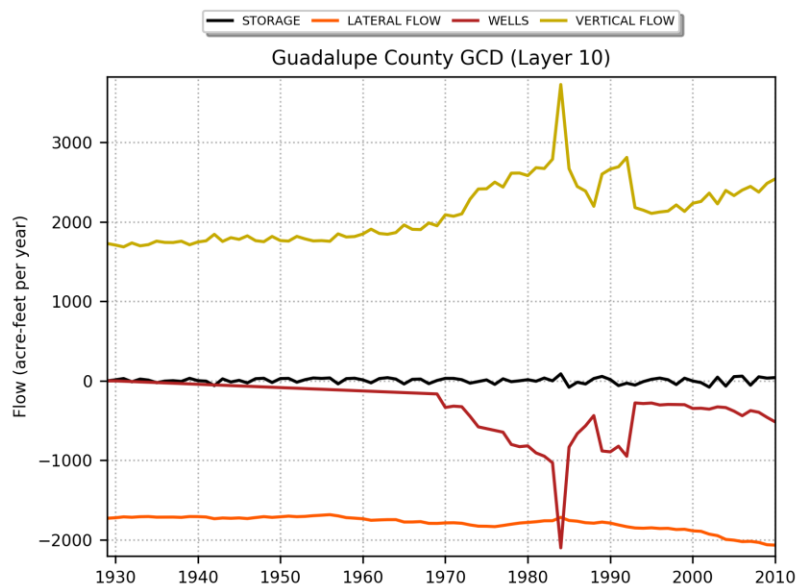
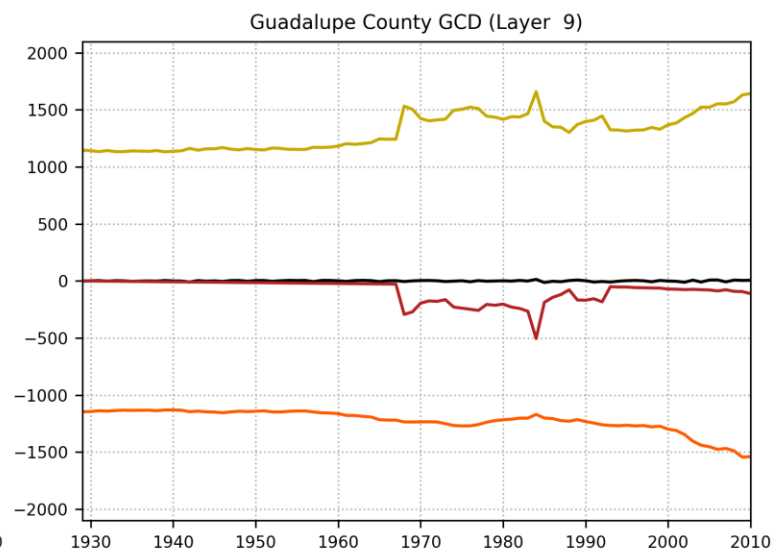
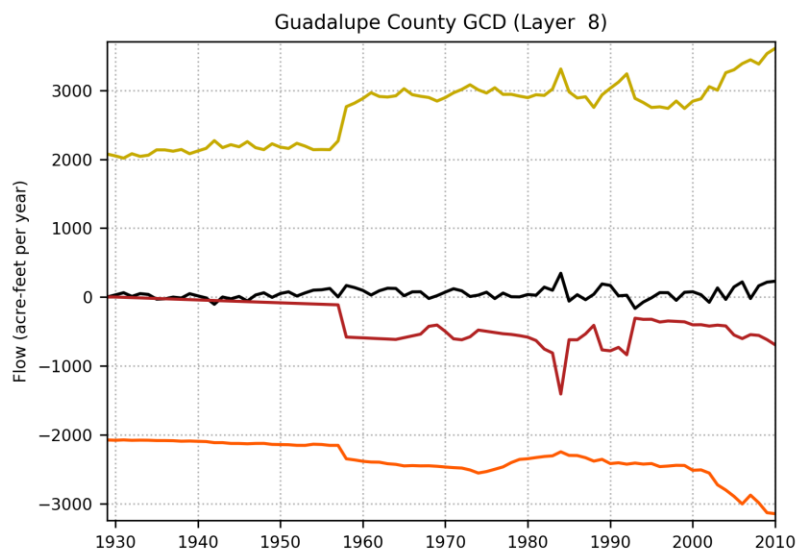
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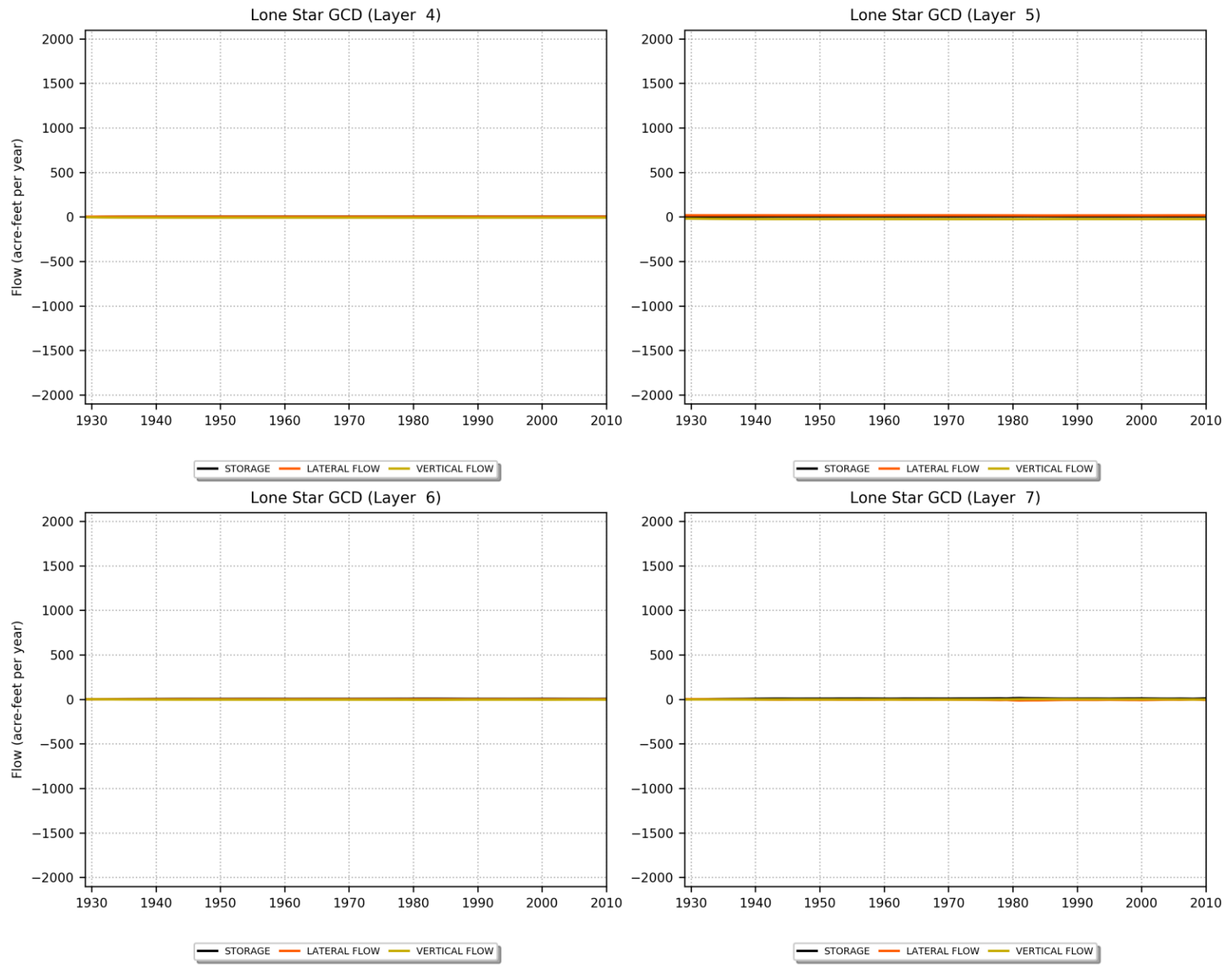
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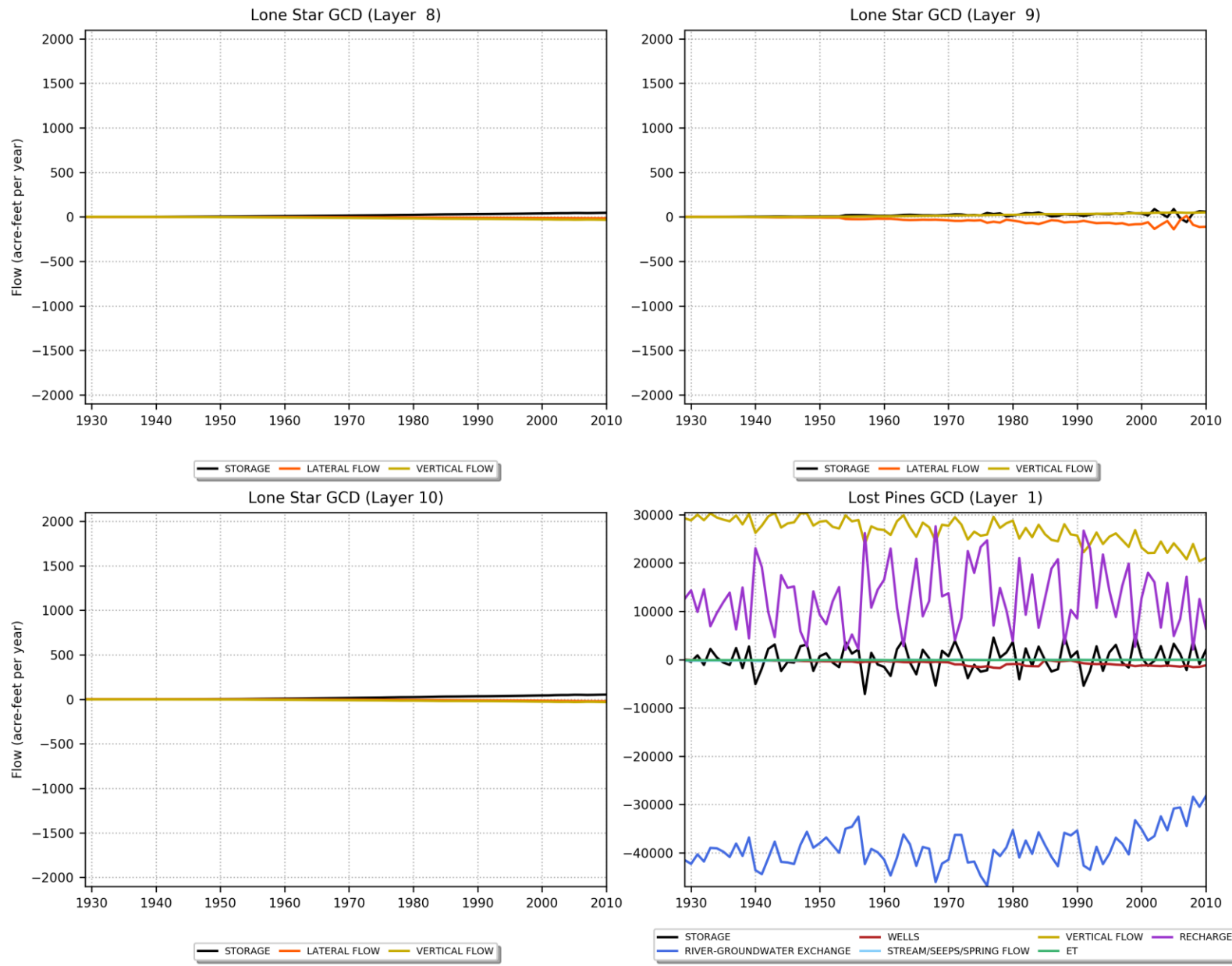
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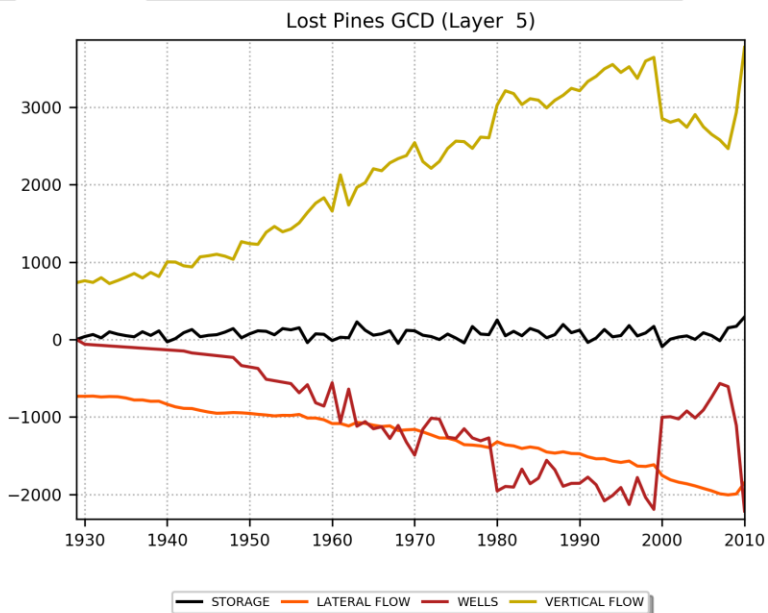
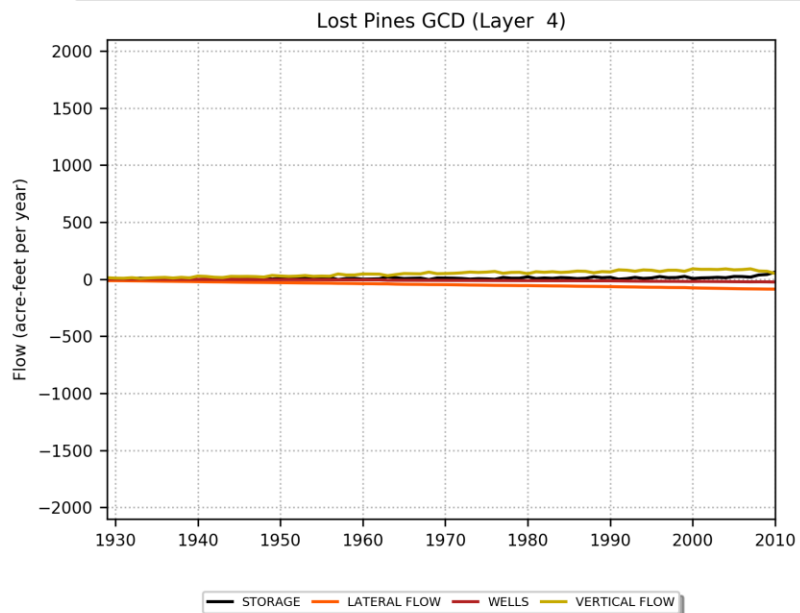
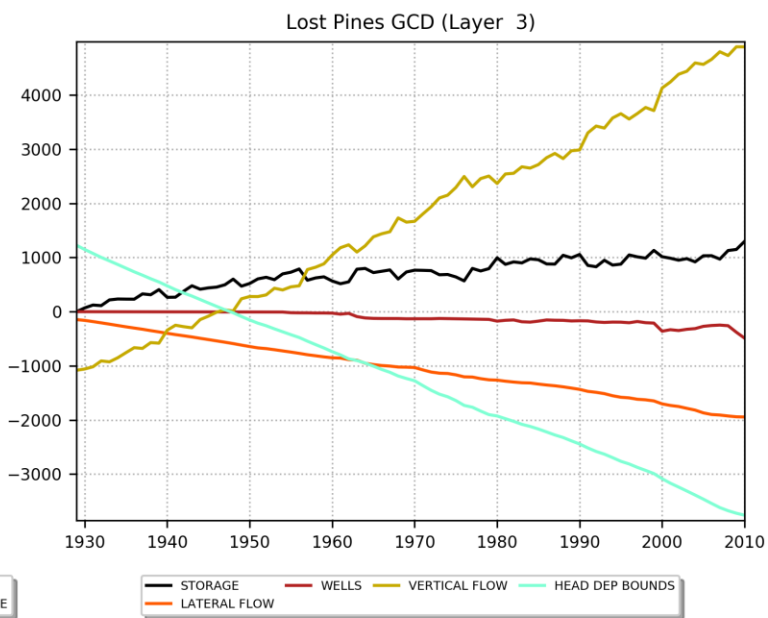
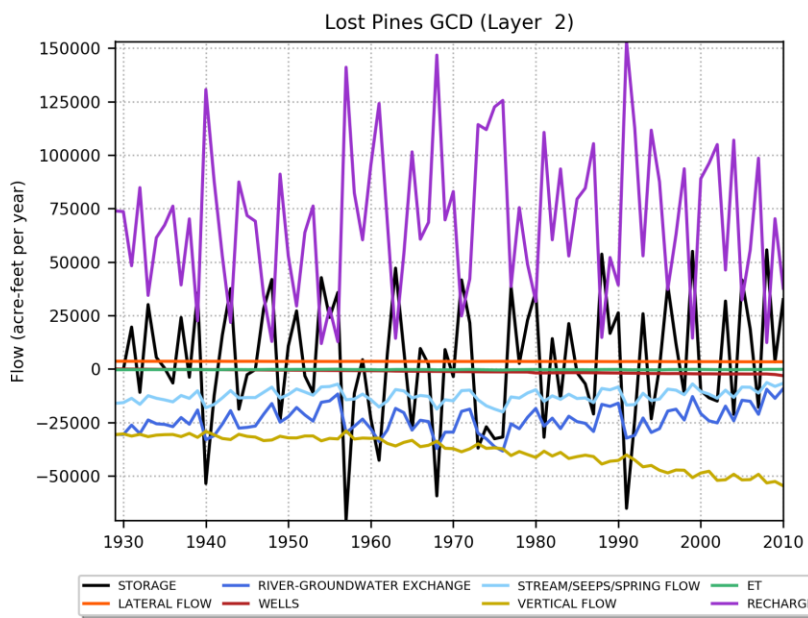
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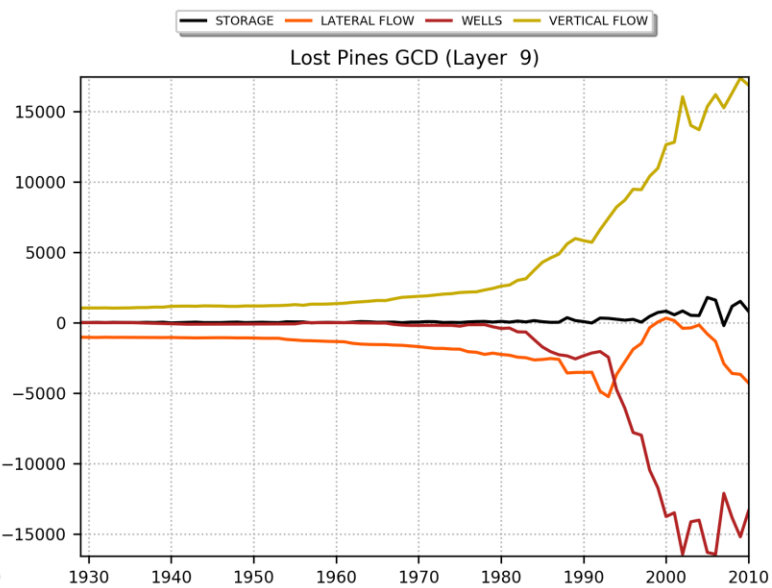
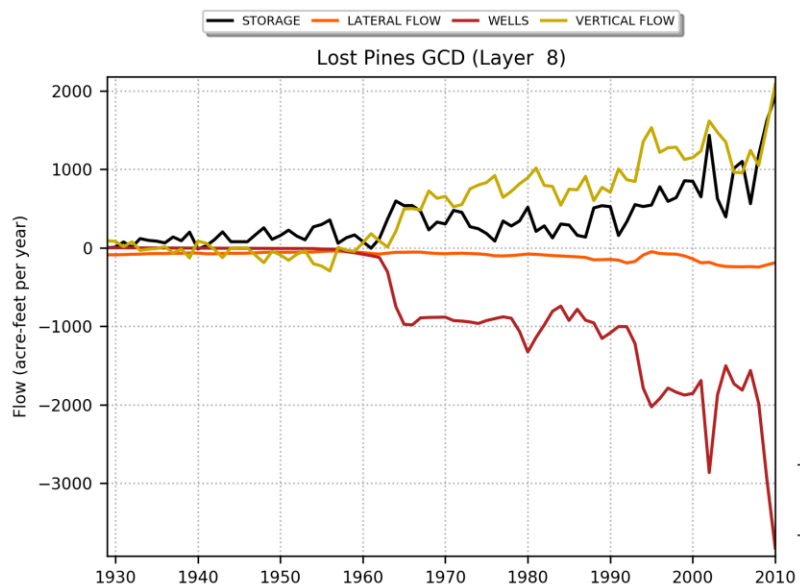
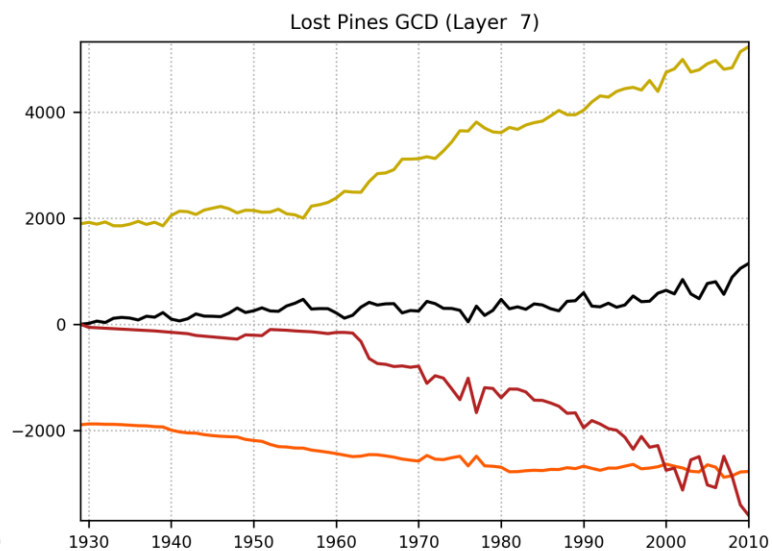
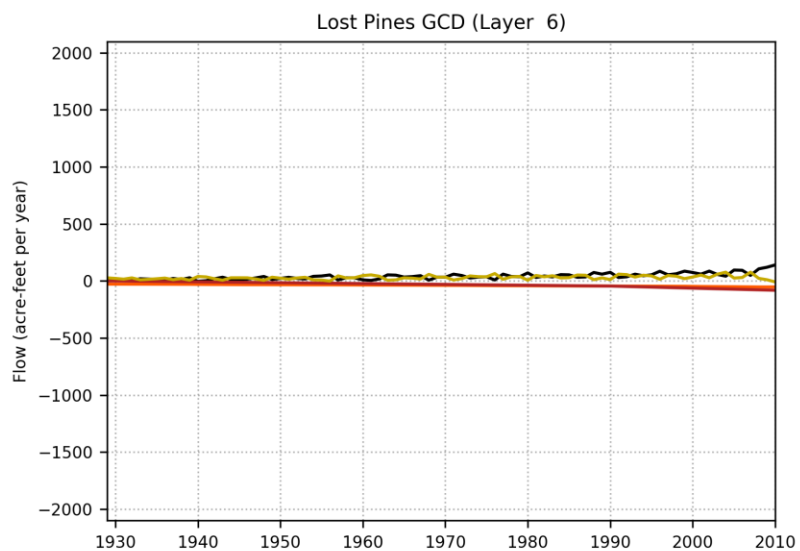
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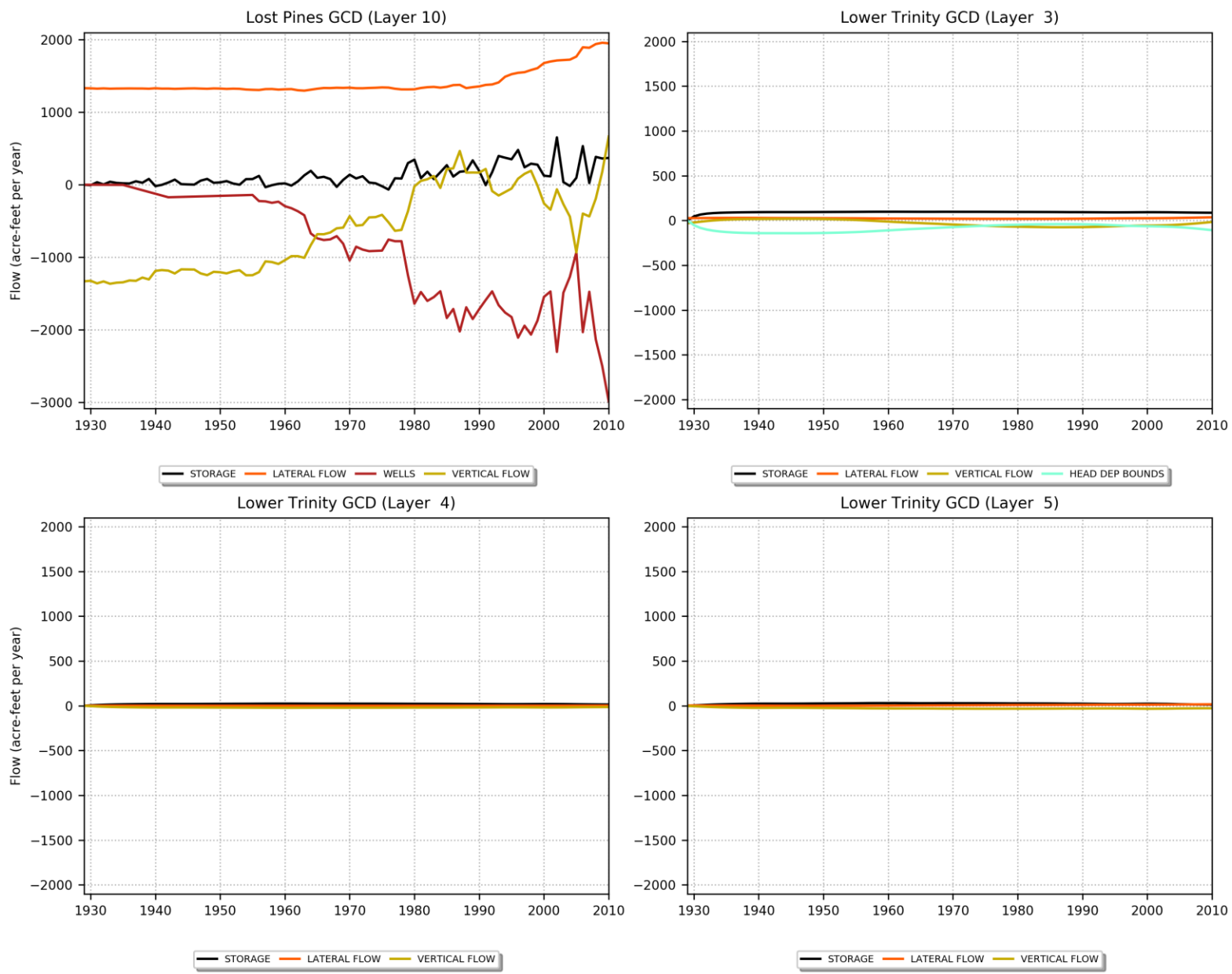
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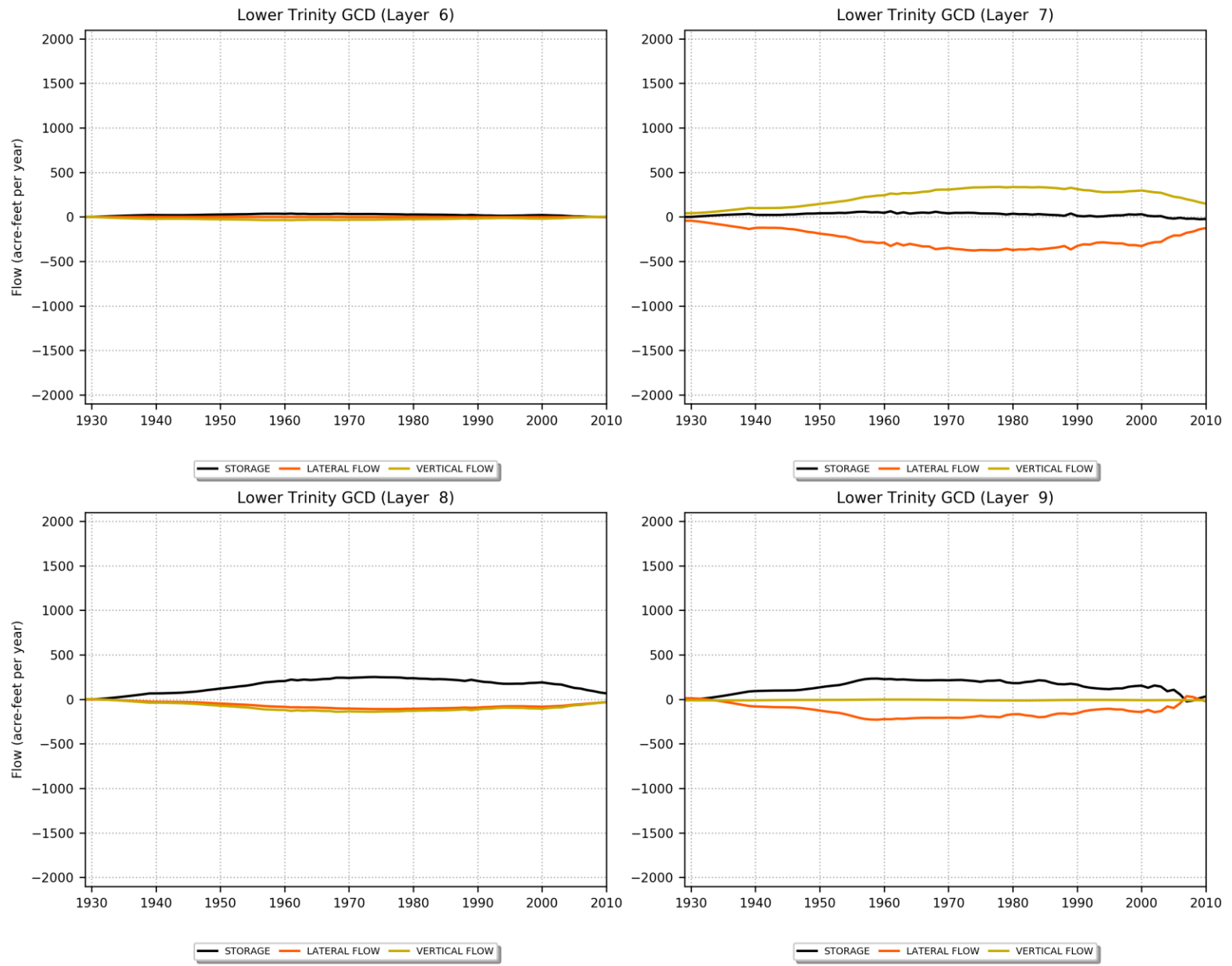
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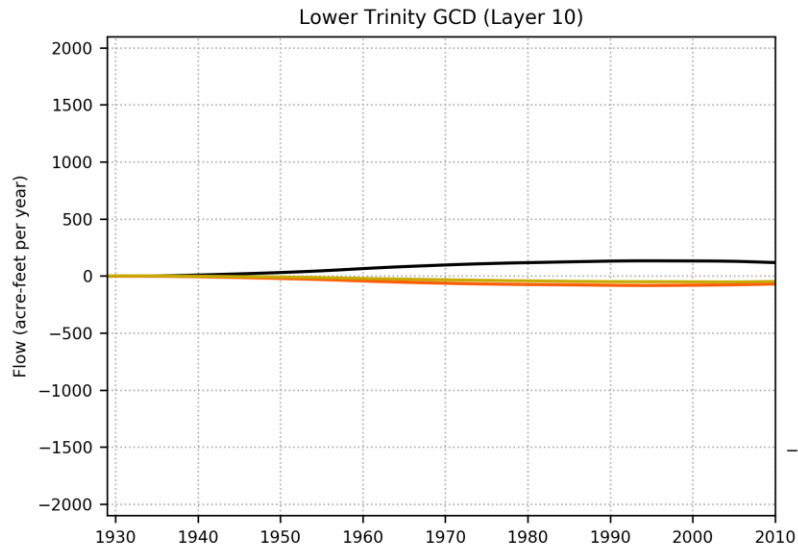
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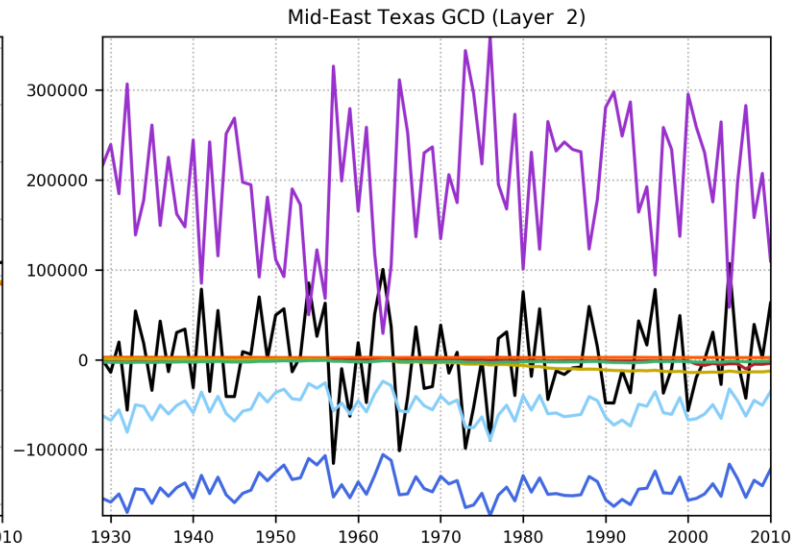
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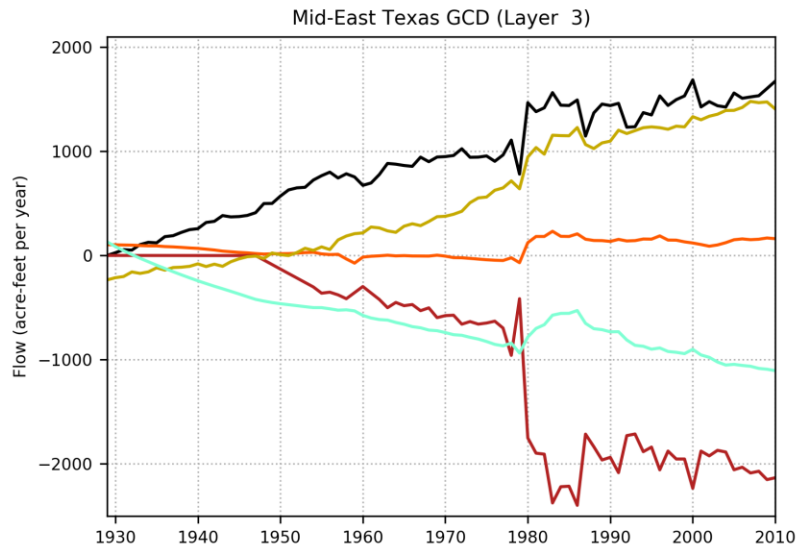
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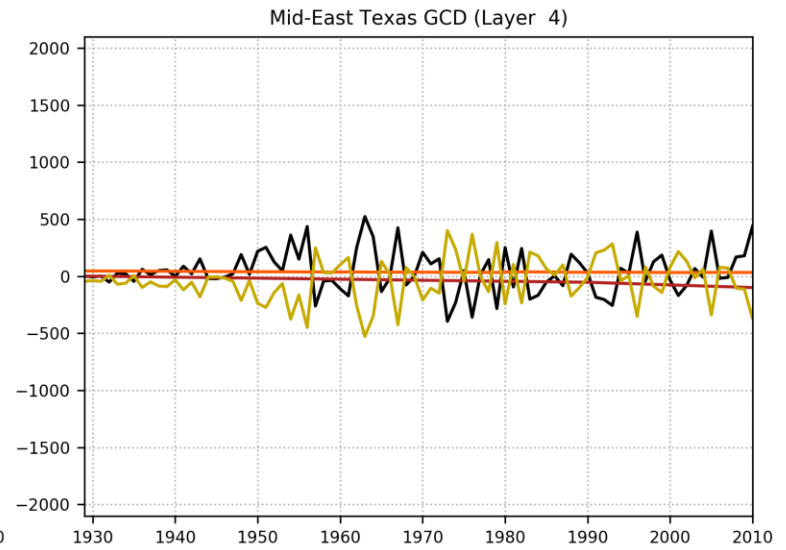
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— STORAGE — RIVER-GROUNDWATER EXCHANGE — STREAM/SEEPS/SPRING FLOW — ET
— LATERAL FLOW — WELLS — VERTICAL FLOW — RECHARGE

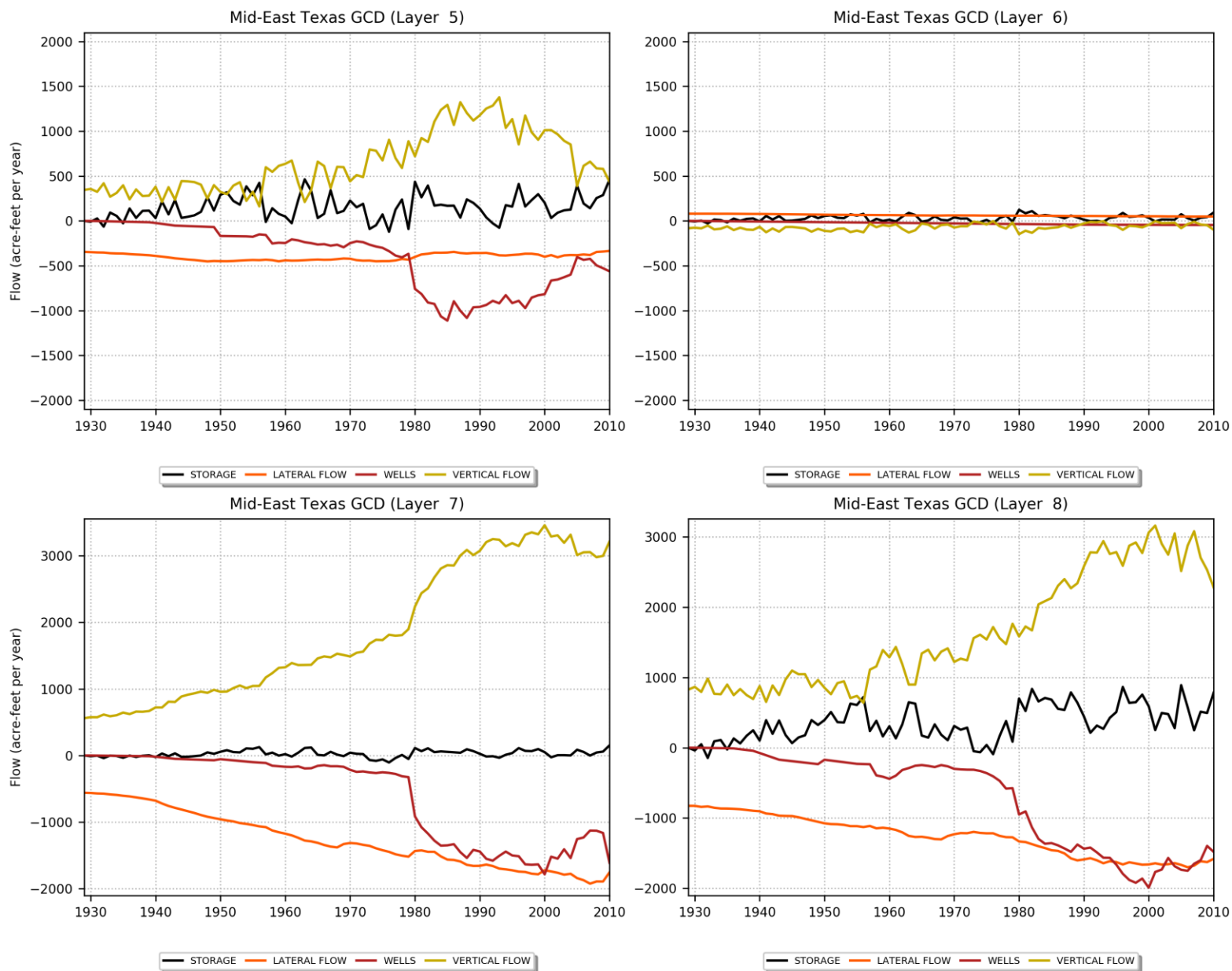


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— LATERAL FLOW

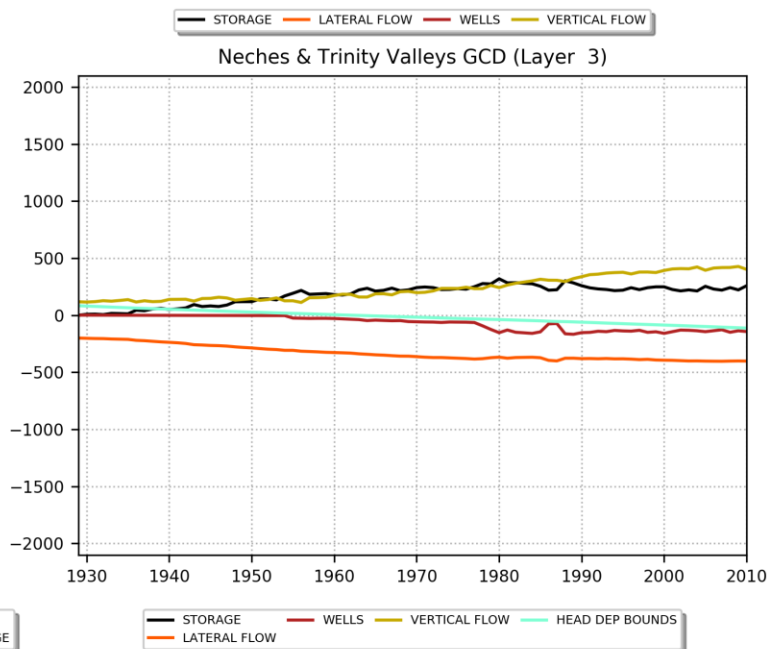
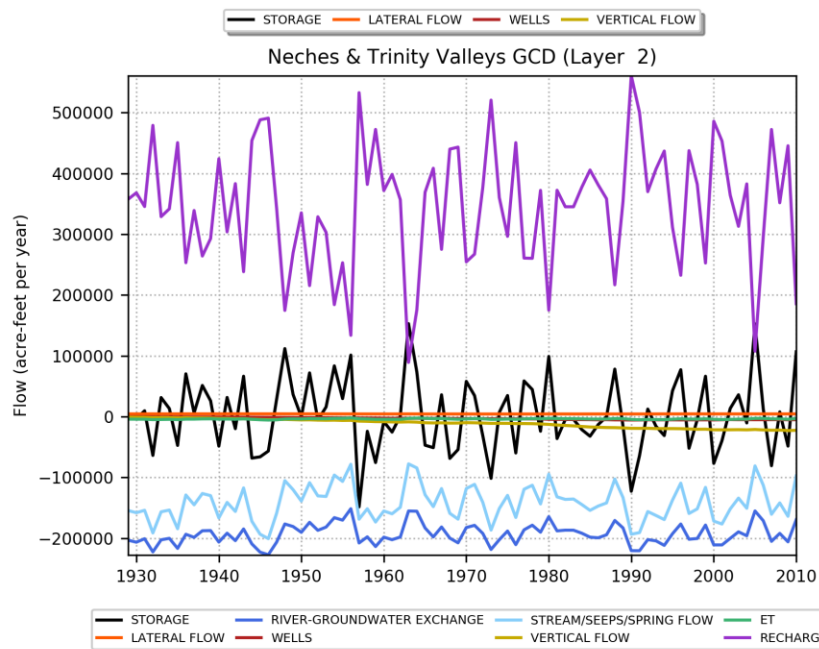
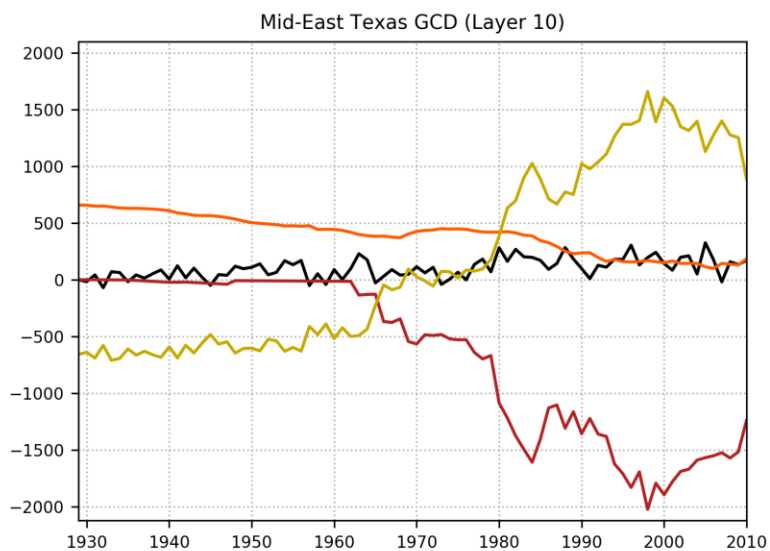
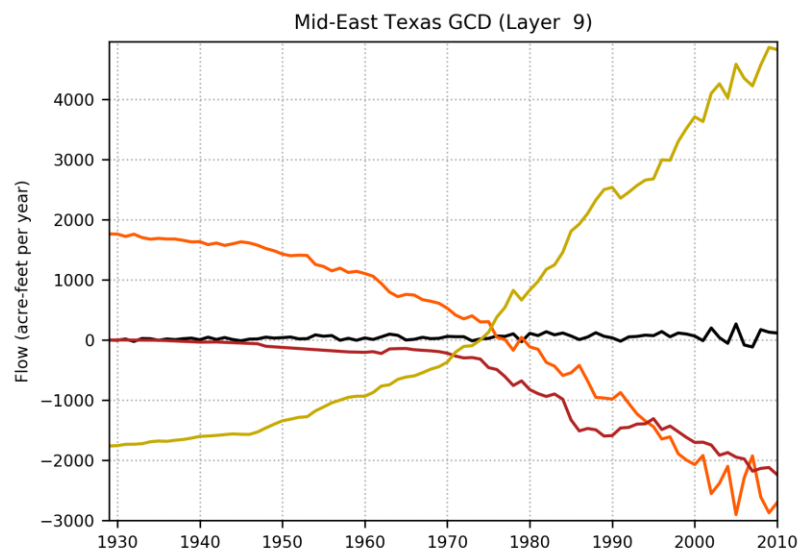


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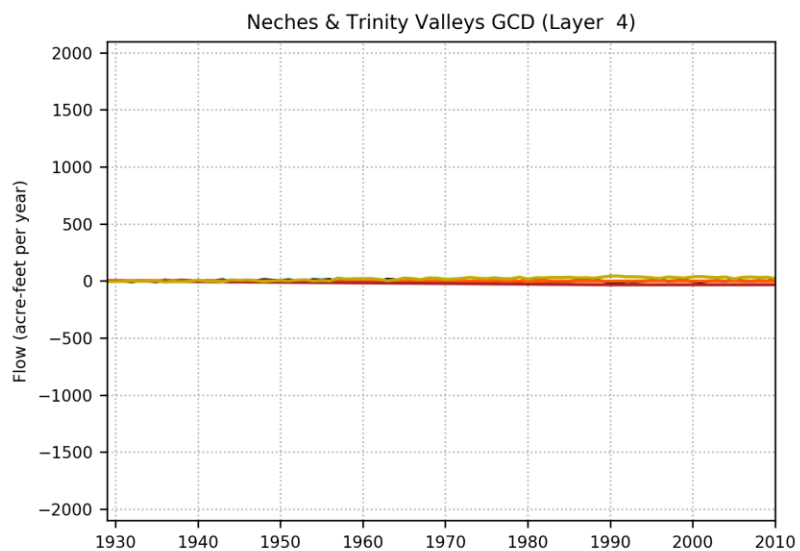
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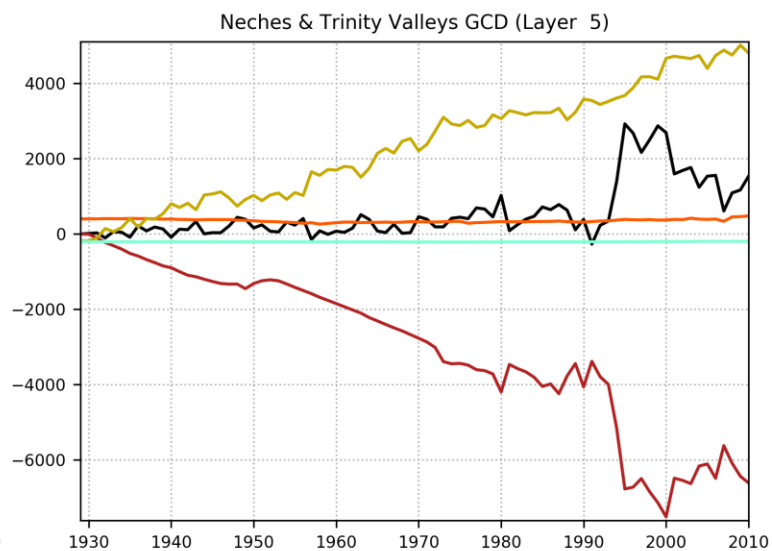
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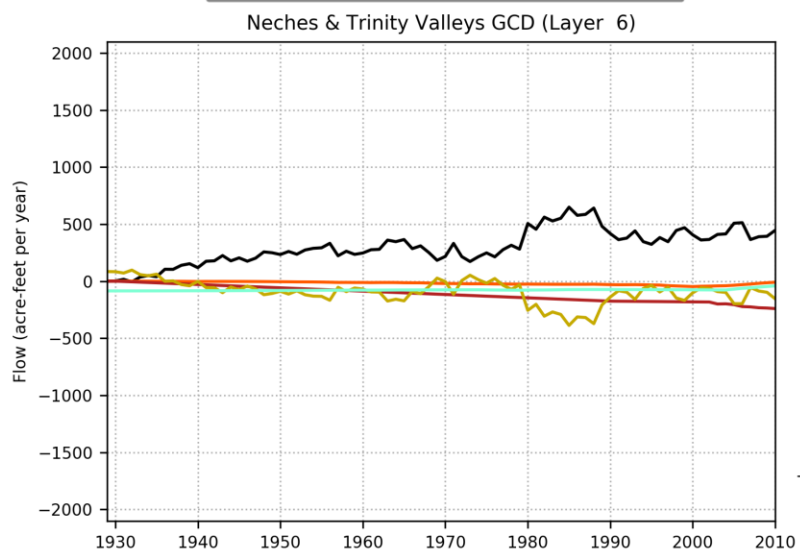
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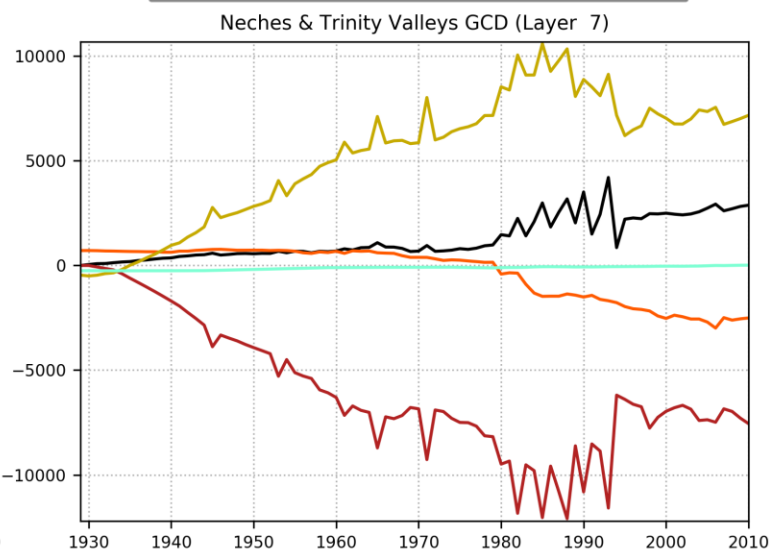
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— STORAGE — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS
— LATERAL FLOW

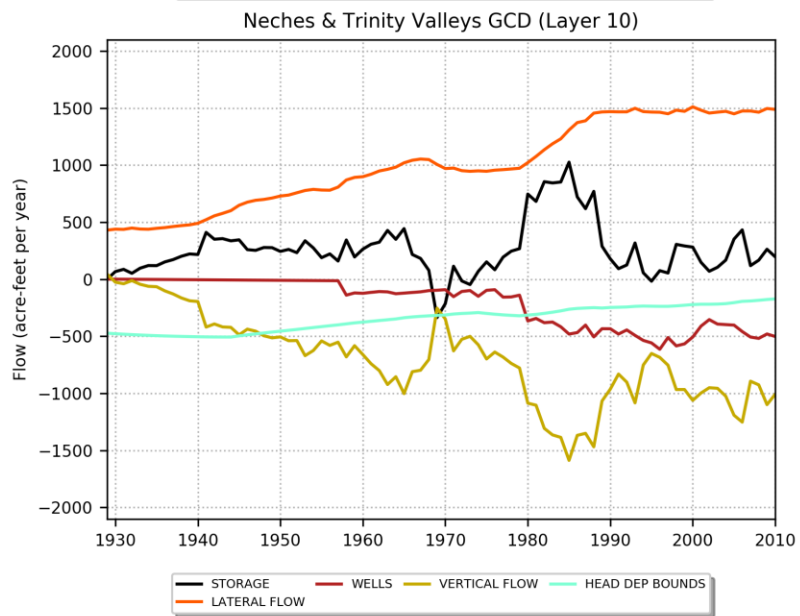
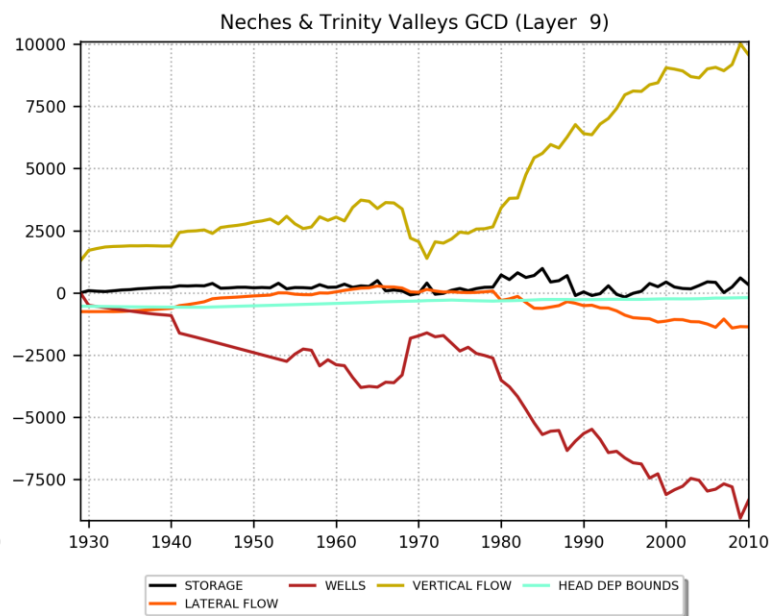
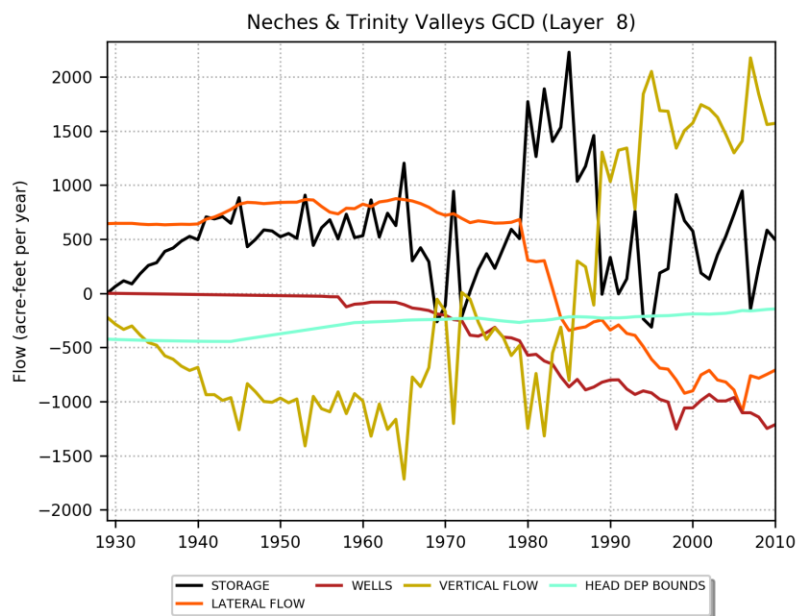


— STORAGE — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS
— LATERAL FLOW

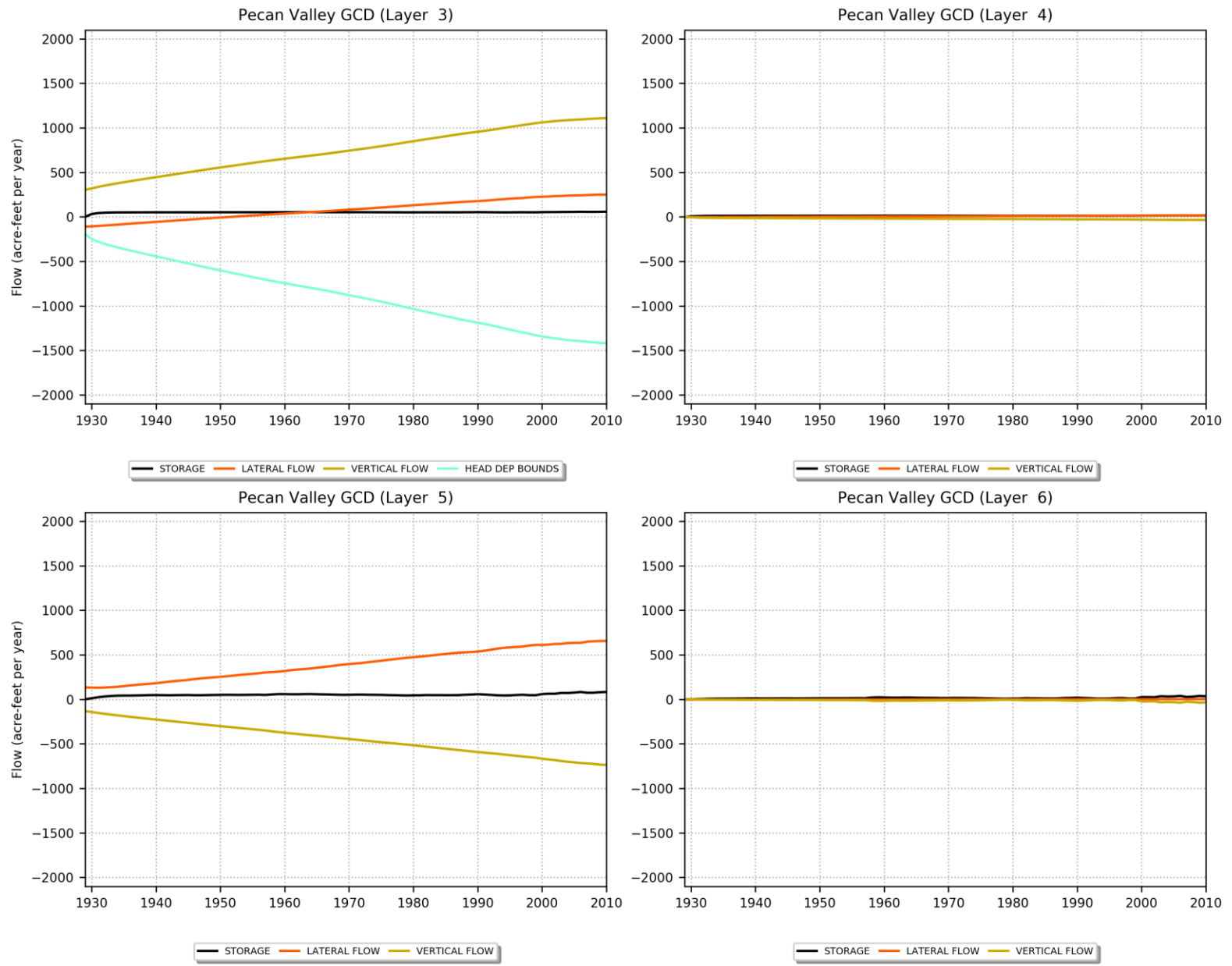


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— LATERAL FLOW

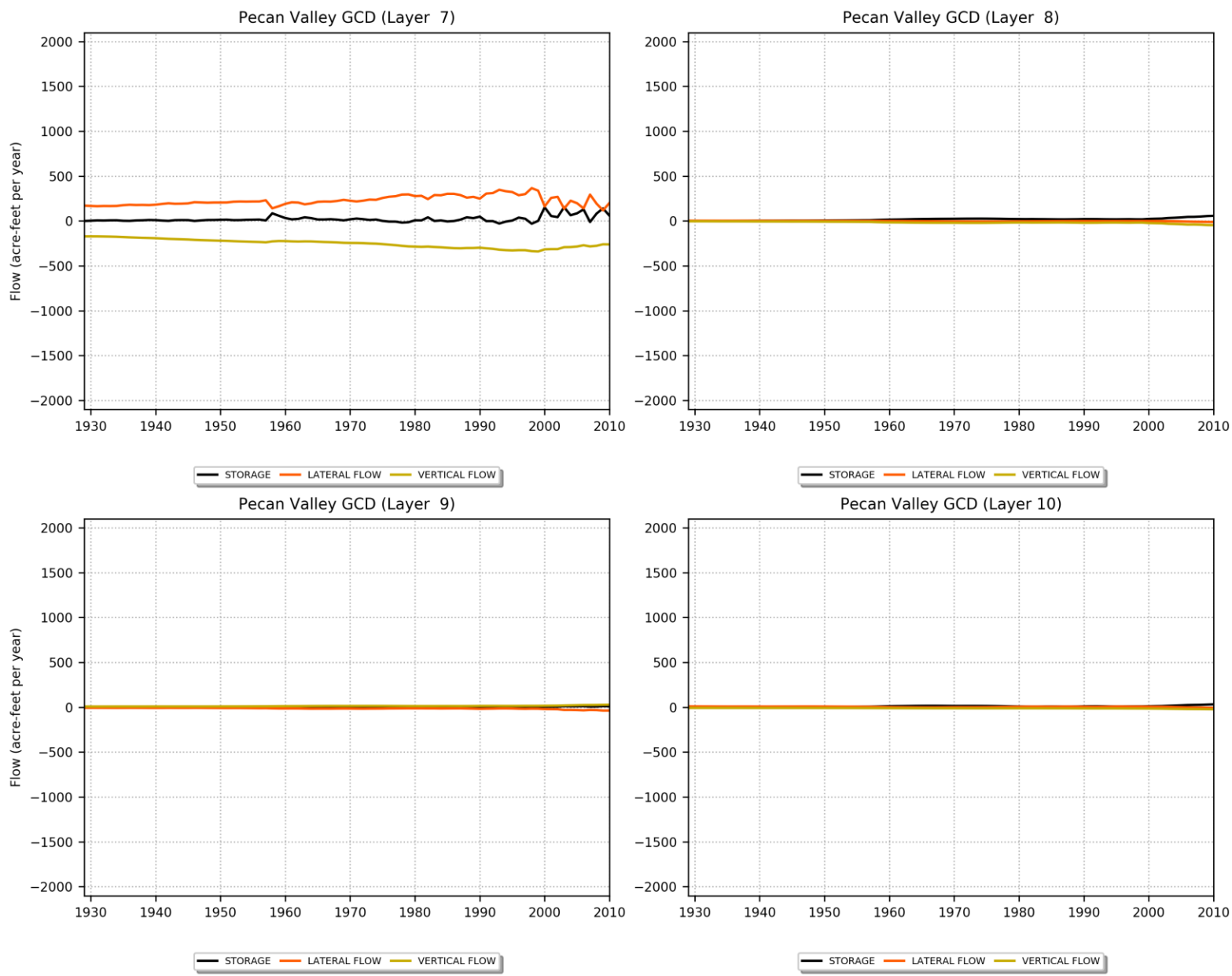
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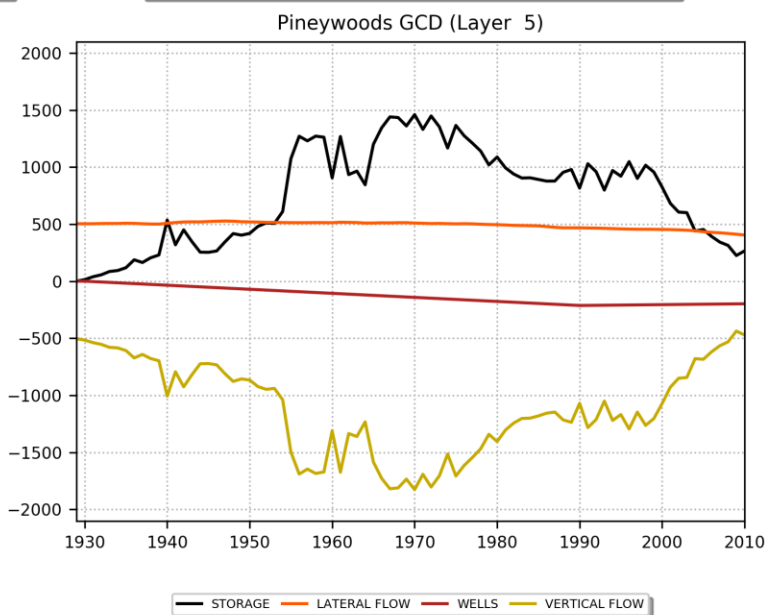
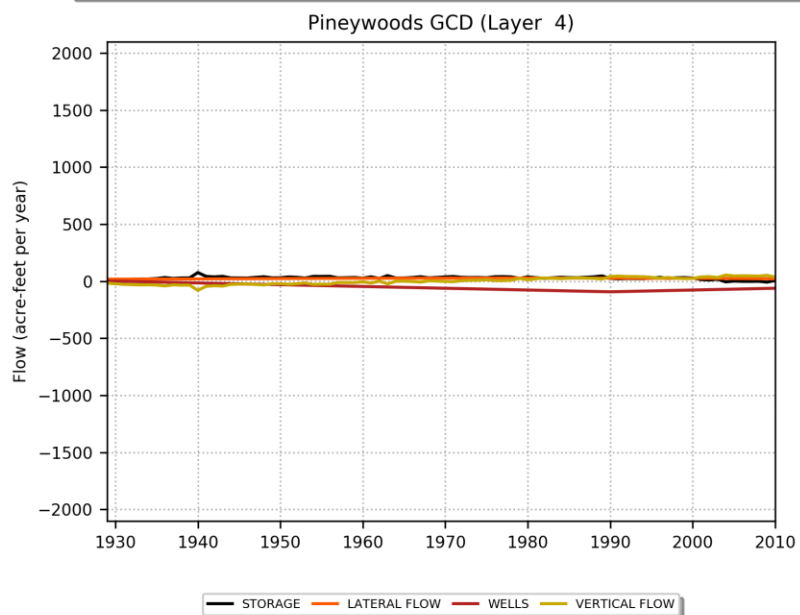
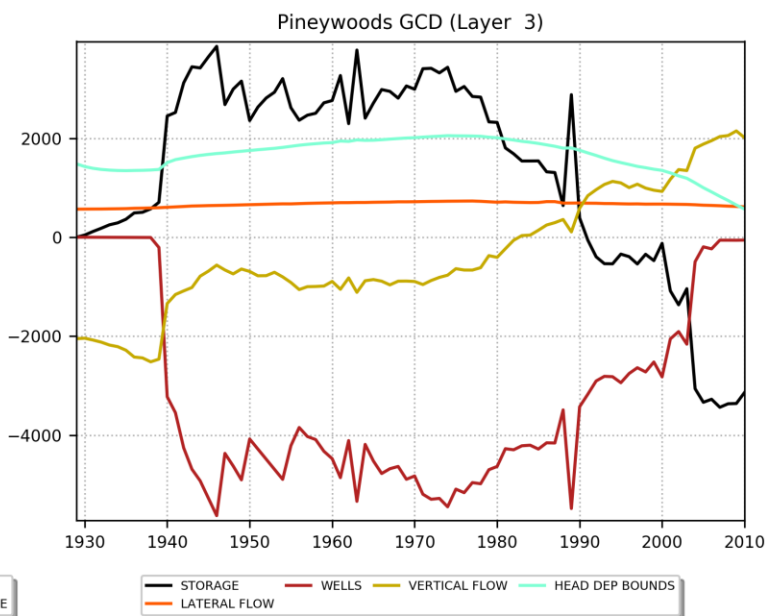
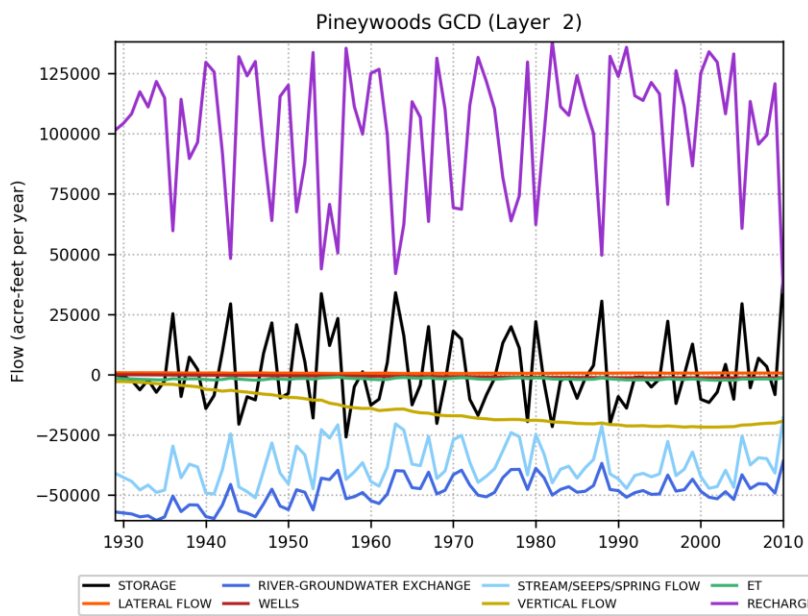
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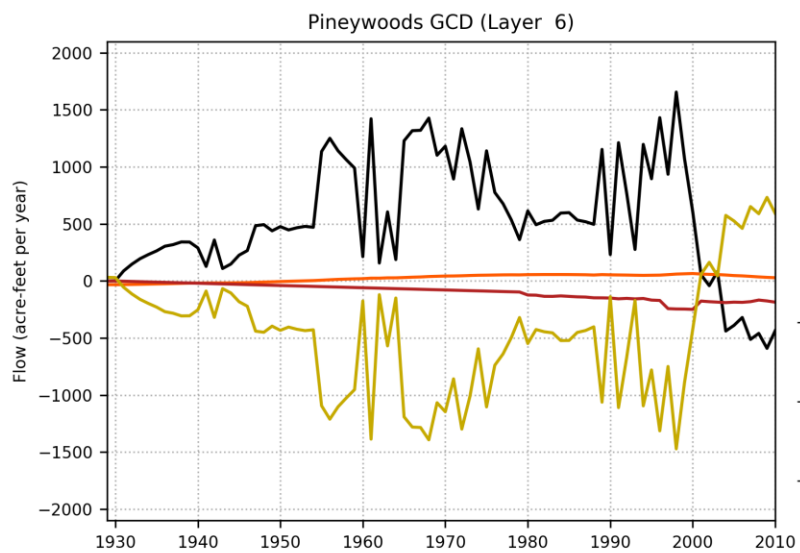
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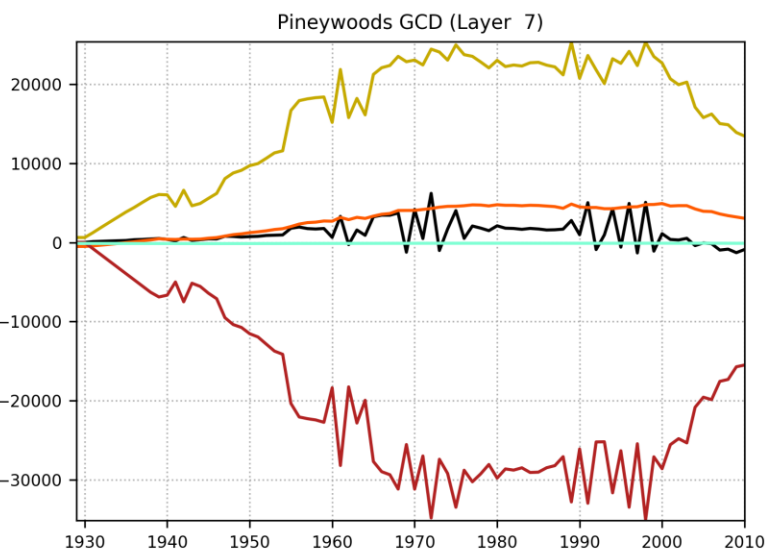
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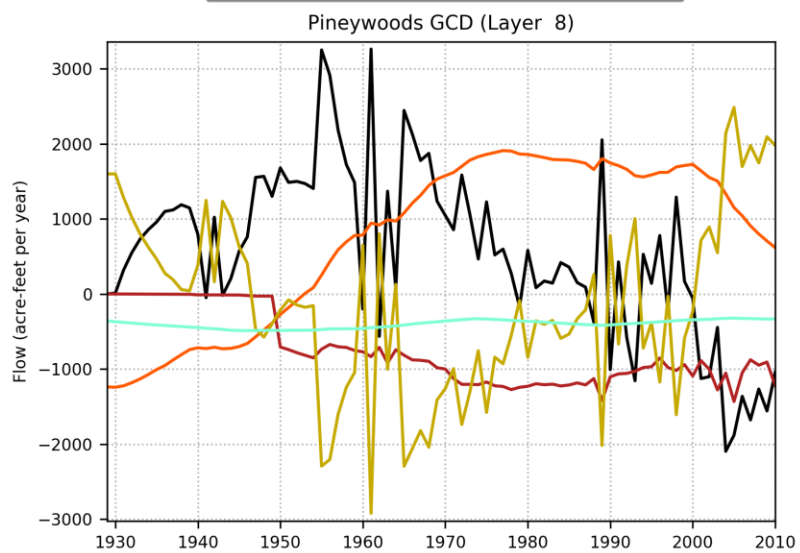
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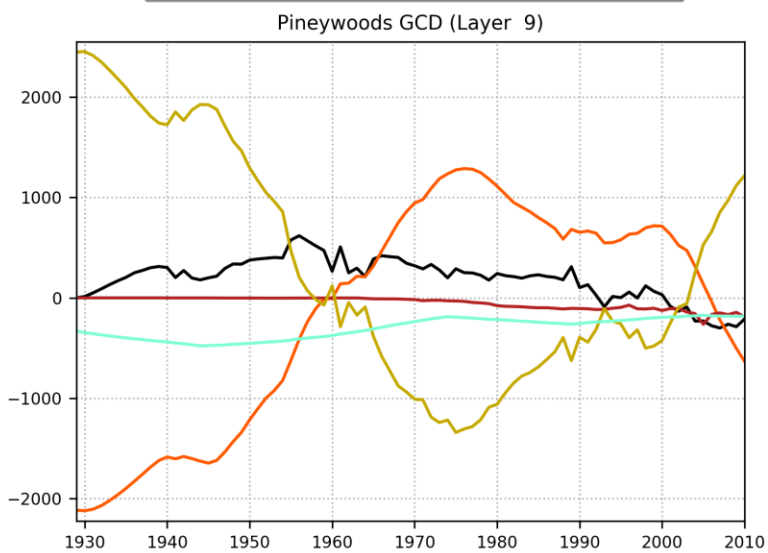
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— STORAGE — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS
— LATERAL FLOW

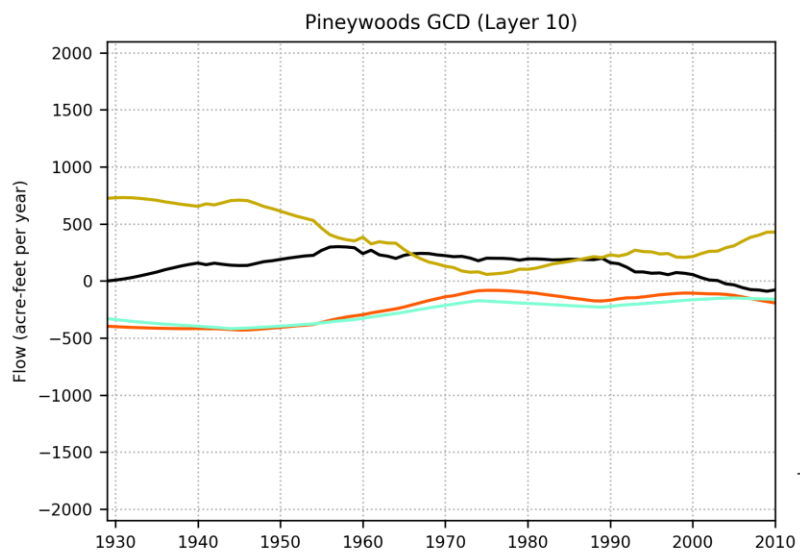


— STORAGE — WELLS — VERTICAL FLOW — HEAD DEP BOUNDS
— LATERAL FLOW

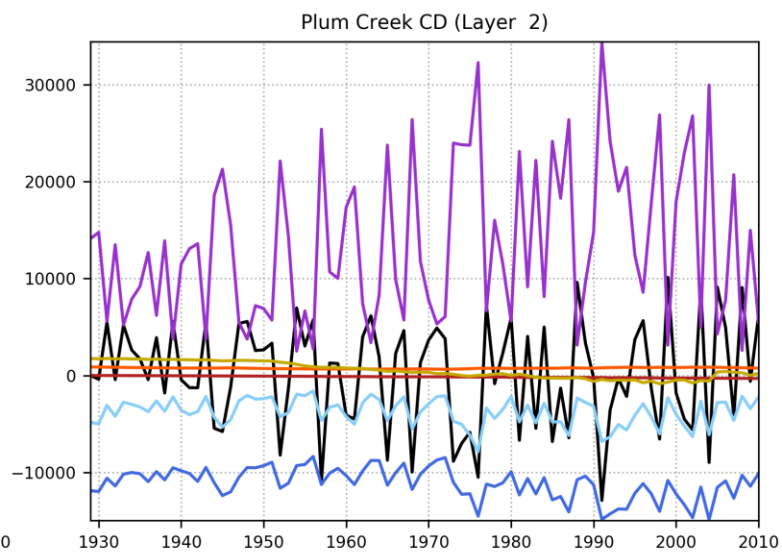


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— LATERAL FLOW

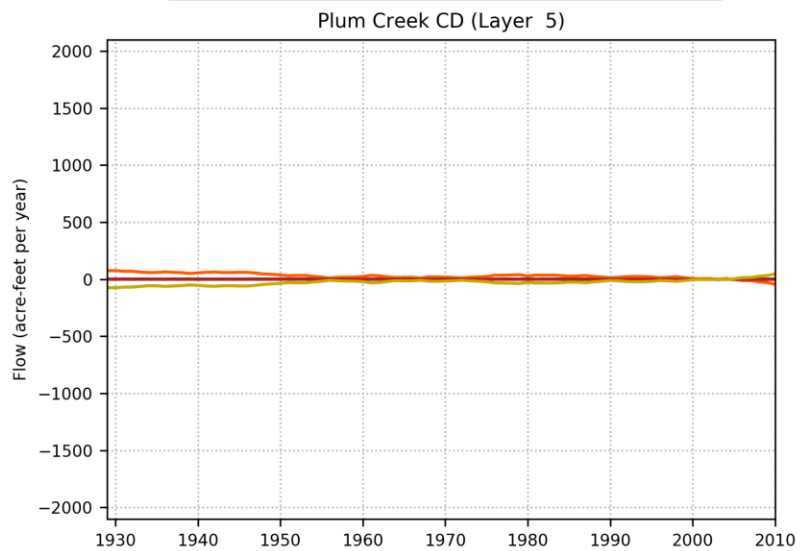
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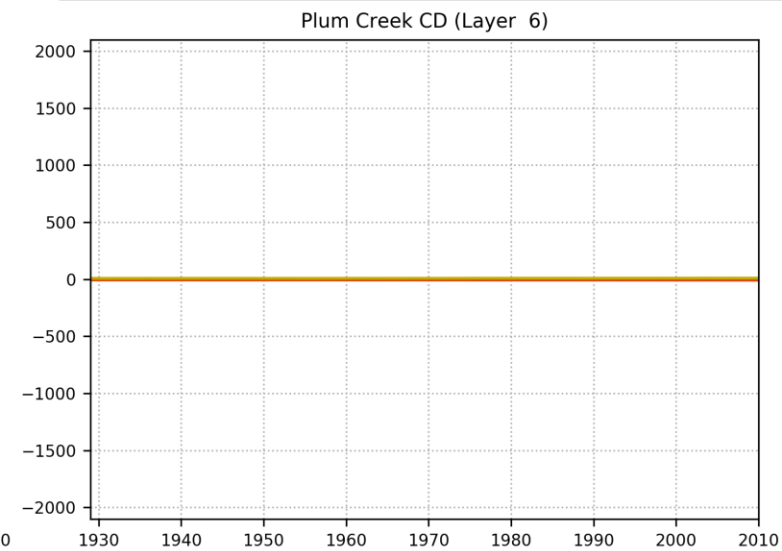
— STORAGE
 — LATERAL FLOW
 — VERTICAL FLOW
 — HEAD DEP BOUNDS



— STORAGE
 — RIVER-GROUNDWATER EXCHANGE
 — STREAM/SEEPS/SPRING FLOW
 — RECHARGE
— LATERAL FLOW
— WELLS
— VERTICAL FLOW

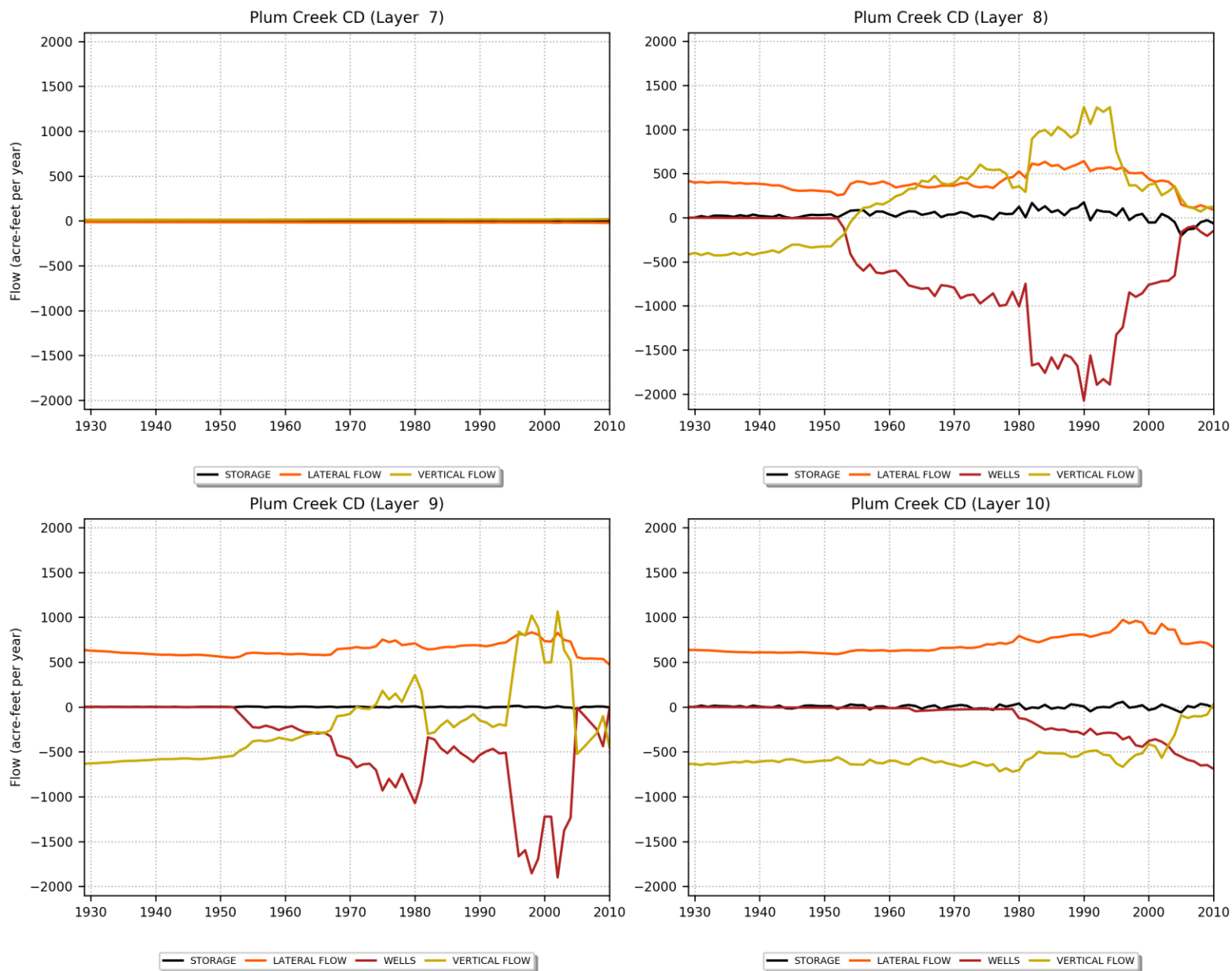


— STORAGE
 — LATERAL FLOW
— WELLS
— VERTICAL FLOW

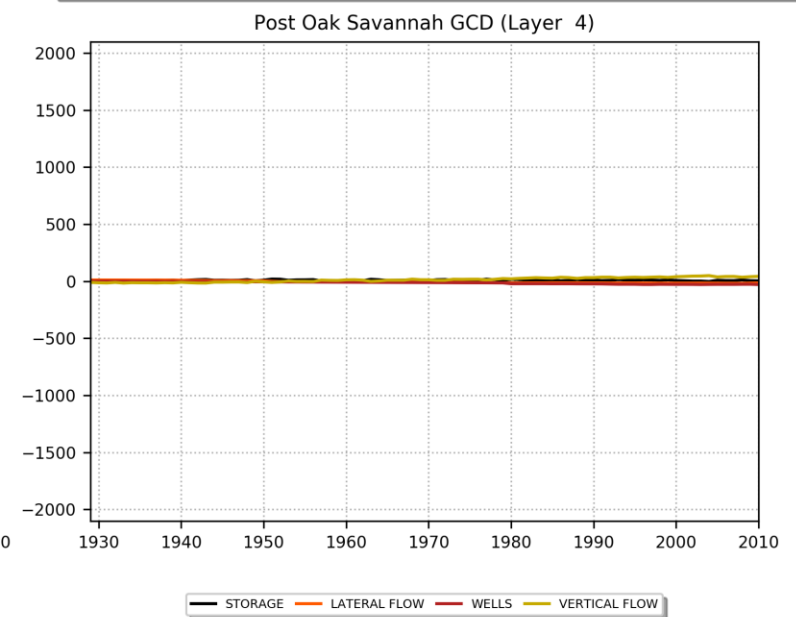
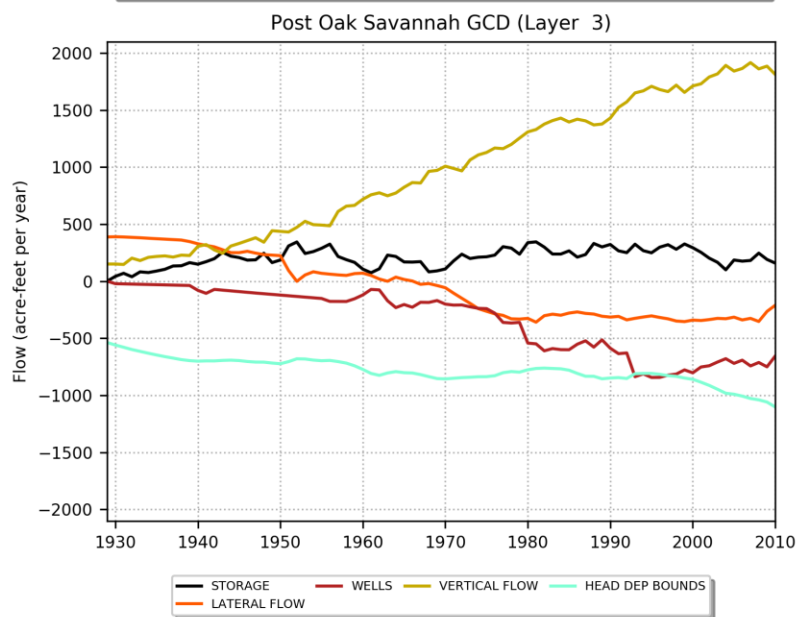
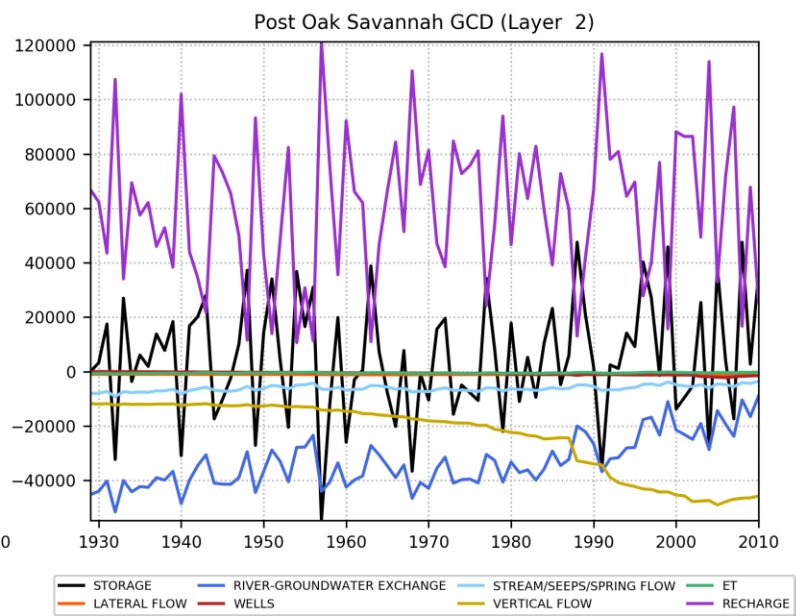
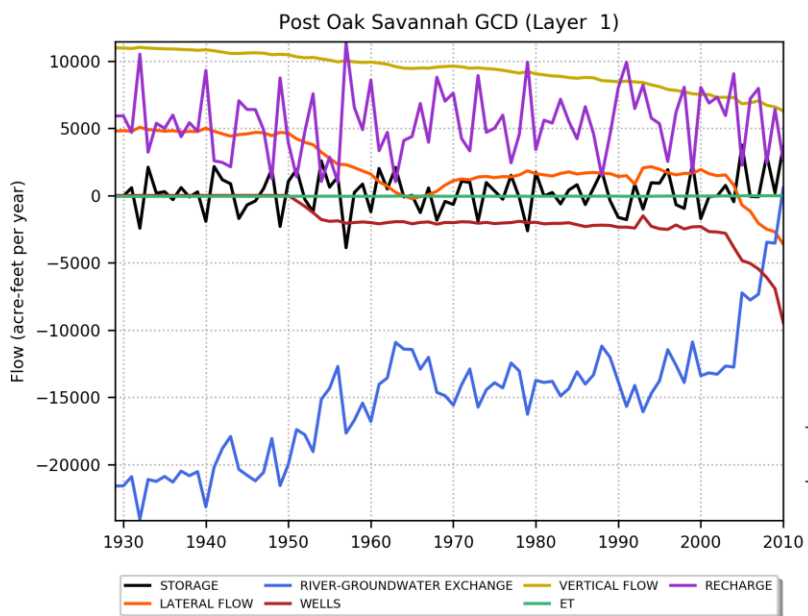


— STORAGE
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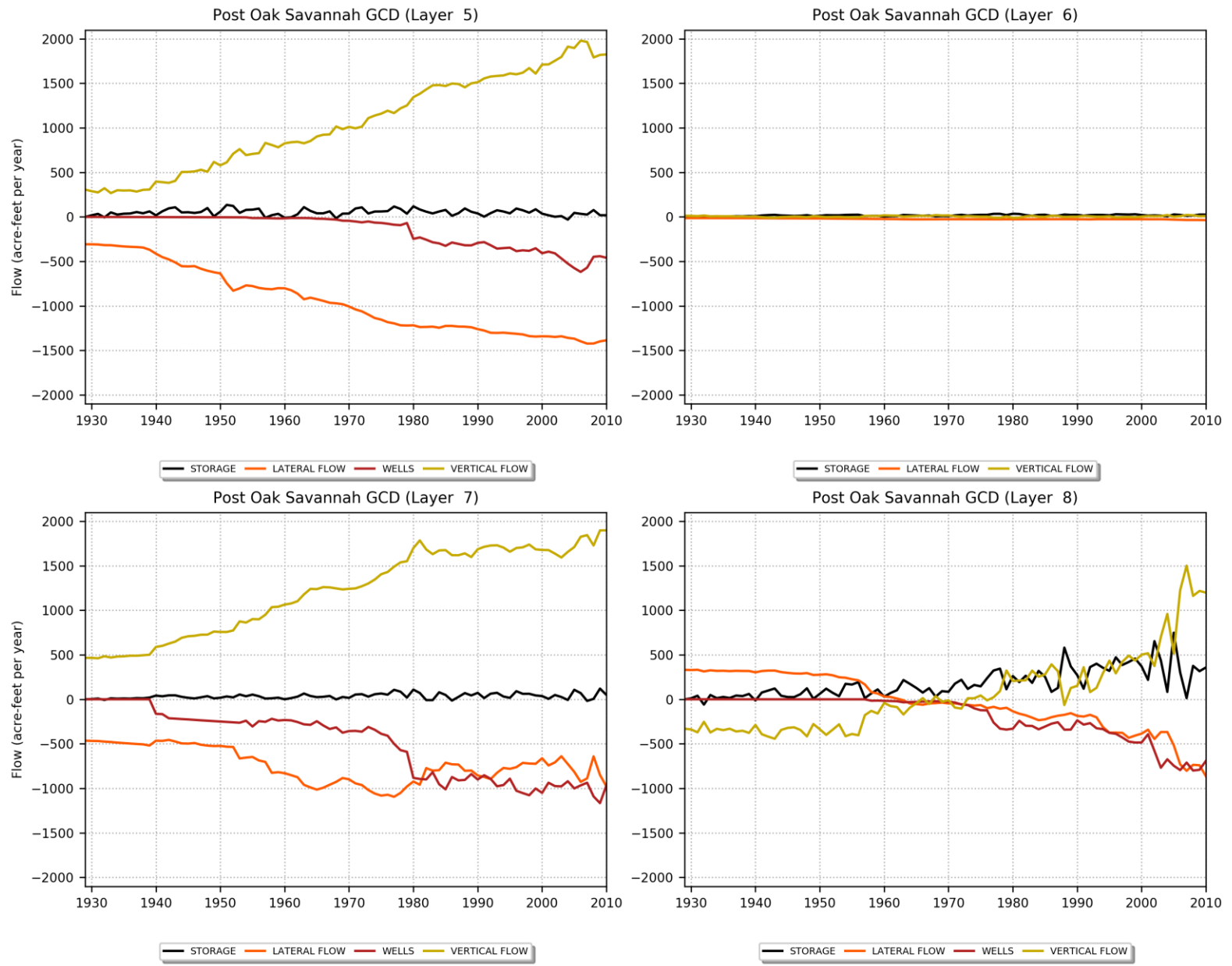
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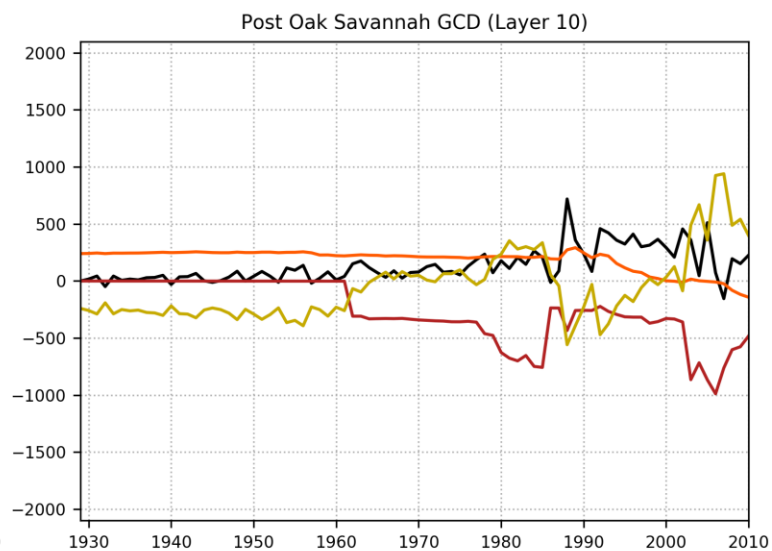
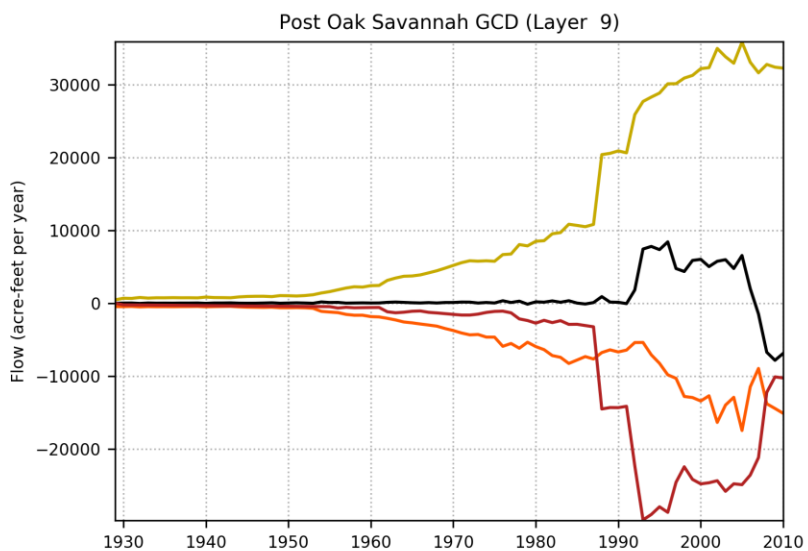
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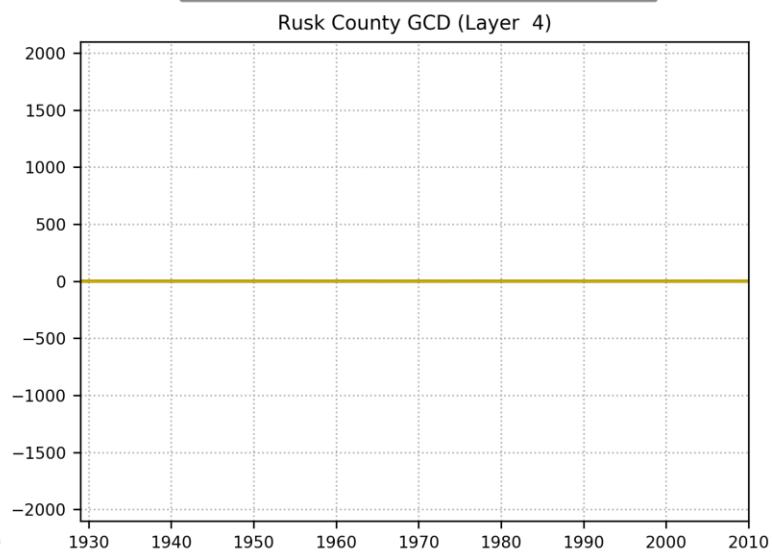
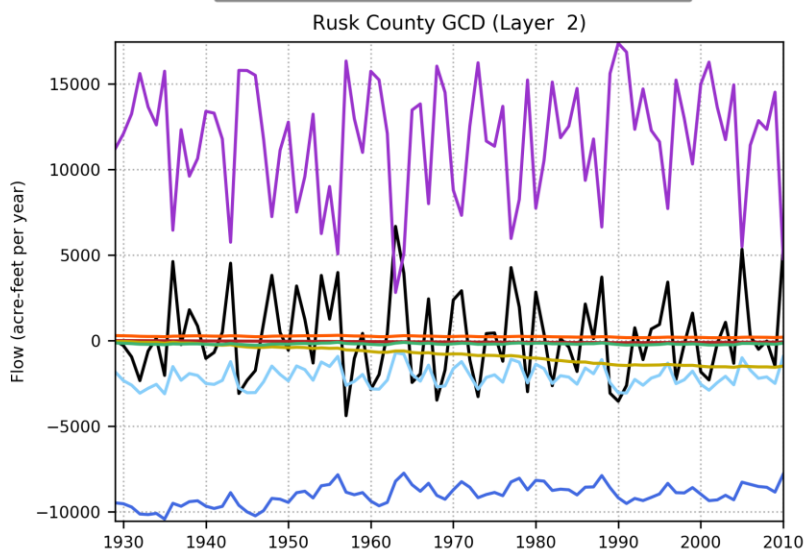


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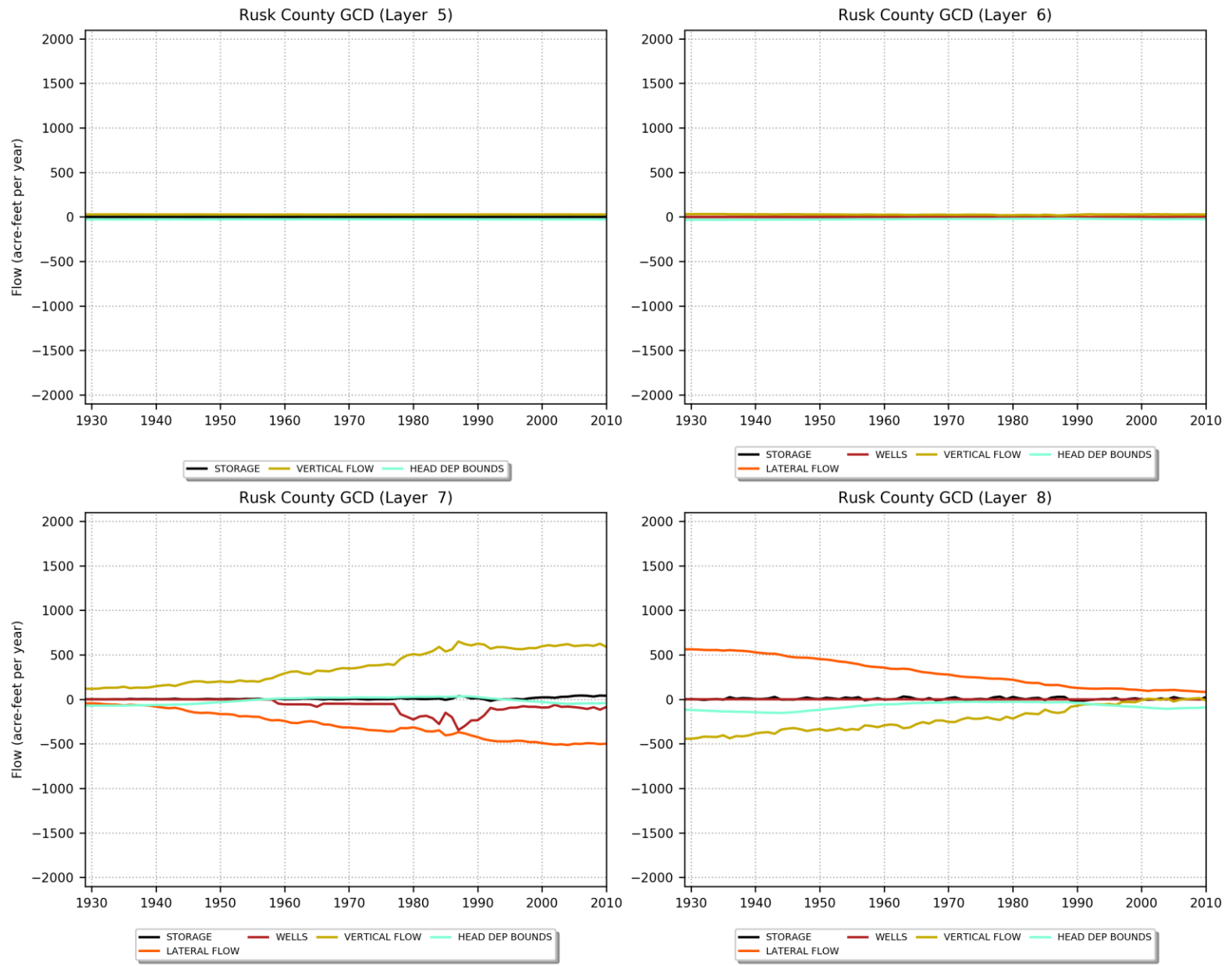
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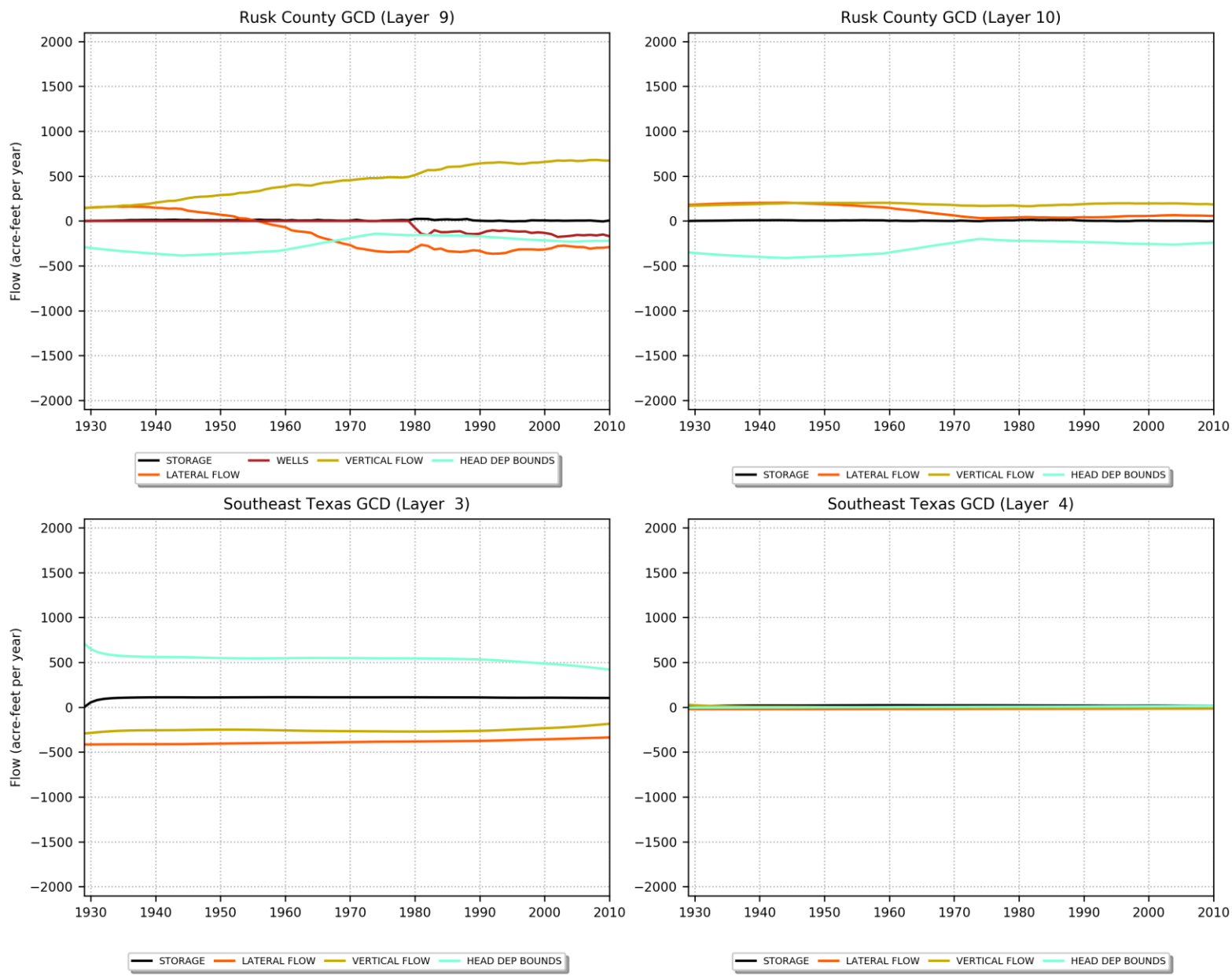
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— LATERAL FLOW — WELLS — VERTICAL FLOW

— STORAGE — VERTICAL FLOW

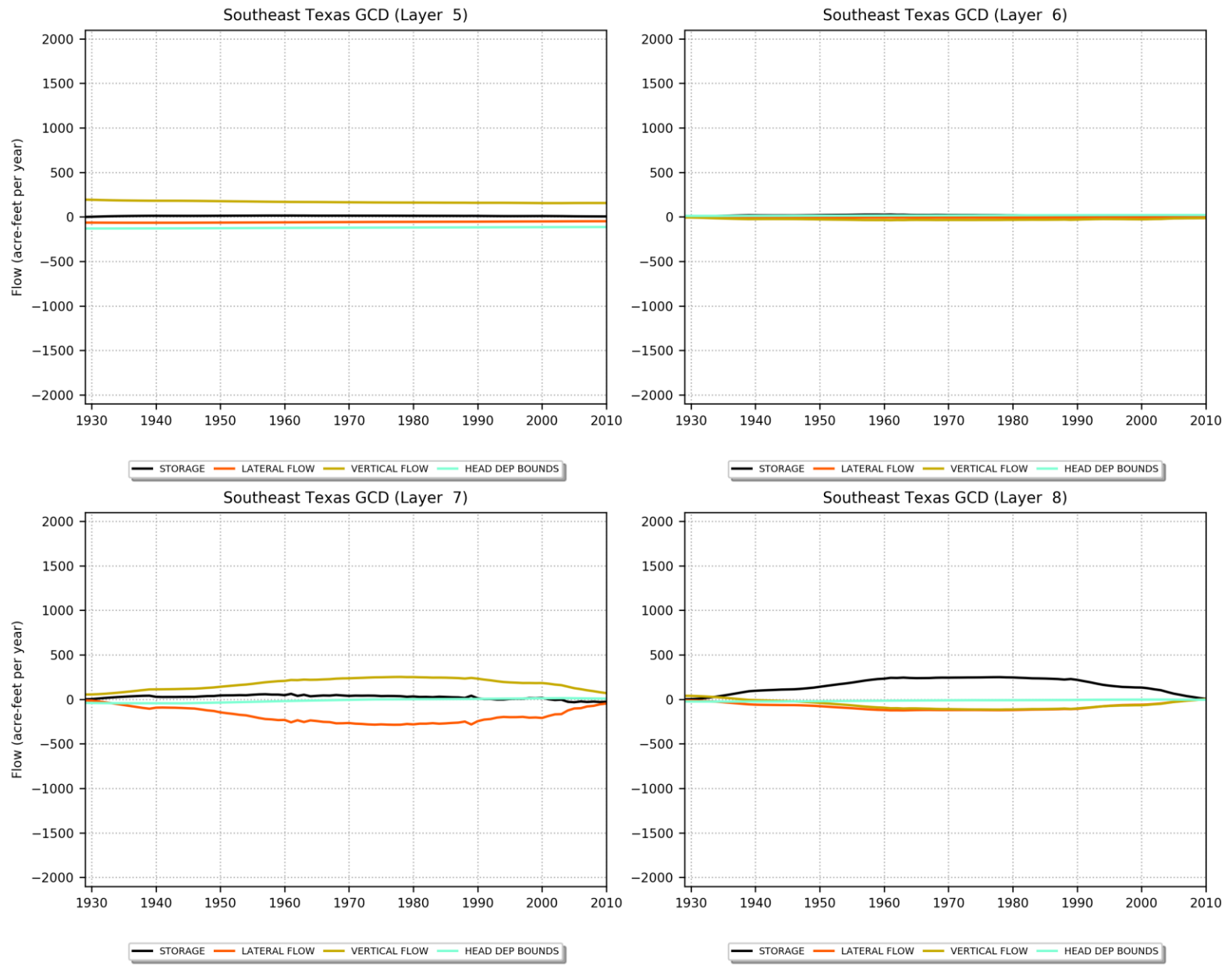
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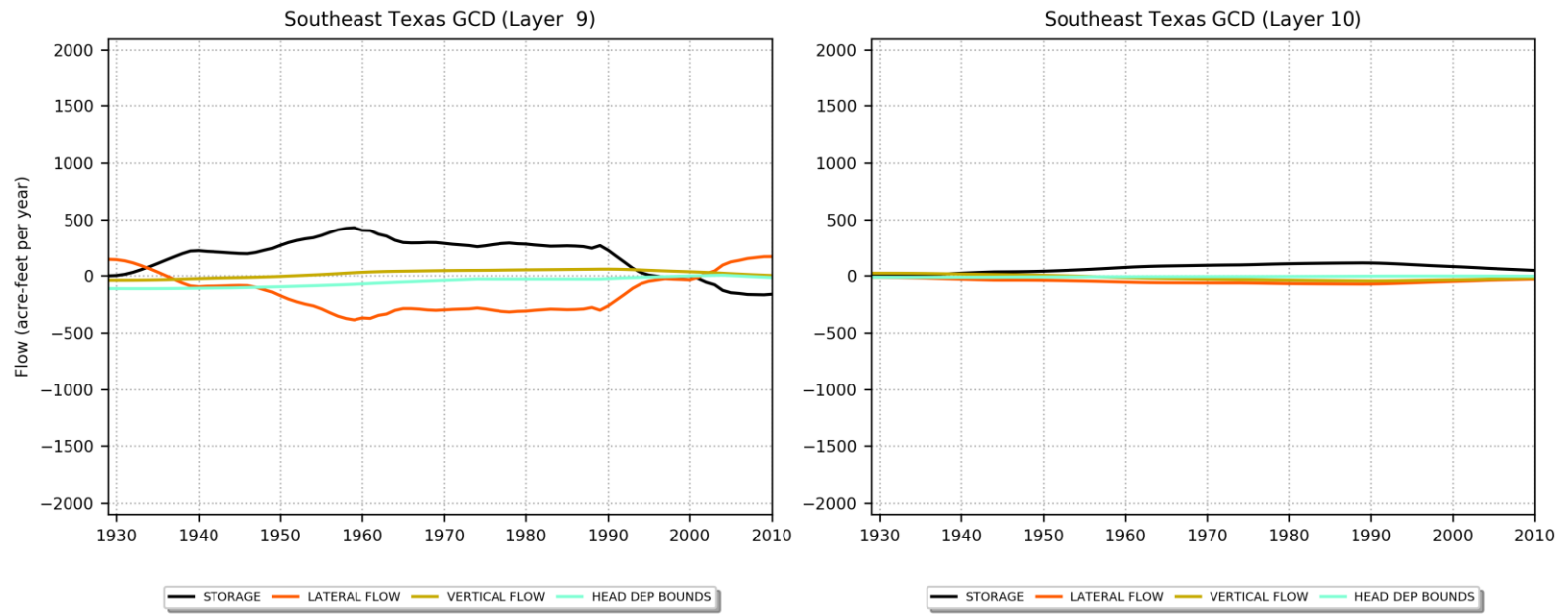
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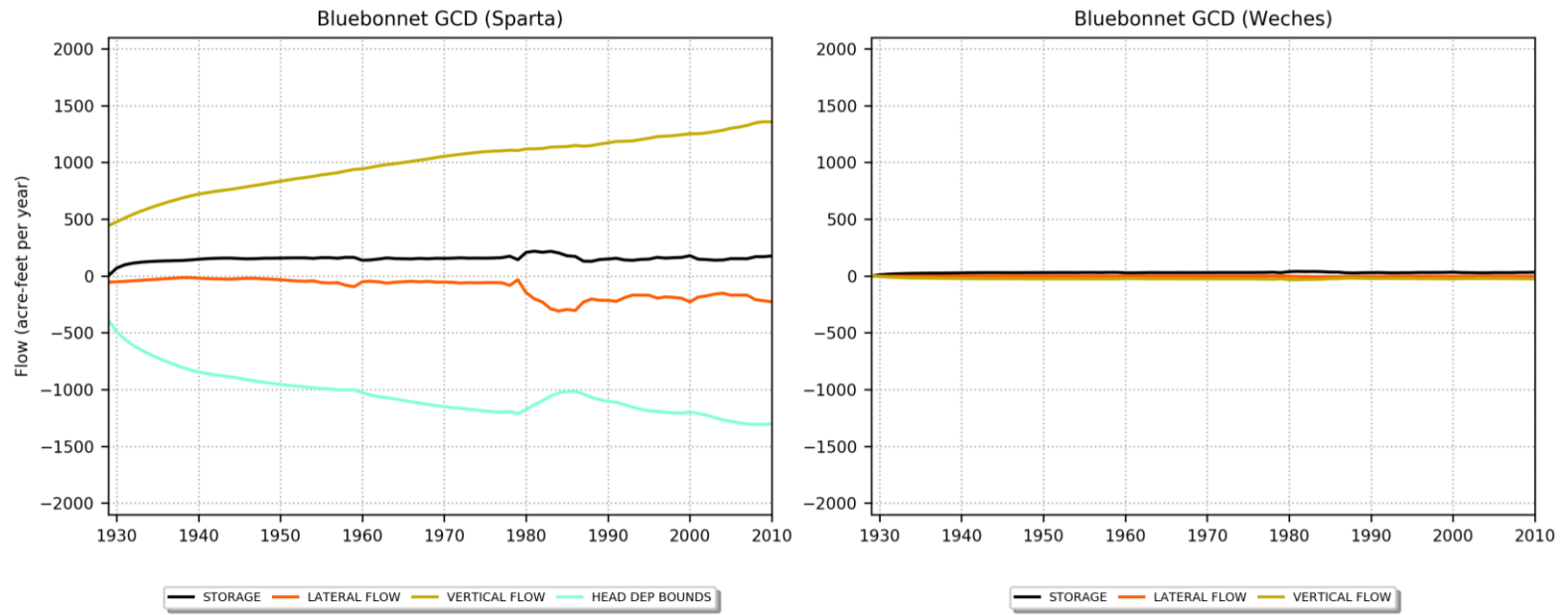
32 Appendix U: Transient Water Budgets by Groundwater Conservation District and Hydrogeologic Unit

Figures showing the transient water budget by groundwater conservation district and hydrogeologic unit are presented in this appendix. The figures are ordered alphabetically by groundwater conservation district then hydrogeologic unit.

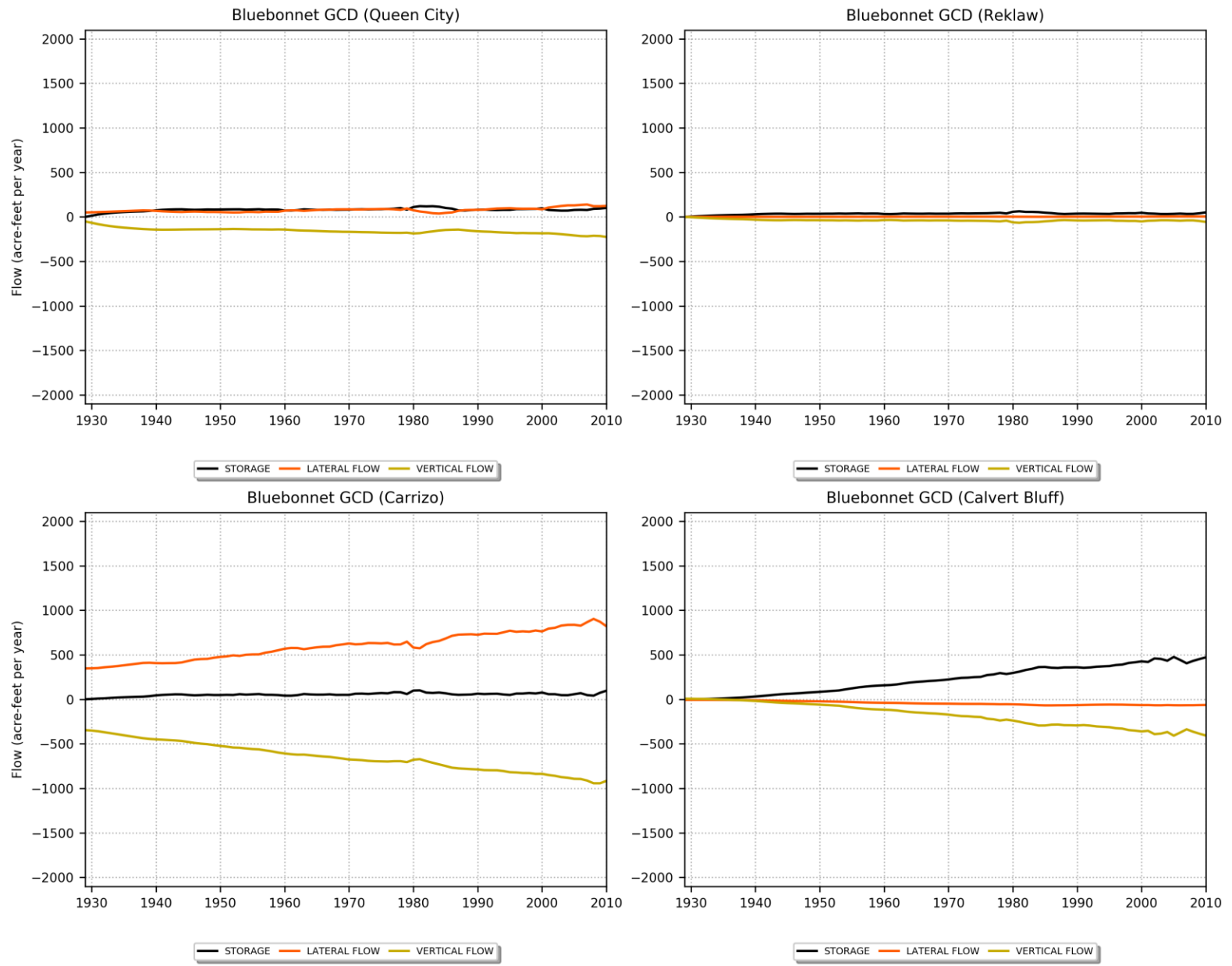
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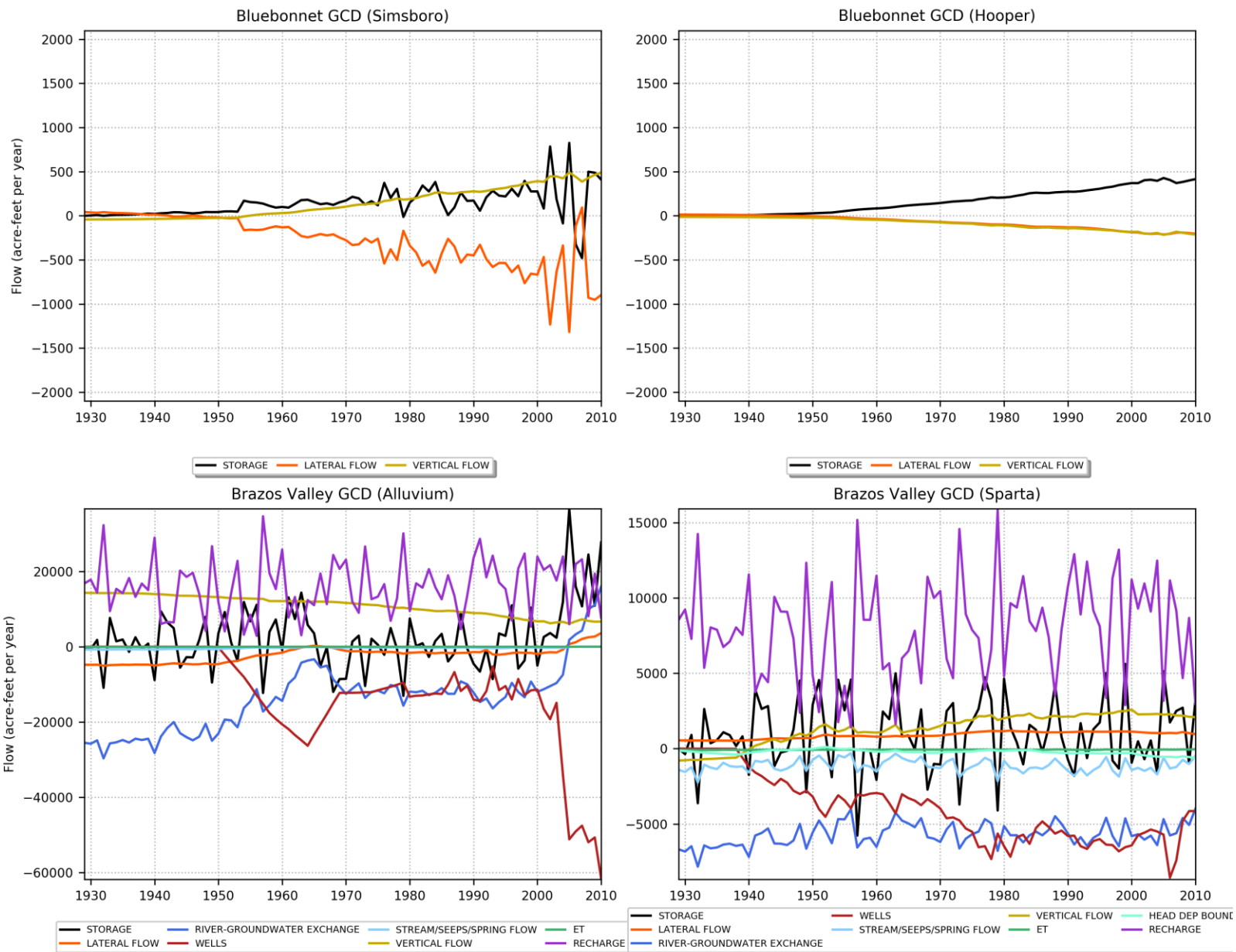
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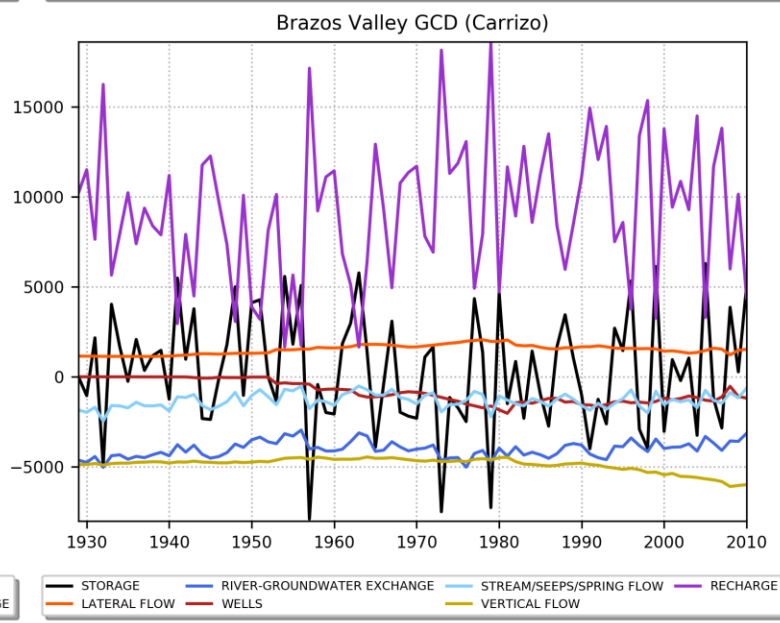
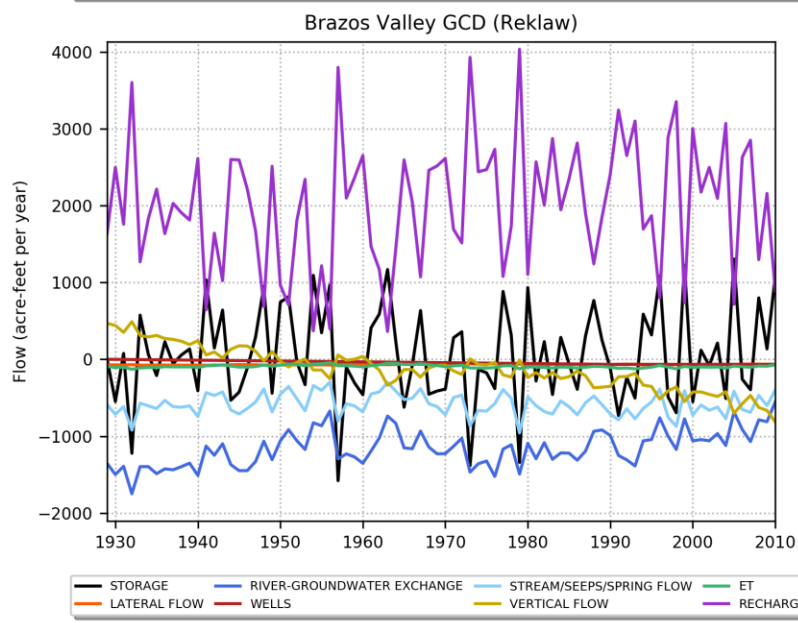
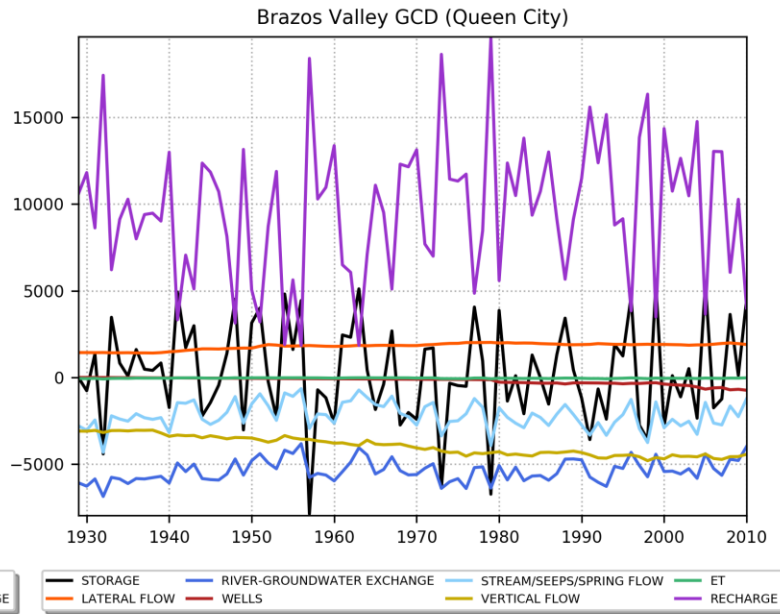
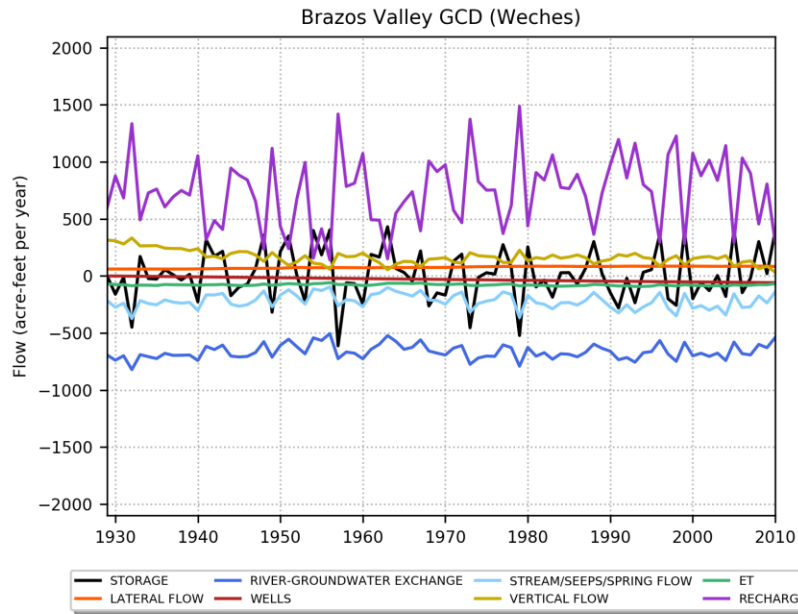
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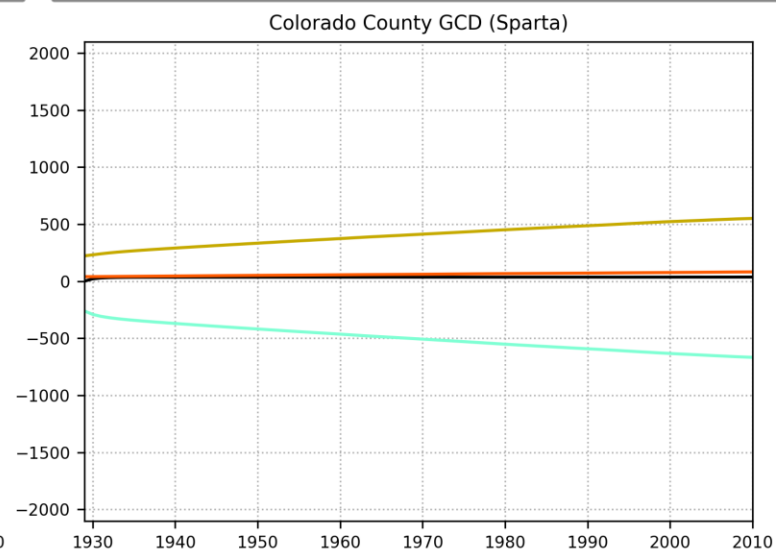
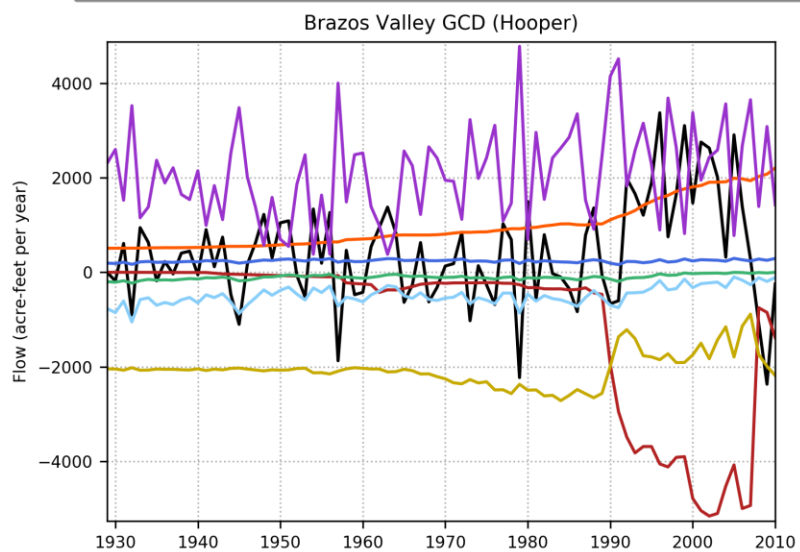
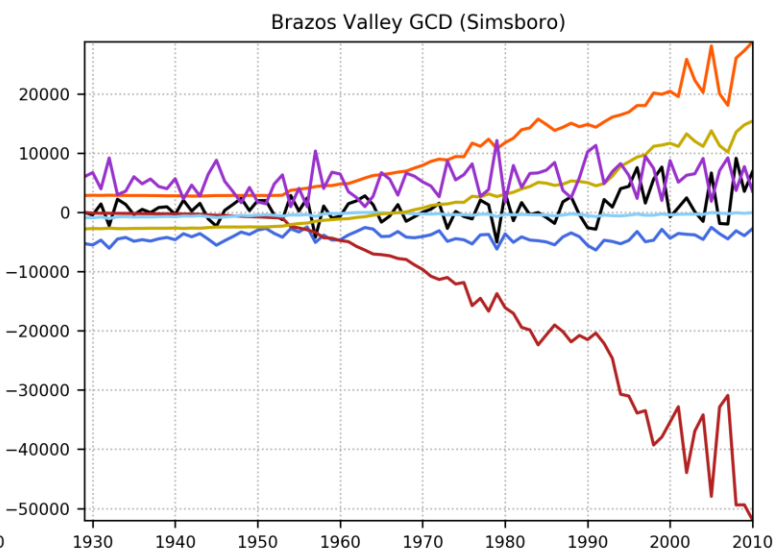
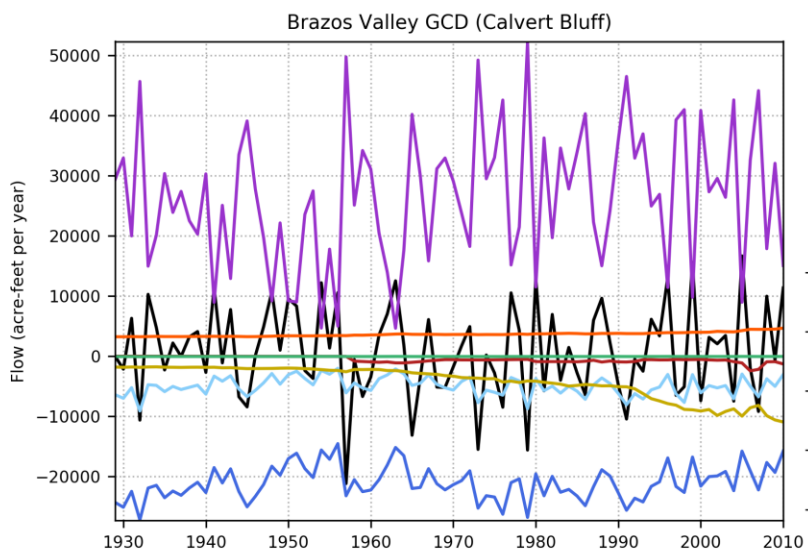
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



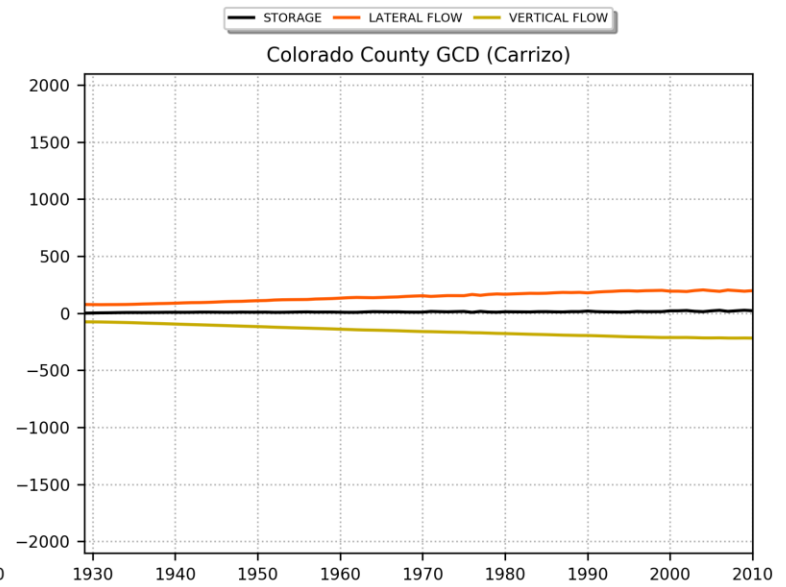
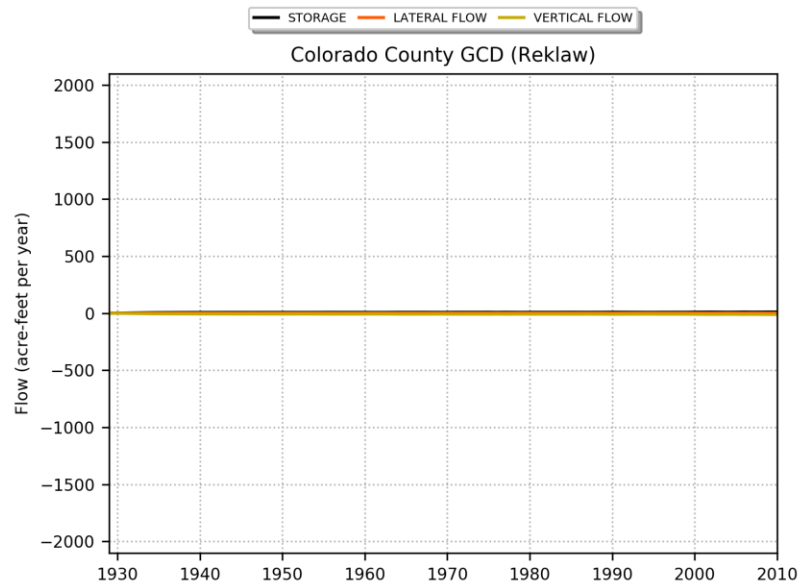
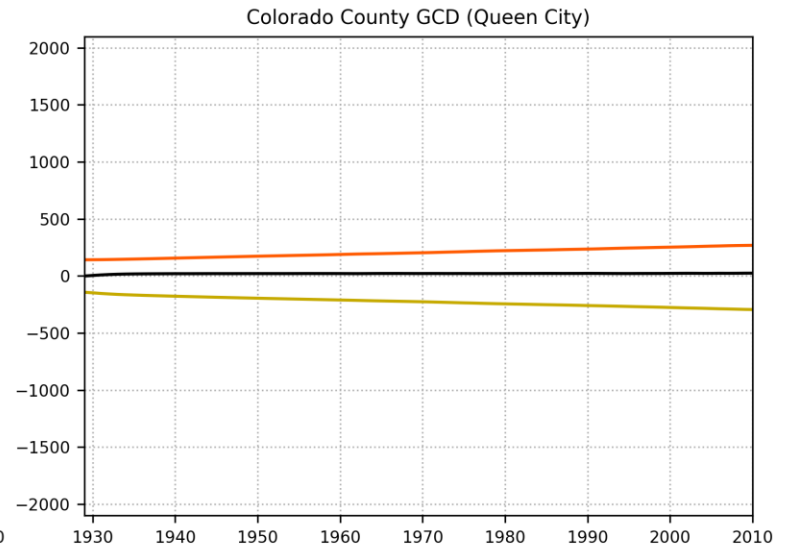
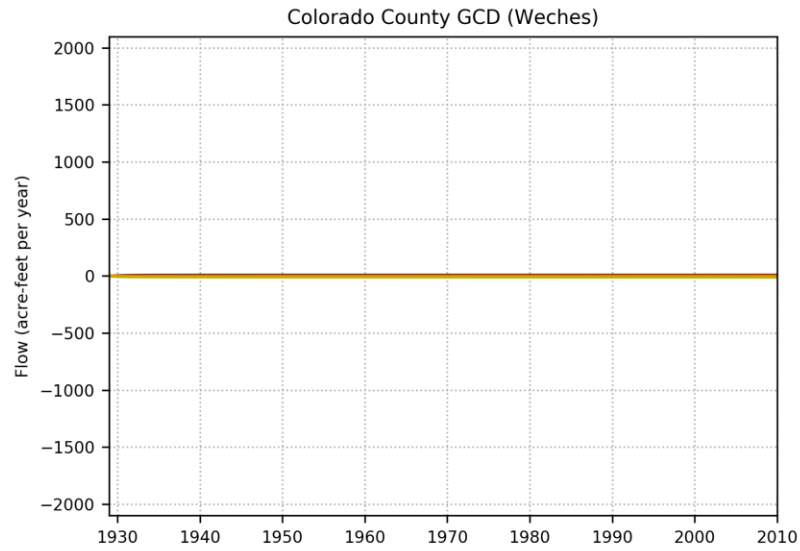
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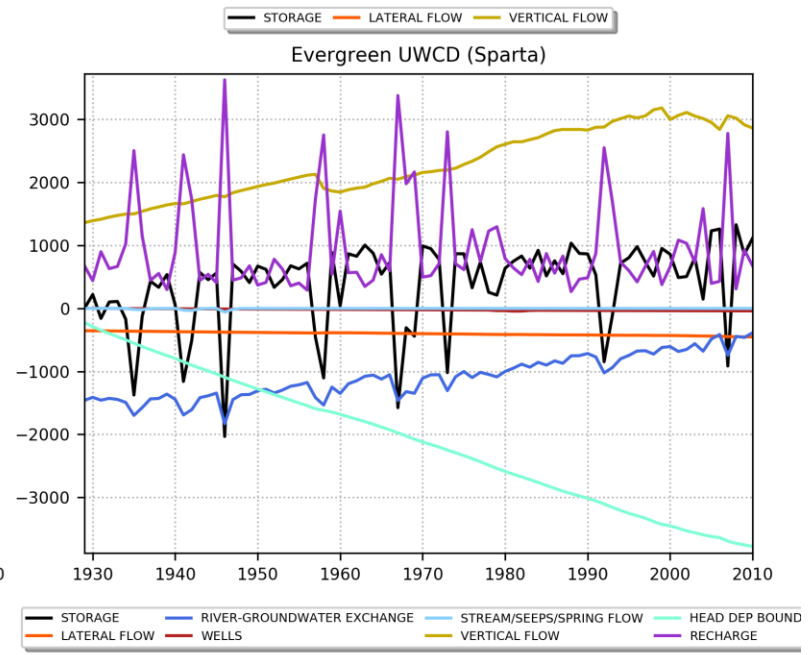
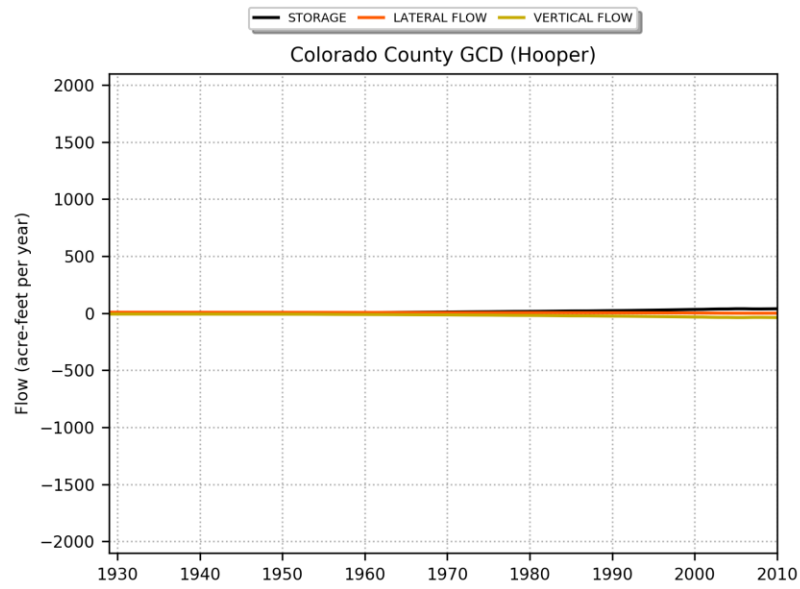
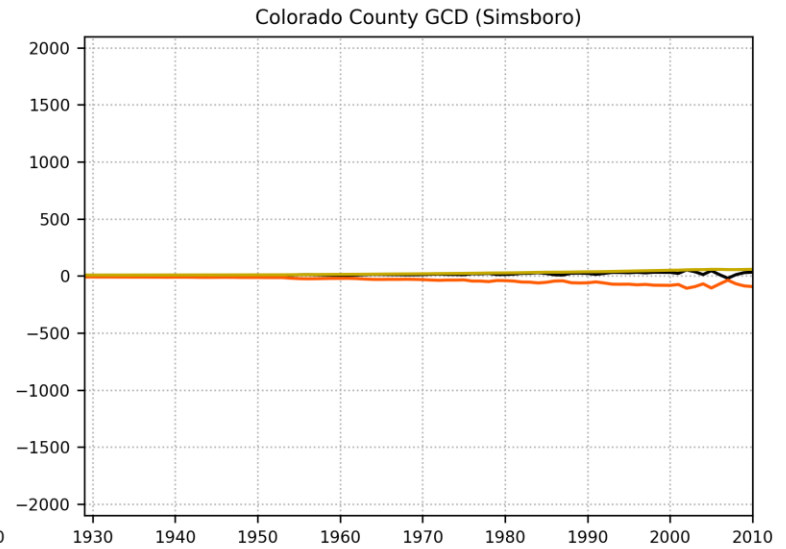
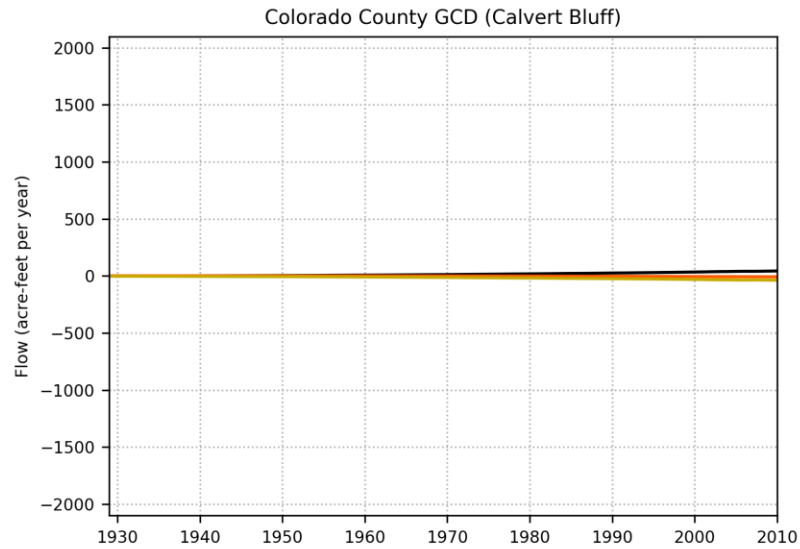
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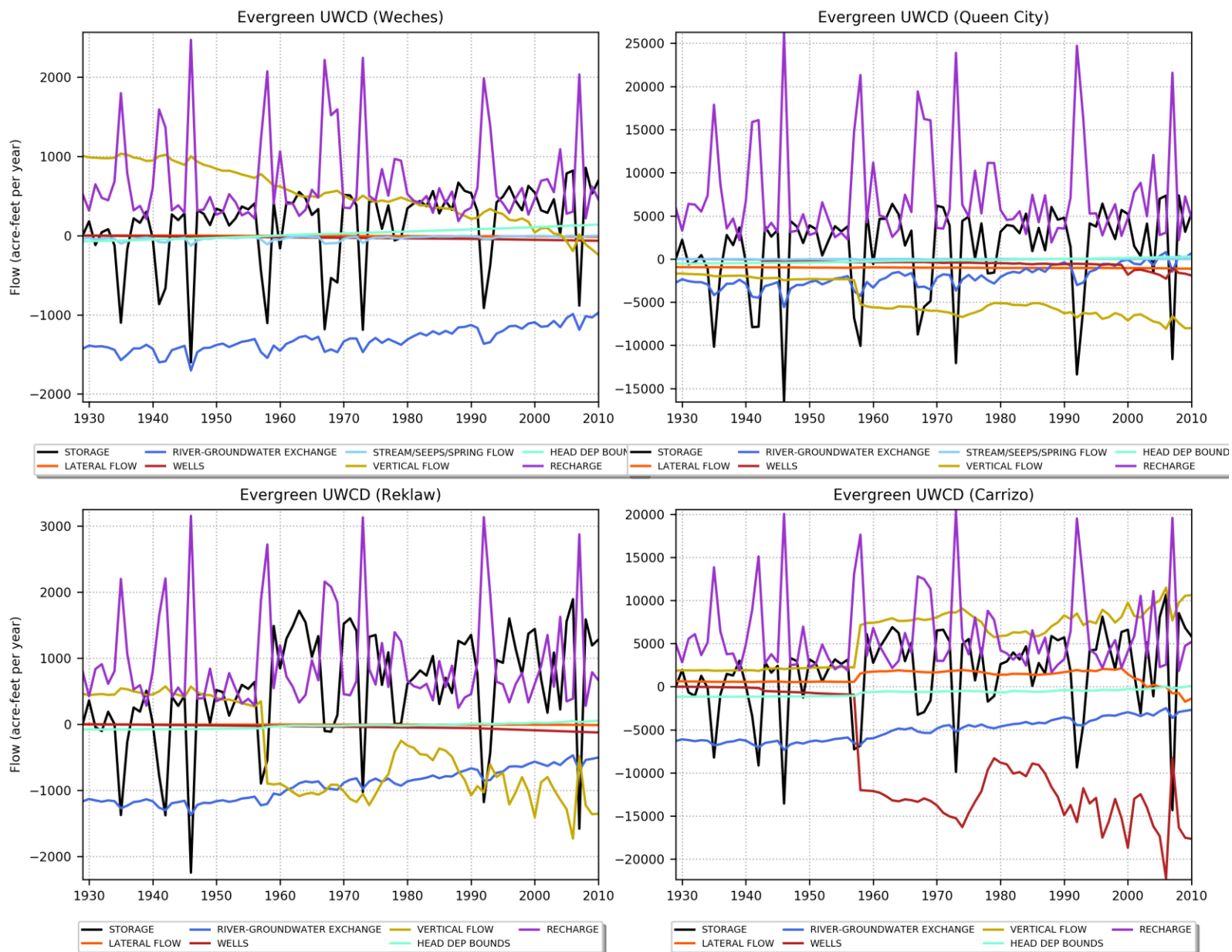
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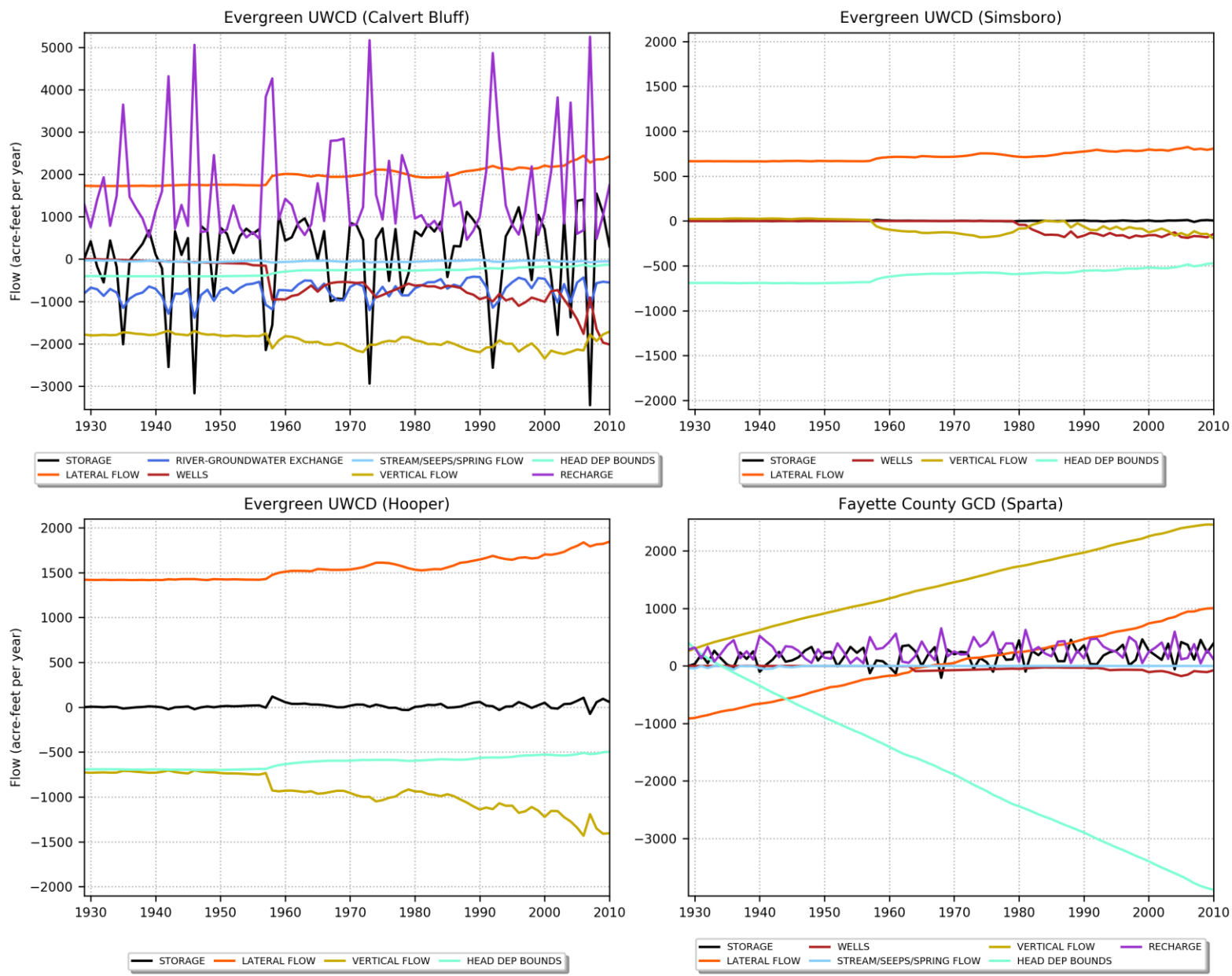
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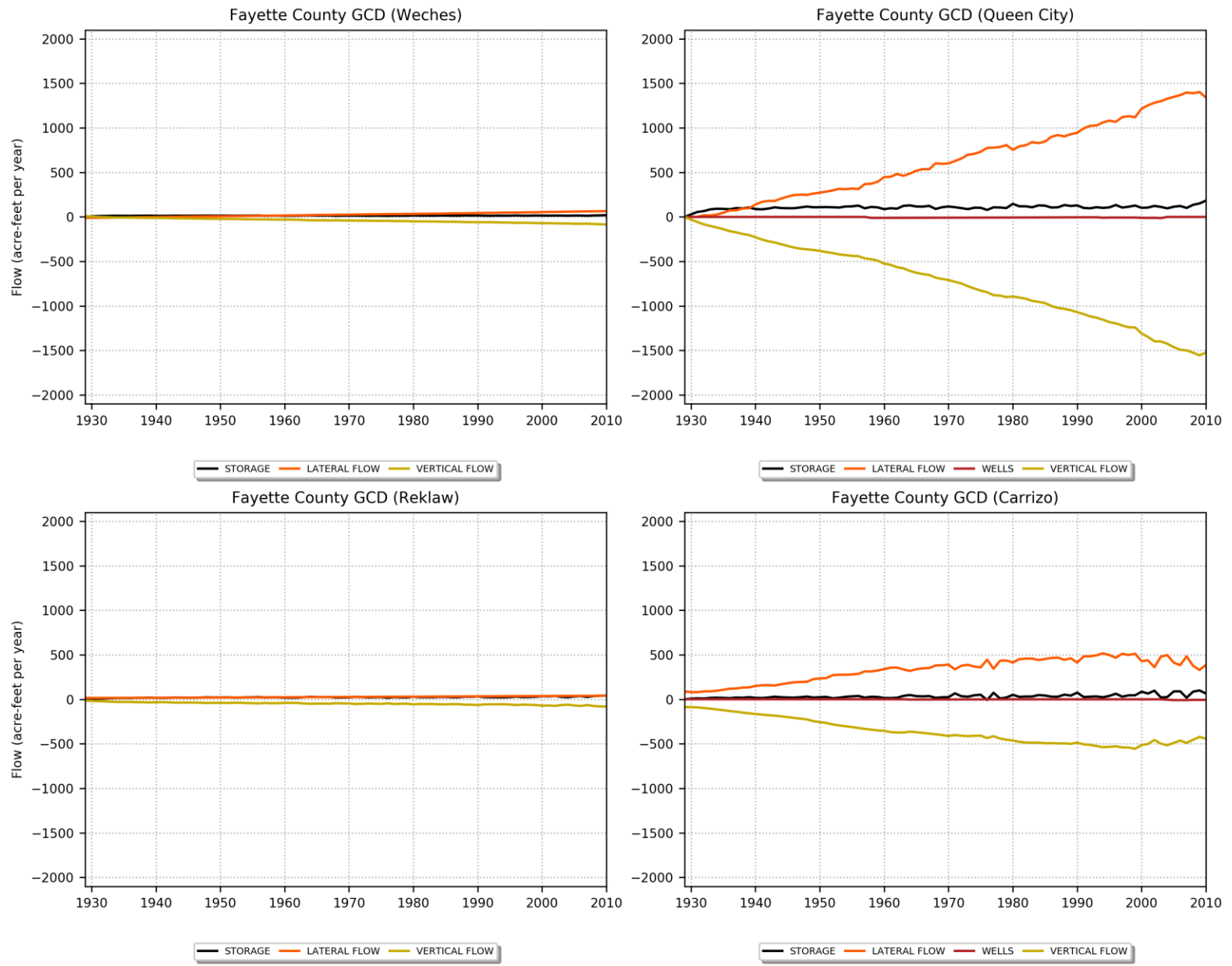
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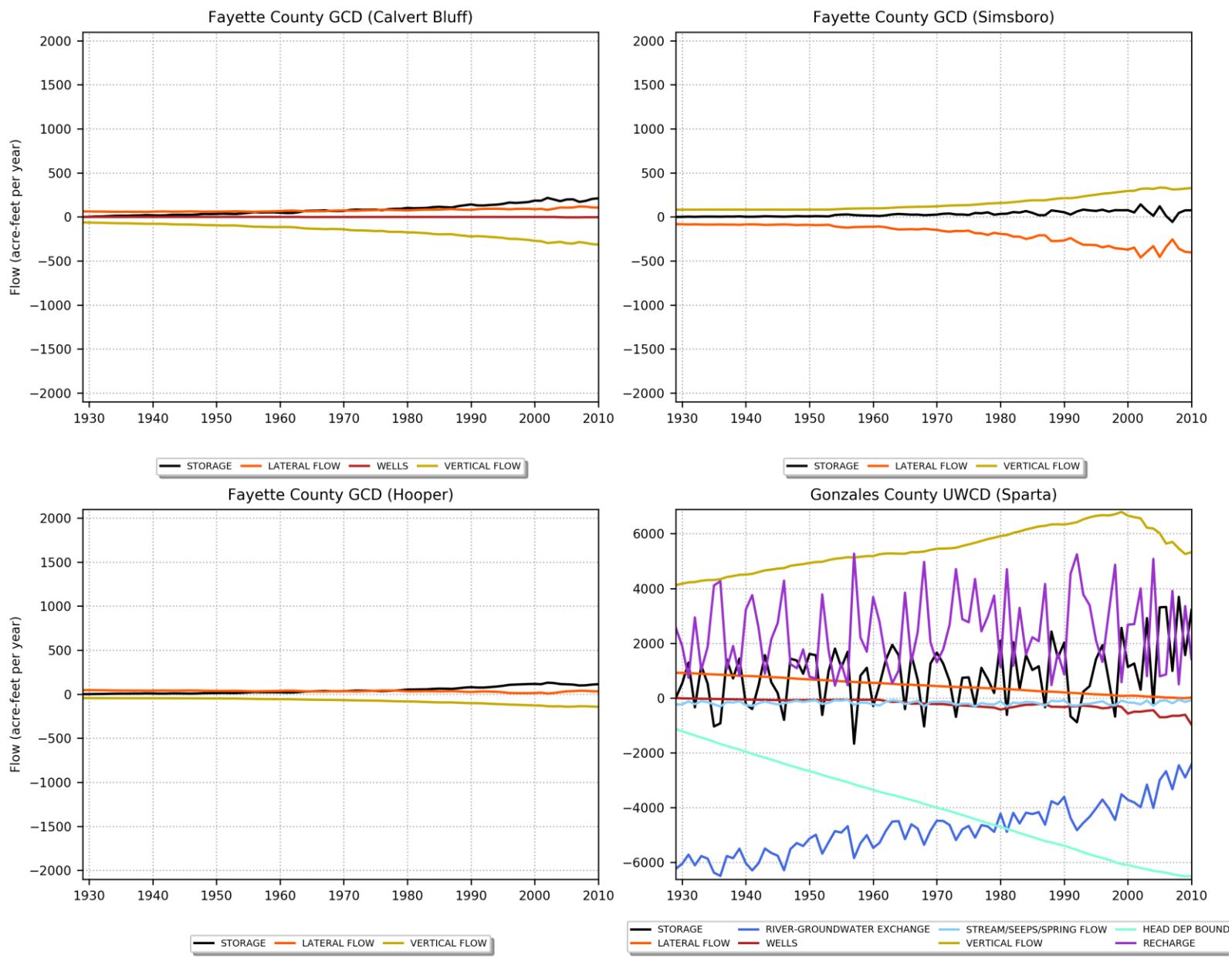
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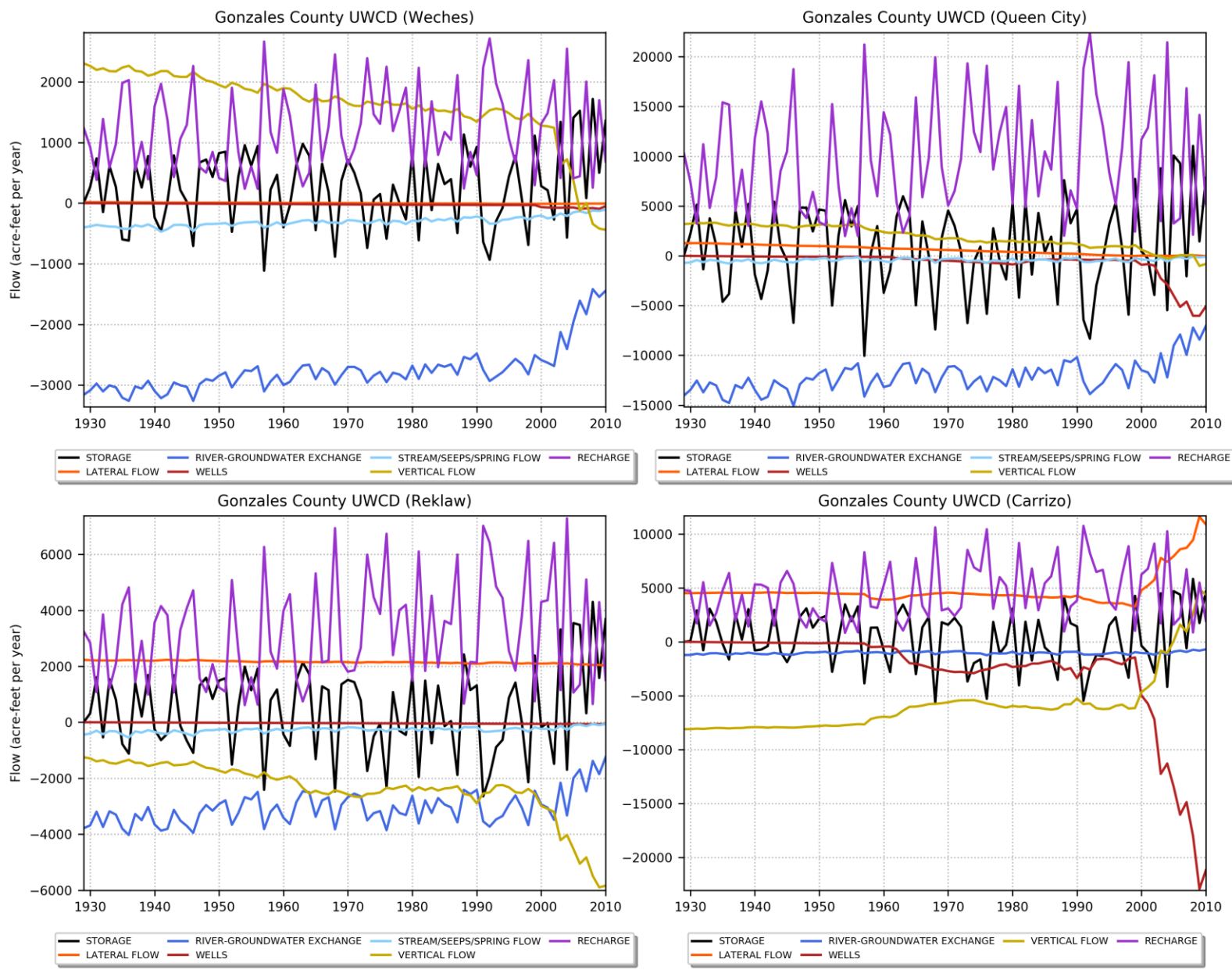
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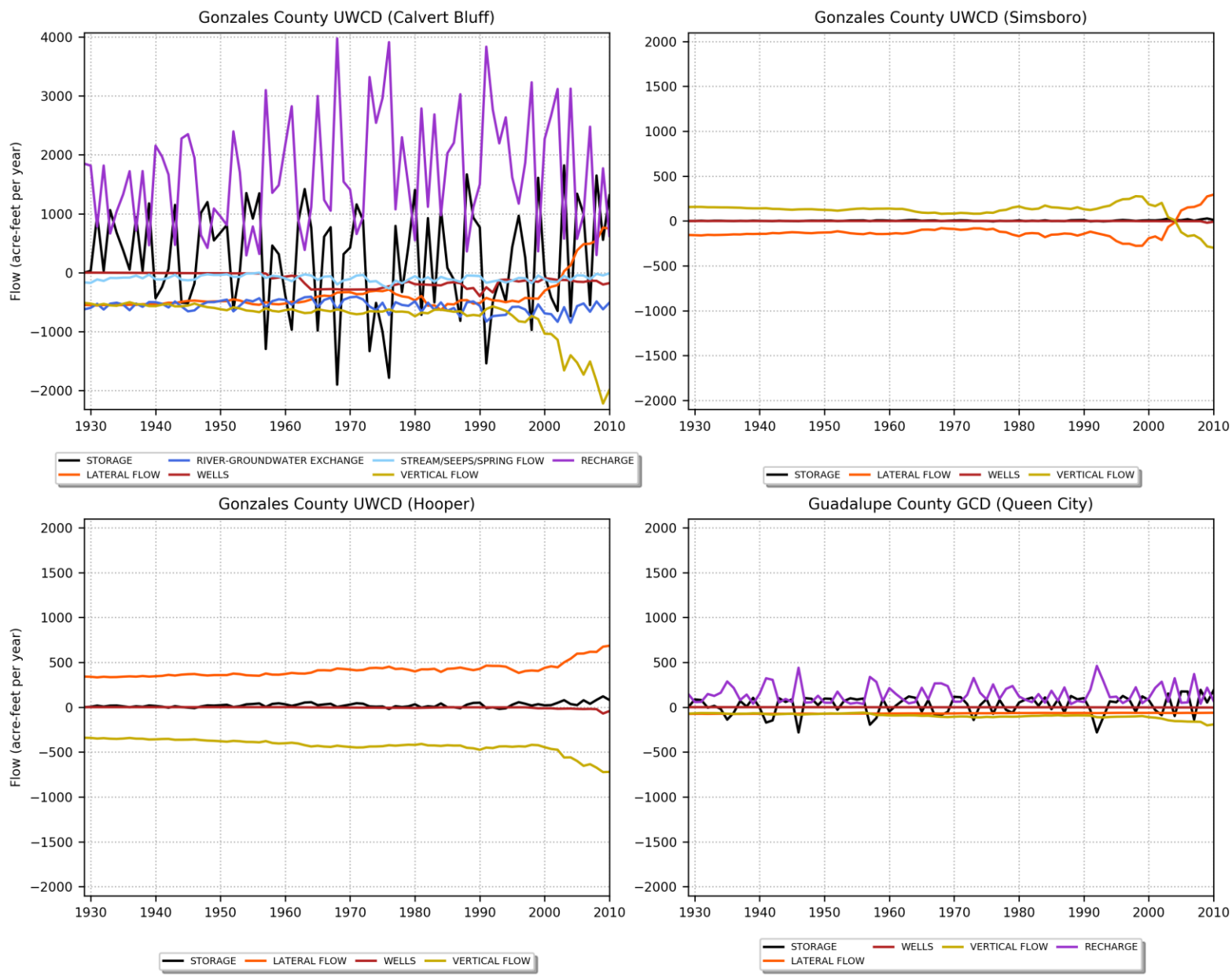
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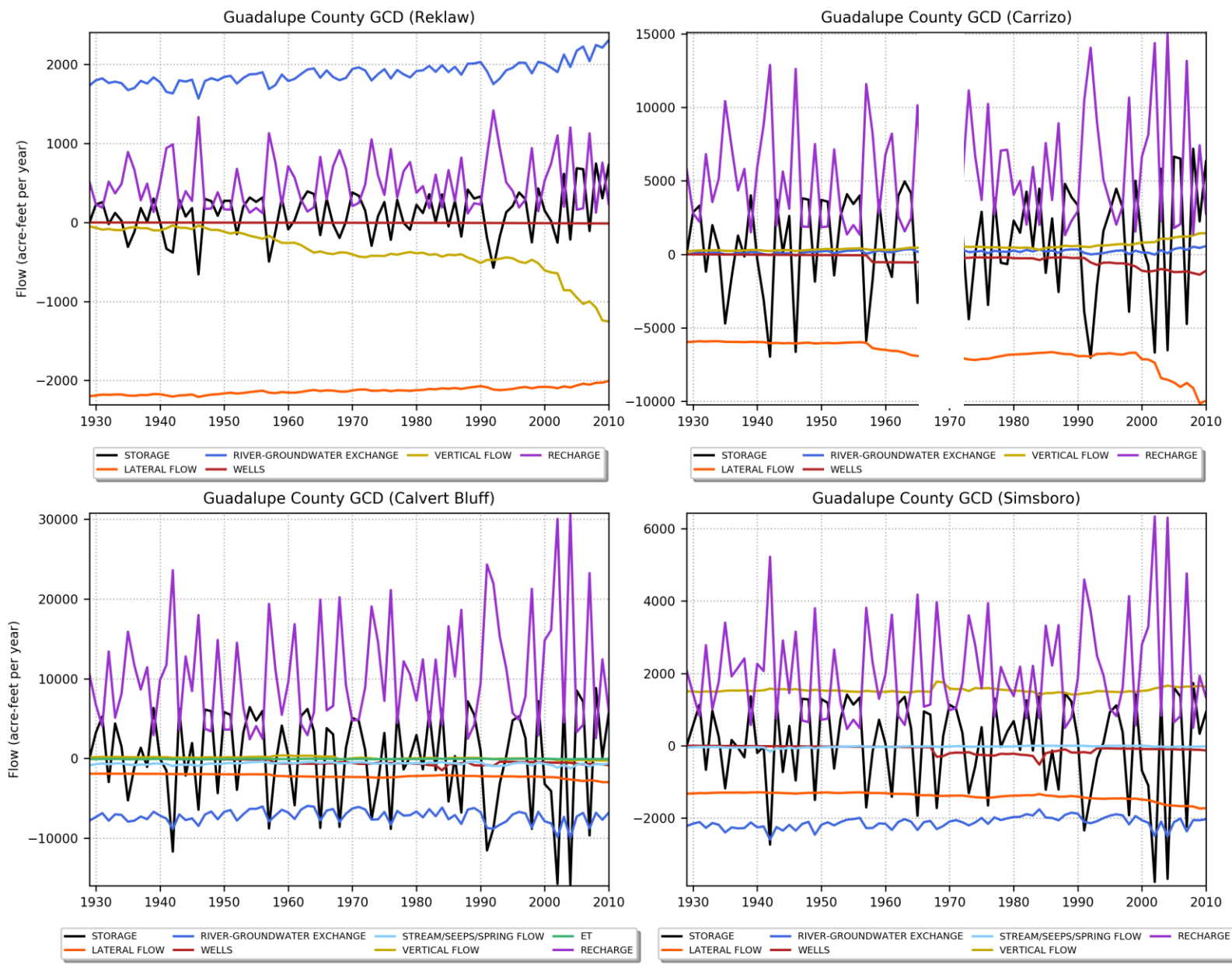
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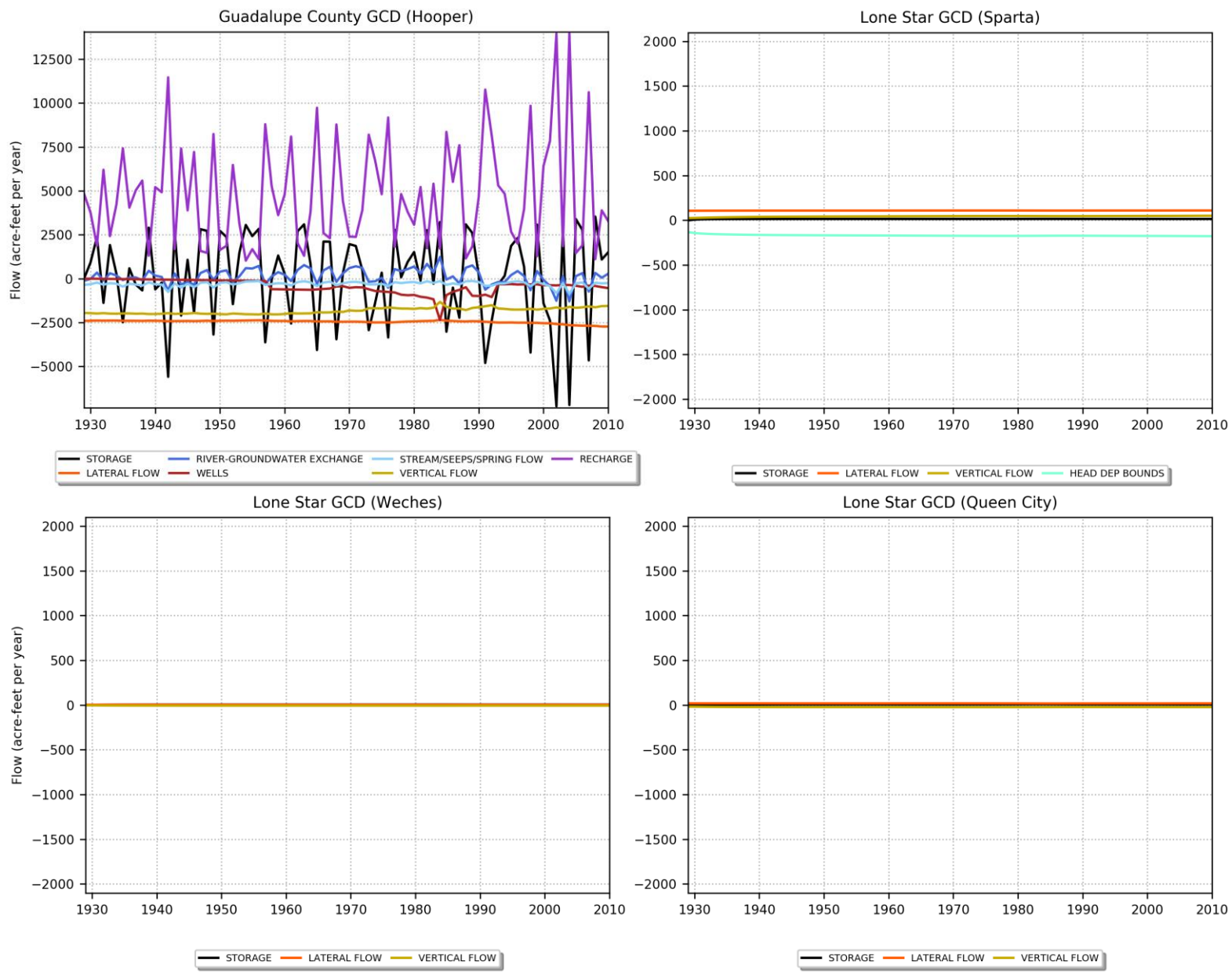
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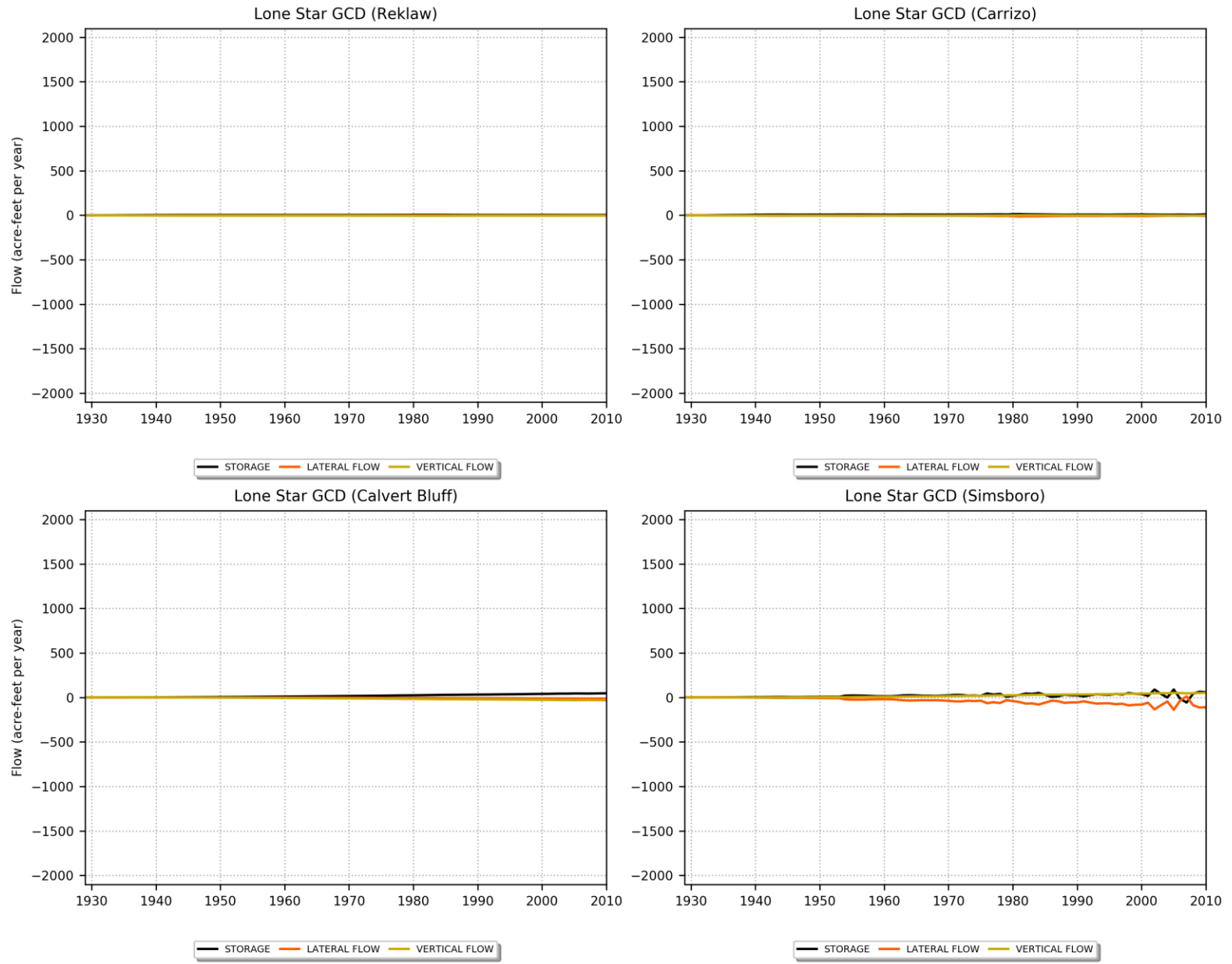
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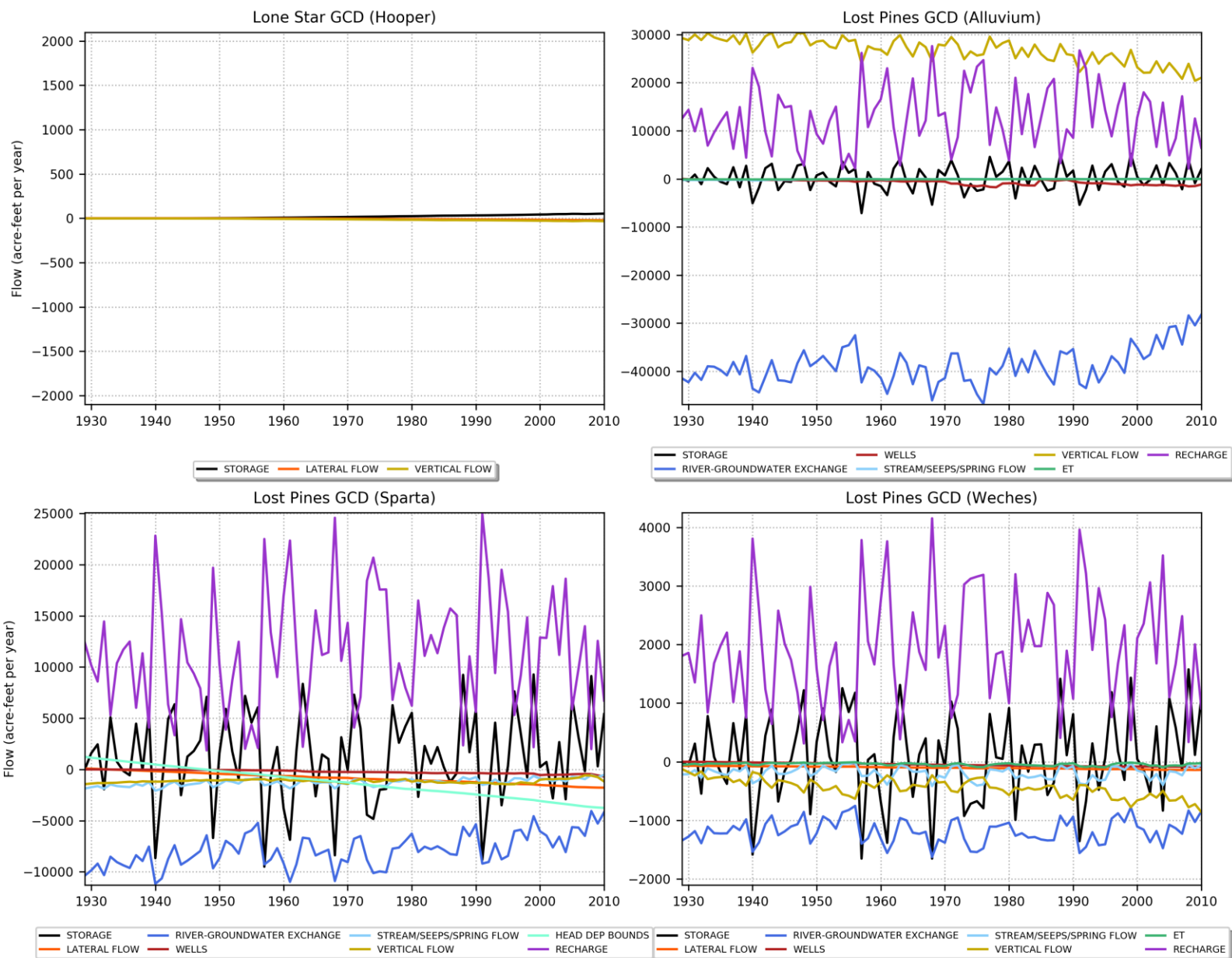
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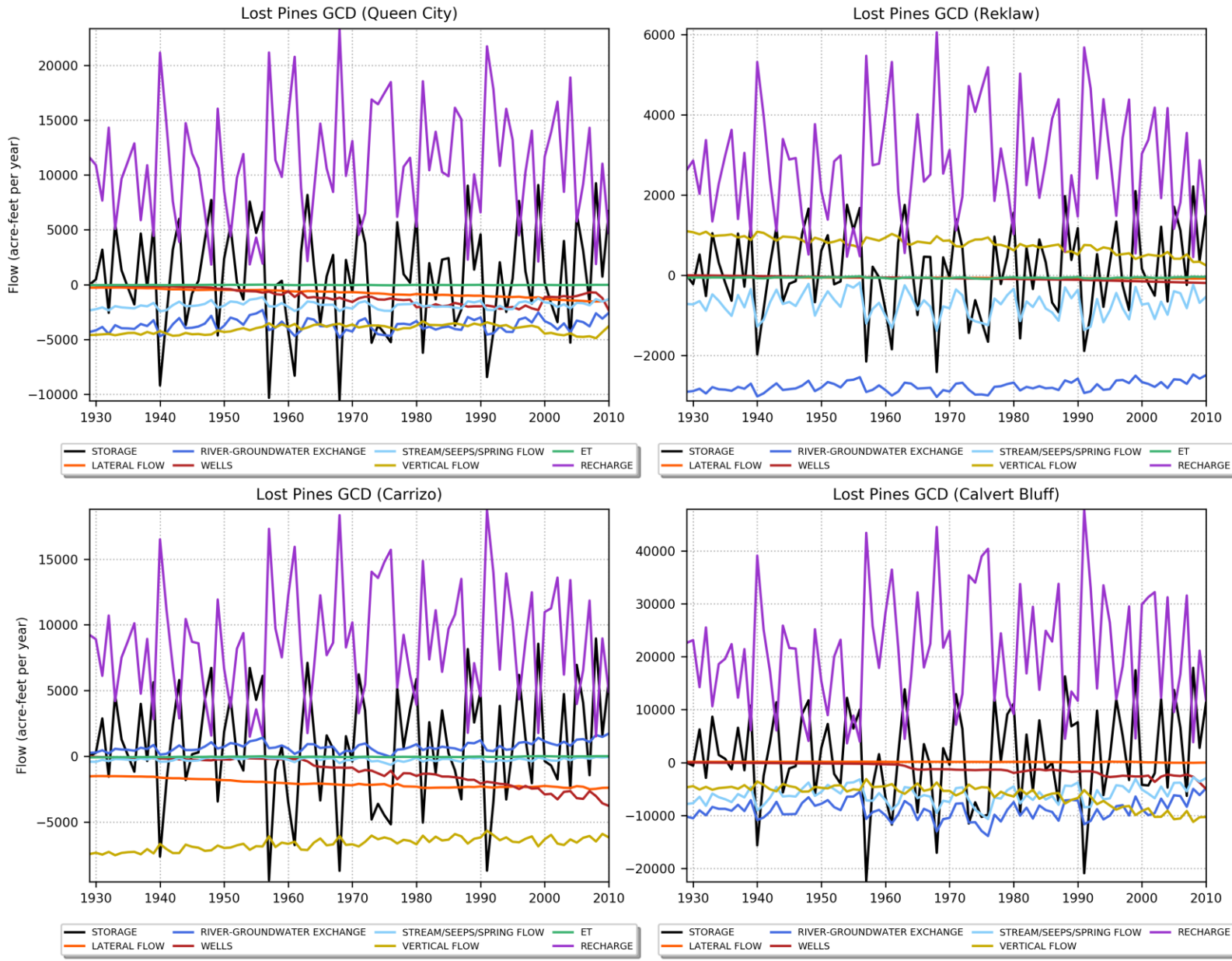
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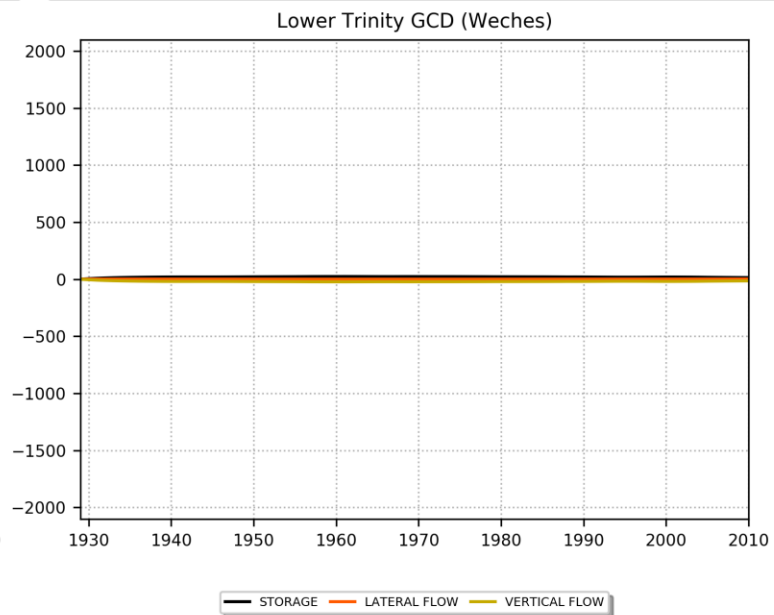
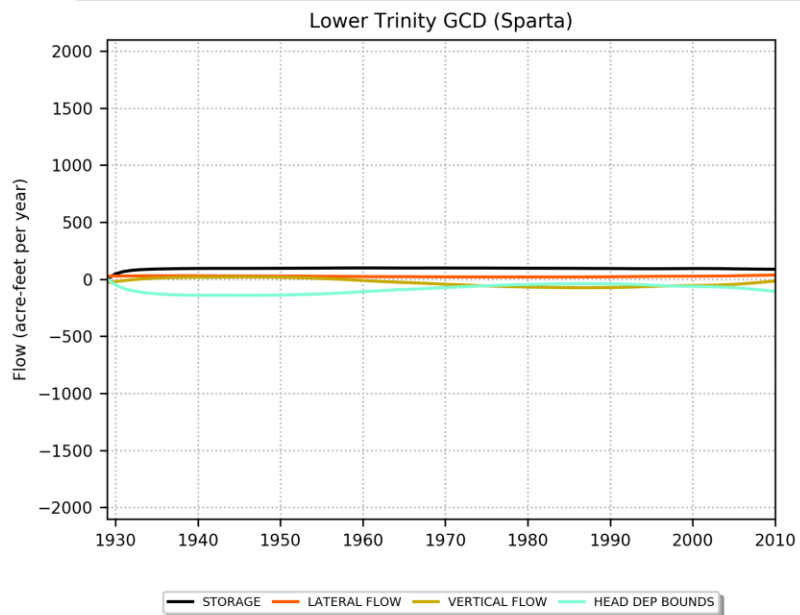
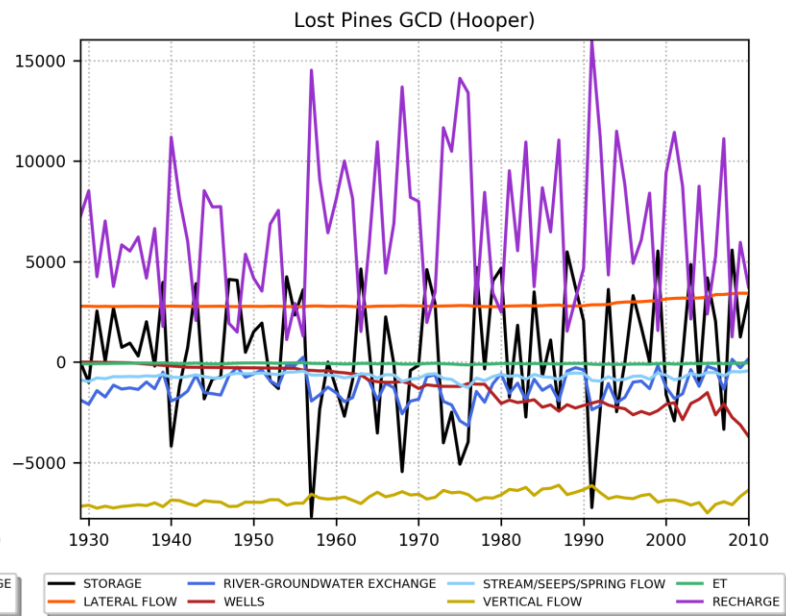
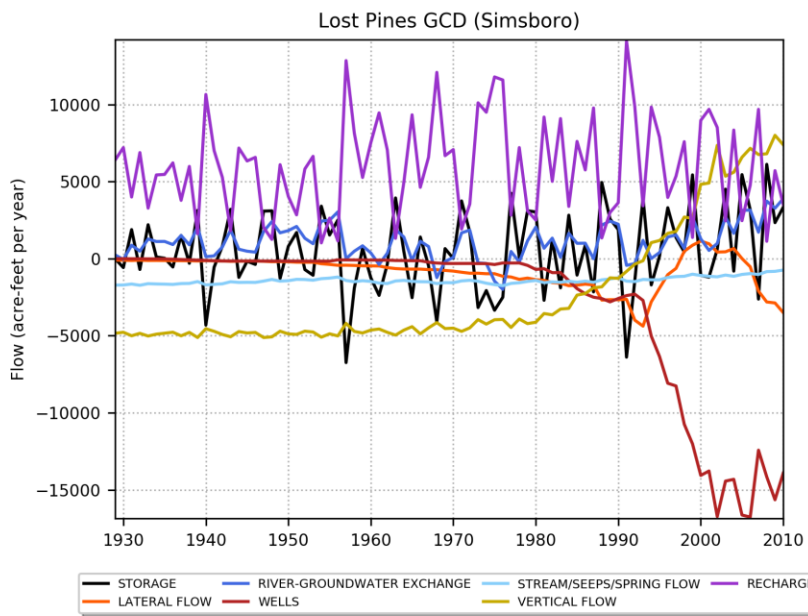
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



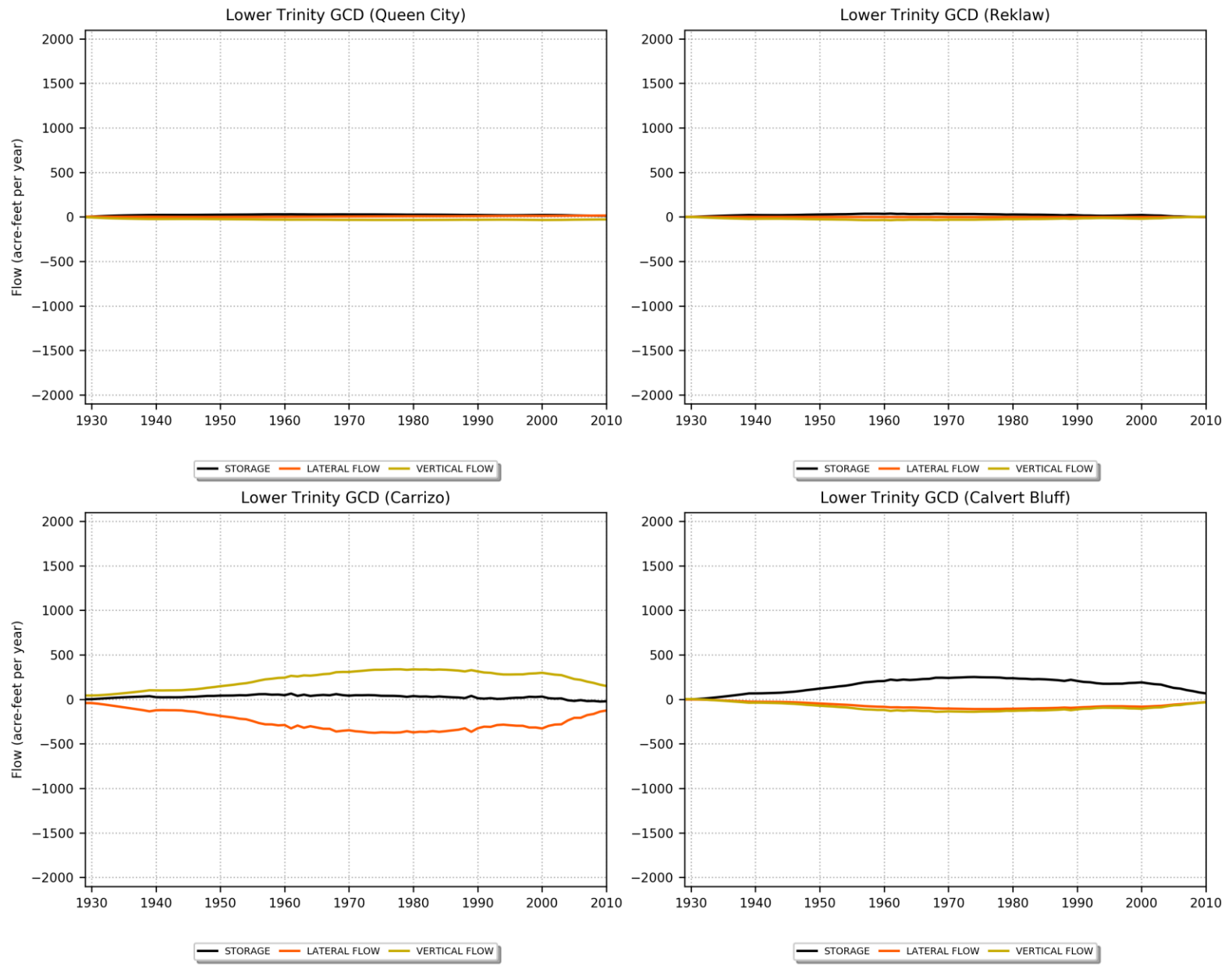
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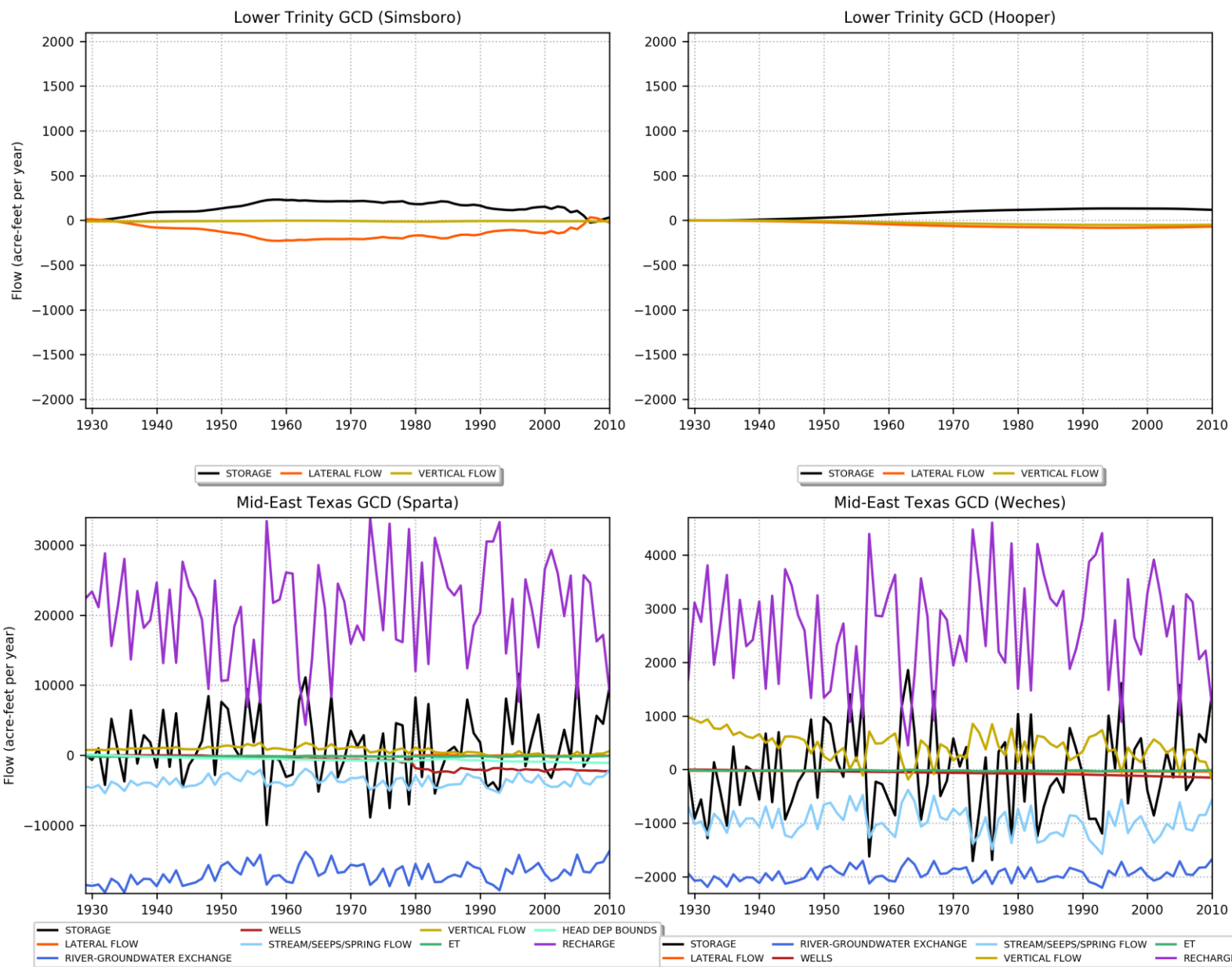
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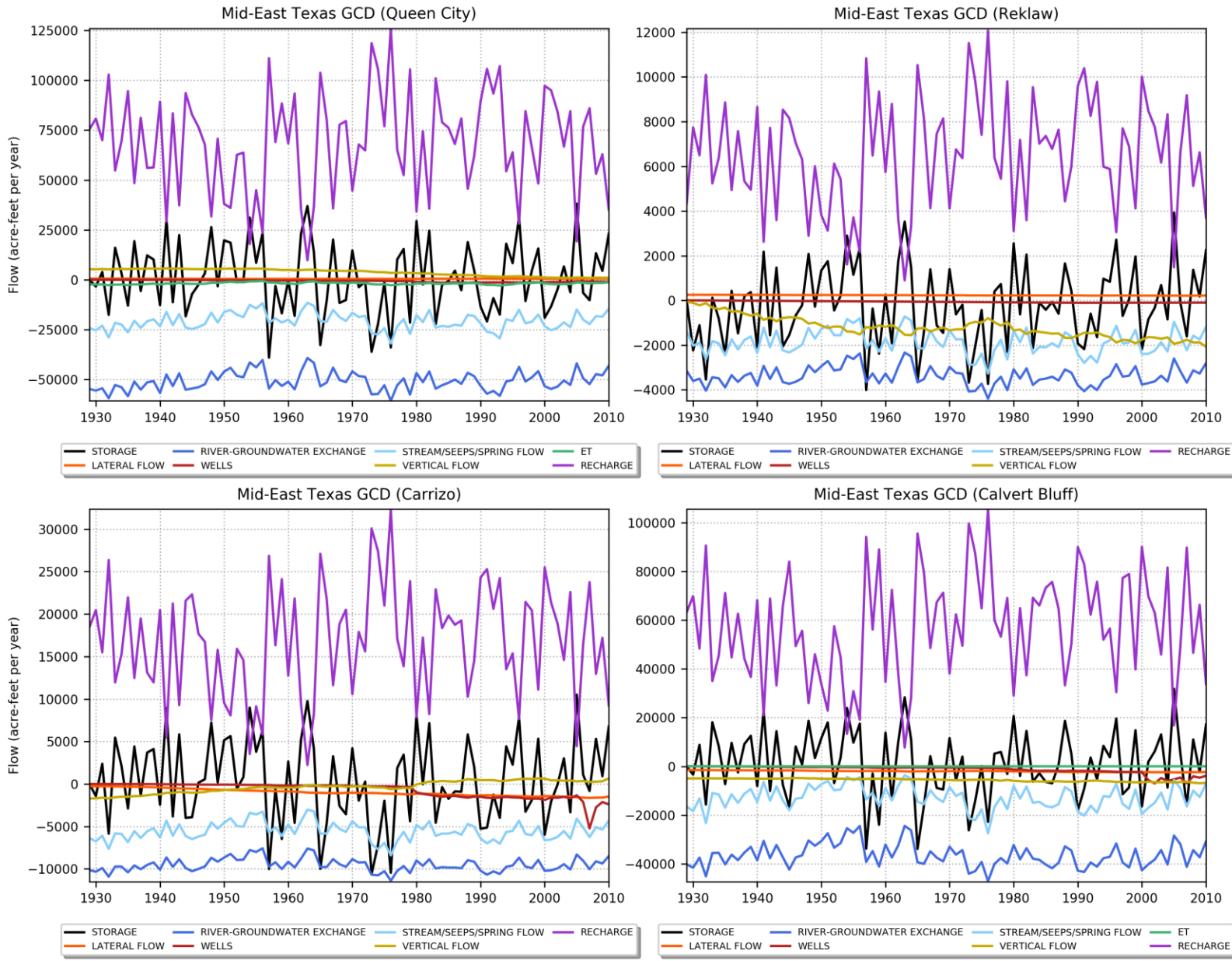
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



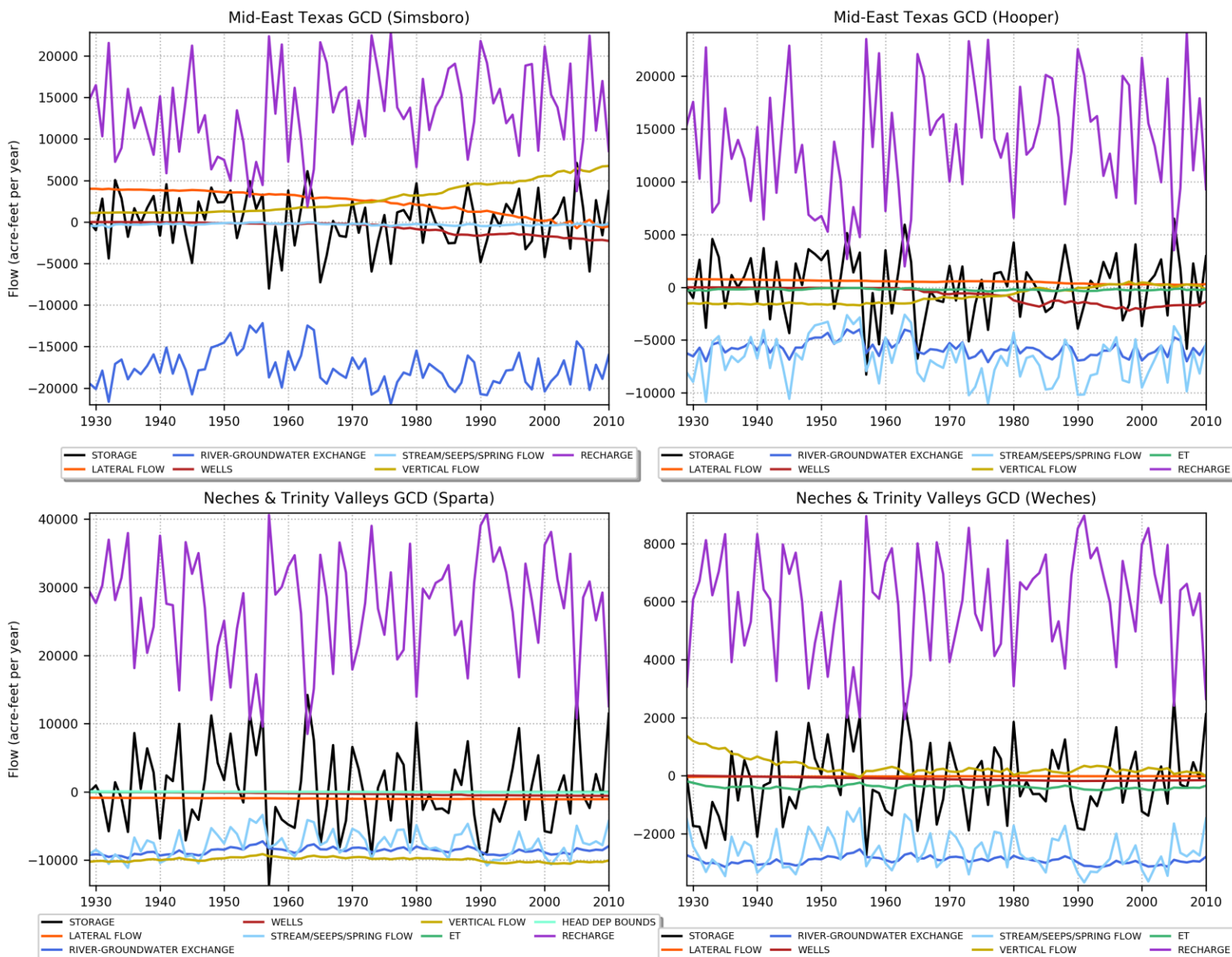
Final Report: Groundwater Availability Model for the Central Portion of the Carrizo-Wilcox, Queen City, and Sparta Aquifers



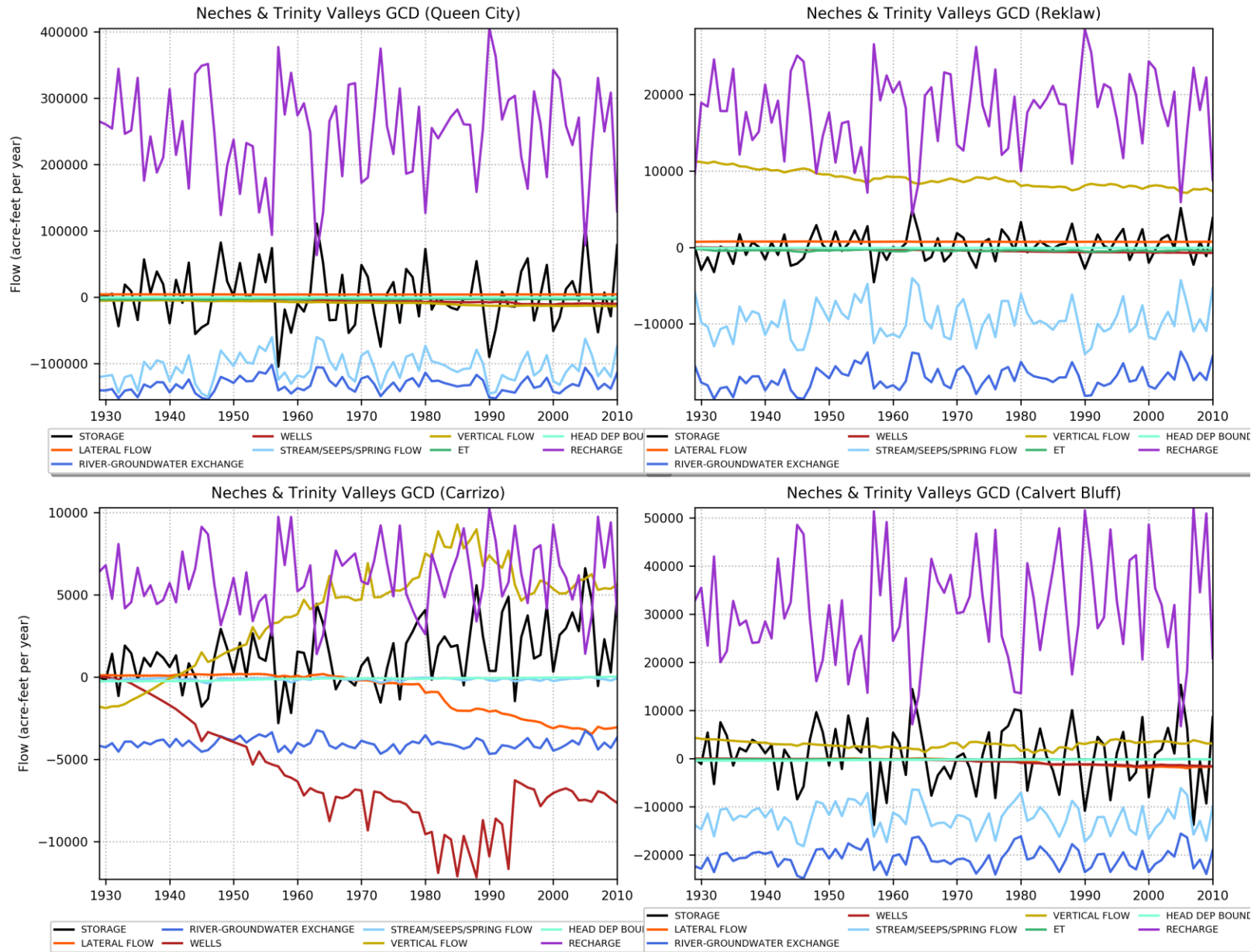
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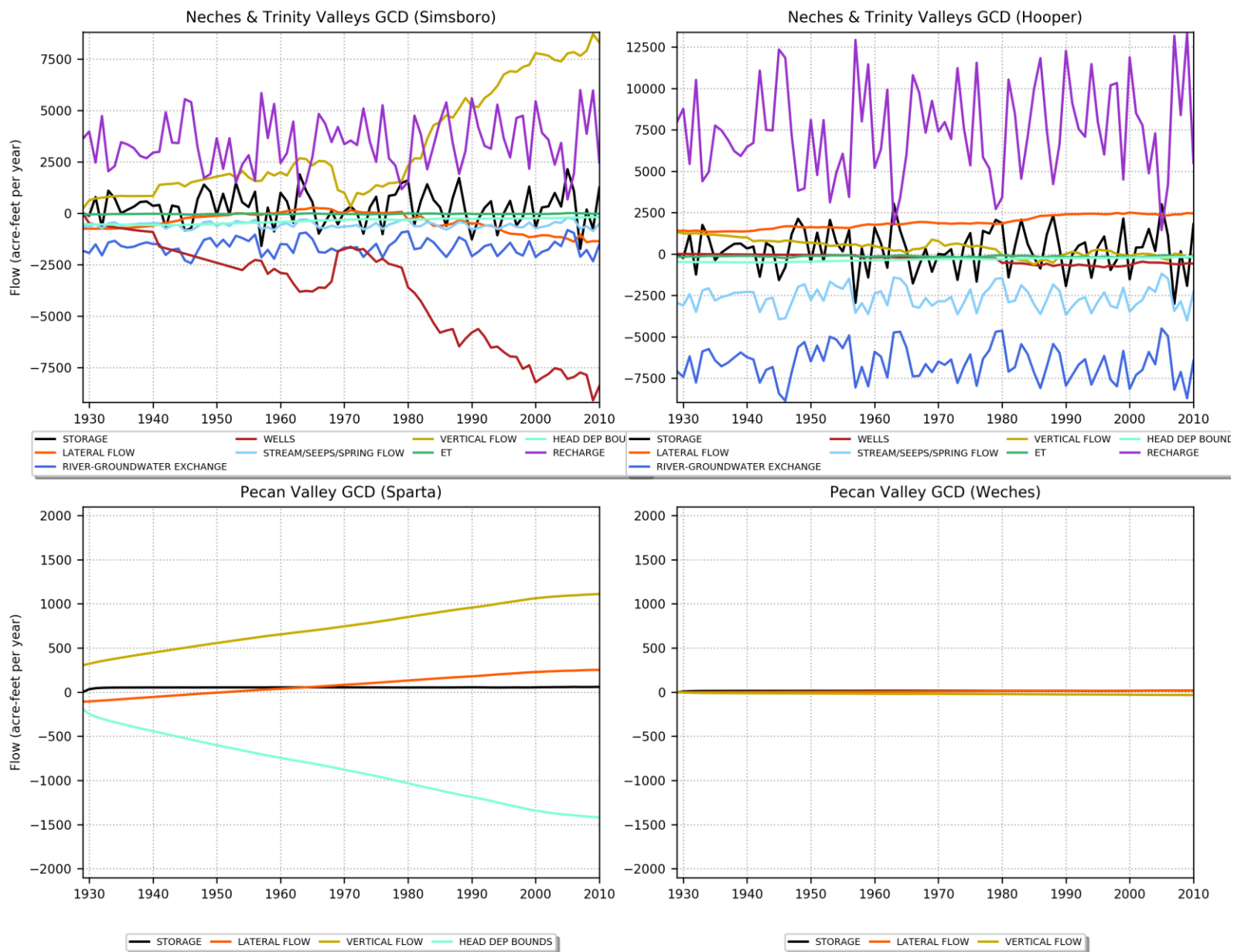
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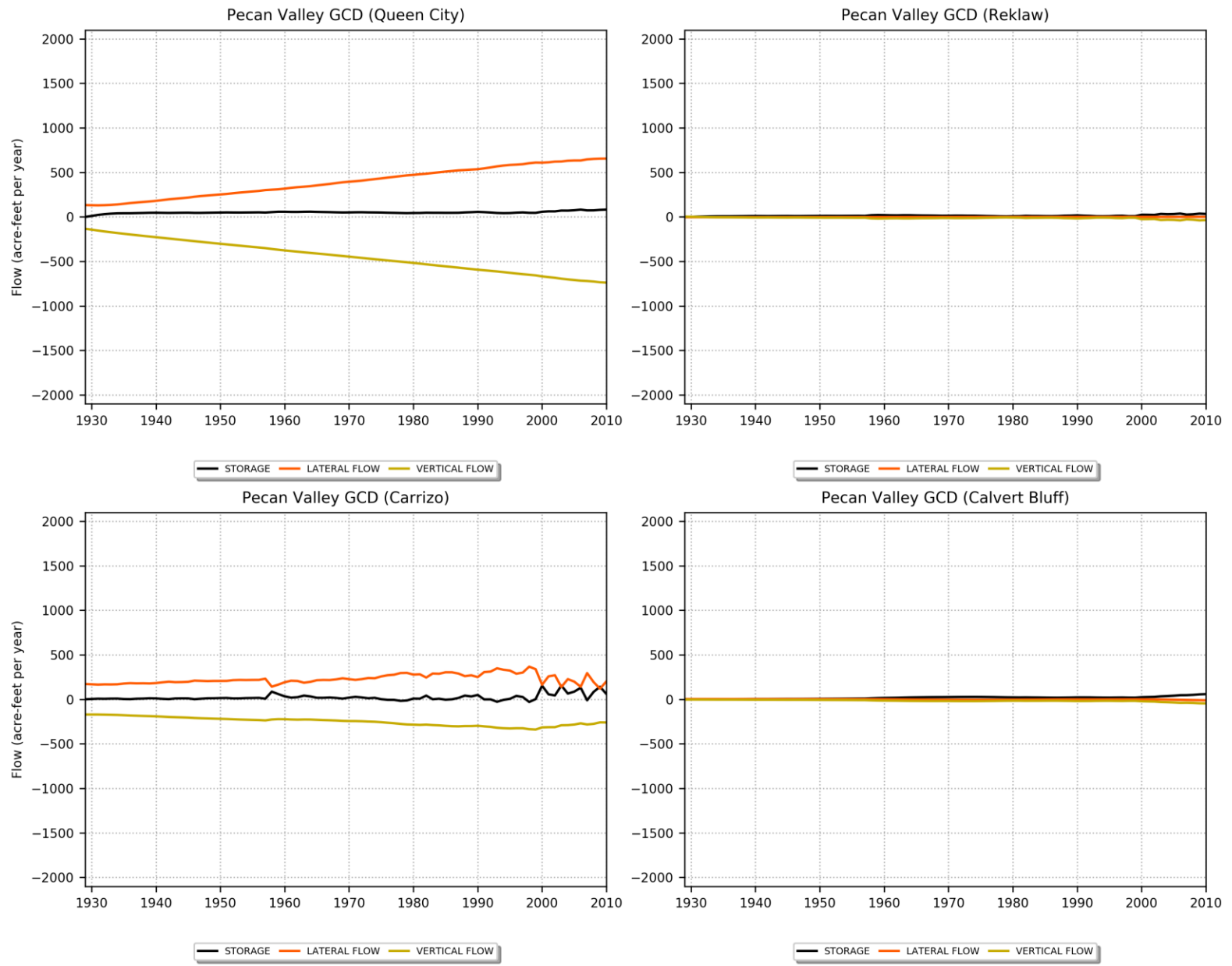
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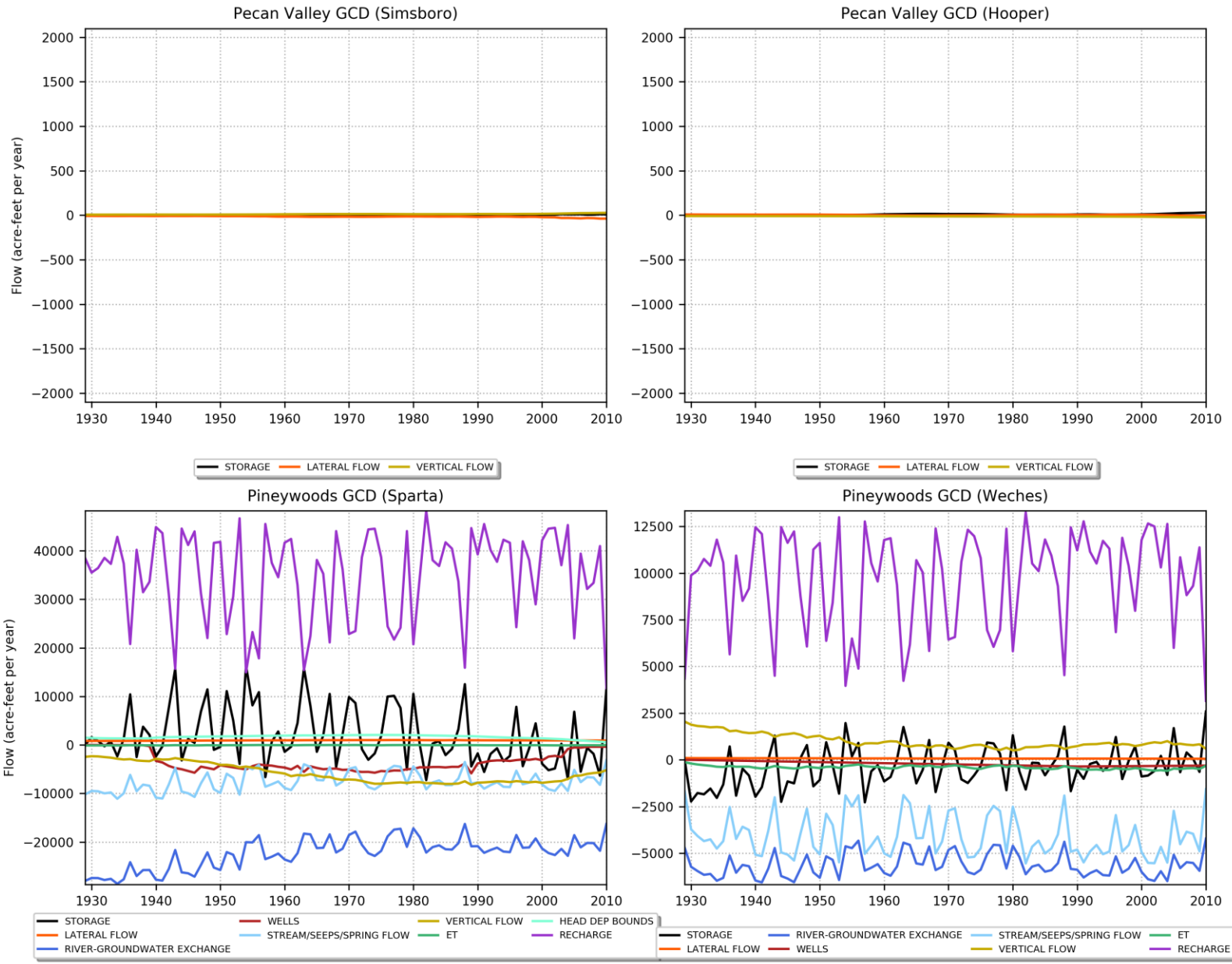
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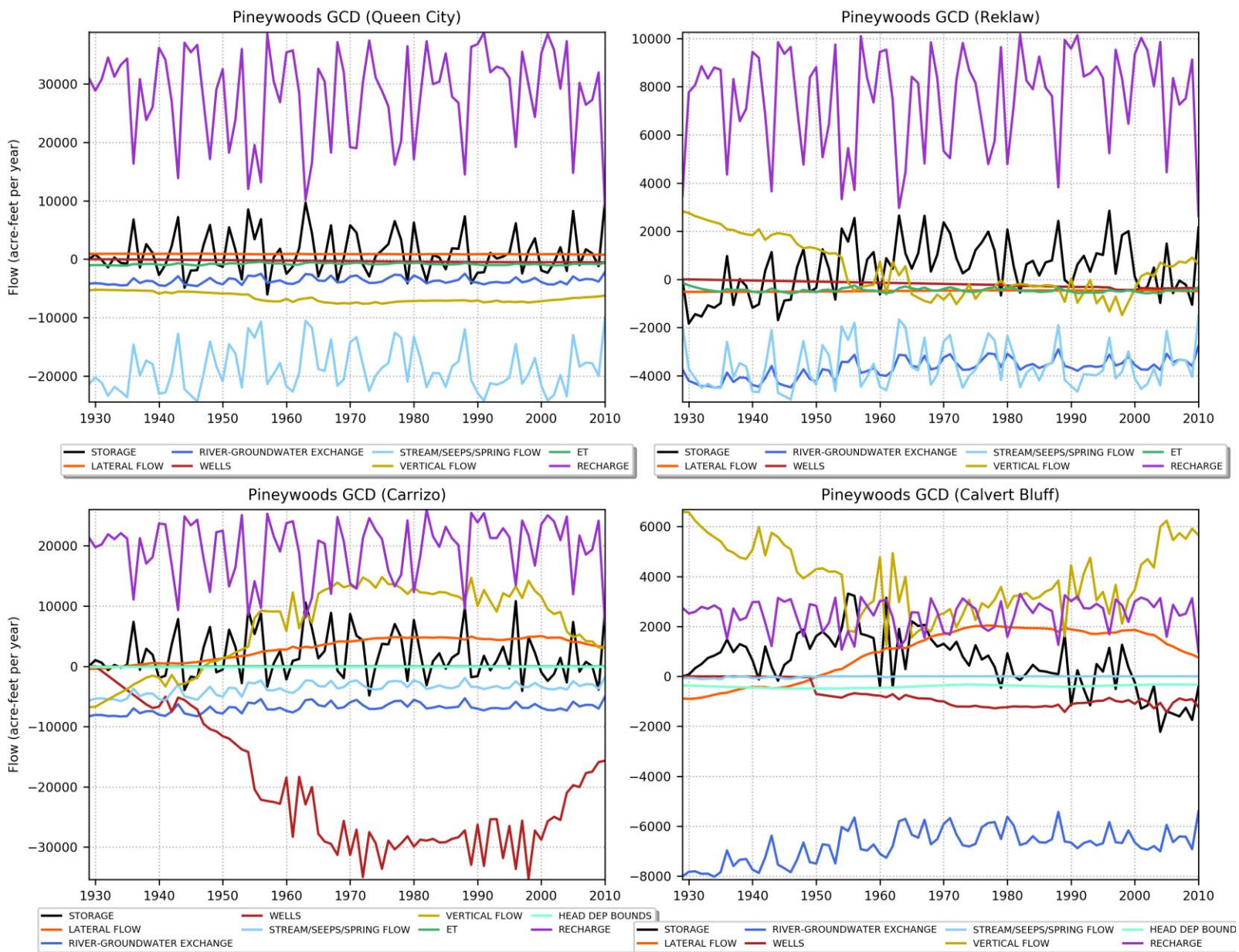
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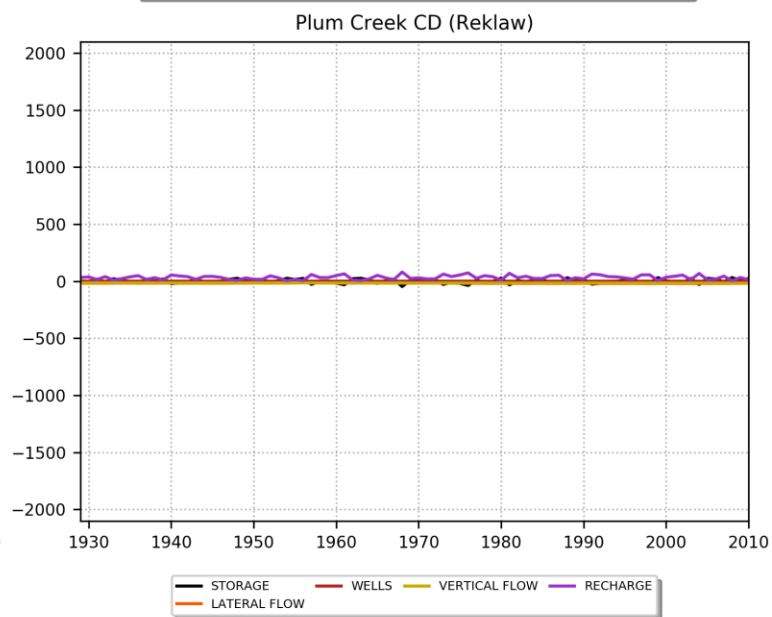
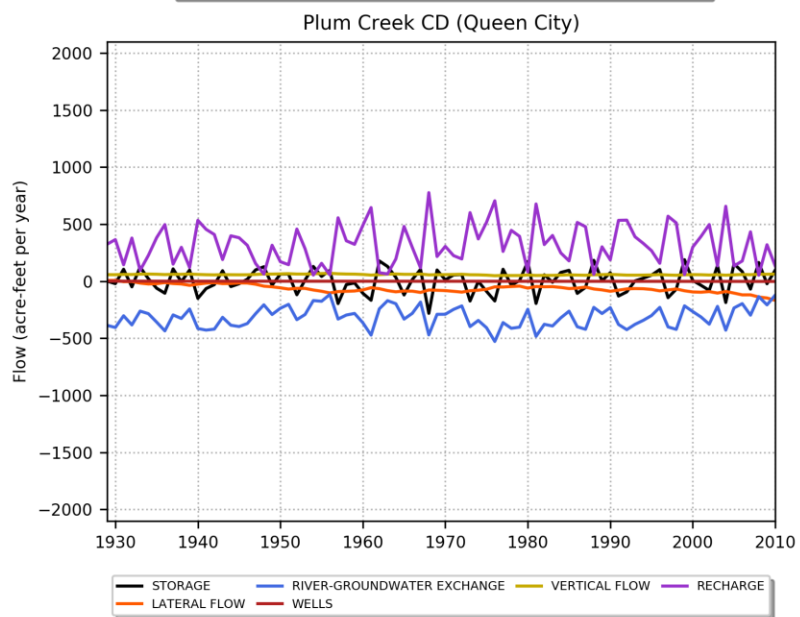
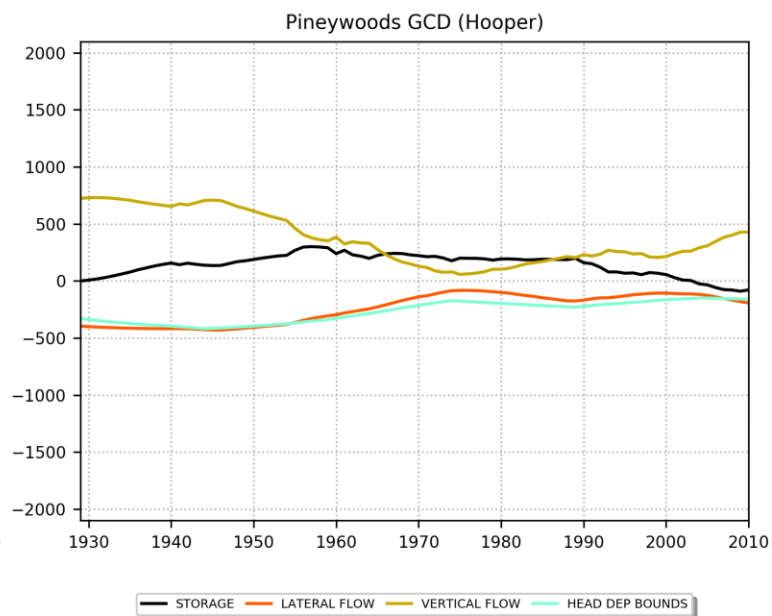
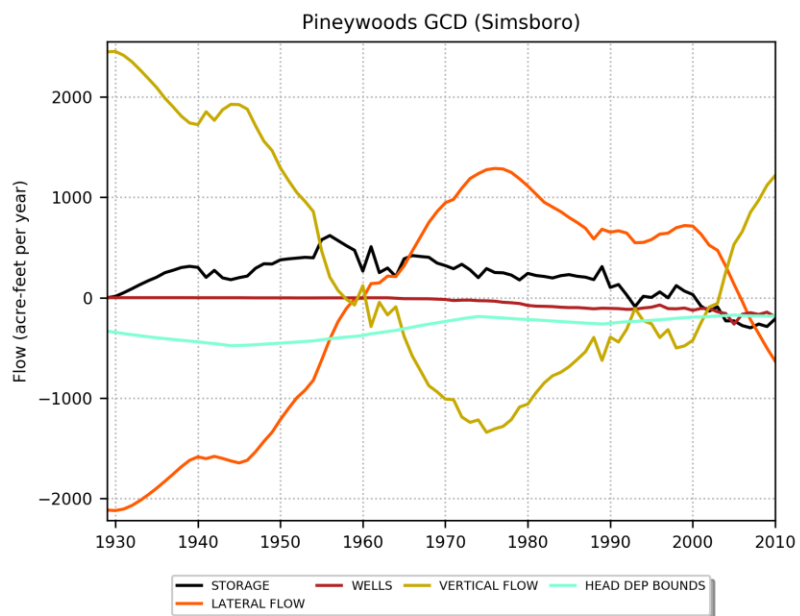
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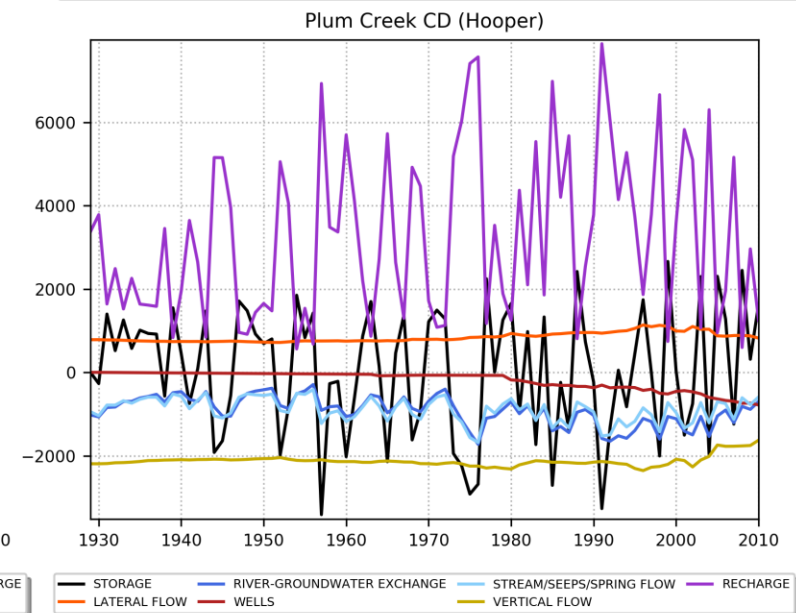
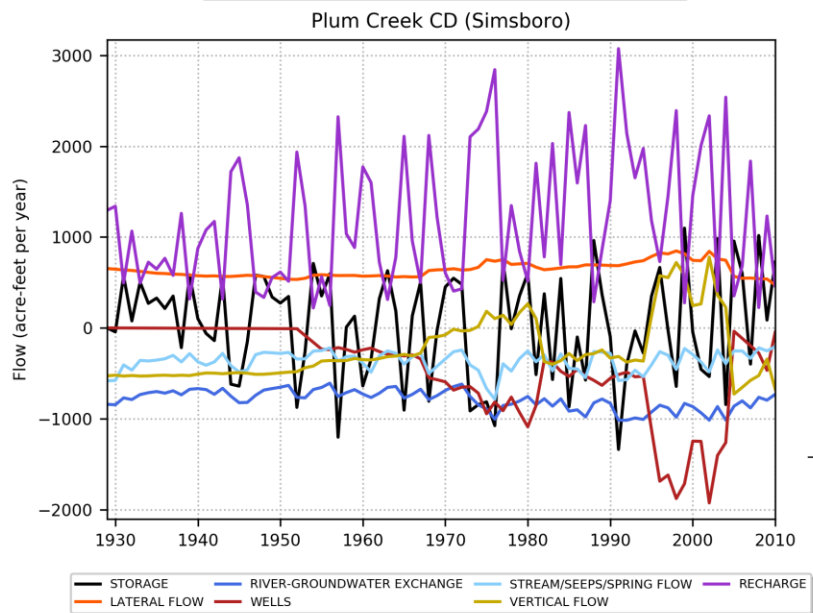
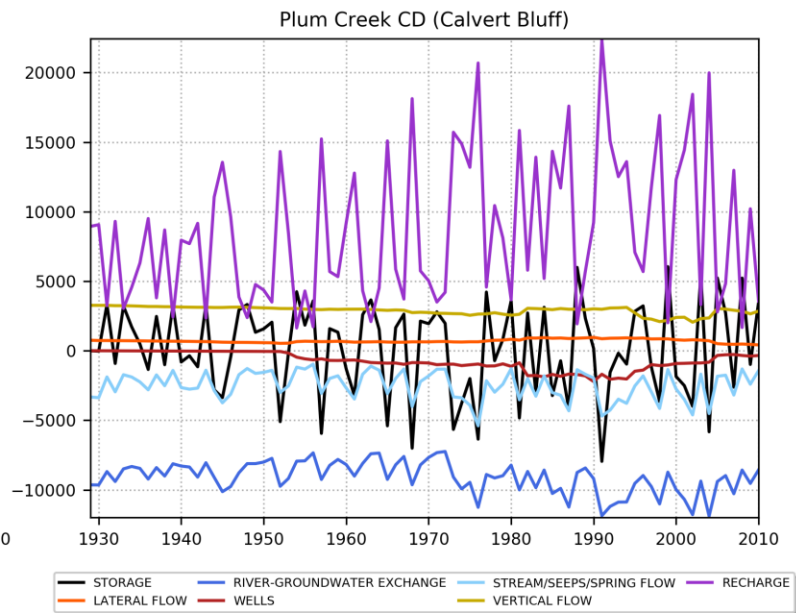
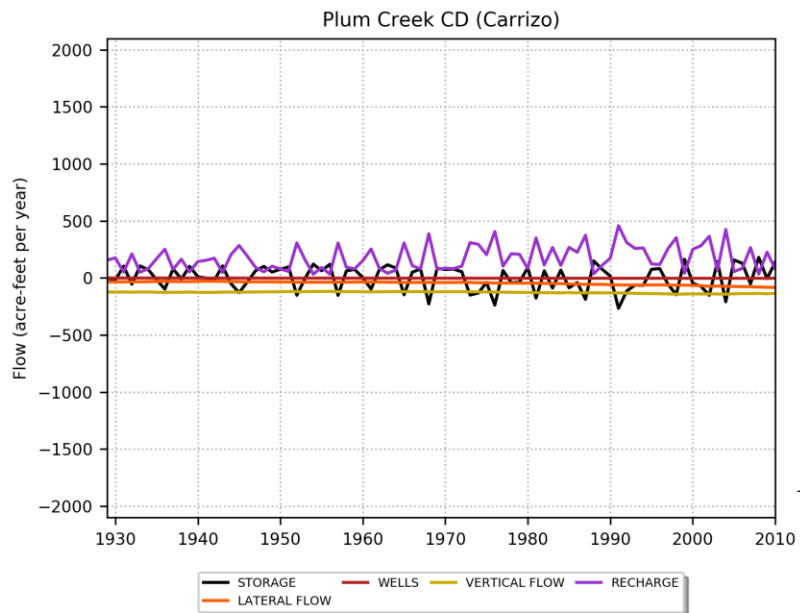
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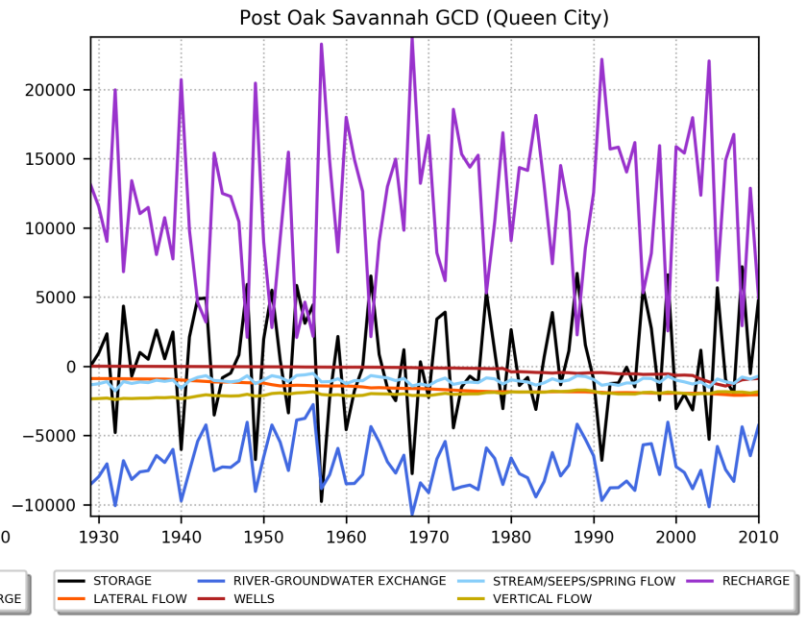
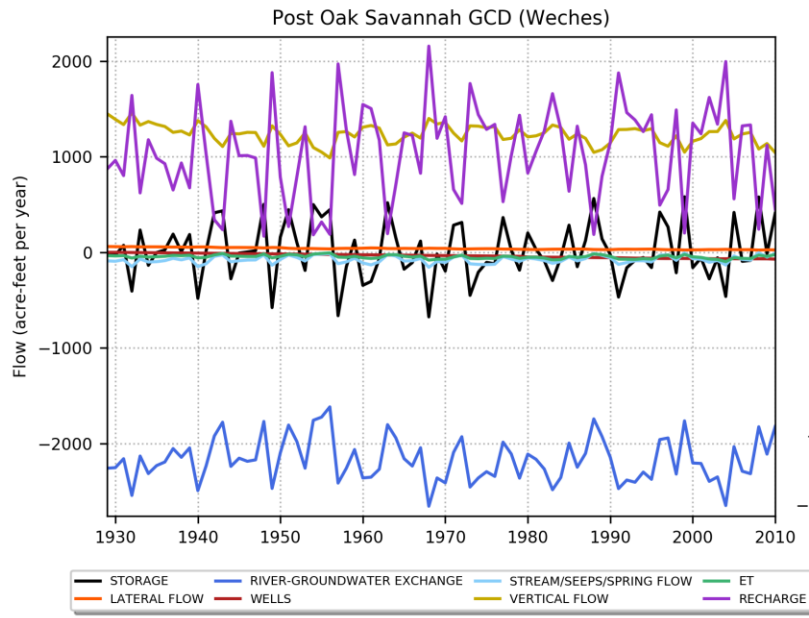
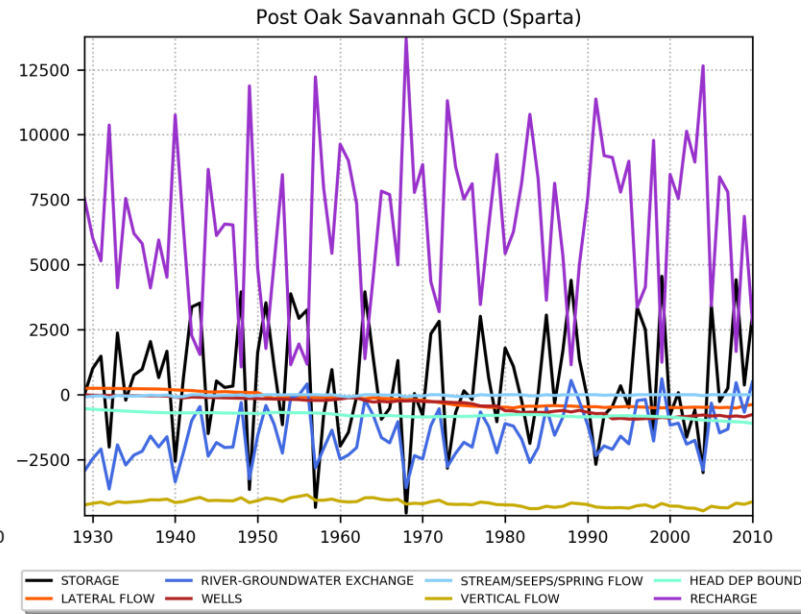
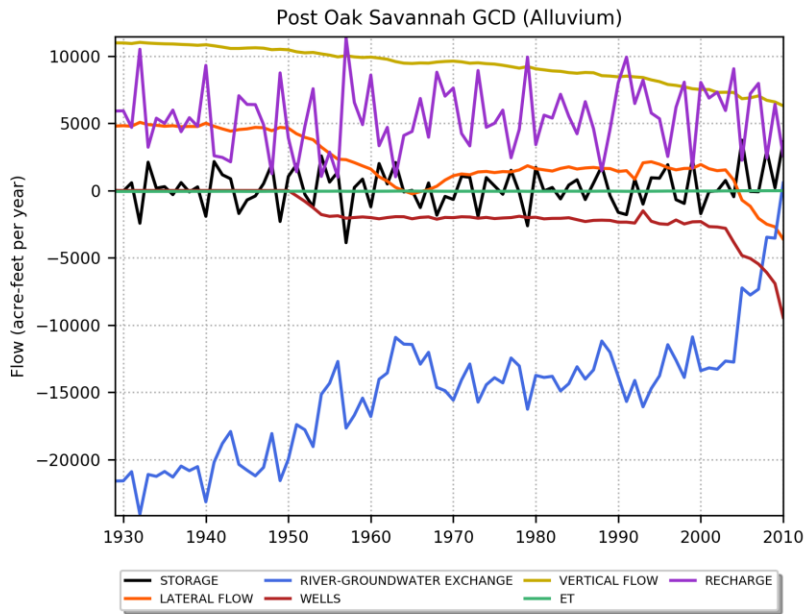
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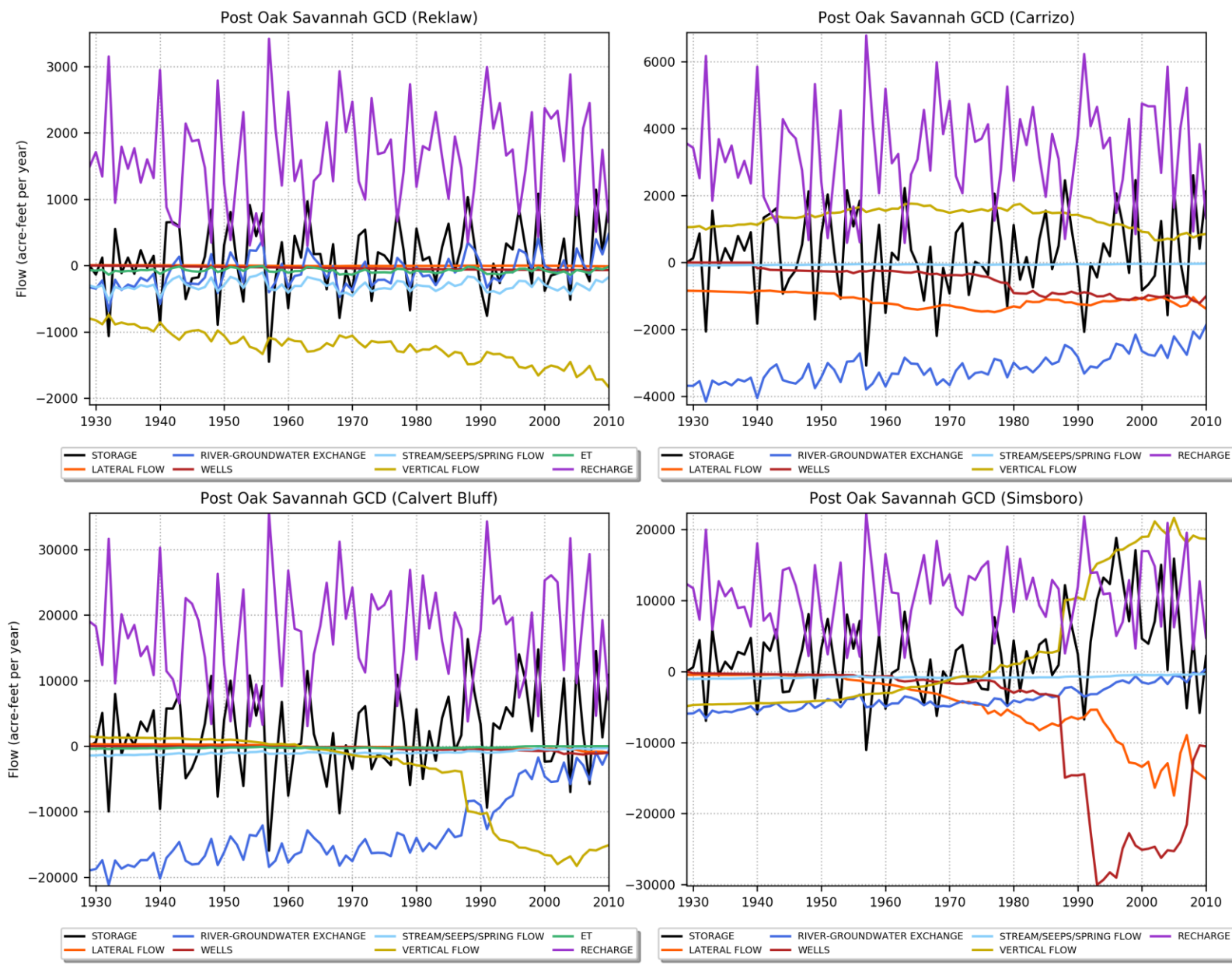
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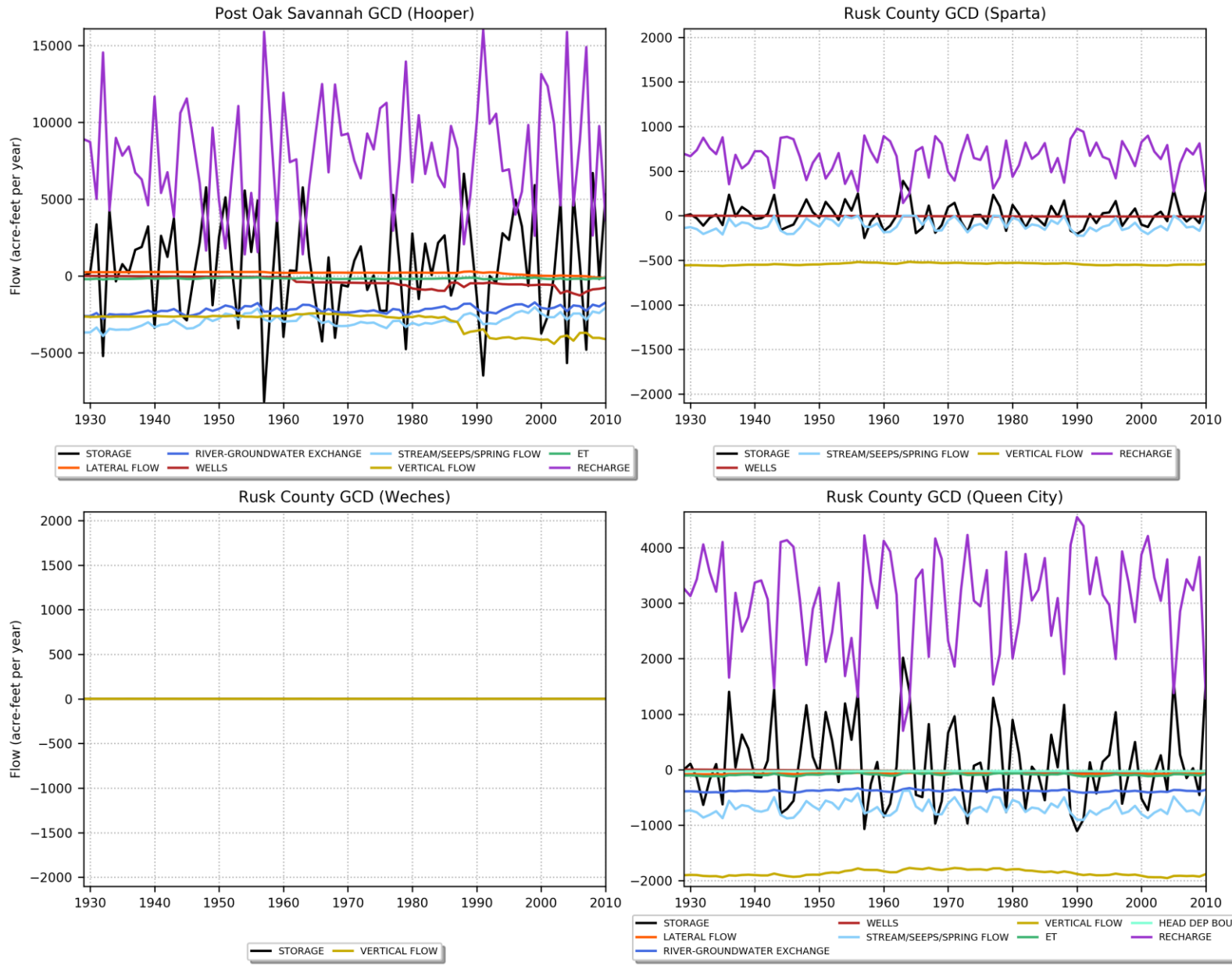
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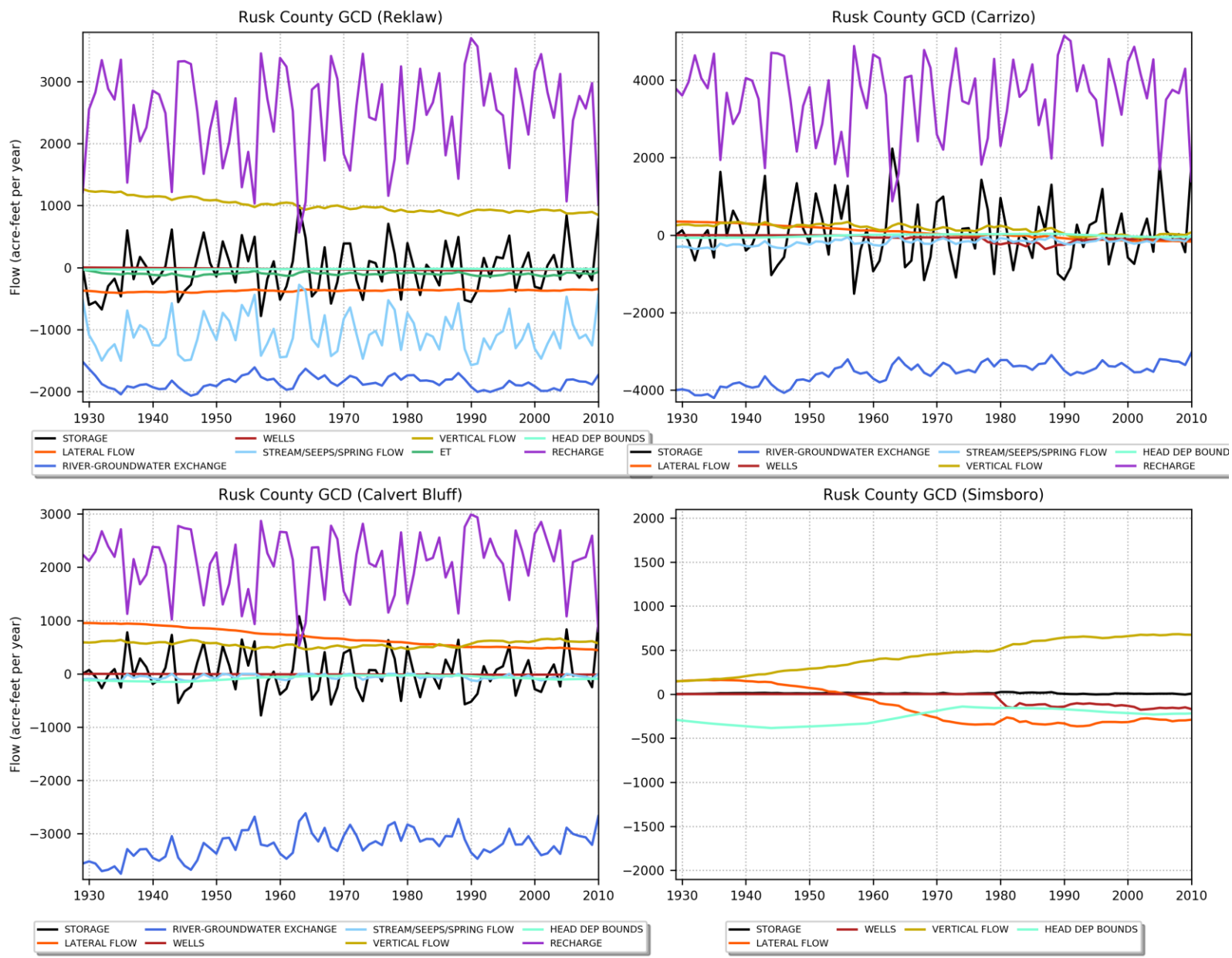
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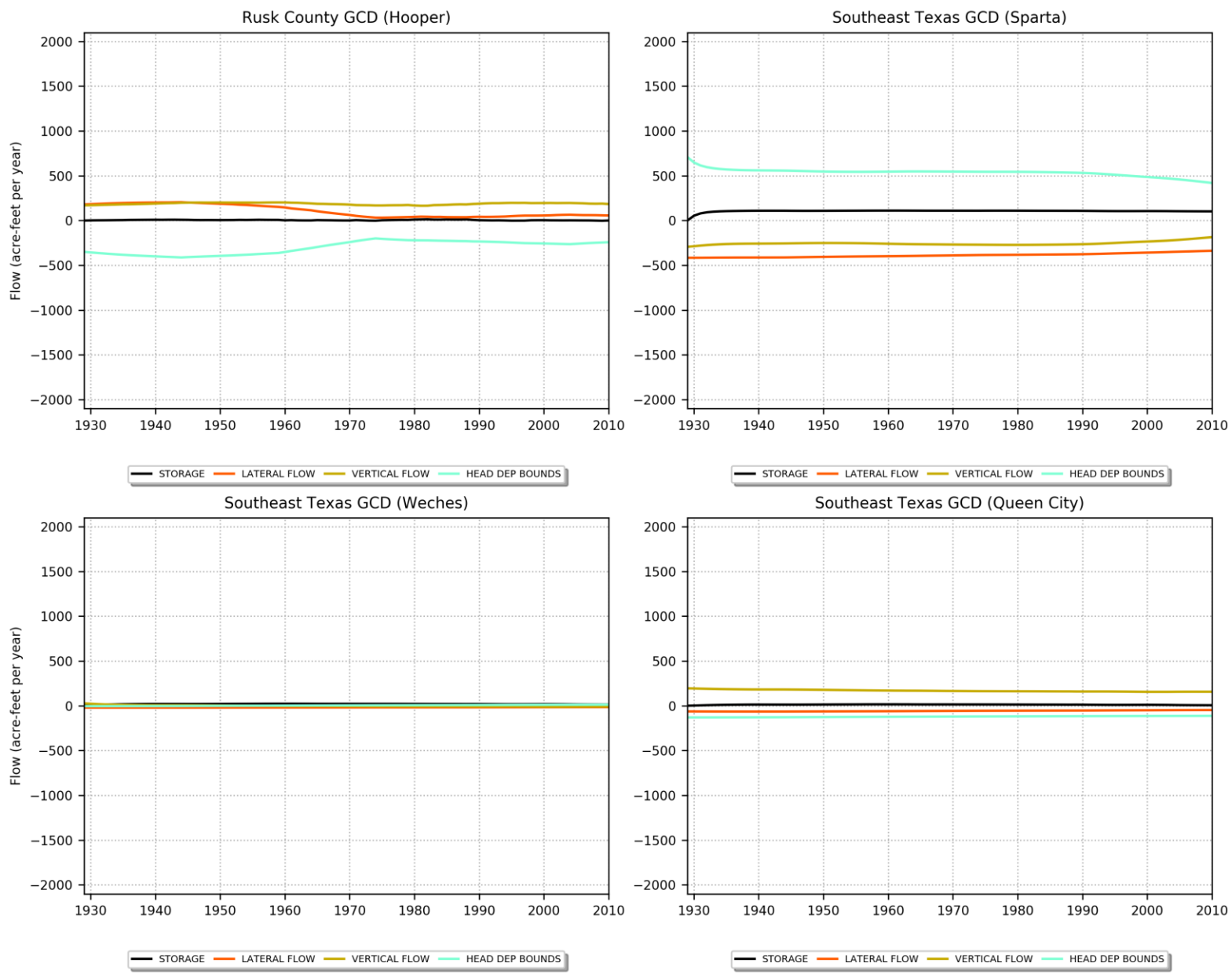
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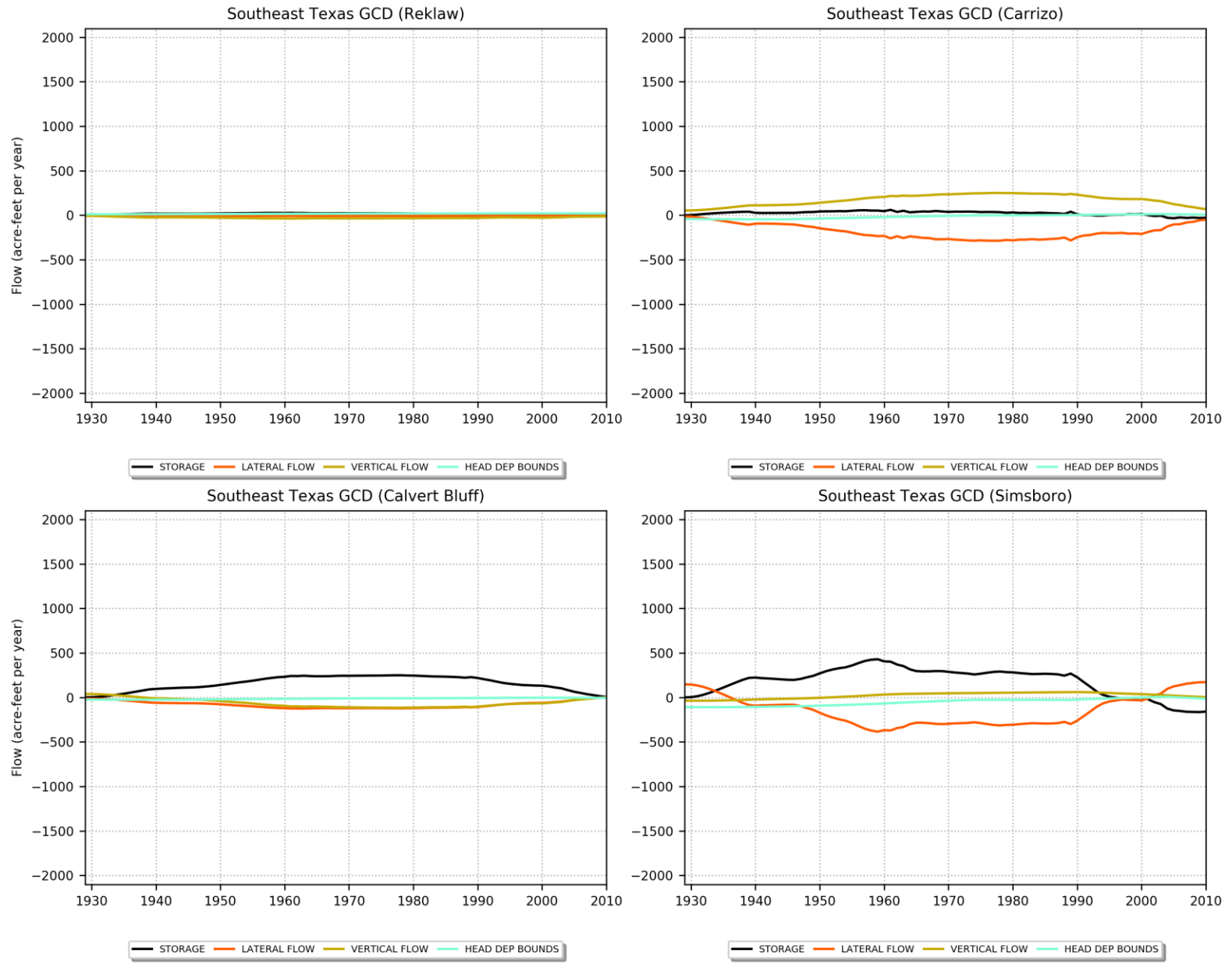
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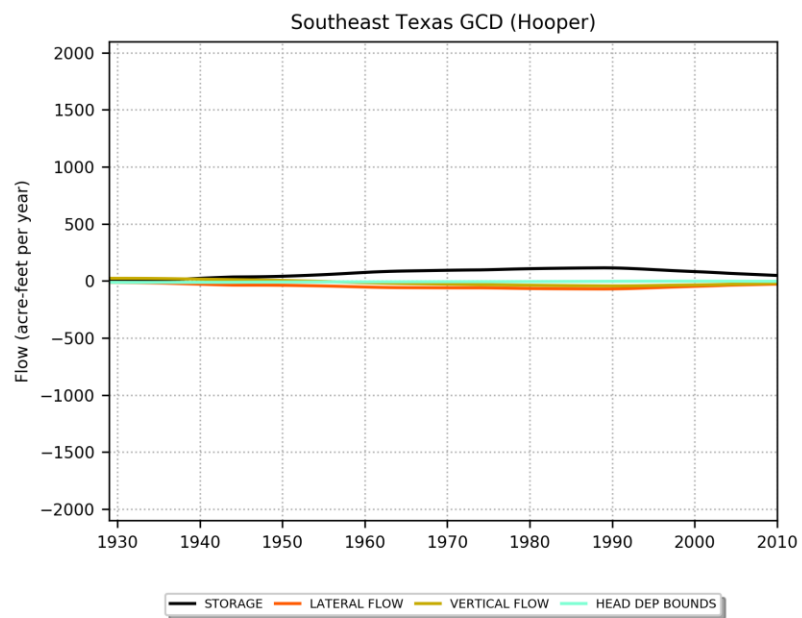
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of the Carrizo-Wilcox, Queen City, and Sparta Aquifers

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33 Appendix V: Fault Report Comment Responses

A draft report on the conceptualization, investigation, and sensitivity analysis regarding the effect of faults in the Milano Fault Zone on groundwater flow in the Carrizo-Wilcox Aquifer in central Texas was provided to the TWDB in March 2017. The findings of that report resulted in approval by the TWDB for INTERA to update the groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers with revised fault locations and characteristics for the Milano Fault Zone. The fault report was only provided in draft form, that is, no final report was prepared. Responses to TWDB comments on the draft fault report as they apply to the portions of that draft report that are included in Section 3 (updates to the conceptual model) of this model report are provided in this appendix.

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Groundwater Availability Model for the Central Portion of the
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PRELIMINARY DRAFT

*TWDB Contract 1548301856, Deliverable received February 28, 2017:
Review of “Draft Report: Conceptualization, Investigation, and Sensitivity Analysis
Regarding the Effects of Faults on Groundwater Flow in the Carrizo-Wilcox Aquifer in
Central Texas*

Attachment 1

The following report and data review comments shall be addressed and included in the final draft deliverables due January 31, 2018. Please note the items listed under suggestions are editorial in context and are not contractually required; however, adjustments noted may improve the readability of the report.

General Response: The draft fault report documents work conducted to assess the need to update the groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers based on an analysis of faults in the Milano Fault Zone and the impact of how those faults are represented in the model. Based on the results presented in the fault report, the TWDB approved the update to the model. The fault report was never finalized. Rather, excerpts from the draft fault report are included in Section 3 (updates to the conceptual model) of this current report on the updated model. The following responses to the TWDB comments on the draft fault report indicate whether the comment was address in development of Section 3 of this report.

Draft fault analysis report comments:

General comments to be addressed

1. The report was very interesting and informative.
Response: Thank you.
2. Please either use only “subsea” or only “below sea level” when referring to the reference for elevation. Alternating between the two terms may confuse the reader.
Response: Done. All references changed to below sea level.
3. Please review the reference citations against the reference section to make sure they are complete, accurate, and consistent.
Response: Not applicable to Section 3.0 of this report. However, references for all excerpts from the draft fault report have been included in the reference section of this report.
4. Please note that the current groundwater availability model for the study area is referred to as groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers.
Response: All references to the model used the indicated text when referencing the model.
5. Please explain how stratigraphic picks for geological units were made from and attributed to geophysical logs that either 1) were cased with the relevant geologic section not represented on the log or 2) the log terminates at total depth far above the geological unit. Some examples of these situations found in review of the table tblWell_Geology in Excel spreadsheet Deliverable_Structure_Picks_.xlsx and the delivered digital geophysical well

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*TWDB Contract 1548301856, Deliverable received February 28, 2017:
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Central Texas*

logs are API numbers 4202100824, 4214930987, 4202130077, 4228700048, and 4202130575.

Response: We had multiple logs for these wells and in error sent the incorrect version, with the shorter logged interval, with the draft deliverable of the fault report. The correct versions are included with the model report deliverable (see folder Data_Deliverables/Logs/tif_files). For well 4202130575, a pick for the Reklaw above the logged interval was erroneously included in the original deliverable, that pick has now been removed.

6. Please address if an attempt was made to do fault picks from geophysical well logs up through the Sparta Formation since the models that were tested for sensitivity include the Sparta, Queen City, Carrizo, and Wilcox aquifers.

Response: No attempt was made.

Specific comments to be addressed

7. Section 1, pages 3 and 4, Figures 1-1 and 1-2: please adjust Groundwater Management Area 12 boundary to include all of Brazos County in Groundwater Management Area 12.

Response: This was done for Figure 2.2a of this report.

8. Section 1, page 4, Figure 1-2: please update the groundwater conservation district map. For example, Deep East Texas and Anderson County are no longer groundwater conservation districts (GCD's).

Response: This was done for Figure 2.2e of this report.

9. Section 1, page 4, Figure 1-2: citation should be (Kelley and others, 2004), not 2014. Please update figure caption.

Response: Correct citation of Kelley and others (2004) has been used in this report.

10. Section 2.2, page 6, Category 2: text refers to "...deep district faults..." Please define "district" or replace with "listric" faults.

Response: This text was not included in Section 3.0 of this report; therefore, a response to this comment is not applicable.

11. Section 2, page 9, Figure 2-1: please note in figure that "(c) Strike-Slip Fault" is map view as opposed to cross-section view.

Response: This figure was not included in Section 3.0 of this report; therefore, a response to this comment is not applicable.

12. Section 3.1 Model Construction, page 15, last paragraph: according to the final report for the Groundwater Availability Model for the central portion of the Carrizo-Wilcox Aquifer, Layer 1 represents alluvium along the Colorado, Brazos, and Trinity rivers, not necessarily all younger formations. Please verify and update text if necessary.

Response: Text of this report is clear that the alluvium in model layer 1 represents only that for the Brazos and Colorado rivers.

13. Section 3.3, page 18, middle of paragraph 1: please clarify if the spelling of "Malino Fault Zone" should be "Milano" and please update if necessary.

Response: Correct spelling of Milano has been used throughout this report.

Groundwater Availability Model for the Central Portion of the
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PRELIMINARY DRAFT

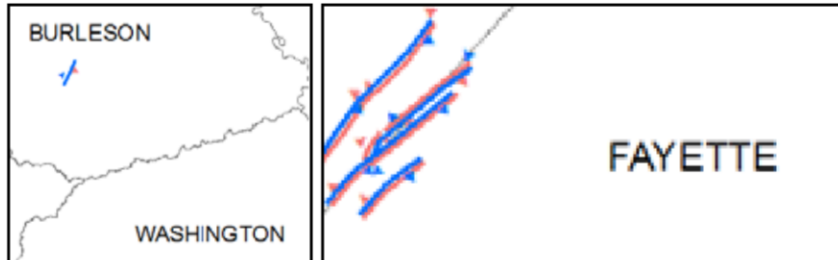
*TWDB Contract 1548301856, Deliverable received February 28, 2017:
Review of "Draft Report: Conceptualization, Investigation, and Sensitivity Analysis
Regarding the Effects of Faults on Groundwater Flow in the Carrizo-Wilcox Aquifer in
Central Texas*

14. Section 4.2, page 25, paragraph 1: please cross reference model verification period (2000 to 2010) to results in Section 6.3 of the report.
Response: Not applicable for Section 3.0 of this report.
15. Section 4.2, page 25, paragraph 2: please clarify in the text of the report if the predicted water levels were verified from measured water levels in 2010. If not, please expand discussion on when and what targets were used for verification.
Response: Not applicable for Section 3.0 of this report.
16. Section 4.3, page 26: please cross reference aquifer pumping tests to results in Section 7.3 of the report.
Response: Not applicable for Section 3.0 of this report.
17. Section 4.3, page 26, middle of paragraph 2: reference for "Young (1995)" is missing from references in section 10. Please update reference section.
Response: Not applicable for Section 3.0 of this report.
18. Section 5.2, page 30, paragraph 4: the report states that the six logs in Figure 5-5 were digitized. If these logs were digitized into Log ASCII Standard (LAS) format, please provide them to TWDB.
Response: Provided. See folder Data_Deliverables\Logs\LAS_files.
19. Section 5.2.1, page 31, first bullet: please update the text with the formation that is missing (possibly Navarro Formation).
Response: Done. See Section 3.1.2.1.
20. Section 5.3, page 35, second paragraph: Figure 5-12 is cited. Please update to Figure 5-21.
Response: Not applicable for Section 3.0 of this report.
21. Section 5, Figure 5-1, page 36: please remove the file name and location.
Response: Not applicable for Section 3.0 of this report.
22. Section 5, Figure 5-1, page 36: please mention in the caption that the curve responses are relative to the drilling fluid being composed of fresh water.
Response: This figure was not included in Section 3.0 of this report; therefore, a response to this comment is not applicable.
23. Section 5, page 38, Figure 5-3: please include the measurement unit, presumably feet, for the fault offset values.
Response: Done. See Figure 3.1.2b.
24. Section 5, page 38, Figure 5-3: caption states that "Fault arrow point to the down-throw side of the fault." Fault arrows are either missing on many of the faults or difficult to see on the figure where they are stacked. Please make the fault arrows clearer and more prominent in the figure.
Response: Done. See Figure 3.1.2b. Faults with slight or no dip are now indicated in the figure legend.
25. Section 5, page 41, Figure 5-6: please clarify the fault interpretation in the text of the report where it appears in Figure 5-6 that the down-thrown side in a Navarro fault is opposite to the down-thrown side in a Simsboro fault. This appears to be the case in Fayette and Burleson counties (see zoomed extracts of the figure below). Please clarify if the "...fuzzy and inconsistent nature of the picks..." refers to identifying the down-thrown side or the offset of the lines representing the location of the Navarro and Simsboro faults.

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Response: *Done. Fault dip directions have been verified and corrected (see Figure 3.1.2e). Dip direction is now consistent for faults in the Navarro Group and Simsboro Formation. The fuzzy and inconsistent nature relates to the Simsboro picks due to the sand on sand at the top of the Simsboro. Text clarified, see Section 3.1.2.*

26. Section 5, Figure 5-8 (page 43) and Figure 5-9 (page 44): the direction of the arrows for the down-thrown portion for the Navarro faults in Figure 5-8 are opposite to the arrows in Figure 5-9 for the Simsboro fault down-thrown portion. Please clarify the reasoning for this in the text of the report or adjust the figures as needed.

Response: *Figures corrected. See Figures 3.1.2g and 3.1.2.1a.*

27. Section 5, Figure 5-8 (page 43) and Figure 5-11 (page 46): the direction of the arrows for the down-thrown portion for the Navarro faults in Figure 5-8 are opposite to the arrows in Figure 5-11 for the Simsboro fault down-thrown portion for the small fault parallel to well 4202131041. Please clarify the reasoning for this in the text of the report or adjust the figures as needed.

Response: *Figures corrected. See Figures 3.1.2g and 3.12.2a.*

28. Section 5, Figure 5-8 (page 43) and Figure 5-18 (page 53): the direction of the arrows for the down-thrown portion for the Navarro faults for the Calvert Graben in Figure 5-8 are opposite to the arrows in Figure 5-18 for the Simsboro fault down-thrown portion for the small northern fault parallel to the long fault that well 4239500051 transects. Please clarify the reasoning for this in the text of the report or adjust the figures as needed.

Response: *Figures corrected. See Figures 3.1.2g and 3.1.2.5a.*

29. Section 5, Figure 5-8 (page 43) and Figure 5-18 (page 53): in the S. Kosse Graben in Figure 5-8 there appears to be three faults mapped; however, Figure 5-18 only shows one fault. Please review and update figures as needed.

Response: *Figure 3.1.2g of this report (Figure 5-8 in the draft fault report) shows Navarro faults, of which there are three in the S. Kosse Graben, and Figure 3.1.2.5a of this report (Figure 5-18 in the draft fault report) shows Simsboro faults, of which there is one in the S. Kosse Graben. Refer to Figure 3.1.2e (Figure 5-6 in the draft fault report), which shows both the Navarro and Simsboro faults. No change made.*

30. Section 5, Figures 5-9, 5-11, 5-14, and 5-18, pages 44, 46, 49, and 53: Please define the number next to the faults and include the units.

Response: *Numbers next to the fault are defined in the figure caption and the units for the numbers are provided in the figure caption. See Figures 3.1.2.1a, 3.1.2.2a, 3.1.2.3a, and 3.1.2.5a.*

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31. Figures 5-10, 5-12, 5-13, 5-15, 5-16, 5-17, 5-19, and 5-20, pages 45, 47, 48, 50, 51, 52, 54 and 55: Please define the acronym "GSE" used in these figures in the legend or caption. Most of the geophysical well logs are illegible; please replace them with legible logs or simplified representative versions and please label the faults.
Response: GSE has been replaced with GROUND SURFACE ELEVATION. The figures have been simplified and the faults have been labeled. See Figures 3.1.2.1b, 3.1.2.2b-c, 3.1.2.3b-d, and 3.1.2.5b-c.
32. Section 5, Figure 5-11 (page 46) and Figure 5-12 (page 47): Figure 5-12 indicates well 4202100138 has a fault cut but Figure 5-11 does not indicate this with a fault cut symbol. Please review and update as needed.
Response: Figure has been modified to indicate well 4202100138 has a fault cut. See Figure 3.1.2.2b.
33. Section 5, page 49, Figure 5-14: well 4228700005 is labeled twice, please remove one of the labels.
Response: Done. See Figure 3.1.2.3a.
34. Section 5, page 53, Figure 5-18: Cross section H-H' should have seven wells as indicated in Figure 5-20. Please add well 4249520001 to cross-section H-H' in this location map.
Response: Well 4239520001 has been removed from the cross-section figure. See Figure 3.1.2.5a.
35. Section 5, Figure 5-18 (page 53) and Figure 5-19 (page 54): the wells in Figure 5-19 do not match the wells in Figure 5-18 (they appear to have two additional "00" added to the end). Please update figures so the well numbers agree. In addition, Figure 5-19 indicates wells 423960005600 and 423950005200 both have fault cuts but Figure 5-18 does not indicate this with a fault cut symbol. Please review and update as needed.
Response: The well labels in Figure 3.1.2.5b (Figure 5-19 in the draft fault report) were modified to match those in Figure 3.1.2.5a (Figure 5-18 in the draft fault report). Figure 3.1.2.5a (Figure 5-18 in the draft fault report) has been modified to indicate wells 4239600056 and 4239500052 have a fault cut.
36. Section 5, Figure 5-18 (page 53) and Figure 5-20 (page 55): the wells in Figure 5-20 do not match the wells in Figure 5-18 (they appear to have two additional "00" added to the end). Please update figures so the well numbers agree.
Response: The well labels in Figure 3.1.2.5c (Figure 5-20 in the draft fault report) were modified to match those in Figure 3.1.2.5a (Figure 5-18 in the draft fault report).
37. Section 6.1, page 57, paragraph 1: text discusses the "validation" [post audit] by "a concerted effort to accurately represent pumping in the model 2000 to at least 2010". If a document was produced to validate the model including targets used and comparisons, please reference that document and please include in an appendix. Please provide associated data.
Response: This discussion is not included in this report; therefore, a response to this comment is not applicable.
38. Section 6.3.2, (pages 63 to 64) and Figures 6-13 (page 80) and 6-14 (page 81) suggest a better fit with eliminating faults than with the current faults/conductance. Please expand

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discussion and note possible other factors that may cause the current model to under predict water levels even with eliminating faults, such as recharge and/or aquifer properties.

Response: This discussion is not included in Section 3.0 of this report; therefore, a response to this comment is not applicable.

39. Section 6.4, page 67, Table 6-4: maximum drawdowns shown in table are less than the averages for the same scenarios, counties, and aquifers in Table 6-3. Averages should be less than maximums. Also, citations of maximum drawdown in the text (page 66, paragraph 1) do not match Table 6-4. Please review and update table if necessary.

Response: This discussion is not included in Section 3.0 of this report; therefore, a response to this comment is not applicable.

40. Section 6.5, page 68, last paragraph: please remove the last sentence about discussing water level monitoring protocol. The sentence would be better placed in a progress report or discussed in a review meeting, not necessarily added to the final report.

Response: This sentence is not included in Section 3.0 of this report; therefore, a response to this comment is not applicable.

41. Section 6, page 69, Figure 6-1: the pumping for the Queen City Aquifer is not shown on the figure. Please update the figure with Queen City Aquifer pumping.

Response: This figure is not included in Section 3.0 of this report; therefore, a response to this comment is not applicable.

42. Section 6, page 74, Figure 6-7: figure caption means (a) model layers 1, 3, and 5, and (2) model layers 6 and 8. These graphs (a) and (2) are not shown, only (c) model layer 7 is shown. Please either update the caption or update the figure to include (a) and (2 [b]).

Response: This figure is not included in Section 3.0 of this report; therefore, a response to this comment is not applicable.

43. Section 7.1.1, page 91 paragraph 2 middle: text cites Butler (1991), please update Section 10 References with this reference or update text to Butler (1990).

Response: The text has been updated to Butler (1990). See Sections 3.1.4.1 and 8.1.1.

44. Section 7.3.1: [Observation] text discusses the current groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers does not converge in steady state and grid cells are too big to analyze aquifer pumping tests. Importing the unstable model into a different code does not guarantee underlying issues do not import into the new code. Ideally if the grid is refined, properties should be resampled from the original field data and re-contoured, and the model recalibrated. Figure 12-1 suggests the import was successful and as noted in the text of the report some scatter in the Sparta and Queen City layers is noted in Figure 12-1.

Response: The model was successfully imported into MODFLOW USG and the model converged in steady state due to the better solver available in MODFLOW USG. The model has been recalibrated with the refined grid.

45. Section 7.3, pages 97 to 100: for clarity, in addition to Figure 7-7, please insert a figure with pumping tests discussed in text (with well location and faults from existing model and this study). Most are covered in Figures 7-8 through 7-11 (please cross-reference in TTIM figure captions); however, could only locate AT-73, AT-71P, and AT-105P in Figure 7-7. In

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addition, please, explain in text the reasoning for applying TTIM to a different set of wells than those analyzed using CJSL.

Response: See Figure 3.1.4.2a, which shows the location of the wells with aquifer tests for which simulated time-drawdown data generated using TTIm were interpreted using the Cooper-Jacob analysis.

46. Section 7.3.1, page 98, paragraph 4 middle: "The simulated results for the "without-faults" scenario has a straight-line and a constant transmits ..." Please change "transmits" to transmissivity.

Response: This text is not included in this report; therefore, a response to this comment is not applicable.

47. Section 7.3.1, page 98, paragraph 5, line 5: text discusses well AT-95P and references Table 7-4 (which refers to well AT-95C). Please clarify if the data in Table 7-4 is for AT-95P or AT-95C. If table refers to well AT-95C, please expand text for relationship of AT-95C to AT-95P.

Response: Text, tables, and figures in Section 3 consistently refer to this test as AT-95P.

48. Section 7.3.1, page 99, paragraph 1, last sentence: pump test AT-93C is mentioned. Please check whether this should be AT-95C or AT-95P and update if necessary. Also in this section AT-93C, AT-95C, and AT-95P are mentioned or referenced. For example, text references Figures 7-19 and 7-20 and caption states these are for AT-95P; however text is discussing AT-95C. Please clarify if all three were analyzed or just one. Please verify and update text and figures as necessary.

Response: Text, tables, and figures in Section 3 consistently refer to this test as AT-95P.

49. Section 7.3.2, page 99: text mentions pumping tests AT-73P, AT-76C, AT-112C, AT-105P, AT-43C, and AT-42C (Figures 7-22 through 7-27); however, caption for Figure 7-22 states analysis for AT-71P and no associated figure is provided for AT-73P. Please clarify pumping tests used and please verify associated figures are provided. Please spell check captions for all of these figures.

Response: Done. See Section 3.1.4.2 and Appendix C.

50. Section 7.3, pages 116 through 121, Figures 7-18 through 7-27: please provide explanation for why some lines are solid, dashed, or dots.

Response: Table C.1 added in Appendix C to explain the lines in the figures.

51. Section 8, page 123, paragraph 1: text mentions approximately 650 geophysical logs were interpreted; however only 579 digital images were provided and 567 were listed in the location table. Please provide missing logs.

Response: A total of 656 logs were interpreted. Data for some of these wells were already in the BRACS database. A complete summary, by well, of wells in the database and new wells for addition to the database is provided electronically in the Excel spreadsheet Delivery_Status.xlsx in the folder Data_Deliverables\BRACSdb_Logs. Digital images for the logs not previous provided are included with this delivery (see folder Data_Deliverables\Logstif_files). The following summarizes that table.

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<i>BRACS db Tables and TIFs</i>	<i>Already in BRACS db</i>	<i>Provided for Adding to BRACS db</i>	<i>Already Provided</i>	<i>Included with this Delivery</i>	<i>Total</i>
<i>BRACS Location Table</i>	<i>112</i>	<i>544</i>			<i>656</i>
<i>BRACS Geology Table</i>	<i>46</i>	<i>610</i>			<i>656</i>
<i>Digital Image (.tif file)</i>			<i>535</i>	<i>121</i>	<i>656</i>

52. Section 8, page 125, paragraph 3: text states 97 pumping tests involved pumping of the Carrizo, Simsboro, or Hooper. A query of the spreadsheet Appendix_A_Tables_TestID_Completion_Data.xlsx returns 96 records for model layers 5, 6, 7, and 8 and 71 records if you remove the Calvert Bluff. Please update text or data so there is agreement.
Response: Text corrected to say 71 tests. See Section 3.1.5.
53. Section 10, References, page 130: information for Jackson and others (2003) is missing. Please complete this reference.
Response: Full reference for Jackson and others (2003) included in the reference section of this report.
54. Section 10, References: please check the format of this section. Some of the references are not indented on the second line.
Response: Formatting for all references was check and is consistent.

General suggestions for Draft geodatabase and model files

55. Per Article III, number 3, of the contract 1548301856: “The CONTRACTOR will complete the Scope of Work and will submit the fault study, model sensitivity analysis, and any adjustments to the conceptual model; all documented data or analysis associated with this phase of the project... 1 electronic copy of all the related documented source and derived data in the appropriate geodatabases (BRACS and TWDB GAM)”. We did not receive any geodatabases. We did receive two folders with unstructured data:
a. Pump_test_data with 117 files
b. GMA_12_deliverable_bracs with 581 files
We were unable to complete a thorough review since the required geodatabases were not provided.
Response: The geodatabase is provided with the model report.
56. Per Exhibit B, Scope and Attachment 1, Section 4.4.2 Report deliverables, page 21 of 23: “For the draft fault analysis report, and then later for the draft model report, the contractor shall deliver to the TWDB:...
- Model input files (for MODFLOW-2005 or later version of MODFLOW and Groundwater Vistas with the draft report deliverable) including a table correlating stress periods to equivalent time periods and length of time.
 - All computer programs (source code and executable) that are used during the conceptual model development”

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We were unable to complete a thorough review since the required model files were not provided.

Response: Model files for the updated groundwater availability model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers are provided with the model report.

57. Please provide all feature datasets and their feature classes for faults, pump test wells, geophysical logs, structural picks, lines of cross-sections, and all other geographic data used to create all report figures within the appropriate ESRI geodatabase schema. Additionally, please provide GIS (grid cell centroid point and/or polygon) model grid files attributed with modeled faults cells (in report section 5), pumping distributions (in report section 6), drawdown contours (in report section 6), residuals (in report section 6), wells with aquifer pumping tests (in report section 7), spatial distribution of transmissivity categories (in report section 7), and all other modeling related GIS files. We were not able to evaluate the any geodatabase feature classes since no GIS files of any kind were provided.

Response: Done.

Draft geodatabase comments to be addressed

58. Please provide the Cooper-Jacob straight line transmissivity analysis plots and the excel files used to create the plots in the report (Appendix B).

Response: The data used to create these plots have been put in the geodatabase. All plots are shown in Appendix B of the model report.

59. For each well, please provide a record with the lease name and number in the tblBracs_ForeignKey table.

Response: We do not have lease name and number in an electronic format, so they have not been provided.

60. For each well, please provide the drill date in the tblWell_Location table.

Response: We do not have drill dates in an electronic format, so they have not been provided.

61. The provided Kelly Bushing height of 15 feet for all wells is not accurate. For each well, please provide the actual Kelly Bushing height in the tblWell_Location table.

Response: We do not have the Kelly Bushing height in an electronic format, so they have not been provided. The constant value of 15 was removed. The Kelly Bushing elevation was added in the remarks column of the table.

62. There are records for API numbers 4228700012 and 4214931047 in the tblWell_Location table but logs associated with these two wells were not delivered. Please provide digital geophysical well logs for API numbers 4228700012 and 4214931047.

Response: Provided. See folder Data_Deliverables\Logs\tif_files.

63. Table 3-1 defines which formations are contained within the Lower, Middle, and Upper Wilcox Subgroups in the project area. Please include these hydrostatigraphic units in the tblWell_Geology table.

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Response: All picks made for this project for the Middle and Upper Wilcox Subgroups, Simsboro and Hooper formations, respectively, are included in the tblWell_Geology table. No picks for the Upper Wilcox Subgroup were made.

64. Cross sections in the report show stratigraphic picks for the Edwards, Georgetown, Buda, Austin Chalk, Pecan Gap, Carrizo, and Reklaw groups and formations. Please provide these picks in the tblWell_Geology table.

Response: Where a pick was made for these formations, they have been added to the tblWell_Geology table.

65. Please provide geologic information from the "fault cut wells" discussed in the report. This information is a critical component of this study. As an example, the BRACS database geology table is designed to hold fault information. The fields include [geologic_pick] = "fault", field [fault_type] = "normal", field [fault_missing_section] represents the thickness of missing section, the field [depth_top] records the depth to the fault, and the field [remarks] provide additional information, such as the well ID of the comparison well used to discern the missing section and the depth interval of that well that is missing from the faulted well.

Response: Done. The information has been added to the tblWell_Geology table.

66. For each of the 579 digital geophysical well logs delivered, please provide the attributes in the tblGeophysicalLog_Header table. These are described in the BRACS Database Data Dictionary.

Response: Done. The information has been added to the tblGeophysicalLog_Header.

67. For each of the 579 digital geophysical well logs delivered, please provide the attributes in the tblGeophysicalLog_Suite table. These attributes are described in the BRACS Database Data Dictionary.

Response: Done. The information has been added to the tblGeophysicalLog_Suite table.

68. Please provide the digital water well files associated with the 113 pump test wells used in the study.

Response: Provided. See folder Data_Deliverables\WaterWellFiles.

69. The information provided in Appendix A Tables_TestID_Completion_Data.xlsx and INTERA_Test_ID_Lookup_v5_02272017.xlsx is incomplete and needs to be loaded into the BRACS Database table formats. Please provide the complete well attributes and comprehensive pumping test data for the 113 pump test wells in the four relevant BRACS Database tables. These four tables are tblWell_Location, tblBRACS_ForeignKey, tblBRACSWaterWellReports, and tblBRACS_AquiferTestInformation as described in the BRACS Database Data Dictionary (TWDB Open File Report 12-02, Second Edition).

Response: All of the data INTERA has for these tests are provided. See folder Data_Deliverables\BRACSDb_APTs.

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Suggestions for the fault analysis report:

General suggestions

70. Please proofread and correct the report for spelling and other miscellaneous grammatical errors found throughout the report.
Response: A final fault report was not required; therefore, a response to this comment is not applicable.
71. Please define or provide glossary for more technical terms for the public audience; such as depocenter, progradation, syndepositional, autochthonous, decollement, and so on.
Response: These terms are not used in the model report so no glossary was added.
72. Page 31: Consider explaining why the Luling Fault Zone in western Bastrop County mostly does not affect the aquifers in the Wilcox Group.
Response: This was not part of the scope of this project and is not important to our discussion. Therefore, no discussion of the Luling Fault Zone is included in this report.
73. Section 5: Consider making comments on the surface expression or mapping of faults relative to the Kovar Complex like is referenced in the descriptions of the Paige Graben, Tanglewood Graben, Calvert Graben, and South Kosse Area.
Response: As noted in the first paragraph of Section 3.1.2.1, the log control is insufficient to reliably map the faults, so additional comments have not been added.

Public Comments:

As of March 31, 2017, no public comments have been received. The public review comment ends May 4, 2017.

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34 Appendix W: Draft Model Report Comment Responses

Responses to TWDB and public review comments on the draft model report are provided in this appendix.

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Draft Final Model Report comments:

General comments to be addressed

1. Please ensure all text is in Times New Roman font.
Response: Done.
2. Per Exhibit B, author guidelines, the only abbreviation that should be used in the report is TWDB after it is introduced. For example, please delete e.g. and spell this out.
Response: Done.
3. In several places, the word “sensitivity” is used when the word “sensitive” should be used. Please update accordingly.
Response: Done.
4. Please use either “TTim” or “TTIM” consistently throughout the report.
Response: Done.
5. Please use either “base flow” or “base-flow” as an adjective consistently throughout the report; and please be consistent in the use of “base flow” or “baseflow” as a noun.
Response: Done.
6. Please check grammar (noun-verb agreement, use of adjectives vs. nouns) throughout the report.
Response: Done.

Specific comments to be addressed

7. Section 1 Executive Summary, page Vol. 1-1, paragraph 5, last sentence: Please rewrite sentence, “or steady-state conditions...” for clarity.
Response: Done.
8. Section 1 Executive Summary, page Vol. 1-1, paragraph 5, last sentence: Please clarify if the 2.0 inches per year of recharge represents effective recharge from precipitation or also includes bank flow, aggregate recharge including captured recharge, or some other scenario.
Response: We have modified the report to say “an average recharge rate of 2.0 inches per year from precipitation.”
9. Section 1 Executive Summary, page Vol. 1-2 paragraph 3: Author discusses advantage to MODFLOW-USG is refining grid around well fields. Please clarify if this was implemented in this model or if the refined grids were only applied along major streams. If so, please re-write so the distinction is clear.
Response: Text related to refinement around well fields removed and text added stating grid refining was used along select rivers and streams in the model.
10. Section 1 Executive Summary, page Vol. 1-2, paragraph 4: States model has 10 layers but only 9 listed. Please clarify missing layer is Carrizo Formation (Aquifer) and please update text as needed.
Response: Done.

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11. Section 1 Executive Summary, page Vol. 1-3: please update to indicate 20 parameters were varied for the transient sensitivity analyses. Also, please confirm that Kx was appropriately applied in the model for the steady-state sensitivity analyses.
Response: The report was updated to 20 parameters. The steady-state sensitivity simulations were rerun with the appropriate set of Kx values.
12. Section 1 Executive Summary, page Vol. 1-3, last paragraph, second to last and last sentence: The word “sensitivity” is used three times when it should be “sensitive.” Please update the text as appropriate.
Response: Done.
13. Section 2.1 Background, page Vol. 1-5, last paragraph, sentence 2: Please replace “Brazos Valley River Authority” with Brazos River Authority.”
Response: Done.
14. Section 2.1 Background, page Vol. 1-6, last paragraph: There are three reasons listed for updating the model for the central portion of the Carrizo-Wilcox, Queen City, and Sparta aquifers. However, there was also a fourth reason listed in the contract Exhibit A: (page 11 of 307), “a comparison of the framework of the existing model to the results of a TWDB geophysical study and update model as applicable”. Please include the framework comparison in the list of reasons for the model update and discuss this in the appropriate section of the report.
Response: Done. A paragraph was added in Section 3.1. to state that a framework comparison was performed.
15. Section 2, Figures 2.1a to 2.3a, pages Vol. 1-7 to Vol. 1-12: Figures are missing citation of source data. Please update legends or captions and update references, as needed.
Response: Done.
16. Section 2, Figure 2.1b, page Vol. 1-8: Figure missing Cross Timbers Aquifer. Please update figure with missing aquifer.
Response: Done.
17. Section 2.2, 2.3, and 2.4, Figures 2.2b, 2.2c, 2.2d, 2.2e, 2.3a, 2.3b, 2.3c, 2.4a, and 2.4b: Please print these figures larger or at a higher resolution; the labels in the figures are fuzzy and difficult to read.
Response: Done.
18. Section 2.4 Geology, page Vol. 1-14, paragraph 2: Please correct the reference to the fault and structural feature figure (Figure 2.4a instead of 2.4b).
Response: Done.
19. Section 3.1.2 Characterization of the Milano Fault Zone, page Vol. 1-21, paragraph 3: Please explain in the text of the report the meaning of “blue logs”.
Response: The word “blue” was removed and replaced with the number “470”. The sentence now says “...were made on 470 logs in the...”
20. Section 3.1.2 Characterization of the Milano Fault Zone, page Vol. 1-23, Figure 3.1.2b: The caption indicates picks from 650 geophysical logs while the map legend indicates 656 logs. Please update one of these pick counts so they agree or provide explanation for difference.
Response: Caption changed to say 656 geophysical logs.

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21. Section 3.1.2 Characterization of the Milano Fault Zone, page Vol. 1-25, Figure 3.1.2d: Several of the labels indicating feet bgs are either missing a zero or a comma or have an extra zero. Please check these labels and update as applicable. Also, please add a legend or additional explanation in the figure caption about what these red labels are showing. Please clarify if the number of feet represents the offset or thickness. Please clarify why log 42021305810000 has label for Austin but not an additional label for the Navarro.
Response: Labels updated and legend added. Log 42021305810000 does not have a label for the Navarro Formation because there is no fault in the Navarro Formation.
22. Section 3.1.2.3 Tanglewood Graben, page Vol. 1-36, first bullet list: The heading for the list is “South End of Lee County”: however, the graben is in the north end of Lee County. Please review this heading and update as applicable.
Response: Done.
23. Section 3.1.4.1 Comparison of Early and Late Time Transmissivity Values from Aquifer Pumping Tests, page Vol. 1-49, first paragraph, first sentence: The sentence “Where two transmissivity values were calculate ...” is repeated. Please remove the second occurrence of the sentence.
Response: Done.
24. Section 3.1.4.1 Comparison of Early and Late Time Transmissivity Values from Aquifer Pumping Tests, page Vol. 1-49, paragraph 3: Text references Figures 3.1.1b and 3.1.2b in the first sentence however these figures do not convey the message as well as Figure 3.1.3a. Please consider referencing a single figure.
Response: Sentence revised to reference Figure 3.1.3a only.
25. Section 3.1.4.2 Simulation of the Effects of the Faults, page Vol. 1 – 58, Table 3.1.4.2a, paragraph 3: Aquifer test AT-95P is referred to in the text but the table lists aquifer test AT-95C. Please correct the text or table as applicable with the correct pump test name.
Response: Table corrected to say AT-95P.
26. Section 3: Per contract, Exhibit B, Scope and Attachment 1, page 14 of 23, “Include a summary of sections 2.0 Methods, 3.0 Analysis and Results, and 4.0 Summary and Recommendations from the draft report of the fault analysis...” The Updates to the Conceptual Model Section 3.0 does not appear to include anything from the Summary and Recommendations part of the fault analysis report. Please include at least a summary of that section of the fault analysis report in the final model report.
Response: Summary added as Section 3.1.4.
27. Section 3.2 Historical Pumping, pages Vol.1-59 to Vol.1-90: The report indicates that the Brazos River and Colorado River Alluvium was added in model layer 1. Please clarify if pumping was developed for this layer. If so, please discuss the alluvium pumping in Section 3.2 otherwise please note that pumping was not used in model layer 1.
Response: A paragraph discussing pumping in model layer 1 for the Brazos River Alluvium Aquifer was added in Section 3.2. Section 3.2.2.8 was added to discuss pumping in model layer 1 for both the Colorado and Brazos rivers alluvium.
28. Section 3.2 Historical Pumping, page Vol. 1-59, first paragraph, first sentence: Please remove the word “simulates” between the report citation and “calibrated”.
Response: Done.

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29. Section 3.2.1.1 Historical Pumping Data Sources, page Vol. 1-63: The text at the bottom of the page after the table duplicates the text at the beginning of Section 3.2.1. Please update text accordingly by removing duplication.

Response: Done.

30. Section 3.2.1.5 Groundwater Conservation Districts and Public Water Suppliers, page Vol. 1-66, Table 3.2.1.5a: Please remove names from table in report.

Response: Done.

31. Section 3.2.2.5 Irrigation Pumping, page Vol. 1-69, "Pre-1980", first sentence: Please change "industrial pumping" to "irrigation pumping".

Response: Done.

32. Section 3.2.2.6 Livestock Pumping, page Vol. 1-70, "Pre-1980", first sentence: Please change "industrial pumping" to "livestock pumping".

Response: Done.

33. Section 3.2.4 Assignment of Pumping to Model Grid, page Vol. 1-89, Figure 3.2.4a: The figure legend mentions the Colorado Alluvium, but this is the first mention of any pumping from that unit. The Brazos River Alluvium Aquifer is not mentioned. Please clarify whether or how pumping data was developed for the alluvium units. A review of the model indicates pumping was assigned in layer 1 for the Brazos River Alluvium; however, no pumping was assigned to the Colorado River Alluvium. In addition, the figure suggests that unspecified pumping was not assigned in the model; however, the text suggests some pumping was assigned. Please clarify in the text or caption if all unspecified pumping was allocated—irrigation, livestock, and rural domestic.

Response: Section 3.2.2.8 discussing pumping from the Colorado River alluvium was added to the report. Text was added to explain assignment of pumping for the Brazos River Alluvium Aquifer. The model does include pumping of the portion of model layer 1 that represents the Colorado River alluvium as indicated in the pumping tables in Appendix E (see Bastrop County) in the pumping figures in Appendix F. Note that it is very difficult to see the pumping in the figures due to the small size of the grid blocks in which pumping of the Colorado River alluvium occurs. The text has been clarified to indicate that unspecified pumping for municipal, manufacturing, mining, and power purposes was not assigned in the model but unspecified pumping for irrigation, livestock, and rural domestic purposes was assigned in the model.

34. Section 3.2.4.1 Rural Domestic Pumping, page Vol. 1-90, first paragraph: Please expand on the assumption that all rural domestic pumping occurs in outcrop areas only. It seems there may be areas where rural domestic wells are in confined areas. Please clarify if this assumption is supported by domestic well locations from the TWDB groundwater database.

Response: Text was expanded and clarified.

35. Section 3.3.2.2 BFLOW Program for Calculating Base Flow, page Vol. 1-94, Figure 3.3.2.2b: Please remove the extra "F" in the note for AFY.

Response: Done.

36. Section 3.3.3 Recharge Calculation from Base Flow, pages Vol. 1-98 and Vol.1 1-99, Figures 3.3.3a and 3.3.3b: Please update figures by labeling Colorado River... Please expand discussion to specifically address the numerous springs and seeps discussed at Groundwater Management Area 12 meetings to ensure this approach includes this discharge from the aquifer.

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Response: Figures revised to show Colorado River label. A paragraph was added to Section 3.3.3 to specifically state that springs and seeps are included as part of base flow.

37. Section 3.3.3 Recharge Calculation from Base Flow, Figure 3.3.3c, page Vol. 1-100: Caption lists river gage 803705 however figure notes river gage 8111000. River gage 08111000 is in Brazos County. Please update figure and caption as needed. River gage 08065200 is located in Leon County not Freestone County. Please update figure and caption as needed.
Response: Done.
38. Section 3.3.4.2, page Vol. 1-103, paragraph 2: In the middle of the paragraph the phrase “banks of the aquifer” is used. Please clarify if this should be “streambank” or please explain what aquifer banks are. In addition, please proofread this paragraph and edit as needed.
Response: Clarified that it should be stream bank and edited paragraph.
39. Section 3.3.5, page Vol. 1-107, Figure 3.3.5a: It would be helpful to compare the precipitation percentiles if each of these charts had the same scale.
Response: Done.
40. Section 3.4 Surface Water and Groundwater Interaction, page Vol. 1-110: This section contains several errors in the text. Please proofread and update the text for the final report as applicable.
Response: Done.
41. Section 3.4.1 Addition of Model Layers to Represent Shallow, Local Scale Groundwater Flow, page Vol. 1-111, last paragraph: This paragraph contains several errors in the text. Please proofread and update the text for the final report as applicable.
Response: Done.
42. Section 3.5 Conceptual Model of Groundwater Flow, page Vol. 1-118: In the first two paragraphs the author references figure 3.4.3a, which does not exist. Please update the report with this figure or reference another figure.
Response: Figure reference changed to 3.5a.
43. Section 3.5 Conceptual Model of Groundwater Flow, Figure 3.5.0a, page Vol. 1-119: Please update bottom figure to include pumping in Sparta Aquifer. Also, please add box for alluvium to surround river cell then add pumping, recharge, cross formational flow, and evapotranspiration to alluvium. Please include conceptualization for downdip extent—no flow, GHB, or some other boundary condition.
Response: Done.
44. Section 4 Model Overview and Packages, page Vol. 1-121, second paragraph: There is a file path in the text at the bottom of the paragraph which does seem to belong in the text. Please verify and remove the path as applicable.
Response: Done.
45. Section 4 Model Overview and Packages, page Vol. 1-121, Table 4.0a: The general head boundary package is not listed in this table. Please include the general head boundary package. Also, the horizontal flow barrier package is listed as having the name gma12.sfr. Please correct this to, gma12.hfb.
Response: Done.

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46. Section 4 Model Overview and Packages: Please include a section for each package used in the model. There are no sections in this chapter for the horizontal flow barrier package and the ghost node correction package. Please add sections for the ghost node correction and horizontal flow barrier packages.

Response: Done.

47. Section 4 Model Overview and Packages, page Vol. 1-122, Table 4.0b: The drawdown (DDN) is missing from the output table. Please update so text and table agree.

Response: Done.

48. Section 4.1 Basic Package, page Vol. 1-122, first paragraph, sentence 4: Please change “extend” to “extent”.

Response: Done.

49. Section 4.2.1, page Vol. 1-128, Figure 4.2.1i: Please indicate the significance of points A, B, and C in the legend.

Response: Text explaining the significance of points A, B and C was added to the figure caption. No change was made to the figure legend.

50. Section 4.2.2 Stress Period Setup, page Vol. 1-134, Table 4.2.2a: Please clarify why only stress periods 4 and 8 are 366 days in length and the remaining transient stress periods are 365.

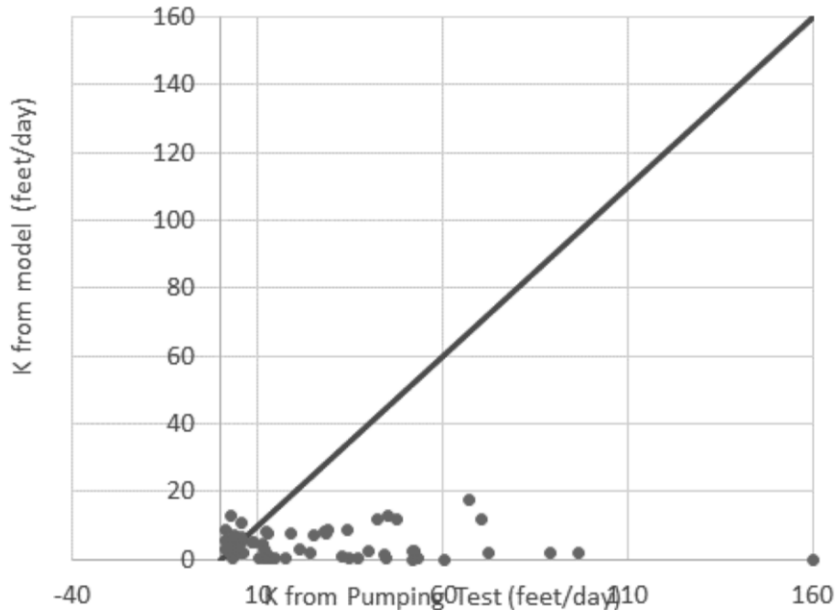
Response: Table has been updated to indicate that the length for stress period 1 is 1 day and the length for all other stress periods is 365.25 days.

51. Section 4.3.1 to 4.3.3.2 Hydraulic Properties Zones, pages Vol 1-135 to Vol. 1-160: Please explain why the hydraulic conductivity values from pumping tests were not honored for the calibrated model, as shown below. Please state in the in the text of the report that the pumping test results were not honored at their specific locations and the model may not reflect the aquifer heterogeneity. As a result, the model is not designed for evaluating local hydrogeology and may not be used for particle tracking to estimate groundwater travel time and pathways.

Response: Several paragraphs were added to Section 5.1 Calibration Procedure to explain why the hydraulic conductivity values were not honored at the respective locations of the aquifer pumping tests used to calculate the values. The discussion explains that the model calibration was not constrained with a sufficient density of measured hydraulic conductivity values to represent local-scale heterogeneity and, therefore, is not suitable for accurate simulation of groundwater flow paths using particle tracking.

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52. Section 4.3.3.1, page Vol. 1-158, Tables 4.3.3.1c and 4.3.3.1d: Table 4.3.3.1c lists A1 values of 0.0004 and 0.0002 for the aquifers and confining units. None of the hydrogeologic zones are listed as having an A1 value equal to 0.0003. However, Table 4.3.3.1d lists specific storage values for A1 = 0.0003. Do some of the aquifers actually have values of A1 = 0.0003? If not, it is unclear why Table 4.3.3.1d lists these values. Please review these two tables and update if applicable. Also, text on the bottom of page Vol. 1 – 157 refers to Tables 3.3.3.1c and 3.3.3.1d. Please correct these table numbers in the text.

Response: *The value 0.0003 should not be in Table 4.3.3.2d and has been removed.*

53. Section 5.1 Calibration Procedure, page Vol 1- 178, first paragraph, second sentence: For the list of steps in running PEST the first is listed as "(1) read MODFLOW's input files." Please clarify if this should be "(1) write MODFLOW's input files" and please update text as applicable.

Response: *Done.*

54. Section 5.1 Calibration Procedure, page Vol 1- 179, text discusses pilot points for the calibration process; however, Figure 5.1.0a only addresses horizontal and vertical conductivity. Please provide figure(s) of the pilot points for the other parameters that used the same process.

Response: *A figure has been added showing the general-head boundary, drain, and river cell pilot points.*

55. Section 5.2 Hydraulic Head Calibration Targets, page Vol. 1 – 182: Please provide further justification on why targets that did not fit the apparent trend of hydraulic data, that differed by more than 50 feet from adjacent heads, or that were significantly different from those within 1.5 miles were removed from calibration. Also, please show results for those excluded wells in plots and show calibration statistics with those wells included. Please note the number of targets removed from consideration in the report.

Response: *Done.*

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56. Section 5.2 Hydraulic Head Calibration Targets, page Vol. 1 – 182: For wells with large fluctuations in measured elevations that were removed from the target set, please discuss whether the TWDB groundwater database had comments or codes noting that pumping was occurring during measurement, or whether other comments were noted in the database. Please further justify removing these targets from the calibration set and show model results compared to these targets. Please note the number of targets removed from consideration in the report.
Response: *The text was amended to state that several hydrographs were omitted in Angelina and Nacogdoches counties where head measurements differed by more than 50 feet in the same year. This criterion was applied before we averaged head values to obtain yearly head values. We only used this check in Angelina and Nacogdoches counties in order to help select representative hydrographs. We did not provide updated statistics because of the few wells associated with this removal.*
57. Section 5.3.3 Statistics and Scatter Plots for Hydraulic Head Residuals for Transient Conditions, page Vol. 1 – 192, paragraph 1: For the weighting scheme where the sets of hydraulic heads at every well are weighted equally, please explain in the please clarify if they were averaged for each well.
Response: *Text was clarified.*
58. Section 5.3.3 Statistics and Scatter Plots for Hydraulic Head Residuals for Transient Conditions, page Vol. 1 – 192, paragraph 1, last sentence: Sentence references Tables 5.3.3d and 5.3.3d. Please review and adjust so sentence does not reference the same table twice.
Response: *Done.*
59. Section 5.3.3 Statistics and Scatter Plots for Hydraulic Head Residuals for Transient Conditions, page Vol. 1 – 192, paragraph 2: The total observed hydraulic heads and wells in the text do not agree with the corresponding totals in the tables. Please update text or tables so they agree.
Response: *Done.*
60. Section 5.3.3 Statistics and Scatter Plots for Hydraulic Head Residuals for Transient Conditions, page Vol. 1 – 192, paragraph 3, sentence 1: The text refers to Tables 3.5.3a and 3.5.3b. Please correct these table numbers to 5.3.3a and 5.3.3b.
Response: *Done.*
61. Section 5.3.3 Statistics and Scatter Plots for Hydraulic Head Residuals for Transient Conditions, page Vol. 1 – 192, paragraph 3: please discuss Calvert Bluff exceeding 10 percent root mean square error of the range in measured hydraulic heads in tables 5.3.3c and 5.3.3d.
Response: *Done.*
62. Section 5.3.3 Statistics and Scatter Plots for Hydraulic Head Residuals for Transient Conditions: Please provide scatter plots for all targets and all targets by hydrogeologic unit where every measurement is weighted equally (11,378 or 11,365 targets). The plots showing one point for each well (646 or 647 targets) do not fully capture the transient behavior of the model. Also, please provide histograms of residuals for all targets by hydrogeologic unit.
Response: *Done.*

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63. Section 5.3.4 Contours of Simulated Hydraulic Head, Figures 5.3.4a to 5.3.4e, pages Vol.1-200 to Vol.1-202: Section 5.3.3 suggests there were targets in Brazos and Colorado; however, these figures do not show targets in the Colorado Alluvium.
Response: *There are no wells completed in the Colorado River alluvium with more than two water-level measurements. Therefore, there are no transient targets in the Colorado River alluvium. A footnote has been added to the tables in Section 5.3.3 to indicate that all alluvium targets are in the Brazos River alluvium and figure captions in other section have been modified to indicate only Brazos River alluvium targets/residuals in model layer 1.*
64. Section 5.3.4 Contours of Simulated Hydraulic Head, Figures 5.3.4a to 5.3.4ss, pages Vol.1-200 to Vol.1-227: Please spell out amsl in legend or caption.
Response: *Done.*
65. Section 5.3.4 Contours of Simulated Hydraulic Head, page Vol.1-200, paragraph 2: Text discusses gaining Colorado River based on the model; however, it appears there were no targets to support this hypothesis. Please provide a source or figures that supports this hypothesis or discuss model limitations and/or assumptions.
Response. *We agree that there are no targets. The evidence is the shape of the contour lines of hydraulic heads that indicate flow is toward the river. Additional text as added to help convey this message.*
66. Section 5.3.4 Contours of Simulated Hydraulic Head, page Vol.1-203: Text discusses larger residuals in the northern portion of the Sparta Aquifer study area due to grid size, high relief, and uncharacterized pumping. However, the highest residuals appear in the “pre-development” steady-state where pumping should not be a factor. Please consider removing pumping as a possible cause of high residuals
Response: *Pumping was removed as a possible cause.*
67. Section 5.3.4 Contours of Simulated Hydraulic Head, page Vol.1 – 221, second to last sentence: Please change “The presents of these local systems ...” to “The presence of the local systems...”.
Response: *Done.*
68. Section 5.3.5 Simulated Drawdowns, page Vol. 1 – 228, paragraph 2, last sentence: Please change “central reign” to “central region”.
Response: *Done.*
69. Section 5.4 Model Simulated Surface Water-Groundwater Interaction, page Vol.1-245 and Figure 5.4a on page Vol.1-248: Text in paragraph 1 states drainage area for five drainage areas cover 90 percent of outcrop and figure caption states 95 percent. Please evaluate area covered and update so text and caption agree.
Response: *Done.*
70. Section 5.4.1 Surface Water-Groundwater Interaction for the Steady-State Conditions, page Vol. 1-246, Table 5.4.1a: Please adjust last header from “Modeled by this Stud” to “Modeled by this Study”
Response: *Done.*
71. Section 5.4.1 Surface Water-Groundwater Interaction for the Steady-State Conditions, page Vol. 1-246: Please edit the last bullet for grammar,” Base flow value calculated from by the...”
Response: *Done.*

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72. Section 5.4.2 Surface Water-Groundwater Interaction, page Vol. 1 – 249, Figures 5.4.2a and 5.4.2b: Please clarify in the figure captions and/or axis label that model calculated” recharge” is model calculated discharge to rivers/streams. If the figure becomes separated from the text the model recharge could be misinterpreted to mean recharge from the recharge package.
Response: Clarification added to figure caption.
73. Section 5.5.2 Transient Water Budgets, page Vol. 1 – 255 Figure 5.5.2a: Please explain in layer 3 why the general head boundary takes out more flow during the transient period than the steady state period.
Response: Done.
74. Section 5.5.2 Transient Water Budgets, page Vol. 1 – 257, Figure 5.5.2c: Transient water budget chart for layer 10 is missing from the figure. Please include a chart for layer 10 in the final report.
Response: Done.
75. Section 5.5.2 Transient Water Budgets, page Vol. 1 – 264, Figure 5.5.2j (Hooper): Please explain why the total inflow is greater than the total outflow under steady state.
Response: In our meeting with the TWDB on August 27, 2018, they indicated errors in this comment. The figure number should be 5.5.2i instead of 5.5.2j and the reference should be to transient instead of steady-state. Taking these corrections into account, the inflows and outflow for the Hooper Formation for the transient calibration period were summed and compared. The results show that total outflow is within a few percent of total inflow. Therefore, no explanation is necessary.
76. Section 6.1 Sensitivity Analysis Procedure, pages Vol. 1-268 to Vol.1-269: Please update last paragraph on Vol. 1-268 from 19 to 20 model parameters for transient sensitivity and please update Table 6.1b to include pumping.
Response: Done.
77. Figure 6.2.2d: Changes in the vertical hydraulic conductivity of the Queen City Aquifer would intuitively have a greater impact on Queen City Aquifer drawdowns, but the top chart in Figure 6.2.2d shows that the Sparta Aquifer is most sensitive to these changes. Please explain this in the text.
Response: Done.
78. Section 6.2.2 Transient Sensitivities, pages Vol. 1-305 to Vol.1-327: the revised Section 6.2.2 received June 28, 2018 shows significant changes to the sensitivity plots (Figures 6.2.2a to 6.2.2s); however, there are no observable changes to the hydrograph plots (Figures 6.2.2t to 6.2.2w). Please verify and confirm in writing that all figures were derived from the same model.
Response: These figures have been replaced to ensure all figures were derived from the same model.
79. Section 7.1 Limitations of Supporting Data, page Vol. 1-329: Please clarify, per previous comments, that either no pumping or no targets were placed or used in the Colorado River Alluvium and should be a model limitation. Per previous sections of the report it appears wells from the Brazos River Alluvium were used in the model; however, this is missing in Chapter 3. Figure 3.2.4a suggests wells in the Colorado; however, targets were not observed in figures regarding calibration of layer 1.

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Response: Discussion of pumping in the Brazos River Alluvium Aquifer has been added to Section 3.2 and pumping in both the Colorado and Brazos rivers alluvium has been added as Section 3.2.2.8. A brief paragraph on the lack of calibration targets in the Colorado River alluvium has been added to Section 7.1.

80. Section 7.1 Limitations of Supporting Data, page Vol. 1-330, paragraph 2: The text states that there was no access to a database of sand and clay picks during model development, but the BRACS database is free to download and has this information. BRACS wells are also included in the data deliverables. Please explain why the BRACS database was not used during model development, as this text suggests.

Response: We have clarified the statement. We downloaded the BRACS database and reviewed it. We also reviewed several digitized sand thickness maps.

81. Section 7.1 Limitations of Supporting Data, page Vol. 1-330, paragraph 4: It would good to discuss the recommendation from the study done as part of this contract for the Colorado-Lavaca Basin and Bay Area Stakeholder Committee concerning surface water-groundwater gaging sites.

Response: Requested text added to report.

82. Section 7.3 Limitations of Model Applicability, pages Vol.1-332 to Vol. 1-333: Please add that there appears to be a small bias in the upper extent of the Simsboro Aquifer of the model underpredicting drawdown (wells 5911703, 5904701, 5903304, 3959905, 3952504, 592129, 5854506, and 3441406).

Response: We agree with the observation and have modified the report.

83. Section 8 Summary and Conclusions, pages Vol.1-335 to Vol.1-340: Please update this section with clarifications from previous sections. For example, the number of geophysical logs, updates to sensitivity for transient model (statistics and number of parameters), number of observations, and number of wells have been cited with different values in the text and tables throughout the report.

Response: Done.

84. Section 8.4 Model Sensitivity Analysis, page Vol. 1 – 340: Please replace “sensitivity” with “sensitive” in multiple locations where appropriate. For example, “all metrics are most sensitive to changes in recharge”.

Response: Done.

85. Section 8.4 , Model Sensitivity Analysis Table 8.4b: Table caption should be “Top five parameters to which transient mode is most sensitive”. Please update table caption and table with revised results.

Response: Done.

86. Section 9.1: Young and others (2017), which was included as a previous deliverable with this contract, suggests a field study to investigate surface water-groundwater interaction. Please include this recommendation in this section.

Response: Done.

87. Section 11 References, pages Vol.1-345 to Vol.1-354: Please review for formatting and consistent font and please update as needed.

Response: Done.

88. Appendix R: Transient Water Budgets by County and Layer: Water budgets charts are missing for Limestone County layers 9 and 10. Please verify and add these charts as applicable.

Response: Done.

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89. Appendix U: Transient Budgets by Groundwater Conservation District and Hydrogeologic Unit: Colorado County GCD seems to be missing charts for some hydrogeologic units (Weches, Queen City, Reklaw, and Carrizo). Please verify and add these charts as applicable.

Response: Done.

90. Appendix U: Transient Budgets by Groundwater Conservation District and Hydrogeologic Unit: Evergreen, Gonzales and Fayette County GCDs charts as mixed together and not in order. Lost Pines, Lone Star and Lavaca charts are mixed together as well. Post Oak Savannah GCD and Rusk County GCD are also mixed together. Please verify and reorder these charts as applicable.

Response: Done.

91. Appendix V: Fault Report Comment Responses: Most of these responses suggest that the comments were addressed in a revised Fault Report. For example, “Comment 50, Figures 7-18 through 7-27: please provide explanation for why some lines are solid, dashed, or dots. Response *New Table 5-5 added to explain the lines in the figures.*” The draft final report does not have a Table 5-5. A revised Fault Report was not delivered so it is difficult to tell whether or how these comments were addressed. Please either deliver a final fault report or revisit this set of comments and responses and more accurately describe how or whether these comments were addressed. If the report or text did not end up in the draft model report please just state that it was not included in the final report. If the text or figure was used in the final model report please describe how and where the comment was addressed in the final report.

Response: Done.

Review comments (FYI)

92. Section 3.2.2 Development of Pumping by Type, page Vol. 1-66: Linear interpolation of pumping is a rudimentary approach to missing data. A previously distributed GAM technical memorandum suggested using data patterns from existing pumping for the same stress period to fill in missing pumping. This approach, if feasible, allows for variations of pumping due to changes in climate or other related factors.

No response necessary.

93. Section 3.2.2.4 Mining Pumping, page Vol. 1-67: states industrial use was reclassified as mining per water intake data. Please note that TWDB uses SIC (later replaced by NAICS) to determine if an entity is considered mining manufacturing.

No response necessary.

Public Review comments

94. Section 5.4: Model Simulated Surface Water-Groundwater Interaction: There are measured values of base flow available for the Colorado River in Bastrop County. They range from approximately 20,000 to 36,000 acre-feet/year (e.g., Saunders, G.P., 2009, *Low-Flow Gain-Loss Study of the Colorado River in Bastrop County, Texas*). Please clarify if these values were used to calibrate surface water-groundwater interaction. If not, please explain in the text of the report the reasoning for excluding this information.

Response: Done.

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Geodatabase:

General suggestions

95. Please organize the geodatabase based on the TWDB empty geodatabase schema as specified in Exhibit B, Attachment 2, Section 1.2 of the contract.
Response: Done.
96. Please ensure that quantitative attributes in all feature classes have units noted in either the attribute table or in the metadata.
Response: Done.

Specific suggestions

97. Please include metadata for all the feature classes in the Pumping feature dataset.
Response: Done.
98. Please remove the ‘empty’ feature class from the HeadDrawdownFig feature dataset.
Response: The head and drawdown figures in the report were created using a script which required this ‘empty’ feature class in order to make the legend on the figures. If this feature class is removed, the legend on the figures will not show up correctly. Therefore, this feature class was not removed. However, metadata was added for this feature class.
99. Please include metadata for all the feature classes in the HeadDrawdownFig feature dataset.
Response: The feature classes in the HeadDrawdownFig feature dataset have been moved to the SubsurfaceHydro feature dataset and metadata has been done.
100. Please include metadata for all the feature classes in the LayerAquiferExtent feature dataset.
Response: The feature classes in the LayerAquiferExtent feature dataset have been moved to the Boundary feature dataset and metadata has been done.
101. Please include metadata for all the feature classes in the ModelTopFig feature dataset.
Response: The feature classes in the ModelTopFig feature dataset have been moved to the Geology feature dataset and metadata has been done.
102. Please include metadata for the ‘Aquifer_Tests_v4_02252017Anno’ feature class.
Response: Done.
103. Please include metadata for the ‘Extent_Alluvium_1’ table.
Response: This table was erroneously included in the geodatabase and has been deleted.
104. Please include metadata for the ‘Extent_Carrizo_4’ table.
Response: This table was erroneously included in the geodatabase and has been deleted.
105. Please include metadata for the ‘HeadContours_Alluvium1_1950’ table.
Response: This table was erroneously included in the geodatabase and has been deleted.
106. Please include metadata for the ‘HeadContours_Layer1_1950’ table.
Response: This table was erroneously included in the geodatabase and has been deleted.

Groundwater Availability Model for the Central Portion of the
Carrizo-Wilcox, Queen City, and Sparta Aquifers

*Review of “Draft Report: Groundwater Availability Model for the Central Portion of the
Carrizo-Wilcox, Queen City, and Sparta Aquifers”
TWDB Contract 1548301856*

107. Please include metadata for the ‘total_DD_QueenCity5’ table.

Response: This table was erroneously included in the geodatabase and has been deleted.

108. Please explain the difference between the layer designations in
“Master_Well_Tests_Tratio and Aquifer_Test_Pumping_Well_Info.

Response: The layer designations in Aquifer_Test_Pumping_Well_Info have been corrected to match those in Master_Well_Tests_Tratio.

Draft Final Model comments:

Specific comments to be addressed

109. Please submit the guide/readme file(s) and program(s) that were used to run parallel computing on the computer in the Texas Advanced Computer Center in Austin, Texas.

Response: The guides we used are provided by the manuals for Parallel Pest. We used the same programs on the TACC as on our own system.

110. It is recommended to fix either the EVT or DRN packages where two boundary conditions are overlapping.

Response: These two boundary conditions represent different processes. No change made.