

Juab Valley Hydrogeologic Study

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HYDROGEOLOGY, GROUNDWATER CHEMISTRY, AND WATER BUDGET OF JUAB VALLEY, EASTERN JUAB COUNTY, UTAH

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SPECIAL STUDY 170
UTAH GEOLOGICAL SURVEY
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UTAH GEOLOGICAL SURVEY

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Juab Valley Hydrogeologic Study

OBJECTIVES

Update and expand on the USGS 1996
(using data from 1993) report DNR Technical
Publication 114

Hydrogeologic Setting

- Basin-fill thickness and lithology
- Variations in predominant grain size

Groundwater Levels

- New potentiometric-surface contours
- Changes from 1993 to 2015

Groundwater Chemistry

- Valley-wide characterization
- Radiometric dates and flow paths
- Sources of recharge

Water Budget

- Inflows and outflows of surface water and groundwater
- Change in groundwater storage



Juab Valley Hydrogeologic Study

Basin-Fill Stratigraphy and Structure

- Lithologic cross sections
- Grain size distribution with depth
- Transmissivity from well tests
- Gravity Isopach map

Water Chemistry

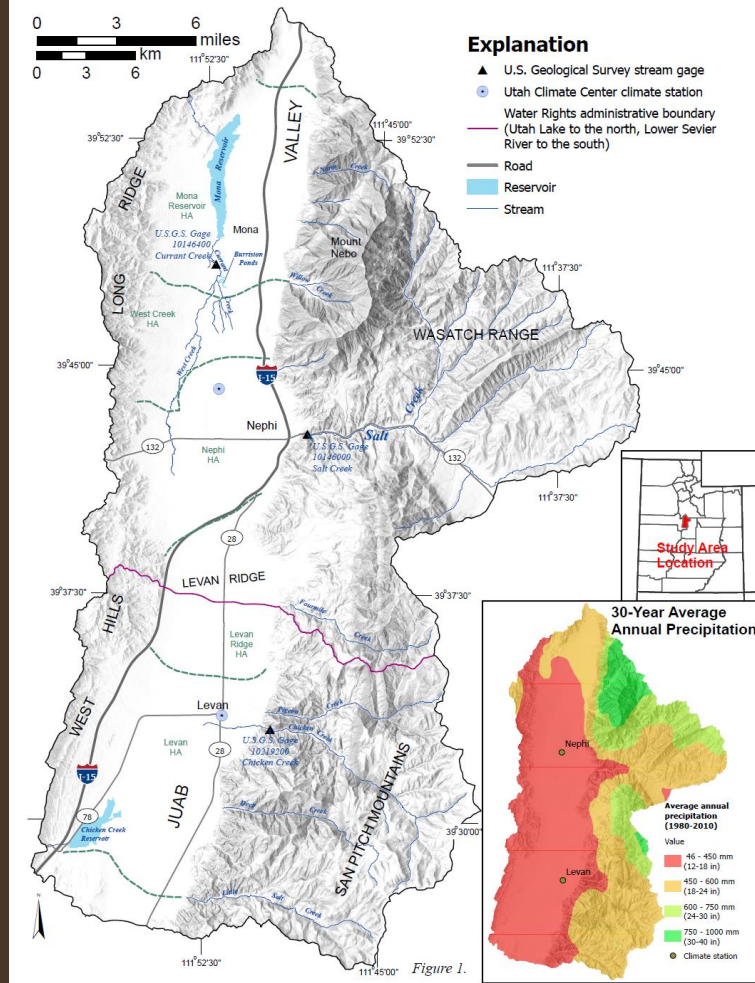
- General Chemistry
- Stable Isotopes
- Age Dates

Groundwater-Levels

- Long term trends
- Water level changes

Water Budget

- Pumping and Precipitation
- Mona Res. Budget
- Streamflow Changes
- ET Changes
- Storage Changes

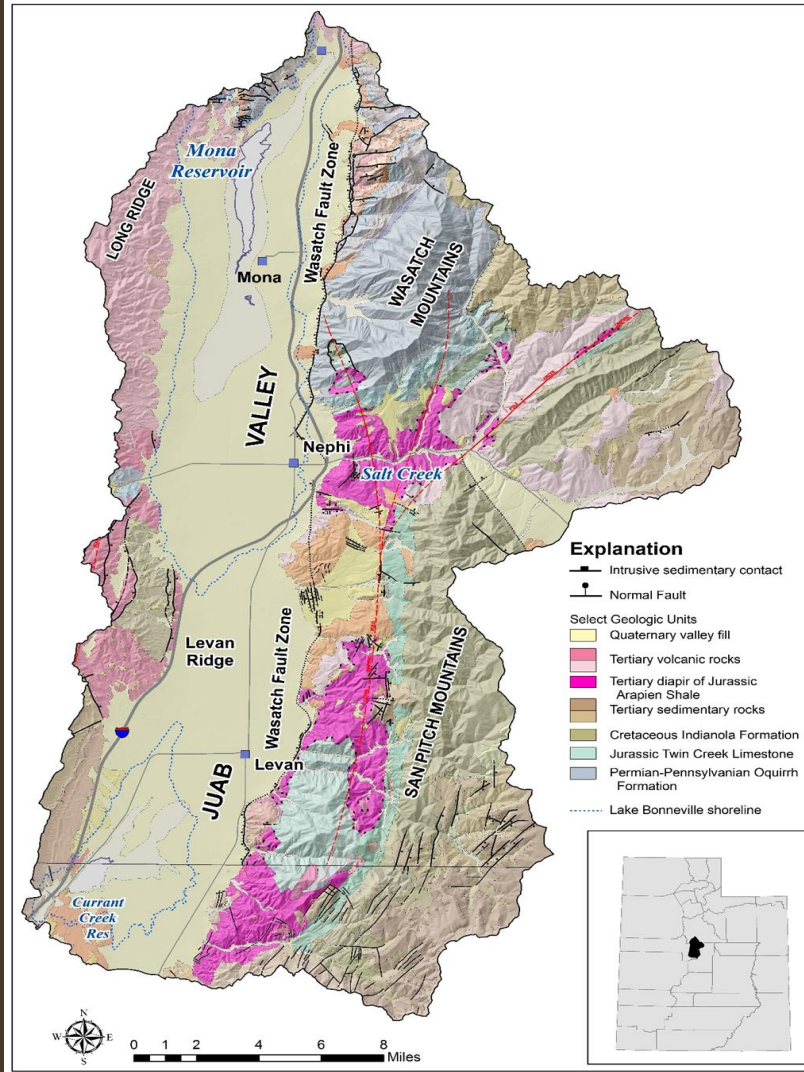


Hydrogeologic Map



Arapien Shale affects surface water & groundwater quality

Carbonates underlying Mt Nebo are permeable and receive the greatest amount of precipitation



Hydrochemical Facies

Diamond Plot

- Calcium sulfate
- Mixed HCO_3 , Mg, Ca, SO_4
- Magnesium bicarbonate
- Sodium chloride
- Mixed HCO_3 , CO_3 , Na, K
- Sodium bicarbonate

Cation Plot

- Bicarbonate
- Sulphate
- Chloride
- Mixed

Anion Plot

- Calcium
- Magnesium
- Sodium & potassium
- Mixed

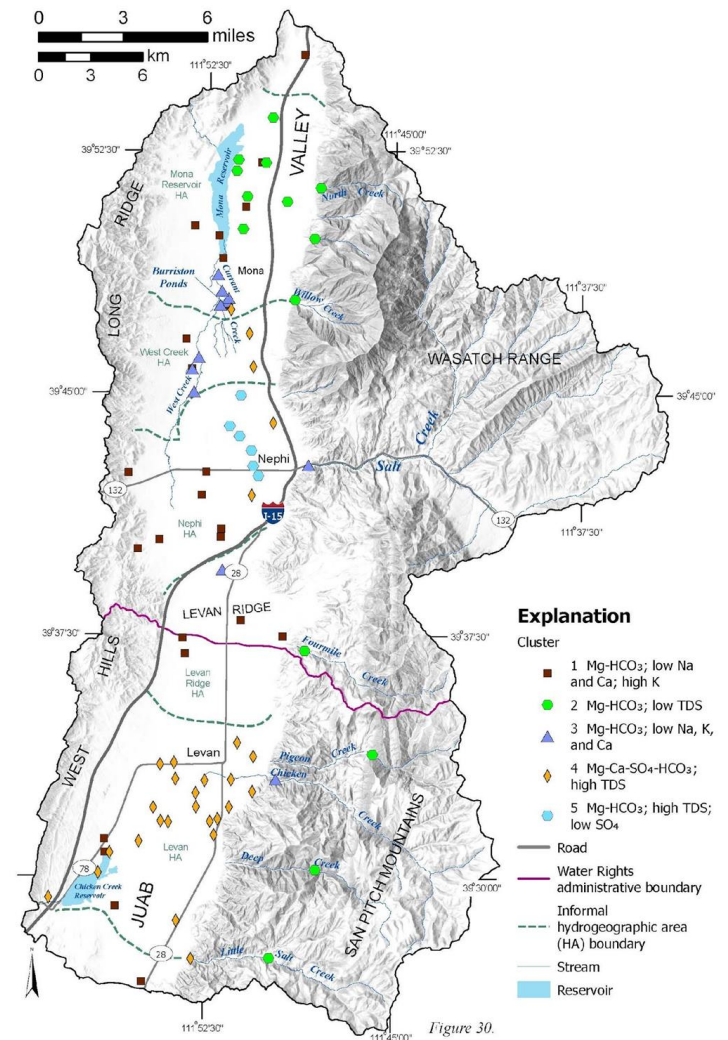
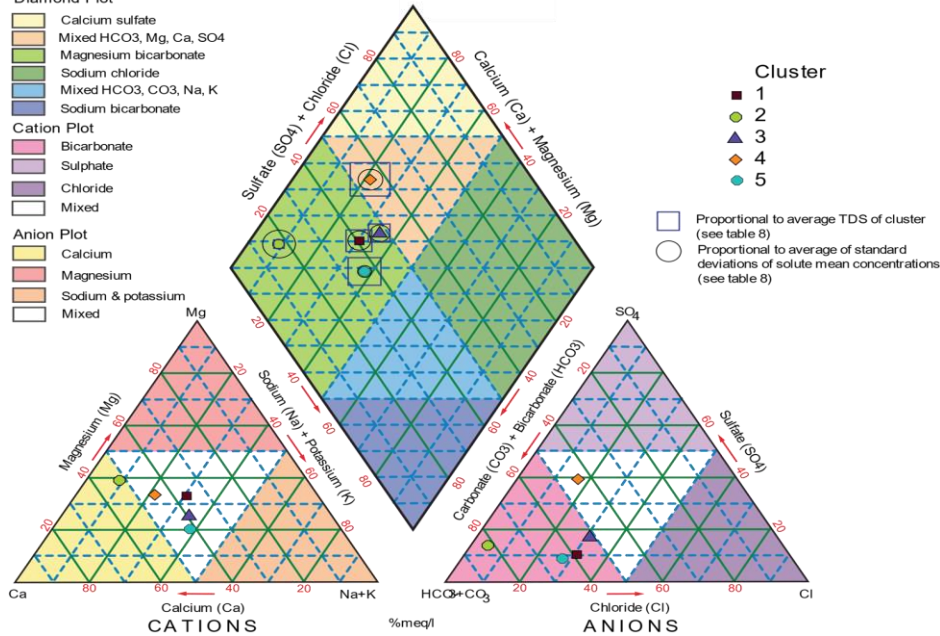


Figure 30.

Basin Fill Thickness

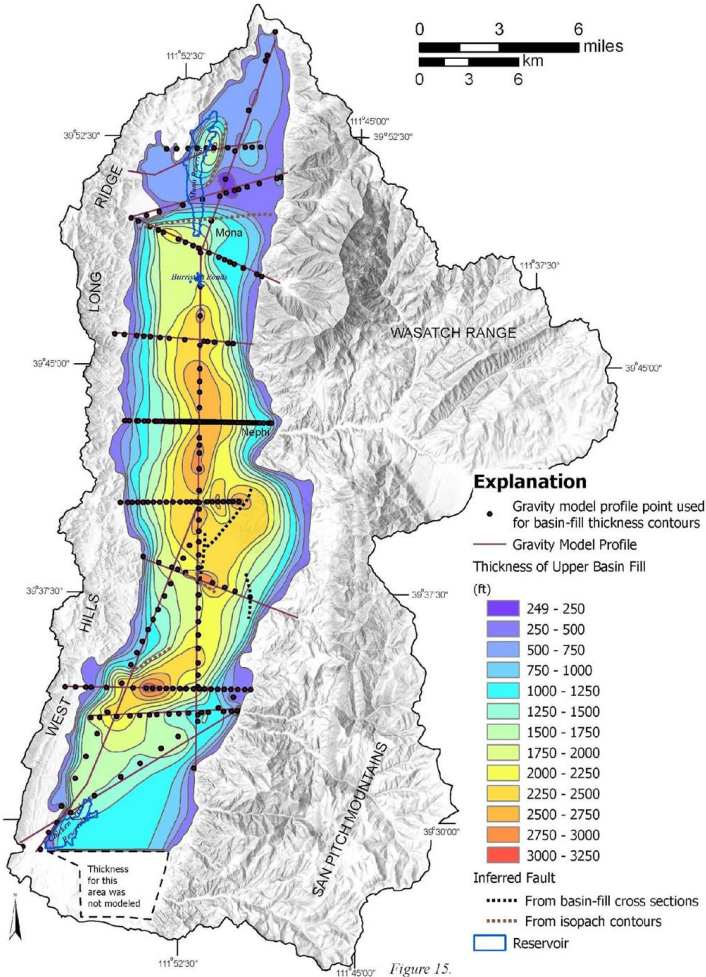
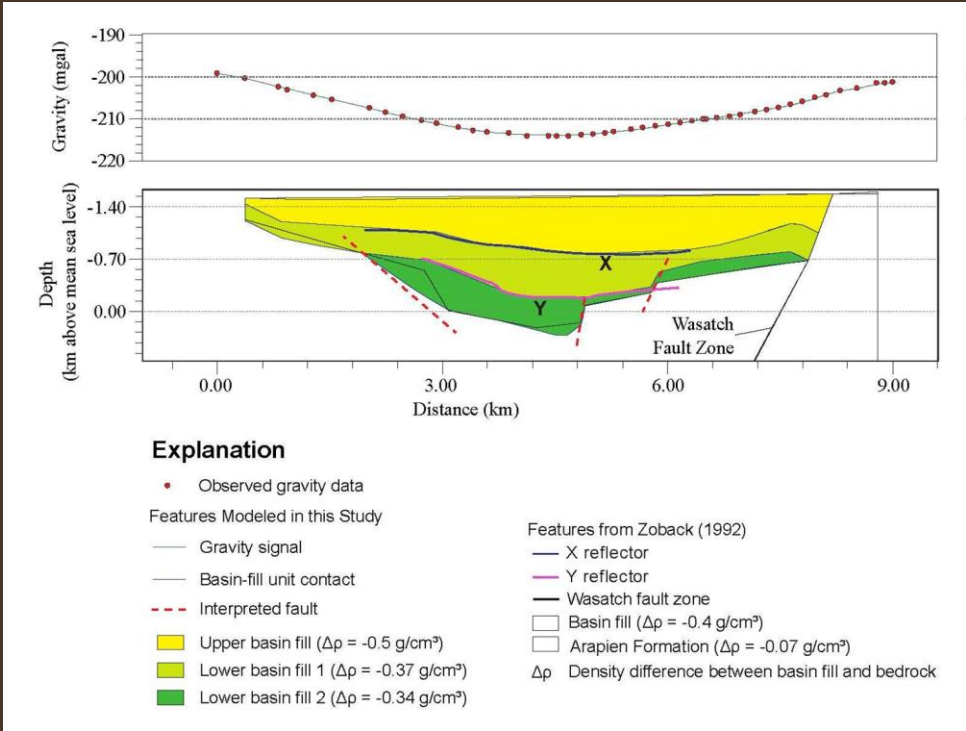
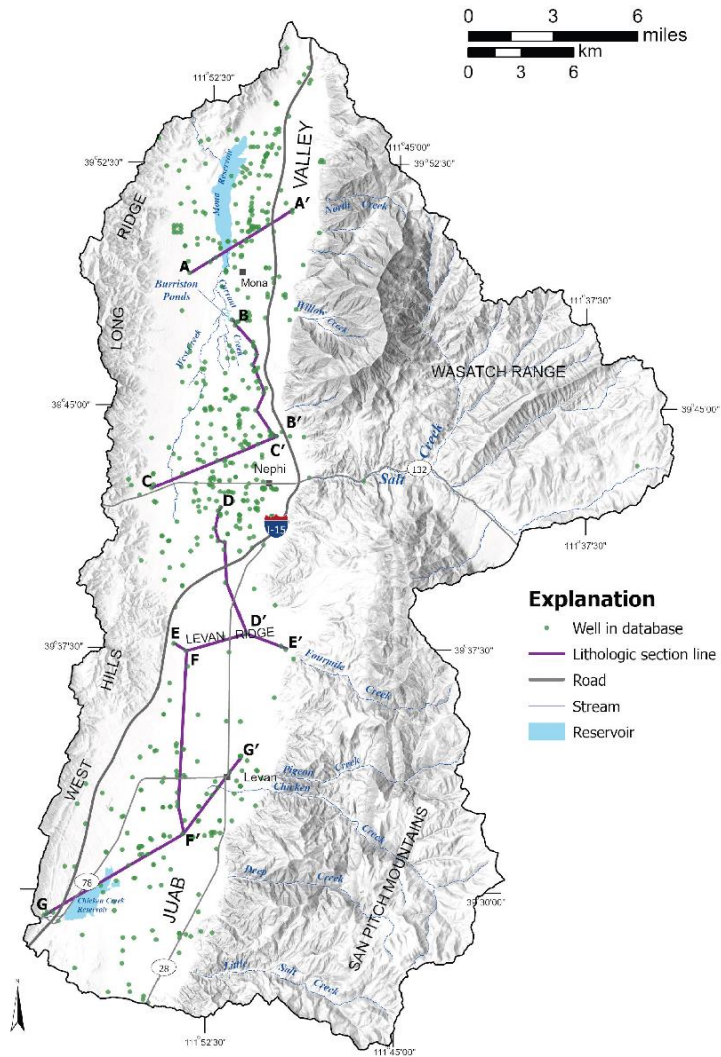


Figure 15.



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Grain Size vs Depth

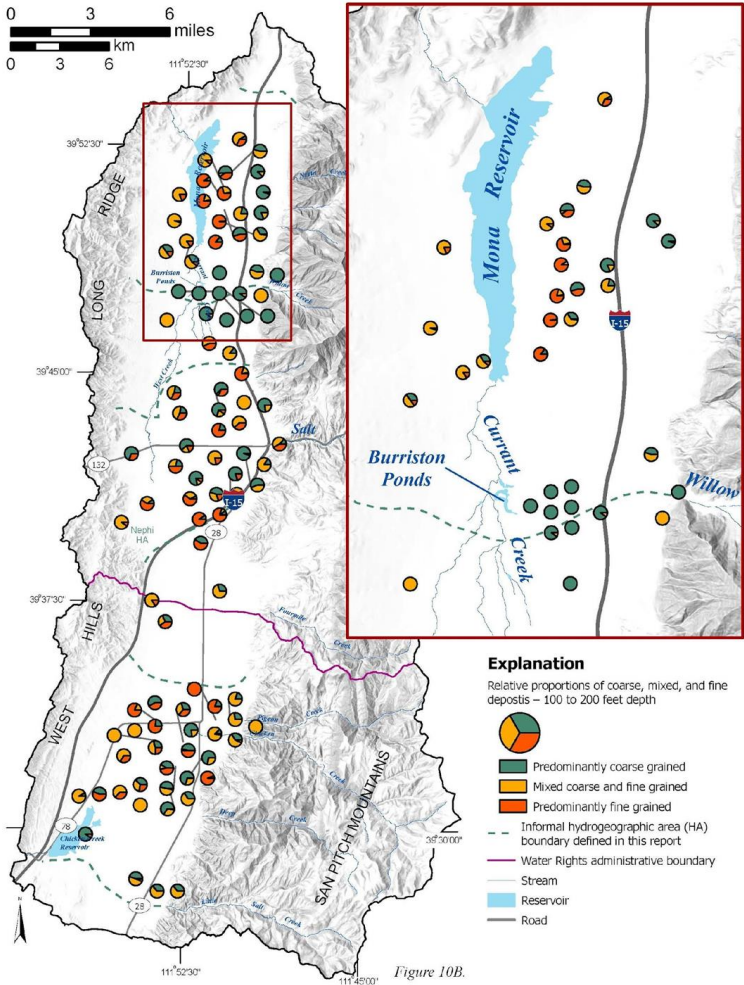


Figure 10B.

2015 Groundwater Levels

Explanation

Wells

UGS Monitoring Wells

italic label is 2015
water-level elevation

- F2-05
- F2-08
- F3-01
- F3-05
- F3-06
- G2-05
- G2-22
- G2-24
- G2-25

Other 2015 Water Levels

label is 2015
water-level elevation

- UGS
- USGS

Water-Level Contours

label is water-level elevation
contour value

Both Interpretations

- 10-ft interval
- 25-ft interval
- 50-ft interval

Alternative Interpretations

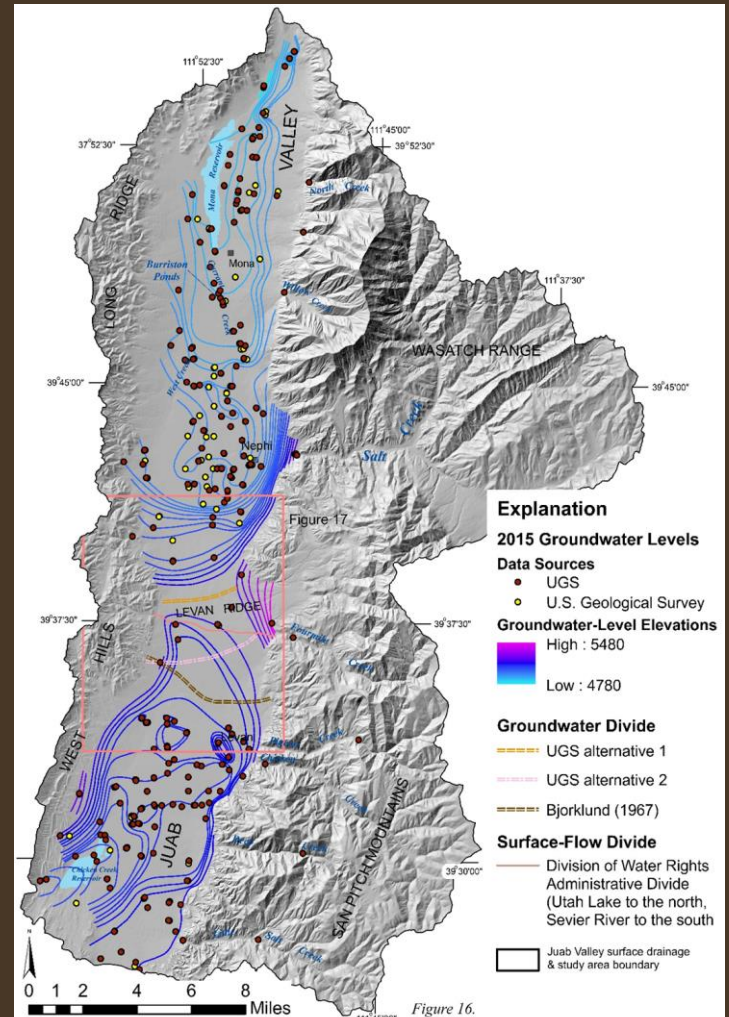
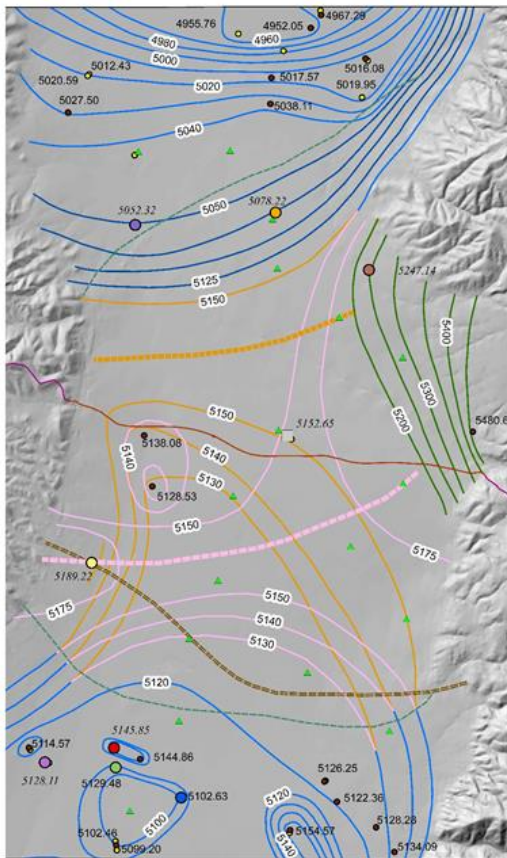
- Alternative 1
- Alternative 2

Groundwater-Divide Interpretations

- Alternative 1
- Alternative 2
- Bjorklund (1967)

TEM Station

- ▲ TEM Station
- Administrative Boundary



Explanation

2015 Groundwater Levels

Data Sources

- UGS
- U.S. Geological Survey

Groundwater-Level Elevations

- High : 5480
- Low : 4780

Groundwater Divide

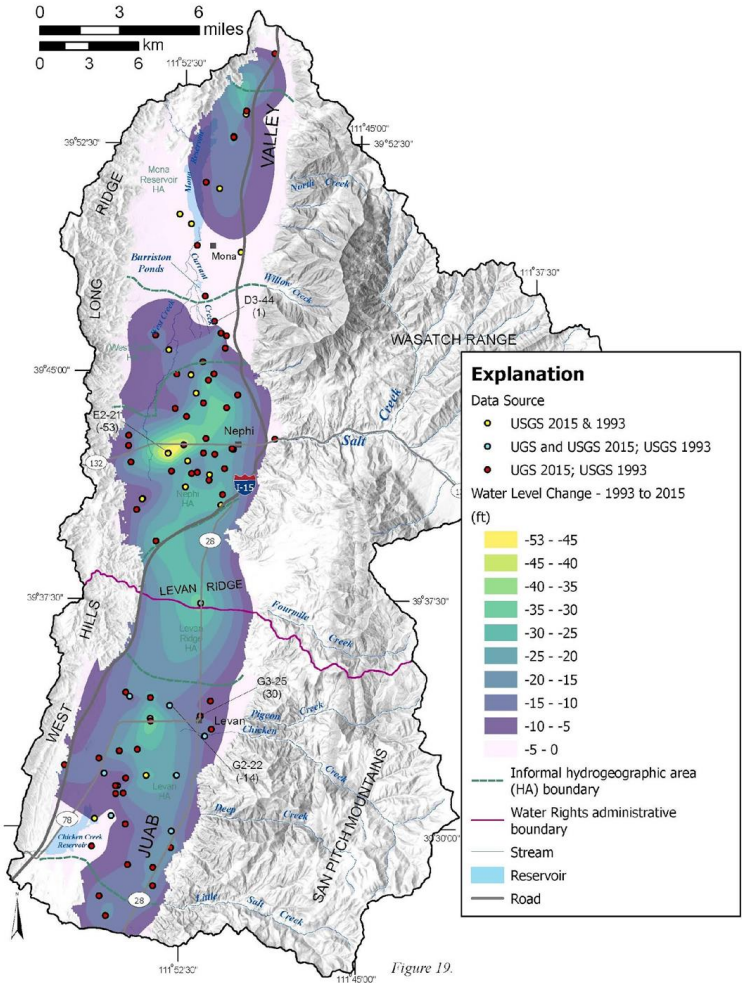
- UGS alternative 1
- UGS alternative 2
- Bjorklund (1967)

Surface-Flow Divide

- Division of Water Rights Administrative Divide (Utah Lake to the north, Sevier River to the south)
- Juab Valley surface drainage & study area boundary

Figure 16.

Groundwater Level Change 1993 to 2015



Long-term Groundwater Levels

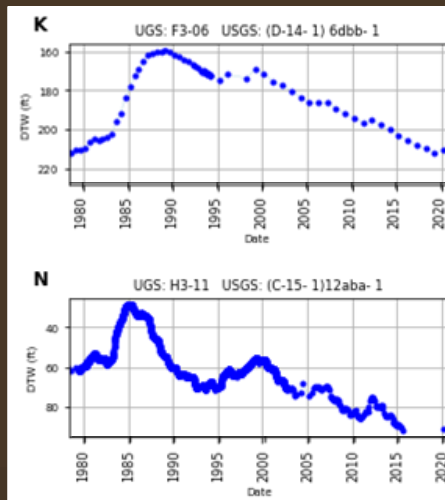
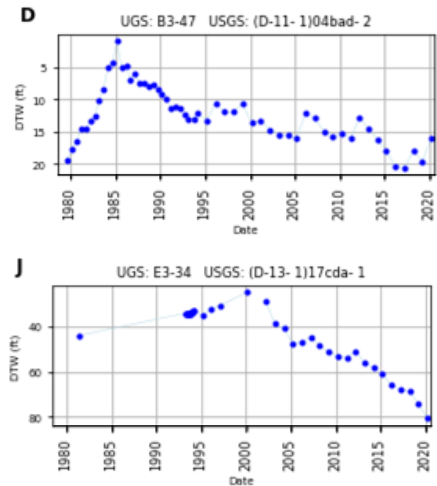
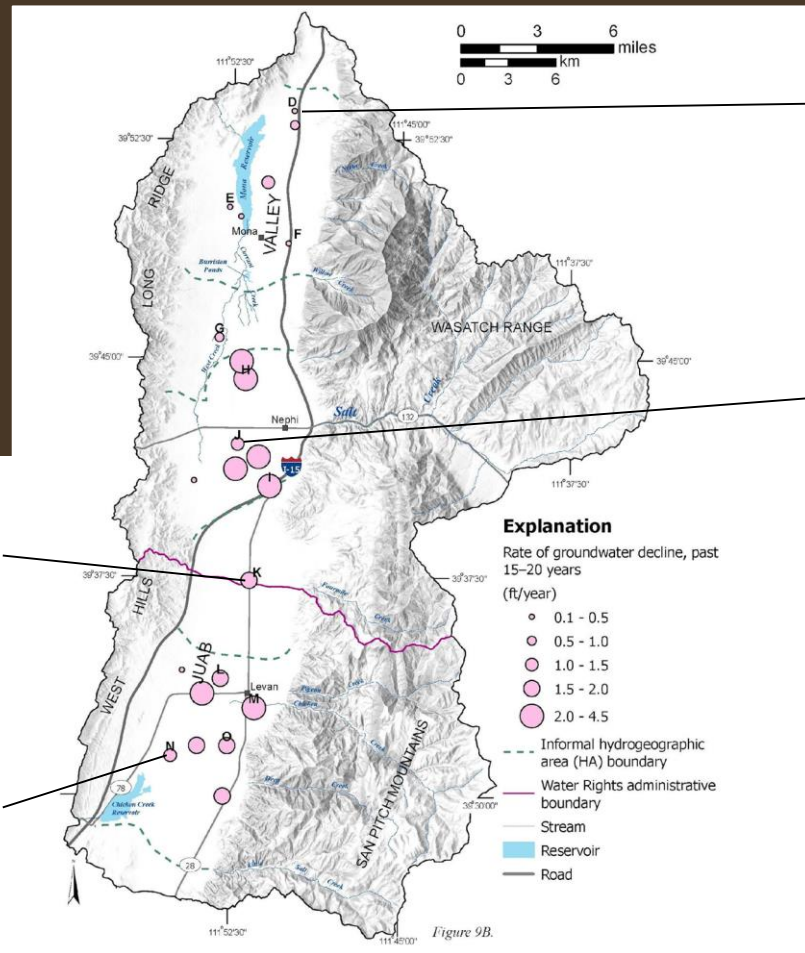


Figure 9B.

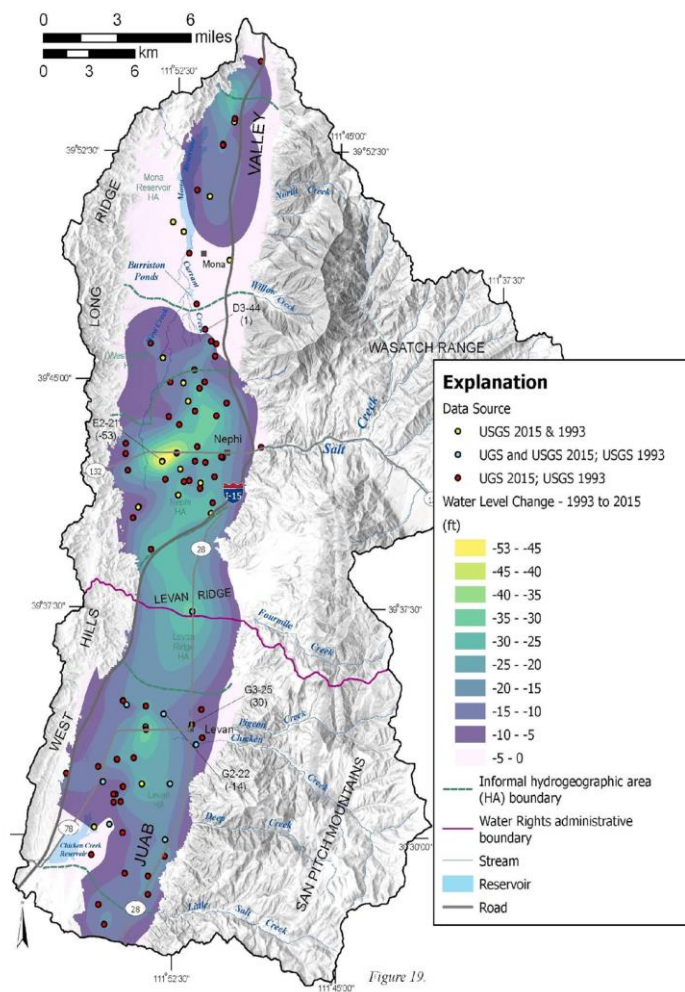


Figure 19.

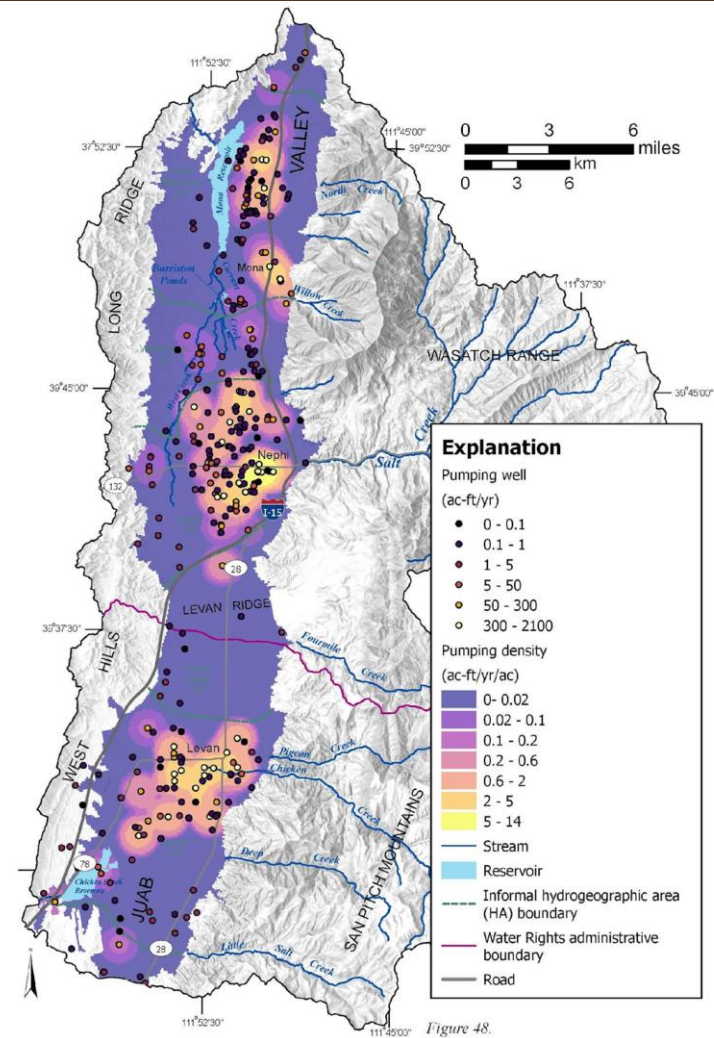
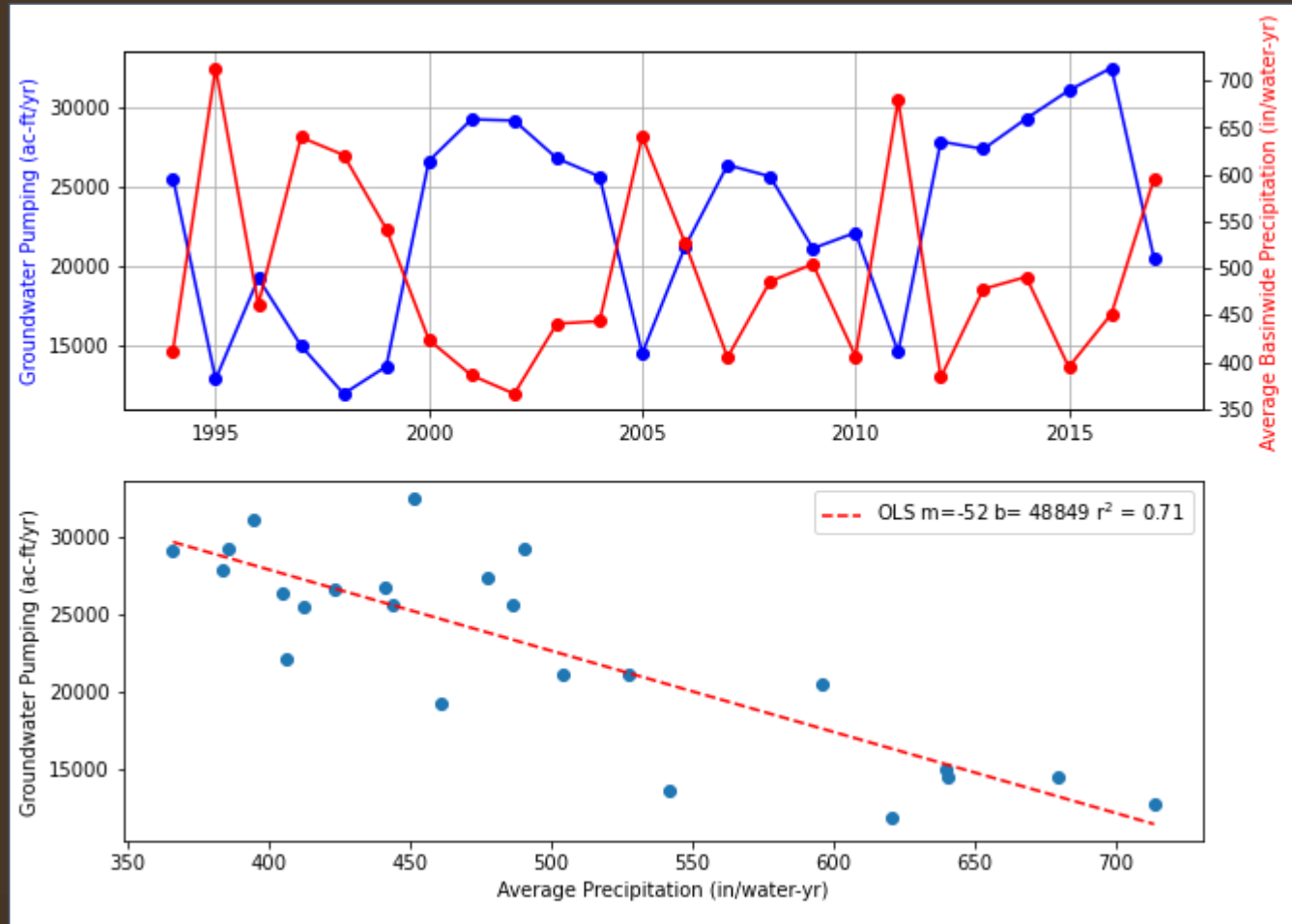
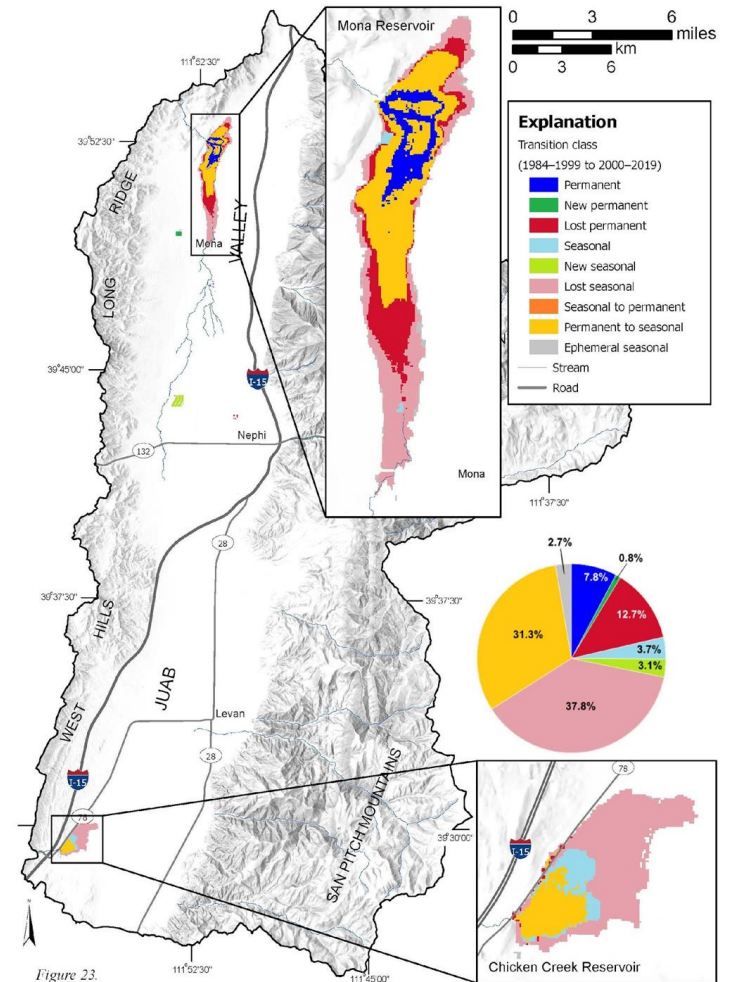
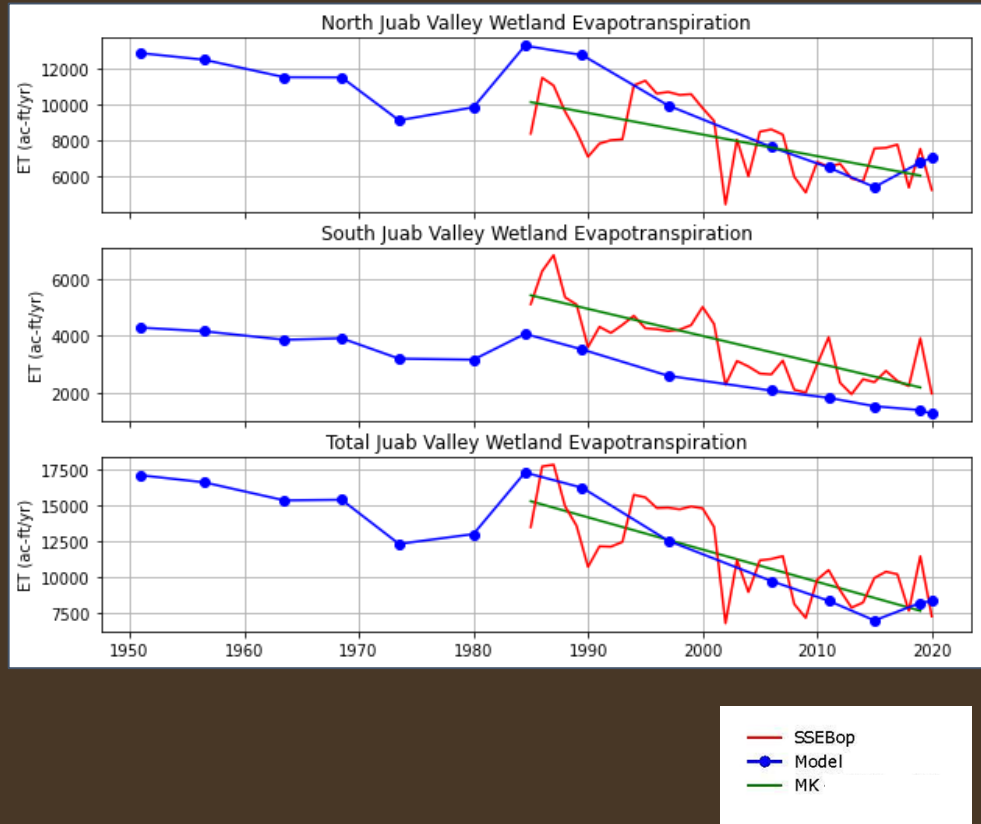


Figure 48.

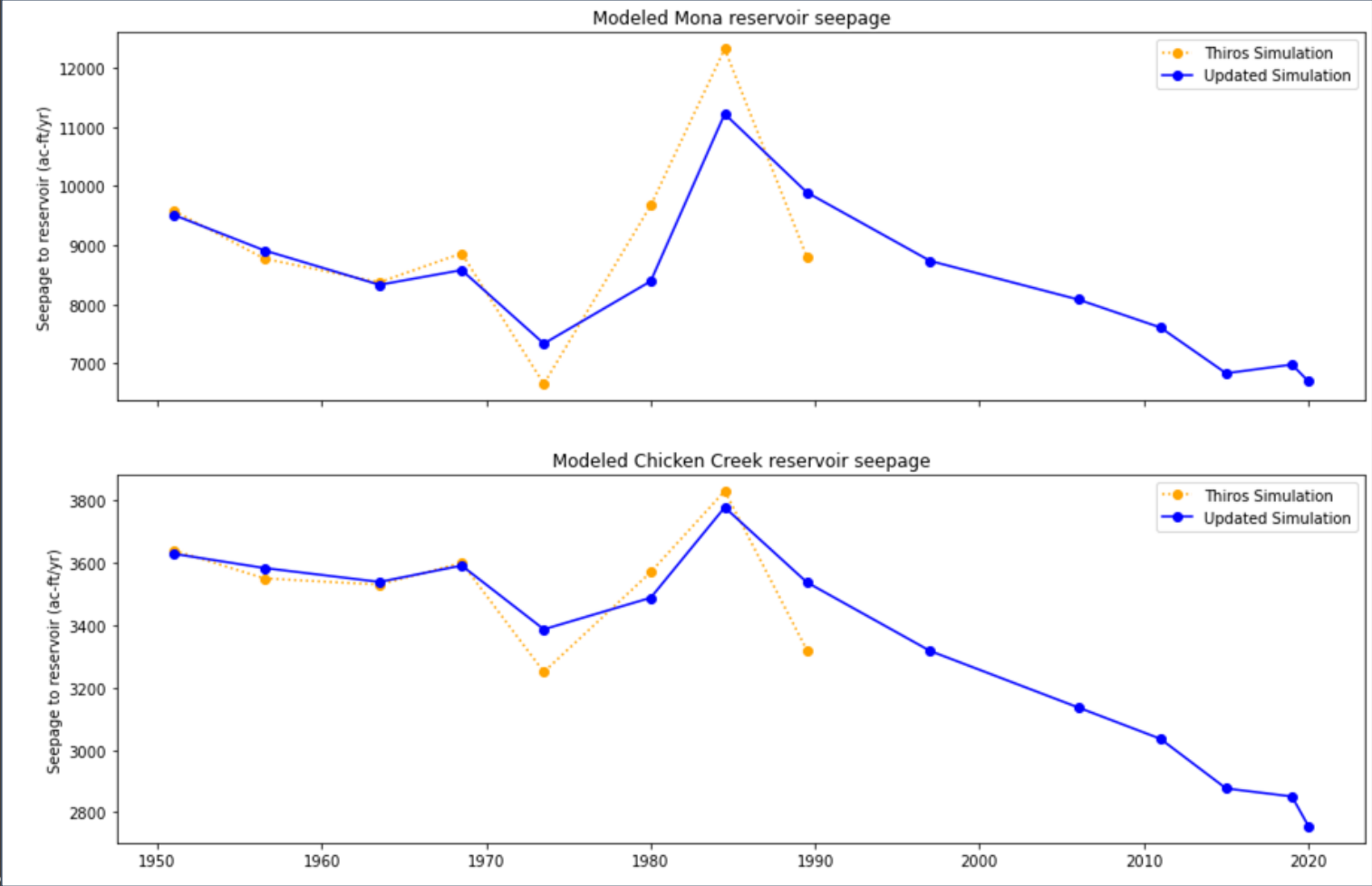
Pumping and Precipitation



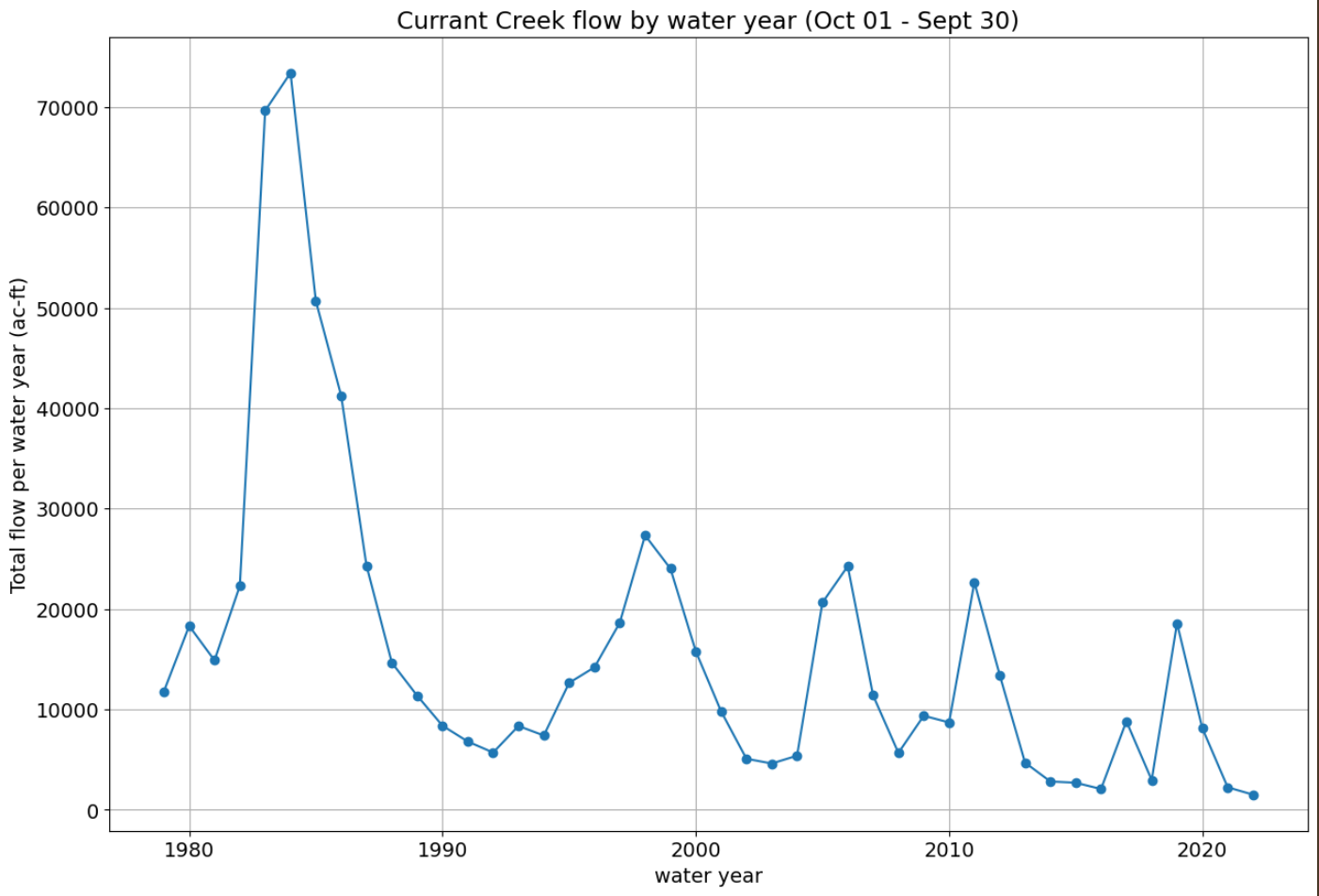
Evapotranspiration



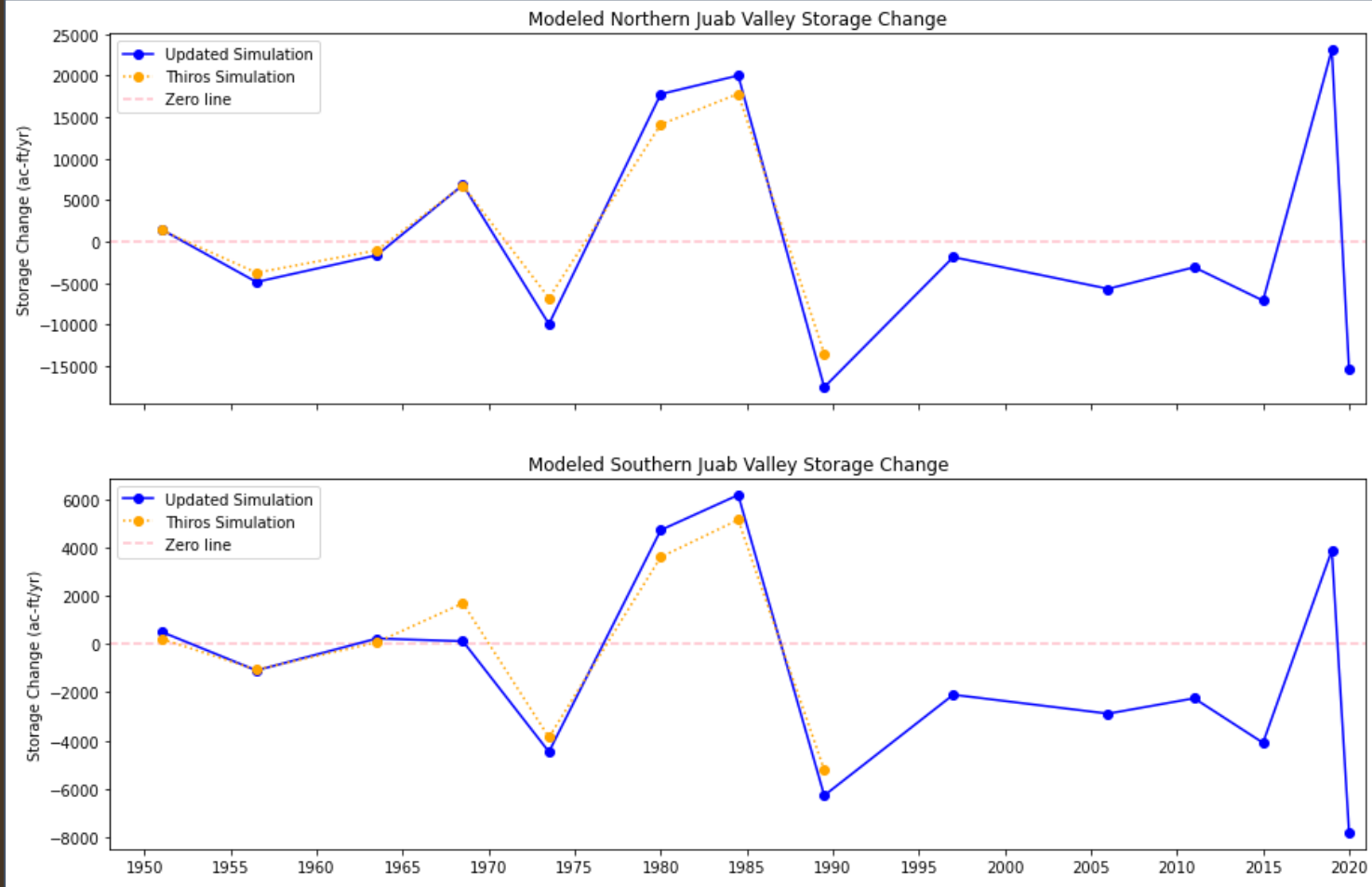
Reservoir seepage over time



Creek Flow Over Time



Storage change over time



Groundwater Budget

	USGS			UGS						
	1993 (Table 6)			2019			2020			Data Source
Recharge	North	South	Valley	North	South	Valley	North	South	Valley	
Nonirrigation-season streamflow loss	14,580	2920	17,500	5800	1340	7140	12,200	2800	15,000	StreamStats
Unconsumed irrigation water and distribution loss	10,000	5280	15,280	13,800	4600	18,400	4200	2100	6300	11-18% of GW ¹ and SW ¹ diversion (Table 9)
Irrigation-season streamflow loss	910	0	910	960	0	960	450	0	450	Relationship derived from Thiros and others (1996)
Precipitation Infiltration	4580	3240	7820	5040	2880	7920	1920	1040	2960	4% of Daymet Precip
Eastern subsurface inflow	20,910	3240	24,150	23,900	3700	27,600	4700	660	5360	Relationship derived from Thiros and others (1996)
Western ephemeral stream loss and subsurface inflow	7950	2840	10,790	8400	2410	10,810	3000	700	3700	StreamStats
Total recharge	58,930	17,520	76,450	57,900	14,930	72,830	26,470	7300	33,770	
Discharge	North	South	Valley	North	South	Valley	North	South	Valley	
Wells										
Total	12,080	8290	20,370	12,000	6000	18,000	24,000	13,000	37,000	Well model
Springs	0	380	380	0	800	800	0	800	800	Water rights
Currant Creek Seepage	13,870	0	13,870	13,100	0	13,100	6300	0	6300	Reservoir balance (table 6)
Seepage to Mona Reservoir	8880	0	8880	2200	0	2200	7200	0	7200	Reservoir balance (table 6)
Seepage to Chicken Creek Res Reservoir	0	3640	3640	0	2900	2900	0	2800	2800	Updated MODFLOW model
Evapotranspiration	5800	1660	7460	7600	3900	11,500	5300	2000	7300	Wetland SEEBop
Subsurface outflow (mostly to Goshen)	1890	0	1890	800	0	800	200	0	200	
Total Discharge	42,520	13,970	56,490	35,700	13,600	49,300	43,000	18,600	61,600	
Storage Change	16,410	3550	19,960	22,200	1330	23,530	-16,530	-11,300	-27,830	

Questions?

