

SRPHM Model Updates Technical Memorandum

TECHNICAL MEMORANDUM

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PROJECT: Technical Support to Santa Rosa Plain Subbasin GSA for GSP Implementation

SUBJECT: SRPHM Model Updates

INTRODUCTION

The original Santa Rosa Plain Hydrologic Model (SRPHM) was developed by the U.S. Geological Survey (USGS) in cooperation with Sonoma Water; the cities of Santa Rosa, Sebastopol, Rohnert Park, and Cotati; the town of Windsor; the County of Sonoma; and the California American Water Company. The model boundary coincides with the Santa Rosa Plain (SRP) watershed and includes the SRP and Rincon Valley groundwater subbasins, along with portions of the Kenwood Valley, Wilson Grove Formation Highlands, Healdsburg area, and Alexander area groundwater subbasins (Figure 1).

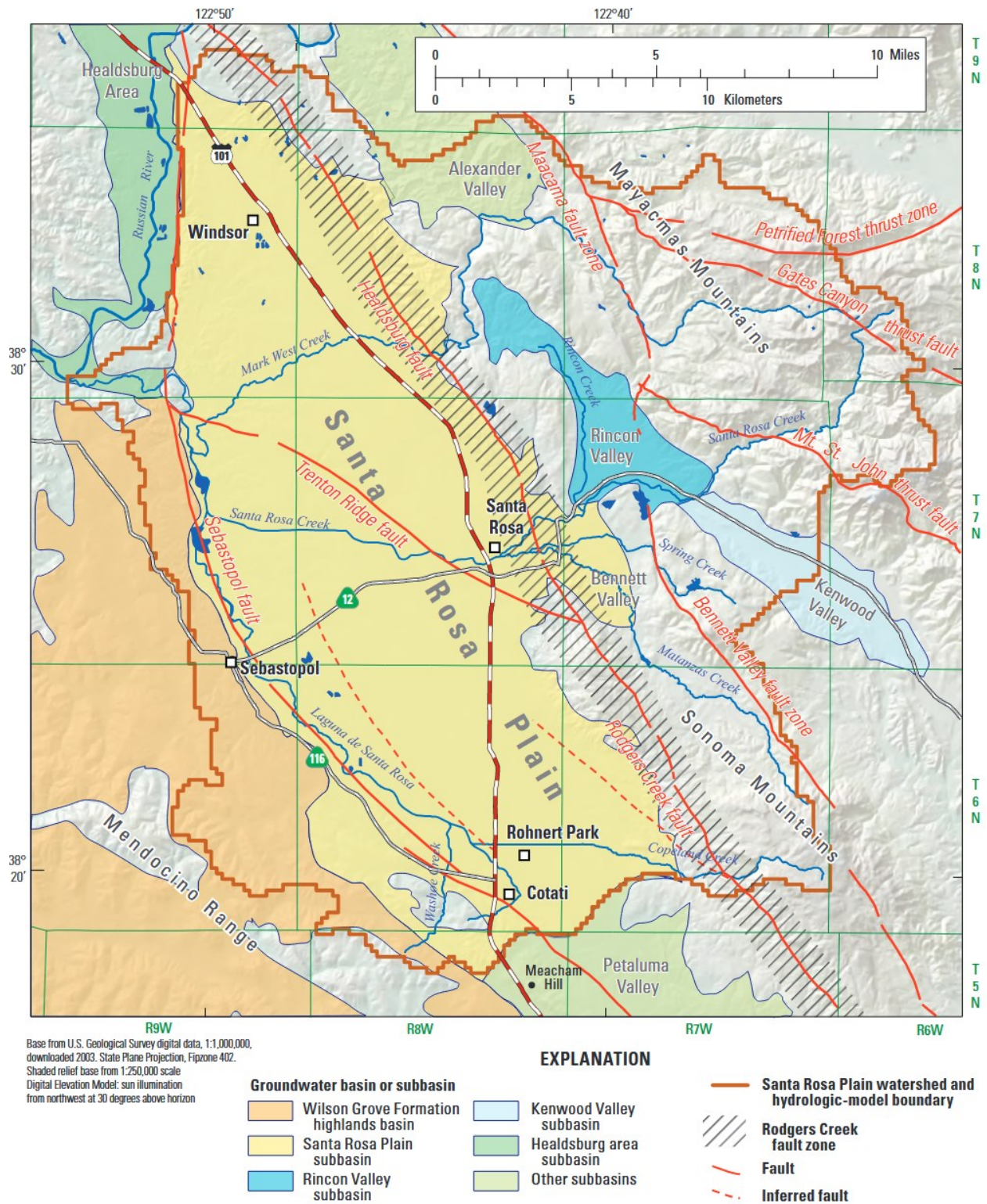
The SRPHM is a fully coupled groundwater and surface water flow model developed using GSFLOW (Markstrom *et al.*, 2008), which includes a watershed-component model, Precipitation Runoff Modeling System (PRMS) (Markstrom *et al.*, 2015), and a groundwater-component model, MODFLOW-NWT (Niswonger *et al.*, 2011). A detailed description of the model's original conceptualization and development is provided in USGS Scientific Investigation Report 2014-5052 (Woolfenden and Nishikawa, 2014). The model was updated, as described in GSP Appendix 3-C, and was used to support the Groundwater Sustainability Plan (GSP) (Sonoma Water, 2021) for the SRP subbasin (Subbasin). Following the updates made during development of the GSP, the USGS—in cooperation with the California State Water Resources Control Board and Sonoma Water—updated and recalibrated the model, as documented in Scientific Investigations Report 2024-5121 (Alzraiee *et al.*, 2025).

This Technical Memorandum (TM) documents the updates made to the Alzraiee *et al.* (2025) version of the SRPHM in accordance with defined tasks as per the Model Update Work Plan (Montgomery & Associates, 2023). Following previous nomenclature, the following versions of the SRPHM are identified:

- **SRPHM 1.0:** the original SRPHM developed by the USGS (Woolfenden and Nishikawa, 2014), which simulated hydrological conditions and water use from water years 1975 to 2010
- **SRPHM 1.0+:** an updated version of the SRPHM developed during preparation of the GSP and described in GSP Appendix 3-C that temporally extended the model through December 2018 and incorporated several updates:
 - New, lower estimates of rural domestic pumping
 - A revised methodology for estimating crop irrigation pumping demand. Originally, the model employed a decoupled soil-moisture balance model, the Crop Water Demand Model (CWDM) (Hevesi, 2014), to estimate crop irrigation pumping demand; this methodology was updated to use the Agricultural Water Use (AG) Package (Niswonger, 2020).
 - Updated public water supply pumping
 - Revised representation of climate variables and recycled water
 - Incorporation of septic return flows
- **SRPHM 2.0:** a recalibrated version of the SRPHM that incorporates the updates of SRPHM 1.0+. Note the changes made to SRPHM 1.0+ that were incorporated into SRPHM 2.0 are described in both the GSP and Alzraiee *et al.*, 2025.
- **SRPHM 2.1:** the updated model described herein, developed for GSP implementation and Periodic Evaluation

Key sections of this TM include:

- Description of adjustments made by the USGS during calibration of SRPHM 2.0
- Temporal updates through water year (WY) 2024, which include updated climate inputs (precipitation and evapotranspiration), recycled water use, groundwater extraction (municipal, industrial, and agricultural), and septic return flows
- Validation of the updated model, which includes model calibration checks and updated hydrologic budgets for the extended simulation period



(Woolfenden and Nishikawa, 2014)

Figure 1. Map of SRPHM Active Domain with Subbasin Boundaries

UPDATES TO SRPHM SINCE GSP

Since the publication of the GSP, the SRPHM 1.0+ was updated and recalibrated and released as SRPHM 2.0 (Alzraiee *et al.*, 2025). This recalibration aimed to improve the fit between measured and simulated hydraulic heads and streamflow following changes in model results induced by the SRPHM 1.0+ updates. In particular, much of the recalibration effort was focused on lowering simulated groundwater heads that resulted from the updated, decreased pumping estimates for rural and agricultural water use. Most of the parameters in SRPHM 2.0 were unchanged from SRPHM 1.0 and 1.0+ (Alzraiee *et al.*, 2025); parameters that were adjusted include:

- General head boundary (GHB) conductance: GHB conductance on the western margin of the active domain was increased by a factor of 10
- Hydraulic conductivity (K) of the streambed: streambed K was decreased for gaining streams and increased for losing streams (as defined by results from SRPHM 1.0)
- Saturated hydraulic conductivity (K_{sat}) of the unsaturated zone beneath streams: as with streambed K, unsaturated zone K_{sat} was decreased for gaining streams and increased for losing streams (as defined by results from SRPHM 1.0)
- PRMS parameters that affect groundwater recharge: 2 PRMS parameters were adjusted as part of the calibration process with the goal of lowering simulated groundwater levels while accommodating crop demands estimated by Sonoma Water (2021). These parameters were: 1) the *ssr2gw_rate* parameter that controls recharge flow rate from gravity storage to the groundwater system, and 2) the Jensen-Haise coefficient (*jh_coef*) that is used in estimating the magnitude of monthly potential evapotranspiration (ET). Adjustments made to SRPHM 2.0 were a 25 percent (%) decrease in *ssr2gw_rate* and a 25% increase in *jh_coef*
- Horizontal hydraulic conductivity (K_h): horizontal K in SRPHM 2.0 was adjusted during calibration

In assessing the results of the recalibration, the USGS focused on comparisons with observed data and SRPHM 1.0 simulated outputs. Results indicated that the streamflow and heads simulated by SRPHM 2.0 were generally in agreement with observed values and SRPHM 1.0 (Alzraiee *et al.*, 2025). For a detailed description of the recalibration process and results, the reader is referred to Scientific Investigations Report 2024-5121 (Alzraiee *et al.*, 2025).

MODEL UPDATES FOR PERIODIC EVALUATION

Updates to SRPHM 2.1 were implemented based on recommended improvements as part of GSP implementation (Montgomery & Associates, 2023) and in consultation with Sonoma Water. Across the model domain, temporal updates were applied from January 2019 through September 2024 (calendar year [CY] 2019 through water year 2024). Updated model inputs include climate data (precipitation and temperature); recycled water use; groundwater pumping for rural domestic, municipal, industrial, and agricultural uses; and septic return flows. Other model files, such as GHBs and streamflow routing (SFR) were extended in time without modification, thereby maintaining previous conditions. Consistent with its emphasis on SRP GSP implementation, this memorandum focuses on the SRP subbasin when presenting inputs and results. It also compares those results with SRPHM 1.0+, the model version used to support GSP development.

Climate Inputs

SRPHM 2.0 relies on input of daily precipitation and daily minimum and maximum air temperatures measured at 2 weather stations: the Santa Rosa and Windsor California Irrigation Management Information System (CIMIS) stations (Table 1) to distribute climate stresses to the PRMS model grid. Daily gridded precipitation and temperature data were obtained from the Parameter-elevation Relationships on Independent Slopes Model (PRISM) (PRISM Climate Group, 2025), interpolated to the station locations. Input climate data for the SRPHM 2.0 simulation period, water year 1975 through CY 2018, were left unchanged; therefore, climate data for January 2019 through September 2024 were required for SRPHM 2.1. Climate inputs used in SRPHM 2.1 for the entire model period are shown on Figure 2, Figure 3, Figure 4, and Figure 5. Note that while the model input files include data before WY 1975, those data are not used in the simulation.

Table 1. CIMIS Climate Stations in SRPHM

CIMIS Station #	DWR Regional Office	Station Name	County	Latitude	Longitude	Elevation (feet)	Status	Connect Date	Status
83	NCRO	Santa Rosa	Sonoma	38.404	-122.800	80	Active	1/1/1990	Active
103	NCRO	Windsor	Sonoma	38.527	-122.814	90	Active	12/14/1990	Active

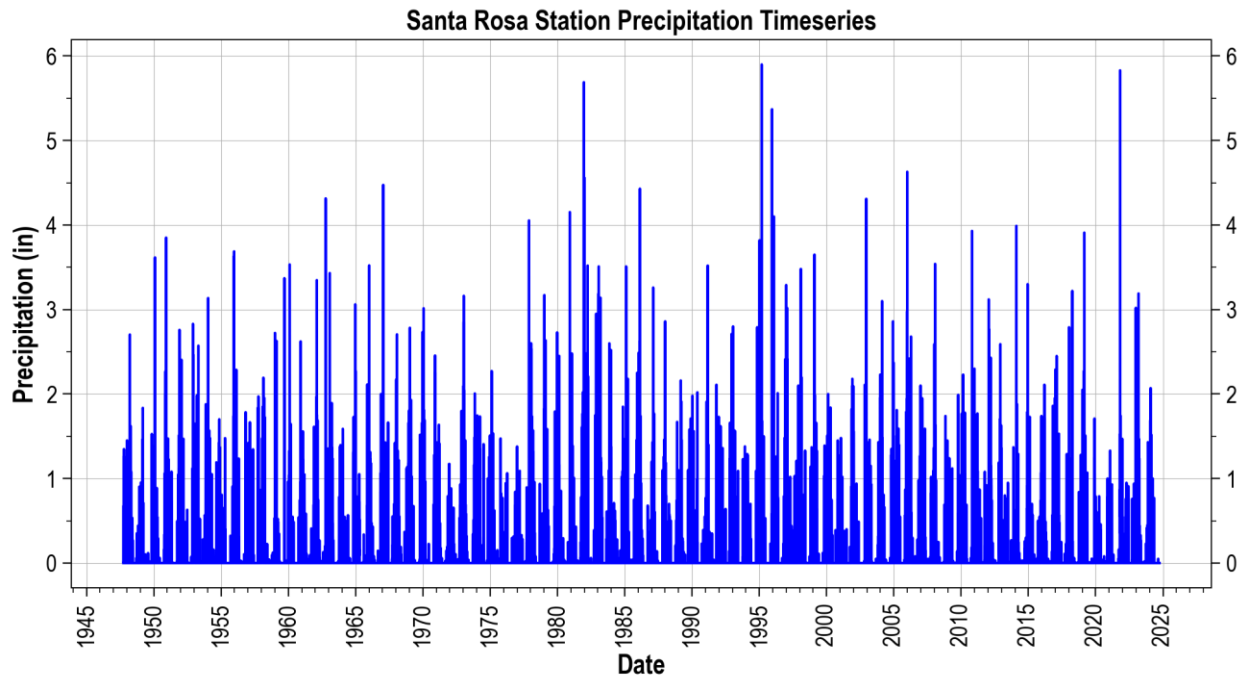


Figure 2. Precipitation Timeseries Input for Santa Rosa Station

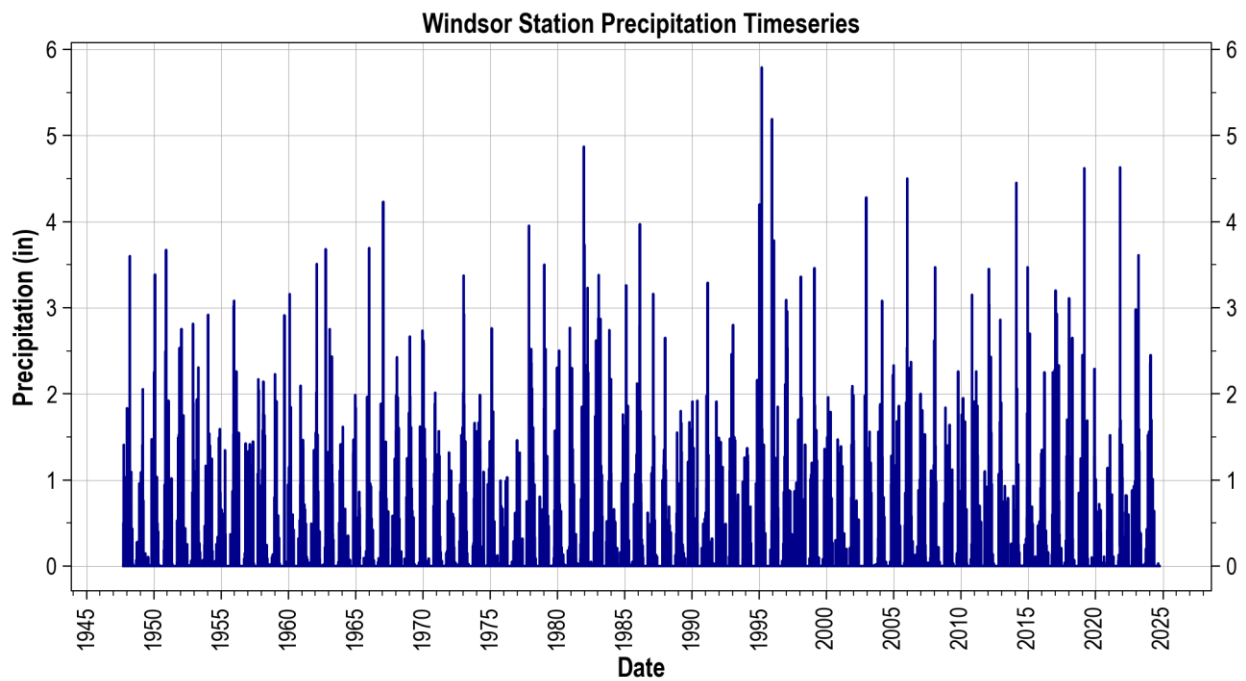


Figure 3. SRPHM 2.1 Precipitation Timeseries Input for Windsor Station

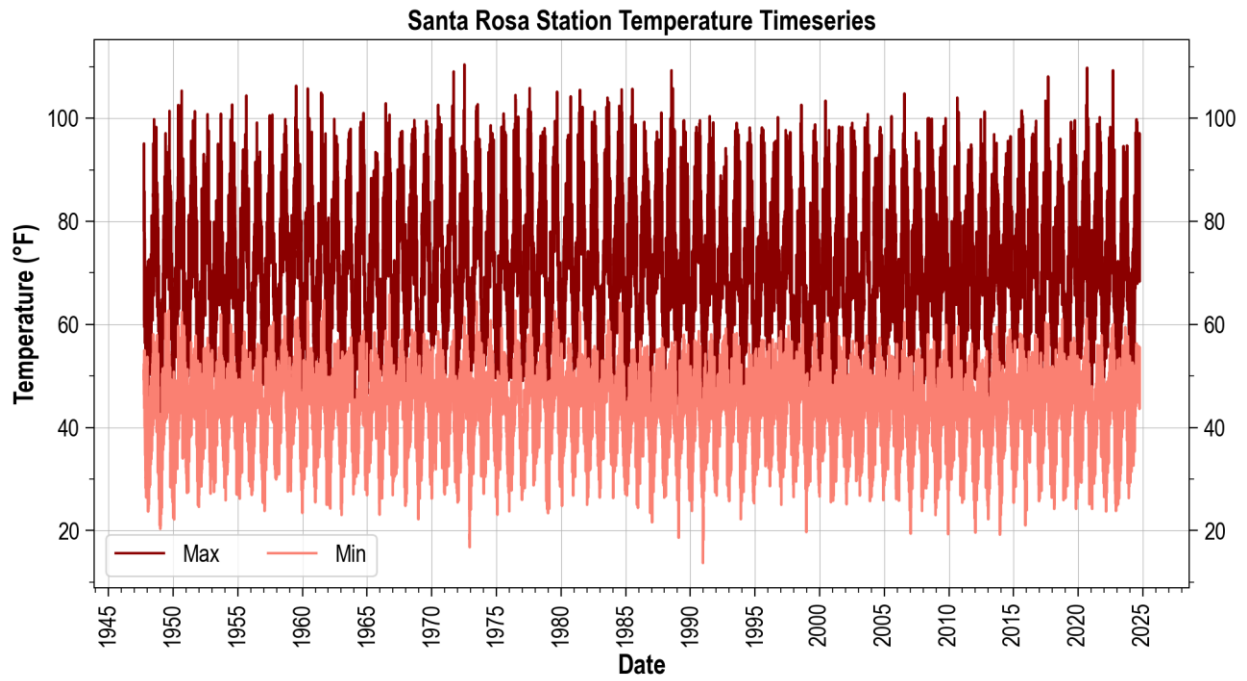


Figure 4. SRPHM 2.1 Temperature Timeseries Input for Santa Rosa Station

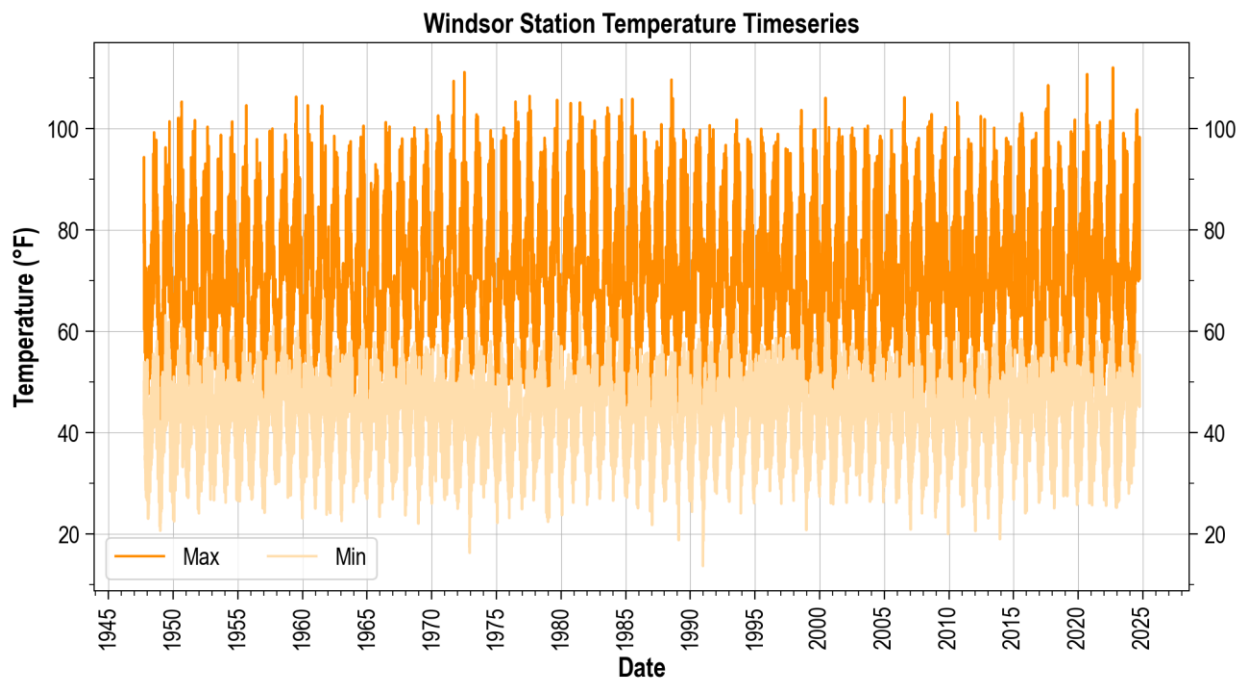


Figure 5. SRPHM 2.1 Temperature Timeseries Input for Windsor Station

Recycled Water Use

Recycled water use started in the SRP in WY 1990 and is specified in SRPHM 2.0 via the dynamic water use module of PRMS (Regan and LaFontaine, 2017). Records of recycled water use provided by Sonoma Water were used to extend the timeseries of the dynamic water use module of PRMS. Additionally, recycled water use in the Airport-Larkfield Wikiup Sanitation Zone, previously not included in SRPHM 2.0, was added during the temporal update period. To apply the timeseries of recycled water to model locations, each parcel was geographically related to one or more model cells or hydrologic response units (HRUs). For users with more than one parcel, or for parcels with more than one associated HRU, recycled water use was allocated based on area. Figure 6 shows the annual applied recycled water use for SRPHM 2.1 within the Subbasin.

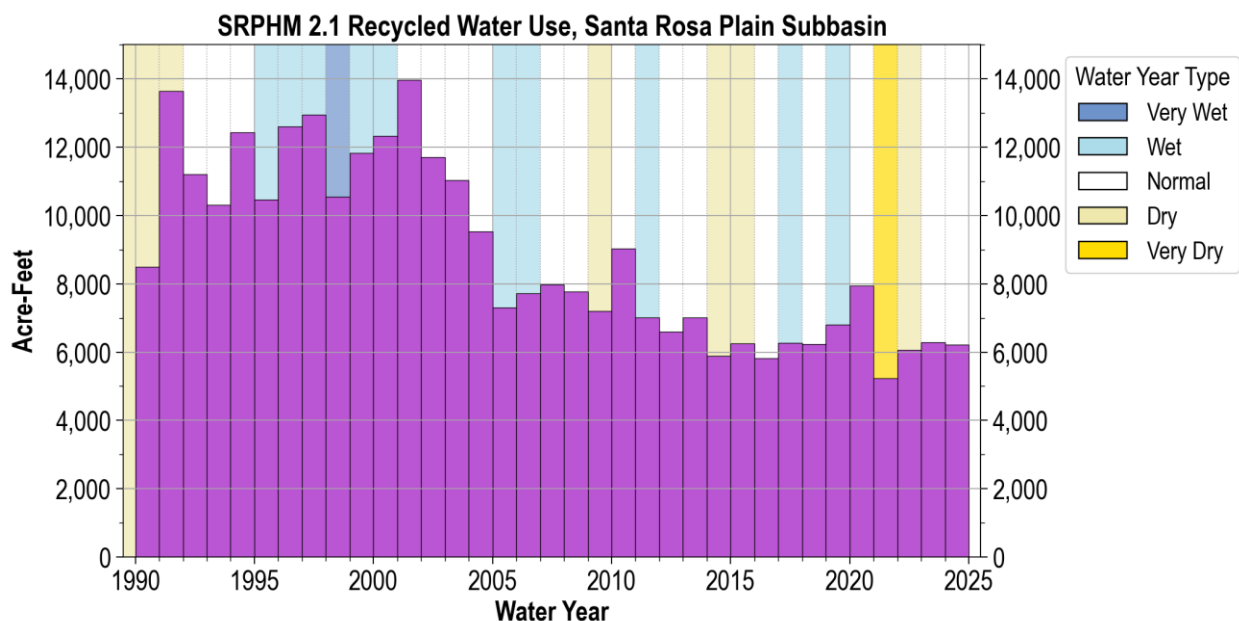


Figure 6. SRPHM 2.1 Recycled Water Use within the Subbasin

Groundwater Extraction

Groundwater extraction inputs in SRPHM 2.1 are specified explicitly for rural domestic, municipal, and industrial wells using the well (WEL) package. Agricultural pumping is not specified explicitly but rather calculated dynamically by the AG package based on remaining crop water demand that is not satisfied by available water in the soil zone, while also considering groundwater availability (Niswonger, 2020). This calculation is performed via PRMS; therefore, a suite of soil moisture processes including Hortonian overland flow and Dunnian runoffs are incorporated into the calculation of groundwater pumping for irrigation.

Municipal and Industrial Groundwater Extraction

Within the SRP watershed, large and small water system (SWS) providers pump groundwater to serve their customers. For large water suppliers, individual well pumping records provided by Sonoma Water were used to update the WEL package. Pumping data for SWS were derived from Division of Drinking Water (DDW) Public Water System (PWS) data. Based on the DDW PWS records, 3 additional SWS not previously included in SRPHM 2.0 were identified and incorporated into SRPHM 2.1 during the temporal update period. Table 2 summarizes the newly added SWS identified by DDW PWS records.

Table 2. SWS added to SRPHM 2.1

Small Water System	SWS ID	Groundwater Subbasin Pumping Location
Sutter Santa Rosa Regional Hospital	CA4901370	Santa Rosa Plain
Safari West	CA4901251	Alexander Valley*
Stonegate Mobile Home Park	CA4900795	Santa Rosa Plain

*Most of the system boundary lies within the Alexander Valley subbasin; a small portion lies to the east of the Alexander Valley subbasin. Well locations indicate pumping occurs within the Alexander Valley subbasin and immediately to the east in the Mayacamas Mountains.

Figure 7 shows the simulated municipal and industrial groundwater pumping for SRPHM 2.1 within the Subbasin.

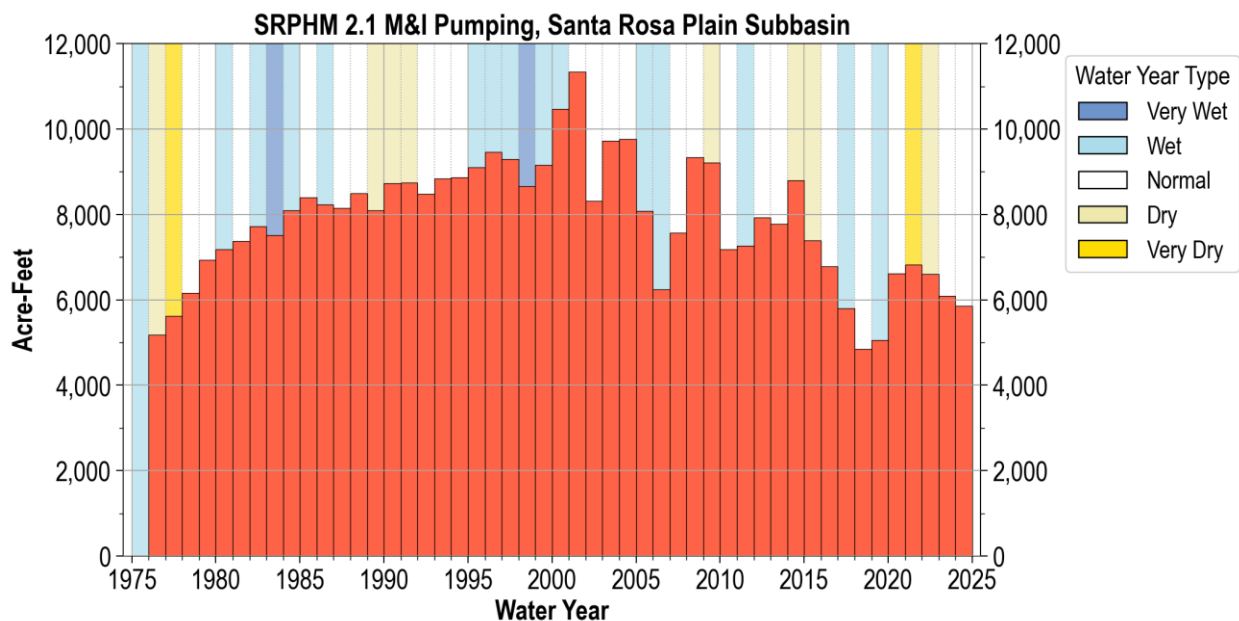


Figure 7. SRPHM 2.1 Municipal and Industrial Pumping within the Subbasin

Rural Domestic Pumping

SRPHM 2.0 calculated rural domestic pumping using a county parcel database combined with zoning and water use assumptions (Alzraiee *et al.*, 2025). For SRPHM 2.1, water and land use information from the Groundwater Users Information Data Exchange (GUIDE) database—which contains reported water use for many parcels in the Subbasin—helped specify rural domestic pumping inside the Subbasin and improve the estimation of rural domestic pumping outside of the Subbasin. Within the Subbasin, reported GUIDE water use data were incorporated directly where available, while outside the Subbasin, rural domestic pumping estimates were made using the same assumptions and methodology as those in the GUIDE dataset. This approach improves spatial representation of water use and reduces uncertainty in estimating rural domestic pumping, particularly in areas with limited direct reporting. Revised estimates of rural domestic pumping in SRPHM 2.1 are 66% higher, on average, than rural domestic pumping in SRPHM 2.0 for WY 1976 to 2018 (Figure 8).

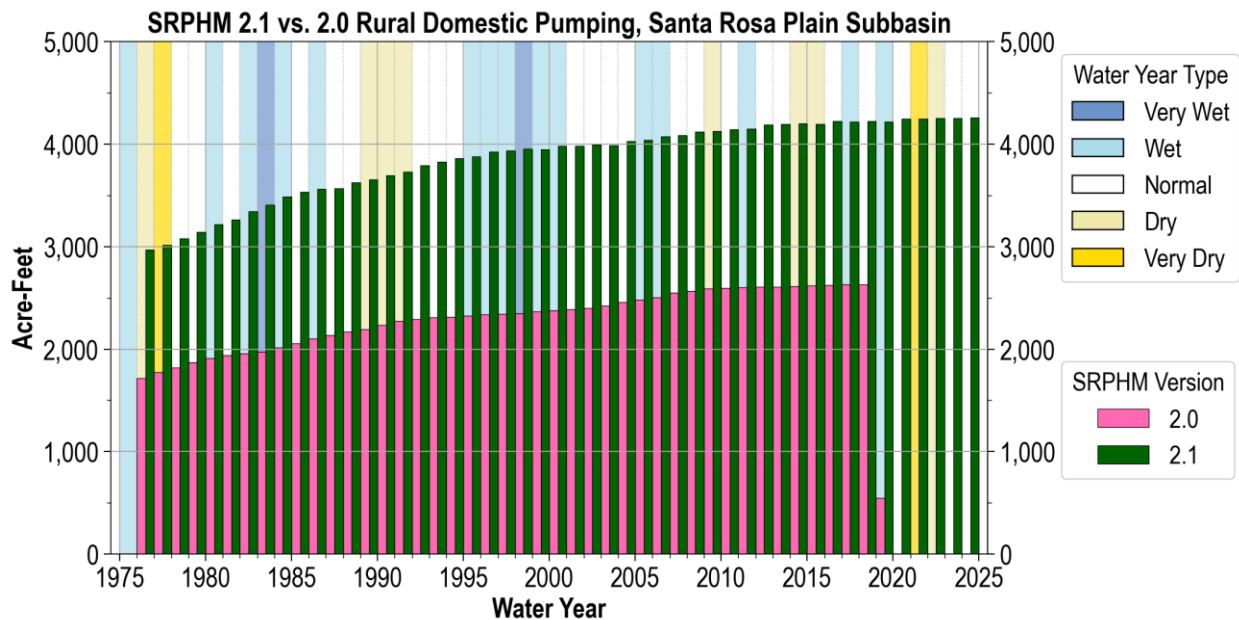


Figure 8. SRPHM 2.1 versus SRPHM 2.0 Rural Domestic Pumping within the Subbasin

Agricultural Pumping

The DWR 2016 land use dataset is the most recent land use input data used in the SRPHM. In collaboration with Sonoma Water, agricultural land use was examined from WY 2016 through WY 2023 to identify whether land use has significantly changed in the temporal update period. DWR land use maps over this period indicate limited changes in agricultural land use including in vineyards, which constitute the majority of agricultural land use in the model area (Table 3; Figure 9). Land use was analyzed at the model cell level, with a land use type being assigned to a model cell if it covered greater than 40% of the cell area. Through this analysis, it was

determined that the model coverage of land use types in more recent (WY 2020 and 2023) DWR land use arrays differ from DWR land use dataset used in SRPHM 2.0 (2016) by less than 2 percentage points (Table 3). Thus, it was agreed with Sonoma Water to replicate the AG package input for the last year of SRPHM 2.0 (CY 2018) over the temporal update period of SRPHM 2.1 (2019-2024). Future model updates should evaluate the need to update land use in the model.

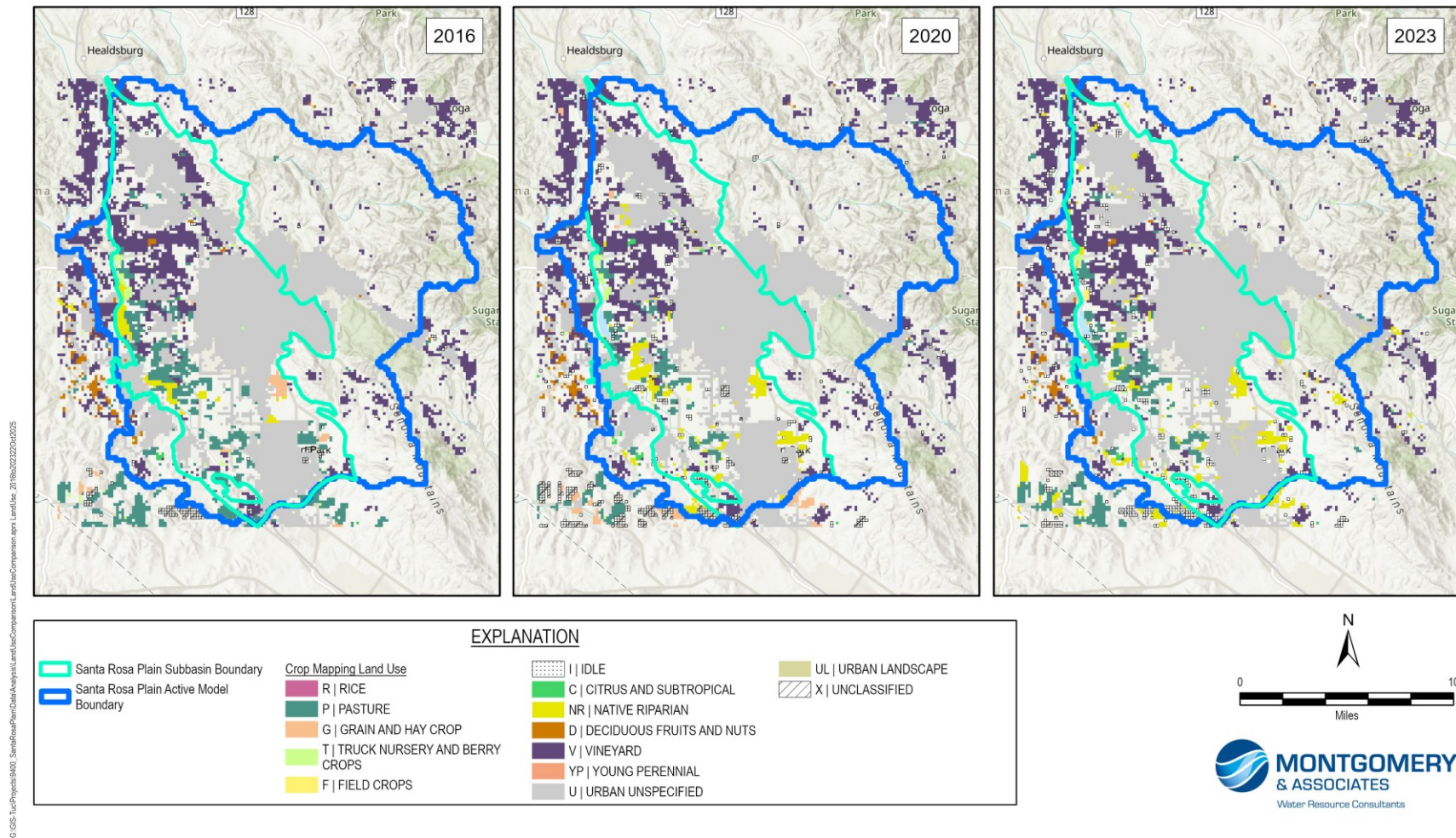


Figure 9. 2016, 2020, and 2023 Land Use in SRPHM Model Area

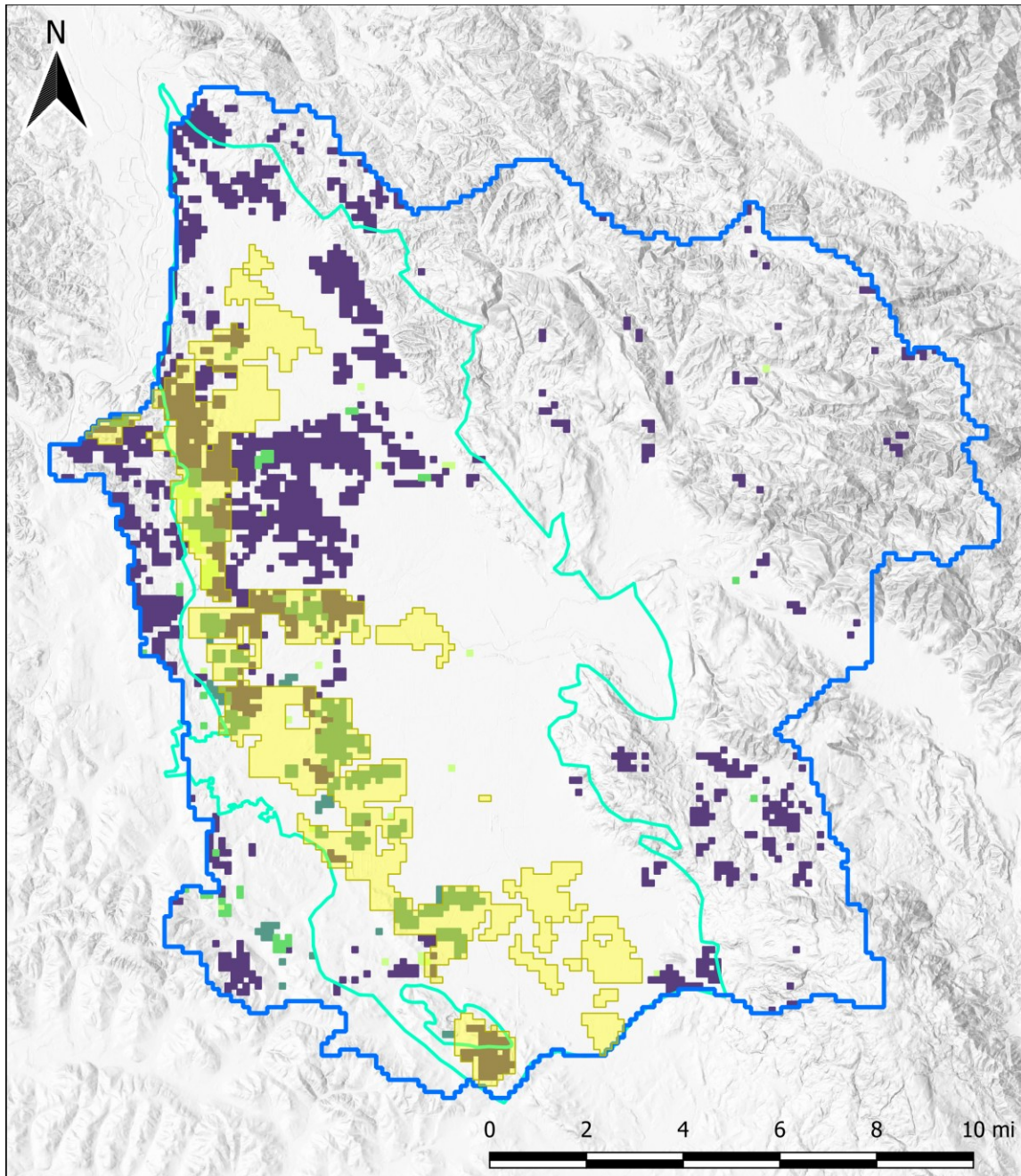
Table 3. Summary of 2016, 2020, and 2023 Land Use in SRPHM Model Area

Land Use Category	Land Use Description	2016		2020		2023	
		Acreage	Model Coverage	Acreage	Model Coverage	Acreage	Model Coverage
C	Citrus and Subtropical	81	0.05%	340	0.2%	70	0.04%
D	Deciduous Fruits and Nuts	495	0.3%	0	0%	260	0.2%
F	Field Crops	0	0%	0	0%	80	0.05%
G	Grain and Hay Crop	617	0.4%	100	0.1%	20	0.01%
I	Idle	0	0%	0	0%	2,120	1.3%
NR	Native Riparian	1,314	0.8%	3,320	2.0%	3,150	1.9%
P	Pasture	6,637	4.0%	2,860	1.7%	4,110	2.5%
T	Truck Nursery and Berry Crops	616	0.4%	510	0.3%	280	0.2%
U	Urban Unspecified	44,194	26.4%	47,602	28.4%	46,912	28.0%
UL	Urban Landscape	0	0%	0	0%	780	0.5%
V	Vineyard	13,183	7.9%	15,611	9.3%	15,031	9.0%
X	Unclassified	637	0.4%	2,070	1.2%	200	0.1%
Total		67,773	40.5%	72,413	43.3%	73,013	43.6%

Agricultural Package: Usage of Recycled Water

After completion of the model updates for SRPHM 2.1, Sonoma Water and the GSFLOW developers identified a model behavior related to how the AG package interfaces with PRMS. Specifically, water applied via the dynamic water use module of PRMS is not currently made available to the AG package for crop uptake. This configuration may lead to an overestimation of agricultural groundwater pumping demand, as recycled water applied to cells with agricultural land use cannot satisfy demand at those locations. The implications of this dynamic and whether adjustments are warranted for the current application of the model are still being assessed.

Figure 10 shows overlap between all recycled water delivery areas and DWR WY2020 irrigated land use to evaluate the potential impact of the absence of recycled water being sent to agricultural cells. There is significant overlap between recycled water deliveries and agricultural land use; roughly 32% of model land use with potential irrigation groundwater demand also receive recycled water.



EXPLANATION

- | | |
|---|--|
| HRUs with Recycled Water Use | <u>Crop Mapping Land Use</u> |
| SRPHM Active Domain | C Citrus and Subtropical |
| Santa Rosa Plain Subbasin Boundary | P Pasture |
| | T Truck Nursery and Berry Crops |
| | V Vineyard |

Figure 10. Comparison Between Recycled Water Areas in SRPHM 2.1 and 2020 DWR Crop Mapping Areas

Septic Return Flows

Septic return flows are a direct function of rural domestic pumping and are simulated via the Flow and Head Boundary (FHB) package in MODFLOW-NWT. As described for rural domestic pumping above, water and land use information from the GUIDE database were used to estimate septic return flows inside the Subbasin and improve the calculation of septic return flows outside the Subbasin. For WY 1976 to 2018, revised estimates of septic return flows within the Subbasin in SRPHM 2.1 are 40% higher, on average, than septic return flows in SRPHM 2.0 (Figure 11).

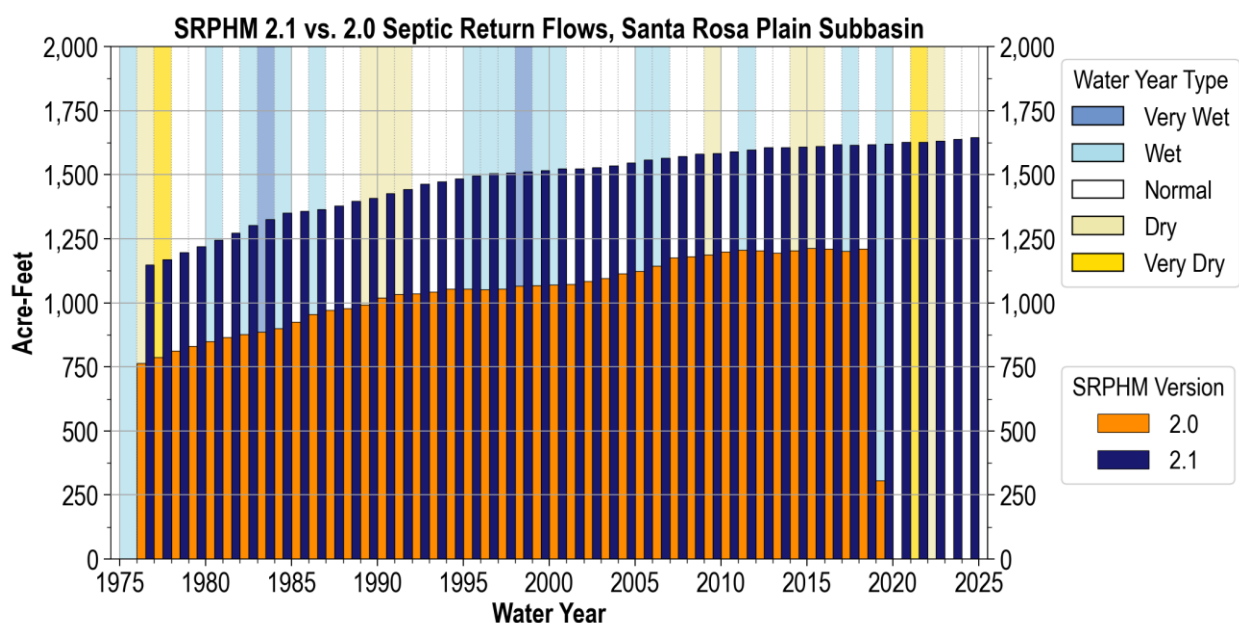


Figure 11. SRPHM 2.1 versus SRPHM 2.0 Septic Return Flows within the Subbasin

VALIDATION OF UPDATED MODEL

The results from SRPHM 2.1 were examined to evaluate how its performance compares to both recent data and earlier published findings. This review relied on these comparisons: 1) simulated and observed streamflow, 2) simulated and observed hydraulic heads, and 3) water budgets simulated by SRPHM 2.1 and SRPHM 1.0+ used in the GSP.

Observed Versus Simulated Water Levels

Comparison of simulated and observed water levels relied on existing water level observations in the Head and Observation package (HOB) during the SRPHM 2.0 model period (WY 1975 through CY 2018), as well as new water level data compiled from the Sonoma Water Information System KISTERS (WISKI) database over the temporal update period. The WISKI

dataset includes both Representative Monitoring Points (RMPs) and non-RMP monitoring wells across the SRP watershed.

Overall, comparison of simulated and observed water levels indicates that SRPHM 2.1 is able to reproduce historical groundwater level trends. Example hydrographs of simulated and observed heads are presented on Figure 12, Figure 13, and Figure 14. Figure 15, and Figure 16 present model fit statistics for the historical period (WY1975 through CY2018) and the temporal update period (CY2019 through WY2024). Model fit statistics between the two periods are very comparable, with a slight improvement in the update period from 30.8 ft to 22.5 ft. This improvement is likely due to improved model input datasets described above.

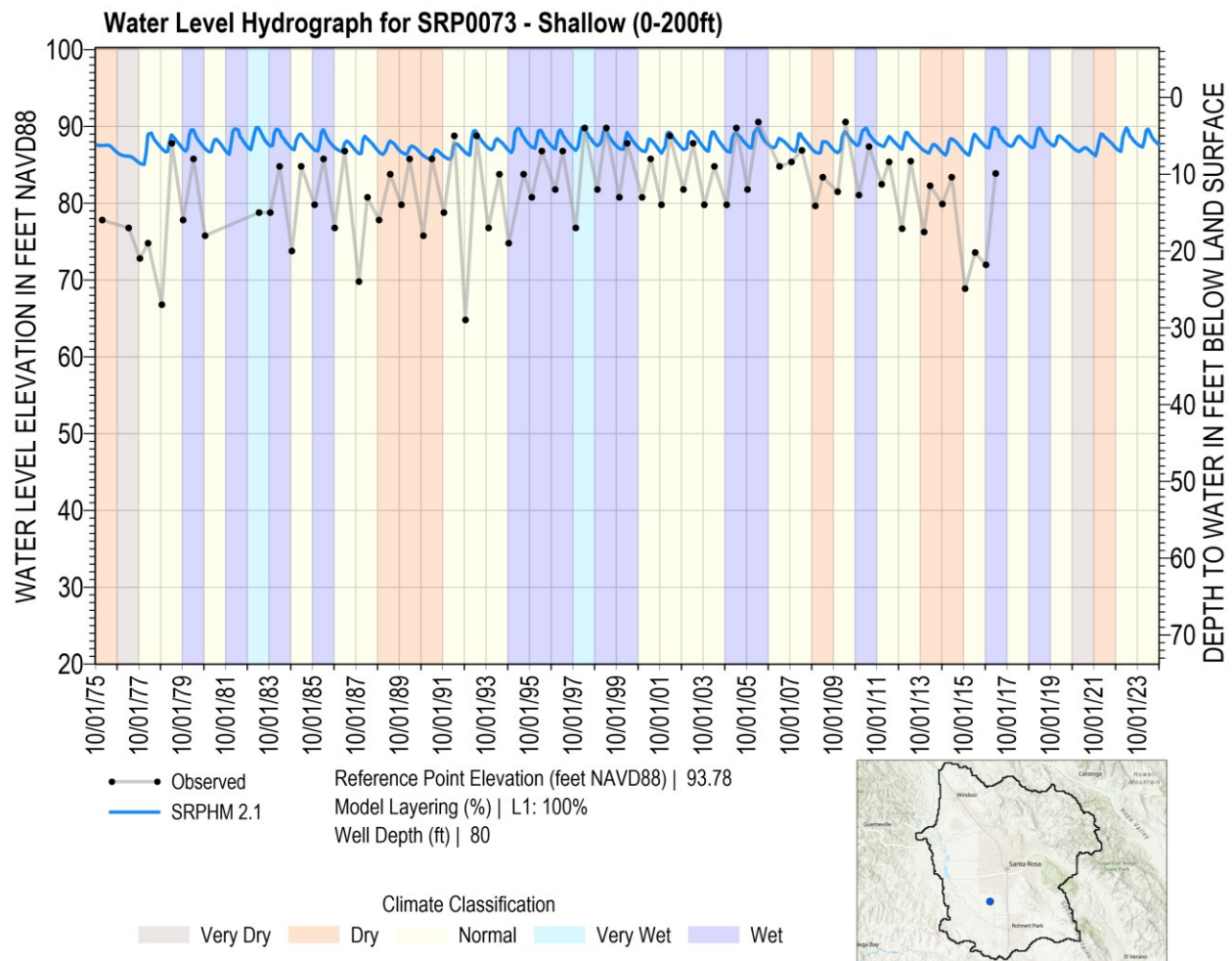


Figure 12. Example Hydrograph for RMP SRP0073

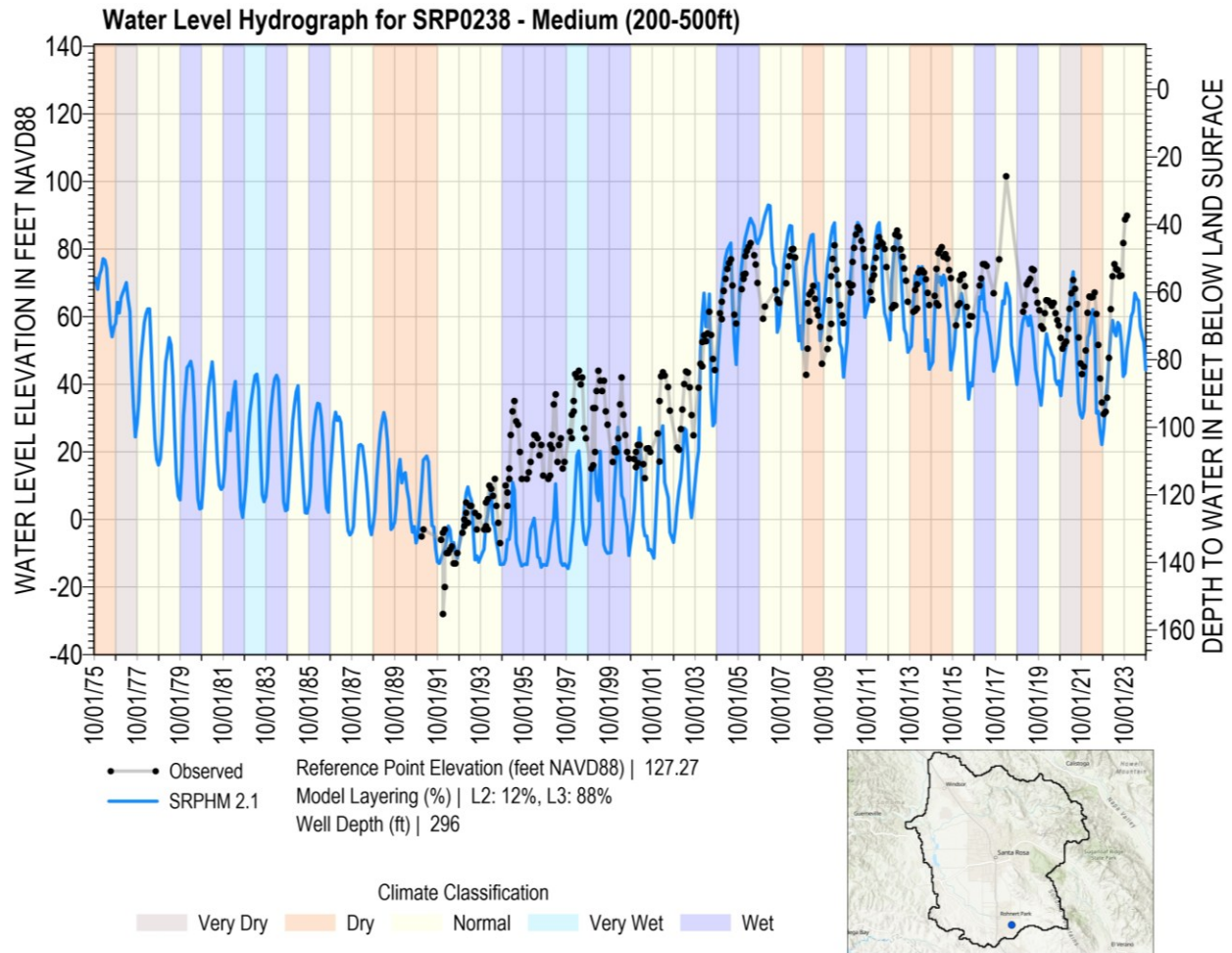


Figure 13. Example Hydrograph for RMP SRP0238

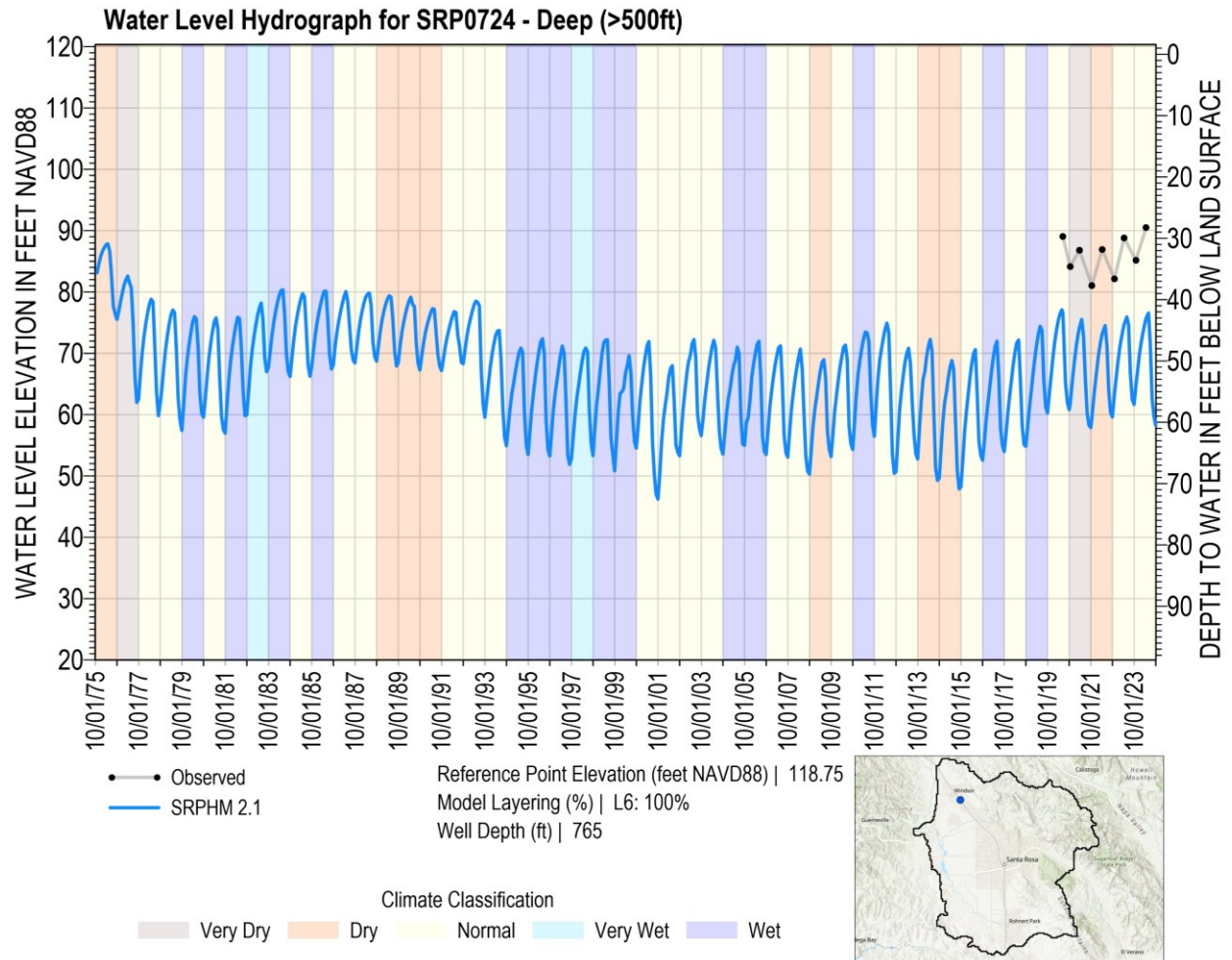


Figure 14. Example Hydrograph for RMP SRP0724

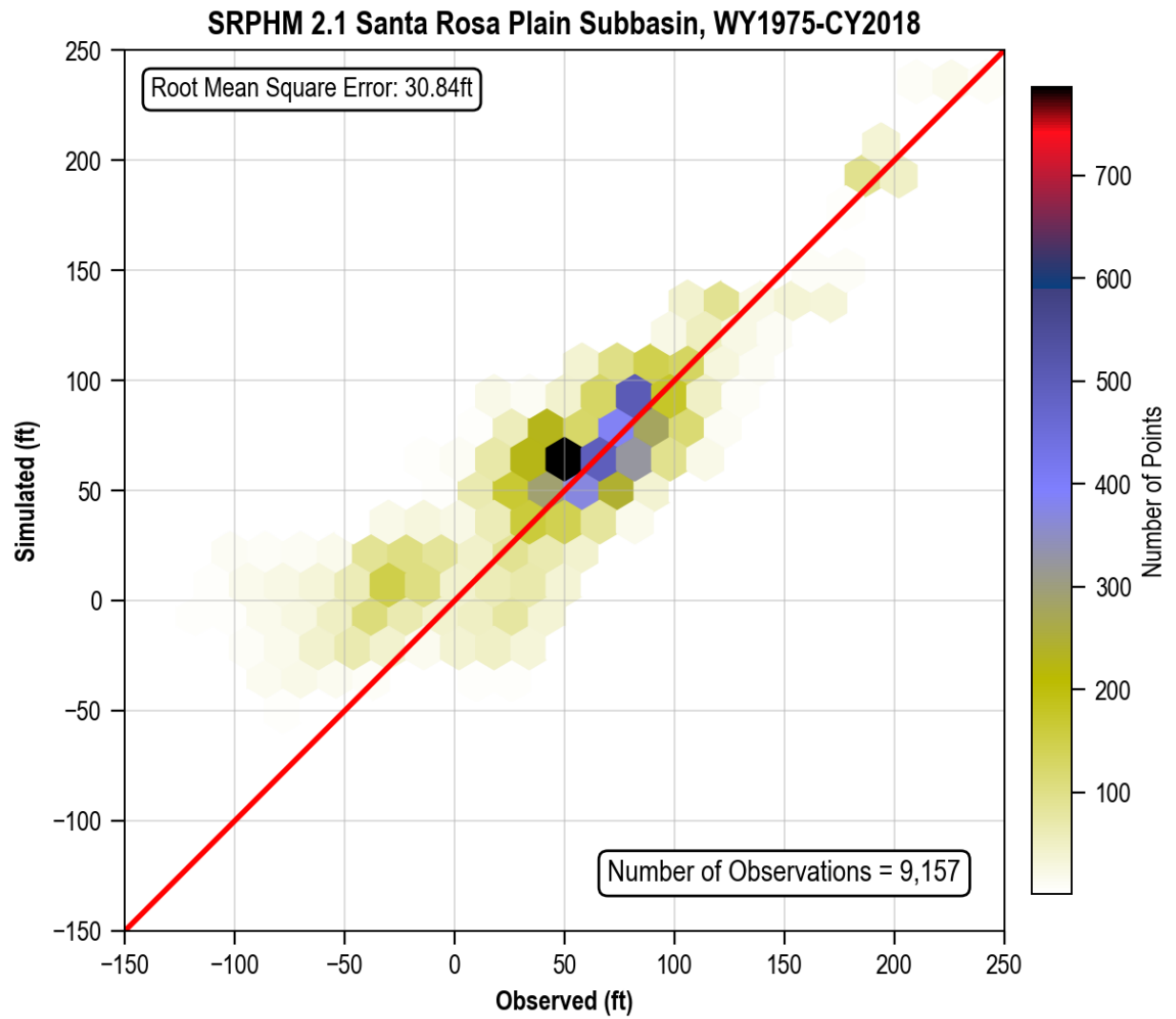


Figure 15. Observed Versus Simulated Groundwater Levels, Santa Rosa Plain Subbasin, WY1975 – CY2018

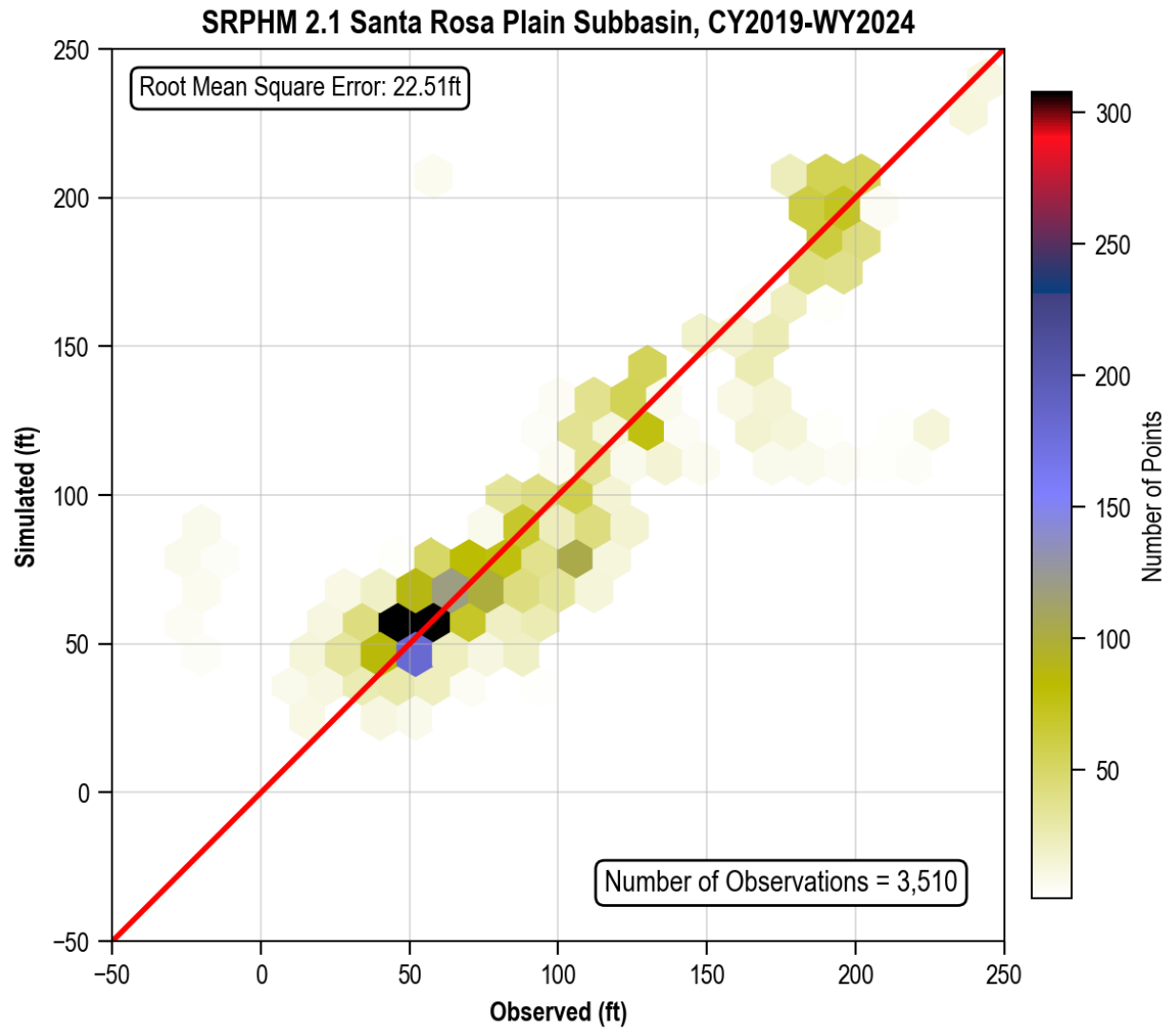


Figure 16. Observed Versus Simulated Groundwater Levels, Santa Rosa Plain Subbasin, CY2019 – WY2024

Observed Versus Simulated Streamflow

Comparisons of simulated and observed streamflow are summarized using discharge hydrographs and 1:1 plots of monthly mean streamflow (Figure 17, Figure 18, and Figure 19). SRPHM 2.1 continues to reproduce historical streamflow trends.

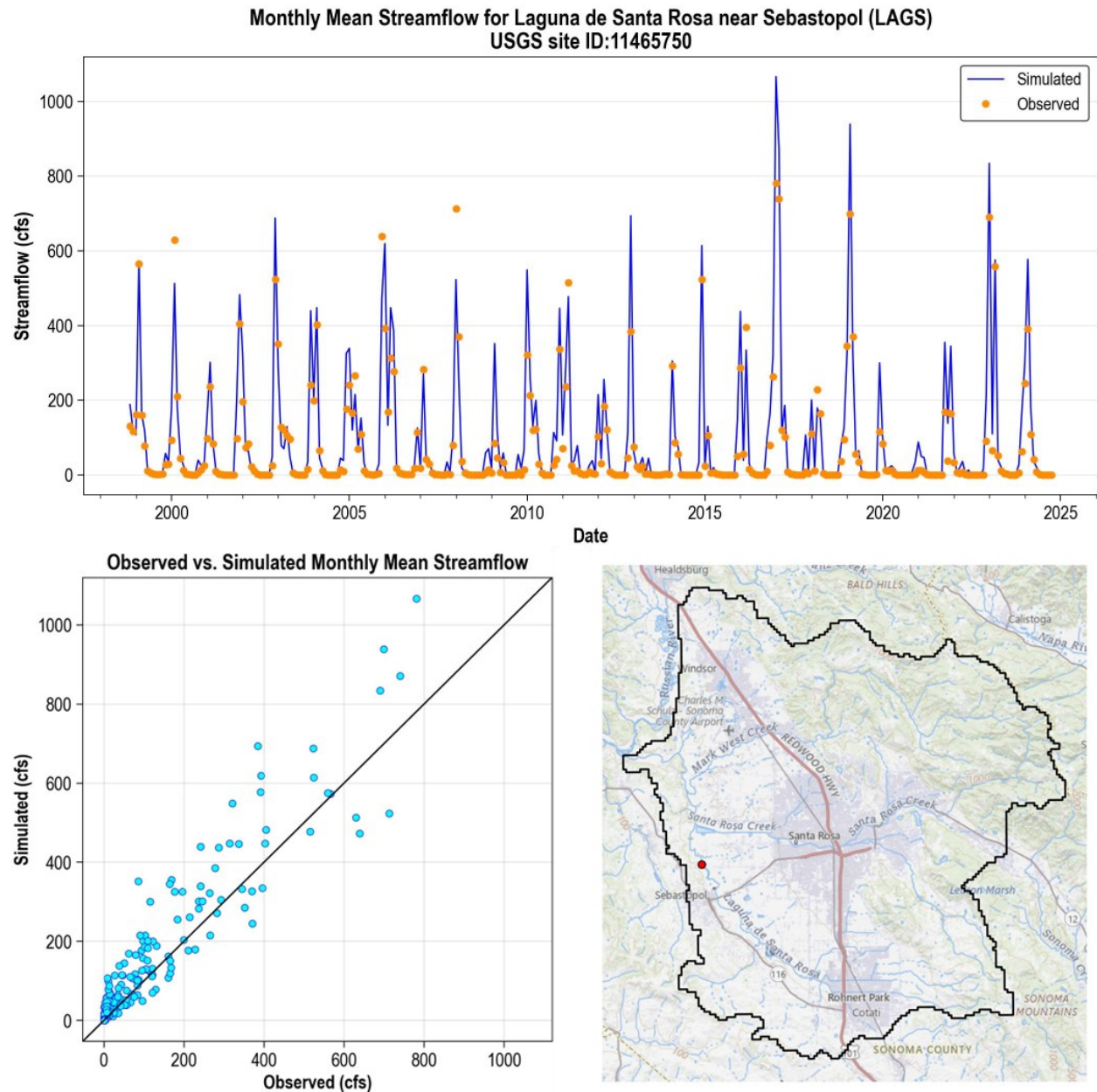


Figure 17. Comparison of Simulated and Observed Streamflow for USGS Gage Station 11465750

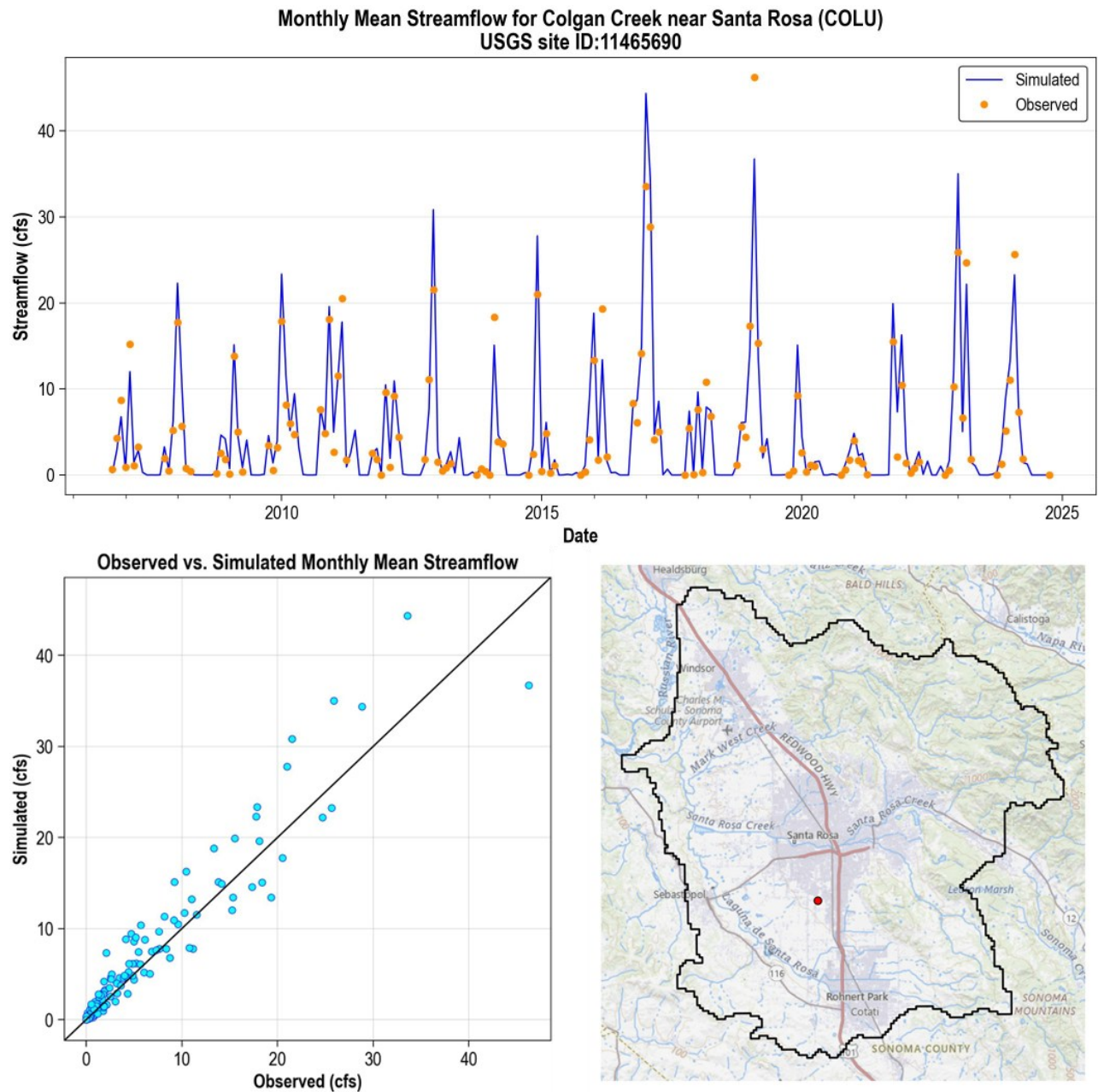


Figure 18. Comparison of Simulated and Observed Streamflow for USGS Gage Station 11465690

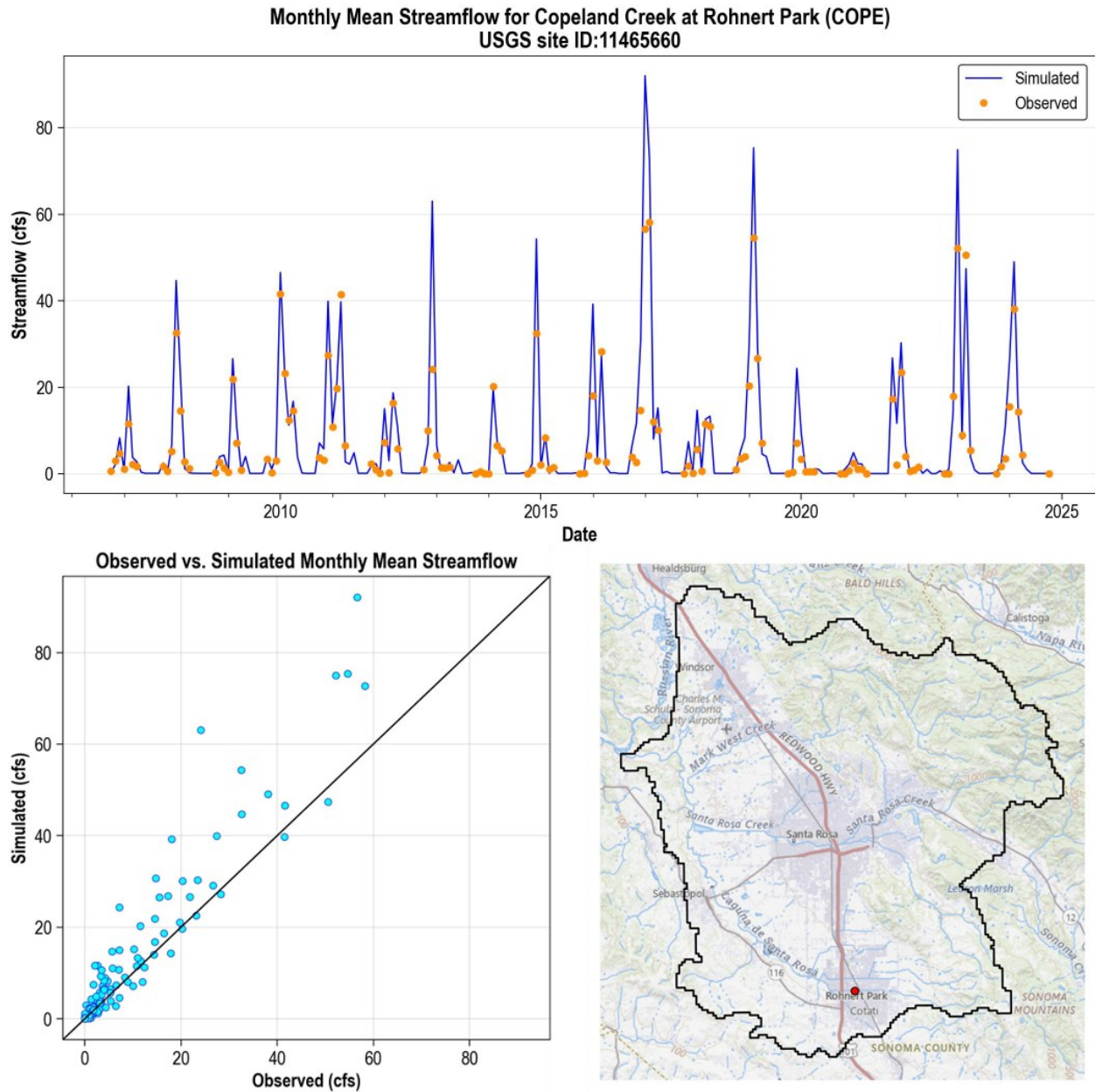


Figure 19. Comparison of Simulated and Observed Streamflow for USGS Gage Station 11465660

Water Budget Comparison to GSP

The SRPHM 2.1 simulated historical groundwater budget for the Subbasin (WY 1976– CY 2018; Table 4 and Table 5) remains largely consistent with values reported in the GSP (SRPHM 1.0+), with differences in septic return flows, pumping, recharge, discharge to streams, and surface leakage. Two main factors explain these changes: revised GUIDE-based estimates of rural domestic pumping and septic return flows, which increased both components by an average of 66% and 40%, respectively, and recalibration of SRPHM 2.0, which decreased recharge and agricultural pumping by an average of 4.5% and 8.8%, respectively. Groundwater discharge to streams and surface leakage, both affected by the decrease in recharge, also decreased by an average of 9% and 10%, respectively. Other budget components show only slight variations from GSP results.

Table 4. Historical (WY 1976 through WY 2018) Santa Rosa Plain Subbasin Groundwater Inflow Summary*

	Annual Statistic (AFY) ^a	Deep percolation (recharge)	Streambed recharge	Septic Return Flows	Subsurface Inflow from Surrounding Watershed	Subsurface Inflow from Neighboring Basins
SRPHM 1.0+ (GSP)	Mean	28,700	15,100	1,000	2,100	7,400
	Minimum	2,000	9,100	800	2,000	6,900
	Maximum	58,100	19,700	1,200	2,300	8,400
	Median	26,500	14,700	1,100	2,100	7,400
SRPHM 2.1	Mean	27,400	14,700	1,500	2,100	7,000
	Minimum	1,900	8,900	1,100	1,900	6,400
	Maximum	53,700	19,700	1,600	2,500	8,000
	Median	25,300	14,000	1,500	2,100	7,000

*Values are rounded to the nearest 100 acre-feet. Percent change values reported above reflect unrounded model results.

^a acre-feet per year

Table 5. Historical (WY 1976 through WY 2018) Santa Rosa Plain Subbasin Groundwater Outflow Summary*

	Annual Statistic (AFY)	Agricultural Pumping	Groundwater ET	Subsurface Outflow to Adjacent Basins	Discharge to Streams	Surface Leakage	M&I + Rural Domestic
SRPHM 1.0+ (GSP)	Mean	9,100	9,400	4,900	15,400	6,200	10,000
	Minimum	5,700	7,100	4,500	8,700	2,500	6,500
	Maximum	13,900	13,100	5,200	23,400	12,300	13,200
	Median	9,000	9,300	4,900	15,400	5,800	10,100
SRPHM 2.1	Mean	8,300	9,100	4,400	14,000	5,600	11,800
	Minimum	4,600	6,800	4,100	7,600	2,100	8,100
	Maximum	14,000	12,800	4,900	20,900	10,300	15,300
	Median	7,800	9,000	4,400	13,600	5,100	11,900

*Values are rounded to the nearest 100 acre-feet. Percent change values reported above reflect unrounded model results.

Figure 20 and Figure 21 present the updated Subbasin groundwater budget inflows and outflows, respectively. Comparison of these updated values with those reported in the GSP indicates that the relative proportions of water budget components remain unchanged.

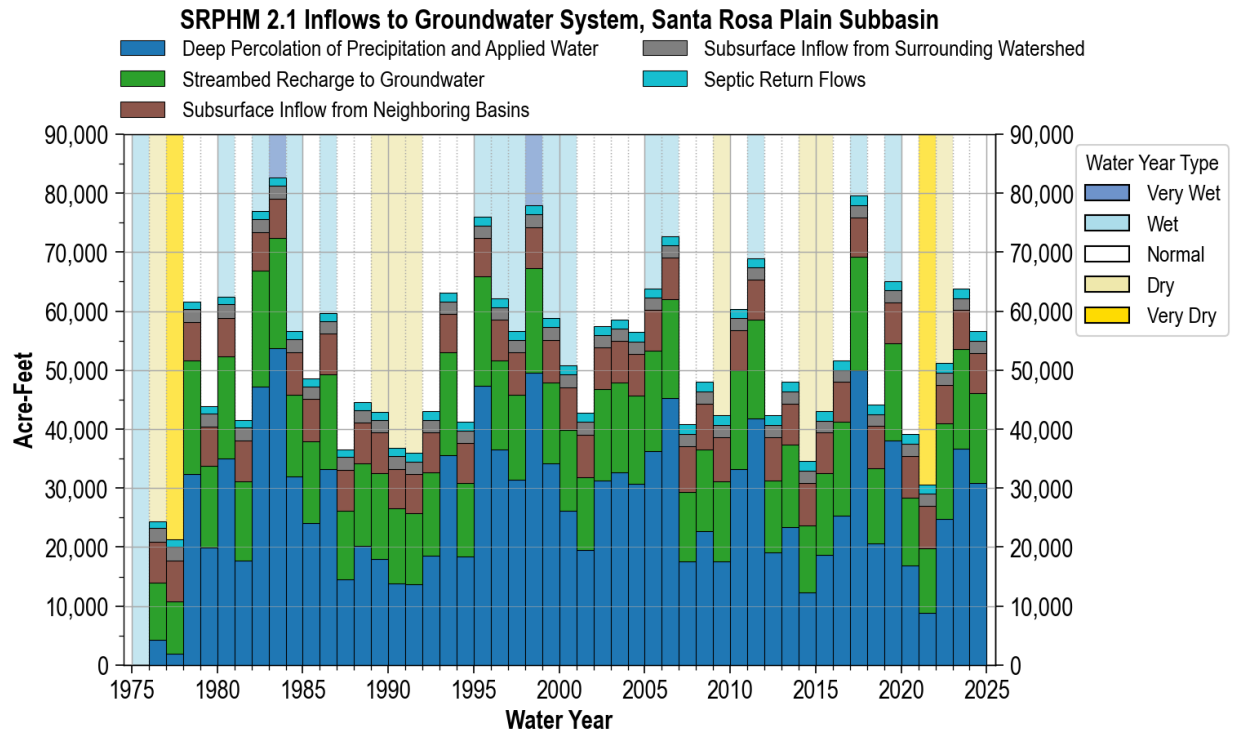


Figure 20. SRPHM 2.1 Subbasin Groundwater Budget Inflows

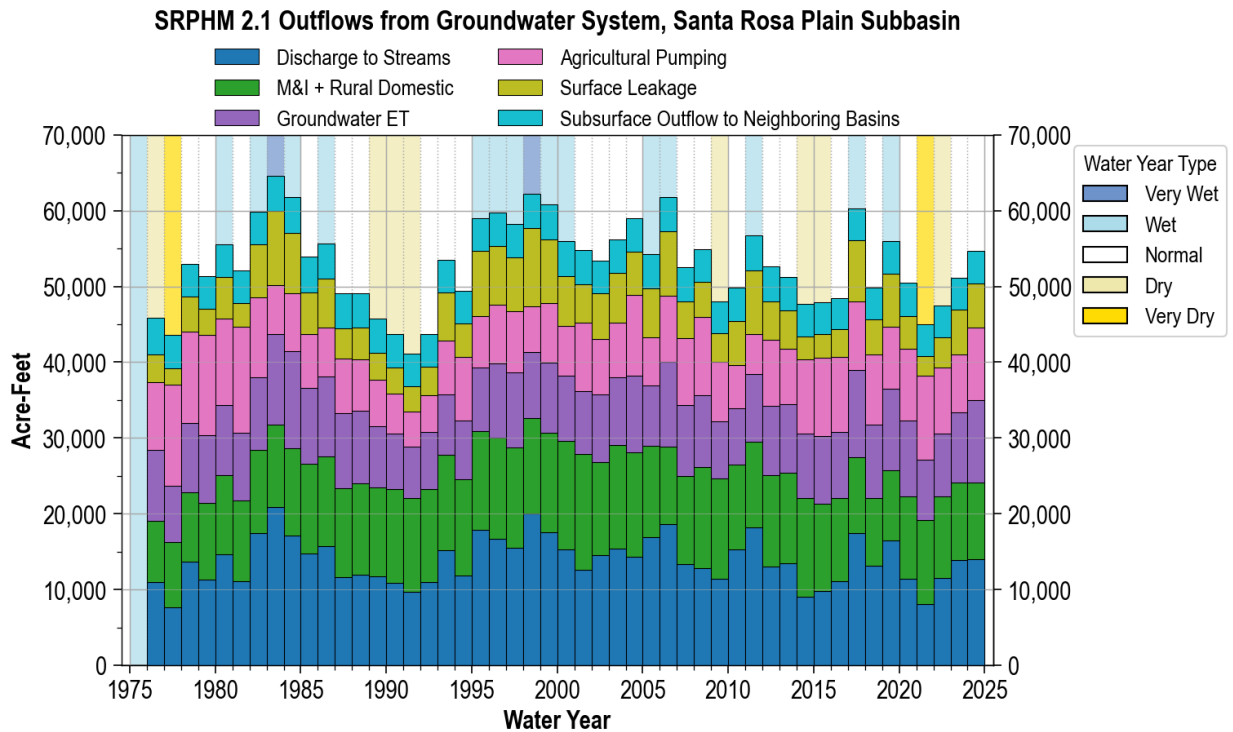


Figure 21. SRPHM 2.1 Subbasin Groundwater Budget Outflows

Groundwater storage trends for SRPHM 2.1 over the historical period generally match those in the GSP (Table 6; Figure 22), although the average annual change in storage is about 300 acre-feet more negative, signifying a greater annual average decrease in storage. This difference reflects the previously discussed increase in rural domestic pumping and decrease in recharge. Both the SRPHM 1.0+ and SRPHM 2.1 results show that changes in storage are correlated with water year type (Figure 22). Across the simulation period, the updated model simulates an overall cumulative decrease in groundwater storage of 37,000 acre-feet from WY 1975 through WY 2024. The cumulative decrease in storage is approximately 10,000 acre-feet greater than that reported in the GSP for the equivalent time period, through 2018 (Figure 22), which reflects the greater annual average decrease in storage.

Table 6. Historical Change in Groundwater Storage Summary*

	Annual Statistic (AFY)	Historical (WY 1976 to 2018)
SRPHM 1.0+ (GSP)	Mean	-600
	Minimum	-22,000
	Maximum	20,000
	Median	-3,000
SRPHM 2.1	Mean	-900
	Minimum	-22,400
	Maximum	18,800
	Median	-3,000

*Values are rounded to the nearest 100 acre-feet.

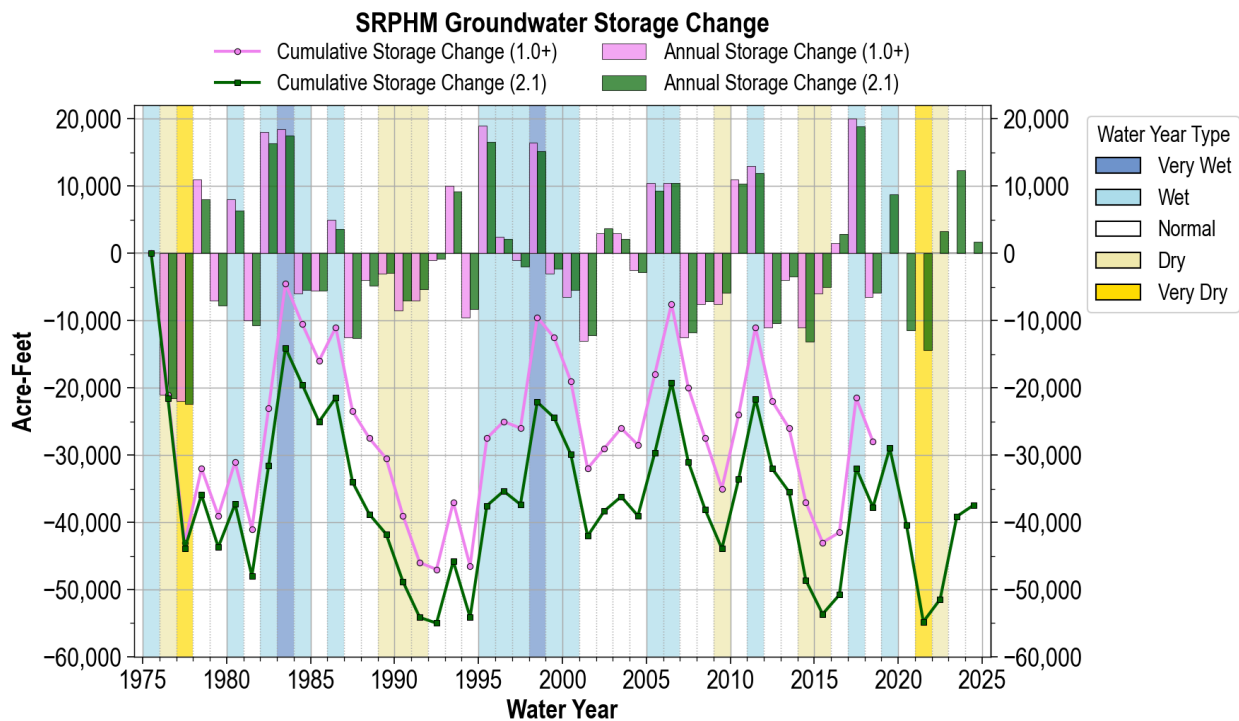


Figure 22. SRPHM Subbasin Groundwater Storage Change Comparison

MODEL CAPABILITIES AND LIMITATIONS

In the context of groundwater sustainability planning, the SRPHM 2.1 provides suitable simulation of absolute groundwater levels, seasonal groundwater level fluctuations, and groundwater level trends in the Santa Rosa Plain Subbasin. Revisions made as part of this model update have maintained its functionality as a long-term sustainability planning tool, while improving the representation of model inputs and extending them with the most recent data. The SRPHM 2.1 is therefore suitable for implementation of scenarios that incorporate regional water

use changes, changes in groundwater use, aquifer storage and recovery projects, and/or climate change. Comparative evaluation of these scenarios against historical trends or against projected baselines will be informative for sustainable groundwater management efforts.

Limitations of the SRPHM have previously been discussed within the original USGS report and highlighted in the GSP. While revised inputs and simulation of stresses have improved the model's representation of the hydrologic system, some limitations remain, which is expected for such a complex model.

Due to its relatively coarse grid, the SRPHM is not suitable for predicting precise localized impacts of projects like ASR, in-lieu recharge, or increases/decreases in net groundwater use. Rather, projects should generally be evaluated comparatively on a regional or Subbasin-wide basis. Because observation data is generally located within the Subbasin, model predictions are likely to be more reliable in this area. Similarly, there is significant uncertainty in the volumes of certain simulated groundwater budget components; volumes of groundwater/surface water interactions, surface leakage, groundwater ET, and flow to/from adjacent basins are best viewed comparatively across model scenarios.

Overall, the SRPHM 2.1 remains a useful tool for groundwater management, climate change analysis, and project implementation planning.

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