DELTA-MENDOTA SGMA

Appendix A

GSP Submittal Checklist

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
§ 354.			**Introduction to Plan Contents**					
			This Article describes the required contents of Plans submitted to the Department for evaluation, including administrative information, a description of the basin setting, sustainable management criteria, description of the monitoring network, and projects and management actions.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
SubArticle 1.			**Administrative Information**					
§ 354.2.			**Introduction to Administrative Information**					
			This Subarticle describes information in the Plan relating to administrative and other general information about the Agency that has adopted the Plan and the area covered by the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.4.			**General Information**					
			Each Plan shall include the following general information:					
(a)			An executive summary written in plain language that provides an overview of the Plan and description of groundwater conditions in the basin.		ES.1-12	Figure ES-1-8	Table ES-1-3	
(b)			A list of references and technical studies relied upon by the Agency in developing the Plan. Each Agency shall provide to the Department electronic copies of reports and other documents and materials cited as references that are not generally available to the public.		References and Technical Studies			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
§ 354.6.			**Agency Information**					
			When submitting an adopted Plan to the Department, the Agency shall include a copy of the information provided pursuant to Water Code Section 10723.8, with any updates, if necessary, along with the following information:					
(a)			The name and mailing address of the Agency.		3.1			
(b)			The organization and management structure of the Agency, identifying persons with management authority for implementation of the Plan.		3.2	Figure Intro-1	Table Intro-2	
(c)			The name and contact information, including the phone number, mailing address and electronic mail address, of the plan manager.		3.3			
(d)			The legal authority of the Agency, with specific reference to citations setting forth the duties, powers, and responsibilities of the Agency, demonstrating that the Agency has the legal authority to implement the Plan.		3.4			
(e)			An estimate of the cost of implementing the Plan and a general description of how the Agency plans to meet those costs.		3.5, 16.2		Table PI-2	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.8, 10727.2, and 10733.2, Water Code.					

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§ 354.8.			**Description of Plan Area**					
			Each Plan shall include a description of the geographic areas covered, including the following information:					
(a)			One or more maps of the basin that depict the following, as applicable:					
	(1)		The area covered by the Plan, delineating areas managed by the Agency as an exclusive Agency and any areas for which the Agency is not an exclusive Agency, and the name and location of any adjacent basins.		5.1.2	Figure PA-1		
	(2)		Adjudicated areas, other Agencies within the basin, and areas covered by an Alternative.		5.1.1			
	(3)		Jurisdictional boundaries of federal or state land (including the identity of the agency with jurisdiction over that land), tribal land, cities, counties, agencies with water management responsibilities, and areas covered by relevant general plans.		5.1.3	Figures PA-2, PA-3	Table PA-1	
	(4)		Existing land use designations and the identification of water use sector and water source type.		5.1.4	Figures PA-4, PA-5	Tables PA-2, PA-3, PA-4	
	(5)		The density of wells per square mile, by dasymetric or similar mapping techniques, showing the general distribution of agricultural, industrial, and domestic water supply wells in the basin, including de minimis extractors, and the location and extent of communities dependent upon groundwater, utilizing data provided by the Department, as specified in Section 353.2, or the best available information.		5.1.5	Figures PA-6, PA-7	Table PA-5	
(b)			A written description of the Plan area, including a summary of the jurisdictional areas and other features depicted on the map.		5.1	Figures PA-1 to PA-7	Tables PA-1 to PA-6	
(c)			Identification of existing water resource monitoring and management programs, and description of any such programs the Agency plans to incorporate in its monitoring network or in development of its Plan. The Agency may coordinate with existing water resource monitoring and management programs to incorporate and adopt that program as part of the Plan.		5.2.1			
(d)			A description of how existing water resource monitoring or management programs may limit operational flexibility in the basin, and how the Plan has been developed to adapt to those limits.		5.2.2			
(e)			A description of conjunctive use programs in the basin.		5.2.3		Tables PMA-1, PMA-2	
(f)			A plain language description of the land use elements or topic categories of applicable general plans that includes the following:					
	(1)		A summary of general plans and other land use plans governing the basin.		5.3.1			

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(2)		A general description of how implementation of existing land use plans may change water demands within the basin or affect the ability of the Agency to achieve sustainable groundwater management over the planning and implementation horizon, and how the Plan addresses those potential effects		5.3.2			
	(3)		A general description of how implementation of the Plan may affect the water supply assumptions of relevant land use plans over the planning and implementation horizon.		5.3.3			
	(4)		A summary of the process for permitting new or replacement wells in the basin, including adopted standards in local well ordinances, zoning codes, and policies contained in adopted land use plans.		5.3.4			
	(5)		To the extent known, the Agency may include information regarding the implementation of land use plans outside the basin that could affect the ability of the Agency to achieve sustainable groundwater management.		5.3.5			
(g)			A description of any of the additional Plan elements included in Water Code Section 10727.4 that the Agency determines to be appropriate.		5.4			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10720.3, 10727.2, 10727.4, 10733, and 10733.2, Water Code.					
§ 354.10.			**Notice and Communication**					
			Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following:					
(a)			A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties.		5.5.1		Table PA-6	
(b)			A list of public meetings at which the Plan was discussed or considered by the Agency.		5.5.2; 5.5.4.2			
(c)			Comments regarding the Plan received by the Agency and a summary of any responses by the Agency.		5.5.3		Table PA-7	
(d)			A communication section of the Plan that includes the following:					
	(1)		An explanation of the Agency's decision-making process.		5.5.4.1			
	(2)		Identification of opportunities for public engagement and a discussion of how public input and response will be used.		5.5.4.2			
	(3)		A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin.		5.5.4.3			
	(4)		The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.		5.5.4.4			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.8, 10728.4, and 10733.2, Water Code					
SubArticle 2.			**Basin Setting**					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
§ 354.12.			**Introduction to Basin Setting**					
			This Subarticle describes the information about the physical setting and characteristics of the basin and current conditions of the basin that shall be part of each Plan, including the identification of data gaps and levels of uncertainty, which comprise the basin setting that serves as the basis for defining and assessing reasonable sustainable management criteria and projects and management actions. Information provided pursuant to this Subarticle shall be prepared by or under the direction of a professional geologist or professional engineer.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.14.			**Hydrogeologic Conceptual Model**					
(a)			Each Plan shall include a descriptive hydrogeologic conceptual model of the basin based on technical studies and qualified maps that characterizes the physical components and interaction of the surface water and groundwater systems in the basin.		7	Figures HCM-1 to HCM-24	Tables HCM-1 to HCM-3	
(b)			The hydrogeologic conceptual model shall be summarized in a written description that includes the following:					
	(1)		The regional geologic and structural setting of the basin including the immediate surrounding area, as necessary for geologic consistency.		7.1.1	Figures HCM-1		
	(2)		Lateral basin boundaries, including major geologic features that significantly affect groundwater flow.		7.1.2	Figures HCM-2, HCM-3	Table HCM-1	
	(3)		The definable bottom of the basin.		7.1.3	Figure HCM-4		
	(4)		Principal aquifers and aquitards, including the following information:					
		(A)	Formation names, if defined.		7.1.4.1		Table HCM-2	
		(B)	Physical properties of aquifers and aquitards, including the vertical and lateral extent, hydraulic conductivity, and storativity, which may be based on existing technical studies or other best available information.		7.1.4.2 and 7.1.4.3	Figures HCM-5 to HCM-7	Table HCM-3	
		(C)	Structural properties of the basin that restrict groundwater flow within the principal aquifers, including information regarding stratigraphic changes, truncation of units, or other features.		7.1.4.4	Figure HCM-3		
		(D)	General water quality of the principal aquifers, which may be based on information derived from existing technical studies or regulatory programs.		7.1.4.5	Figure HCM-8		
		(E)	Identification of the primary use or uses of each aquifer, such as domestic, irrigation, or municipal water supply.		7.1.4.6	Figures PA-6 to PA-8		
	(5)		Identification of data gaps and uncertainty within the hydrogeologic conceptual model		7.1.5			

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				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(c)			The hydrogeologic conceptual model shall be represented graphically by at least two scaled cross-sections that display the information required by this section and are sufficient to depict major stratigraphic and structural features in the basin.		7.2	Figures HCM-9 to HCM-15		
(d)			Physical characteristics of the basin shall be represented on one or more maps that depict the following:					
	(1)		Topographic information derived from the U.S. Geological Survey or another reliable source.		7.3.1	Figure HCM-16		
	(2)		Surficial geology derived from a qualified map including the locations of cross-sections required by this Section.		7.3.2	Figure HCM-17		
	(3)		Soil characteristics as described by the appropriate Natural Resources Conservation Service soil survey or other applicable studies.		7.3.3	Figures HCM-18 to HCM-20		
	(4)		Delineation of existing recharge areas that substantially contribute to the replenishment of the basin, potential recharge areas, and discharge areas, including significant active springs, seeps, and wetlands within or adjacent to the basin.		7.3.4	Figures HCM-21, HCM-22		
	(5)		Surface water bodies that are significant to the management of the basin.		7.3.5	Figure HCM-23		
	(6)		The source and point of delivery for imported water supplies.		7.3.6	Figure HCM-24		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10733, and 10733.2, Water Code.					
§ 354.16.			**Groundwater Conditions**					
			Each Plan shall provide a description of current and historical groundwater conditions in the basin, including data from January 1, 2015, to current conditions, based on the best available information that includes the following:					
(a)			Groundwater elevation data demonstrating flow directions, lateral and vertical gradients, and regional pumping patterns, including:					
	(1)		Groundwater elevation contour maps depicting the groundwater table or potentiometric surface associated with the current seasonal high and seasonal low for each principal aquifer within the basin.		8.2.1	Figures GWC-2 to GWC-9		
	(2)		Hydrographs depicting long-term groundwater elevations, historical highs and lows, and hydraulic gradients between principal aquifers.		8.2.3, 8.2.4	Figures GWC-1 and GWC-10 to GWC-13	Table GWC-1	
(b)			A graph depicting estimates of the change in groundwater in storage, based on data, demonstrating the annual and cumulative change in the volume of groundwater in storage between seasonal high groundwater conditions, including the annual groundwater use and water year type.		8.3	Figures GWC-14, GWC-15	Tables GWC-2, GWC-3	

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(c)			Seawater intrusion conditions in the basin, including maps and cross-sections of the seawater intrusion front for each principal aquifer.		8.4			
(d)			Groundwater quality issues that may affect the supply and beneficial uses of groundwater, including a description and map of the location of known groundwater contamination sites and plumes.		8.5	Figures GWC-16 to GWC-41	Tables GWC-4 to GWC-8	
(e)			The extent, cumulative total, and annual rate of land subsidence, including maps depicting total subsidence, utilizing data available from the Department, as specified in Section 353.2, or the best available information.		8.6	Figures GWC-42 to GWC-53	Table GWC-9	
(f)			Identification of interconnected surface water systems within the basin and an estimate of the quantity and timing of depletions of those systems, utilizing data available from the Department, as specified in Section 353.2, or the best available information.		8.7	Figures GWC-54 to GWC-65	Tables GWC-10, GWC-11	
(g)			Identification of groundwater dependent ecosystems within the basin, utilizing data available from the Department, as specified in Section 353.2, or the best available information.		8.8	Figures GWC-66 to GWC-68	Tables GWC-12, GWC-13	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, and 10733.2, Water Code.					
§ 354.18.			**Water Budget**					
(a)			Each Plan shall include a water budget for the basin that provides an accounting and assessment of the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current and projected water budget conditions, and the change in the volume of water stored. Water budget information shall be reported in tabular and graphical form.		9	Figures WB-1 to WB-6	Tables WB-1 to WB-13	
(b)			The water budget shall quantify the following, either through direct measurements or estimates based on data:					
	(1)		Total surface water entering and leaving a basin by water source type.		9.2.1	Figure HCM-23	Table WB-2	
	(2)		Inflow to the groundwater system by water source type, including subsurface groundwater inflow and infiltration of precipitation, applied water, and surface water systems, such as lakes, streams, rivers, canals, springs and conveyance systems.		9.2.2		Tables WB-3, WB-4	
	(3)		Outflows from the groundwater system by water use sector, including evapotranspiration, groundwater extraction, groundwater discharge to surface water sources, and subsurface groundwater outflow.		9.2.2		Tables WB-3, WB-4	
	(4)		The change in the annual volume of groundwater in storage between seasonal high conditions.		9.3.3	Figures WB-3, WB-4	Tables WB-3, WB-4	
	(5)		If overdraft conditions occur, as defined in Bulletin 118, the water budget shall include a quantification of overdraft over a period of years during which water year and water supply conditions approximate average conditions.		9.3.4	Figures WB-3, WB-4	Tables WB-3, WB-4, WB-11	
	(6)		The water year type associated with the annual supply, demand, and change in groundwater stored.		9.1			

				GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(7)		An estimate of sustainable yield for the basin.		9.5		Table WB-13	
(c)			Each Plan shall quantify the current, historical, and projected water budget for the basin as follows:					
	(1)		Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information.		9.3.2		Tables WB-3, WB-4	
	(2)		Historical water budget information shall be used to evaluate availability or reliability of past surface water supply deliveries and aquifer response to water supply and demand trends relative to water year type. The historical water budget shall include the following:					
		(A)	A quantitative evaluation of the availability or reliability of historical surface water supply deliveries as a function of the historical planned versus actual annual surface water deliveries, by surface water source and water year type, and based on the most recent ten years of surface water supply information.		9.3.1.1			
		(B)	A quantitative assessment of the historical water budget, starting with the most recently available information and extending back a minimum of 10 years, or as is sufficient to calibrate and reduce the uncertainty of the tools and methods used to estimate and project future water budget information and future aquifer response to proposed sustainable groundwater management practices over the planning and implementation horizon.		9.3.1			
		(C)	A description of how historical conditions concerning hydrology, water demand, and surface water supply availability or reliability have impacted the ability of the Agency to operate the basin within sustainable yield. Basin hydrology may be characterized and evaluated using water year type.		9.3.4.1	Figures WB-3, WB-4	Tables WB-3, WB-4, WB-11	
	(3)		Projected water budgets shall be used to estimate future baseline conditions of supply, demand, and aquifer response to Plan implementation, and to identify the uncertainties of these projected water budget components. The projected water budget shall utilize the following methodologies and assumptions to estimate future baseline conditions concerning hydrology, water demand and surface water supply availability or reliability over the planning and implementation horizon:					
		(A)	Projected hydrology shall utilize 50 years of historical precipitation, evapotranspiration, and streamflow information as the baseline condition for estimating future hydrology. The projected hydrology information shall also be applied as the baseline condition used to evaluate future scenarios of hydrologic uncertainty associated with projections of climate change and sea level rise.		9.4.1			

Article 5.			Plan Contents for Sample Basin	GSP Document References				
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		(B)	Projected water demand shall utilize the most recent land use, evapotranspiration, and crop coefficient information as the baseline condition for estimating future water demand. The projected water demand information shall also be applied as the baseline condition used to evaluate future scenarios of water demand uncertainty associated with projected changes in local land use planning, population growth, and climate.		9.4.2			
		(C)	Projected surface water supply shall utilize the most recent water supply information as the baseline condition for estimating future surface water supply. The projected surface water supply shall also be applied as the baseline condition used to evaluate future scenarios of surface water supply availability and reliability as a function of the historical surface water supply identified in Section 354.18(c)(2)(A), and the projected changes in local land use planning, population growth, and climate.		9.4.3, 9.4.4		Tables WB-3, WB-4, WB-11	
(d)			The Agency shall utilize the following information provided, as available, by the Department pursuant to Section 353.2, or other data of comparable quality, to develop the water budget:					
	(1)		Historical water budget information for mean annual temperature, mean annual precipitation, water year type, and land use.		9.3.1		Tables WB-2 to WB-4	
	(2)		Current water budget information for temperature, water year type, evapotranspiration, and land use.		9.3.2		Tables WB-2 to WB-4	
	(3)		Projected water budget information for population, population growth, climate change, and sea level rise.		9.4.4.1	Figures WB-5, WB-6	Tables WB-9 to WB-11	
(e)			Each Plan shall rely on the best available information and best available science to quantify the water budget for the basin in order to provide an understanding of historical and projected hydrology, water demand, water supply, land use, population, climate change, sea level rise, groundwater and surface water interaction, and subsurface groundwater flow. If a numerical groundwater and surface water model is not used to quantify and evaluate the projected water budget conditions and the potential impacts to beneficial uses and users of groundwater, the Plan shall identify and describe an equally effective method, tool, or analytical model to evaluate projected water budget conditions.		9.1	Figures WB-1, WB-2		
(f)			The Department shall provide the California Central Valley Groundwater-Surface Water Simulation Model (C2VSIM) and the Integrated Water Flow Model (IWFM) for use by Agencies in developing the water budget. Each Agency may choose to use a different groundwater and surface water model, pursuant to Section 352.4.		9, 9.1.1	Figures WB-1, WB-2		
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10727.6, 10729, and 10733.2, Water Code.					
§ 354.20.			**Management Areas**					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(a)			Each Agency may define one or more management areas within a basin if the Agency has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin.		10			
(b)			A basin that includes one or more management areas shall describe the following in the Plan:					
	(1)		The reason for the creation of each management area.					Not applicable
	(2)		The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.					Not applicable
	(3)		The level of monitoring and analysis appropriate for each management area.					Not applicable
	(4)		An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.					Not applicable
(c)			If a Plan includes one or more management areas, the Plan shall include descriptions, maps, and other information required by this Subarticle sufficient to describe conditions in those areas.					Not applicable
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10733.2 and 10733.4, Water Code.					
SubArticle 3.			**Sustainable Management Criteria**					
§ 354.22.			**Introduction to Sustainable Management Criteria**					
			This Subarticle describes criteria by which an Agency defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the Agency shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.24.			**Sustainability Goal**					
			Each Agency shall establish in its Plan a sustainability goal for the basin that culminates in the absence of undesirable results within 20 years of the applicable statutory deadline. The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.		12			

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			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10727, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.26.			**Undesirable Results**					
(a)			Each Agency shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin. Undesirable results occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.		11, 13.1.1, 13.2.1, 13.3.1, 13.4.1, 13.5.1, 13.6.1	Table SMC-1		
(b)			The description of undesirable results shall include the following:					
	(1)		The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results based on information described in the basin setting, and other data or models as appropriate.		13.1.1.2, 13.2.1.2, 13.4.1.2, 13.5.1.2, 13.6.1.2			
	(2)		The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator. The criteria shall be based on a quantitative description of the combination of minimum threshold exceedances that cause significant and unreasonable effects in the basin.		13.1.1.3, 13.2.1.3, 13.4.1.3, 13.5.1.3, 13.6.1.3			
	(3)		Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.		13.1.1.4, 13.2.1.4, 13.4.1.4, 13.5.1.4, 13.6.1.4			
(c)			The Agency may need to evaluate multiple minimum thresholds to determine whether an undesirable result is occurring in the basin. The determination that undesirable results are occurring may depend upon measurements from multiple monitoring sites, rather than a single monitoring site.		13.2.1.3, 13.4.1.3, 13.5.1.3, 13.6.1.3			
(d)			An Agency that is able to demonstrate that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin shall not be required to establish criteria for undesirable results related to those sustainability indicators.		13.3.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10721, 10723.2, 10727.2, 10733.2, and 10733.8, Water Code.					
§ 354.28.			**Minimum Thresholds**					
(a)			Each Agency in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.		13.1.2, 13.2.2, 13.3.2, 13.4.2, 13.5.2, 13.6.2	Figures SMC-1, SMC-9	Tables SMC-1, SMC-2, SMC-8, SMC-9	

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(b)			The description of minimum thresholds shall include the following:					
	(1)		The information and criteria relied upon to establish and justify the minimum thresholds for each sustainability indicator. The justification for the minimum threshold shall be supported by information provided in the basin setting, and other data or models as appropriate, and qualified by uncertainty in the understanding of the basin setting.		13.1.2.1, 13.4.2.1, 13.5.2.1, 13.6.2.1	Figures SMC-9, SMC-14	Tables SMC-6, SMC-7	
	(2)		The relationship between the minimum thresholds for each sustainability indicator, including an explanation of how the Agency has determined that basin conditions at each minimum threshold will avoid undesirable results for each of the sustainability indicators.		13.1.2.2, 13.4.2.2, 13.5.2.2, 13.6.2.2			
	(3)		How minimum thresholds have been selected to avoid causing undesirable results in adjacent basins or affecting the ability of adjacent basins to achieve sustainability goals.		13.1.2.3, 13.4.2.3, 13.5.2.3, 13.6.2.3	Figures SMC-2, SMC-3		
	(4)		How minimum thresholds may affect the interests of beneficial uses and users of groundwater or land uses and property interests.		13.1.2.4, 13.4.2.4, 13.5.2.4, 13.6.2.4	Figures SMC-4 to SMC-7, SMC-10 to SMC-13	Tables SMC-3, SMC-4	
	(5)		How state, federal, or local standards relate to the relevant sustainability indicator. If the minimum threshold differs from other regulatory standards, the Agency shall explain the nature of and basis for the difference.		13.1.2.5, 13.4.2.5, 13.5.2.5, 13.6.2.5			
	(6)		How each minimum threshold will be quantitatively measured, consistent with the monitoring network requirements described in Subarticle 4.		13.1.2.6, 13.4.2.6, 13.5.2.6, 13.6.2.6			
(c)			Minimum thresholds for each sustainability indicator shall be defined as follows:					
	(1)		Chronic Lowering of Groundwater Levels. The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results. Minimum thresholds for chronic lowering of groundwater levels shall be supported by the following:					
		(A)	The rate of groundwater elevation decline based on historical trends, water year type, and projected water use in the basin.		13.1.2.1			
		(B)	Potential effects on other sustainability indicators.		13.1.2.2			
	(2)		Reduction of Groundwater Storage. The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results. Minimum thresholds for reduction of groundwater storage shall be supported by the sustainable yield of the basin, calculated based on historical trends, water year type, and projected water use in the basin.		13.2.2		Table SMC-4	

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(3)		Seawater Intrusion. The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Minimum thresholds for seawater intrusion shall be supported by the following:					
		(A)	Maps and cross-sections of the chloride concentration isocontour that defines the minimum threshold and measurable objective for each principal aquifer.					Not applicable
		(B)	A description of how the seawater intrusion minimum threshold considers the effects of current and projected sea levels.					Not applicable
	(4)		Degraded Water Quality. The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the Agency that may lead to undesirable results. The minimum threshold shall be based on the number of supply wells, a volume of water, or a location of an isocontour that exceeds concentrations of constituents determined by the Agency to be of concern for the basin. In setting minimum thresholds for degraded water quality, the Agency shall consider local, state, and federal water quality standards applicable to the basin.		13.4.2	Figure SMC-9	Tables SMC-6, SMC-7	
	(5)		Land Subsidence. The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds for land subsidence shall be supported by the following:					
		(A)	Identification of land uses and property interests that have been affected or are likely to be affected by land subsidence in the basin, including an explanation of how the Agency has determined and considered those uses and interests, and the Agency's rationale for establishing minimum thresholds in light of those effects.		13.5.1.1	Figure SMC-14		
		(B)	Maps and graphs showing the extent and rate of land subsidence in the basin that defines the minimum threshold and measurable objectives.		13.5.2, 13.5.3		Table SMC-9	
	(6)		Depletions of Interconnected Surface Water. The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has adverse impacts on beneficial uses of the surface water and may lead to undesirable results. The minimum threshold established for depletions of interconnected surface water shall be supported by the following:					
		(A)	The location, quantity, and timing of depletions of interconnected surface water.		8.7	Figures GWC-54 to GWC-65	Tables GWC-10, GWC-11	

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
		(B)	A description of the groundwater and surface water model used to quantify surface water depletion. If a numerical groundwater and surface water model is not used to quantify surface water depletion, the Plan shall identify and describe an equally effective method, tool, or analytical model to accomplish the requirements of this Paragraph.		8.7.2	Figure GWC-65	Tables GWC-10, GWC-11	
(d)			An Agency may establish a representative minimum threshold for groundwater elevation to serve as the value for multiple sustainability indicators, where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual minimum thresholds as supported by adequate evidence.		13.2.2.1			
(e)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish minimum thresholds related to those sustainability indicators.		13.3.2		Table SMC-4	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10733, 10733.2, and 10733.8, Water Code.					
§ 354.30.			**Measurable Objectives**					
(a)			Each Agency shall establish measurable objectives, including interim milestones in increments of five years, to achieve the sustainability goal for the basin within 20 years of Plan implementation and to continue to sustainably manage the groundwater basin over the planning and implementation horizon.		13.1.3, 13.2.3, 13.3.3, 13.4.3, 13.5.3, 13.6.3	Figure SMC-8	Tables SMC-1, SMC-2, SMC-5, SMC-8, SMC-9	
(b)			Measurable objectives shall be established for each sustainability indicator, based on quantitative values using the same metrics and monitoring sites as are used to define the minimum thresholds.		13.1.3.1, 13.2.3, 13.3.3, 13.4.3.1, 13.5.3.1, 13.6.3.1	Figure SMC-8	Tables SMC-1, SMC-2, SMC-5, SMC-8, SMC-9	
(c)			Measurable objectives shall provide a reasonable margin of operational flexibility under adverse conditions which shall take into consideration components such as historical water budgets, seasonal and long-term trends, and periods of drought, and be commensurate with levels of uncertainty.		13.1.3.1, 13.2.3, 13.4.3, 13.5.3.1,	Figure SMC-8	1, SMC-2, SMC-5, SMC-8, SMC-9	
(d)			An Agency may establish a representative measurable objective for groundwater elevation to serve as the value for multiple sustainability indicators where the Agency can demonstrate that the representative value is a reasonable proxy for multiple individual measurable objectives as supported by adequate evidence.		13.2.3		Table SMC-5	
(e)			Each Plan shall describe a reasonable path to achieve the sustainability goal for the basin within 20 years of Plan implementation, including a description of interim milestones for each relevant sustainability indicator, using the same metric as the measurable objective, in increments of five years. The description shall explain how the Plan is likely to maintain sustainable groundwater management over the planning and implementation horizon.		13.1.3.2, 13.2.3, 13.3.3, 13.4.3.2, 13.5.3.2, 13.6.3.2		Tables SMC-2, SMC-5, SMC-8, SMC-9	

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(f)			Each Plan may include measurable objectives and interim milestones for additional Plan elements described in Water Code Section 10727.4 where the Agency determines such measures are appropriate for sustainable groundwater management in the basin.					Not applicable
(g)			An Agency may establish measurable objectives that exceed the reasonable margin of operational flexibility for the purpose of improving overall conditions in the basin, but failure to achieve those objectives shall not be grounds for a finding of inadequacy of the Plan.					Not applicable
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					
SubArticle 4.			**Monitoring Networks**					
§ 354.32.			**Introduction to Monitoring Networks**					
			This Subarticle describes the monitoring network that shall be developed for each basin, including monitoring objectives, monitoring protocols, and data reporting requirements. The monitoring network shall promote the collection of data of sufficient quality, frequency, and distribution to characterize groundwater and related surface water conditions in the basin and evaluate changing conditions that occur through implementation of the Plan.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.34.			**Monitoring Network**					
(a)			Each Agency shall develop a monitoring network capable of collecting sufficient data to demonstrate short-term, seasonal, and long-term trends in groundwater and related surface conditions, and yield representative information about groundwater conditions as necessary to evaluate Plan implementation.		14	Figures MN-1 to MN-10	Tables MN-1, MN-2	
(b)			Each Plan shall include a description of the monitoring network objectives for the basin, including an explanation of how the network will be developed and implemented to monitor groundwater and related surface conditions, and the interconnection of surface water and groundwater, with sufficient temporal frequency and spatial density to evaluate the affects and effectiveness of Plan implementation. The monitoring network objectives shall be implemented to accomplish the following:					
	(1)		Demonstrate progress toward achieving measurable objectives described in the Plan.		14.1			
	(2)		Monitor impacts to the beneficial uses or users of groundwater.		14.1			
	(3)		Monitor changes in groundwater conditions relative to measurable objectives and minimum thresholds.		14.1			
	(4)		Quantify annual changes in water budget components.		14.1			
(c)			Each monitoring network shall be designed to accomplish the following for each sustainability indicator:					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		Chronic Lowering of Groundwater Levels. Demonstrate groundwater occurrence, flow directions, and hydraulic gradients between principal aquifers and surface water features by the following methods:					
		(A)	A sufficient density of monitoring wells to collect representative measurements through depth-discrete perforated intervals to characterize the groundwater table or potentiometric surface for each principal aquifer.		14.2.1	Figures MN-1 to MN-4	Table MN-1	
		(B)	Static groundwater elevation measurements shall be collected at least two times per year, to represent seasonal low and seasonal high groundwater conditions.		14.2.1		Table MN-1	
	(2)		Reduction of Groundwater Storage. Provide an estimate of the change in annual groundwater in storage.		14.2.2		Table MN-1	
	(3)		Seawater Intrusion. Monitor seawater intrusion using chloride concentrations, or other measurements convertible to chloride concentrations, so that the current and projected rate and extent of seawater intrusion for each applicable principal aquifer may be calculated.		14.2.3		Table MN-1	
	(4)		Degraded Water Quality. Collect sufficient spatial and temporal data from each applicable principal aquifer to determine groundwater quality trends for water quality indicators, as determined by the Agency, to address known water quality issues.		14.2.4	Figures MN-5 to MN-8	Table MN-1	
	(5)		Land Subsidence. Identify the rate and extent of land subsidence, which may be measured by extensometers, surveying, remote sensing technology, or other appropriate method.		14.2.5	Figure MN-9	Table MN-2	
	(6)		Depletions of Interconnected Surface Water. Monitor surface water and groundwater, where interconnected surface water conditions exist, to characterize the spatial and temporal exchanges between surface water and groundwater, and to calibrate and apply the tools and methods necessary to calculate depletions of surface water caused by groundwater extractions. The monitoring network shall be able to characterize the following:					
		(A)	Flow conditions including surface water discharge, surface water head, and baseflow contribution.		14.2.6			
		(B)	Identifying the approximate date and location where ephemeral or intermittent flowing streams and rivers cease to flow, if applicable.		14.2.6			
		(C)	Temporal change in conditions due to variations in stream discharge and regional groundwater extraction.		14.2.6			
		(D)	Other factors that may be necessary to identify adverse impacts on beneficial uses of the surface water.		14.2.6			
(d)			The monitoring network shall be designed to ensure adequate coverage of sustainability indicators. If management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.		14.2		Tables MN-1, MN-2	

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
(e)			A Plan may utilize site information and monitoring data from existing sources as part of the monitoring network.		14.2.5, 14.2.6		Tables MN-1, MN-2	
(f)			The Agency shall determine the density of monitoring sites and frequency of measurements required to demonstrate short-term, seasonal, and long-term trends based upon the following factors:					
	(1)		Amount of current and projected groundwater use.		14.2			
	(2)		Aquifer characteristics, including confined or unconfined aquifer conditions, or other physical characteristics that affect groundwater flow.		14.2			
	(3)		Impacts to beneficial uses and users of groundwater and land uses and property interests affected by groundwater production, and adjacent basins that could affect the ability of that basin to meet the sustainability goal.		14.2	Figures MN-2, MN-6		
	(4)		Whether the Agency has adequate long-term existing monitoring results or other technical information to demonstrate an understanding of aquifer response.		14.2, 14.5			
(g)			Each Plan shall describe the following information about the monitoring network:					
	(1)		Scientific rationale for the monitoring site selection process.		14.2			
	(2)		Consistency with data and reporting standards described in Section 352.4. If a site is not consistent with those standards, the Plan shall explain the necessity of the site to the monitoring network, and how any variation from the standards will not affect the usefulness of the results obtained.		14.2			
	(3)		For each sustainability indicator, the quantitative values for the minimum threshold, measurable objective, and interim milestones that will be measured at each monitoring site or representative monitoring sites established pursuant to Section 354.36.		14.2, 13	Figures SMC-1, SMC-8, SMC-14	Tables SMC-1, SMC-8, SMC-9	
(h)			The location and type of each monitoring site within the basin displayed on a map, and reported in tabular format, including information regarding the monitoring site type, frequency of measurement, and the purposes for which the monitoring site is being used.		14.2	Figures MN-1, MN-5, MN-9, MN-10	Tables MN-1, MN-2	
(i)			The monitoring protocols developed by each Agency shall include a description of technical standards, data collection methods, and other procedures or protocols pursuant to Water Code Section 10727.2(f) for monitoring sites or other data collection facilities to ensure that the monitoring network utilizes comparable data and methodologies.		14.3			
(j)			An Agency that has demonstrated that undesirable results related to one or more sustainability indicators are not present and are not likely to occur in a basin, as described in Section 354.26, shall not be required to establish a monitoring network related to those sustainability indicators.		14.2.3, 14.2.6			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10727.4, 10728, 10733, 10733.2, and 10733.8, Water Code					
§ 354.36.			**Representative Monitoring**					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
			Each Agency may designate a subset of monitoring sites as representative of conditions in the basin or an area of the basin, as follows:					
(a)			Representative monitoring sites may be designated by the Agency as the point at which sustainability indicators are monitored, and for which quantitative values for minimum thresholds, measurable objectives, and interim milestones are defined.		14.4			
(b)			(b) Groundwater elevations may be used as a proxy for monitoring other sustainability indicators if the Agency demonstrates the following:					
	(1)		Significant correlation exists between groundwater elevations and the sustainability indicators for which groundwater elevation measurements serve as a proxy.		14.4.1.2			
	(2)		Measurable objectives established for groundwater elevation shall include a reasonable margin of operational flexibility taking into consideration the basin setting to avoid undesirable results for the sustainability indicators for which groundwater elevation measurements serve as a proxy.		14.4.1.2			
(c)			The designation of a representative monitoring site shall be supported by adequate evidence demonstrating that the site reflects general conditions in the area.		14.4.1.1			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2 and 10733.2, Water Code					
§ 354.38.			**Assessment and Improvement of Monitoring Network**					
(a)			Each Agency shall review the monitoring network and include an evaluation in the Plan and each five-year assessment, including a determination of uncertainty and whether there are data gaps that could affect the ability of the Plan to achieve the sustainability goal for the basin.		14.5			
(b)			Each Agency shall identify data gaps wherever the basin does not contain a sufficient number of monitoring sites, does not monitor sites at a sufficient frequency, or utilizes monitoring sites that are unreliable, including those that do not satisfy minimum standards of the monitoring network adopted by the Agency.		14.5			
(c)			If the monitoring network contains data gaps, the Plan shall include a description of the following:					
	(1)		The location and reason for data gaps in the monitoring network.		14.5			
	(2)		Local issues and circumstances that limit or prevent monitoring.					Not applicable
(d)			Each Agency shall describe steps that will be taken to fill data gaps before the next five-year assessment, including the location and purpose of newly added or installed monitoring sites.		14.5			
(e)			Each Agency shall adjust the monitoring frequency and density of monitoring sites to provide an adequate level of detail about site-specific surface water and groundwater conditions and to assess the effectiveness of management actions under circumstances that include the following:					

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
	(1)		Minimum threshold exceedances.		14.5			
	(2)		Highly variable spatial or temporal conditions.		14.5			
	(3)		Adverse impacts to beneficial uses and users of groundwater.		14.5			
	(4)		The potential to adversely affect the ability of an adjacent basin to implement its Plan or impede achievement of sustainability goals in an adjacent basin.		14.5			
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10723.2, 10727.2, 10728.2, 10733, 10733.2, and 10733.8, Water Code					
§ 354.40.			**Reporting Monitoring Data to the Department**					
			Monitoring data shall be stored in the data management system developed pursuant to Section 352.6. A copy of the monitoring data shall be included in the Annual Report and submitted electronically on forms provided by the Department.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10728, 10728.2, 10733.2, and 10733.8, Water Code.					
SubArticle 5.			**Projects and Management Actions**					
§ 354.42.			**Introduction to Projects and Management Actions**					
			This Subarticle describes the criteria for projects and management actions to be included in a Plan to meet the sustainability goal for the basin in a manner that can be maintained over the planning and implementation horizon.					
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Section 10733.2, Water Code.					
§ 354.44.			**Projects and Management Actions**					
(a)			Each Plan shall include a description of the projects and management actions the Agency has determined will achieve the sustainability goal for the basin, including projects and management actions to respond to changing conditions in the basin.		15	Figures PMA-1 to PMA-7	Tables PMA-1 to PMA-7	
(b)			Each Plan shall include a description of the projects and management actions that include the following:					
	(1)		A list of projects and management actions proposed in the Plan with a description of the measurable objective that is expected to benefit from the project or management action. The list shall include projects and management actions that may be utilized to meet interim milestones, the exceedance of minimum thresholds, or where undesirable results have occurred or are imminent. The Plan shall include the following:					
		(A)	A description of the circumstances under which projects or management actions shall be implemented, the criteria that would trigger implementation and termination of projects or management actions, and the process by which the Agency shall determine that conditions requiring the implementation of particular projects or management actions have occurred.		15.4		Table PMA-1	

Article 5.			Plan Contents for Sample Basin	GSP Document References				
				Page Numbers of Plan	Or Section Numbers	Or Figure Numbers	Or Table Numbers	Notes
		(B)	The process by which the Agency shall provide notice to the public and other agencies that the implementation of projects or management actions is being considered or has been implemented, including a description of the actions to be taken.		15.5		Table PMA-1	
	(2)		If overdraft conditions are identified through the analysis required by Section 354.18, the Plan shall describe projects or management actions, including a quantification of demand reduction or other methods, for the mitigation of overdraft.		15.6	Figures PMA-2 to PMA-7	Tables PMA-4 to PMA-7	
	(3)		A summary of the permitting and regulatory process required for each project and management action.		15.7		Table PMA-1	
	(4)		The status of each project and management action, including a time-table for expected initiation and completion, and the accrual of expected benefits.		15.8		Table PMA-2	
	(5)		An explanation of the benefits that are expected to be realized from the project or management action, and how those benefits will be evaluated.		15.9		Table PMA-2	
	(6)		An explanation of how the project or management action will be accomplished. If the projects or management actions rely on water from outside the jurisdiction of the Agency, an explanation of the source and reliability of that water shall be included.		15.10		Table PMA-2	
	(7)		A description of the legal authority required for each project and management action, and the basis for that authority within the Agency.		15.11		Table PMA-2	
	(8)		A description of the estimated cost for each project and management action and a description of how the Agency plans to meet those costs.		15.12		Table PMA-2	
	(9)		A description of the management of groundwater extractions and recharge to ensure that chronic lowering of groundwater levels or depletion of supply during periods of drought is offset by increases in groundwater levels or storage during other periods.		15.13			
(c)			Projects and management actions shall be supported by best available information and best available science.		15		Tables PMA-1 to PMA-7	
(d)			An Agency shall take into account the level of uncertainty associated with the basin setting when developing projects or management actions.		15.6	Figures PMA-2 to PMA-7	Tables PMA-4 to PMA-7	
			Note: Authority cited: Section 10733.2, Water Code.					
			Reference: Sections 10727.2, 10727.4, and 10733.2, Water Code.					

Appendix B

DWR Determination Letters

Appendix B-1

2023 Inadequate Determination

March 2, 2023

John Brodie
San Luis & Delta-Mendota Water Authority
P.O. Box 2157
842 6th Street
Los Banos, CA 93635
john.brodie@sldmwa.org

RE: Inadequate Determination of the Revised 2020 Groundwater Sustainability Plans Submitted for the San Joaquin Valley Basin - Delta-Mendota Subbasin

Dear John Brodie,

The Department of Water Resources (Department) has evaluated the six groundwater sustainability plans (GSPs or Plan) submitted for the San Joaquin Valley – Delta-Mendota Subbasin (Subbasin), as well as the materials considered to be part of the required coordination agreement. Collectively, the six GSPs and the coordination agreement are referred to as the Plan for the Subbasin. The Department has evaluated the revised Plan for the San Joaquin Valley Basin – Delta-Mendota Subbasin in response to the Department's incomplete determination on January 21, 2022, and has determined that the actions taken to correct deficiencies identified by the Department were not sufficient (23 CCR § 355.2(e)(3)(C)).

The Department based its inadequate determination on recommendations from the Staff Report, included as an enclosure to the attached Statement of Findings, which explains why the Department believes that the Subbasin's Plan did not take sufficient actions to correct the deficiencies previously identified by the Department and, therefore, does not substantially comply with the GSP Regulations nor satisfy the objectives of the Sustainable Groundwater Management Act (SGMA).

Once the Department determines that a GSP is inadequate, primary jurisdiction shifts from the Department to the State Water Resources Control Board (State Board), which may designate the basin probationary (Water Code § 10735.2(a)). However, Department involvement does not end at that point; the Department may, at the request of the State Board, further assess a plan, including any updates, and may provide technical recommendations to remedy deficiencies to that plan. In addition, the responsibilities of the GSA do not end with an inadequate determination. Regardless of the status of a plan, a GSA remains obligated to continue collecting and submitting monitoring network data (Water Code Part 2.11; Water Code § 10727.2; 23 CCR § 353.40; 23 CCR § 354.40), submit an annual report to the Department (Water Code §

10728; 23 CCR § 356.2), conduct periodic updates to the plan at least every five years (Water Code § 10728.2; 23 CCR § 356.4), and submit this information to DWR's SGMA Portal (23 CCR § 354.40). The Department also encourages GSAs to continue implementation efforts on project and management actions that will support the Subbasin's progress towards achieving sustainability.

Prior to this determination, the Department consulted with the State Board as required by SGMA (Water Code § 10735.2(a)(3)). Moving forward, for questions related to state intervention, please send a request to sgma@Waterboards.ca.gov. For any questions related to assessments, the State Board will coordinate with the Department.

For any other questions, please contact Sustainable Groundwater Management staff by emailing sgmps@water.ca.gov.

Thank You,

Paul Gosselin

Paul Gosselin
Deputy Director
Sustainable Groundwater Management

Attachment:

1. Statement of Findings Regarding the Inadequate Determination of the San Joaquin Valley Basin - Delta-Mendota Subbasin Groundwater Sustainability Plans

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE DETERMINATION OF INADEQUATE STATUS OF THE SAN JOAQUIN VALLEY – DELTA-MENDOTA SUBBASIN GROUNDWATER SUSTAINABILITY PLAN

The Department of Water Resources (Department) is required to evaluate whether a submitted groundwater sustainability plan (GSP or Plan) conforms to specific requirements of the Sustainable Groundwater Management Act (SGMA or Act), is likely to achieve the sustainability goal for the basin covered by the Plan, and whether the Plan adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) The Department is directed to issue an assessment of the Plan within two years of its submission. (Water Code § 10733.4.) If a Plan is determined to be incomplete, the Department identifies deficiencies that preclude approval of the Plan and identifies corrective actions required to make the Plan compliant with SGMA and the GSP Regulations. The groundwater sustainability agencies (GSAs) have up to 180 days from the date the Department issues its assessment to make the necessary corrections and submit a revised Plan. (23 CCR § 355.2(e)(2).)

This Statement of Findings explains the Department's decision regarding the resubmitted Plan, comprised of six (6) individual GSPs and a Coordination Agreement prepared and submitted respectfully, by the following twenty-three (23) GSAs: Aliso Water District GSA, Farmers Water District GSA, County of Fresno GSA (Management Areas A and B), Grasslands GSA, County of Merced GSA, Oro Loma GSA, DM-II GSA, Patterson Irrigation District GSA, Widren Water District GSA, City of Patterson GSA, Northwestern Delta-Mendota GSA, West Stanislaus Irrigation District GSA, Central Delta-Mendota GSA, San Joaquin River Exchange Contractors GSA, City of Firebaugh GSA, City of Los Banos GSA, City of Newman GSA, City of Dos Palos GSA, City of Guistine GSA, City of Mendota GSA, County of Madera GSA, and Turner Island Water District GSA (GSAs or Agencies) for the Delta-Mendota Subbasin (Basin No. 5-022.07).

Department management has discussed the Subbasin's Plan with staff and has reviewed the Department Staff Report, entitled *Groundwater Sustainability Plan Assessment Staff Report – San Joaquin Valley – Delta-Mendota Subbasin*, as enclosed, recommending an inadequate determination of the Plan collectively prepared for the Subbasin. Department management is satisfied that staff have conducted a thorough evaluation and assessment of the revised Plan and concurs with staff's recommendation. The Department therefore finds the revised Plan **INADEQUATE** and makes the following findings:

A. The initial Plan for the Subbasin submitted by the GSAs for the Department's evaluation satisfied the required conditions as outlined in § 355.4(a) of the

GSP Regulations (23 CCR § 350 et seq.), and Department Staff therefore evaluated the initial Plan.

B. On January 23, 2022, the Department issued a Staff Report and Findings determining the initial Plan submitted by the Agencies in the Subbasin to be incomplete, because the Plan did not satisfy the requirements of SGMA, nor did it substantially comply with the GSP Regulations. At that time, the Department provided required corrective actions in the Staff Report that were intended to address the deficiencies that precluded approval. Consistent with the GSP Regulations, the Department provided the Agencies with up to 180 days to address the deficiencies detailed in the Staff Report. On July 20, 2022, within the 180 days provided to remedy the deficiencies identified in the Staff Report related to the Department's initial incomplete determination, the Agencies resubmitted a revised Plan to the Department for evaluation. When evaluating a revised Plan that was initially determined to be incomplete, the Department reviews the materials (e.g., revised or amended GSPs) that were submitted within the 180-day deadline and does not review or rely on materials that were submitted to the Department by the GSAs after the resubmission deadline. Furthermore, the Department does not conduct a full evaluation of all components of a revised Plan, but instead focuses on how the Agencies have addressed the previously identified deficiencies that precluded approval of the initially submitted Plan. The Department shall find a Plan previously determined to be incomplete to be inadequate if, after consultation with the State Water Resources Control Board, the Agencies have not taken sufficient actions to correct the deficiencies previously identified by the Department. (23 CCR § 355.2(e)(3)(C).)

C. The Department's initial Staff Report identified the deficiencies that precluded approval of the initially submitted Plan. After staff's thorough evaluation of the revised Plan, the Department makes the following findings regarding the sufficiency of the actions taken by the Agencies to correct those deficiencies:

1. <u>Deficiency 1:</u> The corrective action advised the Agencies to better address and demonstrate that the multiple, individual GSPs comprising the Plan use the same data and methodologies for various Plan components as required by SGMA and the GSP Regulations. Although the revised GSPs included revisions intended to respond to the corrective action, the Agencies did not provide sufficient information to demonstrate or support a conclusion that numerous components of the six GSPs, including water budget, change in storage, and sustainable yield, are or will use the same data or methodologies as required. Staff noted that the coordination

agreement and various technical memoranda that are part of the proposed management program remain unchanged, making it unclear how or whether certain revisions in some GSPs would be carried through on a basinwide scale. The Staff Report indicates the Agencies did not take sufficient actions to correct this deficiency, which materially affects the ability of the Agencies to achieve sustainability and the ability of the Department to evaluate the likelihood of the Plan to achieve sustainability.

2. Deficiency 2: The corrective action advised the Agencies to develop and establish common definitions of undesirable results for the entire Subbasin. Although the revised Plan included revisions intended to respond to the corrective action, the Plan does not describe or demonstrate that common definitions for undesirable results will be used throughout the Subbasin. While the new undesirable result definitions for each of the five applicable sustainability indicators seem to be aligned across the Subbasin's six GSPs, the coordination agreement and the associated technical memoranda reflect the old definitions that allows each GSP group to locally define sustainability, and no new supporting information is provided to justify the new groundwater management approach. The Plan does not explain what are now considered to be significant and unreasonable conditions for each of the sustainability indicators. The Staff Report indicates that the Agencies did not take sufficient actions to correct this deficiency, which materially affects the ability of the Agencies to achieve sustainability and the ability of the Department to evaluate the likelihood of the Plan to achieve sustainability.

3. Deficiency 3: The corrective action advised the Agencies to set sustainable management criteria in accordance with the GSP Regulations, particularly identifying a need for the various individual GSPs to demonstrate coordinated and consistent criteria for each undesirable result under SGMA. Although the revised Plan included revisions intended to respond to the corrective action, the GSPs do not describe or demonstrate that common definitions for undesirable results and related sustainable management criteria will be used throughout the Subbasin. Additionally, sustainable management criteria was not developed consistent with the GSP Regulations. The Staff Report indicates that the Agencies did not take sufficient actions to correct this deficiency, which materially affects the ability of the Agencies to achieve sustainability and the ability of the Department to evaluate the likelihood of the Plan to achieve sustainability.

4. <u>Deficiency 4:</u> The corrective action advised the Agencies to better describe and support the creation of numerous formal management areas within the Subbasin as required by the GSP Regulations. The revised GSP has eliminated the use of the formal term management areas in the Plan. The Staff Report indicates that the Agencies did take sufficient action to correct this deficiency, but Department staff remain concerned that mere elimination of the term "management area" without concurrent and commensurate revisions to the individual GSPs may continue to complicate or impede basin management towards sustainability goals. The Department will track this issue during Plan implementation and, if needed, revisit this issue in future periodic Plan evaluations.

D. In addition to the grounds listed above, the Department also finds that:

1. The Department developed its GSP Regulations consistent with and intending to further the state policy regarding the human right to water (Water Code § 106.3) through implementation of SGMA and the Regulations, primarily by achieving sustainable groundwater management in a basin. By ensuring substantial compliance with the GSP Regulations the Department has considered the state policy regarding the human right to water in its evaluation of the Plan. (23 CCR § 350.4(g).)

2. The California Environmental Quality Act (Public Resources Code § 21000 *et seq*.) does not apply to the Department's evaluation and assessment of the Plan.

SGMA requires basins to achieve sustainability within 20 years of Plan implementation and requires local GSAs and the Department to continually evaluate a basin's progress towards achieving its sustainability goals. SGMA also requires GSAs to encourage the active involvement of diverse social, cultural, and economic elements of the population within each basin prior to and during development and implementation of Plans. Under SGMA, the GSP is the primary document disclosing and informing the Department, local GSA boards, other local and state agencies, and interested or affected parties of the intended management program for the basin and the potential physical or regulatory impacts or changes that may occur within the basin during decades of Plan implementation. It is therefore essential that each basin begin with a Plan that adequately analyzes, discloses, and informs and that each Plan conform with certain requirements of SGMA and substantially comply with the GSP Regulations. For the reasons stated here and further discussed in the Staff Report, the revised Plan for the Delta-Mendota Subbasin is hereby determined to be **INADEQUATE**.

Signed:

Karla Nemeth

Karla Nemeth, Director
Date: March 2, 2023

Enclosure: Groundwater Sustainability Plan Assessment Staff Report – San Joaquin Valley – Delta-Mendota Subbasin.

State of California
Department of Water Resources
Sustainable Groundwater Management Program
Groundwater Sustainability Plan Assessment
Staff Report

Groundwater Basin Name:	San Joaquin Valley Basin – Delta-Mendota Subbasin (No. 5-022.07)
Number of GSPs:	6 (see list below)
Number of GSAs:	23 (see list below)
Submittal Type:	Revised Plan in Response to Incomplete Determination
Submittal Date:	July 20, 2022
Recommendation:	Inadequate
Date:	March 2, 2023

On July 20, 2022 multiple groundwater sustainability agencies (GSAs) submitted multiple groundwater sustainability plans (GSPs) for the entire Delta-Mendota Subbasin (Subbasin) which are coordinated pursuant to a required coordination agreement, to the Department of Water Resources (Department) in response to the Department's incomplete determination on January 23, 2022,[1] for evaluation and assessment as required by the Sustainable Groundwater Management Act (SGMA)[2] and GSP Regulations.[3] In total, six GSPs have been revised, adopted, and implemented by 23 GSAs.[4] Collectively, all six GSPs and the coordination agreement are, for evaluation and assessment purposes, treated and referred to as the Plan for the Subbasin. Individually, the revised GSPs include the following:

- *Aliso Water District Groundwater Sustainability Plan* (Aliso GSP), revised July 2022. The Aliso GSP is implemented by a single GSA, the Aliso Water District GSA.[5]

[1] Water Code § 10733.4(b); 23 CCR § 355.4(a)(4); https://sgma.water.ca.gov/portal/service/gspdocument/download/6154.
[2] Water Code § 10720 *et seq*.
[3] 23 CCR § 350 *et seq*.
[4] This staff report is limited to providing an independent, technical evaluation and assessment of the submitted Plan, as required of the Department under SGMA and the GSP Regulations. It is not intended as a statement of the Department's position or views regarding any SGMA- or groundwater-related litigation involving the subject Plan, GSAs, or groundwater basin or the merits of any factual or legal claims or allegations made by parties in such litigation.
[5] https://sgma.water.ca.gov/portal/gsp/preview/7.

- *Groundwater Sustainability Plan, Delta-Mendota Subbasin, Farmers Water District* (Farmers GSP), revised July 2022. The Farmers GSP is implemented by a single GSA, the Farmers Water District GSA.[6]

- *Groundwater Sustainability Plan for County of Fresno GSA Management Area A & Management Area B – Delta-Mendota Subbasin* (Fresno County GSP), revised July 2022. The Fresno County GSP is implemented by a single GSA, the County of Fresno GSA.[7]

- *Grassland Groundwater Sustainability Agency Groundwater Sustainability Plan* (Grassland GSP), revised July 2022. The Grassland GSP is implemented by two GSAs, the Grasslands GSA and the County of Merced GSA.[8]

- *Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions* (Northern and Central GSP), revised June 2022. The Northern and Central GSP is implemented by the following eight GSAs: Oro Loma GSA, DM-II GSA, Patterson Irrigation District GSA, Widren Water District GSA, City of Patterson GSA, Northwestern Delta-Mendota GSA, West Stanislaus Irrigation District GSA, and Central Delta-Mendota GSA.[9]

- *Groundwater Sustainability Plan for the San Joaquin River Exchange Contractors GSP Group in the Delta-Mendota Subbasin* (SJREC GSP), revised June 2022. The SJREC GSP is implemented by the following 11 GSAs: San Joaquin River Exchange Contractors GSA; City of Firebaugh GSA, City of Los Banos GSA, City of Newman GSA, City of Dos Palos GSA, City of Guistine GSA, City of Mendota GSA, County of Merced GSA, County of Madera GSA, and Turner Island Water District GSA, as well as a portion of the County of Fresno Management Area B GSA.[10]

The Subbasin's coordination agreement was not revised as part of the July 2022 Plan resubmittal and is still dated August 2019. The *Delta-Mendota Subbasin Coordination Agreement* (Coordination Agreement) is included as Appendix A to the *Common Chapter for the Delta-Mendota Subbasin Groundwater Sustainability Plan* (Common Chapter), which was significantly revised in June 2022. The Common Chapter also includes eight Common Technical Memoranda (Technical Memoranda) in Appendix B that coordinate and guide various aspects of the Subbasin's groundwater sustainability program. The Technical Memoranda were also not revised as part of the July 2022 Plan resubmittal and are still dated July 2019. The Technical Memoranda referenced in this Staff Report include, but are not limited to, the following: Technical Memorandum #1 – *Common Datasets and Assumptions used in the Delta-Mendota GSPs*; Technical Memorandum #3

[6] https://sgma.water.ca.gov/portal/gsp/preview/14.
[7] https://sgma.water.ca.gov/portal/gsp/preview/20.
[8] https://sgma.water.ca.gov/portal/gsp/preview/38.
[9] https://sgma.water.ca.gov/portal/gsp/preview/38.
[10] https://sgma.water.ca.gov/portal/gsp/preview/15.

– *Assumptions for the Historic, Current and Projected Water Budgets of the Delta-Mendota Subbasin, Change in Storage Cross-Check and Sustainable Yield*; and Technical Memorandum #4 – *Assumptions for the Delta-Mendota Subbasin Management Areas, Sustainable Management Criteria*. Because the Technical Memoranda no longer align with the Common Chapter there are numerous inconsistencies throughout the Subbasin's resubmitted Plan.

After evaluation and assessment, Department staff conclude the revised Plan continues to use different data and methodologies for some aspects of the Plan, has not justified or explained what is considered to be significant and unreasonable for the new basinwide definitions of undesirable results, has not set sustainable management criteria in accordance with the GSP Regulations, and, while eliminating the use of management areas in the individual GSPs, has not made revisions that align with a non-management area approach. After evaluation and assessment, Department staff conclude the GSAs have not taken sufficient actions to address some of the deficiencies identified in the Department's incomplete determination.[11]

- **Based on the evaluation of the Plan, Department staff recommend the Plan for the Delta-Mendota Subbasin be determined inadequate.**

This assessment includes five sections and an appendix:

- **Section 1 – Summary:** Provides an overview of the Department staff's assessment.
- **Section 2 – Evaluation Criteria:** Describes the legislative requirements and the Department's evaluation criteria.
- **Section 3 – Required Conditions:** Describes the submission requirements of an incomplete resubmittal to be evaluated by the Department.
- **Section 4 – Deficiency Evaluation:** Provides an assessment of whether and how the contents included in the GSP resubmittal addressed the deficiencies identified by the Department in the initial incomplete determination.
- **Section 5 – Staff Recommendation:** Includes the staff recommendation for the Plan.
- **Appendix A – Summary of Individual GSP Revisions**: Provides brief summarized details of changes made to the six revised GSPs.

[11] 23 CCR § 355.2(e)(3)(C).

1 SUMMARY

Department staff recommend the Plan for the Delta-Mendota Subbasin be determined **INADEQUATE** because three of the four deficiencies were not sufficiently addressed.

After considering the changes made to the Subbasin's Plan, Department staff concluded that sufficient action was taken to correct the following deficiency. However, by removing the use of management areas throughout the Plan and not concurrently restructuring the GSPs themselves to reflect the revisions, this change has resulted in GSPs that remain fragmented and potentially inconsistent with the Subbasin's new groundwater management approach.

- **Deficiency 4** – The management areas established in the Plan have not sufficiently addressed the requirements specified in 23 CCR § 354.20.

In the evaluation of the revised Plan, Department staff conclude the GSAs did not take sufficient action to correct the following deficiencies identified in the incomplete determination:

- **Deficiency 1** – The GSPs do not use the same data and methodologies.
- **Deficiency 2** – The GSPs have not established common definitions of undesirable results in the Subbasin.
- **Deficiency 3** – The GSPs in the Subbasin have not set sustainable management criteria in accordance with the GSP Regulations.

Generally, while the GSAs have put forth a great amount of effort to respond to the Department's corrective actions identified in the incomplete determination staff report, Department staff conclude that the information provided was not sufficiently detailed and the analysis was not sufficiently thorough and reasonable to correct the deficiencies identified by the Department. These deficiencies have been found to materially affect the ability of the Department to evaluate the likelihood of the Plan to attain sustainability.

2 EVALUATION CRITERIA

The Department evaluates whether a Plan conforms to the statutory requirements of SGMA[12] and is likely to achieve the basin's sustainability goal,[13] whether evaluating a basin's first Plan,[14] a Plan previously determined incomplete,[15] an amended Plan,[16] or a GSA's periodic update to an approved Plan.[17] To achieve the sustainability goal, each version of the Plan must demonstrate that implementation will lead to sustainable

[12] Water Code §§ 10727.2, 10727.4, 10727.6.
[13] Water Code § 10733; 23 CCR § 354.24.
[14] Water Code § 10720.7.
[15] 23 CCR § 355.2(e)(2).
[16] 23 CCR § 355.10.
[17] 23 CCR § 355.6.

groundwater management, which means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.[18] The Department is also required to evaluate, on an ongoing basis, whether the Plan will adversely affect the ability of an adjacent basin to implement its groundwater sustainability program or achieve its sustainability goal.[19]

The Plan evaluated in this Staff Report was previously determined to be incomplete. An incomplete Plan is one which had one or more deficiencies that precluded its initial approval, may not have had supporting information that was sufficiently detailed or analyses that were sufficiently thorough and reasonable, or Department staff determined it was unlikely the GSAs in the basin could achieve the sustainability goal. After a GSA has been afforded up to 180 days to address the deficiencies and based on the GSA's efforts, the Department can either approve[20] the Plan or determine the Plan inadequate.[21]

The Department's reevaluation and reassessment of a Plan previously determined to be incomplete, as presented in this Staff Report, continues to follow Article 6 of the GSP Regulations[22] to determine whether the Plan, with revisions or additions prepared by the GSA, complies with SGMA and substantially complies with the GSP Regulations.[23] As stated in the GSP Regulations, "substantial compliance means that the supporting information is sufficiently detailed and the analyses sufficiently thorough and reasonable, in the judgment of the Department, to evaluate the Plan, and the Department determines that any discrepancy would not materially affect the ability of the Agency to achieve the sustainability goal for the basin, or the ability of the Department to evaluate the likelihood of the Plan to attain that goal."[24]

The recommendation to approve a Plan previously determined to be incomplete does not signify that Department staff, were they to exercise the professional judgment required to develop a Plan for the basin, would make the same assumptions and interpretations as those contained in the revised Plan, but simply that Department staff have determined that the modified assumptions and interpretations relied upon by the submitting GSA(s) are supported by adequate, credible evidence, and are scientifically reasonable. The reassessment of a Plan previously determined to be incomplete may involve the review of new information presented by the GSA(s), including models and assumptions, and a reevaluation of that information based on scientific reasonableness. In conducting its reassessment, Department staff does not recalculate or reevaluate technical information or perform its own geologic or engineering analysis of that information.

The recommendation that a Plan previously determined to be incomplete be determined to be inadequate is based on staff's conclusion that the GSAs have not taken sufficient

[18] Water Code § 10721(v).
[19] Water Code § 10733(c).
[20] 23 CCR §§ 355.2(e)(1).
[21] 23 CCR §§ 355.2(e)(3).
[22] 23 CCR § 355 *et seq*.
[23] 23 CCR § 350 *et seq*.
[24] 23 CCR § 355.4(b).

actions to correct the deficiencies previously identified by the Department when it found the Plan incomplete.[25]

3 REQUIRED CONDITIONS

For a Plan that the Department determined to be incomplete, the Department identifies corrective actions to address those deficiencies that preclude approval of the Plan as initially submitted. The GSAs in a basin, whether developing a single GSP covering the basin or multiple GSPs, must attempt to sufficiently address those corrective actions within the time provided, not to exceed 180 days, for the Plan to be reevaluated by the Department.

3.1 INCOMPLETE RESUBMITTAL

The GSP Regulations specify that the Department shall evaluate a resubmitted GSP in which the GSAs have taken corrective actions within 180 days from the date the Department issued an incomplete determination to address deficiencies.[26]

The Department issued its incomplete determination on January 20, 2022. The revised GSPs and the original Coordination Agreement, the collective Plan, was resubmitted on July 20, 2022, in compliance with the 180-day deadline.

4 DEFICIENCY EVALUATION

As stated in Section 355.4 of the GSP Regulations, a basin "shall be sustainably managed within 20 years of the applicable statutory deadline consistent with the objectives of the Act." The Department's assessment is based on a number of related factors including whether the elements of a GSP were developed in the manner required by the GSP Regulations, whether the GSP was developed using appropriate data and methodologies and whether its conclusions are scientifically reasonable, and whether the GSP, through the implementation of clearly defined and technically feasible projects and management actions, is likely to achieve a tenable sustainability goal for the basin.

In its initial incomplete determination, the Department identified four principal deficiencies in the Plan related to the use of same data and methodologies, undesirable results, sustainable management criteria, and management areas, which precluded the Plan's approval in January 2022.[27] The GSAs were given 180 days to take corrective actions to remedy the identified deficiencies. Consistent with the GSP Regulations, Department staff

[25] 23 CCR 355.2(e)(3)(C).
[26] 23 CCR § 355.4(a)(4).
[27] SGMA Portal, California Department of Water Resources, https://sgma.water.ca.gov/portal/service/gspdocument/download/6154.

are providing an evaluation of the revised Plan to determine if the GSAs have taken sufficient actions to correct the deficiencies.

This section describes the corrective actions recommended by the Department related to each deficiency, followed by Department staff's evaluation on the actions taken by the GSAs to address the deficiencies.[28]

4.1 Deficiency 1. The GSPs do not use the same data and methodologies

The January 2022 Staff Report concluded, "The Plan makes general statements that the collection and presentation of data are coordinated throughout the Subbasin, but the Plan lacks detail and confirmation that the six GSPs not only consider the other GSPs within and adjacent to the Subbasin but have addressed the regulatory aspects of SGMA in a manner that substantially complies with the GSP Regulations. A statement that the GSPs are coordinated without accompanying explanation is not sufficient coordination. Department staff find that the Plan for the Subbasin does not utilize same data and methodologies to support the various water budget, change in storage, and sustainable yield approaches; therefore, it is unclear how the GSAs will reach, let alone track, sustainability throughout the Subbasin in a coordinated manner."

4.1.1 Corrective Action

Department staff identified the following corrective action for the Delta-Mendota Subbasin in the GSP Assessment Staff Report released in January 2022:

> "The Common Chapter and the Technical Memoranda do not provide sufficient explanation to confirm that the GSPs have been developed using the same data and methodologies and that elements of the GSPs have been based upon consistent interpretations of the Subbasin's setting. As presented, the GSPs use different data and different methodologies that rely upon multiple versions of the Subbasin setting, with many of the GSPs defining their own version of a hydrogeological conceptual model, often for very small areas of the Subbasin. The 23 GSAs developing the six GSPs should provide supporting information that is sufficiently detailed and provide explanations that are sufficiently thorough and reasonable to explain how the various components of each GSP will together achieve the Subbasin's common sustainability goal. The explanation should describe how the sustainable management criteria established for each GSP (including the management areas if applicable) relate to each other and how they are collectively informed by the basin setting, including the water budget, change in groundwater storage, and sustainable yield, on the Subbasin-wide level."

[28] Appendix A contains additional details noted by staff related to revisions made to each GSP for each deficiency.

4.1.2 Evaluation

The following sections highlight information applicable to Deficiency 1 that was found during the evaluation of the revised Plan.

4.1.2.1 Water Budget

The revised Common Chapter states "[a]ll common coordinated assumptions agreed upon and utilized by each GSP…are presented in Technical Memoranda #3 (*Assumptions for the Historical, Current, and Projected Water Budgets of the Delta-Mendota Subbasin*) …"[29] However, neither Technical Memorandum #3 which discusses water budgets and sustainable yield calculations, nor Technical Memorandum #1 (*Common Datasets and Assumptions used in the Delta-Mendota Subbasin GSPs*) which presents other common datasets and assumptions, were revised to reflect the GSAs' revised approach for developing a Subbasin-wide water budget. Department staff have not been able to identify efforts to amend the Technical Memoranda by the Technical Working Group or the Subbasin's Coordination Committee, which calls into question the adequacy of the required Coordination Agreement prepared for the Subbasin and the ability of the 23 GSAs to implement six separate GSP areas using coordinated data and methodologies.

In response to the corrective action, a significant portion of the coordinated assumptions addressing the water budget methodology were replaced in the revised Common Chapter,[30] but no revisions were made to the Coordination Agreement.[31] As a consequence, the water budget revisions made to the Plan no longer align with the Technical Memoranda or Coordination Agreement and numerous inconsistencies exist throughout the Subbasin's six GSPs. Additionally, the Common Chapter now states that "significant additional detail is presented in the six underlying GSPs," but that detail, in the judgement of Department staff, is lacking, with many of the GSPs simply referring back to the language provided in the Common Chapter. These inconsistencies are problematic in Department staff evaluating the Plan for consistency with the GSP Regulations and understanding how management of the Subbasin will be conducted.

The "Coordinated Water Budget" discussion in the revised Common Chapter states, "…the Delta-Mendota Subbasin GSAs acknowledge additional detail was needed to demonstrate that all water budget components across the six Subbasin GSPs utilize the same data and methodologies. As such, subsequent to receipt of the [Department's Consultation Initiation Letter (CIL)], the Technical Working Group and Coordination Committee met to identify the specific data used and to develop a consistent terminology for the various water budget components. Additionally, the Technical Working Group attempted to simplify the presentation of the Subbasin water budgets through a reduction in the number of water budget components."[32] While Department staff appreciate the

[29] Aliso GSP (Revised 2022) (redline), Section 4.3.1, p. 672.
[30] Aliso GSP (Revised 2022) (redline), Section 4.3, pp. 671-696.
[31] Aliso GSP (Revised 2022) (redline), Appendix A, pp. 814-815.
[32] Aliso GSP (Revised 2022) (redline), Section 4.3.3, p. 682.

efforts to present standardized water budget components and better explain data sources for the purposes of addressing the required corrective action, the revisions seem to be temporary as the Plan states, “a full reconciliation of water budget nomenclature will be conducted as part of the 2025 GSP updates, as well as updates to the datasets and methodologies employed.”[33] It is unclear to Department staff why the methodologies for establishing a water budget have not been solidified for the Subbasin in this Plan revision and what impacts these changes would have, or have had, in the establishment of the new sustainable management criteria.

As stated by Department staff in the January 2022 Staff Report, “some of the GSP groups used numerical models to calculate the inflows and outflows from the respective GSP areas while others used non-numerical and spreadsheet models – there was no explanation in the Common Chapter that indicated how these differing modeling approaches used the same data or methodology.” Each of the revised GSPs still rely upon separate water budgets and use a variety of modeling approaches that rely upon GSP-specific hydrogeologic conceptual models. The January 2022 Staff Report also criticized the GSA’s lack of recent data used in the Subbasin’s water budget calculations. Department staff appreciate the use of measured data from water years 2014-2017 in the revised projected water budget; however, the Plan has not provided an explanation for the continued use of water year 2013 as the Subbasin’s current water year, especially since the projected components of the water budget have substantially changed, as discussed below.

Numerous additions and/or clarifications were made to the land surface and groundwater water budget content of the revised Common Chapter, which seem to address some of the Department’s concerns about the use of same data and methodology and the need for additional explanation. However, as part of the editing and/or clarification process, the inflow and outflow numbers in the water budget tables have changed significantly because the individual GSP areas “mapped their prior water budget components to the new common definitions.”[34] The water budget changes reflected in the revised Common Chapter conflict with the statement made in the revised Plan’s accompanying cover letter which states, “No water budget data were modified during this mapping process.”[35] Below are some examples of the changes which warrant some additional explanation and/or reconciliation.

- The revised Table CC-10 (formerly CC-8) shows far greater inflows and outflows for the historical land surface water budget, which generates different change in storage estimates for the historical groundwater budget shown on Table CC-11 (formerly CC-9). Similar differences are observed in Table CC-14 (formerly CC-12) which present the projected land surface water budget.[36]

[33] Aliso GSP (Revised 2022) (redline), Section 4.3.1, p. 672.
[34] Aliso GSP (Revised 2022) (redline), Section 4.3.3, p. 682.
[35] Aliso GSP (Revised 2022) (redline), Appendix B, p. 292.
[36] Aliso GSP (Revised 2022) (redline), Table CC-10 and CC-11, pp. 684-685.

- For the revised land surface water budget presenting the "current water year" (2013), now shown on Table CC-12, the updated inflows and outflows (in acre-feet) are 3,436,000 and 3,459,000 compared to the original estimates of 2,308,000 and 2,328,000, respectively, which were formerly included in Table CC-10.[37]
- For the revised groundwater water budget presenting the "current water year" (2013), now shown on Table CC-13, the inflows and outflows (in acre-feet) are 752,000 and 942,000 compared to the original estimates of 739,000 and 917,000, respectively, which were formally included in Table CC-11.[38]
- As already indicated, the revised Plan uses measured data from water years 2014-2017 in its water budget. Originally, for years 2014-2017 the estimated change in storage was projected to be (in acre-feet) -556,000, -537,000, -141,000, and 128,000.[39] The revised Plan now presents the change in storage for the same water years as -662,000, -642,000, -219,000, and 120,000 in Table CC-15. For additional context, Table CC-15 now shows a positive (projected) change in storage of 162,000 acre-feet for water year 2021 while the annual report submitted by the Subbasin's GSAs indicated a loss of groundwater in storage of 289,700 acre-feet. This discrepancy seems to cast doubt upon the ability, or demonstrates the inability, of the GSA's fragmented water budget approach to reasonably project change in storage estimates and sustainably manage groundwater in the Subbasin. Department staff support the GSA's plan to provide "a full reconciliation of water budget nomenclature…, as well as updates to the datasets and methodologies employed."

It is unclear why the inflows and outflows in the Subbasin have changed so much if the water budget components were only simplified and more concisely organized. It is also unclear how these efforts were coordinated or if the various modeling efforts were rerun since the Subbasin's Coordination Agreement was not updated. Because of the unexplained discrepancies between the original water budget and the revised water budget, as well as the change in storage most recently reported in the water year 2021 annual report, Department staff continue to have concerns regarding the accuracy of the water budget assumptions in the revised Plan. Additionally, as discussed below, there does not seem to be a quantification of overdraft in the Subbasin, which is based on the water budget which Department staff have concluded has not been prepared consistently with the GSP Regulations.

Based on a review of the information included in the revised Plan, Department staff conclude the GSAs have not sufficiently addressed and corrected the issues identified in Deficiency 1 related to the water budget failing to utilize the same data and methodologies.

[37] Aliso GSP (Revised 2022) (redline), Table CC-12, p. 686.
[38] Aliso GSP (Revised 2022) (redline), Table CC-13, p. 686.
[39] Aliso GSP (Revised 2022) (redline), Table CC-15, pp. 691-694.

4.1.2.2 Change in Groundwater Storage

The January 2022 Staff Report criticized the "sum-of-the-parts" methodology for calculating groundwater storage changes differently in the Subbasin's six GSPs. Among other concerns related to change in storage information Department staff wrote, "Cumulative change in storage declined more rapidly in the Upper Aquifer compared to the Lower Aquifer, declining by about 1,300,000 acre-feet in the Upper Aquifer and 678,000 acre-feet in the Lower Aquifer (a total of 1,978,000 acre-feet). However, when "rolling-up" the water budget information in Tables CC-9 and CC-11, which reflect the Subbasin's historical and current water budgets, the cumulative change in storage in the Upper Aquifer reflects a loss of 624,000 acre-feet and a loss of 375,000 acre-feet in the Lower Aquifer, with a total loss of storage within the Subbasin of 1,003,000 acre-feet."

To address the Department's concerns, the revised Common Chapter states "[c]umulative change in storage declined more rapidly in the Upper Aquifer compared to the Lower Aquifer, declining by about 624,0000 AF in the Upper Aquifer and 375,000 AF in the Lower Aquifer between WY2003 to 2013."[40] With all of the revisions made to the historical, current, and projected water budget tables (new Common Chapter Tables CC-10 through CC-15) as previously described, it is unclear how the revised numbers (624,000 and 375,000) were determined since those numbers were compiled using data from the old tables (former Tables CC-8 through CC-13). Manual calculations by Department staff of data reported in revised Tables CC-11 and CC-13 indicate that, between 2003 and 2013, there was a loss of 673,000 acre-feet in the Upper Aquifer and a loss of 371,000 acre-feet in the Lower Aquifer, for a total change in storage of 1,044,000 acre-feet. The volume discrepancies in the water budgets and how groundwater storage is calculated remain unexplained and unclear to Department staff and, absent an explanation, do not support a conclusion that the same data and methodology was consistently used.

Additionally, Figure CC-64, which relies upon the updated water budget information in Tables CC-14 and CC-15, has significantly changed.[41] Where the cumulative change in Lower Aquifer storage was approximately -50,000 acre-feet in 2070 before the water budget revisions were applied, it now suggests the cumulative Lower Aquifer change in storage in 2070 is approximately -600,000 acre-feet. The original 2040 projection estimate for the Lower Aquifer's cumulative change in storage was approximately -200,000 acre-feet while the revised estimate is approximately -750,000 acre-feet. In the Upper Aquifer, former estimates indicated cumulative change in storage in 2040 was approximately -50,000 acre-feet and revised estimates appear to be similar. The resubmitted materials provide insufficient explanation as to how these change in storage data were computed and why they differ so significantly from the original calculations.

Importantly, there still does not appear to be a straightforward quantification of overdraft in the Subbasin's Plan and no discussion of how it will be mitigated. Some additional

[40] Aliso GSP (Revised 2022) (redline), Section 4.2.3, p. 636.
[41] Aliso GSP (Revised 2022) (redline), Figure CC-64, pp. 695-696.

explanation is required throughout the Plan and its Coordination Agreement to acknowledge overdraft and better identify projects and management actions that could mitigate it. There also does not appear to be a discussion regarding how the loss of storage and planned groundwater elevation declines will affect the drinking water wells in the Subbasin, which is a concern because minimum thresholds established for groundwater levels are now set at historical low elevations. And while Department staff previously identified multiple methods used to calculate change in groundwater storage, Department staff note the methodology for calculating change in storage, as described in Technical Memorandum #1, has not been revised; therefore, there still remains uncertainty how the Subbasin's change in storage is being calculated in a coordinated fashion throughout the six GSPs. Given that the Plan has revised the "Coordinated Assumptions" section of the revised Common Chapter, this is another example of how the Common Chapter no longer aligns with the Technical Memoranda. And it is important to note that the Lower Aquifer is now using the sustainable management criteria set for inelastic land subsidence to determine undesirable results associated with groundwater storage, which is not an option provided for in the GSP Regulations. Additional details are presented in the Deficiency 3 discussion.

Based on a review of the information included in the Plan resubmittal, Department staff conclude the GSAs have not addressed and corrected the issues identified in Deficiency 1 related to the change in storage calculations utilizing the same data and methodologies.

4.1.2.3 Sustainable Yield

The January 2022 Staff Report identified the inconsistent application of a basinwide sustainable yield estimate where "of the six GSPs, three provide a sustainable yield specifically for the GSP area while the other three rely upon the estimate for the entire Subbasin" and "the sustainable yield is determined independent of sustainability criteria and is provided as a guide for water budget planning purposes."

To address the Department's deficiency related to the inconsistent establishment of a sustainable yield for the Subbasin, the GSAs revised the Common Chapter to provide a new sustainable yield for each aquifer.[42] However, the information in Technical Memoranda #1 (*Common Datasets and Assumptions used in the Delta-Mendota Subbasin GSPs*) and #3 (*Assumptions for the Historic, Current and Projected Water Budgets of the Delta-Mendota Subbasin, Change in Storage Cross-Check and Sustainable Yield*) which present agreed-upon sustainable yield assumptions and methodology were not updated. Where the sustainable yield for the Upper Aquifer was initially given a range of 325,000 to 480,000 acre-feet per year with a +/- 10 percent factor to account for uncertainties, the Upper Aquifer sustainable yield is now set at 403,000 acre-feet per year, which is simply the middle of the initial range. The sustainable yield in the Upper Aquifer is now reportedly based on the revised change in storage numbers from the historic water budget (2003-2012) and a slightly revised formula that specifies

[42] Aliso GSP (Revised 2022) (redline), Section 4.3.4, pp. 697-701.

subsurface outflow and subsurface inflow. This new formula and a coordinated approach should be reflected, and more importantly explained and justified, in the Coordination Agreement and its associated Technical Memoranda. The sustainable yield discussion in the Plan also does not appear to account for the maximum quantity of water that can be withdrawn annually from the Subbasin without causing an undesirable result.[43]

In the Lower Aquifer, now acknowledging that (an unspecified amount of) land subsidence is continuing to occur, the sustainable yield estimate was lowered from 250,000 acre-feet per year to 101,000 acre-feet per year. In the original Common Chapter, the calculation of the Lower Aquifer sustainable yield was based on a study conducted in the adjacent Westside Subbasin; however, as stated in the revised Plan, based on undefined extractions from the Lower Aquifer from water year 2015, the Coordination Committee refined the sustainable yield calculation, which it states is consistent with the new definitions of undesirable results established across the Subbasin for all sustainable management criteria. Technical Memorandum #1 and #3, which present the agreed-upon methodologies for determining the Subbasin's sustainable yield, were not revised. No information is provided in the revised Common Chapter that discusses continued subsidence rates in the Subbasin or the extractions observed in 2015.

Department staff have observed that the groundwater extraction volumes provided in the revised historical groundwater budget (2003-2012) and the projected water budget (2014-2070) are different than the original values.[44] Additionally, it should be noted that the projected amount of groundwater extraction from the Upper Aquifer and Lower Aquifer in water year 2021, as indicated on the updated water budget tables, is 224,000 acre-feet and 39,000 acre-feet, respectively, for a total extraction volume of 263,000 acre-feet. However, the water year 2021 annual report submitted for the Subbasin in April 2022 indicated a total of 562,300 acre-feet of groundwater was extracted, which is more than double the projected amount. This calls into question the accuracy and usefulness of the Plan's fragmented water budget methodology to track sustainable groundwater conditions.

Based on a review of the information included the Plan resubmittal, Department staff conclude the GSAs have not addressed and corrected the issues identified in Deficiency 1 related to the sustainable yield utilizing the same data and methodologies.

4.1.3 Conclusion

Based on the review of information included in the revised Plan, Department staff conclude the GSAs have not adequately addressed or corrected the issues related to using the same data and methodologies identified as a deficiency that initially precluded Plan approval. Department staff conclude the revised Plan for the Subbasin still does not

[43] Water Code § 10721(w).
[44] Aliso GSP (Revised 2022) (redline), Table CC-11 (formerly CC-9), pp. 684-685; Table CC-15 (formerly CC-13), pp. 691-694.

utilize same data and methodologies to support the various water budget, change in storage, and sustainable yield approaches.

- Information in the Common Chapter was modified significantly but neither Technical Memorandum #3 nor Technical Memorandum #1 were revised and are still dated July 25, 2019, as are the other six memoranda that coordinate the Subbasin's six GSPs. As a consequence, the water budget, change in storage, and sustainable yield revisions made to multiple sections of the Common Chapter and, in some fashion, the six GSPs no longer align with the Technical Memoranda and the Coordination Agreement which is still dated December 12, 2018. Numerous inconsistencies exist throughout the Subbasin's six GSPs when compared to the required coordination materials.
- Each of the GSPs still rely upon separate water budgets compiled for the individual GSP areas and still use a variety of modeling approaches built around localized hydrogeologic conceptual models, which calls into question the accuracy and usefulness of the Plan's fragmented methodology to track sustainable conditions on a Subbasin-wide scale.
- There still does not appear to be a straightforward quantification of overdraft in the Subbasin and no discussion of how it will be mitigated.
- There does not appear to be a discussion regarding how the continued loss of storage and groundwater elevation declines will affect drinking water wells in the Subbasin or the other beneficial uses and users of groundwater.

Department staff conclude the GSAs have not taken sufficient action to address Deficiency 1 related to utilizing the same data and methodologies. While the Common Chapter has been significantly revised, those revisions are not reflected in the Technical Memoranda or the Coordination Agreement. By maintaining the original Coordination Agreement (including the Technical Memoranda), the GSAs continue to utilize different data and methodologies and, by doing so, have not thoroughly explained or demonstrated how each GSP will together achieve the Subbasin's common sustainability goal.

4.2 Deficiency 2. The GSPs have not established common definitions of undesirable results in the Subbasin

The January 2022 Staff Report concluded, "Because each of the six GSPs prepared in the Subbasin defined its own sustainable management criteria, each applicable sustainability indicator has up to six different definitions of what are considered significant and unreasonable conditions. While this approach was agreed upon by the 23 GSAs in the Subbasin using the required Coordination Agreement, by approaching the sustainability indicators in such an individualistic and isolated manner, Department staff do not believe that the Plan satisfies the SGMA requirement to the use of same data and methodologies.[45] Department staff also believe that this approach does not achieve a coordinated Plan for the Subbasin, and that this approach fragments the Department's ability to track sustainable conditions that are common throughout the Subbasin."

4.2.1 Corrective Action

Department staff identified the following corrective action for the Subbasin in the GSP Assessment Staff Report released in January 2022:

> "The GSAs in the Subbasin should modify each of their respective GSPs, as well as any applicable coordination materials, to substantially comply with the GSP Regulations and define undesirable results in a manner that addresses groundwater conditions occurring throughout the Subbasin, not for only the small portion of the Subbasin represented by the respective GSPs. One way for this deficiency to be remedied is for each of the six separate GSPs to use the same quantitative minimum thresholds, or the same methodology to develop the thresholds, and explicit criteria for undesirable results. Alternatively, if the GSAs believe it is not possible, or for some other reason still desire to use different definitions and metrics for undesirable results within each of the Subbasin's six GSP areas, the Plan must specifically explain how any differences do not affect the requirement to utilize the same data and methodologies for the assumed sustainable yield of the Subbasin. Additionally, if a GSP determines that a sustainability indicator is not applicable within the defined GSP area, then that information must be supported by the best available information and best available science."

4.2.2 Evaluation

In reviewing the revised Plan, Department staff found conflicting or incomplete information applicable to Deficiency 2. Provided below is a description of the original definition of undesirable results (found in Technical Memorandum #4 – *Assumptions for Delta-Mendota Subbasin Management Areas, Sustainability Management Criteria*) and the revised definition of undesirable results and significant and unreasonable conditions in the Subbasin (found in the revised Common Chapter and within the six GSPs).

4.2.2.1 Chronic lowering of groundwater levels

- <u>Original Definition</u>: Significant and unreasonable chronic change in water levels, *as defined by each GSP Group*, that has an impact on the beneficial users of groundwater in the Subbasin through either intra- and/or inter-basin actions.
- <u>Revised Definition</u>: Chronic changes in groundwater levels that diminish access to groundwater, causing significant and unreasonable impacts to beneficial uses and users of groundwater.

[45] 23 CCR § 357.4(a).

- Revised Significant and Unreasonable: Significant and unreasonable impacts to beneficial uses and users of groundwater are substantially increased costs associated with higher total pumping lift, lowering pumps, drilling deeper wells, or otherwise modifying wells to access groundwater, securing alternative water sources, or required mitigation of groundwater dependent ecosystems. Significant and unreasonable is quantitatively defined as exceeding the MT at more than 50% of representative monitoring sites by aquifer in a GSP area.

4.2.2.2 Reduction in groundwater storage

- Original Definition: Significant and unreasonable chronic decrease in groundwater storage, *as defined by each GSP Group*, that has an impact on the beneficial users of groundwater in the Subbasin through either intra- and/or inter-basin actions.
- Revised Definition: A chronic decrease in groundwater storage that causes a significant and unreasonable impact to the beneficial uses and users of groundwater.
- Revised Significant and Unreasonable: A significant and unreasonable impact to beneficial uses and users of groundwater is insufficient water storage to maintain beneficial uses and natural resource areas in the Subbasin, including the conjunctive use of groundwater.

4.2.2.3 Degraded water quality

- Original Definition: Significant and unreasonable degradation of groundwater quality, *as defined by each GSP Group*, that has an impact on the beneficial users of groundwater in the Subbasin through either intra- and/or inter-basin actions and/or activities.
- Revised Definition: Degradation of groundwater quality as a result of groundwater management activities that causes significant and unreasonable impacts to beneficial uses and users of groundwater.
- Revised Significant and Unreasonable: Significant and unreasonable impacts to beneficial uses and users of groundwater as a result of groundwater management activities are the migration of contaminant plumes or elevated concentrations of constituents of concern that reduce groundwater availability, and the degradation of surface water quality as a result of groundwater migration that substantially impair an existing beneficial use. Significant and unreasonable is quantitatively defined as exceeding the MT at more than 50% of representative monitoring sites by aquifer in a GSP area where current groundwater quality (as established in the Subbasins GSPs) does not exceed 1,000 mg/L TDS.

4.2.2.4 Land subsidence

- Original Definition: Changes in ground surface elevation that cause damage to critical infrastructure that would cause significant and unreasonable reductions of conveyance capacity, damage to personal property, impacts to natural resources or create conditions that threaten public health and safety.

- Revised Definition: Changes in ground surface elevation that cause damage to critical infrastructure, including significant and unreasonable reductions of conveyance capacity, impacts to natural resource areas, or conditions that threaten public health and safety.
- Revised Significant and Unreasonable: Significant and unreasonable damage to conveyance capacity from inelastic land subsidence is structural damage that creates an unmitigated and unmanageable reduction of design capacity or freeboard. Significant and unreasonable impacts to natural resource areas from inelastic land subsidence are unmitigated decreases in the ability to flood or drain such areas by gravity. Significant and unreasonable threats to public health and safety from inelastic land subsidence are those that cause an unmitigated reduction of freeboard that allows for flooding, or unmitigated damage to roads and bridges.

4.2.2.5 Depletions of interconnected surface water

- Original Definition: Depletions of interconnected surface water, *as defined by each GSP Group*, that have significant and unreasonable adverse impacts on the beneficial uses of surface water.
- Revised Definition: Depletions of interconnected surface water as a direct result of groundwater pumping that cause significant and unreasonable impacts on natural resources or downstream beneficial uses and users.
- Revised Significant and Unreasonable: Significant and unreasonable impacts on natural resources or downstream beneficial uses and users of groundwater are a reduction in available surface water supplies for natural resource areas, and reductions in downstream water availability as a result of increased streamflow depletions along the San Joaquin River when compared to similar historic water year types.

While the new undesirable result definitions for each of the five applicable sustainability indicators seem to be aligned across the Subbasin's six GSPs, Technical Memorandum #4 still reflects the original definitions that allows each GSP group to locally define sustainable conditions within their individual areas, and no new supporting information is provided within the Common Chapter or within the revised GSPs to justify the new groundwater management approach. Also, the significant revisions to the Common Chapter, which still reference Technical Memorandum #4, do not explain what are now considered to be significant and unreasonable conditions for each of the sustainability indicators. For example, no justification for setting a 50 percent threshold for groundwater levels or water quality is provided, details regarding modifying wells and pumps are absent from the resubmitted material, what is considered insufficient water storage is not quantified, and no examples of what are considered an unmitigated and unmanageable reduction of design capacity for conveyance structures are discussed. The lack of specific, quantitative details, or a more defined and transparent decision-making process for establishing definitions of sustainability, causes uncertainty, ambiguity, potential conflict, and an inability for the Department and other interested parties to understand the proposed sustainable management program.

4.2.3 Conclusion

Overall, Department staff conclude the GSAs have not taken sufficient action to address Deficiency 2.

- To address Deficiency 2, the GSAs revised the definition of undesirable results for each of the five applicable sustainability indicators in the Common Chapter and, as a result, nearly all of the associated sustainable management criteria.[46]
- While Department staff acknowledge the considerable effort taken by the Subbasin's GSAs to establish common definitions of undesirable results in the Subbasin, the resubmitted effort was not sufficient because the Coordination Agreement and its associated technical components were not updated, and numerous inconsistencies exist throughout the six GSPs. Many of the details in the revised GSPs still reflect the intent of the Subbasin's original groundwater management structure, which was to establish a range of sustainable management criteria that focused on the individual GSP area and was based on tailored hydrogeologic conceptual models, not the Subbasin as a whole.
- By not updating the definitions of undesirable results in Technical Memorandum #4, which present the original coordinated assumptions for the Subbasin's sustainable management criteria, this creates an inconsistency in the definitions that should be rectified to ensure there is clear understanding of how the Subbasin will be managed.

Based on a review of the information included in the Plan resubmittal, Department staff conclude the GSAs have not adequately addressed or corrected the issues related to establishing common definitions of undesirable results in the Subbasin.

4.3 Deficiency 3. The GSPs in the Subbasin have not set sustainable management criteria in accordance with the GSP Regulations

The January 2022 Staff Report identified deficiencies associated with almost all aspects of the Subbasin's sustainable management criteria. Details associated with the Subbasin's modified sustainability goal, redefined undesirable results, and new minimum thresholds and measurable objectives are presented below.

[46] Aliso GSP (Revised 2022) (redline), Section 5.2, p. 703.

4.3.1 Corrective Action

Department staff identified the following corrective action for the Delta-Mendota Subbasin in the GSP Assessment Staff Report released in January 2022:

> "The GSAs in the Subbasin should adhere to Subarticle 3 of the GSP Regulations which describes sustainable management criteria. The Plan should explain the coordinated criteria by which the GSAs define conditions occurring throughout the Subbasin that constitute sustainable groundwater management, including the process or processes by which the GSAs characterize undesirable results, establish minimum thresholds, and set measurable objectives for each applicable sustainability indicator. Undesirable results should be coordinated and should define when significant and unreasonable effects for any of the sustainable indicators are caused by groundwater conditions occurring throughout the Subbasin, not only in small GSP areas or even smaller management areas. The minimum thresholds must set numeric values that, if exceeded, may cause undesirable results, and must be defined in accordance with 23 CCR § 354.28(c). The supporting information must be sufficiently detailed and the analyses sufficiently thorough and reasonable, and any effort to disregard the applicability of a sustainability indicator in a GSP must be supported by the best available information and best available science. Additionally, if management areas will continue to be used throughout the Subbasin, the management areas must comply with 23 CCR § 354.20, as discussed in Deficiency 4."

4.3.2 Evaluation

This section provides an evaluation of the GSAs' efforts to address Deficiency 3 as it relates to the sustainability goal, undesirable results, minimum thresholds, and measurable objectives.

4.3.2.1 Sustainability Goal

In the original Plan, even though a coordinated sustainability goal was established for the Subbasin, each sustainability indicator had its own "sustainability goal" defined, and some of the Subbasin's GSPs further developed a definition of what the "sustainability goal" was for its own GSP area. In the January 2022 Staff Report, Department staff concluded "While this is the agreed upon sustainability goal for the Subbasin, each of the six GSPs includes its own version of what its GSP-area goal is and does not correlate those goals with the Subbasin's sustainable yield…[and] the Subbasin appears to have multiple definitions of its sustainability goal depending upon which GSP is referenced."

The coordinated sustainability goal established for the Subbasin in the original Plan has been maintained in the revised Plan.[47] However, some of the GSPs continue to further define sustainability goals set for the five applicable sustainability indicators which continues to present a fragmented groundwater management approach. Management of

[47] Aliso GSP (Revised 2022) (redline), Section 5.2, pp. 702-703.

the Subbasin by multiple GSPs requires a common sustainability goal to ensure the Subbasin collectively reaches sustainability – with the continued fragmented approach apparent in the Subbasin, Department staff are unclear how the GSAs will move forward with implementing a common groundwater sustainability program.

Based on a review of the information included the Plan resubmittal, Department staff conclude that all GSAs in the Subbasin have not adequately addressed or corrected the issues related to establishing a common sustainability goal in accordance with the GSP Regulations.

4.3.2.2 Undesirable Results

In the context of Deficiency 3, Department staff concluded in the January 2022 Staff Report "[a]s demonstrated by the review of each specific GSP's definition of undesirable results, the Plan, while purporting to be coordinated, actually presents a very complicated and disparate range of definitions for what constitutes an undesirable result for each category, such that whether or not something is considered an undesirable result depends on where in the Subbasin the condition is occurring. Department staff find that this methodology does not conform to the requirement of Water Code Section 10727.6 that individual [GSPs] utilize the same data and methodologies for the assumed sustainable yield in developing a Plan."

The manner in which deficiencies related to undesirable results were addressed in the revised Plan are presented in the Department's evaluation and response to Deficiency 2. While Department staff acknowledge the considerable effort taken by the Subbasin's GSAs to establish common definitions of undesirable results in the Subbasin and restructure the Subbasin's sustainable management criteria, the resubmitted effort is not complete, nor is Department staff clear on how the new criteria will be used in basin management, because the Coordination Agreement and its associated technical components were not updated and numerous inconsistencies exist throughout the six GSPs. Many of the details in the revised GSPs still reflect the intent of the Subbasin's original groundwater management structure which was to establish a range of sustainable management criteria that benefited an individual GSP area based on tailored hydrogeologic conceptual models, not the Subbasin as a whole. Furthermore, no explanation was provided to explain the process used to develop or to justify the new definitions of what are considered significant and unreasonable conditions in the Subbasin.

As previously stated in Section 4.2.3 of this staff report, Department staff conclude the GSAs have not adequately addressed or corrected the issues related to establishing undesirable results in accordance with the GSP Regulations.

4.3.2.3 Minimum Thresholds and Measurable Objectives

In the January 2022 Staff Report, Department staff concluded "[t]he establishment of minimum thresholds and measurable objectives in the Subbasin are not coordinated, nor are they supported by information that is sufficiently detailed." And "[s]ection 5.4 of the

Common Chapter provides, in Tables CC-14 through CC-18, a summary of the Subbasin-wide definition of an undesirable result, GSP-level definition of significant and unreasonable, sustainability goals, 5-year interim goals, minimum thresholds, and measurable objectives. However, as shown in the tables, each GSP generally contains a wide variety of what are considered significant and unreasonable conditions, sets different interim goals, minimum thresholds, and measurable objectives, often with different units of measurement, or determines that a particular sustainability indicator is not applicable to its GSP area without providing sufficient justification."

The new language in the Common Chapter states "[s]ubsequent to this submittal, the Technical Working Group and Coordination Committee met to develop consistent definitions and methodologies for establishing numeric metrics for each applicable sustainability indicator."[48] The original Plan relied upon Technical Memorandum #4, which presented the assumptions for sustainable management criteria in the Subbasin; however, as previously stated, the Technical Memoranda were not updated as part of the revised Plan. Because the GSPs expressly incorporated and refer to the Technical Memoranda as part of the Subbasin's groundwater management program, the fact that no concurrent amendments were made to them causes Department staff to question how or whether the changes will be clearly or consistently implemented throughout the Subbasin.

To address Deficiency 3 in the revised Common Chapter, Tables CC-14 through CC-18 have been modified and are now shown as Tables CC-16 through CC-23.[49] The Department's staff have evaluated the revisions made to the minimum thresholds and measurable objectives in the Plan.

Chronic Lowering of Groundwater Levels

The revised Common Chapter states "[t]he Subbasin GSAs are committed to maintaining groundwater levels above historic low conditions in order to avoid undesirable results to beneficial uses and users of groundwater and to prevent further decrease of groundwater levels due to groundwater management actions performed within the Subbasin."[50] The GSAs relied upon "readily available historic records of groundwater level data for 61 of the 75 representative monitoring sites (RMS)" and state that bi-annual groundwater monitoring will track progress towards sustainability at those 75 RMS.[51] The Plan does not indicate when these historic low groundwater levels were observed within the Subbasin, but Department staff note many of them appear to be prior to SGMA's implementation date of 2015.

[48] Aliso GSP (Revised 2022) (redline), Section 5.3, p. 704.
[49] Aliso GSP (Revised 2022) (redline), Tables CC-16 through CC-23, pp. 731-732, 733-735, 739, 741-742, 742-744, 747-748, 750-751, and 753-755.
[50] Aliso GSP (Revised 2022) (redline), Section 5.4.1, p. 704.
[51] Aliso GSP (Revised 2022) (redline), Table CC-16 and CC-17, pp. 731-732 and pp. 733-735.

- Former minimum thresholds and measurable objectives for chronic lowering of groundwater levels were initially based on a 100-foot buffer zone above the Corcoran Clay, various assumptions based on seasonal highs and lows, and trigger levels to not allow groundwater to be transferred out of management areas.
- <u>Revised Minimum Threshold</u>: "The groundwater elevation indicating a chronic lowering of groundwater levels that may lead to undesirable results is an elevation that is lower than the historical seasonal low. The historic seasonal low is a fixed elevation at each site, based on available groundwater level data prior to the end of Water Year 2016. To account for future year-to-year variations in hydrology, compliance with the fixed historic seasonal low threshold will be compared with a 4-year rolling average of annual groundwater level measurements. Shorter-term ("acute") groundwater elevation thresholds will also be established at each representative monitoring site by 2025 using a coordinated methodology. Acute thresholds will be established at levels that are intended to avoid short-term undesirable results, particularly for domestic water wells, groundwater dependent ecosystems, and interconnected surface waters where present in the Upper Aquifer, and for subsidence in the Lower Aquifer. Each year, both the historic seasonal low and the acute groundwater elevation thresholds will apply, whichever is more protective. For any RMS without data prior to Water Year 2016, MTs and acute thresholds will be established using the aforementioned methodologies and the data resulting from the first five years of monitoring following Water Year 2016 or following construction of the well."
- <u>Revised Measurable Objective</u>: "Maintain seasonal high groundwater levels at an elevation that is at or above the Water Year 2015 seasonal high at more than 50% of representative monitoring sites in a GSP area. The Water Year 2015 seasonal high is a fixed elevation at each site, based on available groundwater level data. If data are unavailable for Water Year 2015 at a representative monitoring site, either a Water Year 2014 or Water Year 2016 Seasonal High will be used. To account for future year-to-year variations in hydrology, compliance with the fixed seasonal high threshold will be compared with a 4-year rolling average of annual groundwater level measurements. Each GSP area includes multiple representative monitoring sites (RMS) to which the measurable objective applies. For any RMS without data prior to Water Year 2016, Measurable Objectives will be established using the aforementioned methodology and the data resulting from the first five years of monitoring following Water Year 2016 or following the construction of the well."
- <u>Revised Interim Milestones</u>:
  - "Year 5: Gather data and complete the establishment of seasonal low and seasonal high elevations at representative monitoring sites in the Lower Aquifer for the Grassland GSP area. Develop a coordinated methodology and complete the establishment of acute groundwater elevation thresholds.

Identify chronic lowering of groundwater levels caused by pumping outside the Subbasin.

- o Year 10: Maintain groundwater levels at measurable objectives. Where chronic lowering of groundwater levels is caused by pumping outside of the Subbasin, seek remedies in coordination with the Department of Water Resources and neighboring GSAs.
- o Year 15: Maintain groundwater levels at measurable objectives. Where chronic lowering of groundwater levels is caused by pumping outside of the Subbasin, seek remedies in coordination with the Department of Water Resources and neighboring GSAs."

The minimum threshold for groundwater levels has been revised to reflect the historic seasonal low, which is a fixed elevation at each of the representative monitoring sites, based on available groundwater level data prior to the end of Water Year 2016. An undesirable result is not stated to occur unless more than 50 percent of the wells within one of the six GSP areas has exceeded its minimum threshold. No analysis was provided explaining or justifying why 50 percent was chosen as the threshold or what impacts would occur to the Subbasin's pumping wells or the beneficial uses and users of groundwater if that threshold is approached or exceeded. Additionally, most of the six GSPs do not identify the year when historical groundwater elevations were observed.

As shown in the respective GSPs, in almost all of the Subbasin's RMS wells, the minimum threshold for groundwater elevation has been raised by several feet to almost 150 feet to now reflect historical low levels rather than the original approach where elevations were much lower. Department staff appreciate the acknowledgement by the Subbasin's GSAs that the original minimum thresholds were unreasonable. What is not discussed in the Plan, however, are the related effects of managing the Subbasin to the newly established historic low levels – there is no discussion in the Plan related to continued overdraft or subsidence, migration of contamination plumes, degradation of water quality, or depletions of interconnected surface water if groundwater levels approach or exceed the new minimum thresholds, especially for those wells located near the San Joaquin River.

While Department staff appreciate the use of a common methodology for determining undesirable results associated with groundwater levels, the revised Plan does not provide an explanation how the GSAs have determined that managing the Subbasin to near historical low groundwater elevations would avoid undesirable results for the other applicable sustainability indicators. Based on information provided in the Subbasin's six GSPs, when groundwater levels were at or near historic low levels there was increased pumping to account for lack of surface water supplies which decreased storage, increased rates of subsidence, and an unknown effect on interconnected surface water and groundwater. The revised Plan does not recognize or account for these conditions or circumstances, and without such an analysis or discussion, Department staff cannot determine if this is a reasonable approach for managing the Subbasin. It is unclear if the minimum thresholds have been selected to avoid undesirable results. It is important to note that the sustainable management criteria set for groundwater levels are now being used to track undesirable results associated with groundwater storage in the Upper Aquifer (the Lower Aquifer is using the thresholds set for subsidence) and temporarily for depletions of interconnected surface water.

Based on a review of the information included in the revised Plan, Department staff conclude the GSAs have not adequately addressed or corrected the issues related to establishing sustainable management criteria for the chronic lowering of groundwater levels in accordance with the GSP Regulations.

Reduction in Groundwater Storage

The revised Common Chapter states “[t]he GSAs intend to maintain groundwater storage at volumes that will continue to meet the demands of beneficial uses and users of groundwater, provide a three-year drought buffer, and minimize reductions in groundwater storage during extended dry periods. Further, the GSAs will coordinate with neighboring subbasins to address reductions in groundwater storage caused by pumping outside of the Subbasin.”[52]

The revised approach to monitor the groundwater storage sustainability indicator is to use groundwater levels, as well as subsidence data, as a proxy. The revised Common Chapter states “[b]ecause the [sustainable management criteria] established for Chronic Lowering of Groundwater Levels are designed to maintain groundwater levels above historic low conditions, they are protective of the Reduction of Groundwater Storage Sustainability indicator and local beneficial uses and users of the Upper Aquifer, as the [sustainable management criteria] maintain sufficient water storage to maintain beneficial uses, including the conjunctive use of groundwater.” For the Lower Aquifer, “the [sustainable management criteria] set for Land Subsidence (which are designed to reduce subsidence caused by groundwater extraction in the Subbasin, with no additional subsidence after 2040) are reasonably protective and used as a tool to calculate the Reduction of Groundwater Storage Sustainability Indicator [sustainable management criteria] in the Lower Aquifer.”[53]

- Former minimum thresholds and measurable objectives for reduction in groundwater storage were initially based on groundwater levels as a proxy (which had a variety of assumptions) and various calculated volumes from the Upper Aquifer and Lower Aquifer.
- Revised Minimum Threshold: “For the Upper Aquifer, as a reasonable proxy for an individual groundwater storage threshold, maintain groundwater levels in accordance with the minimum threshold set for Chronic Lowering of Groundwater Levels. For the Lower Aquifer, correlate the [sustainable management criteria] for inelastic land subsidence with the reduction in groundwater storage that would

[52] Aliso GSP (Revised 2022) (redline), Section 5.4.2, p. 738.
[53] Aliso GSP (Revised 2022) (redline), Table CC-18, p. 739.

cause undesirable results, estimated to be 1.1 million acre-feet of storage loss by 2040 attributable to groundwater extraction in the Subbasin."

- Revised Measurable Objective: "For the Upper Aquifer, maintain groundwater levels in accordance with the measurable objectives set for Chronic Lowering of Groundwater Levels. For the Lower Aquifer, minimize loss of groundwater storage caused by inelastic land subsidence."
- Revised Interim Milestones:
    - "Year 5: Maintain groundwater levels in accordance with the measurable objectives. Identify reduction in groundwater storage caused by pumping outside the Subbasin.
    - Year 10: Maintain groundwater levels in accordance with the measurable objectives. Where reduction in groundwater storage is caused by pumping outside of the Subbasin, seek remedies in coordination with the Department of Water Resources and neighboring GSAs.
    - Year 15: Maintain groundwater levels in accordance with the measurable objectives. Where reduction in groundwater storage is caused by pumping outside of the Subbasin, seek remedies in coordination with the Department of Water Resources and neighboring GSAs."

Groundwater levels are proposed as a proxy for determining undesirable results associated with reduction in groundwater storage in the Upper Aquifer. The Lower Aquifer is now using the sustainable management criteria established for land subsidence, which is a total of two feet of additional subsidence and an estimated additional loss of 1,100,000 acre-feet of storage. The use of land subsidence as a proxy for groundwater storage is not consistent with the GSP Regulations, and it is important to note that the timeframe for the two additional feet of subsidence is not defined in the Plan.

While Department staff acknowledge the efforts taken by the Subbasin's GSAs to simplify the methodology used to assess changes in groundwater storage, there still does not appear to be a straightforward quantification of overdraft in the Subbasin and no discussion of how the overdraft will be mitigated seems to exist in the Common Chapter or in any of the Subbasin's GSPs. Some additional coordinated explanation is required throughout the Plan to quantify overdraft and better identify projects and management actions that could mitigate it. There also does not appear to be a discussion regarding how the loss of storage and groundwater elevation declines will affect the drinking water wells in the Subbasin, which is a concern because minimum thresholds established for groundwater levels are now set at historical low elevations.

Based on a review of the information included in the Plan resubmittal, Department staff conclude the GSAs have not adequately addressed or corrected the issues related to establishing sustainable management criteria for reduction in groundwater storage in accordance with the GSP Regulations.

Degraded Water Quality

The revised Common Chapter states "[t]he GSP groups within the Delta-Mendota Subbasin are committed to preventing the migration or elevated concentrations of constituents of concern due to groundwater management activities. The primary constituent of concern in the Subbasin is salinity, frequently reported as total dissolved solids (TDS)."[54] The revised information explains that "California has three secondary maximum contaminant level (SMCL) standards for TDS, all based on aesthetic considerations such as taste and odor, not public health concerns. These are 500 milligrams per liter (mg/L) (recommended limit), 1,000 mg/L (upper limit), and 1,500 mg/L (short-term limit). To reflect the Subbasin's designation as a Municipal (MUN) beneficial use, as established in the Central Valley Water Control Plans (often referred to as Basin Plans), the Subbasin has selected the upper limit of 1,000 mg/L as the Minimum Threshold."[55]

- Former minimum thresholds and measurable objectives for degraded water quality initially used a variety of constituents with a variety of concentrations, such as electrical conductivity, chloride, nitrate as nitrogen, TDS, boron, and "poor quality groundwater".
- Revised Minimum Threshold: "The minimum threshold for salinity is 1,000 mg/L TDS. For representative monitoring sites that currently exceed the minimum threshold, existing regulatory water quality compliance and remediation programs will apply, including but not limited to, the CV-SALTS Salt Control Program, the Irrigated Lands Regulatory Program, the County Drought Plan requirements for State Small Water Systems and Domestic Wells (SB 552), and the Safe and Affordable Funding for Equity and Resilience (SAFER) program. For any RMS without data prior to the end of Water Year 2016, current (ambient) groundwater quality will be established using data collected during the first five years of monitoring following Water Year 2016 or following construction of the well. For representative monitoring sites that do not currently exceed the minimum threshold but are found to exceed minimum thresholds in the future, the applicable GSP group will conduct and publish an assessment of the effect of groundwater management activities on the documented exceedance, and propose timely actions to manage groundwater differently, if needed, to avoid exacerbating the exceedance. The applicable GSP group will also coordinate with the appropriate regulatory program to address the impact."
- Revised Measurable Objective: "The measurable objective for salinity will be concentrations less than 1,000 mg/L TDS. Each GSP group will participate in, provide data for, and track and report on compliance with orders and objectives adopted by the State and Central Valley Regional Water Quality Control Boards

[54] Aliso GSP (Revised 2022) (redline), Section 5.4.3, p. 739.
[55] Aliso GSP (Revised 2022) (redline), Tables CC-19 and CC-20, pp. 741-744.

and similar regulatory agencies, in coordination with the Central Valley Groundwater Monitoring Collaborative."

- Revised Interim Milestones:
    - Year 5: Maintain salinity consistent with measurable objectives. Participate in, provide data for, and track and report on compliance with orders and objectives adopted by the State Water Resources and Central Valley Regional Water Quality Control Boards and similar regulatory agencies, in coordination with the Central Valley Groundwater Monitoring Collaborative. Develop correlation between groundwater quality and groundwater levels in order to establish methodology for the use of groundwater levels as a proxy for groundwater quality.
    - Year 10: Maintain water quality consistent with measurable objectives. Continue monitoring and publishing groundwater quality data, and tracking and reporting on compliance with regulatory orders and objectives. Where water quality impairments are caused by activities outside the Subbasin, seek remedies in coordination with the Department of Water Resources and neighboring GSAs. Utilizing the methodology developed by the Year 5 Interim Milestone, develop minimum thresholds and measurable objectives for groundwater quality that utilize groundwater elevations as a proxy for monitoring.
    - Year 15: Maintain water quality consistent with measurable objectives. Continue monitoring and publishing groundwater quality data, and tracking and reporting on compliance with regulatory orders and objectives. Where water quality impairments are caused by activities outside the Subbasin, seek remedies in coordination with the Department of Water Resources and neighboring GSAs.

Only TDS is indicated to be a groundwater quality constituent of concern in the Subbasin, and the minimum threshold is set at 1,000 mg/L; however, the Plan indicates that significant and unreasonable conditions would not be considered to occur until more than 50 percent of RMS wells have exceeded the threshold in a particular GSP area. No analysis has been conducted to justify the use of 50 percent as a threshold. As indicated in the Subbasin's six GSPs, water quality already exceeds 1,000 mg/L in many areas. The Common Chapter refers wells that have already exceeded the threshold concentration to existing regulatory programs such as the CV-SALTS Program, Irrigated Lands Regulatory Program, the SAFER Program, and others. Minimum thresholds associated with other constituents of concern, such as boron, nitrate as nitrogen, and unquantified "poor quality groundwater" have been removed from the revised Plan and no justification for the removal of these constituents has been provided. The Department's corrective action did not advise or recommend eliminating these constituents of concern from the Subbasin's groundwater management program. No details are provided in the revised Common Chapter nor the six GSPs as to how the updated minimum threshold would impact the beneficial uses or users of groundwater.

Based on a review of the information included the revised Plan, Department staff conclude the GSAs have not adequately addressed or corrected the issues related to establishing sustainable management criteria for degraded water quality in accordance with the GSP Regulations as identified in the deficiency.

Land Subsidence

The revised Common Chapter states the "GSAs are committed to ramping down the amount of allowable subsidence caused by groundwater extraction in the Subbasin and eliminating additional subsidence within the Subbasin by 2040. Further, the GSAs will coordinate with neighboring subbasins to address inelastic land subsidence caused by groundwater management activities that occur outside of the Subbasin." Additionally, "[t]he [sustainable management criteria] for Land Subsidence were coordinated at the Subbasin level and are designed to be protective of critical infrastructure, including significant and unreasonable reductions of conveyance capacity (i.e., structural damage that creates an unmanageable reduction of design capacity), impacts to natural resource areas (i.e., unmitigated decreases in the ability to irrigate or drain these areas by gravity), or conditions that threaten public health and safety (i.e., unmitigated reduction of freeboard that allows for flooding, or unmitigated damage to roads and bridges). The Subbasin-wide [minimum threshold] is set to prevent subsidence that exceeds the corrective design standards or established triggers for critical infrastructure, including the Delta-Mendota Canal and California Aqueduct."[56]

- Former minimum thresholds and measurable objectives for inelastic land subsidence were set at 0.2 feet per year or a total of 4.0 feet, various compaction rates of the Corcoran Clay, other compactions rates monitoring the Lower Aquifer, or no rates at all.
- Revised Minimum Threshold: "At representative monitoring sites, the change in ground surface elevation that would cause undesirable results is up to 2 feet of additional inelastic land subsidence attributable to groundwater extraction in the Subbasin. Prevent subsidence caused by groundwater extractions in the Delta-Mendota Subbasin that exceeds corrective design standards or established triggers for critical infrastructure including the Delta-Mendota Canal, California Aqueduct, and roads and bridges."
    - o It is important to note that this revised minimum threshold is not a rate of subsidence but a total amount of subsidence, and the threshold does not indicate an extent of subsidence as required by the GSP Regulations. The Plan does not indicate when the period for calculating a total of two feet of additional subsidence begins, causing uncertainty or ambiguity in the

[56] Aliso GSP (Revised 2022) (redline), Tables CC-21 and CC-22, pp. 747-748 and 750-751.

proposed management program and the Department's ability to assess the Subbasin's progress towards achieving sustainability.

- Revised Measurable Objective: "Minimize inelastic land subsidence attributable to groundwater extraction within the Subbasin, with no additional subsidence after 2040."
- Revised Interim Milestones: "The [interim milestones] allow for no more than 1.0 foot of additional subsidence by 2025, 0.5 feet of additional subsidence by 2030 (1.5 feet of cumulative subsidence), 0.25 feet of additional subsidence by 2035 (1.75 feet of cumulative subsidence), and 0.25 feet of additional subsidence by 2040 (2.0 feet of cumulative subsidence)."

A rate and extent of subsidence is the metric required by the GSP Regulations, but the revised Common Plan only provides a total amount of subsidence, which is "up to two feet of additional inelastic subsidence attributable to groundwater extraction in the Subbasin." Many of the GSPs provide statements that, should subsidence occur within the Subbasin, it is the result of groundwater management actions occurring in adjacent Subbasins. Department staff determine the revised approach to managing land subsidence in the Subbasin is not consistent with the GSP Regulations, which require the minimum threshold to be expressed as a rate and extent of subsidence and the new minimum threshold is only expressed as a total amount of subsidence.

Based on a review of the information included in the Plan resubmittal, Department staff conclude the GSAs have not adequately addressed or corrected the issues related to establishing sustainable management criteria for land subsidence in accordance with the GSP Regulations as identified in the deficiency that initially precluded Plan approval.

Depletions of Interconnected Surface Water

The revised Common Chapter states "[t]he GSAs are committed to managing groundwater within the Subbasin to maintain interconnected surface waters comparable to existing conditions and prevent a trend of increasing interconnected surface water losses from the San Joaquin River. The GSAs will coordinate with neighboring subbasins to address interconnected surface water losses caused by groundwater management activities that occur outside of the Subbasin." [57] Additionally, "[t]he Depletion of Interconnected Surface Water Sustainability Indicator is identified as a data gap within the Subbasin. Until the GSAs are able to collect the additional data necessary to set quantitative [sustainable management criteria] for this Sustainability Indicator, the [sustainable management criteria] for Chronic Lowering of Groundwater Levels serve as a proxy in the Upper Aquifer."[58]

- Former minimum thresholds and measurable objectives for the depletion of interconnected surface water were either not established at all, were based on a

[57] Aliso GSP (Revised 2022) (redline), Section 5.4.5, p. 753.
[58] Aliso GSP (Revised 2022) (redline), Table CC-23, pp. 753-755.

groundwater gradient between two wells, were based on the historic decline in stage values in the Mendota Pool and Fresno Slough, groundwater elevations as a proxy, or an “X percent in surface water depletions” along interconnected reaches of surface water.

- Revised Minimum Threshold: “Interconnected Surface Water is an identified data gap in the Delta-Mendota Subbasin. As an interim minimum threshold, use the Chronic Lowering of Groundwater Level Minimum Threshold as a proxy for impacts to interconnected surface waters.”
- Revised Measurable Objective: “Interconnected Surface Water is an identified data gap in the Subbasin. As an interim measurable objective, use the Chronic Lowering of Groundwater Level Measurable Objective as a proxy for interconnected surface waters.”
- Revised Interim Milestones:
    - “Year 5: Fill data gaps, establish, and manage groundwater use to avoid the rate or volume of surface water depletions that have adverse impacts on beneficial uses and users and may lead to undesirable results. The Subbasin will complete a monitoring network of Interconnected Surface Water sites that will include six existing sites and datasets. GSP groups will complete the monitoring network with additional sites installed with SGMA Implementation Grant funding awarded to the Subbasin. The existing nine sites are part of the San Joaquin River Restoration Program and are located along the San Joaquin River at the southern end of the Subbasin. These nine sites, and the associated datasets, will continue to be utilized by the Subbasin as part of its monitoring network. Additional representative monitoring network sites for Interconnected Surface Water will focus on the Northern & Central Delta-Mendota and Grassland GSP areas along the San Joaquin River.
    - Year 10: Gather and analyze data from Subbasin’s established representative monitoring network sites. Also gather and analyze available data in cooperation with neighboring subbasins, the U.S. Bureau of Reclamation’s San Joaquin River Restoration Program, the U.S. Geological Survey, and DWR’s California Data Exchange Center (CDEC), to estimate the influence of groundwater on gains and losses in the San Joaquin River. Establish minimum thresholds and measurable objectives as a rate or volume of surface water depletions that have adverse impacts on beneficial uses and users and may lead to undesirable results.
    - Year 15: Monitor and maintain interconnected surface waters in accordance with revised minimum thresholds and measurable objectives. Where increased interconnected surface water losses are caused by pumping outside of the Subbasin, seek remedies in coordination with the Department of Water Resources and neighboring GSAs.”

Each of the Subbasin's six GSPs has identified depletions of interconnected surface water as a data gap and has not established sustainable management criteria in accordance with the GSP Regulations. Minimum thresholds and measurable objectives are not expected to be established until Year 10 or Year 15, as indicated in the Plan's revised interim milestones, which is significant because the Subbasin is located adjacent to the San Joaquin River and adjacent basins have set sustainable management criteria for this indicator. In the interim, the Plan proposes to use groundwater levels as a proxy for determining undesirable results "until the GSAs are able to collect the additional data necessary to set quantitative [sustainable management criteria] for this Sustainability Indicator."[59] However, as stated in the GSP Regulations, groundwater elevations cannot be used as a proxy unless "the Agency can demonstrate that the representative value [for groundwater elevations] is a reasonable proxy…as supported by adequate evidence."[60]

Although some of the GSPs in the Subbasin have some details regarding interconnected reaches of the San Joaquin River and could have presented an interim value for stream depletion based on available data, the Plan does not propose to set rates and volumes of surface water depletions until at least 2030.[61] A table in the Common Chapter provides the estimated quantity of gains and losses for interconnected reaches of the San Joaquin River, but this table does not appear to have been incorporated into the GSA's decision to identify surface water and groundwater interaction as a data gap.[62] Department staff conclude establishing sustainable management criteria consistent with the GSP Regulations by 2030 to not be reasonable, could risk undesirable results for the Subbasin or in adjacent basins, and could impact the beneficial uses and users of groundwater in the Subbasin and in adjacent basins. The beneficial uses and users, as they pertain to the depletions of interconnected surface water sustainability indicator, are briefly defined in the Common Chapter as "San Joaquin River surface water diverters and groundwater dependent ecosystems."[63] In the Subbasin's six GSPs, the beneficial uses and users are identified in general terms and are not necessarily associated with specific sustainability indicators.[64]

Department staff understand that quantifying depletions of interconnected surface water from groundwater extractions is a complex task that likely requires developing new, specialized tools, models, and methods to understand local hydrogeologic conditions, interactions, and responses. During the initial review of GSPs, Department staff have observed that most GSAs have struggled with this requirement of SGMA. However, staff believe that most GSAs will more fully comply with regulatory requirements after several

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[59] Aliso GSP (Revised 2022) (redline), Section 5.4.5, pp. 753-755.
[60] 23 CCR § 354.28(d).
[61] Aliso GSP (Revised 2022) (redline), Section 5.4.5, p. 753.
[62] Aliso GSP (Revised 2022) (redline), Table CC-6, pp. 655-656.
[63] Aliso GSP (Revised 2022) (redline), Section 4.2.7, p. 653.
[64] Aliso GSP (Revised 2022) (redline), Section 2.5.1, p. 69; Farmers GSP (Revised 2022) (redline), Section 2.5.1, p. 51; Fresno County GSP (Revised 2022) (redline), Section 2.5.1, p. 67; Grassland GSP (Revised 2022) (redline), Section 2.6.1, p. 84-85; Northern and Central GSP (Revised 2022) (redline), Section 4.1, pp. 200-203; SJREC GSP (Revised 2022) (redline), Section 2.1.5, pp. 73-75.

years of Plan implementation that includes projects and management actions to address the data gaps and other issues necessary to understand, quantify, and manage depletions of interconnected surface waters. Department staff further advise that, at this stage in SGMA implementation, GSAs address deficiencies related to interconnected surface water depletion where GSAs are still working to fill data gaps related to interconnected surface water and where these data will be used to inform and establish sustainable management criteria based on timing, volume, and depletion as required by the GSP Regulations.

The Department will continue to support GSAs in this regard by providing, as appropriate, financial and technical assistance to GSAs, including the development of guidance describing appropriate methods and approaches to evaluate the rate, timing, and volume of depletions of interconnected surface water caused by groundwater extractions. Once the Department's guidance related to depletions of interconnected surface water is publicly available, GSAs, where applicable, should consider incorporating appropriate guidance approaches into their future periodic updates to the GSP. GSAs should consider availing themselves of the Department's financial or technical assistance, but in any event must continue to fill data gaps, collect additional monitoring data, and implement strategies to better understand and manage depletions of interconnected surface water caused by groundwater extractions and define segments of interconnectivity and timing within their jurisdictional area. Furthermore, GSAs should coordinate with local, state, and federal resources agencies as well as interested parties to better understand the full suite of beneficial uses and users that may be impacted by pumping induced surface water depletion.

4.3.3 Conclusion

Overall, Department staff conclude the GSAs have not taken sufficient action to address Deficiency 3.

As previously concluded, Deficiency 2 associated with undesirable results was not sufficiently addressed. The revised Plan relies upon the collective Coordination Agreement, Technical Memoranda, Common Chapter, and the six GSPs; however, the revisions are not consistent throughout the revised Plan and numerous inconsistencies present unclear management of the Subbasin. Sustainable management criteria for all sustainability indicators have not been prepared in a manner consistent with the GSP Regulations.

4.4 Deficiency 4. The management areas established in the Plan have not sufficiently addressed the requirements specified in 23 CCR § 354.20.

As stated in the January 2022 Staff Report, "Technical Memorandum #4 addresses the use of management areas with the following statement: The Coordination Committee left management areas and management of their respective GSPs to the six GSP Groups."

In the Subbasin's original Plan, four of the six GSPs had a total of 17 management areas, none of which adhered to the GSP Regulations (the Aliso GSP and Grassland GSP did not use management areas). Department staff concluded, "While the use of management areas is technically allowed in a basin if the GSAs determine that the creation of management areas will facilitate implementation of their GSPs, the use of management areas in a basin that is already managed under six separate GSPs significantly complicates the Subbasin's implementation of SGMA. It also impedes the ability of Department staff to determine if the sustainability goal established for the Subbasin is being met, especially if established management areas do not have monitoring points and it is uncertain what sustainable management criteria apply to each area."

4.4.1 Corrective Action

Department staff identified the following corrective action for the Delta-Mendota Subbasin in the GSP Assessment Staff Report released in January 2022:

> "The Common Chapter and coordination materials prepared for the Subbasin should describe all the management areas established in each of the six GSPs and clearly define the applicable minimum thresholds and measurable objectives and indicate where the monitoring points are within each of the management areas for all applicable sustainability indicators. Also, because many of the defined management areas follow GSA boundaries, additional information related to legal authority and financial resources necessary to implement the respective GSPs should be explained. If details specific to the management areas are not available or the GSAs cannot justify, in accordance with the GSP Regulations, the use of management areas, then the GSAs in the Subbasin should reconsider the use of management areas in the Subbasin's Plan."

4.4.2 Evaluation

Overall, Department staff conclude that Deficiency 4 was sufficiently addressed by the Subbasin's GSAs. In response to the Department's required corrective action, all GSPs removed the use of management areas or simply renamed them monitoring zones. Department staff appreciate the recognition that the previous development and use of management areas was not consistent with the GSP Regulations. However, while this revision is considered a sufficient action to correct the issues related to the use of management areas identified in the January 2022 Staff Report, Department staff continue to have concerns about the structure of the individual GSPs for use in guiding future management of the Subbasin. Simply removing the use of management areas and not concurrently restructuring the GSPs themselves to reflect this change has resulted in GSPs that remain fragmented and potentially inconsistent with the new groundwater management program. The four GSPs that previously established management areas are still organized around the use of those management areas and many of the explanations that remain in the revised GSPs are meant to justify the use of those discarded management areas. Given the elimination of these management areas in the revised Plan, Department staff conclude sufficient action has been taken to address the management area deficiency; however, Department staff believe the individual GSPs should be reconciled to be consistent with the new management approach to avoid confusion among the public, the Department, and managers in adjacent basins.

5 STAFF RECOMMENDATION

Department staff conclude that sufficient action has not been taken by the GSAs in the Subbasin to remedy the deficiencies previously identified. Department staff, therefore, recommend the Plan be determined **inadequate**.

APPENDIX A - SUMMARY OF INDIVIDUAL GSP REVISIONS

This section provides a summary of certain changes in the Subbasin's six GSPs. These details are not considered exhaustive of the Plan's inconsistencies but are provided to support the conclusions made by Department Staff and the recommendation the Plan be determined inadequate.

DEFICIENCY 1: SUMMARY OF PLAN REVISIONS

The following briefly describes revisions to water budget, change in groundwater storage, and sustainable yield components of the Subbasin's six GSPs to address Deficiency 1.

- Aliso GSP.
    - To make the water budgets comparable a "crosswalk" figure was developed to capture the recategorization of data for current and projected conditions. The water budget discussions were explained in the revised Common Chapter but few text changes were made to the revised Aliso GSP.[65] The Aliso GSP does not quantify overdraft in its water budget information.
    - The Aliso GSP relies upon information in Appendix A (Hydrogeologic Conceptual Model and Groundwater Conditions) and the Common Chapter to discuss groundwater storage. No revisions were made to Appendix A and very basic revisions were made to the Common Chapter.[66]
    - Methods calculating sustainable yield were changed and the Aliso GSP now only references the estimates for the Subbasin rather than its small GSP area.[67] The former sustainable yield for the small Aliso GSP area, which considered the Upper Aquifer and Lower Aquifer to act as a single system, was 83,600 acre-feet per year.
- Farmers GSP.
    - Basic revisions were made to the water budget discussion in the Farmers GSP to reflect the changes made to the Common Chapter.[68] The Farmers GSP does not quantity overdraft in its water budget discussions.
    - As a result of the changes made to the water budget assumptions, the change in storage estimates for the Farmers GSP area also changed. For example, the total change in storage between 2003-2013 now shows a loss of approximately 600 acre-feet per year rather than a gain of 80 acre-feet

[65] Aliso GSP (Revised 2022) (redline), Section 3.3.4, pp. 93-106.
[66] Aliso GSP (Revised 2022) (redline), Section 3.2, p. 73; Appendix A, pp. 232-288; Common Chapter Section 4.3.4 p. 636.
[67] Aliso GSP (Revised 2022) (redline), Section 3.3.3, pp. 89-92.
[68] Farmers GSP (Revised 2022) (redline), Section 3.3, pp. 76-85.

per year, and the yearly change in storage values (in acre-feet per year) now range from +5,000 to -6,000 rather than +3,000 to -3,000.[69]

- Instead of calculating a sustainable yield for the small Farmers GSP area as originally done, the GSP provided a re-labeled table presenting historic pumping volumes and updated the sustainable yield to reflect that revised for the Subbasin.[70]

- Fresno County GSP.
  - Revisions were made to the water budget discussions in the Fresno County GSP. The GSP continues to state, "Overdraft in the form of long-term decline in storage of a significant amount (change in storage greater than five percent of groundwater pumping) has not occurred in the FCMA in the Upper Aquifer. Nor is overdraft projected to occur under the Projected Baseline with Climate Change Factors presented in Table 3-6" and "Overdraft conditions were only determined for the Upper Aquifer as there is no known pumping in the FCMA from the Lower Aquifer, therefore any change in storage or overdraft conditions that may exist in the Lower Aquifer are due to regional influences out of the control of the FCMA."[71] Some of the statements made in the Fresno County GSP do not align with the modifications made the Common Chapter.
  - Minimal changes were made to the Fresno County GSP Change in Storage.[72] The details remain specific to the small GSP area and do not reference the Subbasin's conditions. Estimated annual change in storage volumes are presented in Table 3-8 and 3-10 for the Fresno County GSP area.
  - A paragraph in the Fresno County GSP was revised to reflect the new sustainable yield estimates set for the Subbasin.[73]
- Grassland GSP.
  - A crosswalk of the reorganization of components from the initial Grassland GSP water budget and the revised Subbasin water budget of the amended Grassland GSP. The GSP has been revised to reflect some of the new terminology.[74]

[69] Farmers GSP (Revised 2022) (redline), Section 3.2.4, p. 72.
[70] Farmers GSP (Revised 2022) (redline), Section 3.3.3 and 3.3.4, pp. 83-84.
[71] Fresno County GSP (Revised 2022) (redline), Section 3.3.4, p. 150.
[72] Fresno County GSP (Revised 2022) (redline), Section 3.2.2, p. 111.
[73] Fresno County GSP (Revised 2022) (redline), Section 3.3.5, p. 150.
[74] Grassland GSP (Revised 2022) (redline), Section 3.3.2, Figures 3-27(a) and 3-27(b), pp. 138-148.

    - No substantive changes were made to the groundwater storage sections in the Grassland GSP.[75]
    - A paragraph in the Grassland GSP was revised to reflect the new sustainable yield estimates set for the Subbasin.[76]

- Northern and Central GSP.
    - No substantive changes were made to the water budget section in the Northern and Central GSP, but a new section was added that briefly describes how the GSP area water budget was mapped to the categories revised in the Common Chapter. The GSP references the Common Chapter for explanation.[77]
    - No substantive changes were made to the groundwater storage sections in the Northern and Central GSP.[78]
    - The sustainable yield section of the Northern and Central GSP was revised to reflect the updated methodology for determining sustainable yield estimates.
- SJREC GSP.
    - Other than eliminating the use of management areas and calling them monitoring zones, the SJREC GSP was not significantly revised. Most of the modifications were done as part of the revisions to the Common Chapter.

DEFICIENCY 2: SUMMARY OF PLAN REVISIONS

In general, each of the six GSPs have incorporated, in some fashion, the updated definitions of undesirable results. However, none of the coordination materials, neither the Coordination Agreement nor the eight Technical Memoranda, were updated, and explanations are lacking throughout the Plan to justify the new approach to defining significant and unreasonable for each of the five applicable sustainability indicators.[79]

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[75] Grassland GSP (Revised 2022) (redline), Section 3.3.3.1, pp. 149-152.
[76] Grassland GSP (Revised 2022) (redline), Section 3.3.3.2, p. 152.
[77] Northern and Central GSP (Revised 2022) (redline), Section 5.4.6, p. 411.
[78] Northern and Central GSP (Revised 2022) (redline), Section 5.3.3, p. 330-332.
[79] Aliso GSP (Revised 2022) (redline), Executive Summary and Section 4.3.1, pp. 18 and 114-115; Farmers GSP (Revised 2022) (redline), Section 4.4, pp. 152-156; Fresno County GSP (Revised 2022) (redline), Sections 4.1 and 4.4, pp. 161-162 and 186-189; Grassland GSP (Revised 2022) (redline), Section 4.3.1, pp. 167-171; Northern and Central GSP (Revised 2022) (redline), Section 6.3, pp. 474-529; SJREC GSP (Revised 2022) (redline), Section 3.4, pp. 137-139.

DEFICIENCY 3: SUMMARY OF PLAN REVISIONS

The following briefly describes what was revised in the Subbasin's six GSPs to address Deficiency 3. It should be noted that some of the GSPs in the Subbasin have also modified the RMS wells within their respective monitoring networks.

Sustainability Goal

- Aliso GSP. Basic changes were made to the Aliso GSP to reflect a coordinated sustainability goal for the Subbasin.[80]
- Farmers GSP. The Subbasin's coordinated sustainability goal was added to the Farmers GSP.[81]
- Fresno County GSP. The Subbasin's coordinated sustainability goal was added to the Fresno County GSP.[82]
- Grassland GSP. No changes were made to the sustainability goal section of the Grassland GSP as it already included the coordinated sustainability goal set for the Subbasin. However, the GSP continues to reflect the original management intent of the Subbasin by stating, "The success of the GSP is reflected in the avoidance of undesirable results as described in section 4.3 Undesirable Results. This allows a significant amount of flexibility in defining and implementing Sustainable Management Criteria in the absence of undesirable results."[83]
- Northern and Central GSP. No changes were made to the sustainability goal section of the Northern and Central GSP as it already included the coordinated sustainability goal set for the Subbasin. However, the Northern and Central GSP added text in the GSP to reflect "sustainability goals for each applicable sustainability indicator" which suggests there could be multiple sustainability goals in the Subbasin.[84]
- SJREC GSP. The sustainability goal for the Subbasin is not found in the SJREC GSP, but the GSP does include the new "sustainability goals" for each of the applicable sustainability indicators.[85] The SJREC GSP references the sustainable management criteria section of the revised Common Chapter where the Subbasin's sustainability goal is presented.

[80] Aliso GSP (Revised 2022) (redline), Section 4.1, pp. 107-109.
[81] Farmers GSP (Revised 2022) (redline), Section 4.1, pp. 132-133.
[82] Fresno County GSP (Revised 2022) (redline), Section 4.1, p. 161.
[83] Grassland GSP (Revised 2022) (redline), Section 4.1, pp. 165-166.
[84] Northern and Central GSP (Revised 2022) (redline), Section 4.1, pp. 472-474.
[85] SJREC GSP (Revised 2022) (redline), Section 3.0, pp. 120-121.

Minimum Thresholds and Measurable Objectives

Chronic Lowering of Groundwater Levels

The following briefly describes what was revised in the Subbasin's six GSPs to address Deficiency 3 as it pertains to chronic lowering of groundwater levels.

- Aliso GSP. The original minimum threshold in four RMS wells was to provide a 100-foot buffer above the Corcoran Clay. The new minimum threshold has been coordinated as described in this Staff Report to reflect historical low groundwater levels.[86] As indicated in the Aliso GSP, the minimum thresholds have been modified to be approximately 50 to 150 feet higher in elevation. No analysis has been conducted to determine how the threshold change would impact wells in the small GSP area or the other applicable sustainability indicators.
- Farmers GSP. The original minimum threshold considered the annual maximum groundwater elevations for each year. The new minimum threshold has been coordinated as described in this Staff Report to reflect historical low groundwater levels.[87] No analysis has been conducted to determine how the threshold change would impact wells in the small GSP area or the other applicable sustainability indicators. It is important to note that significant and unreasonable lowering of groundwater levels is quantitatively defined as exceeding the minimum threshold at more than 50 percent of representative monitoring sites by aquifer in a GSP area. In the Farmers GSP area there is only one RMS well in each aquifer.
- Fresno County GSP. The original minimum threshold considered the annual maximum groundwater elevations for each year. The new minimum threshold has been coordinated as described in this Staff Report to reflect historical low groundwater levels.[88] No analysis has been conducted to determine how the threshold change would impact wells in the small GSP area or the other applicable sustainability indicators.
- Grassland GSP. The original minimum threshold in the Upper Aquifer was set at an elevation that was 20 percent lower than the lowest groundwater elevation observed between 2000 to "present." No minimum thresholds were originally set for the Lower Aquifer because "no historical data exists."[89] The new minimum threshold is set "at a fixed elevation…equivalent to the historic seasonal low prior to the end of Water Year 2016." However, the GSP does not indicate when these elevations were observed since the original minimum threshold only considered data prior to 2000. No minimum thresholds were set for the Lower Aquifer.
- Northern and Central GSP. The original minimum thresholds were set as the hydrologic low for wells perforated in the Upper Aquifer and 95 percent of the

[86] Aliso GSP (Revised 2022) (redline), Section 4.4.1, pp. 121-125.
[87] Farmers GSP (Revised 2022) (redline), Section 4.3.1, pp. 144-145.
[88] Fresno County GSP (Revised 2022) (redline), Section 4.3.1, pp. 174-175.
[89] Grassland GSP (Revised 2022) (redline), Section 4.4.1, pp. 182-186.

hydrologic low for wells perforated in the Lower Aquifer.[90] The new minimum threshold has been coordinated as described in this Staff Report to reflect historical low groundwater levels; however, the Lower Aquifer still does not have a threshold assigned due to lack of data.

- SJREC GSP. The first sentence of Section 3.3.1 of the revised SJREC GSP has not been modified and still reflects the original GSP area definition of a minimum threshold.[91] New language reflecting the updated approach to defining minimum thresholds has been added to this section. As such, there is conflicting information in the revised SJREC GSP.

Reduction in Groundwater Storage

The following briefly describes what was revised in the Subbasin's six GSPs to address Deficiency 3 as it pertains to the reduction of groundwater storage.

- Aliso GSP. The original Aliso GSP used groundwater elevations as a proxy for determining undesirable results for groundwater storage in the Upper Aquifer and did not establish sustainable management criteria for the Lower Aquifer "due to a considerable lack of deep wells" despite the use of composite wells screened in both aquifers (40 percent of the wells). The revised Aliso GSP continues to use groundwater elevations as a proxy for the Upper Aquifer but now uses the minimum thresholds for subsidence to determine undesirable results in the Lower Aquifer.[92] It should be noted that the revised minimum thresholds for groundwater levels are now approximately 100 to 150 feet higher in elevation when compared to the original levels and the Aliso GSP formerly considered the Upper and Lower aquifers to be a single system. The Aliso GSP indicates that the average annual change in storge is negative 2,200 acre-feet per year in the Upper Aquifer (time period not defined) and negative 4,400 acre-feet per year in the Lower Aquifer (time period not defined).[93]

- Farmers GSP. The original Farmers GSP calculated change in storage using the difference between the "current [did not define what current is] groundwater elevation level to MT level for all representative sites." The revised Farmers GSP uses groundwater elevations as a proxy for the Upper Aquifer and the sustainable management criteria established for the subsidence sustainability indicator for the Lower Aquifer.[94] The revised Table 4-8 indicates the total storage change for the Upper Aquifer in the Farmers GSP area is 30,000 acre-feet (previously 11,000 acre-feet) and the total storage change for the Subbasin's entire Lower Aquifer is

[90] Northern and Central GSP (Revised 2022) (redline), Section 6.3.1.2, pp. 476-485.
[91] SJREC GSP (Revised 2022) (redline), Section 3.3.1, pp. 124-128.
[92] Aliso GSP (Revised 2022) (redline), Section 4.4.1, pp. 125-127.
[93] Aliso GSP (Revised 2022) (redline), Section 3.3.3.1.1 and Table 3-4, p. 92.
[94] Farmers GSP (Revised 2022) (redline), Section 4.3.2.1 and Table 4-8, pp. 146-147.

1,100,000 acre-feet (previously 4,400 acre-feet for the GSP area only). This information conflicts with the data presented on Figures 3-26 and 3-27.[95]

- Fresno County GSP. The original Fresno County GSP took an approach similar to the Farmers GSP and revised its GSP to use groundwater levels as a proxy for the Upper Aquifer. The revised Table 4-8 indicates the total storage change for the Upper Aquifer is 120,000 acre-feet (time period not defined) for the Fresno County GSP area. Per the revised Fresno County GSP, "A GSP specific volume of water was only determined for the Upper Aquifer as FCMA does not pump from the Lower Aquifer [and] thus does not contribute to decline in Lower Aquifer storage."[96] This information does not align with the data provided in the GSP which indicates the cumulative change in storage between 2003-2013 in the Upper Aquifer was zero acre-feet and negative 19,000 acre-feet in the Lower Aquifer (-1,700 acre-feet per year average).[97]

- Grassland GSP. The Grassland GSP was revised to reflect the continued use of groundwater elevations as a proxy for addressing groundwater storage in the Upper Aquifer and the updated approach to using the sustainable management criteria for subsidence in the Lower Aquifer.[98] The GSP continues to state, "Most of the upper aquifer representative monitoring wells have only three years' worth of groundwater levels and have conflicting temporal measurement periods. None of the lower aquifer representative monitoring wells have adequate historical data to develop a meaningful volumetric minimum threshold…" Change in storge information is provided in the GSP for what is defined as the "Northern Division" and the "Southern Division."[99] During the 1987-1993 drought the loss of storage was estimated to be 12,000 acre-feet per year in the Northern Division and a loss of 6,500 acre-feet per year in the Southern Division.

- Northern and Central GSP. The Northern and Central GSP was modified to reflect the revised approach for the Subbasin. The revised GSP states, "This GSP uses the minimum thresholds for the chronic lowering of groundwater levels as a proxy for the reduction of groundwater storage sustainability indicator for the Upper Aquifer, and correlates minimum thresholds for inelastic land subsidence with the reduction in groundwater storage that would case un undesirable result for the Lower Aquifer."[100] The groundwater conditions section of the GSP indicates that "Cumulative change in storage declined more rapidly in the Upper Aquifer compared to the Lower Aquifer, declining by about 830,000 acre-feet (AF) in the

[95] Farmers GSP (Revised 2022) (redline), Figures 3-26 and 3-27, pp. 112-113.
[96] Fresno County GSP (Revised 2022) (redline), Section 4.3.2, p. 177.
[97] Fresno County GSP (Revised 2022) (redline), Section 3.2.2 and Figures 3-27 and 3-28, pp. 111 and 132-133.
[98] Grassland GSP (Revised 2022) (redline), Section 4.4.1.1, p. 187.
[99] Grassland GSP (Revised 2022) (redline), Section 3.2.6, pp. 124-125.
[100] Northern and Central GSP (Revised 2022) (redline), Section 6.3.2.2, p. 491.

Upper Aquifer and 160,000 AF in the Lower Aquifer between WY2003 and WY2018."[101]

- SJREC GSP. The brief discussion of groundwater storage minimum thresholds in the SJREC GSP has been revised to reflect the changed approach to using groundwater elevations as a proxy for the Upper Aquifer and the minimum thresholds for subsidence in the Lower Aquifer.[102] Change in storage information is provide in Appendix I, which organizes data into what were originally identified as management areas and revised to be monitoring zones.[103] The combined decrease in storage from these areas between 2003-2012 was 11,950 acre-feet per year.

Degraded Water Quality

The following briefly describes what was revised in the Subbasin's six GSPs to address Deficiency 3 as it pertains to degraded water quality.

- Aliso GSP. The original Aliso GSP used minimum thresholds set for electrical conductivity (4.5 dS/m), chloride (13.3 meq/L), and nitrate as nitrogen (30 mg/L) following Food and Agriculture Organization guidelines. The revised GSP now uses only TDS as a minimum threshold at a concentration of 1,000 mg/L.

- Farmers GSP. The original Farmers GSP created a water quality management area due to the Steffens Plume and established "an annual rate of degradation of 60 mg/L total dissolved solids (TDS) for the saline front." The original water quality threshold was set in five wells at 1,200 mg/L for TDS – the original Farmers GSP acknowledged that the EPA secondary standard for TDS in drinking water is 500 mg/L, but stated it is a non-enforceable guideline. The amended Farmers GSP eliminated the use of management areas. The revised GSP now uses only TDS as a minimum threshold at a concentration of 1,000 mg/L.

- Fresno County GSP. The minimum thresholds for degraded water quality in the original Fresno County GSP were set by two different methods depending on the cause of degraded groundwater. Wells along the west side of the Fresno Sough affected by naturally occurring saline water had values set based on the maximum annual change in TDS concentration, and wells in areas where groundwater quality is affected by the Steffens Plume were set at a fixed concentration of TDS. The revised GSP now uses only TDS as a minimum threshold at a concentration of 1,000 mg/L.

- Grassland GSP. The original Grassland GSP stated, "The minimum threshold for water quality is set to a TDS measurement of 2500 mg/L for all representative

[101] Northern and Central GSP (Revised 2022) (redline), Section 5.3.3, p. 330.
[102] SJREC GSP (Revised 2022) (redline), Section 3.3.2, p. 129.
[103] SJREC GSP (Revised 2022) (redline), Appendix I and Figure 41, pp. 1009-1012 and 1013.

monitoring wells in both the Upper Aquifer and Lower Aquifer." The revised GSP now uses only TDS as a minimum threshold at a concentration of 1,000 mg/L.

- Northern and Central GSP. In the original Northern and Central GSP, minimum thresholds for water quality were "set as the upper Secondary MCL for TDS (1,000 mg/L), the Primary MCL for nitrate (10 mg/L as N), and the agricultural WQO for irrigation for boron (0.7 mg/L) or current groundwater quality as of December 2018 for both the Upper Aquifer and Lower Aquifer if the listed MCL or WQO is already exceeded." The minimum thresholds formerly assigned to the Upper Aquifer and Lower Aquifer in the Northern and Central GSP for TDS ranged from 1,000 mg/L to 4,000 mg/L. The revised GSP now uses only TDS as a minimum threshold at a concentration of 1,000 mg/L.

- SJREC GSP. In the original SJREC GSP the minimum threshold was simply defined as the amount of poor-quality groundwater that is greater than what can be successfully managed through the management actions. The revised GSP now uses only TDS as a minimum threshold at a concentration of 1,000 mg/L.

Land Subsidence

The following briefly describes what was revised in the Subbasin's six GSPs to address Deficiency 3 as it pertains to land subsidence.

- Aliso GSP. The Aliso GSP states the land within its GSP area is subsiding at a rate of approximately 0.2 feet per year, which was its original minimum threshold.[104] At this rate, which was observed between 2012-2018, the Aliso GSP area could reach two feet of total subsidence in approximately 10 years. Because minimum thresholds for groundwater levels are set at historical lows, it is likely that subsidence in the Aliso GSP area will not stop after 2040.

- Farmers GSP. The Farmers GSP discusses subsidence in two ways – compaction of the Upper Aquifer and total subsidence.[105] Two of the subsidence monitoring sites (Fordel and Yearout Ranch) measure Upper Aquifer compaction and one site (P304) measures total subsidence. Historical (1999-2018?) amounts of total compaction are reported to range between 0.02 and 0.08 feet. Historical (2004-2011?) amounts of total subsidence are reported to be 0.3 feet. This information does not necessarily correspond to the data presented on Figures 3-32 through 3-34 and conflicts with the minimum thresholds set on Table 4-9.[106]

- Fresno County GSP. The Fresno County GSP takes an approach similar to the Farmers GSP and uses the Fordel and P304 monitoring points.[107]

[104] Aliso GSP (Revised 2022) (redline), Section 4.3.3, p.119.
[105] Farmers GSP (Revised 2022) (redline), Section 3.2.7, pp. 73-74.
[106] Farmers GSP (Revised 2022) (redline), Figures 3-32 to 3-34 and Table 4-9, pp.118-120 and 148.
[107] Fresno County GSP (Revised 2022) (redline), Section 4.3.3, pp. 179-180.

- Grassland GSP. The Grassland GSP states that the average subsidence rate in its GSP area between 2011-2017 is 0.075 feet per year.[108] The minimum threshold is stated to be two additional feet of subsidence by 2040 and additional details are included in the Common Chapter, not in the Grassland GSP.

- Northern and Central GSP. The Northern and Central GSP initially established subsidence management areas.[109] In the WSID-PID Management Area the minimum threshold was set as the acceptable loss in distribution capacity as a result of subsidence resulting from groundwater pumping as based on future capacity study. In the TRID Management Area the minimum threshold was set as four (4) feet additional subsidence compared to 2019 benchmark elevation. In the remaining GSP area, the minimum threshold was set as target rate/goal by monitoring subregion, based on the average 2014-2016 elevation change from recent DMC surveys. Subsidence threshold rates in the original GSP were generally between -0.13 and -0.26 ft/year.

- SJREC GSP. Current and historical subsidence information is presented in an appendix and is still organized by what are now called “monitoring zones” which are rebranded management areas. The SJREC GSP originally did not set a minimum threshold for land subsidence but has indicated that the new threshold is up to two feet of additional subsidence by 2040. The SJREC GSP continues to state that “most, if not all, of the land subsidence observed is a result of groundwater extractions from outside of the SJREC GSA boundary.”[110]

Depletions of Interconnected Surface Water

The following briefly describes what was revised in the Subbasin’s six GSPs to address Deficiency 3 as it pertains to depletions of interconnected surface water.

- Aliso GSP. The original Aliso GSP did not establish sustainable management criteria for interconnected surface water because of an existing legal agreement, despite the GSP area being located adjacent to the San Joaquin River. The hydrogeologic conceptual model prepared for the Aliso GSP identified locations in the GSP area where there are direct hydraulic connections between surface water and groundwater. The revised Aliso GSP does not consider interconnected surface water to be an issue and has indicated this sustainability indicator to be a data gap.[111] No details are provided in the Aliso GSP regarding the referenced legal agreement.

- Farmers GSP. The original Farmers GSP acknowledged interaction between surface water and groundwater and set a minimum threshold as a gradient

[108] Grassland GSP (Revised 2022) (redline), Section 4.4.1.2, pp. 188-189.
[109] Northern and Central GSP (Revised 2022) (redline), Section 6.3.5.2 and Table 6-5, pp. 512-514 and 519.
[110] SJREC GSP (Revised 2022) (redline), Section 3.3.5, p. 131-134.
[111] Aliso GSP (Revised 2022) (redline), Section 4.3.7, pp. 122-123.

between two wells. The Farmers GSP continues to state, "No surface water features are present in FWD, but the SJR flows along its northern boundary."[112] The revised Farmers GSP considers interconnected surface water to be a data gap.

- Fresno County GSP. The Fresno County GSP identifies the Fresno Slough to be interconnected with groundwater and initially set its minimum threshold "based on the historic decline in stage values in the Mendota Pool and Fresno Slough." The revised Fresno County GSP considers interconnected surface water to be a data gap.[113]

- Grassland GSP. The Grassland GSP identified a nine-mile long stretch of the San Joaquin River to be in direct hydraulic connection with groundwater and initially proposed to use groundwater elevation as a proxy and stated, "If a twenty percent or greater decrease from the recent historical (2000 to 2019) upper aquifer groundwater level lows are experienced or exceeded at more than fifty percent of the representative monitoring network wells for three consecutive years, then it can be assumed that significant and unreasonable undesirable results have occurred." The revised Grassland GSP now considers this sustainability indicator to be a data gap.[114]

- Northern and Central GSP. The original Northern and Central GSP did not establish sustainable management criteria for interconnected surface water despite including detailed information about interconnected surface water systems. The original GSP stated, "At the time of GSP development, there are insufficient data available to set numeric values for minimum thresholds for the depletions of interconnected surface water sustainability indicator in a manner that is not subjective." The revised Northern and Central GSP continues to consider this sustainability indicator as a data gap.[115]

- SJREC GSP. The original SJREC GSP did not set numerical sustainable management criteria for interconnected surface water but instead set a qualitative minimum threshold which was, "Observed increase in seepage from the San Joaquin River due to groundwater extractions in the SJREC GSP Group area. The SJREC plan to work with the counties to restrict perforating wells above the first encountered restrictive clay layer (near the San Joaquin River) to prevent induced seepage similar to the established operations defined in the Herminghaus Agreement on Reach 2 of the San Joaquin River." The revised SJREC GSP now considers this sustainability indicator to be a data gap.[116]

[112] Farmers GSP (Revised 2022) (redline), Section 3.2.8, pp. 74-75.
[113] Fresno County GSP (Revised 2022) (redline), Sections 4.2.5 and 4.3.5, pp. 141-142 and 150-151.
[114] Grassland GSP (Revised 2022) (redline), Sections 3.2.9 and 4.4.1.1, pp. 130 and 187.
[115] Northern and Central GSP (Revised 2022) (redline), Sections 5.3.7 and 6.3.6, pp. 384-386 and 523-526.
[116] SJREC GSP (Revised 2022) (redline), Section 3.3.6, p. 135.

Deficiency 4: Summary of Plan Revisions

The following briefly describes what was revised in the Subbasin's GSPs to address Deficiency 4. No management areas were used in the original Aliso GSP or the Grassland GSP.

- Farmers GSP. The Farmers GSP originally stated, "FWD elected to become a management area for two of the five applicable sustainability indicators, Degraded Water Quality and Interconnected Surface Waters. A management area was created for these sustainability indicators due to their high sensitivity to the management actions of surrounding areas." In response to the Department's required corrective action, the Farmers GSP no longer utilizes management areas.[117] As a result, a significant portion of the GSP's sustainable management criteria components were revised. Because the Farmers GSP was originally structured to be a management area and only covers approximately 0.3 percent of the Subbasin's total area, Department staff question the appropriateness of this small area having its own GSP, especially since the original Farmers GSP was created "to represent the interest of local landowners within the [Farmers Water] District."[118] Department staff note that with the elimination of management areas, the GSP is now not clear in describing how the GSA will manage water quality or depletions of interconnected surface water, especially since the interconnected surface water sustainability indicator is now identified as a data gap in the Subbasin.

- Fresno County GSP. The Fresno County GSP originally stated, "A management area was created for degraded water quality due to the existing contamination and Regional Board regulatory requirements for the Steffens plume in MAA. A management area for interconnected surface waters for MAB was developed because levels in the Fresno Slough are managed by SJREC, SLDMWA and USBR and not a function of naturally occurring conditions."[119] Most references to management areas within the small (three percent of the Subbasin area) Fresno County GSP were removed.[120] As a result, a significant portion of the GSP's sustainable management criteria components, previously managed as management areas, were revised and no details were provided as to how Fresno County would manage water quality with the Regional Water Quality Control Board or depletions of interconnected surface water with the other regional entities, especially since the interconnected surface water sustainability indicator is now identified as a data gap in the Subbasin.

- Northern and Central GSP. Previously, two management areas were established for land subsidence in the Northern and Central GSP. The West Stanislaus

[117] Farmers GSP (Revised 2022) (redline), Section 3.4, pp. 86 and 130-131.
[118] Farmers GSP (Revised 2022) (redline) Executive Summary, p. 14.
[119] Fresno County GSP (Revised 2022) (redline), Section 3.4, p. 158.
[120] Fresno County GSP (Revised 2022) (redline), Section 3.4, pp. 158-159.

Irrigation District and Patterson Irrigation District (WSID-PID) Management Area and the Tranquility Irrigation District (TRID) Management Area were "established to better manage progress toward sustainability through sustainable management criteria for the land subsidence sustainability indicator." Each of these management areas had their own defined thresholds and measurable objectives and versions of what conditions are considered undesirable results. The management area section and the reasons for creating those management areas have been deleted from the GSP.[121]

- SJREC GSP. As stated in the revised SJREC GSP, "For the purposes of this plan, the historic reference to management areas originally established in 1997, will now be renamed and in the future referred to as "monitoring zone(s)".[122] The structure of the revised SJREC GSP remains the same but the 11 management areas are now called monitoring zones. Each of the "monitoring zones" still have individual water budgets and customized hydrogeologic conceptual models and basin setting definitions.

[121] Northern and Central GSP (Revised 2022) (redline), pp. 452-454.
[122] SJREC GSP (Revised 2022) (redline), Section 2.2.4, pp. 113-115.

Appendix B-2

2022 Incomplete Determination

CALIFORNIA DEPARTMENT OF WATER RESOURCES

SUSTAINABLE GROUNDWATER MANAGEMENT OFFICE

715 P Street | Sacramento, CA 95814 | P.O. Box 942836 | Sacramento, CA 94236-0001

January 21, 2022

John Brodie
Delta-Mendota Subbasin Point of Contact
San Luis & Delta-Mendota Water Authority
842 6th Street
Los Banos, CA 93635
john.brodie@sldmwa.org

RE: "Incomplete" Determination of the 2020 Groundwater Sustainability Plans Submitted for the San Joaquin Valley – Delta-Mendota Subbasin

Dear John Brodie,

The Department of Water Resources (Department) has evaluated the six groundwater sustainability plans (GSPs) submitted for the San Joaquin Valley – Delta-Mendota Subbasin (Subbasin), as well as the materials considered to be part of the required coordination agreement. Collectively, the six GSPs and the coordination agreement are referred to as the Plan for the Subbasin. The Department has determined that the Plan is "incomplete" pursuant to Section 355.2(e)(2) of the GSP Regulations.

The Department based its incomplete determination on recommendations from the Staff Report, included as an enclosure to the attached Statement of Findings, which describes that the Subbasin's Plan does not satisfy the objectives of the Sustainable Groundwater Management Act (SGMA) nor substantially comply with the GSP Regulations. The Staff Report also provides corrective actions which the Department recommends the Subbasin's 23 groundwater sustainability agencies (GSAs) review while determining how and whether to address the deficiencies in a coordinated manner.

The Subbasin's GSAs have 180 days, the maximum allowed by the GSP Regulations, to address the identified deficiencies. Where addressing the deficiencies requires modification of the Plan, the GSAs must adopt those modifications into their respective GSPs and all applicable coordination agreement materials, or otherwise demonstrate that those modifications are part of the Plan before resubmitting it to the Department for evaluation no later than July 20, 2022. The Department understands that much work has occurred to advance sustainable groundwater management since the GSAs submitted their GSPs in January 2020. To the extent to which those efforts are related or responsive to the Department's identified deficiencies, we encourage you to document that as part of your Plan resubmittal. The Department prepared a Frequently Asked Questions document to provide general information and guidance on the process of addressing deficiencies in an "incomplete" determination.

Department staff will work expeditiously to review the revised components of your Plan resubmittal. If the revisions sufficiently address the identified deficiencies, the Department will determine that the Plan is "approved". In that scenario, Department staff will identify additional recommended corrective actions that the GSAs should address early in implementing their GSPs (i.e., no later than the first required periodic evaluation). Among other items, those corrective actions will recommend the GSAs provide more detail on their plans and schedules to address data gaps. Those recommendations will call for significantly expanded documentation of the plans and schedules to implement specific projects and management actions. Regardless of those recommended corrective actions, the Department expects the first periodic evaluations, required no later than January 2025 – one-quarter of the way through the 20-year implementation period – to document significant progress toward achieving sustainable groundwater management.

If the Subbasin's GSAs cannot address the deficiencies identified in this letter by July 20, 2022, then the Department, after consultation with the State Water Resources Control Board, will determine the GSP to be "inadequate". In that scenario, the State Water Resources Control Board may identify additional deficiencies that the GSAs would need to address in the state intervention processes outlined in SGMA.

Please contact Sustainable Groundwater Management Office staff by emailing sgmps@water.ca.gov if you have any questions about the Department's assessment, implementation of your Plan, or to arrange a meeting with the Department.

Thank you,

Paul Gosselin

Paul Gosselin
Deputy Director of Sustainable Groundwater Management

Attachment: Statement of Findings Regarding the Determination of Incomplete Status of the San Joaquin Valley – Delta-Mendota Subbasin Groundwater Sustainability Plans

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

STATEMENT OF FINDINGS REGARDING THE DETERMINATION OF INCOMPLETE STATUS OF THE SAN JOAQUIN VALLEY – DELTA-MENDOTA SUBBASIN GROUNDWATER SUSTAINABILITY PLANS

The Department of Water Resources (Department) is required to evaluate whether a submitted groundwater sustainability plan (GSP) conforms to specific requirements of the Sustainable Groundwater Management Act (SGMA), is likely to achieve the sustainability goal for the basin covered by the GSP, and whether the GSP adversely affects the ability of an adjacent basin to implement its GSP or impedes achievement of sustainability goals in an adjacent basin. (Water Code § 10733.) The Department is directed to issue an assessment of the GSP within two years of its submission. (Water Code § 10733.4.)

SGMA allows for multiple GSPs implemented by multiple groundwater sustainability agencies (GSAs) and coordinated pursuant to a single coordination agreement that covers the entire basin to be an acceptable planning scenario. (Water Code § 10727.) In the San Joaquin Valley – Delta-Mendota Subbasin (Subbasin), six separate GSPs were prepared by 23 GSAs pursuant to the required coordination agreement. This Statement of Findings explains the Department's decision regarding the multiple GSPs covering the Subbasin submitted jointly by the multiple GSAs. Collectively, the six GSPs and the coordination agreement are referred to as the Plan for the Subbasin. Individually, the GSPs include the following:

- *Aliso Water District Groundwater Sustainability Plan* (Aliso GSP) – the Aliso GSP is implemented by a single GSA, the Aliso Water District GSA.
- *Groundwater Sustainability Plan, Delta-Mendota Subbasin, Farmers Water District* (Farmers GSP) – the Farmers GSP is implemented by a single GSA, the Farmers Water District GSA.
- *Groundwater Sustainability Plan for County of Fresno GSA Management Area A & Management Area B – Delta-Mendota Subbasin* (Fresno County GSP) – the Fresno County GSP is implemented by a single GSA, the County of Fresno GSA.
- *Grassland Groundwater Sustainability Agency Groundwater Sustainability Plan* (Grassland GSP) – the Grassland GSP is implemented by two GSAs, the Grasslands GSA and the County of Merced GSA.
- *Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions* (Northern and Central GSP) – the Northern and Central GSP is

implemented by the following eight GSAs: Oro Loma GSA, DM-II GSA, Patterson Irrigation District GSA, Widren Water District GSA, City of Patterson GSA, Northwestern Delta-Mendota GSA, West Stanislaus Irrigation District GSA, and Central Delta-Mendota GSA.

- *Groundwater Sustainability Plan for the San Joaquin River Exchange Contractors GSP Group in the Delta-Mendota Subbasin* (SJREC GSP) – the SJREC GSP is implemented by the following 11 GSAs: San Joaquin River Exchange Contractors GSA; City of Firebaugh GSA, City of Los Banos GSA, City of Newman GSA, City of Dos Palos GSA, City of Guistine GSA, City of Mendota GSA, County of Merced GSA, County of Madera GSA, and Turner Island Water District GSA, as well as a portion of the County of Fresno Management Area B GSA.

Department management has reviewed the enclosed Staff Report, which recommends that the deficiencies identified should preclude approval of the Plan. Based on its review of the Staff Report, Department management is satisfied that staff have conducted a thorough evaluation and assessment of the Plan and concurs with, and hereby adopts, staff's recommendation and all the corrective actions provided. The Department thus deems the Plan incomplete based on the Staff Report and the findings contained herein.

A. The GSPs do not use the same data and methodologies.

    1. The Plan makes general statements that the collection and presentation of data are coordinated throughout the Subbasin, but the Plan lacks detail and confirmation that the six GSPs not only consider the other GSPs within and adjacent to the Subbasin but have addressed the regulatory aspects of SGMA in a manner that substantially complies with the GSP Regulations.

        i. A statement that the GSPs are coordinated without accompanying explanation is not sufficient coordination. Department staff find that the Plan for the Subbasin does not utilize same data and methodologies to support the various water budget, change in storage, and sustainable yield approaches; therefore, it is unclear how the GSAs will reach, let alone track, sustainability throughout the Subbasin in a coordinated manner.

        ii. By allowing each of the GSPs to move forward with collecting, compiling, and analyzing data on its own, set sustainable management criteria that support the respective GSP area's definition of what is considered sustainable within its boundaries, and relying upon a "sum-of-the-parts" approach to reflect the

Subbasin's conditions, it is uncertain whether or how the six GSPs use the same data and methodologies.

B. The GSPs have not established common definitions of undesirable results in the Subbasin.

1. Because each of the six GSPs prepared in the Subbasin defined its own sustainable management criteria, each applicable sustainability indicator has up to six different definitions of what are considered significant and unreasonable conditions.

    i. While this approach was agreed upon by the 23 GSAs in the Subbasin using the required coordination agreement, by approaching the sustainability indicators in such an individualistic and isolated manner, Department staff do not believe that the Plan satisfies the SGMA requirement to the use of same data and methodologies.

    ii. A broad, generic definition of undesirable results was developed for the entire Subbasin, but the various GSAs responsible for each GSP further defined what they considered "significant and unreasonable." This process has resulted in setting different thresholds with different metrics and establishing a wide range of measurable objectives, if at all, often for very small portions of the Subbasin that do not seem to align with adjacent areas governed by other GSPs. Department staff find that this fragmented approach towards establishing separate criteria that define sustainable conditions in various parts of the Subbasin does not meet the intent of SGMA or the requirements of the GSP Regulations.

C. The GSPs in the Subbasin have not set sustainable management criteria in accordance with the GSP Regulations.

1. While a sustainability goal was agreed upon for the Subbasin, each of the six GSPs includes its own version of what its GSP-area goal is and does not correlate those goals with the Subbasin's sustainable yield.

    i. The individual GSPs do not include supporting information that is sufficiently detailed, but instead provide statements, for example, that the GSP areas have "a significant amount of flexibility in defining and implementing Sustainable Management Criteria in the absence of undesirable results." Like the Subbasin's definition of undesirable results, which has up to six different GSP definitions of what is considered a significant and unreasonable condition, the Subbasin appears to have multiple definitions of its sustainability goal depending upon which GSP is referenced.

2. Each of the six GSPs prepared in the Subbasin defined its own sustainable management criteria and each sustainability indicator has up to six different definitions of what are considered significant and unreasonable conditions.

    i. As demonstrated by the review of each GSP's definition of undesirable results, the Plan, while purporting to be coordinated, actually presents a very complicated and disparate range of definitions for what constitutes an undesirable result for each category, such that whether or not something is considered an undesirable result depends on where in the Subbasin the condition is occurring.

3. The establishment of minimum thresholds and measurable objectives in the Subbasin are not coordinated, nor are they supported by information that is sufficiently detailed.

    i. Each GSP generally contains a wide variety of what are considered significant and unreasonable conditions, sets different interim goals, minimum thresholds, and measurable objectives, often with different units of measurement, or determines that a particular sustainability indicator is not applicable to its GSP area without providing sufficient justification.

D. The management areas established in the Plan have not sufficiently addressed the requirements specified in 23 CCR § 354.20.

1. The six GSPs prepared in the Subbasin have established a total of 17 management areas.

    i. While the use of management areas is technically allowed in a basin if the GSAs determine that the creation of management areas will facilitate implementation of their GSPs, the use of management areas in a basin that is already managed under six separate GSPs significantly complicates the Subbasin's implementation of SGMA. It also impedes the ability of

Department staff to determine if the sustainability goal established for the Subbasin is being met, especially if established management areas do not have monitoring points and it is uncertain what sustainable management criteria apply to each area.

Based on the above, the Plan submitted by the GSAs in the San Joaquin Valley – Delta-Mendota Subbasin is determined to be incomplete because the Plan does not satisfy the requirements of SGMA, nor does it substantially comply with the GSP Regulations. The corrective actions provided in the enclosed Staff Report are intended to address the deficiencies that, at this time, preclude the Plan's approval. The GSAs have up to 180 days to address the deficiencies outlined above and detailed in the Staff Report. Once the GSAs resubmit their respective GSPs and the required coordination agreement, the Department will review the revised Plan to evaluate whether the deficiencies were sufficiently addressed. Should the GSAs fail to take sufficient actions to correct the deficiencies identified by the Department, the Department shall disapprove the Plan if, after consultation with the State Water Resources Control Board, the Department determines the Plan to be inadequate pursuant to 23 CCR § 355.2(e)(3)(C).

Signed:

Karla Nemeth, Director
Date: January 21, 2022

Enclosure: Groundwater Sustainability Plan Assessment Staff Report – San Joaquin Valley – Delta-Mendota Subbasin

State of California
Department of Water Resources
Sustainable Groundwater Management Program
Groundwater Sustainability Plan Assessment Staff Report

Groundwater Basin Name:	San Joaquin Valley Basin – Delta-Mendota Subbasin (No. 5-022.07)
Number of GSPs:	6 (see list below)
Number of GSAs:	23 (see list below)
Point of Contact:	John Brodie, San Luis & Delta-Mendota Water Authority
Recommendation:	Incomplete
Date:	January 21, 2022

The Sustainable Groundwater Management Act (SGMA)[1] allows for any of the three following planning scenarios: a single groundwater sustainability plan (GSP) developed and implemented by a single groundwater sustainability agency (GSA); a single GSP developed and implemented by multiple GSAs; and multiple GSPs implemented by multiple GSAs and coordinated pursuant to a single coordination agreement.[2] GSAs developing GSPs are expected to comply with SGMA and substantially comply with the Department of Water Resources' (Department) GSP Regulations.[3] The Department is required to evaluate an adopted GSP within two years of its submittal date and issue a written assessment.[4]

In the Delta-Mendota Subbasin (Subbasin), six separate GSPs were prepared by 23 GSAs pursuant to a required coordination agreement.[5] Collectively, the six GSPs and the coordination agreement, for evaluation and assessment purposes, will be treated and referred to as the Plan for the Subbasin. Individually, the GSPs include the following:

- *Aliso Water District Groundwater Sustainability Plan* (Aliso GSP) – covers approximately 3.5 percent of the Subbasin. The Aliso GSP is implemented by a single GSA, the Aliso Water District GSA.
- *Groundwater Sustainability Plan, Delta-Mendota Subbasin, Farmers Water District* (Farmers GSP) – covers approximately 0.3 percent of the Subbasin. The Farmers GSP is implemented by a single GSA, the Farmers Water District GSA, and has two management areas.

[1] Water Code § 10720 *et seq*.
[2] Water Code § 10727.
[3] 23 CCR § 350 *et seq*.
[4] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[5] Water Code § 10733.4(b).

- *Groundwater Sustainability Plan for County of Fresno GSA Management Area A & Management Area B – Delta-Mendota Subbasin* (Fresno County GSP) – covers approximately 3 percent of the Subbasin. The Fresno County GSP is implemented by a single GSA, the County of Fresno GSA, and has two management areas.

- *Grassland Groundwater Sustainability Agency Groundwater Sustainability Plan* (Grassland GSP) – covers approximately 14 percent of the Subbasin. The Grassland GSP is implemented by two GSAs, the Grasslands GSA and the County of Merced GSA.

- *Groundwater Sustainability Plan for the Northern and Central Delta-Mendota Regions* (Northern and Central GSP) – covers approximately 41 percent of the Subbasin. The Northern and Central GSP creates two management areas and is implemented by the following eight GSAs: Oro Loma GSA, DM-II GSA, Patterson Irrigation District GSA, Widren Water District GSA, City of Patterson GSA, Northwestern Delta-Mendota GSA, West Stanislaus Irrigation District GSA, and Central Delta-Mendota GSA.

- *Groundwater Sustainability Plan for the San Joaquin River Exchange Contractors GSP Group in the Delta-Mendota Subbasin* (SJREC GSP) – covers approximately 39 percent of the Subbasin. The SJREC GSP creates 11 management areas and is implemented by the following 11 GSAs: San Joaquin River Exchange Contractors GSA; City of Firebaugh GSA, City of Los Banos GSA, City of Newman GSA, City of Dos Palos GSA, City of Guistine GSA, City of Mendota GSA, County of Merced GSA, County of Madera GSA, and Turner Island Water District GSA, as well as a portion of the County of Fresno Management Area B GSA.

Included as an appendix in each GSP is a document called the *Common Chapter for the Delta-Mendota Subbasin Groundwater Sustainability Plan* (Common Chapter)[6] which was prepared under the oversight of the Delta-Mendota Subbasin Coordination Committee (Coordination Committee) to "[integrate] key parts of the six GSPs to meet subbasin-level requirements per [SGMA and the GSP Regulations]."[7] The Common Chapter contains eight technical memoranda addressing a variety of SGMA topics (Technical Memoranda).[8] The Common Chapter and the following Technical Memoranda are referenced throughout this staff report:

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[6] Aliso GSP, Appendix B, pp. 262-456; Farmers GSP, Appendix A, pp. 187-379; Fresno County GSP, Appendix A, pp. 226-418; Grassland GSP, Appendix A, pp. 236-430; Northern and Central GSP, Identified as Appendix B in the GSP Table of Contents but provided as Supporting Information on the SGMA Portal; SJREC GSP, Appendix B, pp. 226-419.

[7] Aliso GSP, Common Chapter, Section 1.1, p. 274. Note: While each GSP contains the same Common Chapter and Technical Memoranda, all footnote references herein will only be made with reference to the Aliso GSP.

[8] Aliso GSP, Appendix B, pp. 513-549; Farmers GSP, Appendix A, pp. 436-472; Fresno County GSP, Appendix B, pp. 475-511; Grassland GSP, Appendix B, pp. 487-523; Northern and Central GSP, Identified as Appendix B in the GSP Table of Contents but provided as Supporting Information on the SGMA Portal; SJREC GSP, Appendix B, pp. 476-512.

- Technical Memorandum #1 – *Common Datasets and Assumptions used in the Delta-Mendota Subbasin GSPs*
- Technical Memorandum #2 – *Assumptions for Hydrogeological Conceptual Model of the Delta-Mendota Subbasin*
- Technical Memorandum #3 – *Assumptions for the Historic, Current and Projected Water Budgets of the Delta-Mendota Subbasin, Change in Storage Cross-Check and Sustainable Yield*
- Technical Memorandum #4 – *Assumptions for Delta-Mendota Subbasin Management Areas, Sustainability Management Criteria*
- Technical Memorandum #5 – *Assumptions for Delta-Mendota Subbasin Monitoring Network*
- Technical Memorandum #6 – *Coordination of the Delta-Mendota Subbasin Data Management System*
- Technical Memorandum #7 – *Adoption and Use of the Subbasin Coordination Agreement*
- Technical Memorandum #8 – *Coordinated Noticing, Communication, and Outreach Activities in the Delta-Mendota Subbasin*

The Technical Memoranda are specified in the Plan's coordination agreement.[9] The Plan's coordination agreement addresses each of the components identified in the GSP Regulations. Department staff do not have comments on the legal aspects of that document but do have concerns regarding some of the explanations in the Common Chapter as they relate to Water Code Section 10733.4(b)(2) and the assumptions agreed upon in the Technical Memoranda – primarily how or whether the six GSPs have been applied and implemented in the Subbasin in a consistent and coordinated manner. As stated in the Common Chapter, "[g]iven the variability of conditions within the Delta-Mendota Subbasin, a subbasin-wide sustainability goal and definitions of undesirable results were developed at the subbasin-level, while the definitions of significant and unreasonable, minimum thresholds, measurable objectives and 5-year interim goals were established at the GSP Plan area-level."[10] This approach has created multiple sustainability goals, multiple definitions of undesirable results, and a wide variety of minimum thresholds, measurable objectives and interim goals, with several GSP-specific hydrogeological conceptual models.

The overall context presented in the Plan is that the critically overdrafted Subbasin has been operating sustainably in the past, the six GSP areas are currently sustainable and are not experiencing undesirable results, and the proposed management approach

[9] Aliso GSP, Delta-Mendota Subbasin Coordination Agreement, p. 472.
[10] Aliso GSP, Common Chapter, Section 5, p. 418.

moving forward is to generally maintain the status quo during SGMA's planning and implementation horizon while maintaining historical pumping amounts. This approach would further lower groundwater levels and does not appear to sufficiently account for recharge from depleting surface flows in the San Joaquin River, and would not eliminate or mitigate overdraft. Additionally, some of the GSPs have not set sustainable management criteria for applicable sustainability indicators as required by the GSP Regulations, and each of the applicable sustainability indicators has up to six undesirable result definitions for what are considered significant and unreasonable conditions.

Department staff have thoroughly evaluated the Plan, the Subbasin's coordination agreement, and other information provided or available and known to staff, and have exercised their professional expertise and judgment to identify several deficiencies that staff recommends should preclude its approval.[11] In addition, consistent with the GSP Regulations, Department staff have provided corrective actions that the GSAs should review while determining how and whether to address the deficiencies in a coordinated manner.[12] The deficiencies and corrective actions are explained in greater detail in Section 3 of this staff report but are generally related to the approach taken to coordinate the six GSPs, the creation of multiple definitions of what are considered significant and unreasonable conditions throughout the Subbasin, the insufficient application of sustainable management criteria used to evaluate sustainability, and the use of numerous management areas in an already fragmented Plan.

This assessment includes the following four sections:

- **Section 1 – Evaluation Criteria:** Describes the legislative requirements and the Department's evaluation criteria.
- **Section 2 – Required Conditions:** Describes the submission, Plan completeness, and basin coverage requirements for a Plan to be evaluated by the Department.
- **Section 3 – Plan Evaluation:** Provides a detailed assessment of identified deficiencies in the Plan. Consistent with the GSP Regulations, Department staff have provided corrective actions for the GSAs to address the deficiencies.
- **Section 4 – Staff Recommendation:** Provides the recommendation of staff regarding the Department's determination.

[11] 23 CCR §355.2(e)(2).
[12] 23 CCR §355.2(e)(2)(B).

1 EVALUATION CRITERIA

The Department evaluates whether a Plan conforms to the statutory requirements of SGMA[13] and is likely to achieve the basin's sustainability goal.[14] To achieve the sustainability goal, the Plan must demonstrate that implementation will lead to sustainable groundwater management, which means the management and use of groundwater in a manner that can be maintained during the planning and implementation horizon without causing undesirable results.[15] Undesirable results are required to be defined quantitatively by the GSAs overlying a basin and occur when significant and unreasonable effects for any of the applicable sustainability indicators are caused by groundwater conditions occurring throughout the basin.[16] The Department is also required to evaluate whether the Plan will adversely affect the ability of an adjacent basin to implement its groundwater sustainability program or achieve its sustainability goal.[17]

For a Plan to be evaluated by the Department, it must first be determined that it was submitted by the statutory deadline[18] and that it is complete and covers the entire basin.[19] Additionally, for those GSAs choosing to develop multiple GSPs, the Plan submission must include a coordination agreement.[20] The coordination agreement must explain how the multiple GSPs in the basin have been developed and implemented utilizing the same data and methodologies and that the elements of the multiple GSPs are based upon consistent interpretations of the basin's setting. If these required conditions are satisfied, the Department evaluates the Plan to determine whether it complies with SGMA and substantially complies with the GSP Regulations.[21] As stated in the GSP Regulations, "[s]ubstantial compliance means that the supporting information is sufficiently detailed and the analyses sufficiently thorough and reasonable, in the judgment of the Department, to evaluate the Plan, and the Department determines that any discrepancy would not materially affect the ability of the Agency to achieve the sustainability goal for the basin, or the ability of the Department to evaluate the likelihood of the Plan to attain that goal."[22]

When evaluating whether the Plan is likely to achieve the sustainability goal for the basin, Department staff review the information provided for sufficiency, credibility, and consistency with scientific and engineering professional standards of practice.[23] The Department's review considers whether there is a reasonable relationship between the

[13] Water Code §§ 10727.2, 10727.4, 10727.6.
[14] Water Code § 10733(a).
[15] Water Code § 10721(v).
[16] 23 CCR § 354.26.
[17] Water Code § 10733(c).
[18] 23 CCR § 355.4(a)(1).
[19] 23 CCR §§ 355.4(a)(2), 355.4(a)(3).
[20] 23 CCR § 357.4.
[21] 23 CCR § 350 *et seq*.
[22] 23 CCR § 355.4(b).
[23] 23 CCR § 351(h).

information provided by the GSAs and the assumptions and conclusions presented in the Plan, including whether the interests of the beneficial uses and users of groundwater in the basin have been considered; whether sustainable management criteria and projects and management actions described in the Plan are commensurate with the level of understanding of the basin setting; and whether those projects and management actions are feasible and likely to prevent undesirable results.[24] The Department also considers whether the GSAs have the legal authority and financial resources necessary to implement the Plan.[25]

To the extent overdraft is present in a basin, the Department evaluates whether the Plan provides a reasonable assessment of the overdraft and includes reasonable means to mitigate it.[26] When applicable, the Department will assess whether coordination agreements have been adopted by all relevant parties and satisfy the requirements of SGMA and the GSP Regulations.[27] The Department also considers whether the Plan provides reasonable measures and schedules to eliminate identified data gaps.[28] Lastly, the Department's review considers the comments submitted on the Plan and evaluates whether the GSAs have adequately responded to the comments that raise credible technical or policy issues with the Plan.[29]

The Department is required to evaluate the Plan within two years of its submittal date and issue a written assessment.[30] The assessment is required to include a determination of the Plan's status.[31] The GSP Regulations provide three options for determining the status of a Plan: approved,[32] incomplete,[33] or inadequate.[34]

After review of the Plan, Department staff may find that the information provided is not sufficiently detailed, or the analyses not sufficiently thorough and reasonable, to evaluate whether it is likely to achieve the sustainability goal for the basin. If the Department determines the deficiencies precluding approval may be capable of being corrected by the GSAs in a timely manner,[35] the Department will determine the status of the Plan to be incomplete. A formerly deemed incomplete Plan may be resubmitted to the Department for reevaluation after all deficiencies have been addressed and incorporated into the Plan within 180 days after the Department makes its incomplete determination. The Department will review the revised Plan to evaluate whether the identified deficiencies were sufficiently addressed. Depending on the outcome of that evaluation,

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[24] 23 CCR §§ 355.4(b)(1), (3), (4) and (5).
[25] 23 CCR § 355.4(b)(9).
[26] 23 CCR § 355.4(b)(6).
[27] 23 CCR § 355.4(b)(8).
[28] 23 CCR § 355.4(b)(2).
[29] 23 CCR § 355.4(b)(10).
[30] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[31] Water Code § 10733.4(d); 23 CCR § 355.2(e).
[32] 23 CCR § 355.2(e)(1).
[33] 23 CCR § 355.2(e)(2).
[34] 23 CCR § 355.2(e)(3).
[35] 23 CCR § 355.2(e)(2)(B)(i).

the Department may determine the resubmitted Plan is approved. Alternatively, the Department may find a formerly deemed incomplete GSP is inadequate if, after consultation with the State Water Resources Control Board, it determines that the GSAs have not taken sufficient actions to correct any identified deficiencies.[36]

The staff assessment of the Plan involves the review of information presented by the GSAs, including models and assumptions, and an evaluation of that information based on scientific reasonableness. In conducting its assessment, the Department does not recalculate or reevaluate technical information provided in the Plan or perform its own geologic or engineering analysis of that information. The recommendation to approve a Plan does not signify that Department staff, were they to exercise the professional judgment required to develop a Plan for the basin, would make the same assumptions and interpretations as those contained in the Plan, but simply that Department staff have determined that the assumptions and interpretations relied upon by the submitting GSAs are supported by adequate, credible evidence, and are scientifically reasonable.

Lastly, the Department's review and assessment of an approved Plan is a continual process. Both SGMA and the GSP Regulations provide the Department with the ongoing authority and duty to review the implementation of the Plan.[37] Also, GSAs have an ongoing duty to reassess their GSPs, provide annual reports to the Department, and, when necessary, update or amend their GSPs.[38] The passage of time or new information may make what is reasonable and feasible at the time of this review to not be so in the future. The emphasis of the Department's periodic reviews will be to assess the GSA's progress toward achieving the basin's sustainability goal and whether implementation of the Plan adversely affects the ability of GSAs in adjacent basins to achieve their sustainability goals.

[36] 23 CCR § 355.2(e)(3)(C).
[37] Water Code § 10733.8; 23 CCR § 355.6 *et seq*.
[38] Water Code §§ 10728 *et seq.*, 10728.2.

2 REQUIRED CONDITIONS

A GSP, to be evaluated by the Department, must be submitted within the applicable statutory deadline.[39] The GSP must also be complete and must, either on its own or in coordination with other GSPs, cover the entire basin.[40] Additionally, when multiple GSPs are developed in a basin, the submission of all GSPs must include a coordination agreement.[41] The coordination agreement must explain how the multiple GSPs in the basin have been developed and implemented utilizing the same data and methodologies and that the elements of the multiple GSPs are based upon consistent interpretations of the basin's setting. If a Plan is determined to be incomplete, Department staff may require corrective actions that address minor or potentially significant deficiencies identified in the Plan. The GSAs in a basin, whether developing a single GSP covering the basin or multiple GSPs, must sufficiently address those required corrective actions within the time provided, not to exceed 180 days, for the Plan to be reevaluated by the Department and potentially approved.

2.1 SUBMISSION DEADLINE

SGMA required basins categorized as high- or medium-priority as of January 1, 2017 and that were subject to critical conditions of overdraft to submit a GSP no later than January 31, 2020.[42]

The Point of Contact representing 23 GSAs submitted the Subbasin's Plan on January 23, 2020, in compliance with the statutory deadline. The Plan consists of six adopted GSPs and the required coordination agreement.

2.2 COMPLETENESS

GSP Regulations specify that the Department shall evaluate a Plan if that Plan is complete and includes the information required by SGMA and the GSP Regulations.[43] For those basins choosing to submit multiple GSPs, a coordination agreement is required.

The Subbasin's 23 GSAs submitted six adopted GSPs that cover the Subbasin. Department staff found the GSPs, and the collective Plan, to be complete and include the required information, sufficient to warrant an evaluation by the Department. The Department posted the Subbasin's six GSPs and coordination agreement to its website on January 31, 2020.

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[39] Water Code § 10720.7.
[40] 23 CCR § 355.4(a)(3).
[41] Water Code § 10733.4(b); 23 CCR § 357.4.
[42] Water Code § 10720.7(a)(1).
[43] 23 CCR § 355.4(a)(2).

2.3 BASIN COVERAGE

A GSP, either on its own or in coordination with other GSPs, must cover the entire basin.[44] A Plan that intends to cover the entire basin may be presumed to do so if the basin is fully contained within the jurisdictional boundaries of the submitting GSAs.

The Plan intends to manage the entire Delta-Mendota Subbasin and the jurisdictional boundaries of the submitting GSAs cover the entire Subbasin.

[44] Water Code § 10727(b); 23 CCR § 355.4(a)(3).

3 PLAN EVALUATION

As stated in Section 355.4 of the GSP Regulations, a basin "shall be sustainably managed within 20 years of the applicable statutory deadline consistent with the objectives of the Act." The Department's assessment is based on a number of related factors[45] including whether the elements of a GSP were developed in the manner required by the GSP Regulations, [46] whether the GSP was developed using appropriate data and methodologies and whether its conclusions are scientifically reasonable,[47] and whether the GSP, through the implementation of clearly defined and technically feasible projects and management actions, is likely to achieve a tenable sustainability goal for the basin.[48]

Department staff have identified deficiencies in the GSPs, the most serious of which preclude staff from recommending approval of the Plan at this time. Department staff believe the GSAs may be able to correct the identified deficiencies within 180 days. Consistent with the GSP Regulations, Department staff are providing corrective actions related to the deficiencies, detailed below, including the general regulatory background, the specific deficiency identified in the Plan, and the specific actions to address the deficiency.

GENERAL BACKGROUND

SGMA allows for multiple GSPs to be implemented by multiple GSAs and coordinated pursuant to a single coordination agreement that covers an entire basin.[49] The GSP Regulations and SGMA detail the requirements for a coordination agreement and the elements of the GSPs necessary to be coordinated to achieve the basin's sustainability goal.[50] The coordination agreement must provide both administrative and technical coordination and consistency between all the GSPs. The collective submittals for the basin are to be based upon consistent interpretations of the basin setting and utilize the same data and methodologies.[51] In the context of utilizing the same data and methodologies, the coordination agreement must provide the following:[52]

- a coordinated water budget for the basin, including groundwater extraction data, surface water supply, total water use, and change in groundwater in storage;
- a sustainable yield for the basin, supported by a description of the undesirable results for the basin, and an explanation of how the minimum thresholds and

[45] 23 CCR § 355.4.
[46] 23 CCR § 355.4(a)(1).
[47] 23 CCR § 355.4(b)(1).
[48] 23 CCR §§ 355.4(b)(5), 355.4(b)(6).
[49] Water Code § 10727(b)(3).
[50] 23 CCR § 357.4; Water Code § 10727.6.
[51] 23 CCR § 357.4(a).
[52] Water Code § 10727.6 *et al;* 23 CCR §§ 357.4(b)(3)(B), 357.4(b)(3)(C), 357.4(c).

measurable objectives defined by each GSP relate to those undesirable results, based on information described in the basin setting; and

- an explanation of how the GSPs implemented together satisfy the requirements of SGMA and are in substantial compliance with the GSP Regulations.

The Department is tasked with evaluating whether the GSPs, in coordination with one another, conform with the required regulatory contents and are likely to achieve the sustainability goal for the basin.[53]

3.1 Deficiency 1. The GSPs do not use the same data and methodologies.

3.1.1 Background

The Plan is subject to Water Code Section 10727.6 as well as Section 357.4 of the GSP Regulations. The GSPs require coordination to ensure that they utilize the same data and methodologies for the following sustainable groundwater management assumptions: *groundwater elevation data; groundwater extraction data; surface water supply; total water use; change in groundwater storage; water budget; and sustainable yield*.[54] For GSAs developing multiple GSPs, the GSAs are also required to jointly submit an explanation of how the GSPs implemented together satisfy Water Code Sections 10727.2, 10727.4 and 10727.6, as well as a copy of the coordination agreement.[55] Coordination agreements are required to address a variety of regulatory topics, including how the GSAs have used the same data and methodologies to prepare coordinated GSPs where the sustainable yield is supported by a description of the undesirable results and an explanation of how the minimum thresholds and measurable objectives relate to those undesirable results.[56]

3.1.2 Deficiency Details

The Plan makes general statements that the collection and presentation of data are coordinated throughout the Subbasin, but the Plan lacks detail and confirmation that the six GSPs not only consider the other GSPs within and adjacent to the Subbasin but have addressed the regulatory aspects of SGMA in a manner that substantially complies with the GSP Regulations. A statement that the GSPs are coordinated without accompanying explanation is not sufficient coordination. Department staff find that the Plan for the Subbasin does not utilize same data and methodologies to support the various water budget, change in storage, and sustainable yield approaches; therefore, it is unclear how the GSAs will reach, let alone track, sustainability throughout the Subbasin in a coordinated manner.

By allowing each of the GSPs to move forward with collecting, compiling, and analyzing data on its own, set sustainable management criteria that supports the respective GSP

[53] Water Code § 10733(b); 23 CCR § 355.4(b).
[54] Water Code § 10727.6.
[55] Water Code §§ 10733.4(b)(2), 10733.4(b)(3).
[56] 23 CCR § 357.4(b)(3).

area's definition of what is considered sustainable within its boundaries, and relying upon a "sum-of-the-parts" approach to reflect the Subbasin's conditions, it is uncertain whether or how the six GSPs use the same data and methodologies. Technical Memorandum documents do not resolve this uncertainty. In many cases, as presented below, the six GSPs do not use the same data and methodologies and do not provide a detailed explanation that complies with Water Code Section 10733.4(b)(2), other than general reference to insufficient discussions in the Common Chapter.

Common to all six GSPs is Technical Memorandum #1, which is "Common Datasets and Assumptions used in the Delta-Mendota Subbasin GSPs." [57] According to the memorandum, "[d]uring development of the six coordinated Groundwater Sustainability Plans (GSPs) for the Delta-Mendota Subbasin (Subbasin), the twenty-three Groundwater Sustainability Agencies (GSAs) in the Subbasin agreed upon methodologies and assumptions for water budgets, change in storage, and sustainable yield." The following briefly describes the approaches taken to address the three assumptions referenced in Technical Memoranda #1.

Water Budget

Water Budget information is presented in Section 4.3 of the Common Chapter and in Technical Memorandum #3.[58] While the categories of inflows and outflows were agreed upon by the Coordination Committee for the land surface budget and groundwater budget, each of the GSP areas prepared separate water budgets[59] using different modeling methods while often relying upon customized hydrogeological conceptual models[60] which were then "rolled-up" to the Subbasin level. It is uncertain whether the outflow from a particular GSP area within the Subbasin is comparable to the inflow from an adjacent GSP area, as there is no coordinated explanation provided in the Plan.

The historical water budget reflects water years 2003-2012 (the minimum number of years required under the GSP Regulations), the current water budget is for 2013, and the projected budget is years 2014-2070. A series of analyses were done for periods ranging from 1990-2015, but it was decided by the Subbasin's Coordination Committee that the period chosen should avoid the most recent drought.[61] The Plan also acknowledges that, "[w]hile 'current water budget conditions' are defined in the GSP Emergency Regulations §354.18(c)(1) as the year with 'the most recent population, land use, and hydrologic

[57] Aliso GSP, Technical Memorandum #1, pp. 514-524.
[58] Aliso GSP, Common Chapter, Section 4.3, pp. 404-414, Technical Memorandum #3, pp. 527-531.
[59] Aliso GSP, Section 3.3.1, pp. 68-69; Farmers GSP, Section 3.3, pp. 115-134; Fresno County GSP, Water Budget Section, p. 22; Fresno County GSP, Section 3.3, pp. 131-155; Grassland GSP, Section 3.3.1, pp. 129-154; Northern and Central GSP, Section 5.4.4, p. 404; SJREC GSP, Sections 2.2.3 through 2.2.5, pp. 77-119.
[60] Aliso GSP, Common Chapter, Section 4.1, pp. 324-356, Appendix A, pp. 204-260; Farmers GSP, Section 3.1, pp. 60-80; Fresno County GSP, Section 3.1, pp. 73-95; Grassland GSP, Section 3.1, pp. 89-109; Northern and Central GSP, Section 5.2. pp. 213-244; SJREC GSP, Section 2.2.1. p. 77, Appendix I, pp. 810-1018.
[61] Aliso GSP, Section 3.3.1, p. 69.

conditions,' WY2015, WY2016 and WY2017 were not thought to be representative of the Delta-Mendota Subbasin under 'normal' or 'average' conditions."[62]

As presented below, some of the GSP groups used numerical models to calculate the inflows and outflows from the respective GSP areas while others used non-numerical and spreadsheet models – there was no explanation in the Common Chapter that indicated how these differing modeling approaches used the same data or methodology. Additionally, some of the GSP groups used a hydrogeological conceptual model that was prepared specifically for its GSP area, which was different than the hydrogeological conceptual model submitted as part of the Common Chapter and Technical Memorandum #2.[63]

In general, the details in the respective GSPs are presented in a manner that support each GSP area's perspective that no undesirable results are currently present within its boundaries and will not occur in the future, essentially setting the stage for maintaining the status quo during SGMA's planning and implementation horizon. The following briefly describes the process for developing different water budgets in each of the respective GSP areas:

- *Aliso GSP*: "Due to the homogeneous nature of the District area regarding water use, cropping patterns, and climate, AWD has decided to use an analytical accounting tool to quantify the historic water budget conditions and project historic trends into the future while incorporating factors such as climate change and land use that may alter these trends going forward."[64]
- *Farmers GSP*: "For the FWD GSA in the Delta-Mendota Subbasin, a numerical model tool was developed and used to simulate the geographic extent of the FWD and adjacent areas."[65]
- *Fresno County GSP*: "For the FCMA GSA in the DM Subbasin, a numerical model tool was developed utilizing the United States Geological Survey's MODFLOW-NWT and used to simulate the geographic extent of the FCMA and adjacent areas."[66]
- *Grassland GSP*: "In order to gain a greater understanding of operational and natural conditions in the Plan Area, the GSAs decided to use an analytical accounting tool to quantify the water budget conditions for specific year types where data was prevalent."[67]

[62] Northern and Central GSP, Section 5.4.3, p. 400. Note: 23 CCR § 354.18(c)(1) states, "Current water budget information shall quantify current inflows and outflows for the basin using the most recent hydrology, water supply, water demand, and land use information."
[63] Aliso GSP, Common Chapter, Section 4.1, pp. 324-356, Technical Memorandum #2, pp. 525-526.
[64] Aliso GSP, Section 3.3.1, pp. 68-69.
[65] Farmers GSP, Section 3.3, pp. 115-134.
[66] Fresno County GSP, Water Budget Section, p. 22; Section 3.3, pp. 131-155.
[67] Grassland GSP, Section 3.3, pp. 129-154.

- *Northern and Central GSP*: "The selected alternative approach for water budget development for the Northern and Central Delta-Mendota Regions is a hybrid approach that combines the use of local data and CVHM2 parameters with standard numerical calculations derived from peer-reviewed literature or professional judgment. All water budgets presented herein are based primarily on local land use, water supply, and groundwater elevation data received from agencies as well as data from publicly available sources. Where local data are unavailable, data from CVHM2 is used."[68]

- *SJREC GSP*: "The Historical, Current and Projected Water Budgets were prepared primarily by the SJREC GSA Staff and KDSA in close coordination with the other GSP groups in the Delta-Mendota Subbasin to ensure that each GSP uses the same data and methodologies."[69] However, the methodology, or methodologies, used to develop the various water budgets in the SJREC GSP area is not clearly defined, other than general reference to modified versions of the Department's Best Management Practices documents that address water budgets and modeling, which are provided as Appendices K and L in the SJREC GSP.[70] The SJREC GSP contains a water budget for only the SJREC GSA area, as well as a combined budget that represents the collective SJREC GSP group, which includes the SJREC GSA and the SJREC GSP's 11 management areas.[71] The water budget information for the 11 management areas is far less detailed and relies upon information provided in sections 7 through 16 of the GSP, often relying upon separate hydrogeological conceptual models.[72]

<u>Change in Groundwater Storage</u>

The explanation related to coordinated change in storage calculations and water budgets is insufficient, especially since information presented in text, and data displayed in figures and tables, do not seem to correlate with each other and it is uncertain what the current loss of storage is throughout the Subbasin.[73] Statements in Common Chapter Section 4.2.3, state that, "*For information on how change in storage was calculated, refer to Section 4.3.2 – Water Budgets of this Common Chapter*." However, Section 4.3.2 only states, "*Individual historical, current, and projected water budgets were developed by each GSP Group for their respective Plan Area. For more information on the development of those water budgets, as well as tabular and graphical representation of the results, refer to the respective sections of the individual GSPs*." This fragmented and multi-staged

[68] North and Central GSP, Section 5.5.4, p. 404.
[69] SJREC GSP, Section 2.2.3, pp. 77-112.
[70] SJREC GSP, Section 2.2.3, p. 78, Appendix K, pp. 1038-1079, Appendix L, pp. 1080-1113.
[71] SJREC GSP, Sections 2.2.3 and 2.2.4, pp. 77-115; Section 2.2.5, p. 115-119.
[72] SJREC GSP, Section 2.2.5, pp. 115-119, Section 7.0 through 16.5, pp. 151-215, Appendices Q through W, pp. 1210-1643.
[73] Aliso GSP, Technical Memorandum #3, pp. 527-531, Section 3.3.3.1, p. 84; Farmers GSP, Section 3.2.4, p. 84; Fresno County GSP, Section 3.2.2, p. 99; Grassland GSP, Section 3.2.6, pp. 121-122; Northern and Central GSP, Section 5.3.3, p. 331; SJREC GSP, Section 3.3.2, p. 126.

presentation of information is insufficient to demonstrate that the various GSPs are coordinated – Section 4.2.3 of the Common Chapter refers readers to Section 4.3.2, which then refers readers to six different GSP sections.

The Plan's change in groundwater storage assessment considered a sum-of-the-parts methodology, combining the change in groundwater storage from each GSP area to determine the overall change in groundwater storage for the Subbasin without a clear quantification of overdraft occurring throughout the Subbasin. Per the Common Chapter, despite recharge outpacing extractions, an overall declining trend in groundwater storage was observed in both aquifers between 2003-2013.[74] Cumulative change in storage declined more rapidly in the Upper Aquifer compared to the Lower Aquifer, declining by about 1,300,000 acre-feet in the Upper Aquifer and 678,000 acre-feet in the Lower Aquifer (a total of 1,978,000 acre-feet). However, when "rolling-up" the water budget information in Tables CC-9 and CC-11, which reflect the Subbasin's historical and current water budgets, the cumulative change in storage in the Upper Aquifer reflects a loss of 624,000 acre-feet and a loss of 375,000 acre-feet in the Lower Aquifer, with a total loss of storage within the Subbasin of 1,003,000 acre-feet.[75] Clarification on the Subbasin's cumulative change in storage and total amount of overdraft is required, because the overdraft information does not align throughout the six GSPs.

For the Upper Aquifer, Technical Memorandum #1 states, "Upper aquifer change in groundwater storage was evaluated using annual groundwater level contours from Spring 2003 to Spring 2013 developed using the same datasets identified above and applying specific yield (defined as the volume of water released from storage by an unconfined aquifer per unit surface area of aquifer per unit decline of the water table) provided by each individual GSP Group. The Delta-Mendota Subbasin upper aquifer change in groundwater storage assessment considered a 'sum-of-the-parts' methodology, combining the change in groundwater storage for each GSP to determine the overall change in groundwater storage for the Subbasin."[76] However, according to the annual report filed for water year 2020, "four methods [were] chosen by the respective GSP regions and summed to a Subbasin total [for the Upper Aquifer]: change in groundwater elevation contours used by Aliso Water District, Farmers Water District, and Fresno County Management Areas A and B GSP regions; water budget with calibration to historic below normal water year conditions by Grassland GSP Region; a combination of change in groundwater elevation contours and representative hydrograph methods by the Northern & Central Delta-Mendota Region GSP Region; and representative hydrographs used by the San Joaquin River Exchange Contracts GSP Region."[77] Although it therefore appears that the GSPs use different methodologies and data, there is no coordinated

[74] Aliso GSP, Common Chapter, Section 4.2.3, pp. 372-373.
[75] Aliso GSP, Common Chapter, Tables CC-9 and CC-11, pp. 408-409.
[76] Aliso GSP, Technical Memorandum #1, p. 517.
[77] Delta-Mendota Subbasin WY 2020 Annual Report, p. 31.

explanation in the Plan of how or why the four change in storage methods can be considered as using the same data and methodology.

For the Lower Aquifer, Technical Memorandum #1 states, “On January 15, 2019, the Technical Working Group discussed addressing the historic period change in groundwater storage in the lower aquifer. Instead of using scarce data, the change was compared against loss of storage from inelastic land subsidence as calculated using change in land surface elevation multiplied by the area and supplemented by change in groundwater levels and storativity in areas of the Subbasin where those data were available.”[78] But the annual report filed for water year 2020 states, “two methods [were] chosen by the respective GSP regions and summed to a Subbasin total: change in land surface elevation using the best available data was used by the Aliso Water District, Grassland, Northern & Central Delta-Mendota Region, and San Joaquin River Exchange Contractors GSP regions…”, where the Northern & Central Delta-Mendota Region used additional data sources “to provide complete spatial coverage…”; and “change in groundwater elevation at GSP monitoring wells was utilized by the Farmers Water District and Fresno Management Areas A and B GSP regions.”[79] Again, there is no coordinated explanation in the Plan of how the two approaches to estimate change in storage can be considered as using the same data and methodology.

Additional explanation of historical, current, and projected change in groundwater storage for the Subbasin is warranted, as well as a straightforward quantification of overdraft throughout the Subbasin. The compilation of water budgets and the estimation of change in groundwater storage for the Subbasin do not appear to use the same data and methodology, or the Plan lacks adequate explanation for how or why the various approaches in the GSPs can be considered as using the same data and methodologies.

Sustainable Yield

The Common Chapter (Section 4.3.4)[80] and Technical Memoranda #3[81] address the methodology for calculating sustainable yield in the Subbasin. Of the six GSPs, three provide a sustainable yield specifically for the GSP area while the other three rely upon the estimate for the entire Subbasin. Similar to the discussion for Deficiency #2, each GSP established its own definitions of significant and unreasonable conditions for each of the appliable sustainability indicators, which allows for up to six different situations of what is considered an undesirable result in the Subbasin for each sustainability indicator. Four of the six GSPs have a total of 17 management areas, as discussed in Deficiency #4, and it is uncertain what sustainable management criteria are being followed in all these management areas to define or reach sustainable conditions, especially since some of the management areas do not have monitoring sites.

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[78] Aliso GSP, Technical Memorandum #1, pp. 517-518.
[79] Delta-Mendota Subbasin WY 2020 Annual Report, p. 32.
[80] Aliso GSP, Common Chapter, Section 4.3.4, pp. 415-417.
[81] Aliso GSP, Technical Memorandum #3, pp. 527-531.

The SJREC GSP states, "*The sustainable yield is determined independent of sustainability criteria and is provided as a guide for water budget planning purposes*."[82] Therefore, it does not appear that the various approaches used in the Subbasin to define sustainable yield have been set by considering undesirable results. As indicated throughout the Plan, a sustainable yield estimate is not established for each GSP area and those estimates are not correlated with undesirable results. Department staff note that under management presented in the Plan, groundwater overdraft in the critically overdrafted Subbasin does not appear to stop by 2040 or during SGMA's 50-year planning and implementation horizon.

As stated in the Common Chapter, "Given existing Subbasin data gaps and uncertainties associated with the data used to develop the water budgets and this estimate, it was also decided that a +/- 10% factor should be applied to determine a range for the Upper Aquifer sustainable yield value. The +/- 10% factor is applied based on the percentage difference between the values from change in storage Subbasin contour mapping for the historic water budget period and the reported changes in storage from the Subbasin consolidated historic water budgets (WY2003-2012) for the Upper Aquifer."[83] However, at a Subbasin scale, the Common Chapter did not clarify what the "data gaps and uncertainties associated with the data used" were and did not further explain why the 10 percent factor was chosen. Additionally, Technical Memorandum #3 states, "[t]he distribution of known lower aquifer water level data and extraction volume data are limited and not sufficient to allow for a calculation of lower aquifer sustainable yield."[84]

The following briefly describes the process for developing sustainable yield estimates in the respective GSP areas:

- *Aliso GSP*: "The sustainable yield for the AWD GSA upper aquifer was calculated as the sum of the average pumping in the upper aquifer and the average change in storage calculated using the specific yield method."[85] The Aliso GSP does not differentiate between the Upper Aquifer and Lower Aquifer when calculating sustainable yield because "the GSP area has a significant number of composite wells which draw water from both the upper and lower aquifers" and the GSA considers the two principal aquifers to "act as a single system." The sustainable yield for the Aliso GSP area is estimated to be 83,600 AFY.

- *Farmers GSP*: "Based on the projected water budget analysis, FWD will be sustainably pumping groundwater at an average annual rate of 9,200 AFY. This value is intended to represent a long-term average and not an annual maximum."[86]

[82] SJREC GSP, Section 3.1.1, p. 120.
[83] Aliso GSP, Common Chapter, Section 4.3.4, p. 415.
[84] Aliso GSP, Technical Memorandum #3, p. 531.
[85] Aliso GSP, Section 3.3.3.2, pp. 85-86.
[86] Farmers GSP, Section 3.3.3, p. 122.

- *Fresno County GSP*: There is no sustainable yield established for the Fresno County GSP area, only for the entire Subbasin.[87]
- *Grassland GSP*: A sustainable yield for the GSP area is not defined for either the Upper Aquifer or the Lower Aquifer.[88] Section 3.3.3.2 of the GSP states, "The Plan Area does minimal pumping on a per-acre basis, and undesirable results have not been observed. It is unknown whether increases in pumping will affect the groundwater storage volume or cause undesirable results. Because of the lack of understanding regarding how pumping affects the aquifer, calculating sustainable yield can be complicated."
- *Northern and Central GSP*: There is no sustainable yield established for the North and Central GSP area, only for the entire Subbasin.[89]
- *SJREC GSP*: A sustainable yield of 189,000 AFY (with a one-year sustainable yield of at least 268,000 AFY) has been calculated for the Upper Aquifer. The Lower Aquifer sustainable yield is "primarily driven by avoiding an Undesirable Result for land subsidence."[90]

<u>Additional Coordination Components</u>

In addition to water budget, change in groundwater storage, and sustainable yield, Water Code Section 10727.6 requires the following additional components to use the same data and methodologies when developing a Plan. As summarized below, these components also do not appear to use the same data and methodologies, or the Plan lacks sufficient explanation of how or why these various approaches should be considered as using the same data or methodologies.

Groundwater Elevation Data

General statements in the Technical Memoranda indicate groundwater elevation data would use information provided by local agencies, State and federal sources, and rely upon best management practices and/or best modeled or projected data available; however, few details were provided to explain what those sources were.[91] Most details were spread throughout the six GSPs in an uncoordinated manner.[92] Some GSP areas plan to measure groundwater elevations to the nearest 0.01 foot while others state elevations will be measured to the nearest 1.0 foot. Some of the GSPs state that measuring to the nearest 0.1 foot or 0.01 foot is not feasible for most measurement

[87] Fresno County GSP, Section 3.3.5, p. 137.
[88] Grassland GSP, Section 3.3.3.2, p. 145.
[89] North and Central GSP, Section 5.4.11, pp. 449-450.
[90] SJREC GSP, Sections 3.1.1 and 3.1.2, pp. 120-121.
[91] Aliso GSP, Technical Memorandum #1, pp. 514-524, Technical Memorandum #5, pp. 534-535, Technical Memorandum #6, pp. 536-538.
[92] Aliso GSP, Section 5.1, p. 136, Section 5.2, pp. 159-160; Farmers GSP, Section 4.6.2.1, p. 158; Grassland GSP, Section 5.3, p. 211; Northern and Central GSP, Section 7.2.5.1.2, pp. 551-553; SJREC GSP, Section 3.5.2, p. 135, Appendix N, p. 1152.

methodologies, which is not an accurate statement. The GSP Regulations require measuring groundwater elevations to an accuracy of at least 0.1 feet.[93]

Groundwater Extraction Data

Technical Memorandum #1 states, "Extraction data were estimated or measured by local GSAs for use in the development of individual GSPs. Groundwater extraction volumes used for the Delta-Mendota Subbasin water budgets were compiled from the six individual GSP water budgets."[94] Other than stating groundwater extraction data were estimated or measured by local GSAs for use in individual GSPs, no other organized effort to describe this coordination requirement was provided in the Common Chapter – information was found throughout the six GSPs covering the Subbasin.[95] As presented in the six GSPs, groundwater extraction data was estimated using cropping data, recorded by meters, was "well documented" using land use and climatic data, compiled and estimated through model output, or was voluntarily reported by others. Few details, if any, were found in the six GSPs that describe the coordinated extraction data collection methodology and how it will be applied comparably throughout the Subbasin's groundwater sustainability program.

Surface Water Supply

Technical Memorandum #1 states, "Surface Water Supply allocations, deliveries, imports, and projected supplies were provided or estimated by local GSAs for use in the development of individual GSPs. Applied surface water volumes used for the Delta-Mendota Subbasin water budgets were compiled from the six individual GSP water budgets."[96] Surface water supply and the methods used to quantify that supply is provided using modeling assumptions, landowner reported data, and other methodology. Few details, if any, were found in the six GSPs that describe the coordinated surface water supply data collection methodology, other than using a "sum-of-the-parts" water budgeting approach.[97]

Total Water Use

Historical, current, and projected water budgets for land surface and groundwater are provided in tables CC-8 through CC-13 of the Common Chapter; however, total water use is not provided for the Subbasin.[98] Technical Memorandum #1 states, "Total Water Use

[93] 23 CCR § 352.4(a)(3).
[94] Aliso GSP, Technical Memorandum #1, p. 517.
[95] Aliso GSP, Section 3.3.2.4.1, p. 83, Section 3.3.2.1.5, p. 72; Farmers GSP, Section 3.3.1.2.2, p. 121; Fresno County GSP, Section 3.3.3.2, p. 136; Grassland GSP, Section 3.3.2.1, p. 137; Northern and Central GSP, Appendix D, p. 11 (Appendix D available on the SGMA Portal); SJREC GSP, Section 2.1.2, p. 60, Section 2.2.3.1, p. 81.
[96] Aliso GSP, Technical Memorandum #1, p. 517.
[97] Aliso GSP, Section 3.3.2.1.1, p. 70; Farmers GSP, Section 3.3.1.1.1, p. 119; Fresno County GSP, Section 3.3.2.1, pp. 134-135; Grassland GSP, Section 3.3.2.1, p. 136; Northern and Central GSP, Appendix D, p. 10 (Appendix D available on the SGMA Portal); SJREC GSP, Section 2.2.3.1, p. 81.
[98] Aliso GSP, Common Chapter, Tables CC-8 through CC-13, pp. 408-413.

was estimated or measured by local GSAs for use in the development of individual GSPs. Total water use included in the Delta-Mendota Subbasin water budgets was compiled from the individual GSP water budgets."[99] Total inflows and total outflows are presented on the tables, but not total water use. [100]

3.1.3 Corrective Action

The Common Chapter and the Technical Memoranda do not provide sufficient explanation to confirm that the GSPs have been developed using the same data and methodologies and that elements of the GSPs have been based upon consistent interpretations of the Subbasin's setting. As presented, the GSPs use different data and different methodologies that rely upon multiple versions of the Subbasin setting, with many of the GSPs defining their own version of a hydrogeological conceptual model, often for very small areas of the Subbasin. The 23 GSAs developing the six GSPs should provide supporting information that is sufficiently detailed and provide explanations that are sufficiently thorough and reasonable to explain how the various components of each GSP will together achieve the Subbasin's common sustainability goal. The explanation should describe how the sustainable management criteria established for each GSP (including the management areas if applicable) relate to each other and how they are collectively informed by the basin setting, including the water budget, change in groundwater storage, and sustainable yield, on the Subbasin-wide level.

3.2 Deficiency 2. The GSPs have not established common definitions of undesirable results in the Subbasin.

3.2.1 Background

Section 354.26 of the GSP Regulations states that GSAs shall describe the processes and criteria relied upon to define undesirable results *applicable to the basin* and that undesirable results in a basin occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions *occurring throughout the basin*. The description of undesirable results applicable to the basin shall include the following:[101]

- The cause of groundwater conditions occurring throughout the basin that would lead to or has led to undesirable results.
- The criteria used to define when and where the effects of the groundwater conditions cause undesirable results for each applicable sustainability indicator.

[99] Aliso GSP, Technical Memorandum #1, p. 517.
[100] Aliso GSP, Section 3.3.4.2, Table 3-7, p. 90; Farmers GSP, Executive Summary, p. 21, Section 3.3.4, pp. 122-128; Fresno County GSP, Tables 3-7 and 3-8, pp. 142-143; Grassland GSP, Section 3.3.4.2, Table 3-6, pp. 149-150; Northern and Central GSP, Section 5.4.6, through 5.4.10, pp. 412-449; SJREC GSP, Section 2.2.3, pp. 77-112, Section 2.2.4, pp. 113-119.
[101] 23 CCR § 354.26(b)(1), 354.26(b)(2), 354.26(b)(3).

- Potential effects on the beneficial uses and users of groundwater, on land uses and property interests, and other potential effects that may occur or are occurring from undesirable results.

The definition of sustainable yield in a basin is directly tied to undesirable results. As established in SGMA, sustainable yield means the maximum quantity of water, calculated over a base period representative of long-term conditions in a basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.[102]

3.2.2 Deficiency Details

Because each of the six GSPs prepared in the Subbasin defined its own sustainable management criteria, each applicable sustainability indicator has up to six different definitions of what are considered significant and unreasonable conditions. While this approach was agreed upon by the 23 GSAs in the Subbasin using the required Coordination Agreement, by approaching the sustainability indicators in such an individualistic and isolated manner, Department staff do not believe that the Plan satisfies the SGMA requirement to the use of same data and methodologies.[103] Department staff also believe that this approach does not achieve a coordinated Plan for the Subbasin, and that this approach fragments the Department's ability to track sustainable conditions that are common throughout the Subbasin.

Sustainable management criteria are discussed in Section 5 of the Common Chapter and in Technical Memorandum #4.[104] Section 5 "*describes the coordinated sustainability goal and definition of undesirable results at a subbasin-level and the sustainable management criteria at a GSP-level*." Technical Memorandum #4 acknowledges that "*definitions of undesirable results must be provided at the Subbasin level*." A broad, generic definition of undesirable results was developed for the entire Subbasin, but the various GSAs responsible for each GSP further defined what they considered "significant and unreasonable." This process has resulted in setting different thresholds with different metrics and establishing a wide range of measurable objectives, if at all, often for very small portions of the Subbasin that do not seem to align with adjacent areas governed by other GSPs. Department staff find that this fragmented approach towards establishing separate criteria that define sustainable conditions in various parts of the Subbasin does not meet the intent of SGMA or the requirements of the GSP Regulations.

The following is what was agreed upon in the Subbasin to define undesirable results for each of the six sustainability indicators (main bullet), with multiple definitions of what each GSP group considers to be significant and unreasonable (sub-bullet); this information is presented in tables CC-14 through CC-18 in the Common Chapter.[105] As shown, each sustainability indicator has up to six different definitions of what is considered significant

[102] Water Code § 10721(w).
[103] 23 CCR § 357.4(a).
[104] Aliso GSP, Common Chapter, Section 5, pp. 418-429, Technical Memorandum #4, pp. 532-533.
[105] Aliso GSP, Common Chapter, Section 5.4, Tables CC-14 through CC-18, pp. 420-429.

and unreasonable in the Subbasin, which makes tracking basinwide SGMA implementation and sustainability challenging for Department staff, interested parties, and the beneficial uses and users of groundwater located throughout the Subbasin. Additionally, while each of the six GSPs provided some general discussion related to how the beneficial uses and users of groundwater were considered when setting sustainable management criteria, the individual GSPs were generally concerned with only those beneficial uses and users located within the respective GSP areas and not those collectively located throughout the Subbasin.

- **Chronic lowering of groundwater levels**: *Significant and unreasonable chronic change in water levels, as defined by each GSP Group, that has an impact on the beneficial users of groundwater in the Subbasin through either intra- and/or inter-basin actions*.
    - o A wide range of definitions of significant and unreasonable conditions related to groundwater levels were established throughout the Subbasin depending on GSP coverage.[106] For instance, the **Aliso GSP** states its GSP area is not experiencing significant and unreasonable effects associated with water levels or storage and has linked minimum thresholds with rates of subsidence while setting groundwater level thresholds to provide a 100-foot buffer from the top of the Corcoran Clay.[107] The **Farmers GSP** and the **Fresno County GSP** define groundwater levels dropping below historical lows (2015-2016) as significant and unreasonable.[108] The **Grassland GSP** defines significant and unreasonable as the "lowering of groundwater levels that would lead to increased costs associated with higher total lift, lowering pumps, need to drill deeper wells or costs securing alternative water sources."[109] The **Northern and Central GSP** indicates a significant and unreasonable condition would be " dropping below the Minimum Threshold criteria at 40% of representative monitoring locations concurrently over a given water year resulting in shallow domestic wells going dry in the same subregion as the representative monitoring points in violation, higher pumping costs, and/or the need to modify wells to obtain groundwater."[110] And the **SJREC GSP** states, "The San Joaquin River Exchange Contractors (SJREC) GSP Group has a positive impact on the aquifer and is unlikely to cause Significant and/or Unreasonable lowering of groundwater levels. Triggers have been established to recover aquifer water levels before nearing an Undesirable Result. Currently, an approximation of 25% below historic low for each management area is used

[106] Aliso GSP, Common Chapter, Table CC-14, pp. 420-421.
[107] Aliso GSP, Table 4-1, p. 100.
[108] Farmers GSP, Table 4-6, p. 146; Fresno County GSP, Table 4-6, p. 167.
[109] Grassland GSP, Table 4-5, p. 171.
[110] Northern and Central GSP, Tables 6-1 and 6-2, pp. 477 and 478.

to indicate an Undesirable Result which will be refined based on annual updates and integration with other GSP Groups."[111]

- **Reduction in groundwater storage**: *Significant and unreasonable chronic decrease in groundwater storage, as defined by each GSP Group, that has an impact on the beneficial users of groundwater in the Subbasin through either intra- and/or inter-basin actions*.
  - A wide range of significant and unreasonable definitions related to groundwater storage were established throughout the Subbasin.[112] The **Aliso GSP** has defined significant and unreasonable conditions of chronic reduction in groundwater storage in the same manner as it did for groundwater elevations. The **Farmers GSP** and the **Fresno County GSP** have identified depletion of storage greater than the 2012-2016 period as significant and unreasonable. For the **Grassland GSP**, significant and unreasonable groundwater storage is defined as "insufficient water storage to develop necessary water to maintain critical habitat. Reduction in storage would lead to increased costs associated with higher total lift, lowering pumps, need to drill deeper wells or costs securing alternative water sources. Impacts to habitat would require mitigation, including alternative water supplies and habitat restoration." In the **Northern and Central GSP**, no definition is provided, other than the following statement: "If water levels are managed to meet the Minimum Thresholds, the Northern & Central Delta-Mendota Region GSP Group does not anticipate long-term reductions in storage." The **SJREC GSP** takes a similar approach towards defining significant and unreasonable conditions of groundwater storage as it does groundwater levels, stating that its GSP has a positive impact on the aquifer.
- **Seawater Intrusion**: Determined not applicable to the Subbasin.
- **Degraded water quality**: *Significant and unreasonable degradation of groundwater quality, as defined by each GSP Group, that has an impact on the beneficial users of groundwater in the Subbasin through either intra- and/or inter-basin actions and/or activities*.
  - A wide range of significant and unreasonable definitions related to the degradation of water quality were applied throughout the Subbasin.[113] The **Aliso GSP** states, "Significant and unreasonable is defined as a reduction in crop production due to water quality issues and if 30% of the wells exceed the minimum threshold value on a 4-year consecutive average without treatment." The **Farmers GSP**, which has two management areas, provides the following: "(1) Continued migration of the Steffens plume (elevated Total

[111] SJREC GSP, Section 3.3.1, pp. 122-125.
[112] Aliso GSP, Common Chapter, Table CC-15, pp. 422-423.
[113] Aliso GSP, Common Chapter, Table CC-16, pp. 424-425.

dissolved solids [TDS]) in Upper Aquifer both within Management Area A and towards Farmers Water District. (2) Unreasonable rates of migration of groundwater in the Upper Aquifer with naturally-occurring elevated concentrations of total dissolved solids in Management Area B. (3) Potential effects on the beneficial uses of groundwater include agricultural and domestic uses. (4) Degraded water quality in the Fresno Slough effect [sic] beneficial users of surface water." The **Fresno County GSP**, which also has two management areas, indicates that the following would be considered significant and unreasonable: "(1) Impairment of groundwater quality from the migration of the Steffens Plume from Fresno County's Management Area A. Impacts from the Steffens plume impacts Farmers Water District's ability to utilize groundwater for adjacent use and discharge into the Mendota Pool. (2) Potential effects on the beneficial users of groundwater include water quality levels that impact crops and drinking water standards for domestic uses. (3) Degraded water quality in the Fresno Slough effecting beneficial users of surface water." In the **Grassland GSP**, significant and unreasonable is described as "Degradation of groundwater quality resulting in reduced ability to develop and manage groundwater for habitat productivity." The **Northern and Central GSP** applies the following, "(1) Exceedance of maximum contaminant levels (MCLs) or water quality objectives (WQOs) for irrigation in public water systems for three (3) consecutive sampling events in non- drought years or the additional degradation of current groundwater quality where current groundwater quality exceeds the MCLs or WQOs for irrigation. (2) Water quality degradation due to recharge projects that exceeds 20% of the aquifer's assimilative capacity for one or more constituents without justification of a greater public benefit achieved." And the **SJREC GSP** defines significant and unreasonable as, "[m]igration of contamination plume that makes the water unusable for beneficial use"; however, beneficial use is not expressly defined when establishing significant and unreasonable conditions.

- **Land subsidence**: *Changes in ground surface elevation that cause damage to critical infrastructure that would cause significant and unreasonable reductions of conveyance capacity, damage to personal property, impacts to natural resources or create conditions that threaten public health and safety*.
    - The **Aliso GSP** states, "Aliso is not currently experiencing any significant and unreasonable effects of subsidence. Significant and unreasonable impacts are assumed to occur when the levees within the District have subsided to an elevation causing impacts to the water carrying capacity of the San Joaquin River and Chowchilla Bypass beyond their design flow rates, causing significant and unreasonable flooding or crop damage."[114] In

[114] Aliso GSP, Common Chapter, Table CC-17, p. 426-427.

the **Farmers GSP**, significant and unreasonable is defined as "Damage to infrastructure and loss of conveyance capacity in neighboring Groundwater Sustainability Agencies" and in the **Fresno County GSP** it is defined as "Damage to infrastructure, loss of conveyance capacity, and potential inability to flood or drain by gravity and associated habitat impacts." The **Grassland GSP** considers "Damage to infrastructure, permanent loss of conveyance capacity beyond mitigation, and potential inability to flood or drain by gravity and associated habitat impacts" to be a significant and unreasonable condition. The definition applied by the **Northern and Central GSP** in the WSID-TID management area is: "Impacts to laterals from differential settlement that reduces the ability to deliver surface water supplies" and in the TRID management area "Inadequate freeboard on levee system in wet years as a result of significant additional land subsidence resulting from groundwater extractions." In the remaining Northern and Central GSP area, significant and unreasonable is defined as, "Increases in 2014-2016 subsidence rates due to groundwater pumping in two or more subregions that results in 50% loss of standup capacity and/or 75% overtopping of lining in the Delta-Mendota Canal as a result of inelastic land subsidence." In the **SJREC GSP**, "Reduction in the conveyance capacity for water distribution and/or damage to critical infrastructure" is considered significant and unreasonable.

- **Depletions of interconnected surface water**: *Depletions of interconnected surface water, as defined by each GSP Group, that have significant and unreasonable adverse impacts on the beneficial uses of surface water*.
    - The **Aliso GSP** does not consider the depletion of interconnected surface water to be applicable to its area, but states, "A significant and unreasonable result would be a reduction in water availability to downstream beneficial users beyond what was experienced in similar water years in recent history as a result of groundwater extractions."[115] The **Farmers GSP** considers the following to constitute a significant and unreasonable condition, "(1) San Joaquin River Restoration Project (SJRRP) operations and groundwater extractions from the Upper Aquifer that will influence stream depletion along San Joaquin River; (2) Water level measurements along the San Joaquin River in the shallow zone of the Upper Aquifer to determine degree of vertical gradient; (3) Potential degradation to groundwater dependent ecosystems (GDEs) along San Joaquin River primarily dependent on SJRRP operations of San Joaquin River flows since groundwater pumping expected to remain stable and consistent with historical (pre-SJRRP) levels." The **Fresno County GSP** has applied the following definition, "Decrease in surface water stage in

[115] Aliso GSP, Common Chapter, Table CC-18, p. 428-429.

Mendota Pool from Bureau of Reclamation and Central California Irrigation District (CCID) operations that impact groundwater dependent ecosystems (GDEs) and operations in Mendota Wildlife Area." The **Grassland GSP** states groundwater pumping does not influence surface water depletion but defines a significant and unreasonable undesirable result to be impaired habitat directly associated with interconnected surface waters." The **Northern and Central GSP** has not defined what a significant and unreasonable condition related to depletions of interconnected surface water would be, and the **SJREC GSP** states, "When groundwater extraction directly decreases streamflow in losing stretch of the San Joaquin River."

As demonstrated by the review of each specific GSP's definition of undesirable results, the Plan, while purporting to be coordinated, actually presents a very complicated and disparate range of definitions for what constitutes an undesirable result for each category, such that whether or not something is considered an undesirable result depends on where in the Subbasin the condition is occurring and the definition applicable to that location. Department staff find that this methodology does not conform to the requirement of Water Code Section 10727.6 that individual plans utilize the same data and methodologies for the assumed sustainable yield in developing a basin's Plan.

3.2.3 Corrective Action

The GSAs in the Subbasin should modify each of their respective GSPs, as well as any applicable coordination materials, to substantially comply with the GSP Regulations and define undesirable results in a manner that addresses groundwater conditions occurring throughout the Subbasin, not for only the small portion of the Subbasin represented by the respective GSPs. One way for this deficiency to be remedied is for each of the six separate GSPs to use the same quantitative minimum thresholds, or the same methodology to develop the thresholds, and explicit criteria for undesirable results. Alternatively, if the GSAs believe it is not possible, or for some other reason still desire to use different definitions and metrics for undesirable results within each of the Subbasin's six GSP areas, the Plan must specifically explain how any differences do not affect the requirement to utilize the same data and methodologies for the assumed sustainable yield of the Subbasin. Additionally, if a GSP determines that a sustainability indicator is not applicable within the defined GSP area, then that information must be supported by the best available information and best available science.

3.3 Deficiency 3. The GSPs in the Subbasin have not set sustainable management criteria in accordance with the GSP Regulations.

3.3.1 Background

The GSP Regulations, in Subarticle 3, describe criteria by which a GSA defines conditions in its Plan that constitute sustainable groundwater management for the basin, including the process by which the GSA, or GSAs, shall characterize undesirable results, and establish minimum thresholds and measurable objectives for each applicable sustainability indicator.[116] The Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.[117] Additionally, each GSA shall describe in its Plan the processes and criteria relied upon to define undesirable results applicable to the basin, which occur when significant and unreasonable effects for any of the sustainability indicators are caused by groundwater conditions occurring throughout the basin.[118] Finally, each GSA in its Plan shall establish minimum thresholds that quantify groundwater conditions for each applicable sustainability indicator at each monitoring site or representative monitoring site established pursuant to Section 354.36. The numeric value used to define minimum thresholds shall represent a point in the basin that, if exceeded, may cause undesirable results as described in Section 354.26.[119] Minimum thresholds for each sustainability indicator shall be defined as follows:[120]

- The minimum threshold for chronic lowering of groundwater levels shall be the groundwater elevation indicating a depletion of supply at a given location that may lead to undesirable results.
- The minimum threshold for reduction of groundwater storage shall be a total volume of groundwater that can be withdrawn from the basin without causing conditions that may lead to undesirable results.
- The minimum threshold for seawater intrusion shall be defined by a chloride concentration isocontour for each principal aquifer where seawater intrusion may lead to undesirable results. Note that this sustainability indicator is not applicable to the Subbasin.
- The minimum threshold for degraded water quality shall be the degradation of water quality, including the migration of contaminant plumes that impair water supplies or other indicator of water quality as determined by the GSA that may lead to undesirable results.
- The minimum threshold for land subsidence shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results.
- The minimum threshold for depletions of interconnected surface water shall be the rate or volume of surface water depletions caused by groundwater use that has

[116] 23 CCR § 354.22.
[117] 23 CCR § 354.24.
[118] 23 CCR § 354.26.
[119] 23 CCR § 354.28(a).
[120] 23 CCR § 354.28(b).

adverse impacts on beneficial uses of the surface water and may lead to undesirable results.

3.3.2 Deficiency Details

Coordinated sustainable management criteria are briefly discussed in Section 5 of the Common Plan and in Technical Memorandum #4.[121] The following summarizes the deficiencies associated with the approaches taken to define the Subbasin's sustainability goal, undesirable results, and minimum thresholds.

<u>Sustainability Goal</u>

Section 5.2 of the Common Chapter states, "The sustainability goal for the Delta-Mendota Subbasin was established to succinctly state the objectives and desired conditions of the Subbasin that culminates in the absence of undesirable results by 2040."[122] The sustainability goal for the Subbasin is:

> *The Delta-Mendota Subbasin will manage groundwater resources for the benefit of all users of groundwater in a manner that allows for operational flexibility, ensures resource availability under drought conditions, and does not negatively impact surface water diversion and conveyance and delivery capabilities. This goal will be achieved through the implementation of the proposed projects and management actions to reach identified measurable objectives and milestones through the implementation of the GSP(s), and through continued coordination with neighboring subbasins to ensure the absence of undesirable results by 2040.*

While this is the agreed upon sustainability goal for the Subbasin, each of the six GSPs includes its own version of what its GSP-area goal is and does not correlate those goals with the Subbasin's sustainable yield.[123] As indicated in the GSP Regulations, the Plan shall include a description of the sustainability goal, including information from the basin setting used to establish the sustainability goal, a discussion of the measures that will be implemented to ensure that the basin will be operated within its sustainable yield, and an explanation of how the sustainability goal is likely to be achieved within 20 years of Plan implementation and is likely to be maintained through the planning and implementation horizon.[124] The Common Chapter does not provide any of this required information, but instead references the individual GSPs which present this information in a manner that is not sufficiently detailed nor coordinated. The individual GSPs also do not include supporting information that is sufficiently detailed, but instead provide statements, for example, that the GSP areas have "a significant amount of flexibility in defining and implementing Sustainable Management Criteria in the absence of undesirable results."[125]

[121] Aliso GSP, Common Chapter, Section 5, pp. 418-429, Technical Memorandum #4, pp. 532-533.
[122] Aliso GSP, Common Chapter, Section 5.2, pp. 418-419.
[123] Aliso GSP, Section 4.1, pp. 97-98; Farmers GSP, Section 4.1, p. 138; Fresno County GSP, Section 4.1, p. 159; Grassland GSP, Section 4.1, pp. 156-157; Northern and Central GSP, Section 6.2, pp. 470-471; SJREC GSP, Section 3.1, p. 120.
[124] 23 CCR § 354.24.
[125] Grassland GSP, Section 4.1, pp. 156-157.

Like the Subbasin's definition of undesirable results, which has up to six different GSP definitions of what is considered a significant and unreasonable condition, the Subbasin appears to have multiple definitions of its sustainability goal depending upon which GSP is referenced.

Undesirable Results

The details associated with this insufficient aspect of the Plan's sustainable management criteria are presented in the discussion for Deficiency #2. As previously stated, each of the six GSPs prepared in the Subbasin defined its own sustainable management criteria and each sustainability indicator has up to six different definitions of what are considered significant and unreasonable conditions.[126] While this approach was agreed upon by the 23 GSAs in the Subbasin using the required coordination agreement, by approaching the sustainability indicators in such an individualistic and isolated manner, Department staff do not believe that the Plan satisfies the SGMA requirement to use the same data and methodologies.[127] Department staff also believe that this approach does not achieve a coordinated Plan for the Subbasin, and this approach fragments the Department's ability to track sustainable conditions that are common throughout the Subbasin.

As demonstrated by the review of each specific GSP's definition of undesirable results, the Plan, while purporting to be coordinated, actually presents a very complicated and disparate range of definitions for what constitutes an undesirable result for each category, such that whether or not something is considered an undesirable result depends on where in the Subbasin the condition is occurring. Department staff find that this methodology does not conform to the requirement of Water Code Section 10727.6 that individual plans utilize the same data and methodologies for the assumed sustainable yield in developing a Plan.

Minimum Thresholds and Measurable Objectives

The establishment of minimum thresholds and measurable objectives in the Subbasin are not coordinated, nor are they supported by information that is sufficiently detailed. Section 5.3 of the Common Chapter simply states, "For more information on the development of the sustainable management criteria and information used to support the established sustainable management criteria for the individual GSP Groups, refer to the individual GSPs. Each GSP Group defined what is considered significant and unreasonable in their Plan Area for each applicable sustainability indicators, in addition to establishing minimum thresholds, measurable objectives and 5-year interim goals for their Plan Area."[128] Section 5.4 of the Common Chapter provides, in Tables CC-14 through CC-18,[129] a summary of the Subbasin-wide definition of an undesirable result, GSP-level definition of significant and unreasonable, sustainability goals, 5-year interim goals, minimum

[126] Aliso GSP, Common Chapter, Tables CC-14 through CC-18, pp. 420-429.
[127] Water Code § 10727.6; 23 CCR § 357.4(a).
[128] Aliso GSP, Common Chapter, Section 5.3, p. 419.
[129] Aliso GSP, Common Chapter, Tables CC-14 through CC-18, pp. 420-429.

thresholds, and measurable objectives. However, as shown in the tables, each GSP generally contains a wide variety of what are considered significant and unreasonable conditions, sets different interim goals, minimum thresholds, and measurable objectives, often with different units of measurement, or determines that a particular sustainability indicator is not applicable to its GSP area without providing sufficient justification. Below is a summary of what the minimum thresholds are for each of the five applicable sustainability indicators – note that some of the GSPs have determined that relevant sustainability indicators are not applicable and have not set thresholds or objectives.

- Chronic lowering of groundwater levels: Table CC-14 in the Common Chapter summarizes sustainable management criteria for groundwater levels.[130]
    - The Aliso GSP has set its minimum thresholds in four wells to provide a 100-foot buffer from the top of the Corcoran Clay to the top of the water table.[131] However, some of the wells used in the Aliso GSP to monitor groundwater levels are composite wells screened through the Corcoran Clay which cannot provide an accurate indication of Upper Aquifer and Lower Aquifer conditions. The Aliso GSP assumes, differently than the other GSPs, that the Upper and Lower aquifers function as "one aquifer." Additionally, the definition of significant and unreasonable is linked to accelerated rates of subsidence which is stated to occur "if 30% of the wells in the monitoring zone exceed the minimum threshold value on a 4-year consecutive average under normal or average year conditions,"[132] which needs further explanation to understand how or why this threshold was selected and precisely how it will be applied.
    - The Farmers GSP and the Fresno County GSP have identified seasonal highs and seasonable lows in units of feet below ground surface (ft bgs) in the Common Chapter, indicating that an undesirable result would be exceeding historic lows from 2015-2016, but the details in the respective GSPs present different descriptions, such as elevation declines observed between 2011-2016, and threshold metrics are shown as an elevation not feet below ground surface.[133]
    - The Grassland GSP defines its water level thresholds to "not exceed a 20% lowered water elevation from the recent historical low set uniquely at each representative monitoring site. Recent Historical is defined as the period from 2000 to the present." Some of the monitoring wells in the Grassland GSP do not have any historical data.[134]

[130] Aliso GSP, Common Chapter, Table CC-14, pp. 420-421.
[131] Aliso GSP, Table 4-2, p. 111.
[132] Aliso GSP, Common Chapter, Table CC-14, p. 420.
[133] Farmers GSP, Section 4.3.1, pp. 145-147; Fresno County GSP, Section 4.3.1, pp. 167-169.
[134] Grassland GSP, Table 4-5, p. 171.

- For the Northern and Central GSP, minimum thresholds are set at the hydrologic low for wells perforated in the Upper Aquifer and 95 percent of the hydrologic low for the Lower Aquifer, but an undesirable result would not occur until 40 percent of monitoring locations exceed thresholds (7 out of 17 wells in the Upper Aquifer and/or 8 out of 18 wells in the Lower Aquifer).[135] If these conditions were to occur, the GSP anticipates that shallow domestic wells would go dry and/or these conditions would result in higher pumping costs and/or the need to modify wells to obtain groundwater.

- And in the SJREC GSP, trigger levels have been established in each of the 11 management areas, which if exceeded, would not allow groundwater to be transferred out of the management area, but would not limit the extraction and application of groundwater on the overlying land. The minimum threshold represents a 25 percent increase in the depth to water than the trigger water surface elevation.[136]

- Reduction in groundwater storage: Table CC-15 in the Common chapter summarizes sustainable management criteria for groundwater storage.[137]

  - The Aliso GSP has set minimum thresholds for reduction of groundwater storage just as it has for chronic lowering of groundwater levels – the GSP is using groundwater levels as a proxy and ties undesirable results with rates of subsidence.[138]

  - The minimum thresholds set in the Farmers GSP do not match what is presented in the Common Chapter.[139] The Farmers GSP states annual change in storage will be estimated based on changes observed between seasonal high contours and indicates the threshold for total storage change in the Upper Aquifer is 11,000 acre-feet and 4,400 acre-feet in the Lower Aquifer – the Common Chapter indicates 12,000 acre-feet and 4,600 acre-feet, respectively, but over an extended dry period.

  - The Fresno County GSP takes a similar approach as the Farmers GSP, and the thresholds presented in the GSP do not match the Common Chapter.[140] The Fresno County GSP indicates the threshold for total storage change in the Upper Aquifer is 110,000 acre-feet and 38,000 acre-feet in the Lower Aquifer – the Common Chapter indicates 90,000 acre-feet and 55,000 acre-feet, respectively, but over an extended dry period.

[135] Northern and Central GSP, Sections 6.3.1.1.2 and 6.3.1.2, pp. 472-474.
[136] SJREC GSP, Section 3.3, pp. 122-125.
[137] Aliso GSP, Common Chapter, Table CC-15, pp. 422-423.
[138] Aliso GSP, Section 4.4.1.1, pp. 111-113.
[139] Farmers GSP, Section 4.3.2, pp. 147-148, Common Chapter, Table CC-15, p. 345.
[140] Fresno County GSP, Section 4.3.2, pp. 169-170, Common Chapter Table CC-15, p. 384.

  - o The Grassland GSP uses groundwater levels as a proxy to determine change in storge and applies a “20% lowered water elevation from recent historic low” as its minimum threshold (recent historical is the period 2000 to present).[141]
  - o The Northern and Central GSP uses groundwater elevations as a proxy for groundwater storage.[142]
  - o The SJREC GSP uses groundwater elevations as a proxy for groundwater storage.[143]

- Degraded water quality: Table CC-16 in the Common Chapter summarizes sustainable management criteria for degraded water quality.[144]
  - o In the Aliso GSP minimum thresholds have been set for electrical conductivity (4.5 dS/m), chloride (13.3 meq/L), and nitrate as nitrogen (30 mg/L) following Food and Agriculture Organization guidelines. None of the monitoring wells within the Aliso GSP area have historical or current water quality information attributed to them.[145]
  - o The Common Chapter indicates the Farmers GSP, which has created a water quality management area due to the Steffens Plume, has established “an annual rate of degradation of 60 mg/L total dissolved solids (TDS) for the saline front” but the Farmers GSP states the minimum threshold was set “at a slightly higher value than historic high TDS to maintain agricultural practices”.[146] The threshold set in five wells is 1,200 mg/L for TDS – the Farmers GSP acknowledges that the EPA secondary standard for TDS in drinking water is 500 mg/L, but states it is a non-enforceable guideline.
  - o The minimum thresholds for degraded water quality in the Fresno County GSP “were set by two different methods depending on the cause of degraded groundwater. Wells along the west side of the Fresno Sough affected by naturally occurring saline water had values set based on the maximum annual change in TDS concentration, and wells in areas where groundwater quality is affected by the Steffens Plume were set at a fixed concentration of TDS.”[147] The Common Chapter indicates the minimum threshold for TDS is 1,100 mg/L, which is different than what the Fresno County GSP presents.[148]

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[141] Grassland GSP, Section 4.4.1, pp. 170-173.
[142] Northern and Central GSP, Section 6.3.2, pp. 480-482.
[143] SJREC GSP, Section 3.3.2, p. 126.
[144] Aliso GSP, Common Chapter, Table CC-16, pp. 424-425.
[145] Aliso GSP, Table 4-6, p. 134.
[146] Farmers GSP, Section 4.3.4, pp. 149-150.
[147] Fresno County GSP, Section 4.3.4.1, pp. 171-172.
[148] Fresno County GSP, Common Chapter, Table CC-16, p. 386.

- The Grassland GSP states, "The minimum threshold for water quality is set to a TDS measurement of 2500 mg/L for all representative monitoring wells in both the Upper Aquifer and Lower Aquifer."[149]
- In the Northern and Central GSP, minimum thresholds for water quality "are set as the upper Secondary MCL for TDS (1,000 mg/L), the Primary MCL for nitrate (10 mg/L as N), and the agricultural WQO for irrigation for boron (0.7 mg/L) or current groundwater quality as of December 2018 for both the Upper Aquifer and Lower Aquifer if the listed MCL or WQO is already exceeded."[150] Minimum thresholds assigned to the Upper Aquifer and Lower Aquifer in the Northern and Central GSP are shown in Tables 6-5 and 6-6, respectively, and thresholds for TDS range from 1,000 mg/L to 4,000 mg/L.
- And in the SJREC GSP, the minimum threshold is simply defined as the amount of poor-quality groundwater that is greater than what can be successfully managed through the management actions.

- <u>Land subsidence</u>: Table CC-17 in the Common Chapter summarizes sustainable management criteria for land subsidence.[151]
  - In the Aliso GSP, the minimum threshold is based on the average rate of subsidence observed by the San Joaquin River Restoration Program and the U.S. Bureau of Reclamation and is set at 0.2 feet per year, or a total of 4.0 feet of additional subsidence by 2040. However, Department staff note that this rate of subsidence is not projected to cease after 2040.[152]
  - The Farmers GSP states, "The minimum threshold was established as the maximum rate of subsidence or compaction that occurred during the historic groundwater period (2000-present)."[153] The minimum threshold at the Yearout site is 0.017 ft per year and 0.1 feet per year at site P304 – both representing rates for the Upper Aquifer only.
  - The Fresno County GSP is similar to the Farmers GSP – minimum thresholds for "were based on conditions observed during historic groundwater conditions. The MT was established as the maximum rate of subsidence or compaction that occurred during historic groundwater conditions. These values coincided with the greatest decline in groundwater elevation which occurred between the years of 2011 and 2016."[154] The

[149] Grassland GSP, Table 4-5, p. 171, Section 4.4.1.4, p. 175.
[150] Northern and Central GSP, Section 6.3.3.2, pp. 484-487.
[151] Aliso GSP, Common Chapter Table CC-17, pp. 426-427.
[152] Aliso GSP, Section 4.4.1.2, pp. 116-120, Appendix A, 246-248.
[153] Farmers GSP, Section 4.3.3, p. 148.
[154] Fresno County GSP, Section 4.3.3, pp. 170-171.

minimum threshold at the Fordel site is 0.011 ft per year and 0.1 feet per year at site P304.

- In the Grassland GSP the minimum threshold "is set to not exceed the historical annual average rate of subsidence from December 2011 to December 2015."[155] At subsidence monitoring points 108, 152 and 137 the minimum thresholds in feet per year are -0.11, -0.15 and -0.13, respectively.

- The Northern and Central GSP has subsidence management areas.[156] In the WSID-PID Management Area "the minimum threshold is set as the acceptable loss in distribution capacity as a result of subsidence resulting from groundwater pumping as based on future capacity study." In the TRID Management Area "the minimum threshold is set as four (4) feet additional subsidence compared to 2019 benchmark elevation." In the remaining GSP area, "The minimum threshold is set as target rate/goal by monitoring subregion, based on the average 2014-2016 elevation change from recent DMC surveys." Subsidence threshold rates are generally between -0.13 and -0.26 ft/year.

- And in the SJREC GSP, no numerical minimum thresholds are provided. The minimum threshold for land subsidence "shall be the rate and extent of subsidence that substantially interferes with surface land uses and may lead to undesirable results. Minimum thresholds shall be supported by maps and graphs showing the extent and rate of subsidence and the potential impact to land use and property interests."[157]

• <u>Depletions of interconnected surface water</u>: Table CC-18 in the Common Chapter summarizes sustainable management criteria for interconnected surface water.[158]

  - The Aliso GSP has not established sustainable management criteria for interconnected surface water because of an existing legal agreement, despite the GSP area being located adjacent to the San Joaquin River.[159]

  - The Farmers GSP acknowledged interaction between surface water and groundwater but set a minimum threshold as a gradient between two wells.[160]

  - The Fresno County GSP set its minimum threshold "based on the historic decline in stage values in the Mendota Pool and Fresno Slough. The historic average stage was set as the MO and the MT was determined from the average historic decline of 0.5 ft/year from the MO which corresponds with

[155] Grassland GSP, Table 4-5, p. 171.
[156] Northern and Central GSP, Section 6.3.5.2, pp. 494-496, Table 6-9, p. 499.
[157] SJREC GSP, Section 3.3.5, pp. 127-129.
[158] Aliso GSP, Common Chapter, Table CC-18, pp. 428-429.
[159] Aliso GSP, Section 4.3.7, p. 110.
[160] Farmers GSP, Section 3.2.8, p. 87, Section 4.3.5, pp. 151-152.

recent stage levels." The minimum threshold at the Mendota Pool Staff Gauge is 13 feet and the measurable objective is 14 feet.[161]

- The Grassland GSP proposes to use groundwater elevation as a proxy and states, "If a twenty percent or greater decrease from the recent historical (2000 to 2019) upper aquifer groundwater level lows are experienced or exceeded at more than fifty percent of the representative monitoring network wells for three consecutive years, then it can be assumed that significant and unreasonable undesirable results have occurred."[162]
- Sustainable management criteria for interconnected surface water have not been established for the Northern and Central GSP. The Northern and Central GSP states, "At the time of GSP development, there are insufficient data available to set numeric values for minimum thresholds for the depletions of interconnected surface water sustainability indicator in a manner that is not subjective. A qualitative statement of minimum thresholds has been developed in the interim for this sustainability indicator as follows: An X percent increase in surface water depletions along interconnected stretches of surface water as a result of groundwater pumping, where 'X' is the present increase in depletions to be determined from monitoring data collected between 2020 and 2025 and associated analyses of these data."[163]
- The SJREC GSP has not set numerical sustainable management criteria for interconnected surface water. The qualitative minimum threshold is, "Observed increase in seepage from the San Joaquin River due to groundwater extractions in the SJREC GSP Group area. The SJREC plan to work with the counties to restrict perforating wells above the first encountered restrictive clay layer (near the San Joaquin River) to prevent induced seepage similar to the established operations defined in the Herminghaus Agreement on Reach 2 of the San Joaquin River."[164]

3.3.3 Corrective Action

The GSAs in the Subbasin should adhere to Subarticle 3 of the GSP Regulations which describes sustainable management criteria. The Plan should explain the coordinated criteria by which the GSAs define conditions occurring throughout the Subbasin that constitute sustainable groundwater management, including the process or processes by which the GSAs characterize undesirable results, establish minimum thresholds, and set measurable objectives for each applicable sustainability indicator. Undesirable results should be coordinated and should define when significant and unreasonable effects for any of the sustainable indicators are caused by groundwater conditions occurring

[161] Fresno County GSP, Section 4.2.5, pp. 165-166, Section 4.3.5, pp. 174-176.
[162] Grassland GSP, Section 4.3.3, pp. 163-165, Table 4-5, p. 171.
[163] Northern and Central GSP, Section 6.3.6.2, p. 503.
[164] SJREC GSP, Section 3.3.6, p. 130.

throughout the Subbasin, not only in small GSP areas or even smaller management areas. The minimum thresholds must set numeric values that, if exceeded, may cause undesirable results, and must be defined in accordance with 23 CCR § 354.28(c). The supporting information must be sufficiently detailed and the analyses sufficiently thorough and reasonable, and any effort to disregard the applicability of a sustainability indicator in a GSP must be supported by the best available information and best available science. Additionally, if management areas will continue to be used throughout the Subbasin, the management areas must comply with 23 CCR § 354.20, as discussed in Deficiency #4.

3.4 Deficiency 4: The management areas established in the Plan have not sufficiently addressed the requirements specified in 23 CCR § 354.20.

3.4.1 Background

The term "management area" refers to an area within a basin for which a Plan may identify different minimum thresholds, measurable objectives, monitoring, or projects and management actions based on differences in water use sector, water source type, geology, aquifer characteristics, or other factors.[165] The use of management areas is optional in a Plan, and each GSA may define one or more management areas within a basin "if the GSA has determined that creation of management areas will facilitate implementation of the Plan. Management areas may define different minimum thresholds and may be operated to different measurable objectives than the basin at large, provided that undesirable results are defined consistently throughout the basin."[166] As previously discussed, undesirable results are not defined consistently throughout the Subbasin – each GSP group has defined differently what is considered significant and unreasonable for each of the applicable sustainability indicators, and each of the GSP groups have decided which areas of the Subbasin are subject to a range of established thresholds and measurable objectives.

If a GSA determines that the creation of management areas will help facilitate Plan implementation, the GSA must provide the following, while including descriptions, maps, and other information sufficient to describe the conditions in those areas:[167]

- The reason for the creation of each management area.
- The minimum thresholds and measurable objectives established for each management area, and an explanation of the rationale for selecting those values, if different from the basin at large.
- The level of monitoring and analysis appropriate for each management area.

[165] 23 CCR § 351(r).
[166] 23 CCR § 354.20(a).
[167] 23 CCR § 354.20(b).

- An explanation of how the management area can operate under different minimum thresholds and measurable objectives without causing undesirable results outside the management area, if applicable.

Additionally, if management areas are established, the quantity and density of monitoring sites in those areas shall be sufficient to evaluate conditions of the basin setting and sustainable management criteria specific to that area.[168]

3.4.2 Deficiency Details

This deficiency is related to the use of management areas in four of the six GSPs prepared for the Subbasin. There are a total of 17 management areas in the Subbasin.

Technical Memorandum #4 addresses the use of management areas with the following statement: "*The Coordination Committee left management areas and management of their respective GSPs to the six GSP Groups. Management areas were determined individually by each GSP Group with Woodard & Curran preparing a map showing all management areas ('sum of the parts' approach)*."[169] However, the map referenced was not part of the Technical Memoranda and could not be found as part of the Common Chapter – management area maps are only found in the respective GSPs. The following describes the use of management areas in each of the six GSPs prepared for the Subbasin:

- Aliso GSP: No management areas are being used.[170]
- Farmers GSP: Two management areas appear to be used. The Farmers GSP states, "FWD elected to become a management area for two of the five applicable sustainability indicators, Degraded Water Quality and Interconnected Surface Waters. A management area was created for these sustainability indicators due to their high sensitivity to the management actions of surrounding areas."[171] Without further explanation, it is uncertain why management areas were created in the Farmers GSP, particularly in light of the fact that the Farmers GSP area occupies such a small portion of the Subbasin (0.3 percent).
- Fresno County GSP: Two management areas appear to be used. The Fresno County GSP states, " FCMA elected to become a management area for two of the five applicable sustainability indicators, degraded water quality and Interconnected Surface Waters. A management area was created for degraded water quality due to the existing contamination and Regional Board regulatory requirements for the Steffens plume in MAA [Management Area A]. A management area for interconnected surface waters for MAB [Management Area B] was developed because levels in the Fresno Slough are managed by SJREC, SLDMWA and

[168] 23 CCR § 354.34(d).
[169] Aliso GSP, Technical Memorandum #4, pp. 532-533.
[170] Aliso GSP, Section 3.4, p. 96.
[171] Farmers GSP, Section 3.4, pp. 135-136.

USBR and not a function of naturally occurring conditions."[172] While the Fresno County GSP provides an explanation as to why two management areas were created in its small GSP area (3 percent of the Subbasin), it is not clear how the use of management areas in the GSP will work in conjunction with the SJREC GSP, since the management area is managed by other entities. The Fresno County GSP should provide an explanation of how the management area can operate under different sustainable management criteria without causing undesirable results which, as discussed in this staff report, have not be set following the GSP Regulations.

- Grassland GSP: No management areas are being used.[173]
- North and Central GSP: Two management areas have been established for land subsidence.[174] The West Stanislaus Irrigation District and Patterson Irrigation District (WSID-PID) Management Area and the Tranquility Irrigation District (TRID) Management Area were "established to better manage progress toward sustainability through sustainable management criteria for the land subsidence sustainability indicator." The TRID Management Area is in the southern tip of the Subbasin and is adjacent to the Fresno County GSP. The GSP states, "subsidence occurring within this [WSID-PID] MA is expected to be minimal and is not anticipated to have significant potential to impact water conveyance infrastructure of statewide importance" because "WSID and PID both hold appropriative water rights…and minimal pumping occurs from the Lower Aquifer..." The TRID Management Area was established "because it is geographically separated from the remainder of the Plan Area and distant from the DMC [Delta-Mendota Canal]." Each of these management areas have their own defined thresholds and measurable objectives and versions of what conditions are considered undesirable results.
- SJREC GSP: The SJREC GSP has established 11 management areas.[175] The management areas defined as Management Areas A through K appear to roughly follow the boundaries of the 11 GSAs included in the SJREC GSP. The management areas are reportedly defined by water supply, aquifer, and drainage characteristics, but detailed maps of those management areas and how well they correlate with established GSA boundaries do not seem to be readily available. Additional descriptions of the areas, with customized hydrologic conceptual models, are provided in Sections 7 through 16 of the SJREC GSP[176] and in Appendices Q through W.[177] Not all the management areas have monitoring

[172] Fresno County GSP, Section 3.4, pp. 156-157.
[173] Grassland GSP, Section 3.4, p. 155.
[174] North and Central GSP, Section 5.5, pp. 450-452.
[175] SJREC GSP, Section 2.2.4, pp. 113-115.
[176] SJREC GSP, Sections 7 through 16, pp. 151-215.
[177] SJREC GSP, Appendices Q through W, pp. 1210-1643.

locations to determine if thresholds or objectives are being met.[178] Additionally, as discussed in other sections of this document, the SJREC GSP has not set numerical sustainable management criteria for a variety of sustainability indicators and it is uncertain what thresholds or objectives these management areas must adhere to. Most of the management areas are assigned individual basin settings, hydrogeologic conceptual models, water budgets, and "sustainable management criteria," and each of the descriptions generally have statements that the SJREC GSP management areas are operating sustainably. Additionally, the information related to the separate GSA areas indicate whether the thresholds and measurable objectives relevant to the SJREC GSP are applicable to those sub-areas – many management areas disregard the sustainable management criteria set for the GSP area. One complexity of using the management area approach in the SJREC GSP is the creation of a management area for the Fresno County GSA areas since Fresno County prepared its own GSP for its small portion of the Subbasin. It is not clear how the use of management areas in the SJREC GSP will work with the Fresno County GSP, and it raises the question as to whether the creation of a Fresno County GSP was justified if portions of that small GSP area are being managed by the SJREC GSP group.

While the use of management areas is technically allowed in a basin if the GSAs determine that the creation of management areas will facilitate implementation of their GSPs, the use of management areas in a basin that is already managed under six separate GSPs significantly complicates the Subbasin's implementation of SGMA. It also impedes the ability of Department staff to determine if the sustainability goal established for the Subbasin is being met, especially if established management areas do not have monitoring points and it is uncertain what sustainable management criteria apply to each area.

3.4.3 Corrective Action

As previously stated, if management areas are used in a basin, the management areas must adhere to Section 354.20 of the GSP Regulations. The GSAs in their respective GSPs have not: (1) clearly defined a reasonable reason for the creation of each management area; (2) explained what the thresholds and measurable objectives are for each of the management areas; (3) presented the levels of monitoring and analysis appropriate for each of the management areas; and (4) explained using the best available information and best available science, with supporting data, that the management areas can operate under different thresholds and objectives without causing undesirable results outside of the management area.

The Common Chapter and coordination materials prepared for the Subbasin should describe all the management areas established in each of the six GSPs and clearly define the applicable minimum thresholds and measurable objectives and indicate where the monitoring points are within each of the management areas for all applicable sustainability

[178] SJREC GSP, Figure 22, p. 125.

indicators. Also, because many of the defined management areas follow GSA boundaries, additional information related to legal authority and financial resources necessary to implement the respective GSPs should be explained. If details specific to the management areas are not available or the GSAs cannot justify, in accordance with the GSP Regulations, the use of management areas, then the GSAs in the Subbasin should reconsider the use of management areas in the Subbasin's Plan.

4 STAFF RECOMMENDATION

Department staff believe that the deficiencies identified in this assessment should preclude approval of the Plan for the Delta-Mendota Subbasin. Department staff recommend that the Plan be determined incomplete.

Appendix C

Board Resolutions to Adopt the Delta-Mendota Subbasin dated July 2024

APPENDIX TO BE INCLUDED IN THE FINAL GSP

UNSIGNED
TO BE REPLACED
WITH EXECUTED MOA
UPON ADOPTION OF
THE FINAL GSP

Appendix D

Memorandum of Agreement Among the Delta-Mendota Subbasin Groundwater Sustainability Agencies

MEMORANDUM OF AGREEMENT
AMONG THE DELTA-MENDOTA SUBBASIN
GROUNDWATER SUSTAINABILITY AGENCIES

THIS MEMORANDUM OF AGREEMENT (this "**MOA**") is entered into and shall be effective as of the date of full execution below (the "**Effective Date**"), by and among the groundwater sustainability agencies within the Delta-Mendota Subbasin listed in Exhibit "A" (each a "**Party**" and collectively the "**Parties**") and the San Luis & Delta-Mendota Water Authority, which would be executing not as a Party, and is made with reference to the following facts:

<u>RECITALS</u>

A. **WHEREAS**, on September 16, 2014, Governor Jerry Brown signed into law Senate Bills 1168 and 1319 and Assembly Bill 1739, known collectively as the Sustainable Groundwater Management Act ("**SGMA**"); and

B. **WHEREAS**, SGMA requires all groundwater subbasins designated as high- or medium-priority by the California Department of Water Resources ("**DWR**") to manage groundwater in a sustainable manner; and

C. **WHEREAS**, the Delta-Mendota Subbasin (Basin Number 5-22.07, DWR Bulletin 118) within the San Joaquin Valley Groundwater Basin ("**Subbasin**"), has been designated as a high-priority, critically overdrafted basin by DWR; and

D. **WHEREAS**, the Subbasin includes multiple groundwater sustainability agencies (each a "**GSA**" and collectively, the "**GSAs**") that initially managed the Subbasin through the development and implementation of six different groundwater sustainability plans; and

E. **WHEREAS**, pursuant to the requirements of SGMA (Wat. Code §§ 10720, *et seq*.) and DWR's SGMA regulations (23 Cal. Code Regs., §§ 350, *et seq*.), and in recognition of the need to sustainably manage the groundwater within the Subbasin, the Parties entered into that certain Delta-Mendota Subbasin Coordination Agreement effective December 12, 2018 ("**Coordination Agreement**"), to outline the Parties' obligations and responsibilities regarding SGMA coordination in the Subbasin among the multiple GSAs and multiple groundwater sustainability plans; and

F. **WHEREAS**, after an approximately two-year review, DWR determined that the coordinated groundwater sustainability plans in the Subbasin were "incomplete" on January 21, 2022, and required that the groundwater sustainability plans be revised to address certain corrective actions by July 20, 2022; and

G. **WHEREAS**, the Parties did so timely revise and re-submit the amended groundwater sustainability plans to DWR; however, those groundwater sustainability plans, even after revision, were deemed "inadequate" under SGMA by DWR on March 2, 2023; and

H. **WHEREAS**, the Parties understand that upon DWR's determination that a groundwater sustainability plan is inadequate, SGMA authorizes the State Water Resources Control Board ("**State Water Board**") to seek to intervene and exercise jurisdiction over the affected subbasin; and

I. **WHEREAS**, the Parties would like to be able to continue to manage the Subbasin locally in lieu of intervention by the State Water Board if possible; and

J. **WHEREAS**, in order to efficiently coordinate among the large number of GSAs in the Subbasin, the GSAs now desire to adopt one groundwater sustainability plan ("**GSP**") for the Subbasin; and

K. **WHEREAS**, if there is only one GSP for the Subbasin, then the GSAs no longer need the Coordination Agreement, as defined by SGMA; and

L. **WHEREAS**, the GSAs desire to enter into this MOA to coordinate the work and management of the Subbasin and clarify responsibilities of the respective GSAs, in accordance with SGMA; and

M. **WHEREAS**, the Coordination Agreement shall remain binding and in effect until all Parties have approved a single GSP for the Subbasin, at which time the Coordination Agreement shall automatically terminate, and this MOA shall become operative as provided in Section 12.2.

NOW, THEREFORE, in consideration of the Recitals, which are deemed true and correct and incorporated herein, and of the covenants, terms and conditions set forth herein, the Parties hereto agree as follows:

ARTICLE I– DEFINITIONS

1.1 "**Coordination Committee**" shall mean the committee of GSA Representatives or GSA Group Representatives established pursuant to this MOA.

1.2 "**Coordinated Plan Expenses**" are those Subbasin-wide Activities expenses that are shared equally amongst the Coordination Committee members, in accordance with the Participation Percentages.

1.3 "**DWR**" shall mean the California Department of Water Resources.

1.4 "**Effective Date**" shall be as set forth in the Preamble.

1.5 "**GSA**" shall mean a groundwater sustainability agency established in accordance with SGMA and its associated regulations, and "**GSAs**" shall mean more than one such groundwater sustainability agency. Each Party is a GSA.

1.6 "**GSA Representative**" shall refer to the representative of a single GSA that holds a single seat on the Coordination Committee.

1.7 “**GSA Group Representative**” shall refer to the representative of a group of GSAs that share a single seat on the Coordination Committee.

1.8 “**GSP**” shall mean the single Delta-Mendota Subbasin Groundwater Sustainability Plan.

1.9 “**MOA**” shall mean this Memorandum of Agreement by and among the Parties.

1.10 “**Participation Percentages**” shall mean that percentage of Coordinated Plan Expenses allocated to each GSA or GSA Group as described on Exhibit “B” to this MOA, which is attached and incorporated by reference herein, as updated from time to time, but not more frequently than annually.

1.11 “**Party**” or “**Parties**” shall mean a GSA or in the plural, two or more GSAs within the Subbasin, who are signatories to this MOA.

1.12 “**Plan Manager**” shall mean an entity or individual, appointed at the pleasure of the Coordination Committee, or as provided in Article III of this MOA, to perform the role of the Plan Manager to serve as the point of contact to DWR and/or the State Water Board.

1.13 “**San Luis & Delta-Mendota Water Authority**” or “**SLDMWA**” shall mean the San Luis & Delta-Mendota Water Authority, a California joint powers agency.

1.14 “**SGMA**” shall mean the Sustainable Groundwater Management Act, as amended from time to time, commencing at Water Code section 10720, together with its implementing regulations applicable to groundwater sustainability plans, set forth at California Code of Regulations, Title 23, Division 2, Chapter 1.5, Subchapter 2.

1.15 “**SGMA Definitions**” shall mean those SGMA-specific definitions provided by statute or regulation; in the event of any inconsistency between a term defined in this MOA and a SGMA-specific definition, the definition contained in this MOA shall prevail.

1.16 “**State Water Board**” shall mean the California State Water Resources Control Board.

1.17 “**Subbasin**” shall mean the Delta-Mendota Subbasin (Basin Number 5-22.07, DWR Bulletin 118) within the San Joaquin Valley Groundwater Basin.

1.18 “**Subbasin-wide Activities**” shall mean those activities or actions that affect the Subbasin as a whole or are otherwise required by SGMA to be determined at the Subbasin level and as defined by a unanimous vote of the Coordination Committee. An initial list of Subbasin-wide Activities is identified in Exhibit “D”.

1.19 “**Water Year**” shall mean the period from October 1 through the following September 30.

ARTICLE II– PURPOSE & KEY PRINCIPLES

2.1 **Purpose**. The Parties shall continue to work together in mutual cooperation to develop the GSP in compliance with SGMA, for the sustainable management of the Subbasin. Once adopted, each Party hereto shall implement the terms and conditions of the GSP within their respective GSA territories.

2.2 **Collaboration**. The Parties intend to mutually cooperate to adopt a single GSP for the Subbasin, and to implement the GSP within their respective GSA territories.

2.3 **Each Party's Rights**. This MOA shall not limit or interfere with any Party's rights or authorities over its own internal matters, including, but not limited to, a Party's legal rights to surface water supplies and assets, groundwater supplies and assets, facilities, operations, water management and water supply matters. Nothing in this MOA is intended to modify or limit a Party's police powers, land use authorities, or any other authority, including the authority to pursue a comprehensive groundwater adjudication or other alternative SGMA compliance strategy, should the Party deem it to be in its best interest to do so.

2.4 **Participation Percentage**. Each Party shall pay its proportionate share of the Participation Percentage, to cover coordinated Subbasin-wide Activities, set forth on Exhibit "B," as said Exhibit "B" may be modified from time to time in accordance with Section 4.6(b). Participation Percentage financial contributions shall be treated in accordance with the provisions of Article III.

2.5 **Management and GSP Implementation**. It is the responsibility and obligation of each Party to this MOA, and any applicable separate agreements, to manage its own GSA and implement the GSP within its GSA's boundaries. It is further the responsibility and obligation of each Party to pay its proportionate share of the Participation Percentage and other payments required as part of implementation of SGMA Subbasin-wide Activities, as may arise from time to time.

ARTICLE III– ROLE OF SLDMWA

3.1 **Agreement to Serve**. By executing this MOA, not as a Party, SLDMWA agrees to carry out the functions described in this Article III and its subparts consistent with the terms of this Article and under the direction and supervision of the Coordination Committee, subject to the reimbursement and the termination provisions contained in this Article.

(a) Secretary. SLDMWA agrees to perform the obligations of the Secretary described in this MOA, by delegation to one or more of its employees or to a consultant under contract to the SLDMWA.

(b) Plan Manager. SLDMWA agrees to perform the obligations of the Plan Manager described in this MOA, by delegation to one or more of its employees or to a consultant under contract to SLDMWA.

3.2 **Fiscal Management by SLDMWA and Reimbursement to SLDMWA**. SLDMWA will provide necessary financial and administrative support services contemplated by this MOA, including, but not limited to: holding financial contributions made in accordance with the Participation Percentages, accounting for funds held by SLDMWA, reports as requested by the Coordination Committee members concerning funds held, and disbursing said funds for authorized purposes.

(a) Coordination Committee members shall make Participation Percentage contributions required pursuant to this MOA directly to SLDMWA.

(b) SLDMWA shall maintain a strict accountability of all funds contributed pursuant to this MOA. SLDMWA shall establish and maintain such accounts to provide for segregation of funds as may be required by good accounting practice. The books and records of SLDMWA pertaining to funds held and expended pursuant to this MOA shall be open to inspection at reasonable times by any entity that has made a contribution. SLDMWA shall provide an unaudited report of all financial activities for each fiscal year to each Party that has made a contribution during that fiscal year within 60 days after the close of each fiscal year.

(c) SLDMWA shall be authorized to expend funds upon authorization of the Coordination Committee, as provided for in this MOA.

(d) Upon mutual agreement of SLDMWA and each entity obligated to contribute funds pursuant to the Participation Percentages, SLDMWA and the Parties may execute a further agreement concerning fiscal responsibilities not inconsistent with the terms described herein.

3.3 **Termination of SLDMWA's Services**. Either the Parties acting through the Coordination Committee or SLDMWA, at any time, may terminate the services being provided by SLDMWA pursuant to this MOA upon thirty (30) days' written notice, if from SLDMWA, to the Coordination Committee; and if from the Coordination Committee, to SLDMWA.

ARTICLE IV– COORDINATION COMMITTEE

4.1 **Coordination Committee**.

(a) The Parties agree to establish a Coordination Committee to perform the functions set forth in this Section 4 in accordance with the voting procedures and requirements set forth herein. Recommendations from the Coordination Committee that require approval or action of each GSA within the Subbasin shall be provided to each Party's respective governing boards for adoption, approval or other recommended action.

(b) The Coordination Committee will consist of a total of seven (7) voting members to represent the Subbasin and shall be comprised of the representative of a GSA ("**GSA Representative**") or a group of GSAs (a "**GSA Group Representative**"), as identified on Exhibit "B." Each GSA Representative or GSA Group Representative shall have one Alternate Representative authorized to vote in the absence of the GSA Representative or GSA Group Representative, as applicable.

(c) Individuals serving on the Coordination Committee as a GSA Representative or GSA Group Representative shall be selected by each respective GSA or GSA Group at the discretion of that particular GSA or GSA Group, and such appointments shall be effective upon providing written notice to the Secretary.

(d) The Coordination Committee will recognize each GSA Representative or GSA Group Representative and their applicable Alternative Representatives until such time as the Secretary is provided written notice of removal and replacement of said Representative.

(e) Minutes of the Coordination Committee will be prepared and maintained by the Secretary as set forth in Article 4.4(b).

4.2 **Representation**. Each Party understands its participation, as more fully set forth in Article IV of this MOA, is based on representation on the Coordination Committee. It is the responsibility and obligation of each Party under this MOA to develop its manner of selecting its respective Coordination Committee Representative and Alternate Representative. For purposes of this MOA, it is assumed that each Coordination Committee Representative has been authorized by the Parties in their respective GSA or GSA Group to participate as described herein.

4.3 **Non-Entity Status**. The Parties acknowledge and agree that the Coordination Committee created by this MOA does not create a legal entity with power to sue or be sued, to enter into contracts, to enjoy the benefits or accept the obligations of a legal entity, or to exercise any legal authority. The Coordination Committee is not a GSA.

4.4 **Coordination Committee Officers**. The Officers of the Coordination Committee will include a Chair, Vice Chair, and the Secretary. Except where the Parties have named such Officer in Article III of this MOA, Officers shall be selected at the initial meeting of the Coordination Committee or as soon thereafter as reasonably can be accomplished.

(a) Chair and Vice Chair. Any GSA Representative or GSA Group Representative may serve as the Chair. The Vice Chair, who shall also be a GSA Representative or GSA Group Representative, shall serve in the absence of the Chair. In the absence of both the Chair and Vice Chair, a meeting may be led by an Acting Chair, selected on an ad hoc basis, who is a member of the Coordination Committee.

The positions of Chair and Vice Chair shall rotate among the GSA Representative and GSA Group Representatives on the Coordination Committee on an annual basis according to alphabetical order, by name of the GSA or GSA Group, with the first rotation beginning on the date the first Chair is selected. The schedule for annual rotation of Chair and Vice Chair will be set at the first meeting after the Chair is appointed and reviewed and rotated annually at the first meeting of the Water Year. Any GSA Representative or GSA Group Representative may waive designation as Chair. In such a case, the office of Chair would rotate to the next designated entity.

(b) Secretary. By a simple majority vote, the Coordination Committee shall select a Secretary to carry out the functions described in this Article 4.4(b), to serve at the pleasure of the Coordination Committee. The Secretary may, but need not, be a Party to this MOA. Notwithstanding the requirement for a majority vote of the Coordination Committee to appoint a Secretary, SLDMWA is hereby designated to serve as the initial Secretary. Termination of SLDMWA's services is subject to Article 3.3.

The Secretary shall select an appointee (who may be SLDMWA staff or a consultant contracting with SLDMWA) to implement the Secretary's responsibilities under this MOA, for example, to coordinate meetings; prepare agendas; circulate notices and agendas; provide written notice to all Parties that the Coordination Committee has made a recommendation requiring approval by the Parties; prepare and maintain minutes of meetings of the Coordination Committee; receive notices on behalf of the Coordination Committee and call to the Coordination Committee's attention the need for responding; and provide such other assistance in coordination as may be appropriate.

The Secretary shall assume primary responsibility for Ralph M. Brown Act compliance, including without limitation, the responsibility to prepare an agenda and notices, publicly post and distribute agendas to all Coordination Committee Representatives and Alternate Representatives, the Parties, and any other person who requests, in writing, such notices. The agenda shall be of adequate detail to inform the public and the Parties of the meeting and the matters to be transacted or discussed and shall be posted in a public location and distributed to each of the Parties to this MOA in compliance with the noticing requirements of the Ralph M. Brown Act.

4.5 **Plan Manager.** By a simple majority vote of Coordination Committee members present, the Coordination Committee shall select a Plan Manager, who may be a consultant hired by the Secretary, as directed by the action of the Coordination Committee pursuant to this MOA, the representative of an entity that has been selected as Secretary, or a public agency serving as or participating in a GSA that is a Party to this MOA, and who shall serve as the point of contact for DWR as specified by SGMA. Notwithstanding the requirement for a majority vote of the Coordination Committee to appoint a Plan Manager, SLDMWA is hereby designated as the initial Plan Manager, to serve at the pleasure and direction of the Coordination Committee, pursuant to Article III above.

The Plan Manager shall carry out the duties of a "plan manager" as provided in Title 23, division 2, Chapter 1.5, Subchapter 2, California Code of Regulations.

The Plan Manager has no authority to make policy decisions or represent the Coordination Committee without the specific direction of the Coordination Committee. The Plan Manager is obligated to disclose all substantive communications he/she transmits and receives in his/her capacity as Plan Manager to the Coordination Committee.

4.6 **Coordination Committee Authorized Actions**. The Coordination Committee is authorized to act upon the following enumerated items:

(a) By a simple majority vote of Coordination Committee members present at a regular or special meeting, the Coordination Committee shall review and approve:

(i) recommendation(s) to the GSAs for approving any technical analyses;

(ii) updating of technical analyses as needed;

(iii) developing budgets for Subbasin-wide Activities;

(iv) providing assistance with grants and with coordinated projects and programs;

(v) assigning work to subcommittees and workgroups as needed, providing guidance and feedback, and ensuring that subcommittees and workgroups prepare work products in a timely manner; and

(vi) providing direction to its Officers concerning other administrative and ministerial issues necessary for the fulfillment of the above-enumerated tasks.

(b) By a unanimous vote of Coordination Committee members, the Coordination Committee shall review and approve:

(i) determination of Subbasin-wide Activities, which are initially described in Exhibit "D", but may be modified by the Coordination Committee from time to time;

(ii) submittal of annual reports;

(iii) a representative monitoring network;

(iv) final budgets;

(v) submittal of five-year updates;

(vi) revisions to this MOA;

(vii) adding new Parties to this MOA;

(viii) work plans;

(ix) annual estimates of Coordinated Plan Expenses presented by the Secretary and any updates to such estimates, in accordance with the budgetary requirements of the respective Parties; provided, that such estimates or updates with supporting documentation shall be circulated to all Parties for comment at least thirty (30) days in advance of the meeting at which the Coordination Committee will consider approval of the annual estimate;

(x) directing the Plan Manager in the performance of its duties under SGMA; and

(xi) the hiring of consultants for Subbasin-wide Activities, providing direction to and supervision over consultants engaged to assist in acquiring and processing technical data, conducting monitoring and reporting, and all other activities in support of Subbasin-wide Activities.

4.7 **Coordination Committee Limitations.** When the terms of this MOA or applicable law require the approval of a GSA (such as approval of the GSP, acceptance of an annual report, or approval of a five-year update), that approval shall be required and evidenced as indicated in Article V of this MOA. The Coordination Committee is not a separate GSA and shall not be responsible for approving the GSP, any annual report, or any five-year update thereto; each GSA retains responsibility for such approvals. The Coordination Committee may make recommendations to the Parties for approval of the GSP, an annual report, or any five-year update of the GSP.

4.8 **Subcommittees and Workgroups**. The Coordination Committee may appoint ad hoc or standing subcommittees, workgroups, or otherwise direct staff made available by the Parties. Such subcommittees or workgroups may include qualified individuals possessing the knowledge and expertise to advance the goals of the GSP on the topics being addressed by the subcommittee, whether or not such individuals are GSA Representatives, GSA Group Representatives or Alternate Representatives.

4.9 **Coordination Committee Meetings**.

(a) Timing and Notice. The Chair of the Coordination Committee, any two GSA Representatives or GSA Group Representatives, or the Secretary may call meetings of the Coordination Committee as needed to carry out the activities described in this MOA. The Coordination Committee may, but is not required to, set a date for regular meetings for the purposes described in this MOA. All Coordination Committee meetings shall be held in compliance with the Ralph M. Brown Act (Gov. Code § 54950 *et seq*.).

(b) Quorum. A majority of the Coordination Committee members, as listed on Exhibit "B", shall constitute a quorum of the Coordination Committee for purposes of holding a meeting. The Alternate Representative of each GSA or GSA Group shall be counted towards a quorum and as the voting representative(s) in absence of the Coordination Committee GSA Representative or GSA Group Representative for which the Alternate Representative was appointed. If less than a quorum is present, no action may be taken.

(c) Open Attendance. Members of the public, stakeholders, and representatives of the Parties who are not appointed as a GSA Representative or GSA Group Representative on the Coordination Committee may attend all Coordination Committee meetings and shall be provided with an opportunity to comment on matters on the meeting agenda, but shall have no vote.

(d) Minutes. The Secretary's appointee shall keep and prepare minutes of all Coordination Committee meetings. Notes of subcommittee and workgroup meetings shall be kept by the Secretary's appointee or an assistant to the appointee. All minutes and subcommittee and workgroup meeting notes shall be maintained by the Secretary as Subbasin records and shall be available to the Parties and the public upon request.

4.10 **Voting by Coordination Committee**.

(a) Each GSA Representative or GSA Group Representative that is a member of the Coordination Committee shall be entitled to one (1) vote at the Coordination Committee meetings. For GSAs represented by a GSA Group Representative, it shall be up to the Parties in that GSA Group to determine how the GSA Group vote will be cast. The Coordination Committee shall not be obligated to honor the vote of an individual Party and will only accept the vote of the GSA Representative or GSA Group Representative or Alternate Representative, as identified on Exhibit “B”.

(b) Except as expressly set forth in Articles 4.6 above and 4.11 and 11.1 below, the vote of a majority of a quorum present at a regular or special meeting of the Coordination Committee shall be required for all other matters on which the Coordination Committee is authorized to act.

4.11 **Voting Procedures to Address Lack of Unanimity**. When it appears likely that the Coordination Committee will not be able to come to a unanimous decision of Coordination Committee members on any matter for which a unanimous decision is required, upon a majority vote of a quorum of the Coordination Committee, the matter may be subjected to any or all of the following additional procedures.

(a) Straw Polls. Straw poll votes may be taken for the purpose of refining ideas and providing guidance to the Coordination Committee, subcommittees, or both.

(b) Provisional Voting. Provisional votes may occur prior to final votes. This will be done when an initial vote is needed to refine a proposal, but the GSA Representatives or GSA Group Representatives wish to consult with their respective GSA or GSA Group(s) before making a final vote.

(c) A vote shall be delayed if any GSA Representative or GSA Group Representative declares its intention to propose an alternative or modified recommended action, to be proposed at the next meeting, or as soon thereafter as the GSA Representative or GSA Group Representative can obtain any further information or clarifying direction from its GSA Group or governing body, or both, as needed to propose its alternative or modified recommended action.

(d) If the process outlined in Article 4.11(a)-(c) fails to result in a unanimous vote of the GSA Representatives and GSA Group Representatives, any GSA Representative or GSA Group Representative not voting in favor of the recommended action may request that the vote be delayed so that the Coordination Committee can obtain further information on the recommended action (for example, by directing a subcommittee established under this MOA), so the GSA Representative or GSA Group Representative can obtain clarifying direction from its GSA Group or governing body, or both, as needed.

(e) Each Party acknowledges that time is of the essence with respect to SGMA compliance and GSP implementation and agrees to make its best efforts to cooperate through the Coordination Committee in coming to a unanimous vote of representatives at a regular or special meeting.

ARTICLE V – APPROVAL BY INDIVIDUAL PARTIES

5.1 Where law or this MOA require separate written approval by each of the Parties, such approval shall be evidenced in writing by providing the adopted resolution or minutes of the respective GSA's Board of Directors' meeting to the Secretary of the Coordination Committee.

ARTICLE VI – POWERS RESERVED TO PARTIES

6.1 Nothing in this MOA shall be interpreted to deprive any Party of its right to:

(a) Act as a GSA within its boundaries;

(b) Exercise authorities granted to each of the Parties as a GSA under SGMA in a manner consistent with the adopted GSP;

(c) Exercise authority to implement SGMA and any GSP adopted pursuant to this MOA consistent with the terms and conditions set forth therein; and

(d) Defend, with legal counsel of its own choosing, any challenge to the adoption or implementation of a GSP developed pursuant to this MOA.

ARTICLE VII – EXCHANGE OF DATA AND INFORMATION

7.1 **Exchange of Data and Information**. The Parties acknowledge and recognize pursuant to this MOA that the Parties will need to exchange data and information among and between the Parties.

7.2 **Procedure for Exchange of Data and Information**.

(a) The Parties shall exchange public and non-privileged information through collaboration and/or informal requests made at the Coordination Committee level or through subcommittees designated by the Coordination Committee. However, to the extent it is necessary to make a written request for information to another Party, each Party shall designate a representative to respond to information requests and provide the name and contact information of the designee to the Coordination Committee. Requests may be communicated in writing and transmitted in person or by mail, facsimile, or other electronic means to the appropriate representative as named in this MOA. The designated representative shall respond in a reasonably timely manner.

(b) Nothing in this MOA shall be construed to prohibit any Party from voluntarily exchanging information with any other Party by any other mechanism separate from the Coordination Committee.

(c) The Parties agree that each GSA shall provide the data required to develop the Subbasin-wide coordinated water budget.

(d) To the extent that a court order, subpoena, or the California Public Records Act is applicable to a Party, such Party in responding to a request made pursuant to the California Public Records Act for release of information exchanged from another Party shall timely notify the Coordination Committee in writing of its proposed release of information in order to provide the other Parties with the opportunity to seek a court order preventing such release of information.

ARTICLE VIII – MONITORING NETWORK

8.1 In accordance with SGMA, the Parties hereby agree to coordinate the development and maintenance of a monitoring network at a Subbasin level. The Subbasin monitoring network description shall include monitoring objectives, protocols, and data reporting requirements specific to enumerated sustainability indicators. Each GSA is responsible for the following:

(a) Operating and maintaining the representative monitoring network within its boundary;

(b) Filling data gaps in its GSA on a defined schedule;

(c) Collecting data per the approved Subbasin-wide monitoring protocol;

(d) Considering developing and maintaining a supplementary network for collecting data in excess of the minimum need, for the purposes of supporting local management decisions (since the level of detail necessary may not be sufficient in a Subbasin level network); and

(e) Each GSA shall have a minimum of one representative monitoring well (measuring water level and water quality) from each aquifer (above the Corcoran Clay layer – shallow aquifer, or below the Corcoran Clay layer – deep aquifer) in which it has groundwater pumping either within its GSA boundaries or within the area of influence of the pumping that is occurring, sufficient to meet the recommendations of the Subbasin-wide GSP consultant.

8.2 The minimum monitoring network shall be based on the evaluation performed by the Subbasin-wide GSP consultant and may change from time to time. The Subbasin-wide GSP consultant shall evaluate the monitoring network to ensure:

(a) There is a proper spatial and temporal coverage to inform a groundwater model;

(b) The level of monitoring is commensurate with the use in an area (e.g., limited monitoring well(s) in areas that do not pump or higher density of survey benchmarks in areas that have numerous deep wells); and

(c) The network is balanced, so that should an exceedance occur, it is not biased or weighted as a function of a poorly distributed monitoring network.

ARTICLE IX – COORDINATED DATA MANAGEMENT SYSTEM

9.1 The Parties developed and currently maintain a coordinated data management system that is capable of storing and reporting information relevant to the reporting requirements and/or implementation of the GSP and monitoring network of the Subbasin. After providing the Coordination Committee with data from the individual GSAs, the Plan Manager will ensure the data is stored and managed in a coordinated manner throughout the Subbasin and reported to DWR annually as required.

ARTICLE X – ADAPTIVE MANAGEMENT FRAMEWORK

10.1 The Coordination Committee established a "Adaptive Management Framework" applicable to all GSAs in the Subbasin, which is attached hereto as Exhibit "C" and incorporated herein by this reference. This Adaptive Management Framework shall be further refined as part of the GSP development and implementation.

10.2 If and when required pursuant to Exhibit "C", each Party to this Agreement shall participate in the procedures discussed therein without regard to whether the Party is represented by another entity on the Coordination Committee

10.3 As part of the Adaptive Management Framework, each Party commits to continue to evaluate and implement projects and management actions ("**P&MAs**") within its boundaries to reach sustainability in compliance with SGMA.

ARTICLE XI – MODIFICATION OF THIS MOA

11.1 **Addition of a Party**. A Party may be added to this MOA only upon the unanimous vote of Coordination Committee members at a regular or special meeting, the Party's execution of a counterpart of this MOA, and its provision of any additional documentation required by this MOA. No Party may be added that is not a GSA within the Subbasin or that fails to share in GSP coordinated expenses.

11.2 **Modification or Amendment of this MOA**. The Parties hereby agree that this MOA may be supplemented, amended, or modified only by a writing signed by all Parties.

11.3 **Amendment for Compliance with Law**. Should any provision of this MOA be determined to not be in compliance with legal requirements under circumstances where amendment of the MOA to include a provision addressing the legal requirement will cure the non-compliance, the Parties agree to promptly prepare and shall not unreasonably withhold approval of such amendment.

ARTICLE XII – WITHDRAWAL, TERM, AND TERMINATION

12.1 **Withdrawal**. A Party may unilaterally withdraw from this MOA without causing or requiring termination of this MOA, effective upon one (1) year written notice to the Secretary and all other Parties. The Plan Manager shall report any such withdrawal to DWR and/or the State Water Board within five (5) days of receipt of the written notice.

Any Party who withdraws shall remain obligated for GSP coordinated expenses as provided in a separate Cost Sharing Agreement. If no separate Cost Sharing Agreement is then in effect or enforceable against the withdrawing Party, the Party is obligated to pay its share of all debts, liabilities, and obligations the Party incurred or accrued under the MOA prior to the effective date of such withdrawal, which is one (1) year after providing written notice to the Secretary and all other Parties, and as also may be established under its separate GSA Group agreement, as applicable, concerning such share of obligations.

Upon withdrawal, a Party agrees that it has a continuing obligation to comply with SGMA and any coordination guidelines and regulations issued by DWR, which require a coordination agreement if there are multiple groundwater sustainability plans in the Subbasin. This obligation shall survive the withdrawal from this MOA and is for the express benefit of the remaining Parties.

12.2 **Term; Termination of Coordination Agreement**. This MOA shall take effect on the Effective Date. Provisions requiring compliance with, and implementation of, the GSP, shall become operative and binding upon the adoption of the GSP. Unless modified as provided in Article 11.2 or terminated as provided in Article 12.3, this MOA shall continue for a term that is coterminous with the requirements of SGMA for the existence of the GSP for the Subbasin. At the time the GSP is adopted by all Parties and this MOA is operative and binding upon the Parties, the Coordination Agreement shall automatically terminate.

12.3 **Termination**. This MOA may be terminated or rescinded by the unanimous written consent of all Parties. Nothing in this MOA shall prevent the Parties from entering into a coordination agreement for coordination with any other subbasin.

12.4 **Indemnification**. No Party nor SLDMWA, nor any director, officer or employee of a Party or SLDMWA, shall be responsible for any damage or liability occurring by reason of anything done or omitted to be done by another Party or SLDMWA under or in connection with this MOA. Each Party shall fully indemnify and hold harmless each other Party and SLDMWA and its agents, directors, officers, employees and contractors from and against all claims, damages, losses, judgments, liabilities, expenses and other costs, including litigation costs and attorney fees, arising out of, resulting from, or in connection with any work delegated to or action taken or omitted to be taken by such Party pursuant to this MOA.

ARTICLE XIII – PROCEDURES FOR RESOLVING CONFLICTS

13.1 In the event of any dispute arising from or relating to this MOA, except for disputes arising from the inability of the Coordination Committee to reach a unanimous decision, the disputing Party shall, within thirty (30) calendar days of discovery of the events giving rise to the dispute, notify all Parties to this MOA in writing of the basis for the dispute. Within thirty (30) calendar days of receipt of said notice, all interested Parties shall meet and confer in a good-faith attempt to informally resolve the dispute. All disputes that are not resolved informally shall be submitted to arbitration. Within ten (10) days following the failed informal proceedings, each interested Party shall nominate and circulate to all other interested Parties the name of one arbitrator. Within ten (10) days following the nominations, the interested Parties shall rank their top three (3) among all nominated arbitrators, awarding three points to the top choice, two points to the second choice, one point to the third choice and zero points to all others. Each interested Party shall forward its tally to the Secretary, who shall tabulate the points and notify the interested Parties of the arbitrator with the highest cumulative score, who shall be the selected arbitrator. The Secretary may also develop procedures for approval by the Parties, for selection in the case of tie votes or in order to replace the selected arbitrator in the event such arbitrator declines to act. The arbitration shall be administered in accordance with the procedures set forth in the California Code of Civil Procedure, section 1280, *et seq*., and of any state or local rules then in effect for arbitration pursuant to said section. Upon completion of arbitration, if the controversy has not been resolved, any Party may exercise all rights to bring a legal action relating to the controversy.

ARTICLE XIV – GENERAL PROVISIONS

14.1 **Authority of Signers**. The individuals executing this MOA represent and warrant that they have the authority to enter into this MOA and to legally bind the Party for whom they are signing to the terms and conditions of this MOA.

14.2 **Governing Law**. The validity and interpretation of this MOA will be governed by the laws of the State of California without giving effect to the principles of conflict of laws, with venue for all purposes to be proper only in the County of Merced, State of California.

14.3 **Severability**. Except as provided for cure by amendment in Articles 11.2 and 11.3, if any term, provision, covenant, or condition of this MOA is determined to be unenforceable by a court of competent jurisdiction, it is the Parties' intent that the remaining provisions of this MOA will remain in full force and effect and will not be affected, impaired, or invalidated by such a determination.

14.4 **Counterparts**. This MOA may be executed in any number of counterparts, each of which will be an original, but all of which will constitute one and the same agreement.

14.5 **Good Faith**. The Parties agree to exercise their best efforts and utmost good faith to effectuate all the terms and conditions of this MOA and to execute such further instruments and documents as are reasonably necessary, appropriate, expedient, or proper to carry out the intent and purposes of this MOA.

Signatures on following page

IN WITNESS WHEREOF, the Parties have executed this MOA as of the Effective Date.

Dated: ___________________________ **ALISO WATER DISTRICT GSA**

____
Print Name: _____________________________
Print Title: ______________________________

Dated: ___________________________ **CENTRAL DELTA-MENDOTA GSA**

____
Print Name: _____________________________
Print Title: ______________________________

Dated: ___________________________ **CITY OF DOS PALOS GSA**

____
Print Name: _____________________________
Print Title: ______________________________

Dated: ___________________________ **CITY OF FIREBAUGH GSA**

____
Print Name: _____________________________
Print Title: ______________________________

Dated: ___________________________ **CITY OF GUSTINE GSA**

____
Print Name: _____________________________
Print Title: ______________________________

Dated: ___________________________ **CITY OF LOS BANOS GSA**

____
Print Name: _____________________________
Print Title: ______________________________

Dated: ___________________________ **CITY OF MENDOTA GSA**

____
Print Name: _____________________________
Print Title: ______________________________

Dated: ____________________________

CITY OF NEWMAN GSA

____
Print Name: ______________________________
Print Title: _______________________________

Dated: ____________________________

CITY OF PATTERSON GSA

____
Print Name: ______________________________
Print Title: _______________________________

Dated: ____________________________

COUNTY OF MADERA–3 GSA

____
Print Name: ______________________________
Print Title: _______________________________

Dated: ____________________________

COUNTY OF MERCED DELTA-MENDOTA GSA

____
Print Name: ______________________________
Print Title: _______________________________

Dated: ____________________________

DM II GSA

____
Print Name: ______________________________
Print Title: _______________________________

Dated: ____________________________

FARMERS WATER DISTRICT GSA

____
Print Name: ______________________________
Print Title: _______________________________

Dated: ____________________________

FRESNO COUNTY MANAGEMENT AREA A GSA

____
Print Name: ______________________________
Print Title: _______________________________

Dated: ____________________________

FRESNO COUNTY MANAGEMENT AREA B GSA

Print Name: ____________________________
Print Title: ____________________________

Dated: ____________________________

GRASSLAND GSA

____
Print Name: ____________________________
Print Title: ____________________________

Dated: ____________________________

NORTHWESTERN DELTA-MENDOTA GSA

____
Print Name: ____________________________
Print Title: ____________________________

Dated: ____________________________

ORO LOMA WATER DISTRICT GSA

____
Print Name: ____________________________
Print Title: ____________________________

Dated: ____________________________

PATTERSON IRRIGATION DISTRICT GSA

____
Print Name: ____________________________
Print Title: ____________________________

Dated: ____________________________

SAN JOAQUIN RIVER EXCHANGE CONTRACTORS WATER AUTHORITY GSA

____
Print Name: ____________________________
Print Title: ____________________________

Dated: ____________________________

TURNER ISLAND WATER DISTRICT–2 GSA

____
Print Name: ____________________________
Print Title: ____________________________

Dated: ___________________________

WEST STANISLAUS IRRIGATION DISTRICT GSA 1

____

Print Name: ___________________________

Print Title: ____________________________

Dated: ___________________________

WIDREN WATER DISTRICT GSA

____

Print Name: ___________________________

Print Title: ____________________________

EXECUTING NOT AS A PARTY:

Dated: ___________________________

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY

____

Print Name: ___________________________

Print Title: ____________________________

EXHIBIT "A"

Parties to the MOA

1. Aliso Water District GSA

2. Central Delta-Mendota GSA
(Includes: San Luis Water District, Panoche Water District, Tranquillity Irrigation District, Fresno Slough Water District, Eagle Field Water District, Pacheco Water District, Santa Nella County Water District, Mercy Springs Water District, County of Merced, and County of Fresno)

3. City of Dos Palos GSA

4. City of Firebaugh GSA

5. City of Gustine GSA

6. City of Los Banos GSA

7. City of Mendota GSA

8. City of Newman GSA

9. City of Patterson GSA

10. County of Madera–3 GSA

11. County of Merced Delta-Mendota GSA

12. DM II GSA

13. Farmers Water District GSA

14. Fresno County Management Area A GSA

15. Fresno County Management Area B GSA

16. Grassland GSA

17. Northwestern Delta-Mendota GSA

18. Oro Loma Water District GSA

19. Patterson Irrigation District GSA

20. San Joaquin River Exchange Contractors GSA
(Includes: Central California Irrigation District, San Luis Canal Company, Firebaugh Canal Water District, and Columbia Canal Company)

21. Turner Island Water District–2 GSA

22. West Stanislaus Irrigation District GSA 1

23. Widren Water District GSA

EXHIBIT "B"

Coordination Committee Representatives & Participation Percentages

	Coordination Committee Representatives	Group Contact Agency	Participation Percentage
1	**Aliso Water District GSA** Aliso Water District GSA	Aliso Water District GSA	1/7
2	**Farmers Water District GSA** Farmers Water District GSA	Farmers Water District GSA	1/7
3	**Fresno County Management Area A and B GSAs Group** Fresno County Management Area A GSA Fresno County Management Area B GSA	Fresno County	1/7
4	**Central Delta-Mendota GSAs Group** Central Delta-Mendota GSA Oro Loma Water District GSA Widren Water District GSA	Central Delta-Mendota GSA	1/7
5	**Northern Delta-Mendota GSAs Group** City of Patterson GSA DM-II GSA Northwestern Delta-Mendota GSA Patterson Irrigation District GSA West Stanislaus Irrigation District GSA	West Stanislaus Irrigation District	1/7
6	**Grassland GSAs Group** Grassland GSA Merced County Delta-Mendota GSA	Grassland Water District	1/7
7	**San Joaquin River Exchange Contractors GSAs Group** City of Dos Palos GSA City of Firebaugh GSA City of Gustine GSA City of Los Banos GSA City of Mendota GSA City of Newman GSA Madera County GSA Merced County Delta-Mendota GSA San Joaquin River Exchange Contractors GSA Turner Island Water District-2 GSA	San Joaquin River Exchange Contractors GSA	1/7

EXHIBIT "C"

ADAPTIVE MANAGEMENT FRAMEWORK FOR THE SUBBASIN

The Groundwater Sustainability Agencies ("GSAs") in the Delta-Mendota Subbasin (the "Subbasin") acknowledge that the Sustainable Groundwater Management Act ("SGMA") has a long-term horizon to achieve sustainability and that management of the Subbasin will require an iterative process on the part of the GSAs and the Coordination Committee to review groundwater conditions at least annually and propose revisions to underlying data, methodologies, assumptions, sustainable management criteria, projects, management actions, and other Subbasin-wide coordinated information as necessary to meet changing conditions. Accordingly, the GSAs in the Subbasin establish the following framework for addressing MT exceedances in the SGMA implementation period, as will be further described in the adopted GSP:

1. As a Subbasin-wide Activity, the Subbasin-wide GSP Consultant shall initiate a review of Subbasin-wide data within sixty (60) days after that data is due to be submitted by each GSA (the "Review"). As reporting dates vary based upon the Sustainable Management Criteria ("SMC"), this Review will be done on a regular basis and will be a regular agenda item on the Coordination Committee agendas.

2. The Review shall take into account all matters to be considered in the Annual Report pursuant to the DWR Regulations, section 356.2, including, but not limited to, changes in groundwater elevation, groundwater storage, subsidence, water quality and the status of minimum thresholds ("MTs") and interim milestones in the Subbasin GSP.

3. Should GSA activities result in either a) a pattern of data showing a downward trend (towards a MT exceedance), or b) a MT exceedance, the Coordination Committee (at the recommendation of the Plan Manager, a designated subcommittee, or the Subbasin-wide GSP Consultant) shall immediately notify the GSA and add the downward trend or exceedance information to the next Coordination Committee agenda packet. That GSA shall also be provided with a checklist to help evaluate possible causes of the MT downward trend or exceedance.

4. The GSA may request the Subbasin-wide GSP Consultant to coordinate such trend or exceedance information with that GSA's own consultant, as applicable. Within thirty (30) days of said notice, the GSA shall present a plan of action to the Coordination Committee to address how the GSA will mitigate any downward trend or exceedance and in what timeframe. The intent is for the Coordination Committee to discuss the mitigation plan in an effort to provide helpful ideas to the GSA. However, the GSA is solely responsible for the management actions within its boundaries and the costs to remedy the cause of the MT exceedance if it is attributed to activities occurring within such GSA's jurisdictional boundaries and/or that GSA is not operating within its Sustainable Yield (the "Responsible GSA"). At its sole cost and expense, the Responsible GSA may ask the Subbasin-wide GSP Consultant to further determine: (a) what caused the exceedance; (b) whether or not the Responsible GSA has control over the cause of the MT downward trend or exceedance; (c) whether it is an intra-basin impact from another GSA or an inter-basin impact by a neighboring subbasin; and (d) whether or not the MT exceedance caused injury.

5. If there is a determination by the Subbasin-wide GSP Consultant that any MT downward trend or exceedance was caused by intra-basin impacts from another GSA within the Subbasin, such determination will be brought back to the Coordination Committee for further discussion and potential Subbasin-wide action. The Coordination Committee will work with other GSAs to increase existing GSA coordination to remedy the issues causing the downward trend or exceedance and to remedy the responsibility of costs associated with identifying and mitigating the exceedance.

6. If there is a determination that any MT exceedance was caused by a neighboring subbasin, this should be brought back to the Coordination Committee for further discussion and potential Subbasin-wide action. Costs for initial investigation by the Subbasin-wide GSP Consultant of a MT downward trend or exceedance across Subbasin boundary lines (such as water quality issues, subsidence, or depletion of interconnected surface waters) shall be shared amongst the Coordination Committee equally between Coordination Committee members (i.e. 1/7th each). The Coordination Committee will work with other subbasins to expand existing inter-basin coordination to remedy the issues causing the downward trends or exceedances.

7. In the event that the GSA is unable to mitigate or avoid future MT exceedances with its existing projects and management actions ("P&MAs") and within the timeframe presented to the Coordination Committee, the GSA may seek assistance from the Coordination Committee. The Coordination Committee may recommend policies or programs to the GSA that the GSA could, in its discretion, adopt to remedy the existence of a MT exceedance and to avoid undesirable results. Furthermore, the Coordination Committee may consider setting triggers in the GSP for GSAs to implement management actions [e.g., sequencing P&MAs] or work on alternative options.


On a rolling basis, annual data and information is due to the Subbasin-wide consultant.
Within 60 days of deadline to submit information, Subbasin-wide consultant Reviews data for MT Exceedances & potential trends in said exceedances
The Coordination Committee provides immediate notice to each GSA with a MT Exceedance & discusses it at the following Coordination Committee meeting. The GSA is provided with a checklist to help evaluate possible causes.
Within 30 days of receiving such information, the GSA with MT Exceedances presents a mitigation plan & timeline to the Coordination Committee
GSA may decide to have Subbasin consultant do further research, at its sole cost.
Within timeframe presented by GSA, GSA presents to Coordination Committee mitigation plan that is successful.
Within timeframe presented by GSA, MT Exceedances are still occurring.
GSA & Coordination Committee recommend triggers in GSP for implementing P&MAs
GSA & Coordination Committee work on alternative options.
GSA and Subbasin-wide GSP Consultant determine that MT Exceedance is caused by neighboring subbasin GSA(s) or intra-basin Subbasin GSA impacts
Coordination Committee meets & negotiates with neighboring Subbasin GSA or GSA(s)

EXHIBIT "D"

SUBBASIN-WIDE ACTIVITIES

(Initial List)

- Preparation of and submittal of annual reports

- Preparation of annual estimates of Coordinated Plan Expenses presented by the Secretary and any updates to such estimates, in accordance with the budgetary requirements of the respective Parties

- Plan Manager costs and expenses for the work directed by the Coordination Committee

- Subbasin-wide Consultant costs and expenses, including, but not limited to, collecting information from the Subbasin GSAs, processing technical data, and those identified in Exhibit "C" for the Adaptive Management Framework for the Subbasin

- Preparation of and submittal of five-year updates to the GSP

- Revisions to this MOA

- Subbasin-wide outreach

- Litigation costs for an attorney coordinating the GSAs for litigation filed against the entire Subbasin

- Costs for initial investigation by the Subbasin-wide GSP Consultant of a MT downward trend or MT exceedance across Subbasin boundary lines

Appendix E

Public Outreach and Communications Log

Appendix E-1

Pre-2020 Outreach and Meetings Log

Appendix E-1
Public Outreach and Meetings Log (Pre-2020)

GSA Group	Outreach Type	Meeting Date	Meeting Location	Topic	Notes
Entire Basin	Coordination Committee Meeting	Generally monthly since August 2017	Los Banos, SLDMWA Office	Updates on SGMA-related activities	
	Technical Working Group Meetings	Monthly from September 2017 to February 2019	Los Banos, SLDMWA Office	Technical issues related to GSP development and implementation	Combined with Coordination Committee Meetings after February 2019
	Communication Working Group Meeting	Eight Meetings from February 2018 to May 2019	Held via Conference Call	Coordinate messaging, education and outreach throughout the Basin relative to SGMA and GSP requirements	Group has been disbanded and no longer meets
	Delta-Mendota Subbasin Website	2018	N/A	SGMA information for the Subbasin	www.deltamendota.org
	Stakeholder Workshop	5/14/2018	Los Banos, SLDMWA Office	• SGMA and Basin Overview • Opportunities for Engagement	
		5/16/2018	Los Banos, SLDMWA Office		
		5/17/2018	Los Banos, SLDMWA Office		
		10/22/2018	Firebaugh, Firebaugh Middle School	•Data Collection •HCM •Groundwater Models	
		10/24/2018	Los Banos, College Greens Building		
		10/25/2018	Patterson, Hammon Senior Center		
		2/19/2019	Los Banos, College Greens Building	•Historic and Current Water Budgets •Sustainability Criteria / URs •P/MAs	
		2/20/2019	Patterson, Patterson City Hall		
		3/4/2019	Santa Nella, Romero Elementary School		
		5/20/2019	Patterson, Patterson City Hall	•Projected water budgets •Sustainable yield •Groundwater monitoring networks •P/MAs	
		5/21/2019	Los Banos, College Greens Building		
		5/22/2019	Santa Nella, Romero Elementary School		
		5/23/2019	Mendota, Mendota Library		
	Central Valley Basin Meetings	10/20/2017			
		1/29/2018			
		4/2/2018			
		6/8/2018			
	Workshop with CDFW, TNC, and the Audubon Society	8/24/2018		Management of GDEs as a beneficial user of groundwater	
Aliso Water District	Aliso Water District GSA Board Meetings	Quarterly on the Fourth Tuesday		Updates on SGMA-related activities	Schedule on https://www.alisowdgsa.org
	Technical Advisory Ad-Hoc Committee	Reports at Board Meetings		Technical issues related to GSP development and implementation	
	Stakeholder Workshop	1/26/2016		Basin Boundary Modification Public Meeting	
		4/26/2016		GSA Formation Public Meeting	
		4/23/2018		Water Budget Workshop	
		8/2/2018		P/MAs Ad-Hoc Committee Meeting #1	
		11/20/2018		SMC Workshop #1	
		4/29/2019		Outreach Meeting with TNC on GDE Mapping	
		5/17/2019		P/MAs Ad-Hoc Committee Meeting #2	
		5/28/2019		SMC Workshop #2	

Appendix E-1
Public Outreach and Meetings Log (Pre-2020)

Central Delta-Mendota	Central Delta-Mendota GSA Board Meetings			Updates on SGMA-related activities	
	Santa Nella County Water District Board Meeting	17 SGMA-related meetings between April 2016 and June 2019	Santa Nella, Santa Nella County WD	Updates on SGMA-related activities	
	Widren Water District Board Meetings	10 SGMA-related meetings between March 2017 and April 2019	Los Banos, Widren Water District	Updates on SGMA-related activities	
	Widren Water District Landowner Monthly Updates	Monthly	Los Banos, Widren Water District	Updates on SGMA-related activities	
	Tranquility Irrigation District Board Meetings	21 SGMA-related meetings between June 2016 and May 2019	Tranquility, Tranquility Irrigation District	Updates on SGMA-related activities	
	Fresno County Board of Supervisors	18 SGMA-related meetings between March 2015 and May 2019	Fresno, Board Chambers, Hall of Records	Updates on SGMA-related activities	Schedule on https://www.fresnocountyca.gov/Departments/Public-Works-and-Planning/divisions-of-public-works-and-planning/water-and-natural-resources-division/fresno-county-management-areas-a-b
	Central Delta-Mendota Management Committee Meetings	Monthly	SLDMWA Board Room	Updates on SGMA-related activities	
	Stakeholder Workshop	12 meetings betweeen May 2017 and April 2019	Los Banos, Widren Water District	Widren Water District Landowner Updates	
		4/29/2019		Outreach Meeting with TNC on GDE Mapping	
		5/14/2018	Los Banos	Description of SGMA, Introduction of Local GSA's in the Area	
		9/29/2017	Fresno County Office of Education	Introduction/Overview of SGMA for Fresno County schools	Hosted by Self-Help Enterprises
		3/13/2017	Tranquility, Tranquility Irrigation District	Status of GSA formation	
		3/8/2017	Santa Nella County Water District	SGMA Education prior to public hearing for Central DM GSA formation	
	Miscellaneous Outreach and Meetings	2018 and 2019	Santa Nella County WD, Tranquility ID	Mailers, notices, and informational fliers related to SGMA	
Farmers Water District	Farmers Water District Board Meetings	1/9/2019	Fresno, Baker Farming Company Conference Room	Updates on SGMA-related activities	Schedule on https://www.farmerswd.com/
		2/21/2019			
		3/13/2019			
		4/10/2019			
Fresno County	Fresno County Board of Supervisors	18 SGMA-related meetings between March 2015 and May 2019	Fresno, Board Chambers, Hall of Records	Updates on SGMA-related activities	Schedule on https://www.fresnocountyca.gov/Departments/Public-Works-and-Planning/divisions-of-public-works-and-planning/water-and-natural-resources-division/fresno-county-management-areas-a-b
	Stakeholder Workshops	3 workshops in 2018 and 2019	Fresno, Wood Office	GSP development	
		9/29/2017	Fresno County Office of Education	Introduction/Overview of SGMA for Fresno County schools	Hosted by Self-Help Enterprises

Appendix E-1
Public Outreach and Meetings Log (Pre-2020)

Grasslands GSA Group	Public Hearing to Form Grasslands GSA	11/22/2016	Los Banos, Grassland Water District	Hearing to form GGSA	
	Grasslands GSA Board Meeting (Grasslands Water District and Grasslands Resource Conservation District Boards)	2/13/2018	Los Banos, Grassland Water District	Updates on SGMA-related activities	
		8/28/2018	Los Banos, Grassland Water District	Updates on SGMA-related activities	
		5/17/2019	Los Banos, Grassland Water District	Updates on SGMA-related activities	
		10/1/2019	Los Banos, Grassland Water District	Updates on SGMA-related activities	
	Public Hearing to Form Merced County - Delta Mendota GSA	3/21/2017	Merced, Merced County Administration Building	Hearing to form GGSA	
	Merced County - Delta Mendota GSA Board Meetings	8/29/2017	Merced, Merced County Administration Building	Updates on SGMA-related activities	
		9/18/2018	Merced, Merced County Administration Building	Updates on SGMA-related activities	
		1/29/2019	Merced, Merced County Administration Building	Updates on SGMA-related activities	
	Merced County Board of Supervisors Meeting	7/31/2018	Merced, Merced County Administration Building	Updates on SGMA-related activities	
	Stakeholder Workshop	5/19/2018	Los Banos, Grassland Water District		
		5/18/2019	Los Banos, Grassland Water District		
	CDFW Public Outreach Meeting	9/8/2018	Los Banos Wildlife Area		
	SGMA Informational Flyer	Annually 2017 to 2019		Merced County Property Tax Bills	
		5/8/2019		Mailers to landowners within the Merced County Delta-Mendota GSA	
Northern Delta-Mendota	City of Patterson City Council Meetings	3/20/2017	Patterson	SGMA and next steps	
		12/16/2016	Patterson	Approve resolution to become GSA	
		11/14/2016	Patterson	Next steps for SGMA	
	Del Puerto Water District Board Meetings	Monthly	Patterson		
	Patterson Irrigation District Board Meetings	32 Meetings between July 2014 and July 2019	Patterson, PID	GSA/SGMA Updates	
	West Stanislaus Irrigation District Board of Supervisors	Monthly	WSID	GSA/SGMA Updates	
	Fresno County Board of Supervisors	18 SGMA-related meetings between March 2015 and May 2019	Fresno, Board Chambers, Hall of Records	Updates on SGMA-related activities	Schedule on https://www.fresnocountyca.gov/Departments/Public-Works-and-Planning/divisions-of-public-works-and-planning/water-and-natural-resources-division/fresno-county-management-areas-a-b
	Patterson Irrigation District Growers Meetings				
	Northern Delta-Mendota Region Management Committee Meetings	Monthly			
	Stanislaus County Board of Supervisors Meeting	10 Meetings from May 2015 to June 2017	Modesto	SGMA Awareness/Education	
	Stanislaus County Water Advisory Committee Meetings	8 Meetings from February 2015 to January 2018	Modesto	SGMA Awareness/Education	

Northern Delta-Mendota	Merced County Board of Supervisors Meeting	10/25/2016	Merced	SGMA Update in Merced County	
		3/7/2017	Merced	GSA Formation	
	Other Board Meeting	6/4/2015	Modesto, StanCo Ag Advisory Board	SGMA/GSA/GSP update	
		6/17/2015	Modesto, Board of Directors	Groundwater Mgt. within the County	
		5/4/2015	StanCo Ag Advisory Board	SGMA Awareness/Education	
	Club Meetings	4/17/2015	Modesto, Modesto Engineer's Club	SGMA Awareness/Education	
		3/26/2015	Modesto, League of Women Voters	SGMA Awareness/Education	
		3/12/2015	Modesto, League of Women Voters	SGMA Awareness/Education	
		2/25/2015	Patterson, Patterson Rotary Club	SGMA Awareness/Education	
		2/17/2015	Waterford, Waterford Lions Club	SGMA Awareness/Education	
		1/22/2015	Newman, Newman Rotary Club	SGMA Awareness/Education	
		1/15/2015	Turlock, Turlock Lions Club	SGMA Awareness/Education	
		1/14/2015	Patterson, Patterson Lions Club	SGMA Awareness/Education	
		1/8/2015	Modesto, Modesto Garden Club	SGMA Awareness/Education	
		1/6/2015	Turlock, Turlock Rotary Club	SGMA Awareness/Education	
	Town Hall Meeting	10/8/2015	Valley Home Community	SGMA Awareness/Education	
		8/12/2015	Denair Community	SGMA Awareness/Education	
		6/25/2015	Knights Ferry Community	SGMA Awareness/Education	
	Stakeholder Workshop	Annual from 2015 to 2019	PID, WSID	Annual Growers Meetings	
		4/29/2019		Outreach Meeting with TNC on GDE Mapping	
		4/18/2018	Modesto, Gallo Winery	Manufacturer's Council of the Central Valley - SGMA Compliance Update	
		3/11/2018	Merced	Ag Community SGMA Workshop	
		12/14/2017	Modesto	PEIR-SGMA Workshop	
		9/29/2017	Fresno County Office of Education	Introduction/Overview of SGMA for Fresno County schools	Hosted by Self-Help Enterprises
		8/28/2017	Modesto	PEIR-SGMA Workshop	
		3/20/2017	Patterson	City of Patterson - Progress on Groundwater Recharge Study and SGMA	
		3/9/2017	Modesto	PEIR-SGMA Workshop	
		10/26/2016	Patterson	Del Puerto WD Stakeholder Workshop	
		9/23/2015	Patterson	City of Patterson - Introduction to Groundwater Recharge Study	
		2/5/2015	Modesto	ACWA-SWF-CSAC-GSA Workshop	
		1/16/2015	Stanislaus County	2015 Water Summit - SGMA Awareness	
	Miscellaneous Outreach and Meetings	Monthly	City of Patterson, PID, WSID	Mailed SGMA newsletter with monthly billing statements	
		August and September 2017	Merced County Property Owners	SGMA informational flier included in Merced County Property Tax Bill	
		9/9/2015	Modesto - MJC Science Colliquium	SGMA Awareness - Regional Water Issues	
		6/2/2015	Denair - Denair Municipal Advisory Committee	SGMA Awareness - Regional Water Issues	

San Joaquin River Exchange Contractors	SJREC GSA Board Meeting	Quarterly	Los Banos, SJREC Water Authority Office	SGMA-related updates	
	SJREC GSA Finance Committee	Quarterly	Los Banos, SJREC Water Authority Office	GSA financial updates	
	Presentations	2/5/2019	57th Annual California Irrigation Institute Conference	SGMA Awareness/Education	
		3/1/2018	Merced County Farm Bueau Water Symposium	SGMA Awareness/Education	
		2/21/2019	Merced County Farm Bueau Water Symposium	SGMA Awareness/Education	
		9/29/2017	Fresno County Office of Education	Introduction/Overview of SGMA for Fresno County schools	Hosted by Self-Help Enterprises
	Stakeholder Meetings	Annual for all GSAs	Various	SGMA Awareness/Education	

Notes:
1. This table only includes meetings that occurred from 2016 to 2019 during initial GSP development. Meetings that occurred in 2020 and beyond are logged in Section 5.5 of the Delta-Mendota Subbasin GSP.

Abbreviations:

CDFW = California Department of Fish and Wildlife
GDE = Groundwater Dependent Ecosystem
GSA = Groundwater Sustainability Agency
GSP = Groundwater Sustainability Plan
HCM = Hydrogeologic Conceptual Model
P/MA = Projects and Management Actions
SGMA = Sustainable Groundwater Management Act
SJREC = San Joaquin River Exchange Contractors
SLDMWA = San Luis & Delta-Mendota Water Authority
TNC = The Nature Conservancy
UR = Undesirable Results

DELTA-MENDOTA SGMA

Appendix E-2

Post-2020 Outreach and Meetings Log

Appendix E-2
Public Outreach and Meetings Log (Post-2020)

GSA Group	Outreach Type	Meeting Date	Meeting Location	Topic	Notes
Entire Basin	Coordination Committee Meetings	Monthly	Los Banos, SLDMWA Office	Updates on SGMA-related activities	
	2024 Water Leadership Institute	Four full-day workshops; 3/9/2024, 4/13/2024, 5/11/2024, 6/15/2024	Los Banos	Educate underserved populations, including residents in DACs and SDACs, with the skills and opportunity to engage on water issues	Partnered with Environmental Defense Fund (EDF) and the Rural Community Assistance Corporation (RCAC)
	Community Water Needs Assessment	2024	N/A	Updating the Community Water Needs Assessment reports, including the identification and engagement of water leaders in DACs, SDACs, and EDAs for engagement in the GSP development process.	
	Webinar on Draft GSP	5/10/2024		Overview of the draft GSP and information on how to submit comments	
	Subbasin Website	N/A	http://deltamendota.org	Subbasin SGMA information and updates	
	Quarterly Basin Newsletter	Quarterly		Subbasin SGMA Updates	
Aliso Water District	Aliso Water District GSA Board Meetings	Quarterly	Madera, AWD Office	Quarterly Board Meeting	
Central Delta-Mendota	Central Delta-Mendota GSA Board Meetings	Quarterly		Quarterly Board Meeting	http://deltamendota.org/event
	Eagle Field Water District Board Meeting	6/26/2020 Board Meeting	Eagle Field Water District	Rewiew of GSA 3rd Central Delta Mendota Regular SGMA Services Act Agreenment / MOA Participation	
	Eagle Field Water District Stakeholder Workshop	12 Meetings from June 2020 to May 2023	Eagle Field Water District	Bennett Monthly Meetings	
	Pacheco Water District Board Meetings	Monthly	Los Banos, Pacheco WD	Monthly Board Meeting	
	Pacheco SGMA workshop	18-Oct-23	Los Banos, Pacheco WD	Grower Recharge Workshop Madera County Farm Bureau	
	Panoche Water District	45 Meetings between January 2020 and September 2023	Panoche Water District	PWD Board Meetings	
	Santa Nella County Water District Board Meeting	Monthly	Santa Nella, Santa Nella County WD	Monthly Board Meeting	
	Santa Nella Direct Outreach	27 Direct Mail between January 2020 and August 2023	Direct Mail	Notice of Public Hearing, DM Subbasin FAQ, quarterly newsletters for various customers	
	Widren Water District Board Meetings	Quarterly	Los Banos, Widren Water District	Report on the NCDM Management Committee Meetings	
	Widren Water District Landowner Monthly Updates	8/21/2021 and N.D. 2023	Los Banos, Widren Water District	Updates on SGMA-related activities	
	Tranquility Irrigation District Board Meetings	Monthly	Tranquility, Tranquility Irrigation District	Updates on SGMA-related activities	
	Central Delta-Mendota Region Management Committee Meetings	Monthly	SLDMWA Board Room	Updates on SGMA-related activities	http://deltamendota.org/event
	Miscellaneous Outreach and Meetings	7/15/2020		Central Delta-Mendota GSA Technical Workshop	http://deltamendota.org/event
Farmers Water District	Farmers Water District Board Meetings	Monthly	Farmers Water District	Monthly pumping, GSP implementation	
Fresno County	Fresno County Board of Supervisors	As-Needed			
Grasslands GSA Group	Grasslands GSA Board Meeting (Grasslands Water District and Grasslands Resource Conservation District Boards)	27 Meetings from January 2020 to September 2023			
	Grassland Resource Conservation District Meeting	3 Meetings February 2023 to July 2023			
	Joint Meeting Grassland Water District, Grassland Resource Conservation District and Grassland Groundwater Sustainability Agency	9 Meetings from June 2020 to July 2023			

Appendix E-2
Public Outreach and Meetings Log (Post-2020)

GSA Group	Outreach Type	Meeting Date	Meeting Location	Topic	Notes
Northern Delta-Mendota	City of Patterson City Council Meetings	7/1/2022	City of Patterson	SGMA amendment presentation	
	Del Puerto Water District Board Meetings	45 Meetings between January 2020 and September 2023	City of Patterson		
	Patterson Irrigation Public Meetings/Board Meetings	45 Meetings between January 2020 and September 2023	Patterson, PID	GSA/SGMA Updates	
	West Stanislaus Irrigation District Board of Supervisors	48 Meetings between January 2020 and December 2023	WSID	GSA/SGMA Updates	
	Patterson Irrigation District Growers Meetings	February 26, 2020; September 15, 2021; April 14, 2023 (Grower Workshop)	PID		
	Northern Delta-Mendota Region Management Committee Meetings	Monthly		Updates on SGMA-related activities	
	Stakeholder Workshop	11/17/2021	DPWD	Annual Del Puerto Water District Customer Meeting	
		12/1/2022	City of Patterson	Presentation on water quality and groundwater management	
	Miscellaneous Outreach and Meetings	2020 - 2023	City of Patterson	Public Newsletters (quarterly), Outreach table at City Hall (monthly), Local festivals (June 2022 and May 2023)	
San Joaquin River Exchange Contractors	Madera County Board Meeting	57 Board Meetings from January 2020 to September 2023			
	Madera County Direct Outreach	113 E-newsletters from January 2020 to September 2023			
	Madera County Stakeholder workshop	11 Workshops from December 2020 to October 2023			

Abbreviations:

AWD = Aliso Water District
DAC = Disadvantaged community
DPWD = Del Puerto Water District
GSA = Groundwater Sustainability Agency
GSP = Groundwater Sustainability Plan
PID = Patterson Irrigation District
SDAC = Severely disadvantaged community
SLDMWA = San Luis & Delta-Mendota Water Authority
SGMA = Sustainable Groundwater Management Act
WD = Water District
WSID = West Stanislaus Irrigation District

DELTA-MENDOTA SGMA

Appendix F

Delta-Mendota Subbasin Communications Plan

Delta Mendota Subbasin Groundwater Management

Sustainable Groundwater Management Act Communications Plan

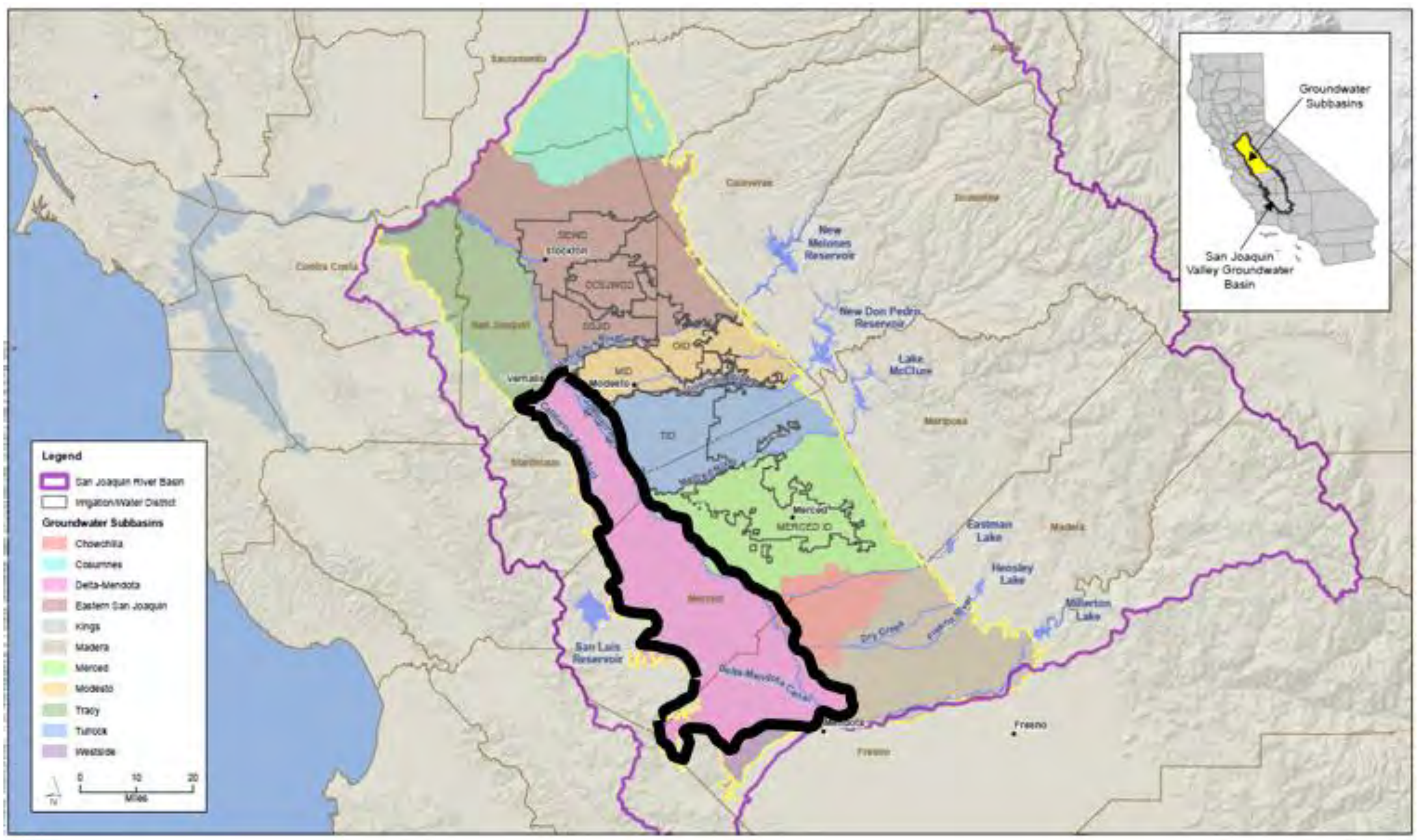

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Figure 9-1
Vicinity Map of Groundwater Subbasins

Prepared by:
Lisa Beutler, MWH/Stantec,
Via CA Dept. of Water Resources,
Facilitation Services Technical Assistance

June 2017

Forward: How to use this Plan

This Communication Plan provides a high-level overview of near and long-term outreach and engagement strategies, tactics and tools. Its purpose is to assist the Groundwater Sustainability Agencies (GSAs) of the Delta Mendota Subbasin with stakeholder outreach and other related actions as required by the Sustainable Groundwater Management Act (SGMA) of 2014. It is presented as a working public draft, and should be considered a living document that is continuously refined and updated as circumstances suggest.

Chapter 1*:* *Introduction and Background* provides text and information about SGMA and the Delta Mendota Subbasin that can be repurposed directly into websites or printed materials by agencies and/or entities with an interest in SGMA and how it will affect the subbasin. This section also describes the communications activities mandated by SGMA.

Chapter 2: *Communications Plan Overview* provides communications planning goals and objectives as well as the scope. This section can be used in support of project management activities.

Chapter 3: *Situation Assessment* provides some of the context for communications activities. This section can be used in developing required assessments of stakeholder issues and interests. It also informs project management activities.

Chapter 4: *Audiences and Messages* identifies key subbasin audiences and message points for specific audience segments. The goal of this chapter is to provide information that can be used by the subbasin GSAs in preparing to work with key stakeholders.

Chapter 5: *Risk Management* is the summary of a communications risk assessment that considers subbasin communications strengths and weakness and proposes on-going adjustments based on best communication management practices. This section informs project management activities and provides a context for some of the recommended communications tactics.

Chapter 6: *Tactical Approaches* offers a communications to do list with specific communications activities relevant for project phases and subbasin audiences.

Chapter 7: *Measurements and Evaluation* outlines methods to determine the effectiveness of outreach and engagement.

Chapter 8: *Roles and Responsibilities* provides a sample list of tasks and illustrates the types of communications roles and responsibilities which might be assigned. This section should be incorporated into project management plans.

Subbasin GSAs should feel free to repurpose any or all parts of the document that will assist them in meeting SGMA requirements.

This document was developed with technical support provided by the California Department of Water Resources' (DWR) SGMA Facilitation Support Services Program and completed by the Communication and Engagement Group of MWH/Stantec.

Delta Mendota Subbasin
Sustainable Groundwater Management Act
Communications Plan
Working Draft

Contents

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List of Acronyms and Abbreviations

Item	Description
Basin	Groundwater Basin or Subbasin
Coms Plan	Delta Mendota Subbasin, Sustainable Groundwater Management Act, Working Draft Communications Plan
CSD	Community Service District(s):
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
DAC	Disadvantaged Communities
DMC	Delta-Mendota Canal
DWR	California Department of Water Resources
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IRWMP	Integrated Resource Water Management Plan
PDF	Portable Document Format
RCD	Resource Conservation District(s)
SGMA	Sustainable Groundwater Management Act
SLDMWA	San Luis Delta- Mendota Water Authority
State Board	State Water Resources Control Board

Item	Description
SA	Situation Assessment
USGS	United States Geological Survey

Revision History

Table 1. Revision History

Revision History			
Revision/Dock Title #	Date of Release	Author	Summary of Changes

INTRODUCTION AND BACKGROUND

The purpose of this Communication Plan is to assist the Groundwater Sustainability Agencies (GSAs) of the Delta Mendota Subbasin with stakeholder outreach and other related actions as required by the Sustainable Groundwater Management Act (SGMA) of 2014. Its chapters identify key stakeholders and provide a high-level overview of near and long-term outreach and engagement strategies, tactics and tools. The plan was developed with technical support provided by the California Department of Water Resources' (DWR) SGMA Facilitation Support Services Program.

1.1. SGMA Basics[1]

After decades of debate, in 2014 California lawmakers adopted SGMA. This far-reaching law seeks to bring the State's critically important groundwater basins into a sustainable regime of pumping and recharge. The change in water management laws has created new obligations for residents and water managers in the Delta-Mendota Groundwater Subbasin. The San Luis Delta- Mendota Water Authority (SLDMWA) is assisting its members in implementation of this law.

SGMA requires, **by June 30, 2017**, the formation of locally-controlled GSAs in many of the State's groundwater basins and subbasins (basins). A GSA is responsible for developing and implementing a **groundwater sustainability plan** (GSP). These plans assist the basins in meeting sustainability goals. The primary goal is to maintain sustainable yields without causing undesirable results.

1.1.1. <u>GSAs & GSPs</u>

Any local public agency that has water supply, water management, or land use responsibilities in a basin can decide to become a GSA. A single local agency can decide to become a GSA, or a combination of local agencies can decide to form a GSA by using either a Joint Power Authority (JPA), a memorandum of agreement (MOA), or other legal agreement. If no agency assumes this role the GSA responsibility defaults to the County; however, the County may decline.

A GSP may be any of the following *(Water Code § 10727(b)):*

- A <u>single plan</u> covering the entire basin developed and implemented by <u>one GSA</u>.
- A <u>single plan</u> covering the entire basin developed and implemented by <u>multiple GSAs</u>.

[1] Sections on SGMA are largely drawn, in whole or in part, from publicly available materials from the Department of Water Resources. For more see: http://www.water.ca.gov/groundwater/sgm

- Subject to Water Code Section 10727.6, multiple plans implemented by multiple GSAs and coordinated pursuant to a single coordination agreement that covers the entire basin.

If local agencies are unable to form an approved GSA and/or prepare an approved GSP in the required timeframe, then the basin or subbasin would be considered unmanaged. Unmanaged groundwater basins and subbasins are subject to State Water Resources Control Board (State Board) oversight. This is true even if the vast majority of the subbasin is covered by a plan. Should intervention occur, the State Board is authorized to recover its costs from the GSAs.

1.2. SGMA Communications and Engagement Requirements

SGMA includes specific requirements for communications and engagement by each planning phase. **Figure 1** (next page) illustrates the requirements and provides water code references. The GSP submittal guidelines also describe the outreach and engagement documentation to be submitted with the plan. **Table 2** describes the submittal requirements. A full list of codes and requirements is also provided in **Appendix 1**.

Table 2. GSP Submittal Requirements[2]

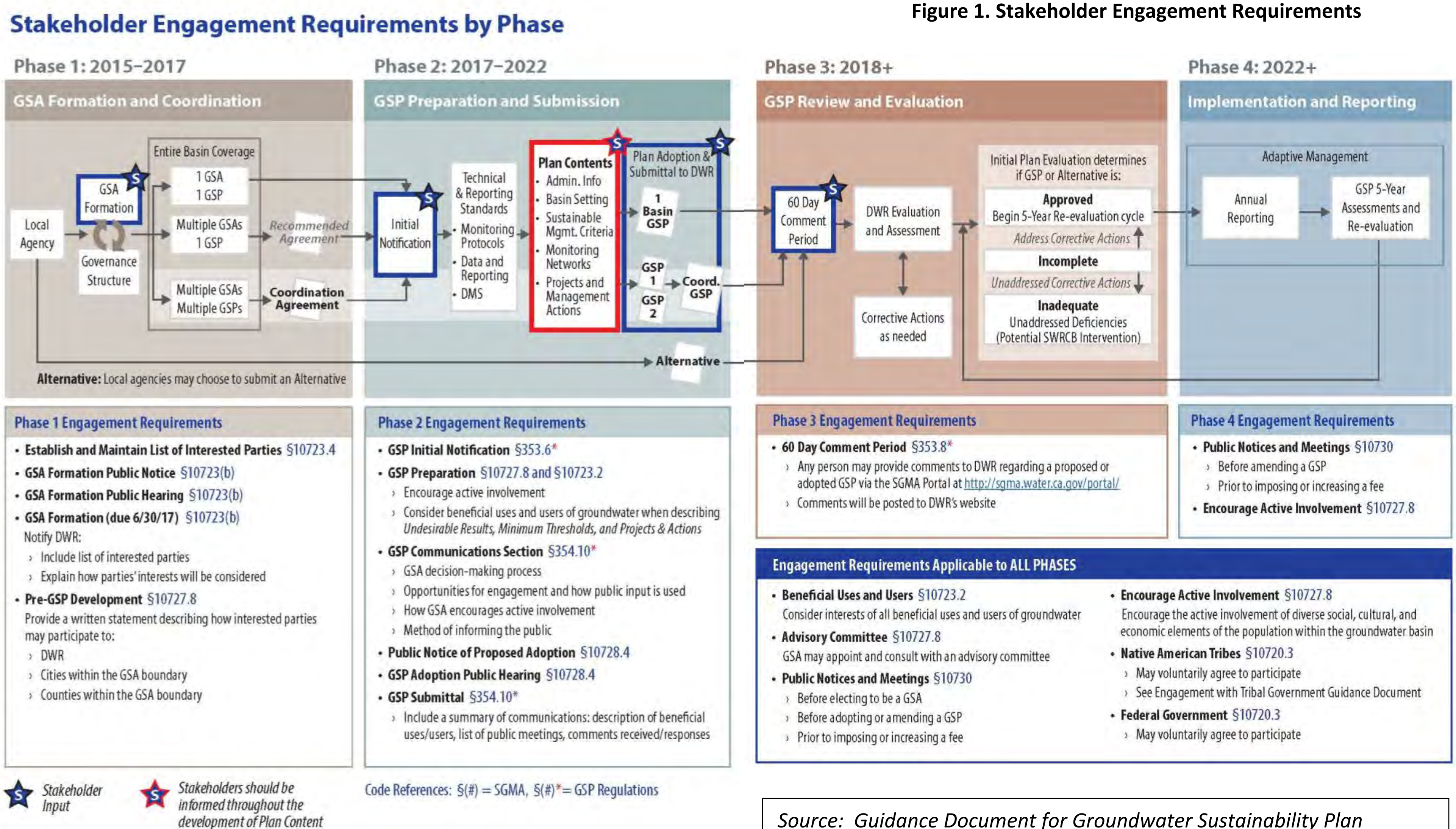
GSP Regulations Section	Requirement	Description
Article 5. Plan Contents, Sub-article 1. Administrative Information		
354.10	Notice and Communication	• Description of beneficial uses and users • List of public meetings with dates • GSP comments and responses • Decision-making process • Public engagement process • Method(s) to encouraging active involvement • Steps to inform the public on GSP implementation progress

1.3. Planning Approach

While the SLDMWA is assisting with the coordination of GSP(s) development, this Communications Plan (Coms Plan) is offered for the voluntary use of all of the GSAs of the Delta-Mendota Subbasin. A full Coms Plan schedule should be developed in conjunction with the overall GSP(s) development schedule. One additional option is for the Coordination Committee of GSAs to provide overall communications guidance. This could potentially be included in a section of the Coordination Agreement.

[2] Guidance Document for the Sustainable Management of Groundwater, Preparation Checklist for GSP Submittal, Department of Water Resources, December 2016

Figure 1. Stakeholder Engagement Requirements



Source: Guidance Document for Groundwater Sustainability Plan Stakeholder Communication and Engagement Department of Water Resources, June 2017

An important additional step will be establishing, in conjunction with the multiple GSAs, the roles and responsibilities for implementing the Coms Plan.

1.4. SGMA and the Delta Mendota Subbasin[3]

The Delta-Mendota Subbasin of the San Joaquin Valley Groundwater Basin is a long, relatively narrow groundwater basin that covers portions of five counties, from north to south, San Joaquin, Stanislaus, Merced, Madera and Fresno Counties (see **Figure 2**). The Delta-Mendota sub-basin is bounded on the west by the Tertiary and older marine sediments of the Coast Ranges. The northern boundary (from west to east) begins on the west by following the Stanislaus/San Joaquin County line, then deviates to the north to encapsulate all of the Del Puerto Water District before returning back to the Stanislaus/San Joaquin County line. The boundary continues east then deviates north again to encapsulate all of the West Stanislaus Irrigation District before returning back to the Stanislaus/San Joaquin County line. The boundary continues to follow the Stanislaus/San Joaquin County line east until it intersects with the San Joaquin River.

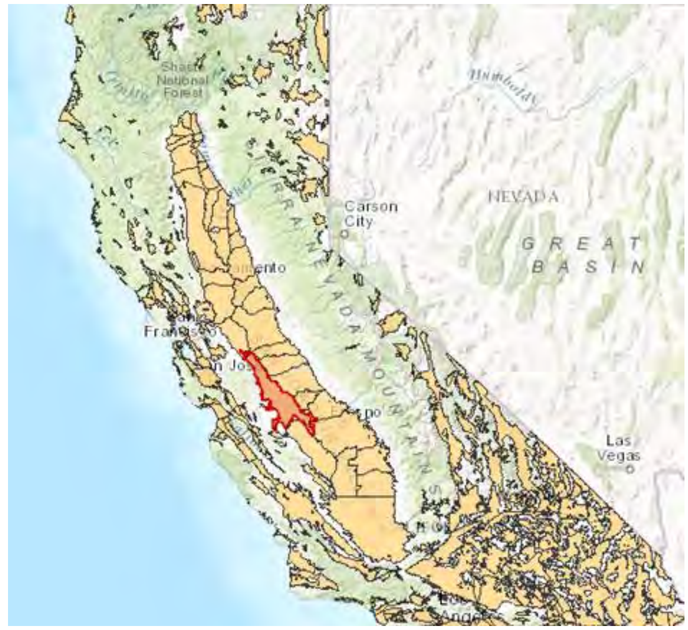


Figure 2. Delta Mendota Subbasin

The eastern boundary (from north to south) follows the San Joaquin River to within Township 11S, where it jogs eastward along the northern boundary of Columbia Canal Company and then follows the eastern boundary of Columbia Canal company until intersecting the northern boundary of the Aliso Water District. The boundary then heads east following the northern and then eastern boundary of the Aliso Water District until intersecting the Madera/Fresno County line. The boundary then heads westerly following the Madera/Fresno County line to the eastern boundary of the Farmers Water District. The boundary then heads southerly along the eastern boundary of the Farmers Water District, and continues southerly along the section line to the intersection with the northern right-of-way of the railroad. The boundary then heads east along the northern right-of-way of the railroad until intersecting with the western boundary of the Mid-Valley Water District. The boundary then heads south along the western boundary of the Mid-Valley Water District to the intersection with the northern boundary of Reclamation District 1606. The boundary then heads west and then south following the boundary of Reclamation District 1606 and James Irrigation District until its intersection with the Westlands Water District boundary.

The southern boundary (from east to west) matches the northerly boundaries of Westlands Water District legal jurisdictional boundary last revised in 2006. The boundary then

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[3] Information related to the Delta Mendota subbasin is drawn directly from http://sgma.water.ca.gov/basinmod/basinrequest/preview/23.

proceeds west along the southernmost boundary of the San Luis Water District. The boundary then projects westward from this alignment until intersecting the Delta-Mendota sub-basin Western boundary described above.

1.5. Delta-Mendota Subbasin GSP Planning

The GSAs of the Delta-Mendota Subbasin intend to work together to meet Sustainable Groundwater Management Act (SGMA) requirements and prepare a Groundwater Sustainability Plan (GSP) or coordinated Sustainability Plans by June 31, 2020. The San Luis Delta- Mendota Water Authority (SLDMWA) is assisting its members and non-members in planning and implementation of this law and has been directly assisting a subset of the local GSA eligible agencies in organizing to accomplish required SGMA tasks. The SLDMWA has also hosted informal, information meetings with all of the subbasin GSAs.

While SLDMWA coordinated GSAs are confident in their ability to prepare a GSP for the areas under their jurisdiction, SGMA requires that an approved GSP or multiple coordinated GSPs are in place to provide sustainable management for the entire subbasin. The identified GSAs have been asked to determine how they wish to proceed in individual GSP development or a coordinated single GSP by July 2017 and whether or not they wish to participate in the Prop 1 Sustainable Groundwater Planning Grant as a joint request.

1.6. Delta Mendota Subbasin GSAs

Following are the DWR identified agencies (as of June 15, 2017).[4]

1. Aliso Water District
2. Central Delta-Mendota Region Multi-Agency GSA
3. City of Dos Palos
4. City of Firebaugh
5. City of Gustine
6. City of Los Baños
7. City of Mendota
8. City of Newman
9. City of Patterson
10. County of Madera—3
11. DM-II
12. Farmers Water District
13. Fresno County—Management Area ‘A’
14. Fresno County—Management Area ‘B’
15. Grasslands Groundwater Sustainability Agency
16. Merced County—Delta-Mendota

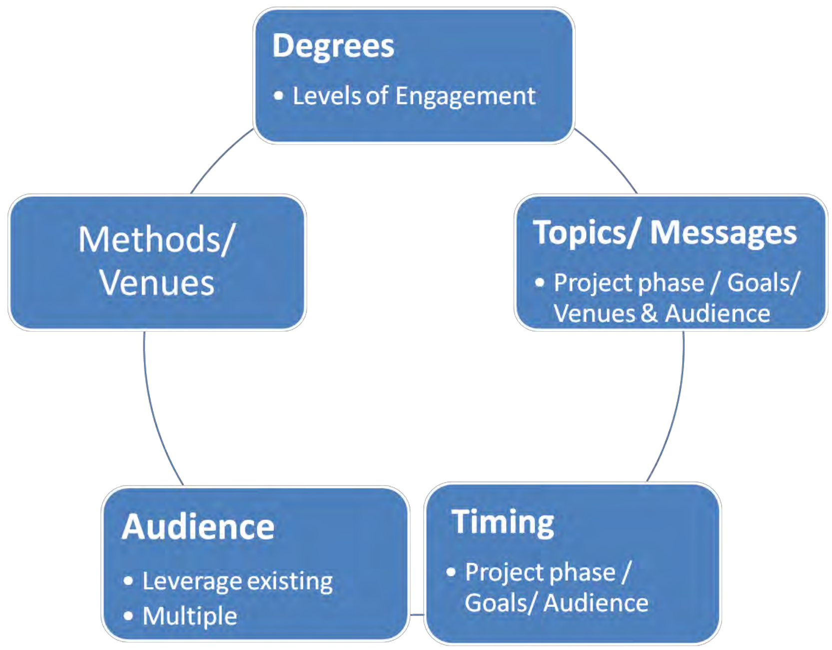
[4] See: http://sgma.water.ca.gov/portal/

17. Northwestern Delta-Mendota GSA
18. Ora Loma Water District
19. Patterson Irrigation District
20. San Joaquin River Exchange Contractors Water Authority
21. Turner Island Water District-2
22. West Stanislaus Irrigation District GSA
23. Widren Water District GSA

COMMUNICATIONS PLAN OVERVIEW

Communication is the process of transmitting ideas and information. According to the Project Management Institute, 75%-90% of a project manager's time is spent communicating. A Coms Plan provides the purpose, method, messages, timing, intensity, and audience of the communication, then describes who will do the communicating, and the frequency of the communication (see **Figure 3**.)

Figure 3. Elements of a Communications Plan



2.1. *Purpose*

The purpose of the Delta-Mendota Subbasin, Sustainable Groundwater Management Act, Coms Plan is to outline the information and communications needs of the project stakeholders and provide a roadmap to meet them. The Coms Plan then identifies how communications activities, processes, and procedures will be managed throughout the project life cycle.

2.2. *Importance*

While communications are important in every project, a well-executed communications strategy will be essential to the success of the GSP(s) development and adoption process. The financial and regulatory stakes are high and communication missteps can create project risks. Further, development of a viable GSP(s) will require an on-going collaboration among all the stakeholders, both organizational and external. The plan will be comprehensive and consider multiple variables, a range of system elements and project costs and benefits. Stakeholder input will be needed to refine GSP requirements and fully define the water management system, and potential impacts, costs and benefits that may result in managing for sustainability.

2.3. Scope

The plan focuses on formal communication elements. Other communication channels exist on informal levels and enhance those discussed within this plan. This plan is not intended to limit, but to enhance communication practices. Open, ongoing communication between stakeholders is critical to the success of the project.

2.4. Communications Goal

Development, adoption and implementation of the GSP(s) will require basin external stakeholders, other agencies, staff, managers, and the multiple GSA Boards to evaluate choices, make decisions and commit resources.

The core communications goal is to plan for and efficiently deliver clear and succinct information:

- At the right time
- To the right people
- With a resonating message

This is done to facilitate quality decision making and build accompanying public support

2.5. Communications Objectives

The Coms Plan Objectives are to present strategies and actions that are:

- Realistic and action-oriented
- Specific and measurable
- Minimal in number (a few well delivered are better than many mediocre efforts)
- Audience relevant

2.6. Strategic Approach

Three primary communications strategies have been identified for the GSP(s) development.

1) Fully leverage the activities of existing groups. This practical approach is cost effective and respectful of the limited time that stakeholders have to participate in collaborative processes.
2) Provide targeted, communications and outreach to opinion leaders in key stakeholder segments.
3) Provide user friendly information and intermittent opportunities through existing communication channels and open houses or workshops to allow interested stakeholders (internal and external) to engage commensurate with their degree of interest.

2.7. Communications Governance, Communications Team

Given the relatively large number of stakeholders, a recommendation for coordinated efforts, and the legal requirements for outreach[5], some form of communications governance is recommended. Several governance options for consideration are offered in Appendix 2. The actual form of the governance is less important than a clear understanding of the roles and responsibilities of those responsible for ensuring required communication. For the purpose of this document, an assumption is made that some form of governance will be identified and a communications team (which may be an individual or multiple individuals, and/or include the project consultants) is designated.

A driving consideration for this recommendation is the level of effort associated with required activities and the fact that communications are highly time dependent. That means that communications activities should be occurring that may happen outside of regularly scheduled GSA meetings. In this case delegation with guidance is efficient and effective.

2.8. Constraints

All projects are subject to limitations and constraints as they must be within scope and adhere to budget, scheduling, and resource requirements. These constraints can be even more challenging in projects with multiple agencies as will be the case with the development and coordination of multiple GSPs.

There are also legislative, regulatory, technology, and other organizational policy requirements which must be followed as part of communications management. These limitations must be clearly understood and communicated where appropriate. While communications management is arguably one of the most important aspects of project management, it must be done in an effective and strategic manner recognizing and balancing the multiple constraints.

All project communication activities should occur within the project's approved budget, schedule, and resource allocations. The GSP(s) project managers and the leadership of the participating GSAs should have identified roles in ensuring that communication activities are performed.

To the extent possible, to support collaboration and reduce costs, GSP(s) partners should utilize standardized formats and templates as well as project file management and collaboration tools.

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[5] See Appendix 1

SITUATION ASSESSMENT

3.1. *Introduction*

The challenges of asking a community to make changes in how things are done, or forging an agreement among multiple parties are often large. Prior to preparing a Coms Plan, a neutral, 3rd party facilitator conducted a stakeholder Situation Assessment (SA).

The facilitator's role was to provide an independent evaluation of potential stakeholder's interest in coordination and governance for GSA formation and GSP development and identify any barriers or concerns that would need to be addressed for the GSA formation process and GSP(s) development to be successful.

3.2. *Situation Assessments*

An SA is an information-gathering process that informs outreach, engagement and collaboration. As part of preparing the basin communication's process, it was important to know more about:

- Stakeholder Categories
- Opinion leaders
- Regulatory and political context
- Advocates and detractors
- Attitudes and knowledge
- Other elements useful to the crafting of decisions

An assessment is also a low risk approach to education and signaling a future relationship. It facilitates the community's appraisal of its needs, wants and values. A well-crafted assessment sets the stage for the parties to better understand and interpret their situation so that they can make informed decisions for actions, in the short term and for the future.

The Delta-Mendota subbasin SA included background research and interviews. Interviews were usually with individuals but in a few cases a very small group was convened. To encourage candor, the results of the input process were bundled so those interviewed were not individually identified unless they explicitly indicated they wished to share their individual response.

3.3. *Background Research*

The facilitator worked closely with the SLDMWA and DWR to identify useful documents, plans and activities that might inform the overall communications planning process.

3.4. *Interviews and Consultations*

Using information gathered during the background research and similar GSA formation efforts throughout the state, the facilitator worked with the SLDMWA to craft interview questions. The facilitator also provided some selection criteria to the SLDWMA to help identify a representative group of interview candidates. Once selected, the SLDMWA staff and facilitation team invited the interviewees to participate. In addition to full interviews, additional calls and in person communications were conducted to acquire amplifying information. **Figure 4** provides a quick overview.

Figure 4. Interview and Consultation Quick Facts

Number of Contacts: 30

Dates of Calls and Interviews Conducted:
February to May 2017

Average Length: 1 hr.
(Shortest = 20 mins., Longest = 1.5 hrs)

Selected participants were all engaged or otherwise stakeholders in some aspect of the basin GSA development process.

A project background sheet was provided in advance of each formal interview and used again during the interviewee discussions with the facilitator. Each interview followed the same format and included 16-18 questions (depending on whether or not a follow-up question was needed).

The questions covered the following topics pertaining to the GSA formations and GSP(s) development:

1. Overarching perspectives from each key stakeholder on general groundwater conditions, GSA governance; subbasin management and associated SGMA compliance
2. Preferred methods to achieve groundwater sustainability consistent with SGMA requirements
3. The level of agreement/conflict around groundwater governance across the range of stakeholder perspectives
4. Experience with facilitated processes, outreach and engagement, and the goals for such support
5. Potential configurations of governance and formations of GSAs and GSP development

3.5. *Summary of key findings*

Interview results indicate an overall positive environment for the project and project communications; however, the effort will require interactions of a large number of parties and planning for an extremely complex system. Following are the reflections, ideas and suggestions of those contacted.

3.5.1. Related to Groundwater Sources and Trends

- *Significant observed impacts associated with Weather, Water Project Deliveries and Cropping Patterns* – Participants observed a declining groundwater situation and were able to attribute it to drought and weather (particularly timing of seasonal rainfall and periods of prolonged, higher temperatures), conversion to permanent crops, and significant changes in access to surface water.

- *Surface & Groundwater Nexus* – As noted in comments related to access to surface water, there was a clear understanding of the surface/groundwater nexus. Many believed that any realistic solution would have to include a full assessment of the region's surface water future.

- *Extremely Complex Systems* – Many of those interviewed reported that parts of the subbasin were doing fine and could, with good management, be sustainable. They described problems as being primarily in pockets of the subbasin. They also characterized some parts of the subbasin as not being managed sustainably and indicated that they believe this would have continued had SGMA not passed. While it was generally agreed that it would have been better if SGMA was not driving the change, they felt change would not occur without something like SGMA. Several of the participants were able to describe specific locations and situations that illustrated this.

  Issues related to operations of the Bureau of Reclamation, the Delta-Mendota Canal (DMC), the Mendota Pool and restoration activities are of keen interest to all the stakeholders. Everyone was familiar with issues of subsidence and with the facts and figures represented in graphics like those in **Figure 5**, prepared by the United States Geological Survey (USGS).[6]

  Many perceived that groundwater supplies for municipal uses in some parts of the basin were at risk.

- *Historic Rights and Arrangements* – Access to surface water is based on numerous historic rights and agreements as well as more contemporary agreements. As such there is no **single** description of the status of surface water availability among the many subbasin GSAs,[7] although there is a strong understanding of the rights and arrangements that do exist.[8]

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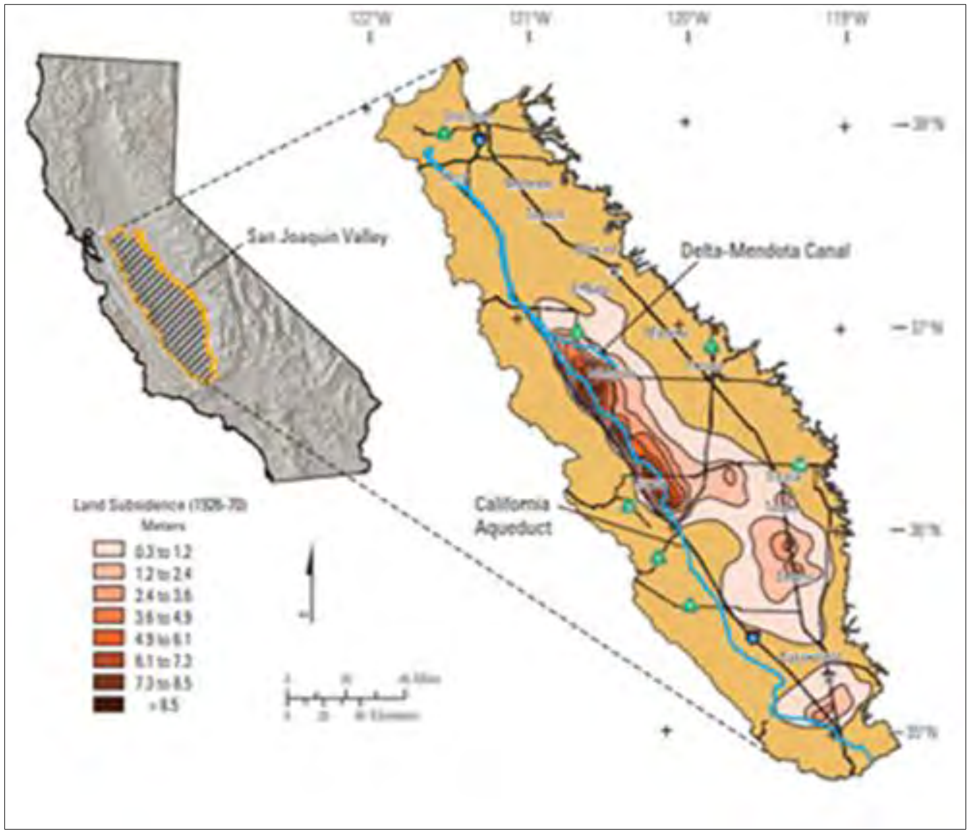
[6] U.S. Department of the Interior | U.S. Geological Survey: https://ca.water.usgs.gov/projects/central-valley/delta-mendota-canal.html, Page Last Modified: Monday, 20-Mar-2017 22:39:47 EDT

[7] A full inventory of water rights and arrangements for the subbasin GSAs is recommended to be prepared as part of the GSP planning process.

[8] In 2010 there were 1,403 water rights claimed in the San Joaquin Delta watershed, the largest number of any watershed in the State. [Source: Associated Press: Original data source is State Water Resources Control Board eWRIMS, Database

Figure 5. USGS Illustration of the DMC and Subsidence



The hierarchy of water rights as well as laws related to groundwater rights will be a significant factor in GSP negotiations.

Another historical factor related to sustainability is the character of land ownership. There was a perceived difference in the values placed on sustainability by multi-generational family farms versus investor driven agriculture and/or water development.

3.5.2. Related to GSA Governance; Subbasin Management and SGMA Compliance

- *Numbers* - The subbasin includes numerous Water Agencies (35) and other potential GSA eligible agencies including Cities and Counties (such as Dos Palos, Firebaugh, Gustine, Los Baños, Mendota, Newman, Patterson, Fresno, Madera, Merced, San Joaquin, and Stanislaus) and Community Service Districts (CSDs) including among others Grayson, Westley, and Volta, as well as multiple Resource Conservation Districts (RCDs) that for the most part were within the general boundaries of other GSA eligible authorities (Panoche, Poso and Grasslands as an example).

By the June 30, 2017 filing deadline, 23 eligible entities had formally filed GSA formations and met SGMA requirements for subbasin coverage.

Even with this large number of GSA entities, during the SA interviews and in a follow-up survey, most agencies indicated a preference for a reduced number of GSPs and potentially just one or two.

At the time of this assessment there was not a full understanding of all of the potential requirements of being a GSA and ultimately what might be required to prepare a compliant GSP.

Table 3. Number of Subbasin Public Water Agencies

Number of Public Water Agencies

- Merced County
- Fresno County
- Broadview WD
- Centinella WD
- Central California ID,
- Davis WD
- Del Puerto WD
- Eagle Field WD
- El Solyo WD
- Farmers WD
- Firebaugh Canal WD

- Foothill WD
- Fresno Slough WD
- Grasslands WD
- Hospital WD
- Kern Canon WD
- Laguna WD
- Mercy Springs WD
- Mustang WD
- Oak Flat WD
- Orestimba WD
- Oro Loma WD
- Pacheco WD

- Panoche WD
- Patterson WD
- Romero WD
- Salado WD
- San Luis Canal Company
- San Luis WD
- Santa Nella C.WD
- Sunflower WD
- Tranquility ID
- West Stanislaus ID
- Widren WD
- Quinto WD

At the time of this assessment participants did not fully recognize the potential number of stakeholders and/or the requirements to conduct outreach.

- *Subbasin Governance Structures* – Many individuals and entities within the subbasin have experience working in cooperative governance and related structures. For example, the SLDMWA provides leadership for an Integrated Resource Water Management Plan (IRWMP) illustrated in **Figure 6**[9] on the following page. Many of the stakeholders are also involved with Irrigated Lands Coalitions (see **Figure 7**).[10]

  Likewise, many are also involved in efforts related to the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) initiative (see **Figure 8**).

[9] Source : San Luis & Delta-Mendota Water Authority, Westside-San Joaquin Integrated Water Resources Plan, July 2014

[10] Source: Central Valley Regional Water Resources Control Board

Existing Cooperative / Collaborative Governance Structures with Delta Mendota Subbasin Stakeholders

Figure 6. Integrated Regional Water Management Groups

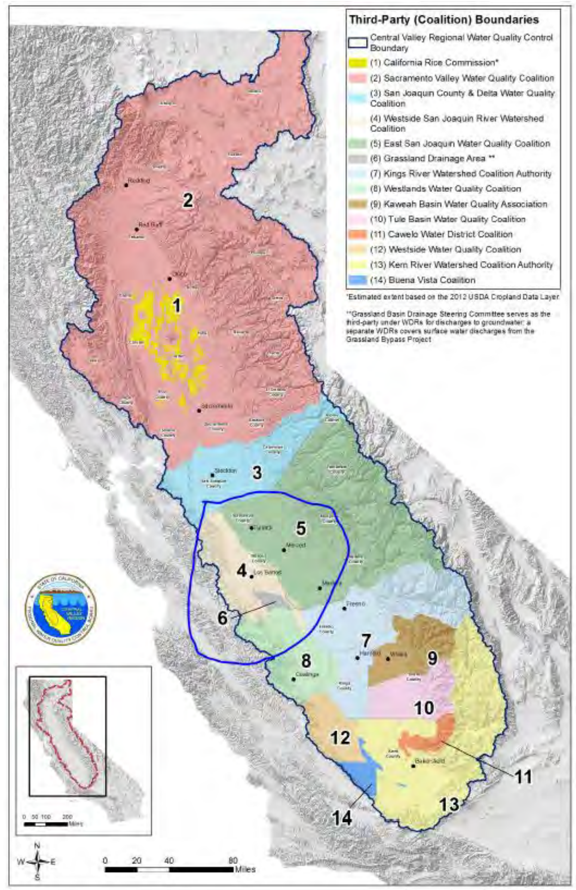


Figure 7. Irrigated Lands Coalitions

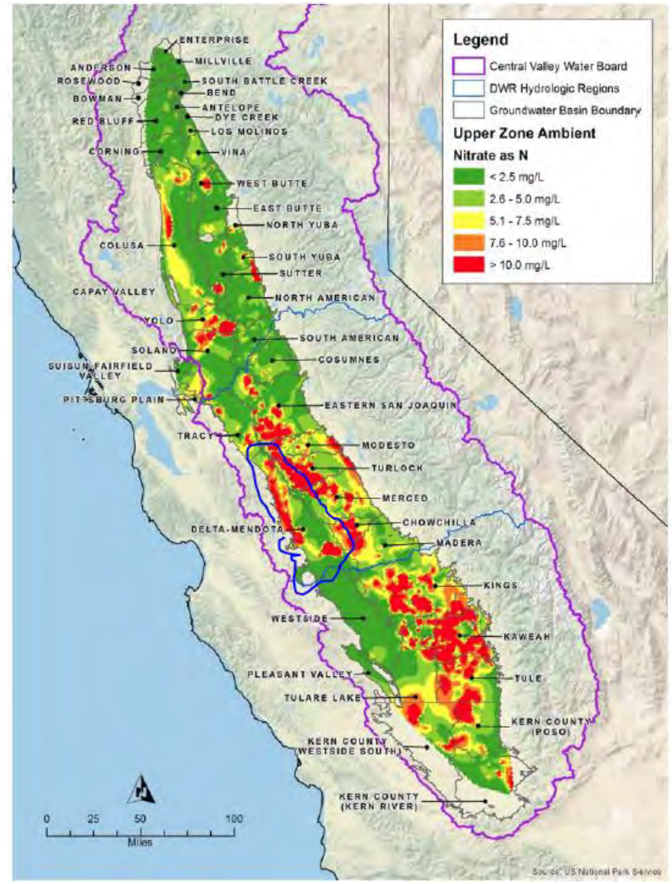


Figure 8. CV-Salts Initiative

CV-Salts was launched to develop sustainable salinity and nitrate management planning for the Central Valley. (See **Figure 8**.[11])

Finally, there are multiple arrangements in place related to surface water transfers and other previous groundwater management planning efforts.

Experience with these programs has created a capacity for collaborative planning that will be essential for GSP development. It also creates opportunities to access and leverage existing stakeholder meetings and events rather than needing to convene multiple new stakeholder processes.

3.5.3. Issues to be Addressed in Creating a Sustainability Plan

Some of the participants indicated they had an extremely good understanding of their section of the subbasin, with exact and extensive records to support their perspective. They found that making projections using historical data had been more reliable than some of the groundwater models that were in use.

In thinking about development of a GSP they felt there could be some difficulty in developing water balances due to lack of quality data for some locations. Another mild concern was the potential for disagreements about the selection of a groundwater model(s) or reconciling differences among methods.

Still another concern was the capacity of the GSAs and/or GSA members to fully participate. Some of these agencies are very lightly staffed and have varying levels of knowledge related to groundwater management. All of the participants had significant other duties prior to the passage of SGMA.

One concern, expressed after completion of the assessment, was the potential for some agencies to simply opt out of participating in the development of a GSP but still receive the benefits of the region having an approved plan without having contributed to the larger good of the subbasin.

3.5.4. Representation

The State Board lists the following as Required Interested Parties for the purpose of SGMA outreach:

- All Groundwater Users
- Holders of Overlying Rights (agriculture and domestic)
- Municipal Well Operators and Public Water Systems
- Tribes
- Counties
- Planning Departments /Land Use
- Local Landowners
- Disadvantaged communities
- Business

[11] Ibid

- Federal Government
- Environmental Uses
- Surface Water Users (if connection between surface and ground water)

All of these stakeholder categories were contacted in the interview process excepting tribes. In the case of tribes, there are no classified tribal lands in the Delta-Mendota subbasin, therefore no planning, outreach or communication needs are currently anticipated for tribes.

Due to subbasin characteristics, a primary focus of the assessment was on agricultural, disadvantaged communities (DACs) and municipal groundwater users.

- *Related to Agricultural Representation* - most respondents believed that the elected leadership of the GSA agencies would do a good job in representing agriculture and noted that many of them were growers themselves. It was also noted that farmers were busy and would be far more interested in any specifics of a GSP that would impact operations or the degree of certainty about water availability than the particulars of GSA governance.

- *Regarding DACs* - Much of the subbasin and its counties (San Joaquin, Stanislaus, Merced, and Fresno) have communities that meet the DAC definition and the region is generally considered disadvantaged. The ability of DACs to participate in GSP development was considered limited and it was thought that there would be a need for specific and direct outreach to DACs through elected leadership and via use of trusted community advocates. As part of the SA, several of those interviewed identified themselves as being able to represent a DAC perspective and one in particular was particularly concerned about the availability of Spanish language materials. As a result, Spanish language materials were included in the meeting materials of the public GSA adoption meetings and the SLDMWA provided a fluent Spanish speaker to assist with meetings.

In the past, to promote DAC identification and involvement, the Westside-San Joaquin IRWM previously conducted an extensive survey of private and public community representatives to educate and encourage understanding of the IRWM process, to help understand the issues confronted by DACs, and to better address the needs of minority and/or low-income communities. This effort resulted in identification of DACs in the Region and an initial list of 22 projects that would benefit DACs and low-income communities. Given known constraints on this community it is recommended that more focused DAC outreach should be coordinated with the IRWM. This effort is now in progress.

- *Regarding Municipals* - The SA outreach also included interviewing Municipal Stakeholders. A significant number of the Cities are fully dependent on wells for water supply and issues related groundwater management are of grave concern. These representatives all felt that even while it would be difficult to make time to participate in GSAs and GSP development, that they must make the time. Many had also determined that they wished to form their own GSA to reflect their specific interests in any kind of broader GSP negotiation.

- *Regarding Environmental Interests* - There appeared to be a less defined stakeholder segment representing traditional, environmentally focused issues. Outreach was made to subbasin government agencies that often serve as a surrogate for these interests and an informal consultation occurred with a representative of the Planning and Conservation League to identify any known, active stakeholders. However, no specific entity or individual was identified by those contacted. A general perception was that this community would desire engagement and would designate representatives if the GSP development was thought to potentially impact existing restoration or other environmental concerns but the formation of GSAs per-se, was of less interest. The next phase of communications should include outreach to organizations such as Audubon, the Nature Conservancy and Ducks Unlimited just to ensure due diligence. These connections will be important going forward, particularly if environmental issues are identified.

- *Regarding Industrial Users* – The region includes some industrial water users. This sector has a relatively lower percent of water use compared to other subbasins users; however, representatives of the sector pointed out how essential access to water was to their industry. The interviewees also emphasized how important these industries were to the local economies. There was a stated concern about representation since there didn't appear to be a direct way to engage, particularly with multiple GSAs being formed.

- *Regarding Counties & Planning Agencies* – All of the subbasin counties have designated representatives and all are assisting with GSA coverage for areas not otherwise covered by a GSA. All of the city and county representatives had direct engagement with the planning arms of their jurisdictions, or were staff to the planning departments. These representatives, like the municipal representatives, viewed this as critical issue even as it creates new workload for the already busy entities.

3.5.5. Communications and Facilitation Preferences

Participants were asked to describe their communications preferences. Several offered specific suggestions on written materials. Most did not believe there would be a need for a high frequency of communications directly with non-GSA stakeholders.

Several suggested using regularly scheduled activities of existing groups and gatherings to share information rather than creating stand-alone events. They listed annual meetings of the water agencies as one good venue as well as meetings related to the IRWM and Irrigated Lands. Several also thought that it would be good to go to places like Farmers Markets, particularly for the disadvantaged communities, and County Fairs.

Farm Bureau representatives also indicated a willingness to support outreach efforts. The Merced Farm Bureau, in particular, has already helped to advertise public meetings related to GSA formations.

Related to facilitation there was not a broad exposure to professional facilitators among many of the stakeholders. Even so, participants consistently listed qualities such as fairness and transparency, a good understanding of the issues, and confidence as helpful facilitator strengths. There was a sense that the GSAs would not need hand holding but that facilitation could be useful for helping the stakeholders forge decisions and making what many believed would need to be compromises.

3.5.6. Success Factors, Barriers to Success

The participants were asked to describe their view on the odds for success as well as any barriers that would prevent successful completion of a GSP.

Overall, most participants expressed a medium to high likelihood for success. They noted that the carrot (grants and technical support) and stick (significant regulatory intervention) by the State creates a dynamic that is supportive to success.

Participants stated barriers related to the capacity of the GSAs to participate and ultimately agree to, and implement changes. The much diffused governance structure of multiple GSAs amplifies this dilemma as do actions beyond the control of the subbasin entities (such as climate and water deliveries).

In addition to perceived barriers, participants outlined their thoughts on opportunities and success strategies.

- *Drought* – While the drought was unwelcome it increased awareness of the need for changes. Many felt it would be easier to move forward while the topic is prominent in everyone's minds.
- *Short and Long Game* – Several suggested it will be important to have a plan that includes long and short term strategies and activities.
- *Integrated Planning* – Many of the participants emphasized the importance of integrated planning.

3.5.7. Other Comments and Advice

Many participants expressed appreciation for being contacted and invited the facilitator to contact them again if there were questions.

3.6. ***Promising messages and methods***

Three primary communications strategies have already been identified for the GSP(s) development:

- Leveraging the activities of existing groups
- Providing targeted, communications and outreach to opinion leaders in key stakeholder segments
- Providing user friendly information and intermittent opportunities for a broader range of stakeholders

The same strategies aligned with the recommendations of the SA participants. These methods will allow stakeholders to engage commensurate with their degree of interest while providing sufficient information to ensure long-term success for plan development and implementation.

AUDIENCES AND MESSAGES

GSA formation and GSP(s) development, like most large planning efforts, consists of a broad range of stakeholders with differing interests and influence.

4.1. Two Core Audience Segments

This Coms Plan Anticipates two core audience segments. First is the subbasin GSA Boards and the communications among and between themselves. This audience segment is significant in size given that 23 GSAs will be working to develop a GSP(s) and each GSA has its own Board and audiences.

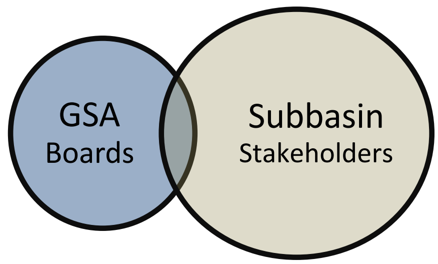


Figure 9. Two Core Audience Segments

The second audience is the subbasin stakeholders as identified in SGMA. This audience is also large. Many of the stakeholders are shared by the GSA Boards and some of the larger stakeholder segments are also represented on the GSA Boards (see **Figure 9**).

Nearly all of the communications strategies apply to both segments; however, some strategies apply to one or the other specifically and are so identified.

4.2. Communications and Change Management

The process of adopting and implementing a GSP will require significant change management. Communications planning should encompass basic change management approaches. Messages should also evolve over time and be tied to the planning process and key decision points. Then, for each audience and each major planning step, communications must do the following:

1. Describe what the actual proposed plan (change) is
2. Articulate how the change will directly impact the category of stakeholder involved
3. Outline the methods that will be used to implement the plan (change)
4. Define the costs and benefits of changing and not changing, and what future conditions will be if change does not occur
5. Consider unintended consequences and others that may also be impacted by the same change then develop a strategy to engage them
6. Offer opportunities for input and for stakeholders and others to improve the approach

The communications requirements for large changes are often underestimated. Some experts indicate that messages may need to be delivered up to 8 different times to be fully absorbed. Communications needs will also evolve as the GSP planning progresses. **Table 4** provides a sample of early communications that focus on SGMA and groundwater basics.

Table 4. Sample – Early Phase Message Elements for Subbasin Stakeholders

Element	What the Change Is	How it will affect the Stakeholder	How the change will be Implemented	Why it is a good idea
Early Phase GSP Development	• Locally governed GSAs will work together to sustainably manage ground water. • The Subbasin /Basin is required to ensure Sustainable Groundwater Management by submitting a sustainability plan by 2020. • The plan must be implemented and found to result in sustainable management by 2040.	(Unique to audience type) • Changes in the current methods of acquiring and utilizing groundwater may occur. • May affect future decisions related to crop types and decisions related to conjunctively using surface water. • May provide additional project resources to the DAC communities.	A collaborative approach is being undertaken to prepare the plan with multiple GSAs coordinating with the SLDMWA as the planning organizer.	• Sustainable and wise use of groundwater allows for the success of future generations and creates greater certainty for today's beneficial users. • Failure to act may result in negative regulatory consequences.

As part of the GSP planning process, the next phase of communications will also need to communicate the requirements for sustainability and how they are achieved in the context of the Delta-Mendota subbasin. Then, communications related to GSP specifics and adoption will require additional outreach, targeted to specific audiences.

4.3. Tied to Decision Making

Communications should also be tightly linked to decision making. For each anticipated decision, stakeholders for that decision should be identified and the following addressed.

1. Who (Is the stakeholder)
    a. An impacted party?
    b. A potential planning partner?
    c. A potential provider of services or resources?
    d. A regulator of the activity?
    (Note: Maybe more than one category.)

2. What (What is the interest of the stakeholder? How will the stakeholder be affected? What are the stakeholders' needs?)
3. Who (Who is the right messenger for the information)
4. How (How should the information be delivered? What are the best methods?)
5. When (What is the appropriate timing for the messages?)
6. Engagement and Knowledge Transfer (How do we create two-way communications?))

Table 5 illustrates some of these ideas.

Table 5. Communications Planning Questions

Who	Interest	Messenger	Delivery	Timing	Knowledge Transfer
• Impacted • Partner • Provider • Regulator	• How will decision affect? • What will stakeholder need?	• Who is a trusted information Source? • How do we ID and Partner	• What are the best delivery methods?	• When should we conduct outreach?	• What do the stakeholders know that we need to know?

4.4. GSA Boards

Due to the multiple subbasin GSAs, specific focus is needed on communications to keep them informed, provide consistent updates and information that the Boards can use in their own outreach, and support their decision making. Primary objectives for communications with the subbasin GSA Boards are to ensure:

- Consistent understanding of the requirements for a GSP and/or GSP coordination
- On-going access to current information
- Timely notice of any significant developments or decision points that may require changes to policies and/or require some other board action
- Confidence that the GSP(s) will be accepted by the GSA's stakeholders

Key communications activities involving the Board include;

1. Providing short and digestible pieces of information to ensure each Board member can quickly articulate to his/her constituents on key matters and remain sufficiently informed so that no decision points are surprises.
2. Provide user-friendly informational materials to be used with public audiences, and will support the Board with their own constituent outreach.
3. Utilize regular Board communications for routine updates and reserve specific Board agenda items for highly significant discussion items.

4.5. Primary Audiences

There are several core stakeholder groups that will require ongoing communications and tailored messaging throughout the planning process. They are:

- Agriculture
- Disadvantaged Communities
- Municipals

Other stakeholders requiring special consideration include:

- Industrial Users/ Business
- Regulators (State and Federal)
- Potential Partners
- Environmental Organizations
- Federal Agencies

While all of the stakeholder types are important to engage for development of a GSP, the first three will be most affected by any changes that might be proposed as a result of the *GSP(s)*.

The following provides an outline of key messages and activities in support of each of the audience types.

4.2.1. Agricultural

Messages about the GSP(s) development should feature the overall desirability of a sustainable management approach how the plan will contribute to management certainty and protect against regulatory oversight.

In thinking about irrigation users it is also important to remember that one size does not fit all.

4.2.2. Disadvantaged Communities

Messages developed for this sector should be tailored and specific to the community. This type of outreach is often best served by use of surrogates and trusted messengers. As identified in the SA, these messages should be aligned with activities of the IRWM, especially given the high, current dependence of many on unsustainable water sources. Messages about ways to access the increased availability of resources due to grant incentives should also be considered.

A specific outreach method to consider relates to the predominance of cells phones within the communities. According to the Pew Research Center, "over 50 percent of low-income households own a smartphone. Smartphone penetration in this demographic creates substantial opportunities for utilities to reach disadvantaged communities with software solutions like customer self-service platforms and targeted digital communications."[12]

4.2.3. Municipals

[12] Secondary Source: Water Smart. https://www.watersmart.com/rethinking-disadvantaged-community-engagement/ (accessed June 1, 2017)

Some care will be needed to address tensions related to the relative percentages of use by Municipal agencies and what constitutes highest and best beneficial uses within an agricultural region. A promising interaction with this community would involve collaboration on messaging to achieve mutually beneficial goals.

Some thought it might be possible for the municipal agencies to provide in-kind support to the GSP development process through support for project websites and mailing lists, production of meeting notices, assistance to the planning process from in-house public information professionals and offering access to physical meeting spaces.

Municipals may need assistance in making the case for the need to think at a Basin scale rather than more local terms.

4.2.4. Business and Industry Interests

Business and industry interests seek assurances about the availability of water for operations and the viability of the farming industry in the region. Messages for these audiences should focus on how the GSP(s) development will contribute to sustainability and how these audiences can participate in discussion specific to their interests.

4.2.5. Regional/Statewide Interests and Regulators

Some degree of uncertainty remains in the overall legal, legislative and regulatory environment as it relates to SGMA implementation.

It is in the interest of the subbasin stakeholders to engage state and federal agencies and regulators throughout the process. These parties may have resources to assist the subbasin and a cooperative attitude will build good will in the event that adjustments are needed to achieve SGMA compliance.

4.2.6. Potential Agency Partners

A variety of collaborations to achieve GSP(s) development goals may be possible. The GSAs should consider the potential for collaboration with non-GSA members and inter-basin (adjacent subbasin) partners, as part of plan deliberations.

4.2.7. GSP Coordinators Planning Forum

A planning forum for subbasin GSP coordinators should be established to further inform a coordination strategy. This forum would include agency representatives as well as the consultant teams and be used for the sole purpose of coordination and mutual support. It is anticipated that this body might meet on a quarterly or as needed basis. This forum would also provide a central point of contact for adjacent subbasin coordinators.

4.2.8. Environmental Community

As noted in the SA, this community will be interested in a GSP features. The focus of messaging for this group being on how the GSP(s) development will contribute to a sustainable regional water portfolio. Special effort should be made to identify specific topics of interest. For example, as part of GSP development, a list of groundwater dependent species may be created, or impacts to wetlands may be identified. These types of lists would highlight where input from the environmental community might be needed.

4.2.9. Federal Government

Federal representatives interviewed for the assessment asked to be kept informed of subbasin SGMA activities. These agencies have a direct interest in surface water integration as well as SGMA activities that could impact wetlands restoration efforts or groundwater dependent ecosystems and species.

RISK MANAGEMENT

Risk management is the identification, assessment, and prioritization of risks (defined as *the effect of uncertainty on achieving objectives*) followed by coordinated, efficient and economical strategies and actions to minimize, monitor, and control the probability and/or impact of negative events. Strategies and actions may also be used to avert risk by leveraging strengths and opportunities.

Risks can come from uncertainty in economic factors, threats from project failures (at any phase), regulatory and legal uncertainties, natural causes and disasters (drought, flood, etc.), as well as dissention from adversaries, or events of uncertain or unpredictable circumstances. Several risk management standards have been developed. This analysis utilizes those from the Project Management Institute.

Table 6 outlines standardized risk categories and translates them to outreach risks.

Table 6. Risk Factors

RISK CATEGORY	Outreach RISK FACTORS
Technical, quality, or performance	• Realistic performance goals, scope and objectives
Project management	• Quality of outreach design • Outreach deployment and change management • Appropriate allocation of time and resources • Adequate support for Outreach in project management plans
Organizational / Internal	• Executive Sponsorship • Proper prioritization of efforts • Conflicts with other functions • Distribution of workload between organizational and consultant teams
Historical	• Past experiences with similar projects • Organizational relations with stakeholders • Policy and data adequacy • Media and stakeholder fatigue*
External	• Legal and regulatory environment • Changing priorities • Risks related to political dynamics

5.1. Technical, quality, or performance

The subbasin is fortunate to have a high level of water knowledge and skilled personnel available to assist with GSP planning. In general, stakeholder expectations for outreach and performance goals, scope and objectives are attainable. The larger concern in this category is properly communicating the scope of the GSP(s) development and the need for extensive coordination and outreach among a number of parties. Communication of SGMA requirements for outreach as a planning requirement should be an ongoing consideration and appears to be underestimated in emphasis.

5.2. Project management

A number of positive project management factors are present for the GSP(s) development outreach. Project managers view outreach as an important planning element. The outreach design is based on best management practices and industry standards. It is not overly complicated and with technical services support from DWR and other sources, sufficient resources should be available to properly execute it. Procedures and practices are already in place that can be leveraged to achieve communication goals.

The primary concern in this category relates to GSP coordination. This type of outreach will require additional assessment as the individual GSAs will determine their own protocols for representation.

5.3. Organizational / Internal

Conflicts with other GSA member functions and/or conflicts with outreach activities by efforts that include the same stakeholders (e.g. Irrigated Lands, IRWM, and CV-Salts) should be monitored.

One additional consideration will be the distribution of workload between GSA, organizational and consultant teams. Clear roles and responsibilities must be defined and continuous interaction in place to ensure successful execution.

The GSP(s) development process will also need identified, high level spokespersons or champions. These individuals should be able to discuss subbasin planning with the media, in discussions with regulators and potentially at professional conferences.

5.4. External

The legal and regulatory environment of the GSP(s) development process is complex and evolving. Ongoing issues with surface water deliveries and changing agricultural market conditions are outside of the control of the parties. It will be important for mechanisms to be in place that allow for relatively rapid responses to changing conditions.

5.5. Historical

The primary stakeholders in this process generally view interactions and meetings as productive. There is a history of cooperation and a willingness to work together to save costs and achieve better outcomes.

TACTICAL APPROACHES

Following are specific tactical approaches that may be utilized to deliver the activities, messages, and recommendations of the previous chapters. These approaches are based on best communication practices and grounded in the public participation philosophy of the International Association for Public Participation, Public Participation Spectrum as illustrated in **Table 7**.

The Spectrum represents a philosophy that outreach should match the desired level of input from both the stakeholder and the organizational entity.

Table 7. IAP2 Public Participation Spectrum

IAP2 Public Participation Spectrum

Developed by the International Association for Public Participation

INCREASING LEVEL OF PUBLIC IMPACT

	INFORM	CONSULT	INVOLVE	COLLABORATE	EMPOWER
Public Participation Goal:	To provide the public with balanced and objective information to assist them in understanding the problems, alternatives and/or solutions.	To obtain public feedback on analysis, alternatives and/or decisions.	To work directly with the public throughout the process to ensure that public issues and concerns are consistently understood and considered.	To partner with the public in each aspect of the decision including the development of alternatives and the identification of the preferred solution.	To place final decision-making in the hands of the public.
Promise to the Public:	We will keep You informed.	We will keep you informed, listen to and acknowledge concerns and provide feedback on how public input influenced the decision.	We will work with you to ensure that your concerns and issues are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.	We will look to you for direct advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.	We will implement what you decide.
Example Tools:	• Fact sheets • Web Sites • Open houses	• Public comment • Focus groups • Surveys • Public meetings	• Workshops • Deliberate polling	• Citizen Advisory Committees • Consensus-building • Participatory decision-making	• Citizen juries • Ballots • Delegated decisions

Based on the assessment findings for the GSP(s) development, most stakeholders would simply like to be <u>INFORMED</u> unless there is a potential for significant changes that may include that stakeholder. Tactics for this group will include fact sheets, websites, open houses, briefings, and informational items placed in publications they already read.

The next largest group of stakeholders, primarily groundwater pumpers and disadvantaged communities, wish to be <u>CONSULTED</u>. This group will have access to all the materials prepared as part of the informational phase. In addition they should be invited to provide comments on written materials and planning concepts and participate in focused workshops and/or briefings. They should also be invited to attend larger public meetings.

The development of some GSP features may require a higher degree of INVOLVEMENT. This would focus on engagement of a subset of stakeholders that may experience significant impacts associated with SGMA.

COLLABORATION opportunities have also been identified; however, they are of a different character than defined in the Spectrum. Collaboration in this GSP(s) development process will focus on working with partners that have mutual goals to achieve those goals together. This will more resemble a partnership than a public engagement activity.

6.1. Communications Coordination.

Each GSA is required to perform legally mandated outreach activities and the GSP submission guidelines require a minimum level of engagement.

The subbasin GSAs should coordinate outreach activities even if there is a decision to move forward with multiple GSPs. In addition to efficiency and cost savings (the GSAs can share resources) this strategy will allow for consistency in messaging and reduce confusion for stakeholders that may not know what GSA jurisdiction they are in, and/or are in multiple GSA jurisdictions. Following are suggested options for communications coordination.

1. Website
2. Meeting calendar
3. Branded informational Flyers, Templates, PowerPoint Presentations, etc.
4. Periodic newsletter
5. GSP related mailing lists
6. Descriptions of interested parties
7. Issues and interest statements for legally mandatory interested parties
8. Public workshops
9. Message calendar
10. Press releases and guest editorials
11. Speakers Bureau
12. Existing group venues
13. Outreach documentation

6.2. Tactics

6.2.1. Website

As part of the communications plan development, a list of website concepts and draft website content was prepared. The following describes the proposed approach:

a. Centralized – Establish a centralized website for the entire subbasin.
b. Individual GSAs – Posting of material to a website is part of the SGMA requirements. Those GSAs with their own webpages can link to and from the centralized site if they wish to provide their own customized information. For those GSAs without their own website, courtesy pages would be provided as an added feature of the main site. The courtesy pages would all use a single template with the same information to facilitate easy management and updates. Individual GSAs choosing to take advantage of the courtesy pages would be responsible for ensuring that information is current. The page should include a "Last Updated" box to indicate the timeliness of the information.
c. **Basic features** – A basic website framework has already been developed along with introductory information that has prepopulated each page. **Figure 10** illustrates the basic content of the site and includes:
    1. Background information
    2. Information about getting involved, including meeting information
    3. A separate link for Spanish Language materials
    4. Frequently asked questions
    5. Links to GSAs
    6. Contact information

Should a GSA decide to not participate in the Central website, a similar structure could be utilized.

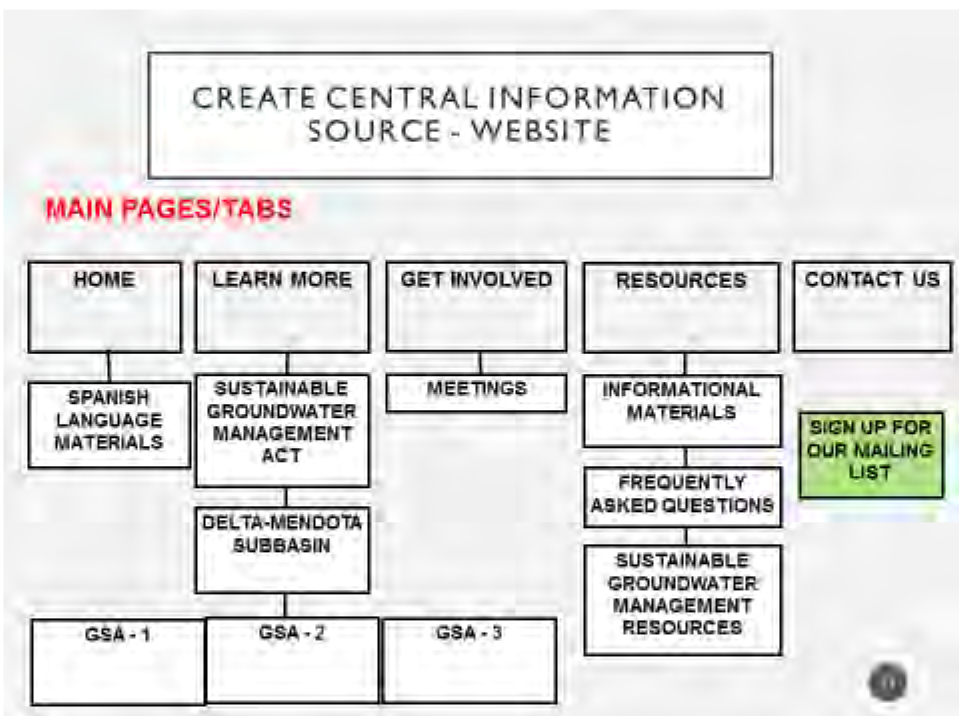


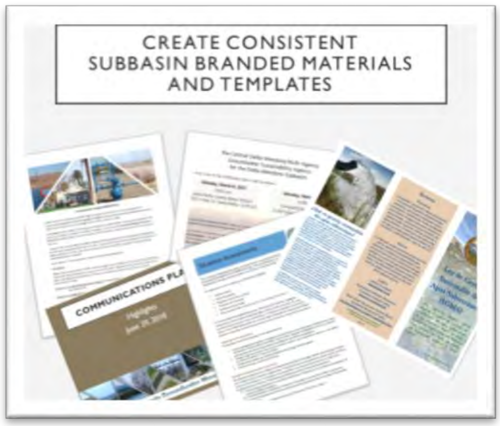
Figure 10. Website Structure

6.2.2. Meeting Calendar

A shared meeting calendar will provide a one-stop shop for stakeholders and assist in preventing meeting conflicts while creating more potential for shared activities. This calendar should include current and scheduled meetings and workshops as well as serve as the repository for agendas and meeting notes, along with copies of meeting materials and presentation.

An integrated project calendar should also be developed that links planning project milestones with communications milestones.

6.2.3. Branded Informational Flyers, Templates, PowerPoint Presentations, etc.



Subbasin level materials should have a single look and feel to create on-going consistency and visual recognition by stakeholders. Use of templates, shared presentations and flyers will create efficiencies and reinforce messaging. This communications plan incorporates some of this type of branding.

6.2.4. Periodic Newsletter

The need for regular communications cannot be overstated. One option is production of a periodic newsletter. Given the relatively short GSP(s) development process timeframe and the GSP development requirements for periodic outreach to identified stakeholders, a quarterly schedule would be realistic and achieve compliance with SGMA requirements for periodic updates to stakeholders. The newsletter should be designed so that individual GSAs can add tailored information if they choose to. For Portable Document Format (PDF) versions of the newsletter, a GSA could add a simple one or two page insert and the edition could be used as a handout or mailer. For a professional looking, email version of the newsletter, we recommend free or low cost services such as Mail Chimp or Constant Comment, which can be integrated with mailing lists.

Adding GSA specific information to an email newsletter can be done with web-links in the email to the very same PDF page prepared for the hardcopy mailer. An alternative is emailing the entire newsletter PDF as an attachment (although this format is less likely to be read than the mailer services).

6.2.5. GSP related mailing lists

Each GSA is required to develop notification lists. A central list may be utilized for GSP(s) related notifications.

6.2.6. Descriptions of Interested Parties

Each GSA is required to develop descriptions of interested parties. These lists should be updated and merged for use in the GSP(s) submittal(s). These can also be provided as background information on the website as part of constructing an administrative record. The SA in Chapter 4 provides an initial start for this documentation.

6.2.7. Issues and Interest Statements for Legally Mandatory Interested Parties

A GSP submission must include a statement of interests for listed stakeholders. As suggested earlier, this can also be included on the website.

6.2.8. Coordinated Public Workshops

SGMA requires a series of public hearings and some public workshops. Such workshops should be coordinated with other subbasin entities.

During the GSA formation process the County of Merced and a forming GSA body conducted a joint workshop to explain more about SGMA and the proposed GSA formation. Distribution of meeting flyers and notices was done concurrently, and DWR attended the event to answer questions. The GSP development process will offer similar opportunities, not only within the subbasin, but with adjacent subbasins.

6.2.9. Message Calendar

Basic messages should be associated with the planning schedule and each stage of GSP(s) development and serve as the theme for the communications materials being generated. For example, during the GSA formation period there was a need to communicate the basics of SGMA and groundwater management. During the GSP(s) initiation phase messages should focus on the basics of groundwater sustainability and the current state of the subbasin. As the GSP(s) begins to take form the specifics of the GSP(s) and what it means for each stakeholder would be the focus.

6.2.10. Press Releases and Guest Editorials

At some point in the GSP development and implementation process, it is likely that stakeholders will be asked to make changes and/or financially support a sustainability effort. It will be more productive for the GSAs and their GSP collaboration partners to frame discussions about these changes than to have others, perhaps with less knowledge, do so on their behalf. For that reason there is a need for press releases and/or guest editorials to offer the media and stakeholders accurate information offered in the context of SGMA. This type of outreach should be closely coordinated as consistency in messages is critical to stakeholder acceptance.

6.2.11. Speakers Bureau

Efforts should be made to conduct outreach at events and meetings that already occur (e.g. Farm Bureau meetings, Rotary Club, etc.). A list of knowledgeable presenters should be developed in the event an organization or other entity would like a presentation. Speakers Bureau engagements should be recorded on the planning project meeting calendar.

6.2.12. Existing Group Venues

Fully leverage the activities of existing groups.

- Maintain a roster of existing groups and typical meeting schedules with a nexus to GSP(s) development. Add the dates to the messaging calendar.
- The list of audiences, messages and existing groups should be referenced when there is a need to deploy information.
- Conduct informal outreach with the leaders of such groups to determine the best way to interact.
- Determine what communications channels these groups are using and equally leverage these, for example by placement of articles in newsletters.

6.2.13. Outreach Documentation

A central point of contact should be identified on the website and an outreach statistics inventory should be established that identifies dates, times, audiences and attendance. This information will be also be useful in conducting follow up with stakeholders as well as documenting outreach as part of GSP submittal guidelines.

6.3. Procedural and Legally Mandated Outreach

A discussion of SGMA outreach requirements was provided in Chapter 1 and a full list of requirements is contained in Appendix 1. One major feature of the requirements is a submission to DWR of the opportunities that interested parties will be given to participate in the GSP deliberations. The Situation Assessment provides an initial description that can be added to with additional outreach.

Following are the Required Interested Parties for the purpose of mandated outreach:

Table 9 provides a list of the mandated outreach and the timeframe in which is required.

Table 8. Mandated Outreach

Timeframe	Item
Prior to initiating plan development	1. Statement of how interested parties may contact the Agency and participate in development and implementation of the plan submitted to DWR.

Timeframe	Item
	2. Web posting of same information.
Prior to plan development	1. Must establish and maintain an interested persons list. 2. Must prepare a written statement describing the manner in which interested parties may participate in GSP development and implementation. Statement must be provided to: a. Legislative body of any city and/or county within the geographic area of the plan b. Public Utilities Commission if the geographic area includes a regulated public water system regulated by that Commission c. DWR d. Interested parties (see Section 10927) e. The public
Prior to and with GSP submission	1. Statements of issues and interests of beneficial users of basin groundwater, including types of parties representing the interests and consultation process 2. Lists of public meetings 3. Inventory of comments and summary of responses 4. Communication section in plan that includes: • Agency decision making process • ID of public engagement opportunities and response process • Description of process for inclusion • Method for public information related to progress in implementing the plan (status, projects, actions)
90 days prior to GSP Adoption Hearing	1. Prior to Public Hearing for adoption or amendment of the GSP, the GSP entities must notify cities and/or counties of geographic area 90 days in advance.
90 days or less prior to GSP Adoption Hearing	2. Prior to Public Hearing for adoption or amendment of the GSP, the GSP entities must: a. Consider and review comments b. Conduct consultation within 30 days of receipt with cities or counties so requesting
GSP Adoption or Amendment	1. GSP must be adopted or amended at Public Hearing.
60 days after plan submission	1. 60-day comment period for plans under submission to DWR. Comments will be used to evaluate the submission.
Prior to adoption of fees	1. Public meeting required prior to adoption of, or increase to fees. Oral or written presentations may be made as part of the meeting. 2. Public notice shall include: a. Time and place of meeting b. General explanation of matter to be considered

Timeframe	Item
	c. Statement of availability for data required to initiate or amend such fees d. Public posting on Agency Website and provision by mail to interested parties of supporting data (at least 20 days in advance) 3. Mailing lists for interested parties are valid for 1 year from date of request and may be renewed by written request of the parties on or before April 1 of each year. 4. Includes procedural requirements per Government Code, Section 6066.
Prior to conducting a fee adoption hearing.	1. Must publish notices in a newspaper of general circulation as prescribed. 2. Publication shall be once a week for two successive weeks. Two publications in a newspaper published once a week or oftener, with at least five days intervening between the respective publication dates not counting such publication dates, are sufficient. 3. The period of notice begins the first day of publication and terminates at the end of the fourteenth day, (which includes the first day.)

6.4. Items for Future Consideration

This GSP(s) Coms Plan outlines an outreach effort based on project and stakeholder needs and preferences. This document has been prepared as a working draft living document and should be updated as new information and the GSP(s) development process needs are developed.

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MEASUREMENTS & EVALUATION

A guiding principle for evaluation and measurement of the Coms Plan's success is to provide regular, unbiased reporting of progress toward achieving goals. Success may be evaluated in several ways, including process measures, outcome measures, and an annual evaluation of accomplishments. Optional evaluation measures are described below.

As part of each outreach effort debrief the following process and outcome measures will be discussed and recorded in a check sheet. The check sheets will be prepared with the goal of continuous improvement rather than criticisms.

7.2. Process Measures

Process measures track progress toward meeting the goals of the Coms Plan. These include:

- Level of attendance at outreach meetings
- Shared understanding of the overarching aims, activities, and opportunities presented by different planning approaches and project activities
- Productive dialogue among participants at meetings and events
- Sense of authentic engagement; people understand why they have been asked to participate, and feel that they can contribute meaningfully
- Timely and accurate public reporting of planning milestones
- Feedback from Coordinating Body and GSA members, regulators, stakeholders, and interested parties about the quality and availability of information materials
- Level of stakeholder interest in the GSP(s) development process information

7.3. Outcome Measures

Outcome measures track the level of success of the Coms Plan in meeting its overall goals. Some outcome measures considered for the GSP(s) development process include the following:

- Consistent participation by key stakeholders and interested parties in essential activities. Participants should have no difficulty locating the meetings, and should be informed as to when and where they will be held.
- Response from meeting participants that the engagement methods provided for a fair and balanced exchange of information.
- Feedback from interested parties that they understand how their input is used, where to track data, and what results to expect.
- The project receives quality media coverage that is accurate, complete and fair.

7.4. Mid-cycle Evaluation of Accomplishments

A mid-cycle evaluation provides an opportunity to examine the current effectiveness of the Coms Plan and provides a chance to reevaluate strategies to meet the GSP(s) development process objectives. The evaluation tasks may include:

- Preparation of an executive-level summary detailing high-level initiatives and accomplishments of the previous cycle. This evaluation should also include positive news, best practices, goals and objectives, notable changes, timelines, and priorities.
- Identifying gaps and areas for improvement.
- Highlighting how gaps and areas for improvement in the cycle has been addressed.
- Outlining process and outcome measures and their current results.

ROLES AND RESPONSIBILITIES

The GSP(s) development Coms Plan outlines numerous strategies, activities and tactics. While none are highly complex, there is a requirement for coordination and clarity regarding who will be responsible for executing the tasks.

After the planning team evaluates the timelines and priorities for each of the communications activities a recommended next step is completion of a Responsible, Accountable, Consulted, and Informed (RACI) Chart. This Chart, as displayed in **Table 10**, outlines key tasks and the assignment of roles and responsibilities for accomplishing them.

Table 9. Sample RACI Chart

Activity TYPE	SPECIFIC PRODUCT	RESPONSIBLE	ACCOUNTABLE	CONSULTED	INFORMED
Internal Staff Communications, information materials for/briefings	Draft	Person A	Person E	Person I	
	Final Draft	Person A	Person E	Person I	Project Team
List Serves, mailing lists	Customer Contacts	Person B - Person A	Person E	Person I	Project Team
	Concurrent jurisdictions	Lisa Beutler/MWH	Person G	Person I	Project Team
	Other - identified stakeholders	Person A	Person G	Person I	Project Team
Web Content and Maintenance	Draft Content and Content Refresh	Lisa Beutler/MWH/	Person G	Person H	Project Team
	Site Administration	Person A	Person G	Person H	
General public Intro Packets, Fact Sheets and Brochures	Draft	Person D	Person E	Person I- Subject Matter Experts	Person J
	Revised Draft	Person D	Person E	Person I- Subject Matter Experts	Person J
	Final Draft	Person D	Person E	Person I- Subject Matter Experts	Project Team
Newsletter Content	Draft	Lisa Beutler/MWH	Person E	Person I- Subject Matter Experts	Person J
	Revised Draft	Person D	Person E	Person I- Subject Matter Experts	Person J
	Final Draft	Person D	Person E	Person I- Subject Matter Experts	Project Team

Responsible
Those who do the work to achieve the task. There is at least one person with a role of *responsible*, although others can be delegated to assist in the work required.

Accountable (also approver or final approving authority)
This is the person ultimately answerable for the correct and thorough completion of the deliverable or task, and the one who delegates the work to those responsible. <u>There **may only** be only one *accountable*</u> specified for each task or deliverable.

Consulted
Those whose opinions are sought, typically subject matter experts were people that are impacted by the activity; and with whom there is two-way communication.

Informed
Those who are kept up-to-date on progress, typically on the launch and completion of the task or deliverable. This is one way communication.

Role distinction
There is a distinction between a role and the individual assigned the task. Role is a descriptor of an associated set of tasks that could be performed by just one or many people.

In the case of the RACI Chart, the team may list as many people as is logical except for the Accountable role.

Scope of Work
Completion of the RACI Chart will also support development of any future scopes of work for consultant provided communication and outreach services.

LIST OF APPENDICES

Appendix 1. Public Outreach Requirements under SGMA

GSP Regulations

CODE	PUBLIC OUTREACH REQUIREMENT
§ 353.6. Initial Notification (a) Each Agency shall notify the Department, in writing, prior to initiating development of a Plan. The notification shall provide general information about the Agency's process for developing the Plan, including the manner in which interested parties may contact the Agency and participate in the development and implementation of the Plan. The Agency shall make the information publicly available by posting relevant information on the Agency's website.	1. Statement of how interested parties may contact the Agency and participate in development and implementation of the plan submitted to DWR. 2. Web posting of same information. **Timing**: *Prior to initiating development of a plan.*
§ 353.8. Comments (a) Any person may provide comments to the Department regarding a proposed or adopted Plan. (b) Pursuant to Water Code Section 10733.4, the Department shall establish a comment period of no less than 60 days for an adopted Plan that has been accepted by the Department for evaluation pursuant to Section 355.2. (c) In addition to the comment period required by Water Code Section 10733.4, the Department shall accept comments on an Agency's decision to develop a Plan as described in Section 353.6, including comments on elements of a proposed Plan under consideration by the Agency.	1. 60-day comment period for plans under submission to DWR. Comments will be used to evaluate the submission. 2. Parties may also comment on a GSA's (or GSAs') statements submitted under section 353.6 **Timing**: For GSP Submittal - *60 days after submission to DWR*
§ 354.10. Notice and Communication Each Plan shall include a summary of information relating to notification and communication by the Agency with other agencies and interested parties including the following: (a) A description of the beneficial uses and users of groundwater in the basin, including the land uses and property interests potentially affected by the use of groundwater in the basin, the types of parties representing those interests, and the nature of consultation with those parties. (b) A list of public meetings at which the Plan was discussed or considered by the Agency. (c) Comments regarding the Plan received by the Agency and a summary of any responses by the Agency. (d) A communication section of the Plan that includes the following: (1) An explanation of the Agency's decision-making process. (2) Identification of opportunities for public engagement and a discussion of how public input and response will be used.	5. Statements of issues and interests of beneficial users of basin groundwater, including types of parties representing the interests and consultation process 6. Lists of public meetings 7. Inventory of comments and summary of responses 8. Communication section in plan that includes: • Agency decision making process • ID of public engagement opportunities and response process • Description of process for inclusion • Method for public information related to progress in implementing the plan (status, projects, actions) **Timing**: For GSP Submittal – *with plan* For GSP Development – *continuous.* *[Note: activities should be included*

CODE	PUBLIC OUTREACH REQUIREMENT
(3) A description of how the Agency encourages the active involvement of diverse social, cultural, and economic elements of the population within the basin. (4) The method the Agency shall follow to inform the public about progress implementing the Plan, including the status of projects and actions.	*in the project schedule and information posted on web.]*
§ 355.2. (c) Department Review of Adopted Plan (c) The Department (DWR) shall establish a period of no less than 60 days to receive public comments on the adopted Plan, as described in Section 353.8.	1. 60 day public review period for public comment on submitted plan. **Timing**: After GSP Submittal to DWR – *60 days*
§ 355.4. & 355.10 Criteria for Plan Evaluation The basin shall be sustainably managed within 20 years of the applicable statutory deadline consistent with the objectives of the Act. The Department shall evaluate an adopted Plan for compliance with this requirement as follows: (b) (4) Whether the interests of the beneficial uses and users of groundwater in the basin, and the land uses and property interests potentially affected by the use of groundwater in the basin, have been considered. … (10) Whether the Agency has adequately responded to comments that raise credible technical or policy issues with the Plan.	1. Required public outreach and stakeholder information is submitted, including statement of issues and interests of beneficial users. 2. Public and stakeholder comments and questions adequately addressed during planning process. **Timing**: For GSP Submittal – *with plan* For resubmittal related to corrective action *– with submittal*

California Water Code

CODE	PUBLIC OUTREACH REQUIREMENT
10720. This part shall be known, and may be cited, as the “Sustainable Groundwater Management Act.” **10720.3** (a) This part applies to all groundwater basins in the state. … (c) The federal government or any federally recognized Indian tribe, appreciating the shared interest in assuring the sustainability of groundwater resources, may voluntarily agree to participate in the preparation or administration of a groundwater sustainability plan or groundwater management plan under this part through a joint powers authority or other agreement with local agencies in the basin. A participating tribe shall be eligible to participate fully in planning, financing, and management under this part, including eligibility for grants and technical assistance, if any exercise of regulatory authority, enforcement, or imposition and collection of fees is pursuant to	1. Tribes and the federal government may voluntarily participate in GSA governance and GSP development. **Timing**: *Prior to initiating development of a plan.*

CODE	PUBLIC OUTREACH REQUIREMENT
the tribe's independent authority and not pursuant to authority granted to a groundwater sustainability agency under this part.	
CHAPTER 4. Establishing Groundwater Sustainability Agencies [10723 - 10724]	
10723. a) Except as provided in subdivision (c), any local agency or combination of local agencies overlying a groundwater basin may decide to become a groundwater sustainability agency for that basin. (b) Before deciding to become a groundwater sustainability agency, and after publication of notice pursuant to Section 6066 of the Government Code, the local agency or agencies shall hold a public hearing in the county or counties overlying the basin.	1. Must hold public hearing in the county or counties overlying the basin, prior to becoming a GSA **Timing**: *Prior to becoming a GSA.*
10723.2 The groundwater sustainability agency shall consider the interests of all beneficial uses and users of groundwater, as well as those responsible for implementing groundwater sustainability plans. These interests include, but are not limited to, all of the following: (a) Holders of overlying groundwater rights, including: (1) Agricultural users. (2) Domestic well owners. (b) Municipal well operators. (c) Public water systems. (d) Local land use planning agencies. (e) Environmental users of groundwater. (f) Surface water users, if there is a hydrologic connection between surface and groundwater bodies. (g) The federal government, including, but not limited to, the military and managers of federal lands. (h) California Native American tribes. (i) Disadvantaged communities, including, but not limited to, those served by private domestic wells or small community water systems. (j) Entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the groundwater sustainability agency.	1. Must consider interest of all beneficial uses and users of groundwater. 2. Includes specific stakeholders as listed. **Timing**: *During development of a GSP.*
10723.4. The groundwater sustainability agency shall establish and maintain a list of persons interested in receiving notices regarding plan preparation, meeting announcements, and availability of draft plans, maps, and other relevant documents. Any person may request, in writing, to be placed on the list of interested persons.	3. Must establish and maintain an interested persons list. 4. Any person may ask to be added to the list **Timing**: *On forming a GSA.*
10723.8. (a) Within 30 days of deciding to become or form a groundwater sustainability agency, the local agency or combination of local agencies shall inform the department of its decision and its intent to undertake sustainable groundwater management. The	1. Creates notification requirements that include: a. A list of interested parties b. An explanation of how interests will be considered

CODE	PUBLIC OUTREACH REQUIREMENT
notification shall include the following information, as applicable: … (4) A list of interested parties developed pursuant to Section 10723.2 and an explanation of how their interests will be considered in the development and operation of the groundwater sustainability agency and the development and implementation of the agency's sustainability plan.	**Timing**: *On forming a GSA & with submittal of GSP*
10727.8 (a) Prior to initiating the development of a groundwater sustainability plan, the groundwater sustainability agency shall make available to the public and the department a written statement describing the manner in which interested parties may participate in the development and implementation of the groundwater sustainability plan. The groundwater sustainability agency shall provide the written statement to the legislative body of any city, county, or city and county located within the geographic area to be covered by the plan. The groundwater sustainability agency may appoint and consult with an advisory committee consisting of interested parties for the purposes of developing and implementing a groundwater sustainability plan. The groundwater sustainability agency shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the groundwater basin prior to and during the development and implementation of the groundwater sustainability plan. If the geographic area to be covered by the plan includes a public water system regulated by the Public Utilities Commission, the groundwater sustainability agency shall provide the written statement to the commission. (b) For purposes of this section, interested parties include entities listed in Section 10927 that are monitoring and reporting groundwater elevations in all or a part of a groundwater basin managed by the groundwater sustainability agency.	2. Agencies preparing a GSP must prepare a written statement describing the manner in which interested parties may participate in its development and implementation. 3. Statement must be provided to: a. Legislative body of any city and/or county within the geographic area of the plan b. Public Utilities Commission if the geographic area includes a regulated public water system regulated by that Commission c. DWR d. Interested parties (see Section 10927) e. The public 4. GSP entities may form an advisory committee for the GSP preparation and implementation. 5. The GSP entities are to encourage active involvement of diverse social, cultural and economic elements of the affected populations. **Timing**: *On initiating GSP*
10728.4 Public Notice of Proposed Adoption, GSP Adoption Pubic Hearing A groundwater sustainability agency may adopt or amend a groundwater sustainability plan after a public hearing, held at least 90 days after providing notice to a city or county within the area of the proposed plan or amendment. The groundwater sustainability agency shall review and consider comments from any city or county that receives notice pursuant to this section and shall consult with a city or county that requests consultation within 30 days of receipt of the notice. Nothing in this section is intended to	3. GSP must be adopted or amended at Public Hearing. 4. Prior to Public Hearing for adoption or amendment of the GSP, the GSP entities must: a. Notify cities and/or counties of geographic area 90 days in advance. b. Consider and review comments

CODE	PUBLIC OUTREACH REQUIREMENT
preclude an agency and a city or county from otherwise consulting or commenting regarding the adoption or amendment of a plan.	c. Conduct consultation within 30 days of receipt with cities or counties so requesting
10730 Fees. (a) A groundwater sustainability agency may impose fees, including, but not limited to, permit fees and fees on groundwater extraction or other regulated activity, to fund the costs of a groundwater sustainability program, including, but not limited to, preparation, adoption, and amendment of a groundwater sustainability plan, and investigations, inspections, compliance assistance, enforcement, and program administration, including a prudent reserve. A groundwater sustainability agency shall not impose a fee pursuant to this subdivision on a de minimis extractor unless the agency has regulated the users pursuant to this part. (b) (1) Prior to imposing or increasing a fee, a groundwater sustainability agency shall hold at least one public meeting, at which oral or written presentations may be made as part of the meeting. (2) Notice of the time and place of the meeting shall include a general explanation of the matter to be considered and a statement that the data required by this section is available. The notice shall be provided by publication pursuant to Section 6066 of the Government Code, by posting notice on the Internet Web site of the groundwater sustainability agency, and by mail to any interested party who files a written request with the agency for mailed notice of the meeting on new or increased fees. A written request for mailed notices shall be valid for one year from the date that the request is made and may be renewed by making a written request on or before April 1 of each year. (3) At least 20 days prior to the meeting, the groundwater sustainability agency shall make available to the public data upon which the proposed fee is based. (c) Any action by a groundwater sustainability agency to impose or increase a fee shall be taken only by ordinance or resolution. (d) (1) As an alternative method for the collection of fees imposed pursuant to this section, a groundwater sustainability agency may adopt a resolution requesting collection of the fees in the same manner as ordinary municipal ad valorem taxes. (2) A resolution described in paragraph (1) shall be adopted and furnished to the county auditor-controller and board of supervisors on or before August 1 of each year that the alternative collection of the fees is being requested. The resolution shall include a list of parcels and the amount to be collected for each parcel. (e) The power granted by this section is in addition to any powers a groundwater sustainability agency has under any other law.	Related to GSAs 5. Public meeting required prior to adoption of, or increase to fees. Oral or written presentations may be made as part of the meeting. 6. Public notice shall include: a. Time and place of meeting b. General explanation of matter to be considered c. Statement of availability for data required to initiate or amend such fees d. Public posting on Agency Website and provision by mail to interested parties of supporting data (at least 20 days in advance) 7. Mailing lists for interested parties are valid for 1 year from date of request and may be renewed by written request of the parties on or before April 1 of each year. 8. Includes procedural requirements per Government Code, Section 6066. **Timing**: *Prior to adopting fees.*

California Government Code

CODE	PUBLIC OUTREACH REQUIREMENT
6060 Whenever any law provides that publication of notice shall be made pursuant to a designated section of this article, such notice shall be published in a newspaper of general circulation for the period prescribed, the number of times, and in the manner provided in that section. As used in this article, “notice” includes official advertising, resolutions, orders, or other matter of any nature whatsoever that are required by law to be published in a newspaper of general circulation. **6066** Publication of notice pursuant to this section shall be once a week for two successive weeks. Two publications in a newspaper published once a week or oftener, with at least five days intervening between the respective publication dates not counting such publication dates, are sufficient. The period of notice commences upon the first day of publication and terminates at the end of the fourteenth day, including therein the first day.	4. Must publish notices in a newspaper of general circulation as prescribed. 5. Publication shall be once a week for two successive weeks. Two publications in a newspaper published once a week or oftener, with at least five days intervening between the respective publication dates not counting such publication dates, are sufficient. 6. The period of notice begins the first day of publication and terminates at the end of the fourteenth day, (which includes the first day.) **Timing**: *Prior to adopting fees*

Appendix 2. Communications Governance

Given the relatively large number of stakeholders, a recommendation for coordinated efforts, and the legal requirements for outreach[13] some form of communications governance is recommended.

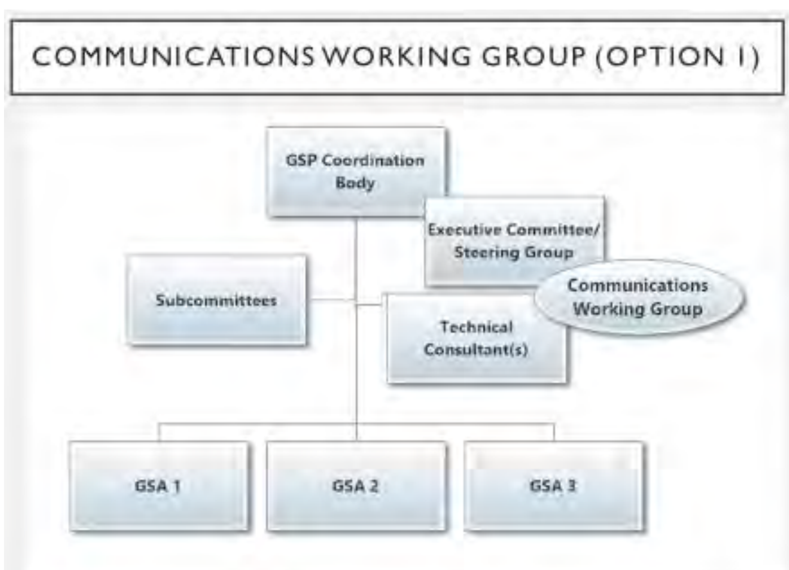
Execution of communications activities can be accomplished by an individual or multiple individuals, and/or include or be solely managed by project consultants. The actual form of the governance is less important than a clear understanding of the roles and responsibilities of those responsible for ensuring required communication. Also essential is a clear chain of command that ensures the elected representatives of GSAs are able to retain communications leadership and guidance.

A driving consideration for establishing a communications governance structure is the level of effort associated with required activities and the fact that communications are highly time dependent. That means that communications activities should be occurring that may happen outside of regularly scheduled GSA meetings. In this case delegation with guidance to a communications team is efficient and effective.

Several governance options for consideration are offered below.

Communications Option 1

Communications Option 1 is based on an overall GSP(s) development structure that includes a GSA member based leadership function that is guiding the Technical Consultants. A communications working group which might include staff, consultants and GSA elected officials, or some combination of those roles could be formed to serve as a communications working group that would ultimately report to the larger GSP coordinating body.

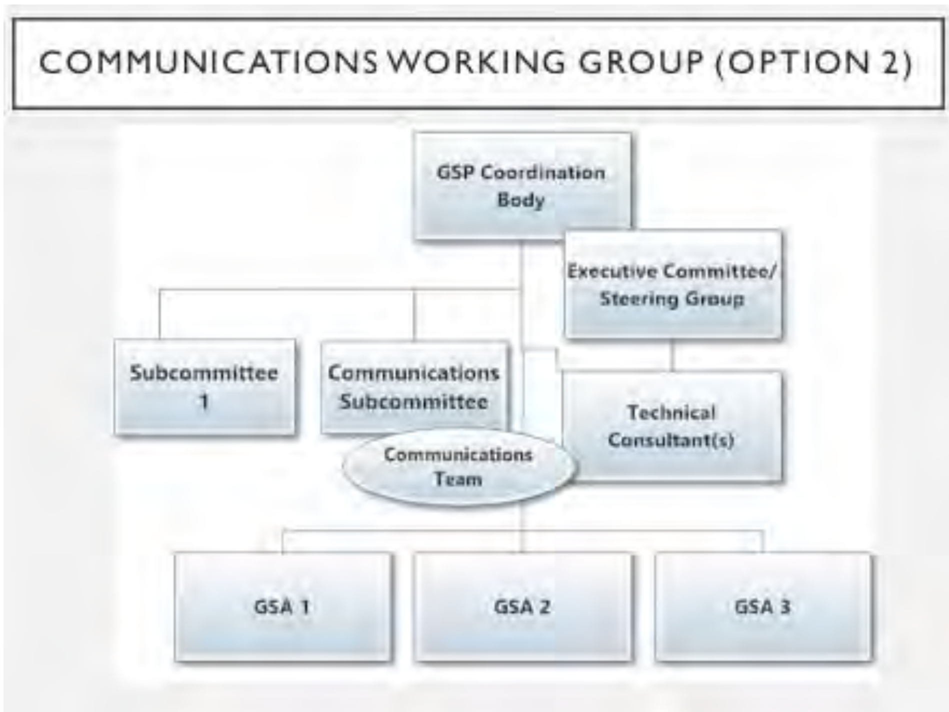


Communications Governance Option 1

Communications Option 2

[13] See Appendix 1

Communications Option 1 is based on an overall GSP(s) development structure that includes a GSA member based subcommittee guiding the Technical Consultants. A communications working group which might include staff, consultants and GSA elected officials, or some combination of those roles could be formed to serve as a communications team that is affiliated with a subcommittee and would ultimately report to the larger GSP coordinating body



Communications Governance Option 2

Appendix G

Comments Received on the GSP

APPENDIX TO BE INCLUDED IN THE FINAL GSP

Appendix H

Modeling Memo

INTEGRATED HYDROLOGICAL MODEL FOR DELTA MENDOTA SUBBASIN

DRAFT | May 2024
EKI C00041.09

INTEGRATED HYDROLOGICAL MODEL FOR DELTA MENDOTA SUBBASIN

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ABBREVIATIONS AND ACRONYMS

AF	acre-feet
AFY	acre-feet per year
BAS	MODFLOW Basic Package
CALGEM	California Geologic Energy Management Division
CalVeg	USDA Forest Service Region 5 Classification and Assessment with Landsat of Visible Ecological Groupings
CCR	California Code of Regulations
CDMG	California Division of Mines and Geology
CIMIS	California Irrigation Management Information System
SUB	MODFLOW Subsidence Package
CVHM	Central Valley Hydrologic Model
DEM	Digital Elevation Model
DWR	California Department of Water Resources
EKI	EKI Environment & Water, Inc.
ET	Evapotranspiration
ETo	Reference evapotranspiration
ft	feet
ft bgs	feet below ground surface
ft/d	feet per day
ft/yr	feet per year
GHB	MODFLOW General-Head Boundary Package
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	Hydrogeological Conceptual Model
Kh	Horizontal Hydraulic Conductivity
Kv	Vertical Hydraulic Conductivity
MT	Minimum Threshold
MO	Measurable Objective
PEST	Model-Independent Parameter Estimation and Uncertainty Analysis
QA/QC	Quality assurance/quality control
Qc	Quaternary continental deposits
Qf	Quaternary alluvial fan deposits
RMS	Representative Monitoring Site
RMSE	Root Mean Square Error
RMW	Representative Monitoring Well
SFR	MODFLOW Streamflow Routing Package
SGMA	Sustainable Groundwater Management Act
Ss	Specific Storage
SSURGO	USDA Soil Survey Geographic Database

STO	MODFLOW Storage Package
Sy	Specific Yield
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WEL	MODFLOW Well Package
WY	Water Year

1 MODEL SOFTWARE SUMMARY

The Central Valley Hydrologic Model Version 2 (CVHM2; Model) is an extensive, detailed three-dimensional (3D) computer model of the hydrologic system of the Central Valley (Faunt et al., 2024) by the United States Geological Survey (USGS). CVHM2 simultaneously accounts for changing water supply and demand across the landscape and simulates surface water and groundwater flow across the entire Central Valley. The purpose of using CVHM2 in the development of the Delta-Mendota Groundwater Sustainability Plan (GSP) is to quantify historical, current, and projected water budgets for the Delta-Mendota Subbasin (Basin), their respective uncertainties, and evaluate the impacts of future land use, hydroclimatic conditions, water supply/demand projections, and proposed projects and management actions (P/MAs) on groundwater conditions within the Basin. To accomplish this objective, the CVHM2 released by the USGS was further refined within the Basin and extended. For the purposes of this report, where a comparison of changes is required, the CVHM2 developed by the USGS is referred to as the USGS-CVHM2, and the refined version for the Basin is referred to as CVHM2 or Model. In other circumstances where both versions are consistent, CVHM2 or Model is used.

1.1 MODFLOW One-Water Hydrologic Flow Model (MODFLOW-OWHM)

The CVHM2 utilizes USGS computer code MODFLOW-OWHM (One-Water Hydrologic Flow Model; Boyce and others, 2020; Hanson and others, 2014). MODFLOW-OWHM is an integrated hydrologic model that couples groundwater flow, surface water flow, landscape and agricultural processes, aquifer compaction, and land subsidence. As an integrated hydrologic model, it is capable of addressing conjunctive use, water management, and climate-crop-water scenarios. As the Basin has both confined and unconfined aquifers, agricultural use, and complex water use operations, MODFLOW-OWHM is an appropriate and effective computer code to solve the groundwater flow equation. MODFLOW-OWHM utilizes the advanced Farm Process package (FMP) to represent the root zone processes and dynamically simulates the integrated supply and demand components of irrigated agriculture, including capturing the Basin's complex surface water delivery system.

1.1.1 Farm Package and Agricultural Use Estimation

The processes of evapotranspiration (ET), runoff, and deep percolation to the groundwater system were estimated using the FMP (Schmid and others, 2006) in CVHM2. The FMP allocates water, simulates corresponding processes, and computes water balances for defined subregions of the model domain. In CVHM2, these subregions or "Farms" are defined as "Water Balance Subregions (WBSs)."

Groundwater pumping for irrigation in the Central Valley, including within the Basin, has not been metered historically. CVHM2 fills this data gap by estimating the applied water and the corresponding groundwater pumping using FMP. It is designed to simulate the demand components representing crop irrigation requirements and on-farm inefficiency losses, and the supply components representing surface water deliveries and supplemental groundwater pumpage. Additional head-dependent inflows and outflows, including canal losses and gains, surface runoff, return flows, evapotranspiration (ET), and deep percolation of excess water, can also be simulated in FMP. On the basis of cell-by-cell estimations for each WBS in the Basin, the FMP first calculates crop water demand as the transpiration from plant-water consumption and related evaporation. FMP then determines residual crop water demand that cannot be satisfied by precipitation and/or root uptake from groundwater. The remaining irrigation requirement is adjusted by accounting for evaporative losses from irrigation and other losses owing to inefficiencies, to yield a final total farm delivery requirement (TFDR). The TFDR is first satisfied using surface water, if available to the model grid cell. Surface water that is not simulated in the stream network is referred to as "non-routed deliveries (NRD)". Surface water that is routed through the stream network and delivered to a WBS is referred to as "semi-routed deliveries (SRD)". TFDR is first supplied by the available NRDs. If not fully met, the TFDR surface water delivery will be supplemented by the available SRDs. If the TFDR is not fully supplied by surface water, the FMP computes the remaining amount of supplemental groundwater necessary to extract from WBS wells in order to satisfy the TFDR.

2 MODEL CONSTRUCTION

2.1 Model Domain

CVHM2 is a regional model that focuses on groundwater availability and land subsidence in the Central Valley (Faunt et al., 2024). The Model covers the entire Central Valley via a rectangular grid, as shown in **Figure H-1**, and incorporates identified groundwater basins and subbasins as subsets of Farms (136 total Farms). Within the Basin, CVHM2 is further refined to better simulate its complex water supply system through forty-four (44) Farms. CVHM2 integrates the components of supply and demand data from each member Groundwater Sustainability Agency (GSA) within the Basin and uses local land use, soil type, and other datasets to calculate their respective irrigation demand.

2.2 Spatial Discretization

In CVHM2, the terrain and groundwater surfaces are represented as a set of distinct, rectangular blocks known as cells. These cells serve as the spatial basis for approximating consumptive use and groundwater flow equations within the model. Spanning the entirety of the Central Valley, the model grid is organized into 441 rows and 98 columns, with approximately 1,400 cells representing the Basin. Each cell measures one square mile in area and has dimensions of one mile by one mile. The Model grid is rotated 34 degrees westward in parallel with the axis of the Central Valley.

2.3 Temporal Discretization

The historical simulation period of CVHM2, representing a baseline period from April 1961 through September 2019, is discretized into 702 monthly stress periods. Under GSP development, this baseline period was extended through September 2023 (WY 2023) for a total of 750 monthly stress periods. CVHM2 has a 6-month spin-up period from April to September of 1961.

2.4 Initial Conditions

Initial conditions define the system state at the beginning of the simulation. The initial heads for the transient simulations in CVHM2 were specified using the approach employed for previous studies in the San Joaquin Valley (Belitz et al., 1993; C. Brush et al., 2006; Faunt, 2009). CVHM2 was originally allowed to run forward one year to dissipate transient effects caused by the imposition of the poorly estimated initial heads. The resulting simulated heads were considered representative and were subsequently used as the 'new' initial heads for CVHM2.

2.5 Boundary Conditions

Boundary conditions are prescribed over the spatial boundaries of the Model domain and are used to represent flow constraints and fluxes affecting the groundwater-flow system. There are various boundary conditions specified in CVHM2, which are further explained in Faunt (2009) and Faunt et al. (2024). Boundary conditions applied around the Basin are discussed as follows.

2.5.1 No-Flow Boundary

For transient simulations within the Basin, most of the western boundary of the Basin and bottom of the Basin are represented as a no-flow boundary. This type of boundary condition prevents inflow to or outflow from the model domain at the model cells to which it is applied.

2.5.2 Flux Boundary

Lateral flux boundary conditions are used within the Basin to represent the contact between the mountain ranges and the unconsolidated alluvial sediments of the Central Valley. Values for mountainfront recharge and runoff are obtained from the Basin Characterization Model (BCM). To extend the Model baseline to WY 2023, recharge and runoff rates were extracted from the BCM Model and added to the Model's WEL Package. At the time of GSP development, the publicly available BCMv8 extended up to WY 2021. Therefore, WY 2022 and 2023 were assumed to be similar to WY 2013 and 2017, respectively, and similar recharge and runoff values were used for the WEL Package extension.

2.6 Model Layering

CVHM2 is vertically discretized into thirteen (13) layers. The top five (5) layers represent the upper aquifer system. The top three (3) layers largely represent the shallow aquifer that exists in most areas of the Central Valley, including in parts of the Basin. The thickness of the corresponding layers in the shallow aquifer (referred to as the Upper Aquifer in the GSP) varies respective to its presence. Layers six (6) through eight (8) represent the Corcoran Clay, the primary aquitard in the Basin separating the Upper and Lower Aquifers. Layers nine (9) through thirteen (13) represent the Lower Aquifer which extends from the bottom of Corcoran Clay to the bottom of the Basin (base of freshwater). Layering in the USGS-CVHM2 model was not modified as part of development of CVHM2.

3 MODEL INPUT DATA AND UPDATES TO THE USGS-CVHM2

MODFLOW-OWHM requires various input datasets based on the computational modules and packages selected for CVHM2. Sources of the data used in the development of USGS-CVHM2 are discussed in detail in Faunt et al. (2024) and Tarum et al. (2024). To extend the model to WY 2023, several packages of the USGS-CVHM2 were modified and extended. This Section primarily focuses on these changes and the data used to refine and extend the Model up to WY 2023.

3.1 Land Surface Inputs

Land surface input datasets are used to establish the Model's representation of land surfaces that drive the relationship between precipitation, runoff, and other elements of the hydrologic cycle, such as evapotranspiration, infiltration, and streamflow. These datasets were held consistent with the USGS-CVHM2 for WY 1962-2019 but were extended and refined for WY 2020-2023 to extend the Model.

3.1.1 Land Use

FMP is employed to estimate consumptive use components across diverse land uses, including vegetation in both irrigated and non-irrigated agriculture, fallow fields, riparian or natural vegetation, and urban landscapes. Within CVHM2, land use attributes are delineated at a granular, cell-by-cell level, encompassing urban and agricultural areas, water bodies, and natural vegetation. The predominant land use within each model cell is designated as the representative land use for that cell. Until Water Year (WY) 2020, land use data remained consistent in the model in line with USGS-CVHM2. However, for the extension period, crop maps provided by the Department of Water Resources (DWR) were adopted for respective years. At the time of GSP development, crop maps were only accessible for WY 2020 and 2021[1] of the extension period, which were accordingly utilized. The land use for WY 2021 was extrapolated as current for WY 2022 and 2023 of the extension period, as well as for the projection period.

3.1.2 Soil Parameters

The soil data used for CVHM2 is based on DWR's C2VSim's fine grid model soil curve number dataset[2]. These values were originally obtained from U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) soil map of the State of California (USDA, 2004), and then an area-weighted average value for each hydrologic soil group within each subregion was calculated to the C2VSim elements. Curve number values obtained from SSURGO were adapted for use in C2VSimFG. To translate the curve numbers from the C2VSim grid to the CVHM2 grid, the curve number from C2VSim that covered the largest area of a CVHM2 cell was used as the zone number. There were eight unique curve numbers in C2VSimFG. Each of these curve numbers was then assigned a different zone number for each of the four regions (Sacramento, Delta-Eastside, San Joaquin, and Tulare), resulting in 26 unique zones for CVHM2. Soil parameters were not changed or modified for extending and fine-tuning the model. Further information can be found in Tarum et al. (2024).

3.2 Climate Data

The climate data used for USGS-CVHM2 is based on BCMv8. The BCMv8 data are extracted from the state-wide data for the modeled area for water years 1922 to 2019. To extend the Model, precipitation and evapotranspiration data were extracted from BCMv8 for the modeled areas within the CVHM2 model boundary for WY 2020-2022. Since BCMv8 did not provide climate data and results for WY 2023, climate data for WY 2017 was substituted due to the similarity of water year type and their calculated DWR San Joaquin Valley Water Year Index (SJV-Index).

Due to the different resolutions in BCMv8 and CVHM2, data extracted from BCMv8 was first clipped to the Model domain and its temporal extent. Then, extracted data from the 270-meter BCMv8 grid cells were aggregated to represent an average number for the corresponding 1-mile CVHM2 grid cells.

3.2.1 Precipitation

Average precipitation in the Basin for WY 2003-2023 (evaluation period) is estimated to be about 655,000 AF. The average precipitation for the Model's baseline (1962-2023) is estimated at 697,000 AF, indicating the drier conditions experienced during the evaluation period. This is also observed from the cumulative departure from the historical average precipitation shown in **Figure 1**. The cumulative departure from the historical average precipitation trend shows three significant drought periods (WY 2007-2009, WY 2012-2015, and WY 2020-2022) experienced during the evaluation period along with three comparably shorter wet periods that follow each drought.

[1] https://data.cnra.ca.gov/dataset/statewide-crop-mapping
[2] https://data.cnra.ca.gov/dataset/c2vsimfg

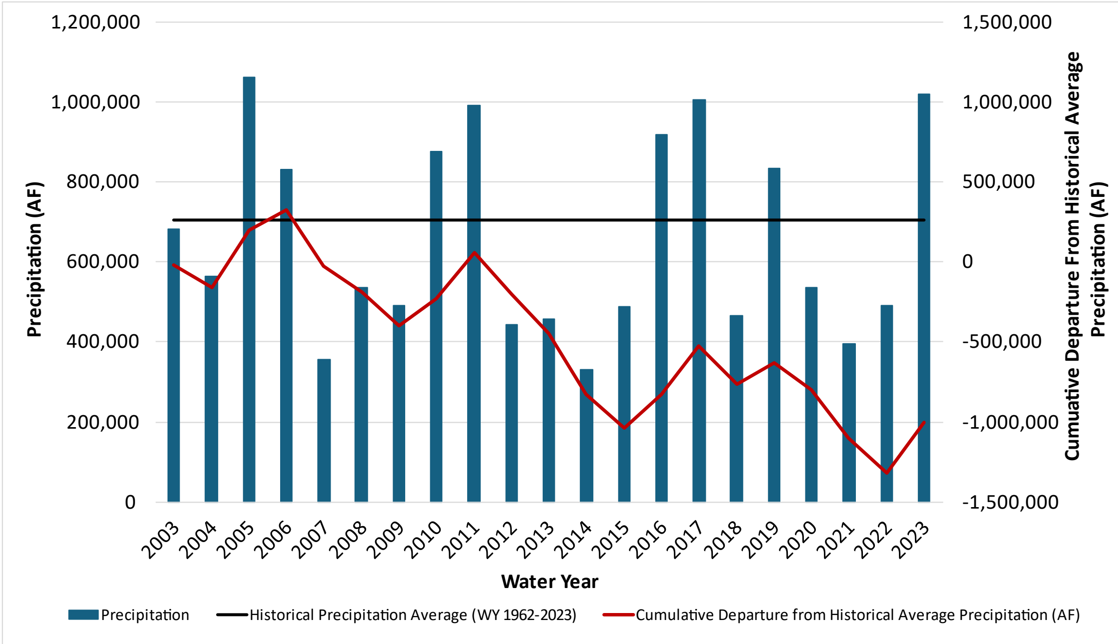

Figure 1. Comparison of Basin's modeled precipitation for WY 2003-2023 with historical average precipitation since WY 1962.

3.2.2 Evapotranspiration

Average evapotranspiration within the Basin for WY2003-2023 is around 1,542,000 AF. The estimated evapotranspiration demand changes based on land use, climatic conditions, and agricultural practices. In the Basin, and subsequently simulated in the Model, a large part of the evapotranspiration demand is supplied by reliable surface water delivery. The remaining evapotranspiration demand is supplied by precipitation, available soil moisture, and groundwater pumping.

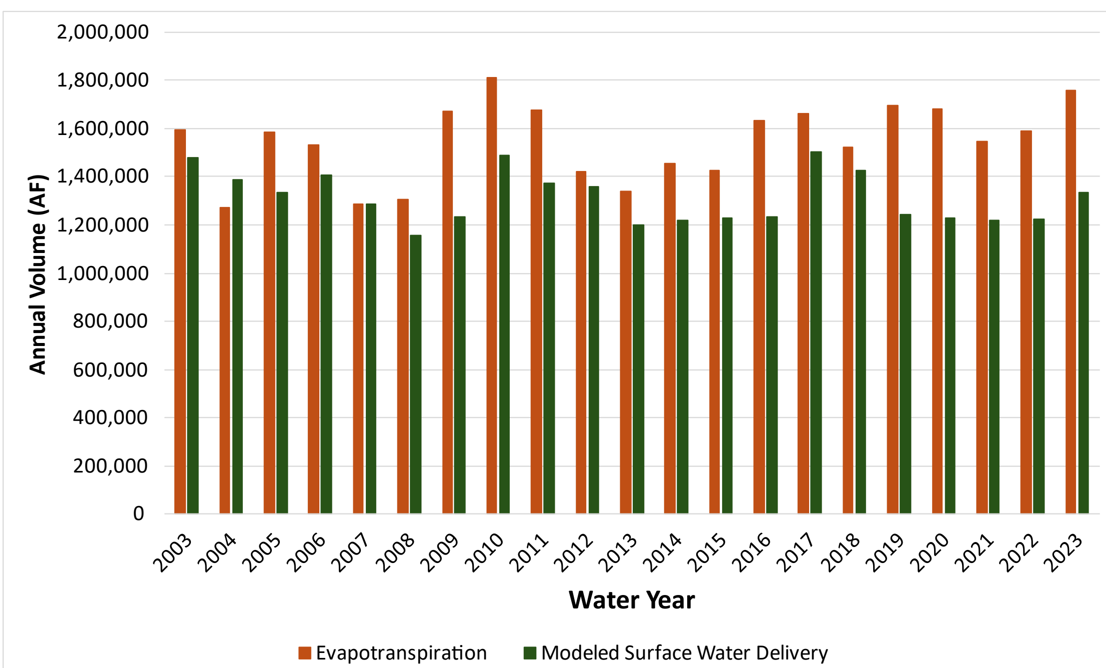

Figure 2. Simulated evapotranspiration and surface water delivery for WY 2003-2023.

3.3 Water Use

Water use in CVHM2 can be divided into groundwater pumping and surface water supply. Groundwater pumping can be broken down into agricultural pumping to satisfy crop evapotranspiration demands, and rural and municipal pumping that satisfy domestic and water supply uses. Farm Package calculates agricultural pumping, while rural and municipal uses are deterministic input values to the Model. CVHM2 also includes recovery well data to simulate recharge and banking projects. Recovery wells are not defined within the Basin. Consumptive use calculation and estimation of agricultural pumping are discussed in **Section 1.1.1**. Estimated agricultural pumping from each WBS is proportioned to defined Farm Wells and each principal aquifer based on well information defined in the Multi-Node Well Package (MNW2).

3.3.1 Surface Water Delivery and Diversion

Central Valley's complex conveyance network is simulated by the Model's Streamflow Routing Package (SFR2) and the Farm-Process (FMP) at 65 inflow locations with 271 stream segments, 13 bifurcations, and 571 diversion locations, providing 564 SRDs and 7 NRDs. The CVHM2 stream network in the Basin is shown in **Figure H-2**.

The Model was refined from USGS-CVHM2 to better represent the average historical surface water delivery in the Basin. This refinement involved scaling the allocated surface water deliveries to various water balance subregions (WBS) within the Basin based on historical delivery data provided by GSAs. As shown in **Table 1**, the average surface water deliveries reported by the GSAs and simulated by the Model are 1,315,119 AF and 1,317,063 AF, respectively, for WY2003-2018. The year-to-year volume of surface water delivery shows larger differences and departures from the GSA data. This is identified as a data gap and a source of uncertainty in the Model that can be addressed in the future for refined representation of annual operation in the Basin.

Table 1. Total surface water delivery in the Basin reported by GSAs and simulated in the Model for WY 2003-2023

Water Year	Water Year Type	Surface Water Delivery Reported by GSAs (AFY)	Surface Water Delivery Simulated in Model (AFY)
2003	Below Normal	1,515,410	1,477,000
2004	Dry	1,450,799	1,356,000
2005	Wet	1,413,541	1,355,000
2006	Wet	1,454,854	1,217,000
2007	Critical	1,353,951	1,208,000
2008	Critical	1,128,325	1,250,000
2009	Below Normal	1,141,968	1,464,000
2010	Above Normal	1,403,034	1,226,000
2011	Wet	1,461,176	1,216,000
2012	Dry	1,359,166	1,336,000

Water Year	Water Year Type	Surface Water Delivery Reported by GSAs (AFY)	Surface Water Delivery Simulated in Model (AFY)
2013	Critical	1,194,029	1,493,000
2014	Shasta Critical	1,130,038	1,490,000
2015	Shasta Critical	1,065,901	1,213,000
2016	Dry	1,106,600	1,353,000
2017	Wet	1,442,246	1,207,000
2018	Below Normal	1,420,859	1,212,000
2019	Wet	1,807,600	1,236,000
2020	Dry	1,394,000	1,358,000
2021	Shasta Critical	1,159,700	1,218,000
2022	Shasta Critical	1,053,300	1,218,000
2023	Wet	1,366,600	1,368,000
Historical Period Average (2003-2018)		**1,315,119**	**1,317,063**
Current Period Average (2019-2023)		**1,356,240**	**1,279,600**
Evaluation Period (2003-2023)		**1,324,909**	**1,308,143**

3.3.2 Groundwater Pumping

CVHM2 simulates pumping using the MNW2 Package in conjunction with estimates provided by the FMP Package. Four types of pumping are simulated in CVHM2, including recovery pumping, rural pumping, urban pumping, and agricultural pumping estimated by the FMP. There is no recovery pumping simulated within the Basin.

Groundwater pumping in CVHM2 was refined in the Basin compared with USGS-CVHM2 based on the data provided by the GSAs. This included changes to pumping due to adjustments to surface water deliveries and minor adjustments to well placement and specifications to better represent pumping allocation to different WBS and principal aquifers according to existing measured data.

3.3.2.1 Agricultural Pumping

Agricultural pumping is simulated through consumptive use calculation by the FMP. In each WBS within the Basin, a single well was placed in each model cell where an irrigated crop was the predominant land use for any given time frame. Wells are added or deleted accordingly in the model during the simulation period due to the extent of irrigated agricultural changes through time. Pumping demand was calculated by FMP and then allocated to the layers according to well-construction information obtained from DWR and USGS databases. Depending on the well completion depths, pumping was assumed to occur mainly in layers 4 and 5 for Upper Aquifer pumping and layers 9 and 10 for the Lower Aquifer pumping within the Basin.

3.3.2.2 Municipal Pumping

Municipal pumping constitutes a relatively small percentage of the annual total estimated pumping in each Water Balance Subregion (WBS) within the Basin. In the CVHM2 model, the locations of municipal wells are determined by the predominant land use, with wells placed where urban land use is most prevalent within a corresponding model grid. A single well is specified in the appropriate model layer(s) to represent composite municipal pumping.

Data on municipal pumping were sourced from datasets compiled by the DWR for the C2VSim model, where available, and estimated using data from the U.S. Department of Commerce and Census Bureau. Annual population estimates for each CVHM2 cell were derived by overlaying census block groups within the CVHM2 cells and applying linear trends to fill gaps between census data years. Urban water use was estimated using a factor of 275 gallons per person per day, aligning with historical per capita demands reported for major cities in the Central Valley (Faunt, 2009; Tarum et al., 2024).

Annual municipal pumping was then distributed into monthly pumping based on specific ratios that reflect the reported monthly water use patterns of major Central Valley cities. Additional details are available in Faunt (2009) and Tarum et al. (2024). Municipal demand was not altered in the extension and adjustments to the CVHM2, maintaining consistency with USGS-CVHM2.

Table 2. Monthly percentage ratios of municipal demand to annual demand.

Month	Percentage
January	4.6%
February	4.5%
March	5.5%
April	7.3%
May	9.9%
June	11.7%
July	13.4%
August	12.8%
September	10.7%
October	8.5%
November	5.9%
December	5.0%

3.3.2.3 Rural Pumping

Rural pumping is estimated using a similar methodology as with municipal pumping in CVHM2. Virtual rural pumping wells are placed at the center of the population block group. Rural demand was not altered in the extension and adjustments to the CVHM2, maintaining consistency with USGS-CVHM2.

4 ADJUSTMENT OF LOCAL PARAMETERS

A primary goal of model calibration is to minimize the residual (i.e., difference) between simulated and observed water levels, subsidence, and other variables. This is primarily achieved through systematic and reasonable modifications to model parameters such that simulated water levels match well with observed measurements, both spatially and temporally. Additionally, it is important to observe and account for water budget outputs during model calibration to ensure that groundwater inflows and outflows are within reasonable ranges based on prior available information and studies.

The USGS-CVHM2 underwent an industry-standard peer-reviewed calibration in its development (Faunt et al., 2024) that assessed its accuracy by comparing simulated hydrologic conditions with observed field data. The observed datasets utilized during the calibration process included groundwater levels, changes in groundwater levels (including drawdowns and trends), land subsidence and compaction, streamflow, and drain flow. Calibration efforts aimed to align simulated conditions with general trends across all groundwater-level altitudes, changes in groundwater levels, land subsidence, and streamflow losses, rather than focusing on matching individual hydrographs, land subsidence records, or streamflow losses. These broader comparisons between simulated and observed values served to ensure that the simulation accurately captured the historical responses of the regional hydrologic system to various stresses across the entirety of the Central Valley.

While USGS-CVHM2 provides a sufficiently good representation of regional conditions for GSP development, it needs further improvement for Basin-wide policy development, estimation of P/MA benefit, and assessing the likelihood of sustainability under the developed sustainable management criteria (SMC). Due to focused calibration based on wells and subsidence locations with long-term data expected to represent historical hydrology, groundwater levels in the Basin in both aquifers are overestimated during the historical baseline. In addition, the subsidence rate and extent are slightly overestimated within the Basin compared to the InSAR data published by DWR and Nasa JPL (2021) and DWR (2023) for the period after WY 2015. Furthermore, average surface water delivery in the Basin for the historical baseline was slightly underrepresented, leading to overestimation of groundwater pumping in both aquifers. The overestimation of groundwater pumping is primarily allocated to the Lower Aquifer at most locations within the Basin, likely to cause the overestimation of subsidence rates and extent.

Due to the general overestimation of groundwater levels in both aquifers, GSAs decided to fine-tune local representation in the Model by making selective adjustments to aquifer parameters and improving local representation of surface water delivery and groundwater pumping.

4.1 Parameter and Observation Data Subset

Adjustments to surface water delivery and groundwater pumping in the Basin slightly improved the simulation of groundwater levels in the CVHM2 model compared to USGS-CVHM2. However, further refinements were necessary to address the general overestimation of groundwater levels in the Basin.

These adjustments in CVHM2 were applied to a selected subset of wells that accurately represent local groundwater levels. Adjustments focused on a few specific aquifer parameters to limit the scope of model refinement and avoid significant changes to the simulated regional hydrogeology. Although the primary goal was to improve groundwater level simulations within the Basin, a few observation wells outside the

Basin's boundary were included to constrain the modifications and ensure a reasonable simulation of boundary conditions.

The final subset of observation wells used for aquifer parameter adjustment included 32 representative monitoring wells (RMWs) within the Basin, providing sufficient spatial coverage across both aquifers. Additionally, 16 monitoring wells outside the Basin were used to constrain parameter changes, ensuring accuracy for both aquifers. Figure 4 shows the distribution of these observation wells. Historical groundwater elevation data collected from the observation wells through the Basin were used for verification, focusing on the evaluation period (WY 2003-2023).

To avoid unreasonable and unjustified changes in regional hydrogeologic simulation compared to USGS-CVHM2 but maximize the improvements to Basinwide representation of groundwater levels, a select subset of aquifer parameters (scaling factors), shown in Table XX, was adjusted in the Multiplier File (MULT) using UCODE_2014 Program (Poeter et al., 2014). The final subset was limited to scaling the hydraulic conductivity of the aquifer in different adjustment zones. However, the initial subset included storage parameters as well that showed to be relatively insensitive compared to hydraulic conductivities.

To maintain hydrogeologic consistency, scaling factors were refined within eight adjustment zones defined within and outside the Basin for Upper and Lower Aquifers (sixteen total adjustment zones). These refinements were done on a percent change basis from the USGS-CVHM2 parameter values and were applied consistently to selected model layers defined within each aquifer.

Table 3. Scaling factors used to adjust the hydraulic conductivity of aquifers in different adjustment zones.

Scaling Factors	Number of Adjustment Zones for Each Aquifer	Application in CVHM2	Range of Scaling Factor
Hku (Upper Aquifer Hydraulic Conductivity Multiplier Factor)	8	Changes (multiplies) “HK” parameters defined in Upstream Weighting Package (UPW) consistently for Upper Aquifer (Layers 1-8)	0.007 – 22.500
Hkl (Lower Aquifer Hydraulic Conductivity Multiplier Factor)	8	Changes (multiplies) “HK” parameters defined in UPW consistently for Lower aquifer (Layers 9-13)	0.004 – 1.000

4.2 Model Adjustment Results

4.2.1 Improved Simulated Groundwater Levels

Resulting changes to the aquifer parameters, surface water delivery, and groundwater pumping in the Model led to a general improvement in its groundwater level simulation. The Root Mean Square Error (RMSE) of the selected subset was reduced by 17%. A scatter plot of calculated vs. observed groundwater levels is shown in **Figure 3**. The scatter plot shows a fairly equal distribution of points above and below the 1:1 line. Hydrographs of groundwater levels simulated and observed at the selected subset of wells are also provided in **Attachment A** to this report, confirming the overall improvement.

A review of groundwater levels during model verification indicates that CVHM2 still tends to overestimate or underestimate groundwater level elevations at different RMWs. Additional data collection and model updates described in **Section 6** will be important in updating and improving the model calibration in the future.

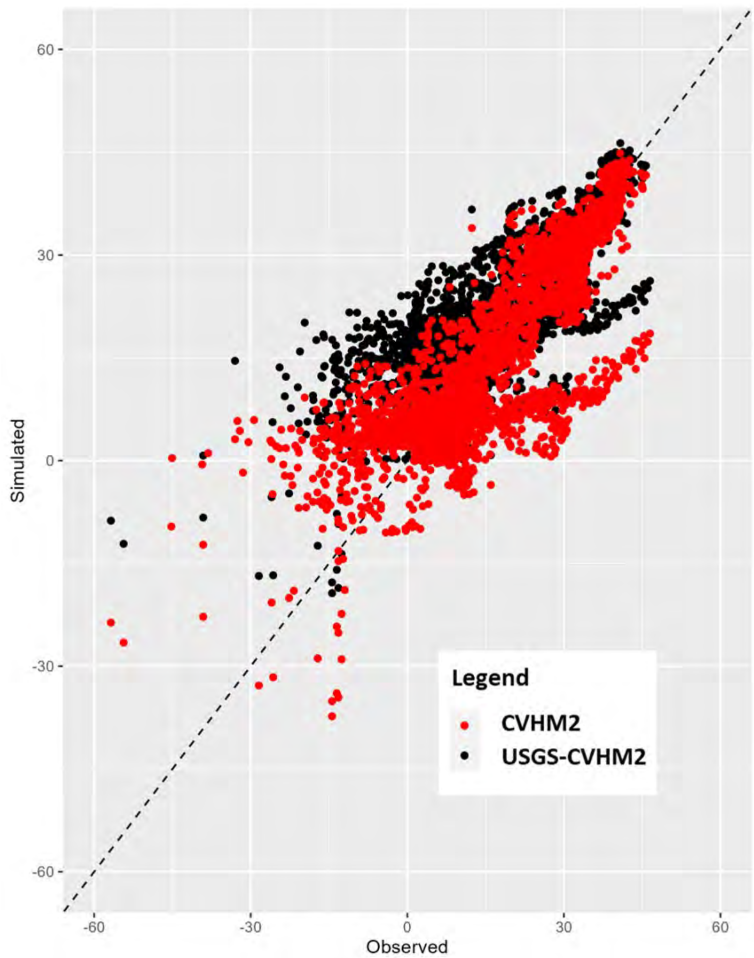

Figure 3. Comparison of simulated vs. observed groundwater levels in the USGS-CVHM2 and CVHM2.

4.2.2 Local Subsidence Overestimation

The subsidence and aquifer-system compaction (SUB) package is used to simulate the drainage, changes in groundwater storage, and compaction of aquifers, interbeds and confining units that constitute an aquifer system. SUB simulates delays in the release of groundwater from interbed storage, and delays in subsidence. Subsidence is calculated by differentiating elevation measurements derived from geodetic surveys, continuous GPS (CGPS), and Interferometric Synthetic Aperture Radar (InSAR) techniques.

As the original USGS-CVHM2 overestimates groundwater level conditions within the Basin, local calibration of aquifer properties was performed to adjust Model-simulated groundwater levels to better match observed groundwater levels. The general lowering of simulated groundwater levels triggered the pre-consolidation heads used in USGS-CVHM2 and resulted in earlier increases in subsidence in the

Model. This leads to overestimation of subsidence in the Basin during the historical and current periods (WY 2003-2023).

However, as the Model progresses into projected periods, USGS-CVHM2 simulated water levels continue to decrease below pre-consolidation heads. As a result, USGS-CVHM2 subsidence estimates increase and eventually become greater than the subsidence simulated by the Model. **Figure 4** shows an example of this phenomenon under the baseline 2030 Central Tendency Climate Change Scenario discussed in **Section 5.3**. The comparison between the simulated water release caused by subsidence, which directly correlates with the rate and extent of subsidence in the Lower Aquifer, indicates less subsidence during the historical period (WY1961-2023) and greater subsidence during the projected period (WY2024-2073) for USGS-CVHM2 compared to the Model.

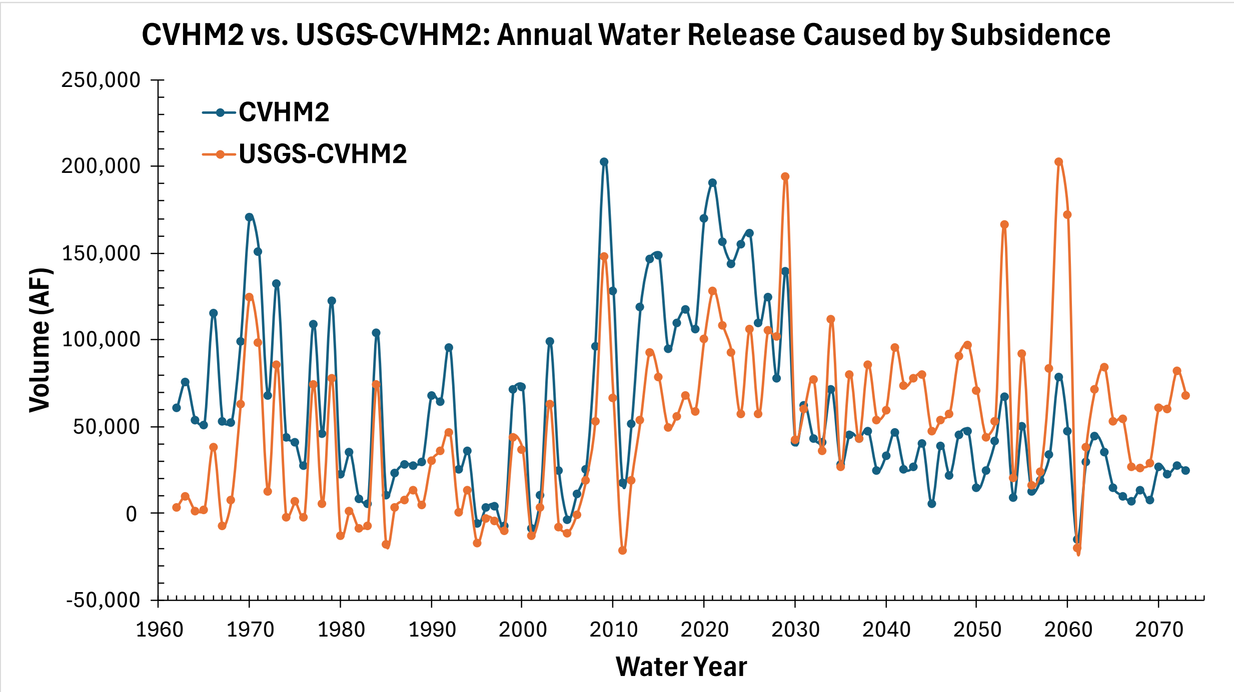

Figure 4. Comparison of simulated water release caused by subsidence, a direct indicator of rate and extent of simulated subsidence in the Basin, between tUSGS-CVHM2 and CVHM2.

5 WATER BUDGET RESULTS

Water budget provides an accounting of the total annual volume of water entering and leaving the Basin for historical, current and projected future conditions. The integrated Model is used to evaluate water budget conditions within the Basin. The water budgets are presented for two interconnected water budget systems quantified by the Model: (1) land-surface water system and (2) groundwater system within the Basin. The water budgets are developed and presented following the terminology and methodology proposed by the Best Management Practice published by DWR (2016) and *Handbook for Water Budget Development With or Without Models* (DWR, 2020).

To generate the land-surface water system results, a combination of Farm Budget Output and SFR Budget Output files was used. Groundwater budgets were generated by post-processing Zonebudget outputs for zones defined for each aquifer and bounded by the Basin boundary. Water budgets are provided for historical (WY 2003-2018), current (WY 2019-2023), and projected periods (WY 2024-2073). The projected period also encompasses all climate change and P/MA scenarios. Justification for using these identified periods and the development of the projected period are further detailed in Section 9 of the Groundwater Sustainability Plan (GSP).

5.1 Water Budget Components

5.1.1 Land-Surface Water System Inflows and Outflows

The land-surface water system budget represents the total amount of water entering and leaving the Basin on the ground surface. The land-surface water system inflows to the Basin include precipitation, stream inflow, stream-groundwater interaction inflow, and applied water, including groundwater extraction and surface water delivery and diversion. Land-surface water system outflows include evapotranspiration, infiltration, stream outflow, and stream-groundwater interaction outflow.

Precipitation

Precipitation on lands within the Basin contributes to the overall land-surface water system budget. Total precipitation across the Basin was estimated based on the USGS BCMv8 (Flint et al., 2021). Precipitation falling on the Basin either becomes surface water runoff that is channeled to nearby drainages and streams or wets the near-surface soil. Water in near-surface soil either evaporates or continues to infiltrate into the subsurface, where it can be consumed by agricultural crops and natural vegetation or continues to percolate downwards to the groundwater table.

Evapotranspiration

The largest outflow from the land-surface water system is evapotranspiration (consumptive use) by crops. The USGS BCMv8 evapotranspiration data were utilized to estimate the consumptive use of water in the Basin, including agricultural uses and direct evaporation from surface water bodies and phreatophytes (i.e., groundwater dependent ecosystems [GDEs]) (Flint et al., 2021).

Stream Inflow and Outflow

The primary natural surface water features in the Basin are the San Joaquin River and its tributaries (**Figure H-2**). The San Joaquin River flows northward along the eastern edge of the Basin. Although it forms the boundary of the Basin in most of its extent, inflow to and outflow from the San Joaquin River is accounted for in calculation of stream inflow and outflow for the land surface water system budget. The calculation also includes exchanges of flows with rivers and tributaries that flow into the San Joaquin River or branch out of it (i.e. Merced River, Kings River, etc.)

Portions of precipitation falling on the Basin and applied water that runs off to nearby drainage become surface water runoff that is channeled to nearby drainages and streams, contributing to stream outflows. Several factors influence the rate and volume of surface water runoff, including the intensity and duration of precipitation, soil type and infiltration capacity, slope of the land, land use and land cover, and the presence of impervious surfaces like pavement or buildings.

Return flow from applied water also contributes to stream outflows from the Basin. Applied water is apportioned into consumptive use (i.e., evapotranspiration or ET) by crops and evaporation from land surface, infiltration past root zone, and runoff and interflow commonly referred to as return flow. Return flow is calculated as a fixed percentage of the total applied water in the Model, a common assumption used in most modeling platforms.

Delivery canals and major diversion structures such as the Delta Mendota Canal and California Aqueduct are also simulated in the model. The inflow and outflow from these canals are included in calculation of the stream inflow and outflow from the Basin.

Applied Water

Applied water is water directly applied to agricultural crop lands for irrigation use and related cultural practices. Applied water includes surface water delivery and diversions, and groundwater pumping used to meet remaining ET demands.

Stream – Groundwater Interactions

Flows within creeks, streams, and rivers can seep to the underlying groundwater system (i.e., a losing stream condition). Alternatively, groundwater can seep into the surface water feature (i.e., a gaining stream condition). Therefore, leakage signifies a loss of streamflow to groundwater and seepage signifies a gain of streamflow from groundwater. Stream-groundwater interaction is calculated by the Model based on stream stage, assumed streambed properties, and the surrounding Model-calculated groundwater levels. Stream stage is calculated by the Model based on specified stream channel properties, as described above.

Infiltration

The portion of precipitation and applied water that is neither consumptively used by plants via ET or returned as runoff or return flow to surface water channels percolates past the root zone to recharge groundwater aquifer. This component is calculated by the Model.

Change in Land-Surface Water System Storage

Land-surface water system inflow into the Basin is primarily driven by precipitation, stream inflow, stream-groundwater interaction inflow, and applied water, including groundwater extraction and surface water delivery and diversion. Land-surface water system outflow includes evapotranspiration, infiltration, stream outflow, and stream-groundwater interaction outflow. The differences between the land-surface water system inflow and the land-surface water system outflow are the changes in land-surface water system storage.

5.1.2 Groundwater System Inflows and Outflows

The groundwater system budget represents the total amount of water entering and leaving the groundwater system within the Basin. Inflows to the groundwater system include groundwater recharge, including recharge of precipitation, applied water, and artificial recharge, subsurface inflows from Basin boundaries or adjacent principal aquifers and aquitards, inflows from stream-groundwater interaction, and water released from storage caused by subsidence. Groundwater system outflows include groundwater extraction, subsurface outflows across Basin boundaries and to adjacent principal aquifers/aquitards, stream-groundwater interaction outflows to the stream network, and losses from the unsaturated zone caused by evapotranspiration and drains. The difference between groundwater inflows and outflows represents the “net change in groundwater storage”.

Groundwater Recharge

Groundwater recharge includes recharge of precipitation, applied water, or artificial recharge. Portions of excess precipitation and applied water infiltrate into the ground and replenish the groundwater system.

Losses from Unsaturated Zone

Losses from unsaturated zone include evaporation and drain outflow from shallow groundwater in areas of shallow groundwater conditions and drains. This primarily occurs in areas that support GDEs and where drains are installed due to shallow groundwater levels. Losses from the unsaturated zone are estimated by the Model based on unsaturated zone ET estimations under FMP package and defined drain heads and estimated groundwater heads under its Drain Return Package (DRT).

Subsurface Inflow and Outflow from Basin Boundaries

Subsurface inflow refers to the movement of groundwater from outside the Basin boundaries into the Basin and leakage from adjacent principal aquifers/aquitards, and subsurface outflow refers to the movement of groundwater from within the Basin to areas outside of the Basin and leakage outflow to adjacent principal aquifers/aquitards. Subsurface inflow and outflow are calculated by the Model based on estimated groundwater elevations and defined aquifer properties and are highly dependent on Model assumptions regarding conditions in the adjacent subbasins

Stream-Groundwater Interaction

Stream-groundwater interaction is estimated using stream stage, assumed streambed properties, and surrounding groundwater levels determined by the Model. Leakage of streamflow from creeks, streams, and rivers to groundwater and seepage of groundwater into surface water bodies affect the available water supply within the Basin and can have considerable impacts on the change in groundwater storage calculated Basin-wide. Stream-groundwater interaction is estimated primarily by the Model through stream properties and parameters defined in the Streamflow Routing Package (SFR), including inflow at headwaters (Traum et al., 2024).

Groundwater Extraction

Groundwater extraction is the process of withdrawing water from the underlying aquifers through wells, pumps, and other infrastructure. Methods used by the Model to calculate agricultural, municipal, and domestic pumping are described in **Section 3.3**.

Change in Groundwater Storage

Inflows to the groundwater system comprise groundwater recharge, including recharge of precipitation, applied water, or artificial recharge, subsurface inflow from Basin boundaries or adjacent principal aquifers and aquitards, inflow from stream-groundwater interaction, and water release caused by subsidence. Groundwater system outflows are primarily driven by groundwater extraction, subsurface outflow across Basin boundaries and to adjacent principal aquifers/aquitards, stream-groundwater interaction outflow to the stream network, and losses from the unsaturated zone caused by evapotranspiration and drains. The difference between groundwater inflows and outflows represents the net change in groundwater storage. The change in groundwater storage is calculated by the Model by solving the groundwater flow equation. A positive change in storage indicates an increase in groundwater storage and a negative change in storage indicates a decrease in groundwater storage.

Water Release Caused by Subsidence

Water release caused by subsidence refers to water released to an aquifer on a one-time basis as a result of land subsidence, which is caused by the inelastic consolidation of porous fine-grained material was estimated by the Model through the Subsidence and Aquifer-System Compaction (SUB) package. The volume of water release caused by subsidence is associated with an equivalent permanent loss of storage capacity in this Basin. This volume is ultimately added to the change in groundwater storage in estimating the Basin overdraft and sustainable yield. As discussed in **Section 4.2.2**, the Model currently generally overestimates the extent of subsidence in the Basin. Therefore, the volume of water release caused by subsidence is also overestimated, leading to conservative estimations of net groundwater storage change and overdraft. Further, sensitivity analysis conducted as part of Model application suggests that as much as 50% of the subsidence (and subsequent loss of storage) simulated within the Basin is caused by pumping in adjacent subbasins. As such, the Basin overdraft attributable to GSA management has been overestimated and the sustainable yield has been underestimated herein.

5.2 Historical and Current Water Budgets

5.2.1 Historical Water Budgets

The Historical water budget for the Basin was estimated using the Model for the period October 2003 through September 2018, which is defined as the Historical Period. Because agricultural water demands, streamflow conditions, surface water supply, and consequently the potential occurrence of overdraft conditions are heavily dependent on water year type, this section provides estimates of average water budget components for each water year type, as well as for the overall 16-year Historical period.

Table H-1 shows the land-surface water system water budget for the Historical period. Land-surface water system inflows are driven by precipitation and surface water delivery, which are both correlated with water year type. The primary driver of outflows from the land-surface water system is evapotranspiration, which is comparably less correlated with water year type. Therefore, groundwater extraction, expected to cover the remainder of the evapotranspiration demand not satisfied by precipitation and surface water delivery, also correlates heavily with water year types, increasing in the drier years and decreasing in the wet and above normal years.

This trend is observed more clearly in the Current water budget due to its more consistent land use definition within the Basin throughout the period. The variability in land use and surface water delivery allocation amounts during the Historical period impacts the relative correlation of groundwater pumping and water year types among years. However, an overall increasing trend in evapotranspiration and groundwater pumping can be observed in the Historical period, indicating growing consumptive use due to the increase in farmed acreage, conversion to crops with higher irrigation demand, and municipal growth.

Table H-2 and **Table H-3** show the groundwater system water budget for the Upper Aquifer and the Lower Aquifer, respectively, for the Historical period. Primary inflows to the groundwater system are groundwater recharge and stream-groundwater interaction inflow, while major outflows include pumping and losses from the unsaturated zone.

The Upper Aquifer receives a net subsurface inflow from the Basin boundary but loses a greater average volume to leakage to the Lower Aquifer, leading to a net subsurface outflow from its boundaries (**Table H-2**). In contrast, the Lower Aquifer loses a net subsurface outflow from the Basin boundary that is smaller than the average volume of water it receives as leakage from the Upper Aquifer. Therefore, the Lower Aquifer shows an average annual net subsurface inflow (**Table H-3**). However, this net subsurface inflow, combined with the relatively small inflows from stream-groundwater interaction and groundwater recharge, is considerably smaller than the total groundwater pumping from the Lower Aquifer, leading to water release caused by subsidence and decrease in groundwater storage.

Based on DWR's San Joaquin Valley WY Hydrologic Classification Index for the 16-year Historical averaging period (WY 2003-2018), the period is characterized by sequences of relatively dry and wet conditions resulting in near-average conditions. The climatic effects are clearly reflected in the water budget, whereby both Upper and Lower Aquifers show consistent increases in storage with wetter conditions and decreases in storage under drier conditions (see **Figure H-4** and **Figure H-5**).

5.2.2 Current Water Budgets

The Current water budget for the Basin was estimated using the Model for the period October 2019 through September 2023, which is defined as the Current period.

As shown in **Table H-1**, the increasing evapotranspiration demand in the Basin during the current period is primarily met through additional groundwater extraction, compared to the historical period. The extreme climatic conditions during the current period highlighted in total precipitation and evapotranspiration cause significant changes in groundwater extraction, stream-aquifer interaction, and stream inflow and outflow.

As shown in **Table H-2**, the total inflow to the Basin's Upper Aquifer during the Current period were greater than during the Historical period. These greater inflows were reflected in all groundwater inflow components, including groundwater recharge, stream-groundwater interaction, and subsurface inflow from the boundaries. Similarly, total outflows from the Basin's Upper Aquifer were greater than during the Historical period, including significantly greater total groundwater extraction. The overall increases in the Upper Aquifer's volumetric groundwater budget terms led to an overall average annual increase in groundwater storage, largely due to the extremely wet years of 2019 and 2023.

Similar to the Upper Aquifer, total inflow and outflow from the Basin's Lower Aquifer were greater during the Current period compared to the Historical period (**Table H-3**). Groundwater extraction and water release caused by subsidence were also greater during the Current period, largely due to the extremely dry period of WY 2020-2022, and the limited recharge of the Lower Aquifer within Basin boundaries.

5.3 Projected Water Budgets

Per the GSP Regulations (23-CCR §354.18(c)(3)), projected water budgets are required to estimate future conditions of water supply and demand within a basin, as well as the aquifer response to GSP implementation over the planning and implementation horizon. The Model was employed to develop projected water budgets that considered updated inputs for climate-driven variables.

5.3.1 Development of 50-Year Analog Period

Per the GSP Regulations 23-CCR §354.18(c)(3)(A), the projected water budgets must use 50 years of historical precipitation, ET, and streamflow information as the basis for evaluating future conditions under baseline and climate-modified scenarios. To develop the required 50 years of projected hydrologic input information, an "analog period" was created by repeating the previous 50 years of historical hydrologic record. Therefore, the hydrology for the projected 50-year analog period is based on the hydrology for the actual years 1973 to 2022. The mapping of actual years to analog years within the required 50-year projected water budget period applies to the precipitation, ET, and streamflow inputs to the Model.

The following scenarios were simulated to represent baseline Basin condition under the assumption that land use and water demand will remain consistent with WY 2023, while climatic data and respective surface water delivery and operations change according to the analog historical years within Central Valley:

1) Projected Baseline;
2) Projected 2030 Central Tendency Climate Change;
3) Projected 2070 Central Tendency Climate Change;
4) Projected 2070 Extreme Dry Climate Change; and,

5) Projected 2070 Extreme Wet Climate Change.

The Projected Baseline scenario is used for comparison purposes and does not include any expected effects of climate change. The DWR 2030 and 2070 Central Tendency Climate Change scenarios are recommended to reflect what might be considered most likely future conditions. However, there is an approximately equal likelihood that actual future conditions will be more stressful or less stressful than those described by the recommended Central Tendency scenarios (DWR, 2018). The DWR 2070 Extreme Dry and Wet Climate Change scenarios enable the exploration of conditions at the bounds of potential future climate change conditions. All five scenarios are used to project the 50-year water budget for the Basin (e.g., WY 2024-2073), and provide insight into the sensitivity of the water budget to uncertainty in future climate conditions.

Section 5.4 presents additional scenarios that simulate the impacts of the well-defined and soon-to-be-activated P/MAs within the Basin. The primary benefits from these P/MAs include water supply augmentation and groundwater pumping reduction, which collectively support the Basin to achieve its Sustainability Goal and avoid Undesirable Results.

5.3.1.1.1 Projected Baseline Scenario

The Projected Baseline scenario is for comparison purposes and does not include any expected effects of climate change. As described below, the Baseline Scenario presents the projected land use and water demands through the GSP implementation period:

- Current (2021) land use.
- Precipitation, ET, stream inflows, and stream diversions from the historical simulation period were repeated in the sequence of analog years.
- For surface water delivery and diversion datasets, a combination of recent water years (i.e., WY 2003-2023) is selected based on the water year type of 1973 to 2022 and the corresponding SJV index to best reflect current status of infrastructure and operations within the Basin.

5.3.1.1.2 Projected Climate Change Scenarios

To estimate potential effects of climate change on the projected water budget, central tendency and extremely dry and wet climate change scenarios were developed using the Climate Period Analysis datasets developed by DWR (DWR, 2018). Modeling of these scenarios was conducted following the Climate Change Data and Guidance Resource Guide published by DWR (DWR, 2018), as follows:

- Precipitation and ET were varied using respective climate change scenario change factors. Basin precipitation and ET were consequently changed, as shown in **Figure 5** and **Figure 6**, respectively.
- Mountain front inflows were varied using respective climate change scenario change factors, while managed stream inflows at reservoirs were adjusted based on CalSim-II results provided.
- Surface water deliveries were varied proportionally to changes resulting from comparing CalSim-II simulations of projected baseline and respective climate change scenarios provided under the same datasets (**Table H-4**).

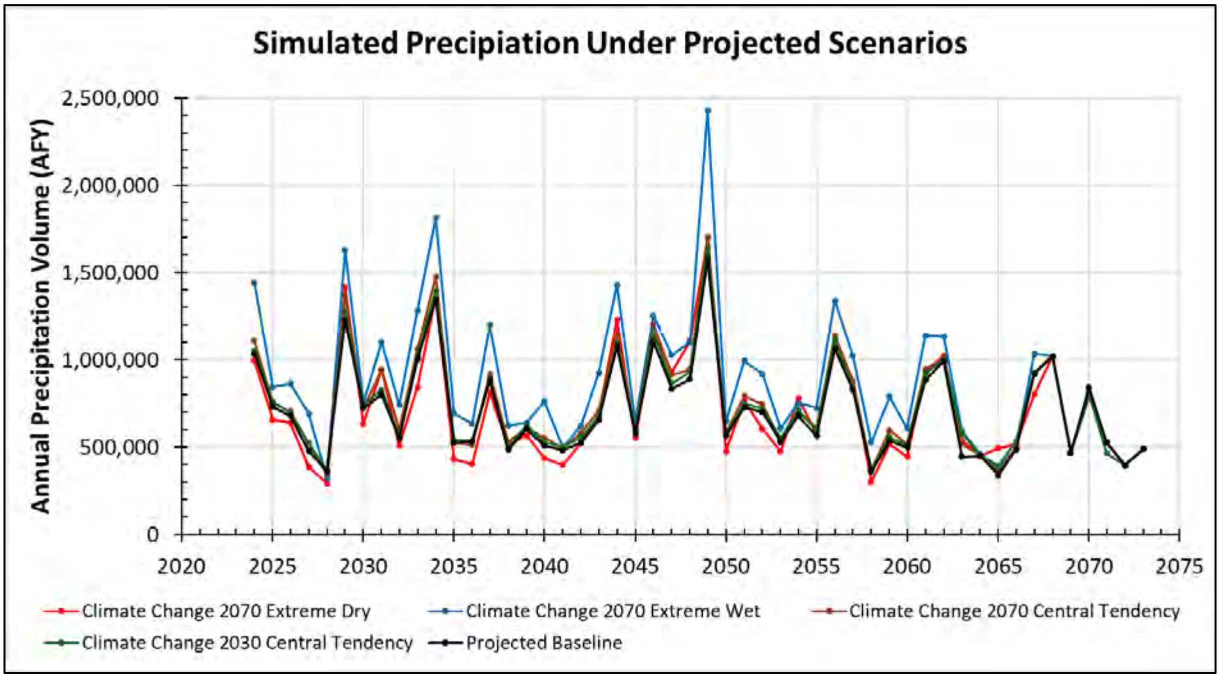

Figure 5. Adjusted precipitation under climate change scenarios and its comparison to the projected baseline.

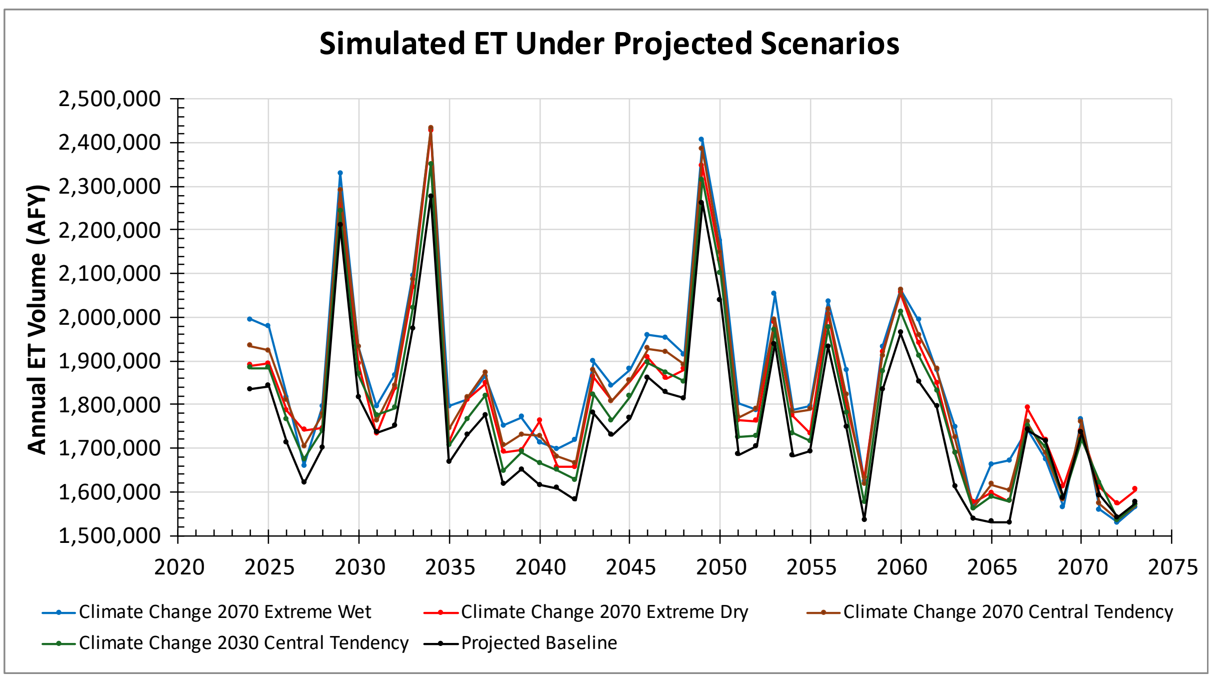

Figure 6. Adjusted ET under climate change scenarios and its comparison to the projected baseline.

5.3.1.1.3 Projected Water Budget Results

Results of the projected water budget analyses are summarized in **Table H-5**, **Table H-6** and **Table H-7**. Due to the Projected Baseline's 50-year averaging period and its better alignment with average hydrologic conditions compared to the Current period, evapotranspiration demand and groundwater extraction during this scenario are less than the Current period (**Table H-5)**. However, both evapotranspiration and groundwater extraction are greater than in the Historical period due to the increased overall demand. Despite minor differences in land surface water system components, the Projected Baseline scenario shows similar trends in its land surface water budget as the Current period, which is reasonably expected due to maintaining the most recent conditions in its simulation.

The Upper Aquifer groundwater budget for Projected Baseline scenario shows a similar average groundwater extraction to the Current period but indicates an overall average annual decrease in its groundwater storage (**Table H-6**). While groundwater recharge remains similar to the Historical period, the comparatively larger groundwater extraction is supplied through increased boundary flow, stream-groundwater interaction, and decreased losses of unsaturated zones due to decreased groundwater levels in the Basin.

Similar to the Upper Aquifer, the Lower Aquifer groundwater budget for the Projected Baseline scenario shows an increase in groundwater extraction compared to the Historical period that better aligns with the Current period (**Table H-7)**. This incremental increase in groundwater extraction is largely offset by increased net boundary inflow to the Basin. While the water release caused by subsidence decreases in average annual volume compared to both the Historical and Current periods, it remains significant and a large portion of the supply source for the Lower Aquifer groundwater extraction. As mentioned in **Section 4.2.2**, water release caused by subsidence, and consequently, the total loss of storage in the Basin, are overestimated due to the overestimation of the rate and extent of subsidence in the Model. It is worth noting that the Projected Baseline scenarios outlined herein, including climate change scenarios, provide a worst-case representation of future conditions in the Basin because they assume the recent and current practices and conditions remain unchanged throughout the 50-year projection (both in the Basin and in the adjacent, hydraulically connected subbasins).

5.3.2 Sensitivity Analysis to Assess Subsidence Caused by Neighboring Basins

To better understand the impact of regional groundwater management on the Basin's conditions, exploratory no-pumping scenarios were generated. By comparing these scenarios to projected conditions ("Business-as-Usual (BAU)"), the specific impacts of groundwater pumping on various SMC, such as subsidence, groundwater levels, groundwater storage, and the depletion of interconnected surface waters (ISWs), were isolated.

As discussed in **Section 4.2.2**, Model generally overestimates the rate and extent of subsidence in the Basin compared to existing data. The subsidence exploratory scenarios were generated by coupling historical, projected, and climate change scenarios with their respective no-pumping scenarios to better understand the proportion of subsidence caused by Basin management. This understanding will help assess the impacts of GSA actions, including its P/MAs on the projected subsidence and overdraft of the Basin.

5.3.2.1 No-Pumping Scenario

The no-pumping scenario was used to evaluate how operations in adjacent basins affect the Basin's groundwater conditions, including groundwater levels, subsidence, groundwater storage, and depletion of ISWs. The no-pumping scenario is generated by removing all groundwater pumping (agricultural, municipal, rural) within the Basin during the respective period of simulation while holding all other conditions consistent and constant.

5.3.2.2 Impacts of Neighboring Basins on Simulated Water Release Caused by Subsidence

As shown in **Table 4**, more than 87% of water release caused by subsidence in the Basin during the historical, current, and evaluation periods will remain even if all groundwater pumping in the Basin is ceased during those periods. This remaining subsidence is primarily due to groundwater management and operations outside the Basin directly impacting Basin conditions as a result of the complex regional hydrogeologic interconnections. A less significant portion of the remaining subsidence may be caused due to delayed subsidence caused prior to ceasing pumping in the Basin.

During the projected period (WY 2024-2073), under all scenarios and including climate change impacts, at least 50% of the water release caused by subsidence will remain even if all groundwater pumping has ceased in the Basin. This is significant for planning and management purposes since it shows even extreme demand management actions may not resolve the subsidence in the Basin if it is not accompanied by similar actions around it by neighboring Basins.

As discussed in **Section 4.2.2**, the overall reduction in total water release caused by subsidence and the corresponding percentage of outside impacts is due to the lowering of groundwater levels as part of the fine-tuning to critical head levels advancing the occurrence of major subsidence.

Table 4. Estimation of water release caused by subsidence resulting from operations outside the Basin.

Scenario	Period	Average Annual Water Release Caused by Subsidence (AFY)		Percent (%) Not Caused by Basin Management
		Business-as-Usual	No-Pumping Scenario	
Historical	WY 2003-2018	-105,000	-92,000	87.6%
Current	WY 2019-2023	-173,000	-154,000	89.0%
Evaluation Period	WY 2003-2023	-121,000	-108,000	89.3%
Projected Baseline	WY 2024-2073 Analog	-98,000	-53,000	54.1%
Projected 2030 Central Tendency Climate Change	WY 2024-2073 Analog with DWR 2030 Climate Change	-109,000	-55,000	50.5%
Projected 2070 Central Tendency Climate Change	WY 2024-2073 Analog with DWR 2070 Climate Change	-123,000	-61,000	49.6%

5.4 Simulation of Projects and Management Actions

The GSAs plan to address the estimated overdraft and reduce groundwater pumping to within the Sustainable Yield by 2040 through implementation of a suite of Projects and Management Actions (P/MAs) that include supply augmentation, demand management, and a Pumping Reduction Plan (PRP) to mitigate overdraft conditions and adaptively avoid Minimum Thresholds (MTs). These P/MAs are further detailed in **Section 15** of the GSP. This section primarily focuses on the methodology used to simulate projected conditions with P/MAs and their projected impact on achieving Basin's Sustainability Goal while considering the simulation and projection uncertainty.

5.4.1 Simulation of Projected Conditions with P/MAs

The Projected Basin condition under the 2030 Central Tendency Climate Change Scenario was used as the basis for the assessment of P/MA impacts. To conduct this simulation the modifications below were made to the Projected 2030 Central Tendency Climate Change Scenario in the Model.

5.4.1.1 Implementation of P/MAs in the Model

The Tier 1, Tier 2 and Tier 3 P/MAs with quantifiable benefits and identified implementation timeline and conditions were directly simulated in the Model to reflect the anticipated location and volume of the associated benefits:

- For recharge projects, the Recharge Package (RCH) was used to directly input the recharge rate and volume expected from the P/MAs to the uppermost Model Layer expected to receive the recharge at the Model Cell(s), corresponding to project locations during the stress periods that align with the projects' implementation timelines.
- For supply augmentation projects, the expected additional supply rate and volumes are added to the appropriate WBS, during the stress periods that align with the projects' implementation timelines. If the source of water supply is diversions from streams, it is simulated as a SRD. Otherwise, water supply augmentation is modeled as NRD.
- For demand reduction and policies impacting groundwater pumping, a representative land use change is implemented in the Model in the area expected to be impacted by the P/MA(s) and during the stress periods that align with the projects' implementation timelines. The same approach was used to simulate the overdraft mitigation component of the PRP. The MT Avoidance components of PRP were not simulated in P/MA scenarios.

5.4.1.2 Projected Conditions in Neighboring Basins under SGMA

To more accurately assess the impacts of P/MAs, it is essential to account for the dynamic interconnection of adjacent basins. To simulate the planned progress under SGMA in neighboring basins, it is assumed that all neighboring basins will achieve their respective 2015 groundwater levels by WY 2040. The 2015 groundwater levels are assumed representative since WY 2015 marks the initiation of SGMA, and it is expected that conditions in neighboring basins will not degrade further under sustainable management. Per SGMA, basins are scheduled to reach sustainable conditions between 2040 and 2042, depending on their respective priorities: critically overdrafted basins by 2040, and high and medium priority basins by 2042.

To represent these conditions in the Model, a constant head boundary was defined using Time-Variant Specified-Head Package (CHD) near the boundary of the Basin. The CHD is set so that groundwater levels around the Basin are linearly adjusted from WY 2024 to reach WY 2015 levels by WY 2040, starting from WY 2023 groundwater levels.

5.4.1.3 Simulated P/MAs and Their Expected Benefits

Table H-8, **Table H-9**, and **Table H-10** present the groundwater budgets for Upper Aquifer, Lower Aquifer, and Basin under 2030 Central Tendency Climate Change scenario with P/MAs for WY 2024-2073. The change in storage and water release caused by subsidence for the equivalent no-pumping scenario (2030 Central Tendency Climate Change scenario with P/MAs with no pumping within Basin for WY 2024-2073) is also included in the tables to estimate the remaining overdraft and subsidence due to Basin management.

As shown in **Table H-8**, the Upper Aquifer is projected not to experience overdraft during the projected period and shows a positive average annual gain in storage and negligible subsidence during WY 2041-2074 (Sustainability Period). The Lower Aquifer and, subsequently the Basin (**Table H-9** and **Table H-10**, respectively), show an overall positive groundwater storage change but remaining water release caused by subsidence during both the projected and sustainability periods. While the summation of change in groundwater storage and water release caused by subsidence in the Basin is negative during the sustainability period, the remaining deficit is comparably negligible and well within the uncertainties of the model in overestimating the extent and rated of subsidence in the Basin (**Figure 7**). Furthermore, any remaining deficit due to subsidence will be addressed through further demand management action under the PRP as part of the MT avoidance components.

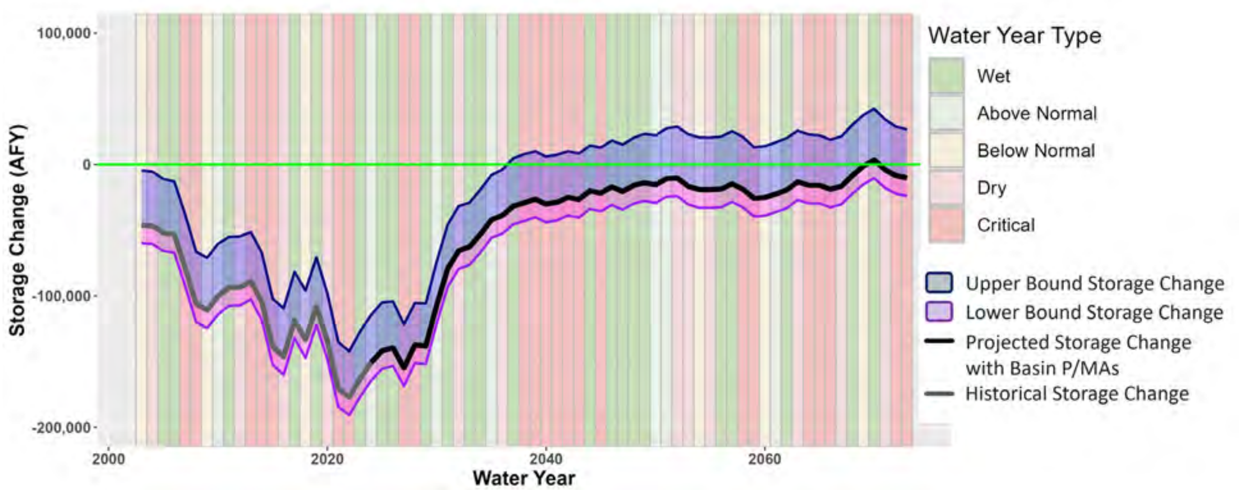

Figure 7. Projected net change in groundwater storage caused by basin, calculated as the summation of change in storage and water release caused by subsidence and its respective variability due to existing sources of uncertainty in the Model.

5.4.1.4 Avoidance of Groundwater Levels Undesirable Results

The simulated 2030 Central Tendency Climate Change Scenario with P/MAs was also used to assess if the Basin will experience a chronic lowering of groundwater levels undesirable results during the implementation period (2024-2040). This was performed by extracting a timeseries of groundwater levels for RMW locations within the Basin with existing data prior to WY 2023 (71 RMWs) and comparing them to the RMW-specific minimum thresholds.

Due to existing uncertainties in the Model regarding the simulation of groundwater levels and its tendency to over- or under-estimate levels at different locations, the change in groundwater levels simulated by the Model was used to extend the most recent observations at RMWs up to WY 2040. For each stress period following the last observation made at an RMW, the change in groundwater levels between those two stress periods, as simulated by the Model at the RMW location, was added to the observed level to calculate the projected groundwater levels. This approach was continued for all subsequent stress periods, using the calculated groundwater level for the previous period as a reference.

Using this methodology and removing the changes caused by operations outside the Basin simulated under the no-pumping scenario, exceedances of minimum thresholds were calculated for the fall of each water year within the implementation period. To assess if undesirable results would be experienced, the number of exceedances was compared to 25% of the assessed RMWs (71 RMWs). As shown in **Figure 8**, the Basin is not projected to experience undesirable results, and the total number of exceedances of minimum thresholds during the implementation period is significantly less than the required 25%, despite the prolonged droughts simulated for WY 2024-2040.

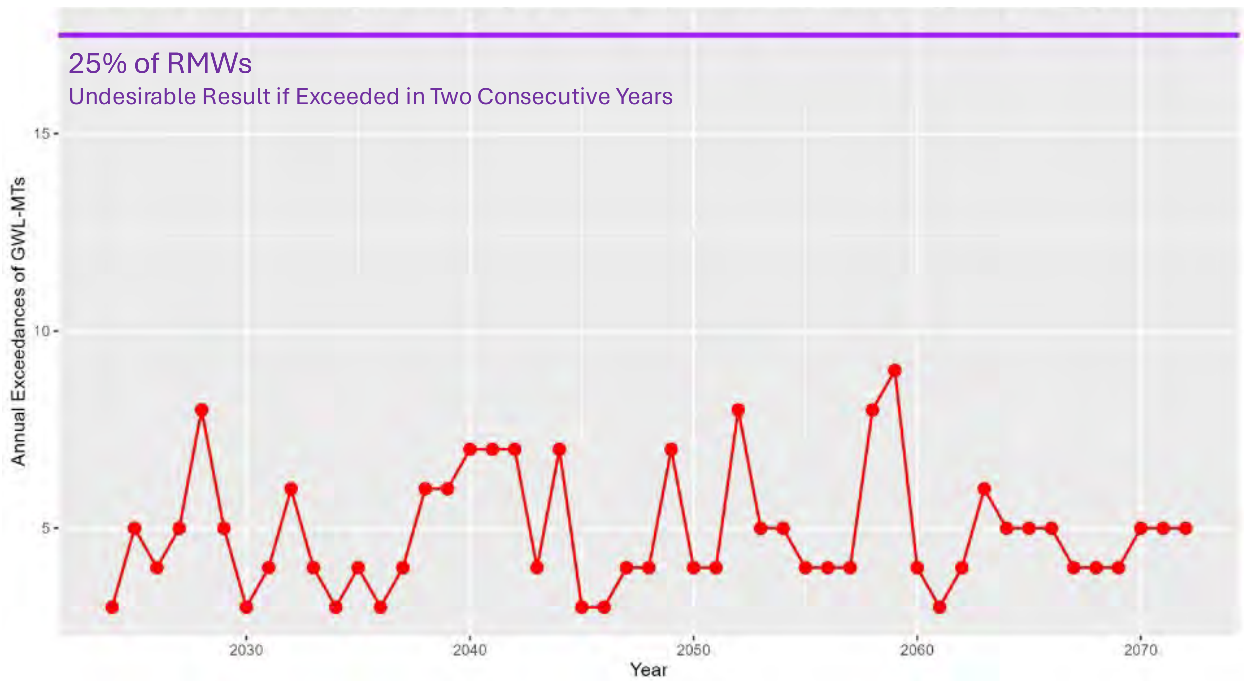

Figure 8. Projection of Chronic Lowering of Groundwater Levels Minimum Threshold Exceedances caused by Basin Management.

6 DATA GAPS, SOURCES OF UNCERTAINTY, AND RECOMMENDATIONS FOR FUTURE WORK

Numerical models are mathematical representations of physical systems. They are limited in their ability to represent physical systems exactly due to limitations in the data inputs and methodologies. There is also an inherent uncertainty in groundwater flow modeling since the mathematical (or numerical) models can only approximate physical systems and have limitations in how they compute results. However, DWR recognizes that although models are not exact representations of physical systems because mathematical depictions are imperfect, they are powerful tools that can provide useful insights (DWR, 2018).

CVHM2 was developed and calibrated using established scientific practices and principles for groundwater flow simulation and calibrated using the best available data within the Basin. Inputs to the models are carefully selected using the best available data, the model's calculations represent established science for groundwater flow, and the model calibration error is within acceptable bounds. As demonstrated by the calibration and verification error statistics summarized above, CVHM2 is improved to represent historical groundwater conditions within the Basin using a set of parameters that are within the range of real-world observations and established scientific principles.

As is the case with any numerical groundwater flow model, CVHM2 is subject to uncertainties and data gaps in hydrogeologic conceptualization (e.g., depth and extent of principal aquifer units and structural features that impact groundwater flow), model parameterization (e.g., aquifer transmitting and storage properties) and calibration data (e.g., historical water level and land subsidence monitoring data), and simulated stresses. Here, “uncertainty” refers to the incomplete understanding of the physical setting, characteristics, and current conditions that significantly affect calculation of simulated water level and land subsidence conditions presented above. “Data gaps” refer to limitations in the spatial coverage of measured data, or periods of time when no data are available. Each of these main categories of uncertainty and/or data gaps contributes to overall uncertainty in the historical and projected model outputs from CVHM2. A summary of the main model limitations is provided in the following subsections.

6.1 Water Use Estimation

Estimation of water use in the Basin, including groundwater pumping and surface water delivery and diversion information, is primarily based on the assumptions and data made available by the GSAs in the development of the CVHM2 (Traum et al., 2024). While water use data have been collected as part of the Annual Report development in the Basin and further supplemented going back to 2003, there is less data accuracy and completeness prior to the implementation of SGMA.

The Model documentation (Traum et al., 2024) indicates that “CVHM2 was designed to portray general characteristics for examining hydrology at a regional scale; CVHM2 was not designed to reproduce every detail of the Central Valley hydrologic system.” Therefore, the GSAs have attempted to fine-tune CVHM2’s representation of surface water delivery and groundwater pumping within the Basin to the extent possible based on the best available data. This fine-tuning was implemented on a subregional scale within the Basin and aimed at improving the periodical average representation of conditions in the Model (Historical and Current period average surface water delivery and pumping). However, local differences and departures can still be observed in annual comparisons of water use between Model representation and existing data. In potential future refinements and calibration of the Model, the GSAs will consider improvements to surface water delivery and groundwater pumping representation in a more detailed and fine-scaled approach.

Most pumping in the Basin is not measured or reported. Groundwater pumping specified in the model relies on estimations by FMP which is based on assumptions and data having inherent uncertainty. Agricultural pumping estimates from FMP could be checked and improved by comparing against metered data from select wells. It is recommended that select wells be identified that several parcels that receive only groundwater irrigation. Meters can be installed on these wells to monitor the volume of water delivered to these parcels and these data can be used to improve the FMP pumping estimates. Furthermore, the definition of wells in MNW2 is based on existing information from well completion reports used in USGS-CVHM2. Groundwater pumping allocated to each principal aquifer relies on this information and cannot be completely validated at this time due to lack of measured data for pumping from each aquifer.

6.2 Aquifer Properties

Groundwater models are heavily reliant on the accurate representation of aquifer properties, which are subject to significant uncertainties. Uncertainties in aquifer properties in USGS-CVHM2 led to significant overestimation of groundwater levels within the Basin. The Model was adjusted to better simulate groundwater level conditions, however uncertainties in subsidence properties led to subsequent overestimation of historical subsidence. To further refine the Model, additional data collection is necessary to increase the density and spatial coverage of field measurements to better capture variability and use geophysical methods to complement traditional data collection techniques. Advanced Geostatistics techniques can also be considered to interpolate properties between measured points and quantify spatial variability and uncertainty.

6.3 Spatial Discretization

The Model has a grid dimension of 1-mile by 1-mile, which can lead to loss of details in representing the heterogeneity of the aquifer systems. Key features such as small-scale variations in hydraulic conductivity, localized recharge, and small water bodies may be averaged out or missed entirely, resulting in less accurate predictions and representations of groundwater conditions within the Basin. Model boundary conditions can also be compromised with a larger grid. Detailed features such as rivers, lakes, and streams might not be accurately represented if they are smaller than or comparable to the grid cell size, which can lead to incorrect estimation of recharge and runoff rates.

6.4 Subsidence Modeling

As discussed in **Section 4.2.2**, the Model is currently overestimating subsidence within the Basin. This may result from less accuracy in SUB parameters, including the inelastic and elastic storage parameters and uncertainties in the preconsolidation heads that trigger subsidence. Lack of observed subsidence datasets further increases the challenges to improve the Model to better represent subsidence conditions within the Basin. Additional geotechnical surveys, remote sensing, and monitoring can be helpful to increase better coverage of subsidence within the Basin, which can be used to regularly update the Model as new data becomes available to refine predictions and reduce uncertainties. By addressing these uncertainties through comprehensive data collection, advanced modeling techniques, and continuous monitoring, subsidence models can be made more reliable, providing better tools for managing and mitigating the risks associated with ground subsidence.

6.5 Subsurface Flow

Groundwater conditions in the Basin are also dependent on conditions outside the Basin. As shown in **Section 5.3.2.2**, through the comparisons with no-pumping scenarios, a considerable part of storage loss within the Basin is caused by groundwater operations outside Basin boundaries. It is essential for the Basin to collectively work with adjacent management areas to ensure there is a net balance in subsurface flow between the Basin and adjacent basins to ensure sustainability.

6.6 Model Representation of Conditions Outside the Basin

Due to the hydrogeologic interconnection of the Basin to its neighboring subbasins and the significant impact of subregional conditions on Basin groundwater levels, boundary flows, stream-groundwater interaction, and subsidence, the projection of the Basin’s future conditions is necessarily incomplete without more accurately representing the changes occurring outside of the Basin boundary. Such changes are currently infeasible to implement since all neighboring subbasins are in their early years of SGMA implementation. Understanding this significant source of uncertainty, the GSAs have used the Model results to bookend potential future conditions, understand the impacts of pumping outside of the Basin on conditions (water levels and subsidence) within the Basin, and assess their P/MA effectiveness. As progress is made and more data and information become available from the surrounding subbasins, the representation of Basin conditions and projected future conditions within the Model can be improved.

6.7 Projection Uncertainty

Projection of Basin conditions is highly dependent on the arrangement of historical years and the corresponding climate conditions, as discussed in **Section 5.3.1**. The 50-year analog period was designed to follow regulation requirements and represent near-average conditions. The arrangement of analog years can vary within the 50-year period but still represent the same average conditions. However, the arrangement of years and the sequence of water year types impact projected conditions during the implementation period (WY 2024-2040) and the projected period (WY 2024-2073), used as the basis for planning and management in this GSP. While the GSP primarily relies on periodical averages and consistently conservative assumptions for planning and management to prepare for worst-case scenarios, these sources of uncertainty should be considered within the context of adaptive management and improved as feasible in the future.

Furthermore, sensitivity analysis using the Model indicates a highly integrated and interrelated hydrogeology between the Basin and its neighboring groundwater subbasins. Therefore, projection of future conditions incorporates significant uncertainty stemming from groundwater management and unknown conditions in those subbasins. The GSP attempts to make conservative assumptions in its water budget estimation by assuming the continuation of current conditions in the Basin and all its neighboring subbasins during the projected period. While the assumption will direct Basin management towards planning for a near worst-case scenario of loss in storage and subsidence, it is expected that conditions around the Basin will progress positively under SGMA and, in turn, help with progress in the Basin. This assumption should be considered in the evaluation of management decisions under this GSP and improved in the future as more information becomes available.

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Tables

Table H-1: Annual Land Surface Water System Inflows and Outflows

Water Year (Oct - Sep)	Water Year Type	INFLOWS (AFY)						OUTFLOWS (AFY)					Change in Storage (AFY)
		Precipitation	Surface Water Delivery	Applied Water		Stream-Groundwater Interaction Inflow	Total Inflows	Evapotranspiration	Stream Outflow	Infiltration	Stream-Groundwater Interaction Outflow	Total Outflows	
				Groundwater Extraction	Stream Inflow								
Historical Water Budget (WY 2003 - 2018)													
2003	Below Normal	681,000	1,481,000	389,000	3,564,000	40,000	6,153,000	1,594,000	4,112,000	367,000	80,000	6,153,000	0
2004	Dry	565,000	1,387,000	308,000	3,699,000	28,000	5,988,000	1,271,000	4,308,000	333,000	76,000	5,988,000	0
2005	Wet	1,062,000	1,336,000	248,000	6,928,000	202,000	9,775,000	1,586,000	7,726,000	377,000	86,000	9,775,000	0
2006	Wet	831,000	1,408,000	297,000	10,670,000	157,000	13,362,000	1,534,000	11,400,000	337,000	91,000	13,362,000	0
2007	Critical	355,000	1,288,000	365,000	3,672,000	40,000	5,720,000	1,284,000	4,117,000	242,000	77,000	5,720,000	0
2008	Critical	537,000	1,157,000	448,000	3,206,000	59,000	5,407,000	1,306,000	3,523,000	499,000	79,000	5,407,000	0
2009	Below Normal	491,000	1,233,000	632,000	2,474,000	22,000	4,854,000	1,669,000	2,599,000	515,000	71,000	4,854,000	0
2010	Above Normal	875,000	1,486,000	466,000	3,598,000	133,000	6,558,000	1,813,000	4,105,000	559,000	81,000	6,558,000	0
2011	Wet	991,000	1,375,000	300,000	10,911,000	208,000	13,785,000	1,676,000	11,639,000	382,000	88,000	13,785,000	0
2012	Dry	442,000	1,359,000	347,000	3,658,000	81,000	5,887,000	1,419,000	4,057,000	338,000	73,000	5,887,000	0
2013	Critical	457,000	1,198,000	421,000	2,735,000	87,000	4,898,000	1,337,000	3,024,000	456,000	81,000	4,898,000	0
2014	Critical	331,000	1,220,000	513,000	1,515,000	89,000	3,668,000	1,455,000	1,802,000	348,000	63,000	3,668,000	0
2015	Critical	489,000	1,227,000	501,000	3,249,000	63,000	5,530,000	1,427,000	3,573,000	461,000	69,000	5,530,000	0
2016	Dry	918,000	1,233,000	388,000	4,779,000	73,000	7,390,000	1,635,000	5,193,000	486,000	76,000	7,390,000	0
2017	Wet	1,004,000	1,501,000	428,000	17,444,000	240,000	20,616,000	1,664,000	18,283,000	573,000	96,000	20,616,000	0
2018	Below Normal	465,000	1,426,000	512,000	7,708,000	96,000	10,208,000	1,522,000	8,265,000	342,000	79,000	10,208,000	0
AVERAGE		**656,000**	**1,332,000**	**410,000**	**5,613,000**	**101,000**	**8,112,000**	**1,512,000**	**6,108,000**	**413,000**	**79,000**	**8,112,000**	**0**
%		**8%**	**16%**	**5%**	**69%**	**1%**		**19%**	**75%**	**5%**	**1%**		
Current Water Budget (WY 2019 - 2023)													
2019	Wet	835,000	1,242,000	455,000	10,877,000	188,000	13,597,000	1,695,000	11,377,000	445,000	80,000	13,597,000	0
2020	Dry	537,000	1,228,000	636,000	4,676,000	81,000	7,158,000	1,681,000	4,937,000	455,000	85,000	7,158,000	0
2021	Critical	396,000	1,221,000	606,000	1,514,000	56,000	3,793,000	1,547,000	1,739,000	436,000	71,000	3,793,000	0
2022	Critical	491,000	1,224,000	578,000	1,650,000	119,000	4,064,000	1,590,000	1,967,000	441,000	66,000	4,064,000	0
2023	Wet	1,020,000	1,334,000	544,000	18,607,000	245,000	21,751,000	1,759,000	19,304,000	604,000	84,000	21,751,000	0
AVERAGE		**656,000**	**1,250,000**	**564,000**	**7,465,000**	**138,000**	**10,072,000**	**1,654,000**	**7,865,000**	**476,000**	**77,000**	**10,072,000**	**0**
%		**7%**	**12%**	**6%**				**16%**	**78%**	**5%**			

Abbreviations

AFY = acre-feet per year

WY = Water Year

Notes

(a) Applied water includes imported surface water, diverted water from streams, and groundwater

(b) Stream inflow and outflow incorporate all flows simulated as part of the Model's Streamflow Routing Package (SFR), including flows simulated in San Joaquin River, California Aqueduct, and Delta Mendota Canal. Although San Joaquin River forms the boundary of the Basin, it is included in the calculation of stream inflow and outflow to the Basin and accounts for streamflow received from streams outside of the Basin, such as Merced and Kings River.

(c) Change in storage is calculated as the difference between inflows and outflows and is negligible in Land Surface Water Budget

(d) All numbers shown are rounded to the nearest 1,000. Summation of terms may have negligible departures due to rounding errors.

Table H-2. Annual Summary of Inflows and Outflows from the Upper Aquifer Groundwater System

Water Year (Oct - Sep)	Water Year Type	INFLOWS (AFY)				OUTFLOWS (AFY)					Change in Groundwater Storage	Water Release Caused By Subsidence	Cumulative Change in Groundwater Storage
		Groundwater Recharge	**Stream-Groundwater Interaction Inflow**	**Subsurface Groundwater Inflow**	**TOTAL INFLOWS**	**Groundwater Extractions**	**Losses from Unsaturated Zones**	**Stream-Groundwater Interaction Outflow**	**Subsurface Groundwater Outflow**	**Total Outflows**			
Historical Water Budget (WY 2003 - 2018)													
2003	Below Normal	304,000	33,000	151,000	488,000	246,000	109,000	80,000	157,000	592,000	-96,000	-8,000	-96,000
2004	Dry	287,000	24,000	144,000	455,000	220,000	87,000	76,000	146,000	530,000	-78,000	3,000	-174,000
2005	Wet	322,000	191,000	141,000	654,000	180,000	120,000	86,000	142,000	528,000	126,000	0	-48,000
2006	Wet	281,000	150,000	146,000	577,000	215,000	110,000	91,000	158,000	574,000	6,000	-3,000	-42,000
2007	Critical	201,000	39,000	146,000	386,000	253,000	66,000	77,000	150,000	546,000	-154,000	-6,000	-196,000
2008	Critical	435,000	51,000	152,000	638,000	287,000	101,000	79,000	167,000	634,000	9,000	-5,000	-187,000
2009	Below Normal	443,000	19,000	172,000	634,000	351,000	109,000	71,000	187,000	719,000	-71,000	-14,000	-258,000
2010	Above Normal	481,000	122,000	170,000	773,000	268,000	134,000	81,000	205,000	688,000	87,000	-2,000	-171,000
2011	Wet	327,000	196,000	162,000	685,000	214,000	122,000	88,000	198,000	621,000	62,000	2,000	-109,000
2012	Dry	285,000	79,000	143,000	507,000	236,000	88,000	73,000	182,000	580,000	-68,000	-5,000	-177,000
2013	Critical	392,000	83,000	151,000	625,000	275,000	102,000	81,000	204,000	662,000	-30,000	-7,000	-207,000
2014	Critical	302,000	88,000	169,000	560,000	310,000	78,000	63,000	209,000	660,000	-95,000	-5,000	-302,000
2015	Critical	403,000	60,000	172,000	634,000	318,000	84,000	69,000	217,000	688,000	-50,000	-4,000	-352,000
2016	Dry	427,000	70,000	159,000	655,000	259,000	93,000	76,000	213,000	641,000	16,000	-2,000	-336,000
2017	Wet	513,000	228,000	179,000	920,000	255,000	162,000	96,000	220,000	733,000	192,000	-5,000	-144,000
2018	Below Normal	294,000	94,000	169,000	557,000	294,000	91,000	79,000	208,000	672,000	-111,000	-4,000	-255,000
AVERAGE		**356,000**	**96,000**	**158,000**	**609,000**	**261,000**	**104,000**	**79,000**	**185,000**	**629,000**	**-16,000**	**-4,000**	
%		**58.5%**	**15.8%**	**25.9%**		**41.5%**	**16.5%**	**12.6%**	**29.4%**				
Current Water Budget (WY 2019 - 2023)													
2019	Wet	398,000	179,000	180,000	757,000	283,000	120,000	80,000	213,000	696,000	64,000	-3,000	64,000
2020	Dry	395,000	77,000	200,000	672,000	375,000	96,000	85,000	243,000	799,000	-122,000	-5,000	-58,000
2021	Critical	383,000	53,000	186,000	622,000	350,000	86,000	71,000	228,000	735,000	-101,000	-12,000	-159,000
2022	Critical	389,000	117,000	195,000	701,000	343,000	82,000	66,000	237,000	729,000	-24,000	-4,000	-183,000
2023	Wet	535,000	232,000	199,000	966,000	295,000	153,000	83,000	240,000	771,000	198,000	-3,000	15,000
AVERAGE		**420,000**	**132,000**	**192,000**	**744,000**	**329,000**	**107,000**	**77,000**	**232,000**	**746,000**	**3,000**	**-6,000**	
%		**56.5%**	**17.7%**	**25.8%**		**44.1%**	**14.3%**	**10.3%**	**31.1%**				

Abbreviations

AFY = acre-feet per year

WY = Water Year

Notes

(a) Change in storage is calculated as the difference between inflows and outflows

(b) All numbers shown are rounded to the nearest 1,000. Summation of terms may have negligible departures due to rounding errors.

(c) Water release caused by subsidence is generally overestimated in the Model due to local overestimations of subsidence rates and extent.

Table H-3. Annual Summary of Inflows and Outflows from the Lower Aquifer Groundwater System

Water Year (Oct - Sep)	Water Year Type	INFLOWS (AFY)				OUTFLOWS (AFY)					Change in Groundwater Storage	Water Release Caused By Subsidence	Cumulative Change in Groundwater Storage
		Groundwater Recharge	Stream-Groundwater Interaction Inflow	Subsurface Groundwater Inflow	TOTAL INFLOWS	Groundwater Extractions	Losses from Unsaturated Zones	Stream-Groundwater Interaction Outflow	Subsurface Groundwater Outflow	Total Outflows			
Historical Water Budget (WY 2003 - 2018)													
2003	Below Normal	4,000	7,000	625,000	635,000	143,000	0	0	635,000	777,000	-10,000	-132,000	-10,000
2004	Dry	2,000	5,000	612,000	619,000	88,000	0	0	564,000	652,000	-5,000	-28,000	-15,000
2005	Wet	3,000	10,000	612,000	625,000	67,000	0	0	552,000	620,000	2,000	3,000	-13,000
2006	Wet	2,000	7,000	619,000	627,000	82,000	0	0	566,000	648,000	-5,000	-16,000	-18,000
2007	Critical	1,000	1,000	624,000	626,000	111,000	0	0	572,000	684,000	-14,000	-44,000	-32,000
2008	Critical	4,000	8,000	641,000	653,000	161,000	0	0	611,000	772,000	-6,000	-113,000	-38,000
2009	Below Normal	3,000	3,000	681,000	687,000	281,000	0	0	648,000	930,000	-15,000	-228,000	-53,000
2010	Above Normal	4,000	10,000	680,000	694,000	198,000	0	0	641,000	839,000	-4,000	-141,000	-57,000
2011	Wet	2,000	12,000	639,000	653,000	87,000	0	0	576,000	663,000	4,000	-14,000	-53,000
2012	Dry	2,000	2,000	631,000	635,000	111,000	0	0	599,000	711,000	-14,000	-62,000	-67,000
2013	Critical	3,000	4,000	637,000	644,000	146,000	0	0	639,000	785,000	-10,000	-131,000	-77,000
2014	Critical	2,000	1,000	654,000	657,000	203,000	0	0	640,000	843,000	-17,000	-169,000	-94,000
2015	Critical	3,000	3,000	661,000	666,000	183,000	0	0	661,000	844,000	-10,000	-168,000	-104,000
2016	Dry	3,000	3,000	648,000	653,000	129,000	0	0	651,000	780,000	-10,000	-117,000	-114,000
2017	Wet	5,000	11,000	660,000	677,000	173,000	0	0	622,000	794,000	1,000	-118,000	-113,000
2018	Below Normal	2,000	2,000	684,000	688,000	218,000	0	0	614,000	832,000	-13,000	-131,000	-126,000
AVERAGE		**3,000**	**5,000**	**644,000**	**653,000**	**149,000**	**0**	**0**	**612,000**	**761,000**	**-8,000**	**-101,000**	
%		**0.5%**	**0.8%**	**98.6%**		**19.6%**	**0.0%**	**0.0%**	**80.4%**				
Current Water Budget (WY 2019 - 2023)													
2019	Wet	3,000	9,000	668,000	680,000	172,000	0	0	629,000	801,000	-5,000	-116,000	-5,000
2020	Dry	5,000	4,000	705,000	713,000	260,000	0	0	653,000	914,000	-12,000	-189,000	-17,000
2021	Critical	4,000	3,000	692,000	700,000	256,000	0	0	667,000	923,000	-15,000	-208,000	-32,000
2022	Critical	4,000	2,000	684,000	690,000	235,000	0	0	645,000	881,000	-14,000	-177,000	-46,000
2023	Wet	6,000	13,000	699,000	717,000	249,000	0	0	610,000	860,000	0	-143,000	-46,000
AVERAGE		**4,000**	**6,000**	**690,000**	**700,000**	**234,000**	**0**	**0**	**641,000**	**876,000**	**-9,000**	**-167,000**	
%		**0.6%**	**0.9%**	**98.6%**		**26.7%**	**0.0%**	**0.0%**	**73.2%**				

Abbreviations
AFY = acre-feet per year
WY = Water Year

Notes
(a) Change in storage is calculated as the difference between inflows and outflows
(b) All numbers shown are rounded to the nearest 1,000. Summation of terms may have negligible departures due to rounding errors.
(c) Water release caused by subsidence is generally overestimated in the Model due to local overestimations of subsidence rates and extent.

Table H-4. Change from Projected Baseline by Scenario

	Scenario	Change (%) from Projected Baseline
Evapotranspiration	2030 Central Tendency	2.2%
	2070 Central Tendency	4.3%
	2070 Extreme Dry	5.3%
	2070 Extreme Wet	3.7%
Precipitation	2030 Central Tendency	3.1%
	2070 Central Tendency	5.5%
	2070 Extreme Dry	-0.2%
	2070 Extreme Wet	23.4%
Surface Water Delivery	2030 Central Tendency	-1.9%
	2070 Central Tendency	-4.9%
	2070 Extreme Dry	-8.8%
	2070 Extreme Wet	2.8%

Table H-5. Projected Land Surface Water System Inflows and Outflows

Water Year (Oct - Sep)	Water Year Type	INFLOWS (AFY)						OUTFLOWS (AFY)					Change in Storage (AFY)
				Applied Water									
		Precipitation	Surface Water Delivery	Groudnwater Extraction	Stream Inflow	Stream-Groundwater Interaction Inflow	Total Inflows	Evapotranspiration	Stream Outflow	Infiltration	Stream-Groundwater Interaction Outflow	Total Outflows	
2024	Above Normal	1,035,000	1,477,000	427,000	5,905,000	137,000	8,982,000	1,835,000	6,439,000	586,000	122,000	8,982,000	0
2025	Wet	734,000	1,356,000	516,000	5,555,000	127,000	8,289,000	1,842,000	6,011,000	354,000	82,000	8,289,000	0
2026	Wet	679,000	1,355,000	486,000	5,618,000	101,000	8,239,000	1,711,000	6,113,000	348,000	67,000	8,239,000	0
2027	Critical	479,000	1,217,000	559,000	3,058,000	67,000	5,379,000	1,620,000	3,296,000	409,000	54,000	5,379,000	0
2028	Critical	363,000	1,208,000	537,000	7,108,000	138,000	9,354,000	1,700,000	7,319,000	269,000	66,000	9,354,000	0
2029	Wet	1,229,000	1,250,000	626,000	8,768,000	264,000	12,137,000	2,209,000	9,263,000	590,000	75,000	12,137,000	0
2030	Above Normal	723,000	1,464,000	452,000	6,481,000	194,000	9,314,000	1,817,000	7,028,000	389,000	80,000	9,314,000	0
2031	Wet	801,000	1,226,000	430,000	8,797,000	153,000	11,406,000	1,736,000	9,184,000	403,000	83,000	11,406,000	0
2032	Dry	550,000	1,216,000	496,000	4,526,000	128,000	6,916,000	1,750,000	4,805,000	294,000	67,000	6,916,000	0
2033	Wet	1,005,000	1,336,000	461,000	16,744,000	304,000	19,850,000	1,973,000	17,452,000	333,000	92,000	19,850,000	0
2034	Wet	1,344,000	1,493,000	581,000	20,818,000	217,000	24,452,000	2,276,000	21,503,000	560,000	113,000	24,452,000	0
2035	Above Normal	524,000	1,490,000	438,000	7,783,000	117,000	10,351,000	1,667,000	8,249,000	344,000	91,000	10,351,000	0
2036	Dry	534,000	1,213,000	485,000	6,329,000	161,000	8,722,000	1,729,000	6,621,000	297,000	75,000	8,722,000	0
2037	Wet	885,000	1,353,000	451,000	10,385,000	146,000	13,219,000	1,776,000	10,976,000	390,000	77,000	13,219,000	0
2038	Critical	486,000	1,207,000	490,000	4,717,000	83,000	6,983,000	1,616,000	5,029,000	279,000	59,000	6,983,000	0
2039	Critical	605,000	1,212,000	436,000	4,426,000	76,000	6,755,000	1,650,000	4,741,000	306,000	58,000	6,755,000	0
2040	Critical	508,000	1,315,000	491,000	4,164,000	78,000	6,555,000	1,615,000	4,635,000	259,000	46,000	6,555,000	0
2041	Critical	483,000	1,210,000	554,000	3,062,000	79,000	5,388,000	1,608,000	3,369,000	366,000	45,000	5,388,000	0
2042	Critical	525,000	1,225,000	556,000	3,036,000	107,000	5,449,000	1,581,000	3,396,000	422,000	50,000	5,449,000	0
2043	Critical	658,000	1,236,000	476,000	5,381,000	167,000	7,917,000	1,780,000	5,734,000	337,000	66,000	7,917,000	0
2044	Wet	1,077,000	1,358,000	566,000	5,339,000	186,000	8,526,000	1,730,000	6,038,000	679,000	79,000	8,526,000	0
2045	Critical	578,000	1,218,000	475,000	7,307,000	176,000	9,754,000	1,768,000	7,629,000	284,000	73,000	9,754,000	0
2046	Wet	1,104,000	1,420,000	478,000	10,717,000	224,000	13,944,000	1,861,000	11,474,000	523,000	86,000	13,944,000	0
2047	Wet	835,000	1,368,000	550,000	9,331,000	204,000	12,288,000	1,827,000	9,919,000	448,000	94,000	12,288,000	0
2048	Wet	890,000	1,377,000	583,000	15,436,000	279,000	18,564,000	1,814,000	16,086,000	555,000	109,000	18,564,000	0
2049	Wet	1,574,000	1,404,000	609,000	10,284,000	174,000	14,045,000	2,262,000	10,944,000	723,000	116,000	14,045,000	0
2050	Above Normal	565,000	1,510,000	601,000	5,490,000	122,000	8,289,000	2,039,000	5,869,000	302,000	79,000	8,289,000	0
2051	Above Normal	729,000	1,473,000	527,000	5,577,000	141,000	8,446,000	1,685,000	6,136,000	544,000	81,000	8,446,000	0
2052	Dry	701,000	1,353,000	412,000	4,351,000	93,000	6,909,000	1,705,000	4,824,000	307,000	73,000	6,909,000	0
2053	Dry	530,000	1,283,000	651,000	4,426,000	109,000	6,999,000	1,938,000	4,644,000	357,000	60,000	6,999,000	0
2054	Below Normal	680,000	1,469,000	454,000	4,477,000	108,000	7,188,000	1,683,000	5,113,000	337,000	55,000	7,188,000	0
2055	Dry	566,000	1,365,000	534,000	5,324,000	147,000	7,937,000	1,692,000	5,823,000	363,000	59,000	7,937,000	0
2056	Wet	1,067,000	1,374,000	437,000	10,477,000	194,000	13,550,000	1,933,000	11,149,000	398,000	70,000	13,550,000	0
2057	Wet	828,000	1,408,000	462,000	10,218,000	150,000	13,065,000	1,748,000	10,886,000	362,000	69,000	13,065,000	0
2058	Critical	361,000	1,304,000	629,000	3,878,000	111,000	6,283,000	1,536,000	4,346,000	342,000	59,000	6,283,000	0
2059	Critical	537,000	1,190,000	846,000	3,492,000	88,000	6,153,000	1,833,000	3,722,000	539,000	59,000	6,153,000	0
2060	Below Normal	499,000	1,263,000	798,000	4,021,000	144,000	6,725,000	1,964,000	4,252,000	455,000	54,000	6,725,000	0
2061	Above Normal	885,000	1,475,000	364,000	7,082,000	179,000	9,985,000	1,852,000	7,700,000	371,000	62,000	9,985,000	0
2062	Wet	993,000	1,380,000	515,000	9,617,000	165,000	12,669,000	1,795,000	10,295,000	510,000	69,000	12,669,000	0
2063	Dry	448,000	1,352,000	494,000	3,739,000	90,000	6,123,000	1,611,000	4,149,000	306,000	57,000	6,123,000	0
2064	Critical	453,000	1,210,000	583,000	2,616,000	51,000	4,913,000	1,538,000	2,878,000	439,000	58,000	4,913,000	0
2065	Critical	341,000	1,225,000	524,000	4,069,000	24,000	6,183,000	1,532,000	4,282,000	327,000	42,000	6,183,000	0
2066	Critical	487,000	1,247,000	527,000	5,539,000	38,000	7,839,000	1,530,000	5,804,000	453,000	52,000	7,839,000	0
2067	Dry	921,000	1,231,000	425,000	10,391,000	152,000	13,119,000	1,741,000	10,827,000	490,000	61,000	13,119,000	0
2068	Wet	1,020,000	1,496,000	456,000	13,470,000	255,000	16,698,000	1,716,000	14,298,000	597,000	87,000	16,698,000	0
2069	Below Normal	470,000	1,426,000	540,000	9,162,000	179,000	11,778,000	1,585,000	9,763,000	365,000	65,000	11,778,000	0
2070	Wet	842,000	1,225,000	513,000	9,788,000	170,000	12,537,000	1,735,000	10,241,000	480,000	81,000	12,537,000	0
2071	Dry	529,000	1,227,000	549,000	2,707,000	82,000	5,094,000	1,592,000	3,003,000	432,000	67,000	5,094,000	0
2072	Critical	396,000	1,223,000	601,000	2,234,000	60,000	4,514,000	1,541,000	2,478,000	439,000	56,000	4,514,000	0
2073	Critical	491,000	1,224,000	569,000	2,261,000	75,000	4,620,000	1,575,000	2,550,000	441,000	54,000	4,620,000	0
AVERAGE		**711,000**	**1,323,000**	**524,000**	**6,910,000**	**140,000**	**9,608,000**	**1,757,000**	**7,366,000**	**414,000**	**71,000**	**9,608,000**	**0**
%		**7%**	**14%**	**5%**				**18%**	**77%**	**4%**			

Table H-5. Projected Land Surface Water System Inflows and Outflows

Abbreviations
AFY = acre-feet per year
WY = Water Year

Notes
(a) Applied water includes imported surface water, diverted water from streams, and groundwater
(b) Stream inflow and outflow incorporate all flows simulated as part of the Model's Streamflow Routing Package (SFR), including flows simulated in San Joaquin River, California Aqueduct, and Delta Mendota Canal. Although San Joaquin River forms the boundary of the Basin, it is included in the calculation of stream inflow and outflow to the Basin and accounts for streamflow received from streams outside of the Basin, such as Merced and Kings River.
(c) Change in storage is calculated as the difference between inflows and outflows and is negligible in Land Surface Water Budget(Proj)
(d) All numbers shown are rounded to the nearest 1,000. Summation of terms may have negligible departures due to rounding errors.

Table H-6. Projected Annual Inflows and Outflows from the Upper Aquifer Groundwater System

Water Year (Oct - Sep)	Water Year Type	INFLOWS (AFY)				OUTFLOWS (AFY)					Change in Groundwater Storage	Water Release Caused By Subsidence	Cumulative Change in Groundwater Storage
		Groundwater Recharge	Stream-Groundwater Interaction Inflow	Subsurface Groundwater Inflow	TOTAL INFLOWS	Groundwater Extractions	Losses from Unsaturated Zones	Stream-Groundwater Interaction Outflow	Subsurface Groundwater Outflow	Total Outflows			
2024	Above Normal	508,000	129,000	213,000	850,000	271,000	144,000	122,000	261,000	798,000	51,000	1,000	51,000
2025	Wet	298,000	123,000	217,000	639,000	295,000	86,000	82,000	259,000	722,000	-76,000	-7,000	-25,000
2026	Wet	297,000	100,000	212,000	609,000	288,000	70,000	67,000	251,000	676,000	-63,000	-4,000	-88,000
2027	Critical	358,000	66,000	205,000	628,000	325,000	77,000	54,000	253,000	709,000	-78,000	-3,000	-166,000
2028	Critical	221,000	126,000	218,000	565,000	332,000	89,000	66,000	248,000	735,000	-163,000	-7,000	-329,000
2029	Wet	512,000	257,000	243,000	1,013,000	341,000	133,000	75,000	282,000	831,000	186,000	-4,000	-143,000
2030	Above Normal	335,000	177,000	229,000	741,000	282,000	107,000	79,000	287,000	755,000	-14,000	0	-157,000
2031	Wet	351,000	149,000	224,000	724,000	284,000	90,000	83,000	274,000	732,000	-5,000	-3,000	-162,000
2032	Dry	249,000	117,000	235,000	600,000	314,000	63,000	67,000	273,000	716,000	-111,000	-5,000	-273,000
2033	Wet	285,000	280,000	238,000	803,000	268,000	121,000	91,000	262,000	742,000	63,000	-2,000	-210,000
2034	Wet	488,000	211,000	246,000	945,000	314,000	136,000	113,000	278,000	842,000	105,000	-2,000	-105,000
2035	Above Normal	296,000	115,000	239,000	650,000	287,000	72,000	91,000	278,000	729,000	-80,000	1,000	-185,000
2036	Dry	254,000	145,000	237,000	636,000	311,000	72,000	75,000	273,000	730,000	-89,000	-5,000	-274,000
2037	Wet	342,000	143,000	221,000	706,000	274,000	69,000	77,000	264,000	684,000	25,000	-3,000	-249,000
2038	Critical	241,000	82,000	222,000	545,000	312,000	48,000	59,000	263,000	682,000	-131,000	-6,000	-380,000
2039	Critical	266,000	75,000	212,000	553,000	288,000	45,000	58,000	259,000	650,000	-94,000	-3,000	-474,000
2040	Critical	224,000	77,000	209,000	510,000	293,000	38,000	46,000	252,000	630,000	-118,000	-2,000	-592,000
2041	Critical	321,000	77,000	208,000	606,000	327,000	49,000	45,000	254,000	675,000	-62,000	-7,000	-654,000
2042	Critical	373,000	104,000	215,000	692,000	334,000	53,000	50,000	257,000	694,000	6,000	-8,000	-648,000
2043	Critical	296,000	153,000	216,000	665,000	305,000	72,000	66,000	271,000	714,000	-46,000	-3,000	-694,000
2044	Wet	607,000	181,000	223,000	1,011,000	308,000	98,000	79,000	275,000	761,000	252,000	-2,000	-442,000
2045	Critical	242,000	163,000	214,000	620,000	306,000	80,000	73,000	269,000	727,000	-106,000	-1,000	-548,000
2046	Wet	456,000	210,000	222,000	889,000	284,000	103,000	86,000	273,000	746,000	143,000	0	-405,000
2047	Wet	393,000	189,000	236,000	818,000	319,000	103,000	93,000	284,000	800,000	21,000	-3,000	-384,000
2048	Wet	488,000	251,000	247,000	987,000	338,000	158,000	108,000	289,000	893,000	98,000	-4,000	-286,000
2049	Wet	640,000	165,000	243,000	1,047,000	323,000	178,000	116,000	294,000	911,000	134,000	2,000	-152,000
2050	Above Normal	251,000	119,000	254,000	623,000	353,000	69,000	79,000	299,000	799,000	-172,000	-4,000	-324,000
2051	Above Normal	481,000	137,000	232,000	849,000	319,000	98,000	81,000	289,000	787,000	62,000	0	-262,000
2052	Dry	262,000	91,000	211,000	563,000	276,000	59,000	73,000	264,000	673,000	-108,000	-2,000	-370,000
2053	Dry	306,000	106,000	246,000	658,000	372,000	58,000	60,000	294,000	784,000	-118,000	-8,000	-488,000
2054	Below Normal	295,000	104,000	215,000	613,000	279,000	51,000	55,000	267,000	652,000	-41,000	2,000	-529,000
2055	Dry	320,000	138,000	220,000	677,000	335,000	69,000	59,000	265,000	728,000	-47,000	-4,000	-576,000
2056	Wet	350,000	189,000	219,000	758,000	266,000	73,000	70,000	262,000	671,000	84,000	3,000	-492,000
2057	Wet	315,000	148,000	211,000	674,000	280,000	58,000	69,000	258,000	666,000	7,000	1,000	-485,000
2058	Critical	298,000	106,000	212,000	617,000	347,000	53,000	59,000	255,000	714,000	-88,000	-9,000	-573,000
2059	Critical	471,000	85,000	233,000	789,000	421,000	75,000	59,000	282,000	837,000	-34,000	-14,000	-607,000
2060	Below Normal	393,000	136,000	251,000	780,000	409,000	70,000	53,000	300,000	833,000	-48,000	-5,000	-655,000
2061	Above Normal	325,000	168,000	219,000	711,000	258,000	72,000	62,000	278,000	670,000	35,000	6,000	-620,000
2062	Wet	456,000	162,000	213,000	831,000	289,000	77,000	69,000	267,000	702,000	129,000	0	-491,000
2063	Dry	262,000	88,000	199,000	549,000	298,000	53,000	57,000	257,000	665,000	-112,000	-4,000	-603,000
2064	Critical	386,000	49,000	207,000	642,000	347,000	64,000	58,000	270,000	738,000	-91,000	-5,000	-694,000
2065	Critical	283,000	22,000	206,000	511,000	340,000	48,000	42,000	247,000	676,000	-163,000	-2,000	-857,000
2066	Critical	400,000	35,000	205,000	639,000	343,000	60,000	52,000	241,000	695,000	-54,000	-2,000	-911,000
2067	Dry	432,000	143,000	200,000	774,000	286,000	87,000	60,000	246,000	679,000	94,000	1,000	-817,000
2068	Wet	530,000	249,000	210,000	989,000	277,000	112,000	87,000	270,000	747,000	240,000	2,000	-577,000
2069	Below Normal	314,000	171,000	197,000	682,000	316,000	81,000	64,000	260,000	722,000	-37,000	-3,000	-614,000
2070	Wet	424,000	167,000	213,000	805,000	306,000	82,000	81,000	277,000	747,000	61,000	-3,000	-553,000
2071	Dry	381,000	79,000	202,000	662,000	332,000	74,000	67,000	280,000	753,000	-89,000	-2,000	-642,000
2072	Critical	382,000	57,000	210,000	648,000	353,000	69,000	56,000	282,000	759,000	-107,000	-4,000	-749,000
2073	Critical	389,000	71,000	222,000	682,000	345,000	68,000	54,000	281,000	748,000	-64,000	-2,000	-813,000
AVERAGE		**361,000**	**134,000**	**221,000**	**716,000**	**313,000**	**81,000**	**71,000**	**269,000**	**734,000**	**-16,000**	**-3,000**	
%		**50.4%**	**18.7%**	**30.9%**		**116.4%**	**30.1%**	**26.4%**					

Table H-6. Projected Annual Inflows and Outflows from the Upper Aquifer Groundwater System

<u>Abbreviations</u>
AFY = acre-feet per year
WY = Water Year

<u>Notes</u>
(a) Change in storage is calculated as the difference between inflows and outflows
(b) All numbers shown are rounded to the nearest 1,000. Summation of terms may have negligible departures due to rounding errors.
(c) Water release caused by subsidence is generally overestimated in the Model due to local overestimations of subsidence rates and extent.

Table H-7. Projected Annual Inflows and Outflows from the Lower Aquifer Groundwater System

Water Year (Oct - Sep)	Water Year Type	INFLOWS (AFY)				OUTFLOWS (AFY)					Change in Groundwater Storage	Water Release Caused By Subsidence	Cumulative Change in Groundwater Storage
		Groundwater Recharge	Stream-Groundwater Interaction Inflow	Subsurface Groundwater Inflow	TOTAL INFLOWS	Groundwater Extractions	Losses from Unsaturated Zones	Stream-Groundwater Interaction Outflow	Subsurface Groundwater Outflow	Total Outflows			
2024	Above Normal	5,000	8,000	706,000	719,000	155,000	0	0	658,000	814,000	-2,000	-93,000	-2,000
2025	Wet	2,000	4,000	723,000	729,000	222,000	0	0	656,000	878,000	-14,000	-135,000	-16,000
2026	Wet	3,000	2,000	726,000	731,000	198,000	0	0	660,000	858,000	-13,000	-114,000	-29,000
2027	Critical	3,000	1,000	737,000	741,000	234,000	0	0	660,000	894,000	-14,000	-139,000	-43,000
2028	Critical	1,000	12,000	722,000	735,000	205,000	0	0	695,000	900,000	-7,000	-158,000	-50,000
2029	Wet	6,000	7,000	735,000	747,000	286,000	0	0	670,000	955,000	-6,000	-202,000	-56,000
2030	Above Normal	3,000	17,000	720,000	740,000	171,000	0	1,000	670,000	841,000	4,000	-105,000	-52,000
2031	Wet	3,000	3,000	687,000	694,000	145,000	0	0	656,000	801,000	-12,000	-95,000	-64,000
2032	Dry	1,000	11,000	714,000	726,000	182,000	0	0	667,000	849,000	-7,000	-116,000	-71,000
2033	Wet	1,000	24,000	722,000	748,000	194,000	0	1,000	602,000	796,000	11,000	-59,000	-60,000
2034	Wet	4,000	6,000	762,000	771,000	267,000	0	0	655,000	922,000	-11,000	-140,000	-71,000
2035	Above Normal	2,000	1,000	775,000	778,000	150,000	0	0	702,000	852,000	-11,000	-63,000	-82,000
2036	Dry	2,000	16,000	761,000	779,000	174,000	0	1,000	698,000	873,000	-1,000	-93,000	-83,000
2037	Wet	3,000	2,000	752,000	757,000	178,000	0	0	662,000	839,000	-11,000	-71,000	-94,000
2038	Critical	1,000	1,000	754,000	756,000	178,000	0	0	701,000	879,000	-17,000	-106,000	-111,000
2039	Critical	2,000	1,000	729,000	732,000	148,000	0	0	676,000	824,000	-14,000	-78,000	-125,000
2040	Critical	1,000	1,000	756,000	759,000	198,000	0	0	685,000	883,000	-15,000	-109,000	-140,000
2041	Critical	2,000	2,000	742,000	746,000	227,000	0	0	661,000	888,000	-16,000	-126,000	-156,000
2042	Critical	3,000	2,000	745,000	750,000	222,000	0	0	679,000	901,000	-16,000	-135,000	-172,000
2043	Critical	2,000	14,000	731,000	747,000	171,000	0	0	688,000	859,000	-4,000	-108,000	-176,000
2044	Wet	7,000	5,000	748,000	760,000	258,000	0	0	630,000	887,000	-7,000	-120,000	-183,000
2045	Critical	1,000	12,000	727,000	741,000	169,000	0	1,000	655,000	825,000	-3,000	-81,000	-186,000
2046	Wet	5,000	14,000	725,000	745,000	194,000	0	1,000	613,000	808,000	3,000	-66,000	-183,000
2047	Wet	3,000	16,000	767,000	785,000	231,000	0	1,000	653,000	884,000	0	-99,000	-183,000
2048	Wet	5,000	28,000	808,000	840,000	245,000	0	1,000	681,000	926,000	14,000	-100,000	-169,000
2049	Wet	9,000	10,000	812,000	830,000	286,000	0	0	667,000	953,000	1,000	-124,000	-168,000
2050	Above Normal	1,000	4,000	828,000	833,000	248,000	0	0	708,000	957,000	-14,000	-110,000	-182,000
2051	Above Normal	4,000	4,000	823,000	831,000	207,000	0	0	694,000	901,000	-6,000	-64,000	-188,000
2052	Dry	2,000	2,000	749,000	752,000	135,000	0	0	669,000	804,000	-11,000	-41,000	-199,000
2053	Dry	2,000	4,000	818,000	824,000	279,000	0	0	716,000	995,000	-15,000	-156,000	-214,000
2054	Below Normal	3,000	4,000	766,000	773,000	175,000	0	0	656,000	831,000	-6,000	-52,000	-220,000
2055	Dry	3,000	9,000	784,000	796,000	200,000	0	0	698,000	898,000	-8,000	-94,000	-228,000
2056	Wet	3,000	6,000	751,000	760,000	171,000	0	0	616,000	787,000	-4,000	-23,000	-232,000
2057	Wet	2,000	2,000	762,000	767,000	181,000	0	0	633,000	815,000	-9,000	-39,000	-241,000
2058	Critical	2,000	5,000	789,000	796,000	282,000	0	0	648,000	930,000	-14,000	-120,000	-255,000
2059	Critical	5,000	4,000	863,000	872,000	425,000	0	0	691,000	1,116,000	-13,000	-231,000	-268,000
2060	Below Normal	3,000	8,000	877,000	888,000	389,000	0	0	715,000	1,104,000	-11,000	-205,000	-279,000
2061	Above Normal	3,000	11,000	754,000	768,000	106,000	0	0	663,000	769,000	6,000	-7,000	-273,000
2062	Wet	3,000	2,000	772,000	778,000	226,000	0	0	619,000	845,000	-12,000	-55,000	-285,000
2063	Dry	2,000	3,000	761,000	766,000	196,000	0	0	633,000	829,000	-12,000	-51,000	-297,000
2064	Critical	3,000	2,000	799,000	804,000	236,000	0	0	680,000	916,000	-12,000	-100,000	-309,000
2065	Critical	2,000	2,000	762,000	766,000	184,000	0	0	663,000	848,000	-10,000	-72,000	-319,000
2066	Critical	3,000	3,000	749,000	755,000	185,000	0	0	662,000	846,000	-9,000	-82,000	-328,000
2067	Dry	3,000	9,000	714,000	726,000	139,000	0	0	623,000	762,000	1,000	-37,000	-327,000
2068	Wet	5,000	6,000	726,000	738,000	179,000	0	0	590,000	769,000	-1,000	-30,000	-328,000
2069	Below Normal	2,000	8,000	758,000	768,000	224,000	0	0	603,000	827,000	-6,000	-53,000	-334,000
2070	Wet	3,000	3,000	766,000	772,000	206,000	0	0	639,000	846,000	-12,000	-62,000	-346,000
2071	Dry	4,000	3,000	786,000	793,000	218,000	0	0	656,000	874,000	-10,000	-71,000	-356,000
2072	Critical	4,000	3,000	806,000	813,000	248,000	0	0	677,000	925,000	-11,000	-101,000	-367,000
2073	Critical	4,000	3,000	782,000	789,000	225,000	0	0	656,000	880,000	-10,000	-81,000	-377,000
AVERAGE		**3,000**	**7,000**	**761,000**	**770,000**	**211,000**	**0**	**0**	**662,000**	**873,000**	**-8,000**	**-95,000**	
%		**0.4%**	**0.9%**	**98.8%**		**31.9%**	**0.0%**	**0.0%**					

Table H-7. Projected Annual Inflows and Outflows from the Lower Aquifer Groundwater System

Abbreviations
AFY = acre-feet per year
WY = Water Year

Notes
(a) Change in storage is calculated as the difference between inflows and outflows
(b) All numbers shown are rounded to the nearest 1,000. Summation of terms may have negligible departures due to rounding errors.
(c) Water release caused by subsidence is generally overestimated in the Model due to local overestimations of subsidence rates and extent.

Table H-8. Projected Annual Inflows and Outflows from the Upper Aquifer Groundwater System Under 2030 Central Tendency Climate Change Scenario and Incorporating Projects and Management Actions (P/MAs)

		Projected 2030 Central Tendency Climate Change Scenario with P/MAs and CHD												Equivalent No-Pumping Scenario		Groundwater Storage Caused by Basin Management	Release Caused By Subsidence Caused by Basin Managem
Water Year (Oct - Sep)	Water Year Type	INFLOWS (AFY)				OUTFLOWS (AFY)											
		Groundwater Recharge	Stream-Groundwater Interaction Inflow	Subsurface Groundwater Inflow	TOTAL INFLOWS	Groundwater Extractions	Losses from Unsaturated Zones	Stream-Groundwater Interaction Outflow	Subsurface Groundwater Outflow	Total Outflows	Change in Groundwater Storage	Water Release Caused By Subsidence	Cumulative Change in Groundwater Storage	Change in Groundwater Storage	Water Release Caused By Subsidence		
Projected Water Budget (WY 2024 - 2073)																	
2024	Above Normal	529,000	139,000	213,000	881,000	278,000	132,000	104,000	296,000	810,000	70,000	1,000	70,000	147,000	13,000	-77,000	-12,000
2025	Wet	329,000	127,000	217,000	672,000	298,000	86,000	83,000	283,000	750,000	-72,000	-6,000	-2,000	-26,000	0	-46,000	-6,000
2026	Wet	319,000	96,000	211,000	626,000	288,000	69,000	73,000	271,000	701,000	-70,000	-5,000	-72,000	-38,000	-1,000	-32,000	-4,000
2027	Critical	366,000	60,000	211,000	637,000	324,000	74,000	65,000	247,000	710,000	-72,000	-1,000	-144,000	-54,000	0	-18,000	-1,000
2028	Critical	227,000	117,000	223,000	566,000	328,000	89,000	77,000	217,000	710,000	-139,000	-5,000	-283,000	-109,000	-1,000	-30,000	-4,000
2029	Wet	552,000	231,000	235,000	1,018,000	336,000	132,000	88,000	257,000	813,000	205,000	0	-78,000	194,000	3,000	11,000	-3,000
2030	Above Normal	355,000	161,000	204,000	721,000	267,000	102,000	88,000	279,000	736,000	-15,000	0	-93,000	-10,000	-2,000	-5,000	2,000
2031	Wet	386,000	137,000	207,000	729,000	271,000	90,000	90,000	281,000	732,000	-1,000	-2,000	-94,000	14,000	-2,000	-15,000	0
2032	Dry	257,000	109,000	206,000	573,000	300,000	64,000	73,000	258,000	694,000	-119,000	-2,000	-213,000	-91,000	-3,000	-28,000	1,000
2033	Wet	309,000	268,000	213,000	790,000	257,000	122,000	93,000	276,000	749,000	45,000	-4,000	-168,000	39,000	-4,000	6,000	0
2034	Wet	516,000	208,000	226,000	950,000	302,000	127,000	108,000	306,000	842,000	108,000	0	-60,000	109,000	2,000	-1,000	-2,000
2035	Above Normal	319,000	107,000	199,000	625,000	267,000	69,000	86,000	289,000	711,000	-85,000	-1,000	-145,000	-75,000	-3,000	-10,000	2,000
2036	Dry	257,000	138,000	200,000	595,000	295,000	70,000	72,000	262,000	699,000	-100,000	-4,000	-245,000	-77,000	-2,000	-23,000	-2,000
2037	Wet	362,000	135,000	202,000	698,000	258,000	64,000	76,000	278,000	675,000	27,000	-4,000	-218,000	29,000	-6,000	-2,000	2,000
2038	Critical	248,000	76,000	198,000	522,000	294,000	47,000	60,000	254,000	654,000	-128,000	-4,000	-346,000	-95,000	-2,000	-33,000	-2,000
2039	Critical	279,000	70,000	197,000	547,000	271,000	46,000	62,000	244,000	623,000	-74,000	-2,000	-420,000	-55,000	-1,000	-19,000	-1,000
2040	Critical	231,000	75,000	208,000	514,000	276,000	39,000	52,000	235,000	602,000	-87,000	-1,000	-507,000	-64,000	0	-23,000	-1,000
2041	Critical	330,000	77,000	214,000	621,000	309,000	50,000	53,000	226,000	639,000	-16,000	-2,000	-523,000	-19,000	0	3,000	-2,000
2042	Critical	387,000	121,000	215,000	724,000	317,000	58,000	59,000	229,000	663,000	63,000	-2,000	-460,000	57,000	-2,000	6,000	0
2043	Critical	307,000	152,000	204,000	663,000	288,000	82,000	75,000	239,000	683,000	-20,000	0	-480,000	-18,000	-1,000	-2,000	1,000
2044	Wet	645,000	154,000	211,000	1,010,000	297,000	106,000	89,000	276,000	768,000	245,000	-3,000	-235,000	194,000	-1,000	51,000	-2,000
2045	Critical	246,000	155,000	190,000	592,000	286,000	87,000	77,000	253,000	703,000	-112,000	1,000	-347,000	-95,000	-2,000	-17,000	3,000
2046	Wet	506,000	192,000	202,000	900,000	270,000	116,000	90,000	285,000	761,000	141,000	-2,000	-206,000	118,000	1,000	23,000	-3,000
2047	Wet	433,000	175,000	200,000	808,000	303,000	113,000	94,000	291,000	801,000	10,000	-3,000	-196,000	16,000	-2,000	-6,000	-1,000
2048	Wet	522,000	239,000	200,000	961,000	317,000	166,000	108,000	301,000	892,000	73,000	-4,000	-123,000	69,000	-3,000	4,000	-1,000
2049	Wet	700,000	154,000	202,000	1,056,000	309,000	193,000	113,000	313,000	928,000	124,000	4,000	1,000	116,000	3,000	8,000	1,000
2050	Above Normal	274,000	109,000	202,000	584,000	331,000	72,000	75,000	277,000	755,000	-167,000	-4,000	-166,000	-136,000	-1,000	-31,000	-3,000
2051	Above Normal	510,000	128,000	191,000	829,000	301,000	101,000	82,000	279,000	762,000	66,000	1,000	-100,000	47,000	0	19,000	1,000
2052	Dry	273,000	88,000	183,000	544,000	258,000	64,000	74,000	271,000	666,000	-122,000	0	-222,000	-103,000	-2,000	-19,000	2,000
2053	Dry	322,000	99,000	215,000	636,000	355,000	64,000	64,000	244,000	726,000	-87,000	-3,000	-309,000	-58,000	0	-29,000	-3,000
2054	Below Normal	312,000	92,000	202,000	606,000	263,000	57,000	62,000	257,000	639,000	-33,000	0	-342,000	-30,000	-2,000	-3,000	2,000
2055	Dry	334,000	137,000	202,000	673,000	312,000	81,000	66,000	242,000	700,000	-27,000	0	-369,000	-14,000	1,000	-13,000	-1,000
2056	Wet	391,000	173,000	206,000	770,000	248,000	85,000	76,000	275,000	685,000	84,000	1,000	-285,000	68,000	0	16,000	1,000
2057	Wet	340,000	138,000	198,000	676,000	263,000	64,000	72,000	280,000	679,000	-2,000	-1,000	-287,000	1,000	-3,000	-3,000	2,000
2058	Critical	304,000	102,000	206,000	611,000	328,000	58,000	62,000	257,000	705,000	-87,000	-7,000	-374,000	-79,000	-4,000	-8,000	-3,000
2059	Critical	487,000	90,000	219,000	797,000	408,000	84,000	67,000	231,000	790,000	13,000	-6,000	-361,000	13,000	1,000	0	-7,000
2060	Below Normal	403,000	125,000	230,000	757,000	398,000	82,000	62,000	224,000	765,000	-5,000	-3,000	-366,000	-16,000	-1,000	11,000	-2,000
2061	Above Normal	347,000	152,000	200,000	700,000	236,000	87,000	73,000	258,000	654,000	42,000	4,000	-324,000	24,000	-3,000	18,000	7,000
2062	Wet	489,000	153,000	201,000	843,000	276,000	89,000	75,000	279,000	720,000	126,000	-3,000	-198,000	99,000	1,000	27,000	-4,000
2063	Dry	267,000	81,000	193,000	541,000	268,000	60,000	65,000	262,000	655,000	-110,000	-4,000	-308,000	-99,000	-4,000	-11,000	0
2064	Critical	389,000	54,000	198,000	641,000	324,000	74,000	68,000	237,000	702,000	-60,000	-1,000	-368,000	-43,000	-1,000	-17,000	0
2065	Critical	293,000	20,000	209,000	522,000	319,000	57,000	52,000	201,000	629,000	-106,000	-1,000	-474,000	-83,000	-1,000	-23,000	0
2066	Critical	414,000	31,000	214,000	659,000	325,000	72,000	63,000	197,000	657,000	2,000	0	-472,000	6,000	0	-4,000	0
2067	Dry	424,000	138,000	212,000	775,000	264,000	99,000	68,000	226,000	658,000	114,000	3,000	-358,000	92,000	2,000	22,000	1,000
2068	Wet	544,000	215,000	205,000	963,000	257,000	128,000	92,000	280,000	757,000	205,000	1,000	-153,000	164,000	2,000	41,000	-1,000
2069	Below Normal	311,000	158,000	198,000	667,000	294,000	92,000	67,000	266,000	719,000	-50,000	-2,000	-203,000	-50,000	-2,000	0	0
2070	Wet	473,000	133,000	202,000	808,000	296,000	103,000	88,000	275,000	763,000	46,000	-1,000	-157,000	43,000	-1,000	3,000	0
2071	Dry	283,000	82,000	194,000	559,000	289,000	64,000	67,000	254,000	675,000	-114,000	-2,000	-271,000	-93,000	-3,000	-21,000	1,000
2072	Critical	381,000	62,000	201,000	644,000	326,000	75,000	63,000	236,000	700,000	-54,000	-2,000	-325,000	-35,000	0	-19,000	-2,000
2073	Critical	387,000	60,000	208,000	654,000	319,000	75,000	64,000	232,000	692,000	-37,000	-1,000	-362,000	-22,000	-2,000	-15,000	1,000
Average (2024-2073)		377,000	126,000	206,000	709,000	297,000	86,000	75,000	260,000	718,000	-7,000	-2,000	-1,000	-1,000	0	-6,000	-2,000
AVERAGE (2041-2073)		395,000	122,000	204,000	721,000	302,000	87,000	73,000	256,000	718,000	4,000	-1,000	4,000	-1,000	0	5,000	-1,000
%		54.8%	16.9%	28.3%		118.0%	34.0%	28.5%									

Abbreviations

AFY = acre-feet per year

WY = Water Year

Notes

(a) Change in storage is calculated as the difference between inflows and outflows

(b) All numbers shown are rounded to the nearest 1,000. Summation of terms may have negligible departures due to rounding errors.

(c) Water release caused by subsidence is generally overestimated in the Model due to local overestimations of subsidence rates and extent.

Table H-9. Projected Annual Inflows and Outflows from the Lower Aquifer Groundwater System Under 2030 Central Tendency Climate Change Scenario and Incorporating Projects and Management Actions (P/MAs)

Projected 2030 Central Tendency Climate Change Scenario with P/MAs and CHD														Equivalent No-Pumping Scenario		Groundwater Storage Caused by Basin Management	Release Caused By Subsidence Caused by Basin Managem
Water Year (Oct - Sep)	Water Year Type	INFLOWS (AFY)				OUTFLOWS (AFY)					Change in Groundwater Storage	Water Release Caused By Subsidence	Cumulative Change in Groundwater Storage	Change in Groundwater Storage	Water Release Caused By Subsidence		
		Groundwater Recharge	Stream-Groundwater Interaction Inflow	Subsurface Groundwater Inflow	TOTAL INFLOWS	Groundwater Extractions	Losses from Unsaturated Zones	Stream-Groundwater Interaction Outflow	Subsurface Groundwater Outflow	Total Outflows							
Projected Water Budget (WY 2024 - 2073)																	
2024	Above Normal	16,000	8,000	742,000	766,000	147,000	0	0	766,000	913,000	-3,000	-144,000	-3,000	0	-117,000	-3,000	-27,000
2025	Wet	17,000	4,000	775,000	796,000	213,000	0	0	735,000	948,000	-12,000	-140,000	-15,000	-8,000	-88,000	-4,000	-52,000
2026	Wet	34,000	2,000	764,000	800,000	181,000	0	0	742,000	923,000	-13,000	-110,000	-28,000	-10,000	-73,000	-3,000	-37,000
2027	Critical	5,000	1,000	801,000	807,000	207,000	0	0	718,000	924,000	-12,000	-105,000	-40,000	-11,000	-79,000	-1,000	-26,000
2028	Critical	1,000	12,000	799,000	813,000	180,000	0	0	716,000	896,000	-5,000	-78,000	-45,000	-1,000	-58,000	-4,000	-20,000
2029	Wet	39,000	7,000	832,000	879,000	256,000	0	0	719,000	976,000	-5,000	-92,000	-50,000	-1,000	-44,000	-4,000	-48,000
2030	Above Normal	27,000	17,000	786,000	830,000	141,000	0	1,000	725,000	866,000	4,000	-40,000	-46,000	6,000	-37,000	-2,000	-3,000
2031	Wet	37,000	3,000	750,000	790,000	111,000	0	0	732,000	843,000	-9,000	-44,000	-55,000	-7,000	-35,000	-2,000	-9,000
2032	Dry	3,000	11,000	798,000	813,000	150,000	0	0	704,000	855,000	-4,000	-38,000	-59,000	-1,000	-28,000	-3,000	-10,000
2033	Wet	35,000	24,000	781,000	840,000	159,000	0	1,000	704,000	863,000	10,000	-33,000	-49,000	12,000	-19,000	-2,000	-14,000
2034	Wet	37,000	6,000	815,000	858,000	224,000	0	0	703,000	927,000	-7,000	-62,000	-56,000	-3,000	-20,000	-4,000	-42,000
2035	Above Normal	26,000	2,000	770,000	798,000	114,000	0	0	710,000	823,000	-9,000	-16,000	-65,000	-9,000	-19,000	0	3,000
2036	Dry	4,000	16,000	784,000	804,000	138,000	0	1,000	702,000	841,000	0	-37,000	-65,000	4,000	-26,000	-4,000	-11,000
2037	Wet	36,000	2,000	768,000	806,000	146,000	0	0	702,000	847,000	-11,000	-30,000	-76,000	-8,000	-18,000	-3,000	-12,000
2038	Critical	4,000	1,000	791,000	796,000	146,000	0	0	693,000	839,000	-14,000	-29,000	-90,000	-11,000	-27,000	-3,000	-2,000
2039	Critical	4,000	1,000	780,000	785,000	115,000	0	0	704,000	819,000	-12,000	-22,000	-102,000	-10,000	-21,000	-2,000	-1,000
2040	Critical	4,000	1,000	809,000	814,000	162,000	0	0	695,000	858,000	-13,000	-31,000	-115,000	-10,000	-16,000	-3,000	-15,000
2041	Critical	4,000	2,000	823,000	830,000	195,000	0	0	690,000	885,000	-13,000	-42,000	-128,000	-9,000	-23,000	-4,000	-19,000
2042	Critical	3,000	3,000	828,000	833,000	187,000	0	0	690,000	878,000	-11,000	-34,000	-139,000	-7,000	-22,000	-4,000	-12,000
2043	Critical	2,000	14,000	807,000	823,000	136,000	0	0	702,000	839,000	2,000	-18,000	-137,000	3,000	-17,000	-1,000	-1,000
2044	Wet	40,000	5,000	823,000	869,000	222,000	0	0	687,000	909,000	-5,000	-35,000	-142,000	1,000	-9,000	-6,000	-26,000
2045	Critical	1,000	12,000	804,000	818,000	140,000	0	1,000	691,000	832,000	0	-14,000	-142,000	1,000	-14,000	-1,000	0
2046	Wet	39,000	15,000	791,000	845,000	164,000	0	1,000	695,000	860,000	5,000	-20,000	-137,000	9,000	-8,000	-4,000	-12,000
2047	Wet	36,000	16,000	812,000	864,000	198,000	0	1,000	688,000	886,000	2,000	-24,000	-135,000	6,000	-12,000	-4,000	-12,000
2048	Wet	38,000	28,000	826,000	893,000	210,000	0	1,000	685,000	896,000	18,000	-21,000	-117,000	21,000	-9,000	-3,000	-12,000
2049	Wet	42,000	10,000	846,000	898,000	252,000	0	0	686,000	938,000	4,000	-44,000	-113,000	8,000	-10,000	-4,000	-34,000
2050	Above Normal	25,000	4,000	846,000	875,000	214,000	0	0	695,000	909,000	-11,000	-23,000	-124,000	-7,000	-15,000	-4,000	-8,000
2051	Above Normal	29,000	4,000	828,000	861,000	178,000	0	0	702,000	880,000	-5,000	-14,000	-129,000	-3,000	-13,000	-2,000	-1,000
2052	Dry	4,000	2,000	785,000	792,000	106,000	0	0	712,000	817,000	-9,000	-16,000	-138,000	-8,000	-15,000	-1,000	-1,000
2053	Dry	4,000	4,000	874,000	882,000	246,000	0	0	690,000	936,000	-12,000	-42,000	-150,000	-6,000	-15,000	-6,000	-27,000
2054	Below Normal	6,000	4,000	821,000	831,000	149,000	0	0	697,000	846,000	-5,000	-10,000	-155,000	-3,000	-9,000	-2,000	-1,000
2055	Dry	5,000	9,000	832,000	846,000	170,000	0	0	696,000	867,000	-3,000	-18,000	-158,000	0	-13,000	-3,000	-5,000
2056	Wet	36,000	6,000	789,000	831,000	140,000	0	0	705,000	845,000	-5,000	-9,000	-163,000	-1,000	-4,000	-4,000	-5,000
2057	Wet	36,000	2,000	798,000	836,000	156,000	0	0	699,000	856,000	-9,000	-11,000	-172,000	-6,000	-6,000	-3,000	-5,000
2058	Critical	4,000	5,000	853,000	863,000	244,000	0	0	671,000	915,000	-10,000	-42,000	-182,000	-6,000	-15,000	-4,000	-27,000
2059	Critical	7,000	4,000	944,000	955,000	389,000	0	0	654,000	1,043,000	-9,000	-79,000	-191,000	-5,000	-17,000	-4,000	-62,000
2060	Below Normal	5,000	8,000	954,000	967,000	356,000	0	0	667,000	1,024,000	-7,000	-50,000	-198,000	-3,000	-15,000	-4,000	-35,000
2061	Above Normal	27,000	11,000	784,000	822,000	81,000	0	0	724,000	806,000	7,000	9,000	-191,000	3,000	-5,000	4,000	14,000
2062	Wet	37,000	3,000	818,000	858,000	197,000	0	0	695,000	892,000	-10,000	-24,000	-201,000	-4,000	-5,000	-6,000	-19,000
2063	Dry	4,000	3,000	804,000	811,000	148,000	0	0	688,000	836,000	-9,000	-16,000	-210,000	-7,000	-12,000	-2,000	-4,000
2064	Critical	5,000	2,000	839,000	846,000	202,000	0	0	680,000	881,000	-10,000	-25,000	-220,000	-7,000	-17,000	-3,000	-8,000
2065	Critical	2,000	2,000	812,000	816,000	154,000	0	0	683,000	836,000	-6,000	-14,000	-226,000	-7,000	-17,000	1,000	3,000
2066	Critical	3,000	3,000	817,000	824,000	157,000	0	0	681,000	837,000	-4,000	-9,000	-230,000	-4,000	-9,000	0	0
2067	Dry	5,000	9,000	789,000	803,000	107,000	0	0	695,000	803,000	2,000	-2,000	-228,000	2,000	-5,000	0	3,000
2068	Wet	38,000	6,000	777,000	821,000	134,000	0	0	695,000	829,000	0	-8,000	-228,000	2,000	-2,000	-2,000	-6,000
2069	Below Normal	4,000	8,000	821,000	834,000	183,000	0	0	670,000	852,000	-3,000	-15,000	-231,000	0	-7,000	-3,000	-8,000
2070	Wet	37,000	3,000	811,000	851,000	184,000	0	0	691,000	875,000	-7,000	-17,000	-238,000	-5,000	-8,000	-2,000	-9,000
2071	Dry	4,000	1,000	807,000	812,000	154,000	0	0	685,000	839,000	-10,000	-17,000	-248,000	-8,000	-15,000	-2,000	-2,000
2072	Critical	4,000	3,000	840,000	847,000	201,000	0	0	680,000	881,000	-7,000	-27,000	-255,000	-5,000	-17,000	-2,000	-10,000
2073	Critical	4,000	3,000	825,000	832,000	177,000	0	0	681,000	858,000	-6,000	-20,000	-261,000	-5,000	-17,000	-1,000	-3,000
Average (2024-2073)		17,000	7,000	812,000	836,000	178,000	0	0	698,000	877,000	-5,000	-36,000	-3,000	-22,000	0	17,000	-36,000
AVERAGE (2041-2073)		16,000	7,000	825,000	848,000	186,000	0	0	689,000	875,000	-4,000	-23,000	-2,000	-12,000	0	8,000	-23,000
%		2.0%	0.8%	97.1%		25.5%	0.0%	0.0%									

Abbreviations

AFY = acre-feet per year

WY = Water Year

Notes

(a) Change in storage is calculated as the difference between inflows and outflows

(b) All numbers shown are rounded to the nearest 1,000. Summation of terms may have negligible departures due to rounding errors.

(c) Water release caused by subsidence is generally overestimated in the Model due to local overestimations of subsidence rates and extent.

Table H-10. Projected Annual Inflows and Outflows from the Basin Groundwater System Under 2030 Central Tendency Climate Change Scenario and Incorporating Projects and Management Actions (P/MAs)

		Projected 2030 Central Tendency Climate Change Scenario with P/MAs and CHD												Equivalent No-Pumping Scenario		Groundwater Storage Caused by Basin Management	Release Caused By Subsidence Caused by Basin Management
Water Year (Oct - Sep)	Water Year Type	INFLOWS (AFY)				OUTFLOWS (AFY)											
		Groundwater Recharge	Stream-Groundwater Interaction Inflow	Subsurface Groundwater Inflow	TOTAL INFLOWS	Groundwater Extractions	Losses from Unsaturated Zones	Stream-Groundwater Interaction Outflow	Subsurface Groundwater Outflow	Total Outflows	Change in Groundwater Storage	Water Release Caused By Subsidence	Cumulative Change in Groundwater Storage	Change in Groundwater Storage	Water Release Caused By Subsidence		
Projected Water Budget (WY 2024 - 2073)																	
2024	Above Normal	545,000	147,000	955,000	1,647,000	425,000	132,000	104,000	1,062,000	1,723,000	67,000	-143,000	67,000	148,000	-105,000	-81,000	-38,000
2025	Wet	346,000	131,000	992,000	1,468,000	512,000	86,000	83,000	1,018,000	1,698,000	-84,000	-146,000	-17,000	-34,000	-88,000	-50,000	-58,000
2026	Wet	353,000	98,000	975,000	1,426,000	469,000	69,000	73,000	1,012,000	1,623,000	-83,000	-114,000	-100,000	-48,000	-73,000	-35,000	-41,000
2027	Critical	371,000	61,000	1,012,000	1,444,000	530,000	74,000	65,000	965,000	1,634,000	-84,000	-106,000	-184,000	-65,000	-79,000	-19,000	-27,000
2028	Critical	228,000	129,000	1,022,000	1,379,000	507,000	89,000	78,000	932,000	1,606,000	-144,000	-83,000	-328,000	-110,000	-60,000	-34,000	-23,000
2029	Wet	591,000	238,000	1,067,000	1,896,000	593,000	132,000	88,000	976,000	1,788,000	200,000	-92,000	-128,000	192,000	-41,000	8,000	-51,000
2030	Above Normal	382,000	179,000	990,000	1,551,000	407,000	102,000	88,000	1,003,000	1,601,000	-10,000	-40,000	-138,000	-4,000	-39,000	-6,000	-1,000
2031	Wet	422,000	140,000	956,000	1,519,000	382,000	90,000	90,000	1,013,000	1,575,000	-9,000	-47,000	-147,000	7,000	-37,000	-16,000	-10,000
2032	Dry	261,000	120,000	1,004,000	1,385,000	450,000	64,000	73,000	962,000	1,549,000	-124,000	-40,000	-271,000	-92,000	-30,000	-32,000	-10,000
2033	Wet	344,000	292,000	994,000	1,630,000	416,000	122,000	93,000	980,000	1,612,000	54,000	-36,000	-217,000	51,000	-23,000	3,000	-13,000
2034	Wet	553,000	213,000	1,040,000	1,807,000	525,000	127,000	108,000	1,009,000	1,769,000	99,000	-61,000	-118,000	105,000	-18,000	-6,000	-43,000
2035	Above Normal	345,000	109,000	969,000	1,423,000	381,000	69,000	86,000	999,000	1,535,000	-95,000	-17,000	-213,000	-84,000	-22,000	-11,000	5,000
2036	Dry	260,000	154,000	984,000	1,398,000	433,000	70,000	73,000	964,000	1,540,000	-101,000	-41,000	-314,000	-73,000	-28,000	-28,000	-13,000
2037	Wet	397,000	137,000	970,000	1,504,000	404,000	64,000	76,000	979,000	1,523,000	15,000	-34,000	-299,000	21,000	-24,000	-6,000	-10,000
2038	Critical	251,000	77,000	989,000	1,318,000	440,000	47,000	60,000	946,000	1,493,000	-141,000	-34,000	-440,000	-106,000	-29,000	-35,000	-5,000
2039	Critical	283,000	71,000	977,000	1,332,000	387,000	46,000	62,000	947,000	1,441,000	-85,000	-24,000	-525,000	-65,000	-22,000	-20,000	-2,000
2040	Critical	235,000	76,000	1,017,000	1,328,000	439,000	39,000	52,000	930,000	1,460,000	-100,000	-32,000	-625,000	-73,000	-16,000	-27,000	-16,000
2041	Critical	334,000	80,000	1,037,000	1,451,000	504,000	50,000	53,000	916,000	1,524,000	-29,000	-44,000	-654,000	-28,000	-23,000	-1,000	-21,000
2042	Critical	390,000	123,000	1,043,000	1,557,000	504,000	58,000	59,000	919,000	1,541,000	52,000	-36,000	-602,000	50,000	-24,000	2,000	-12,000
2043	Critical	309,000	165,000	1,011,000	1,485,000	425,000	82,000	76,000	940,000	1,522,000	-20,000	-17,000	-622,000	-14,000	-18,000	-6,000	1,000
2044	Wet	685,000	160,000	1,034,000	1,879,000	520,000	106,000	89,000	963,000	1,678,000	240,000	-39,000	-382,000	194,000	-10,000	46,000	-29,000
2045	Critical	248,000	168,000	994,000	1,409,000	426,000	87,000	78,000	944,000	1,534,000	-112,000	-13,000	-494,000	-95,000	-16,000	-17,000	3,000
2046	Wet	546,000	207,000	993,000	1,746,000	434,000	116,000	91,000	980,000	1,622,000	146,000	-22,000	-348,000	127,000	-8,000	19,000	-14,000
2047	Wet	470,000	191,000	1,012,000	1,673,000	500,000	113,000	95,000	978,000	1,687,000	14,000	-28,000	-334,000	22,000	-14,000	-8,000	-14,000
2048	Wet	560,000	267,000	1,026,000	1,853,000	527,000	166,000	108,000	987,000	1,789,000	89,000	-25,000	-245,000	90,000	-12,000	-1,000	-13,000
2049	Wet	742,000	164,000	1,048,000	1,954,000	560,000	193,000	113,000	999,000	1,866,000	128,000	-40,000	-117,000	124,000	-6,000	4,000	-34,000
2050	Above Normal	299,000	112,000	1,048,000	1,460,000	545,000	72,000	75,000	972,000	1,664,000	-177,000	-27,000	-294,000	-143,000	-16,000	-34,000	-11,000
2051	Above Normal	538,000	133,000	1,019,000	1,690,000	479,000	101,000	82,000	981,000	1,642,000	62,000	-14,000	-232,000	44,000	-13,000	18,000	-1,000
2052	Dry	277,000	91,000	969,000	1,336,000	363,000	64,000	74,000	982,000	1,483,000	-131,000	-16,000	-363,000	-111,000	-16,000	-20,000	0
2053	Dry	326,000	103,000	1,088,000	1,518,000	600,000	64,000	64,000	934,000	1,662,000	-99,000	-45,000	-462,000	-65,000	-15,000	-34,000	-30,000
2054	Below Normal	318,000	96,000	1,023,000	1,437,000	412,000	57,000	62,000	954,000	1,484,000	-36,000	-11,000	-498,000	-32,000	-11,000	-4,000	0
2055	Dry	339,000	147,000	1,034,000	1,519,000	482,000	81,000	66,000	938,000	1,567,000	-30,000	-18,000	-528,000	-14,000	-12,000	-16,000	-6,000
2056	Wet	427,000	179,000	995,000	1,601,000	388,000	85,000	76,000	980,000	1,529,000	81,000	-9,000	-447,000	67,000	-4,000	14,000	-5,000
2057	Wet	376,000	140,000	997,000	1,512,000	419,000	64,000	72,000	979,000	1,535,000	-11,000	-12,000	-458,000	-6,000	-9,000	-5,000	-3,000
2058	Critical	308,000	107,000	1,059,000	1,474,000	572,000	58,000	62,000	928,000	1,620,000	-97,000	-49,000	-555,000	-84,000	-19,000	-13,000	-30,000
2059	Critical	494,000	94,000	1,163,000	1,751,000	797,000	84,000	67,000	885,000	1,833,000	3,000	-85,000	-552,000	8,000	-16,000	-5,000	-69,000
2060	Below Normal	408,000	132,000	1,184,000	1,724,000	754,000	82,000	62,000	891,000	1,789,000	-12,000	-53,000	-564,000	-19,000	-15,000	7,000	-38,000
2061	Above Normal	374,000	164,000	984,000	1,521,000	317,000	87,000	73,000	983,000	1,460,000	48,000	13,000	-516,000	26,000	-8,000	22,000	21,000
2062	Wet	526,000	155,000	1,019,000	1,701,000	473,000	89,000	75,000	974,000	1,611,000	116,000	-26,000	-400,000	94,000	-5,000	22,000	-21,000
2063	Dry	271,000	83,000	997,000	1,352,000	416,000	60,000	65,000	950,000	1,491,000	-119,000	-20,000	-519,000	-107,000	-16,000	-12,000	-4,000
2064	Critical	394,000	56,000	1,037,000	1,487,000	525,000	74,000	68,000	916,000	1,583,000	-70,000	-26,000	-589,000	-50,000	-18,000	-20,000	-8,000
2065	Critical	294,000	22,000	1,021,000	1,337,000	472,000	57,000	52,000	884,000	1,466,000	-114,000	-15,000	-703,000	-91,000	-17,000	-23,000	2,000
2066	Critical	417,000	35,000	1,032,000	1,483,000	482,000	72,000	63,000	878,000	1,495,000	-3,000	-9,000	-706,000	1,000	-10,000	-4,000	1,000
2067	Dry	429,000	148,000	1,001,000	1,578,000	371,000	99,000	68,000	922,000	1,461,000	117,000	0	-589,000	94,000	-3,000	23,000	3,000
2068	Wet	582,000	221,000	981,000	1,785,000	391,000	128,000	92,000	975,000	1,586,000	206,000	-7,000	-383,000	166,000	0	40,000	-7,000
2069	Below Normal	315,000	166,000	1,019,000	1,501,000	477,000	92,000	67,000	935,000	1,571,000	-53,000	-17,000	-436,000	-50,000	-9,000	-3,000	-8,000
2070	Wet	511,000	136,000	1,013,000	1,660,000	480,000	103,000	88,000	966,000	1,638,000	40,000	-18,000	-396,000	39,000	-9,000	1,000	-9,000
2071	Dry	287,000	84,000	1,000,000	1,371,000	443,000	64,000	67,000	940,000	1,514,000	-124,000	-19,000	-520,000	-102,000	-17,000	-22,000	-2,000
2072	Critical	385,000	65,000	1,041,000	1,491,000	528,000	75,000	63,000	916,000	1,581,000	-61,000	-29,000	-581,000	-40,000	-17,000	-21,000	-12,000
2073	Critical	390,000	63,000	1,033,000	1,486,000	496,000	75,000	64,000	914,000	1,550,000	-43,000	-21,000	-624,000	-27,000	-18,000	-16,000	-3,000
Average (2024-2073)		395,000	133,000	1,017,000	1,545,000	476,000	86,000	76,000	958,000	1,595,000	-12,000	-38,000	-3,000	-23,000	0	11,000	-38,000
AVERAGE (2041-2073)		411,000	129,000	1,029,000	1,569,000	487,000	87,000	74,000	946,000	1,593,000	0	-24,000	2,000	-13,000	0	13,000	-24,000
%		25.6%	8.6%	65.8%		49.7%	9.0%	7.9%									

Abbreviations

AFY = acre-feet per year

WY = Water Year

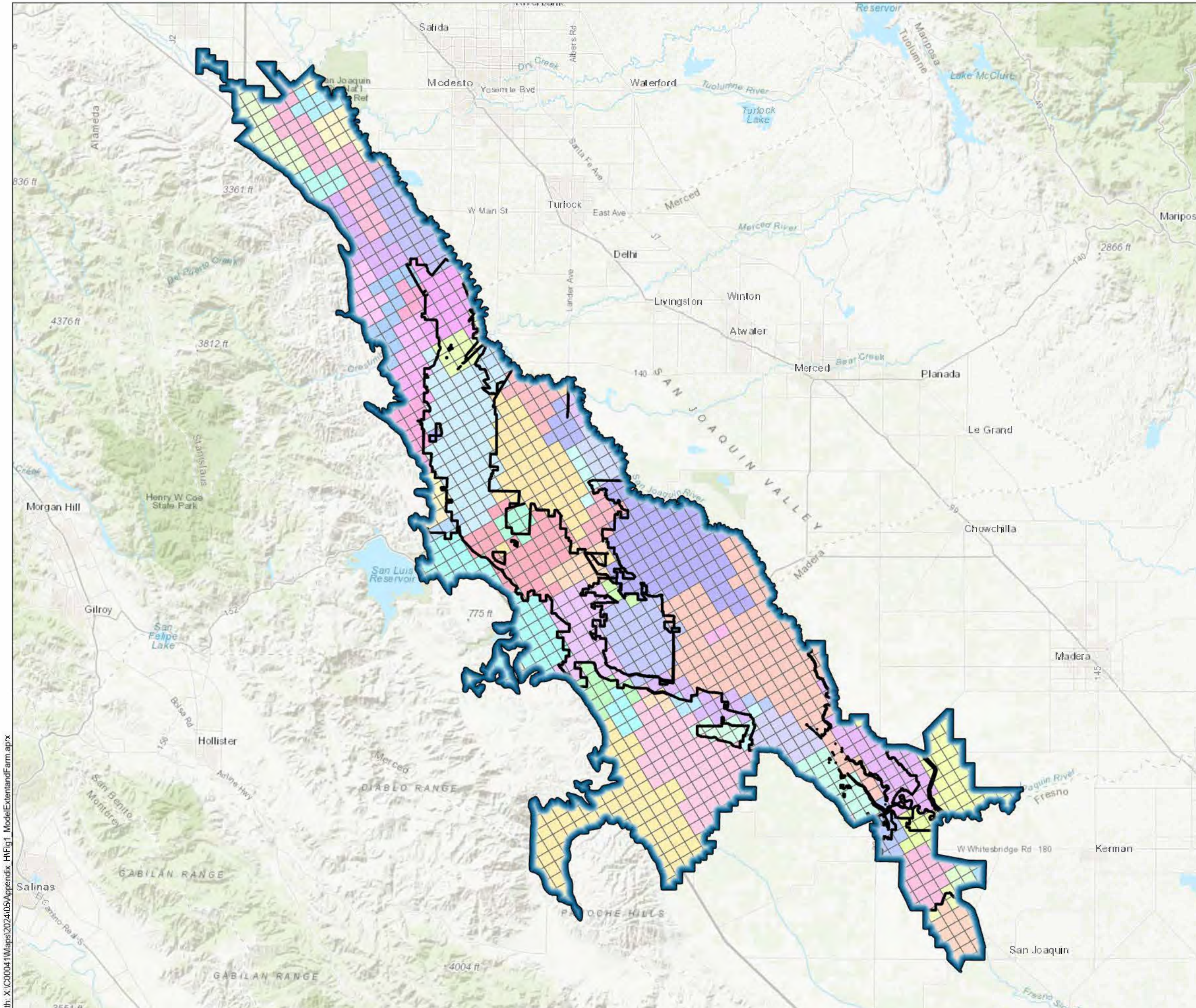
Notes

(a) Change in storage is calculated as the difference between inflows and outflows

(b) All numbers shown are rounded to the nearest 1,000. Summation of terms may have negligible departures due to rounding errors.

(c) Water release caused by subsidence is generally overestimated in the Model due to local overestimations of subsidence rates and extent.

Figures



Legend

Delta-Mendota Subbasin (DWR Basin No. 5-022.07)

GSA Group Boundary

Abbreviations

CVHM2-SJV = Central Valley Hydrologic Model Version 2 – San Joaquin Valley
DWR = California Department of Water Resources
GSA = Groundwater Sustainability Agency

Sources

1. Groundwater basins and subbasins. California Department of Water Resources. August 25, 2023.
2. CVHM2-SJV is developed by the United States Geological Survey's (USGS).

Notes

1. Grid colors represent different Farm IDs.

N 0 12 24 Miles

CVHM2-SJV Model Extent and Grid

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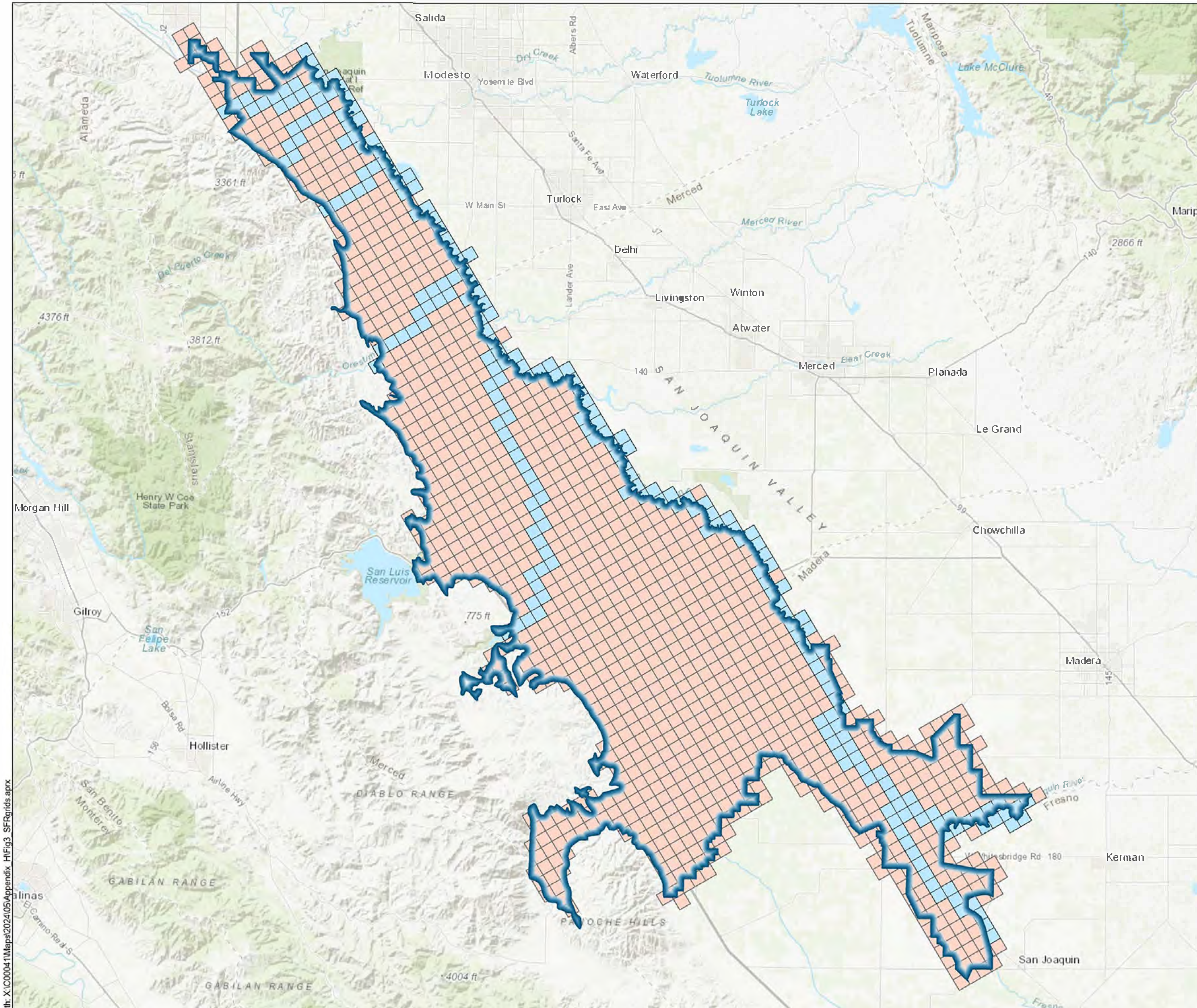
Delta-Mendota Subbasin
July 2024
C00041.09

Figure H-1

Path: X:\C00041\Maps\2024\05\Appendix_H\Fig1_ModelExtentandFarm.aprx



Abbreviations
CVHM2-SJV = Central Valley Hydrologic Model Version 2 – San Joaquin Valley
DWR = California Department of Water Resources
SFR = Streamflow-Routing Package
USGS = United States Geological Survey

Sources
1. Groundwater basins and subbasins. California Department of Water Resources. August 25, 2023.
2. CVHM2-SJV is developed by the USGS.
3. SFR Package is developed by the USGS.

Stream Boundaries

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Delta-Mendota Subbasin
July 2024
C00041.09

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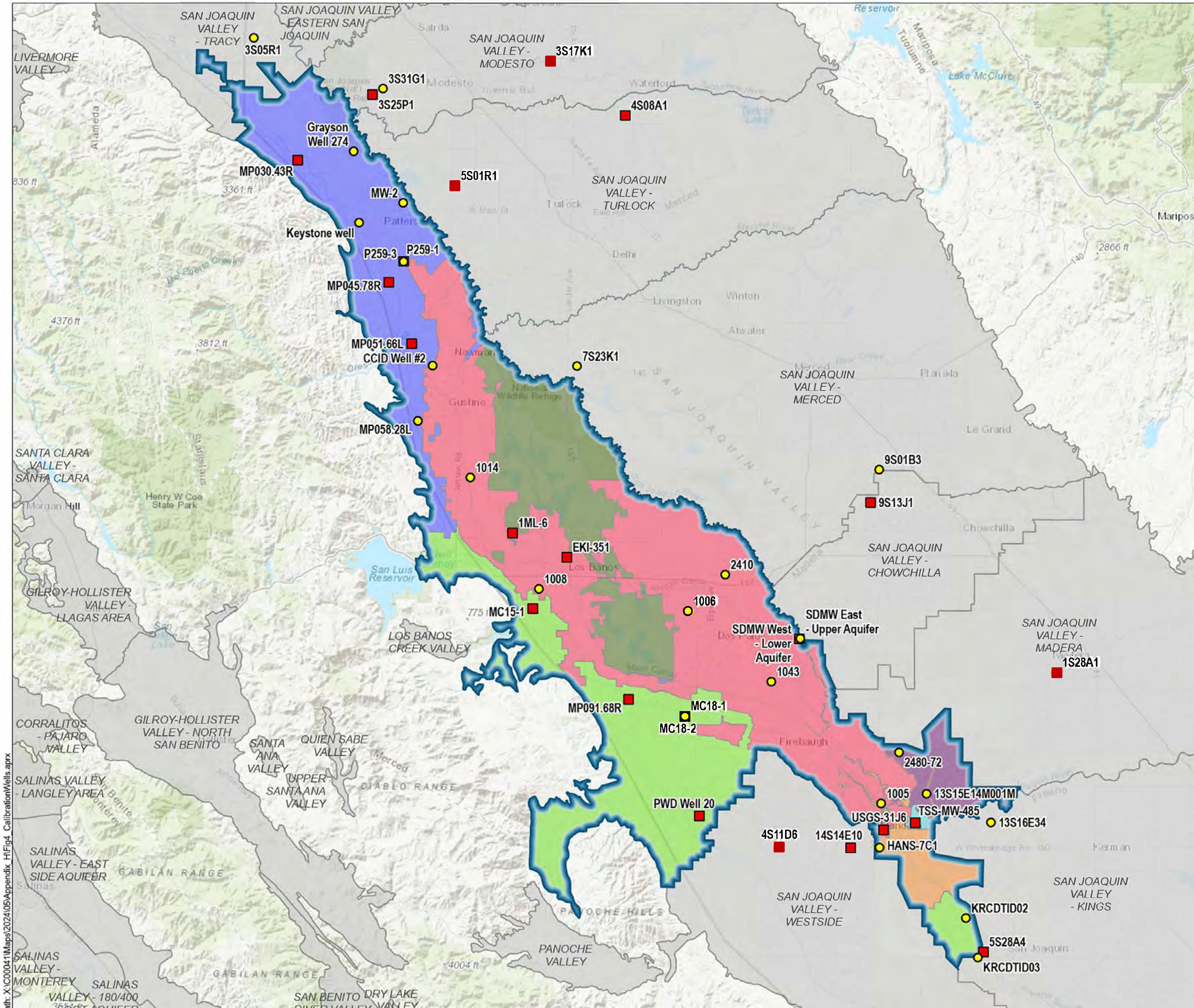
Figure 3

Path: X:\C00041\Maps\2024\05\Appendix_H\Fig3_SFRgrids.aprx



Legend

- Delta-Mendota Subbasin (DWR Basin No. 5-022.07)
- Other Groundwater Basin

Calibration Well

- Lower Aquifer
- Upper Aquifer

GSA Group

- Aliso Water District
- Central Delta-Mendota
- Farmers Water District
- Fresno County
- Grassland Water District
- Northern Delta-Mendota
- San Joaquin River Exchange Contractors

Abbreviations

DWR = California Department of Water Resources
GSA = Groundwater Sustainability Agency
RMW = Representative Monitoring Well

Sources

1. Groundwater basins and subbasins. California Department of Water Resources. August 25, 2023.

Notes

1. Observation data subset includes 32 RMWs within the Basin and 16 monitoring wells outside of the Basin.

N

0 12 24
Miles

Observation Data Subset

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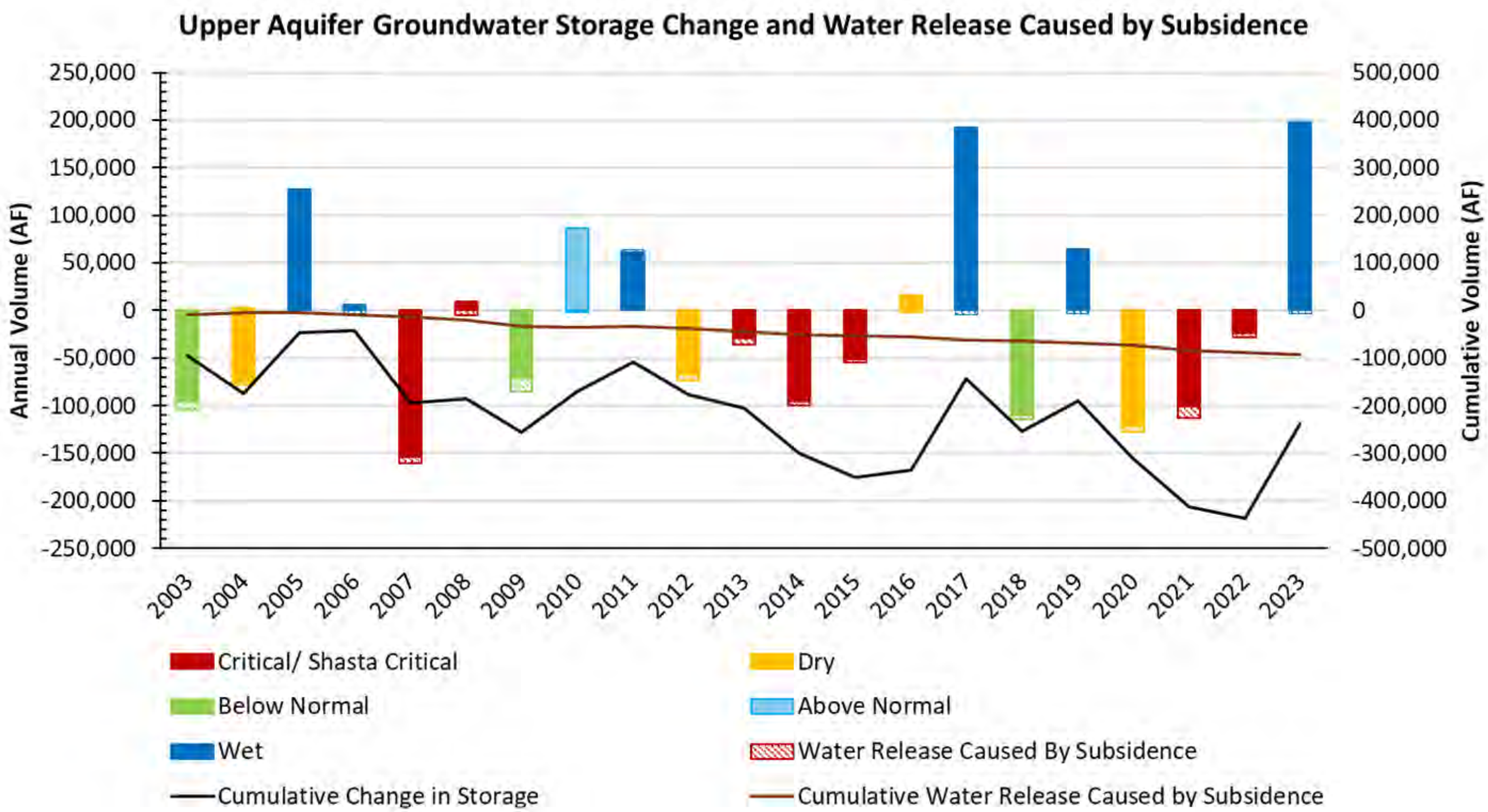
Delta-Mendota Subbasin
July 2024
C00041.09

Figure H-3



Notes:
1. If accommodation or alternative format is needed for this figure, please contact the Plan Manager for assistance.

Abbreviations

AF = acre-feet

SGMA = Sustainable Groundwater Management Act

Annual Groundwater Storage Change, Upper Aquifer

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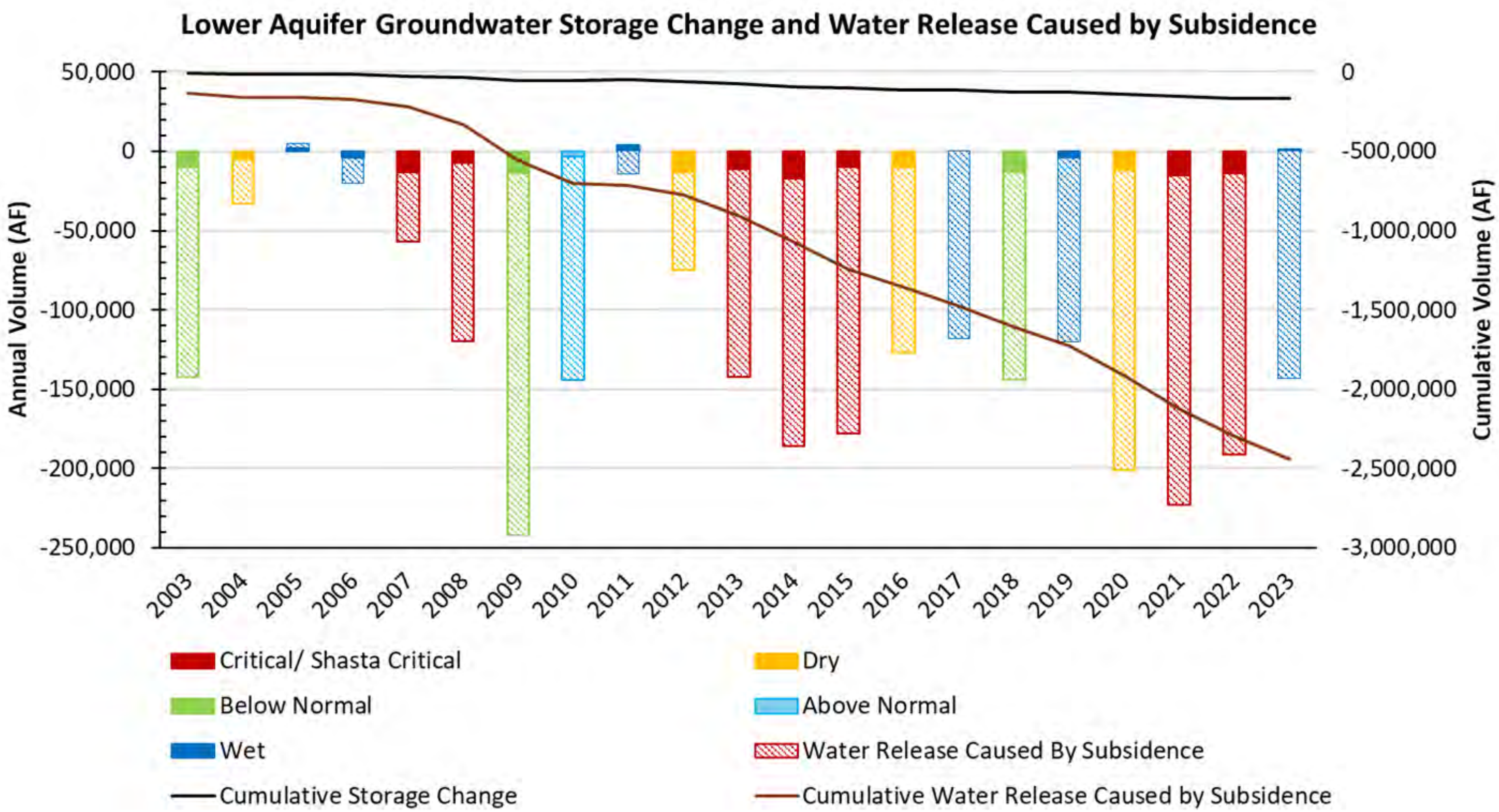
Delta-Mendota Subbasin
July 2024
C00041.09
Figure H-4



Notes:

1. If accommodation or alternative format is needed for this figure, please contact the Plan Manager for assistance.

Abbreviations

AF = acre-feet

SGMA = Sustainable Groundwater Management Act

Annual Groundwater Storage Change, Lower Aquifer

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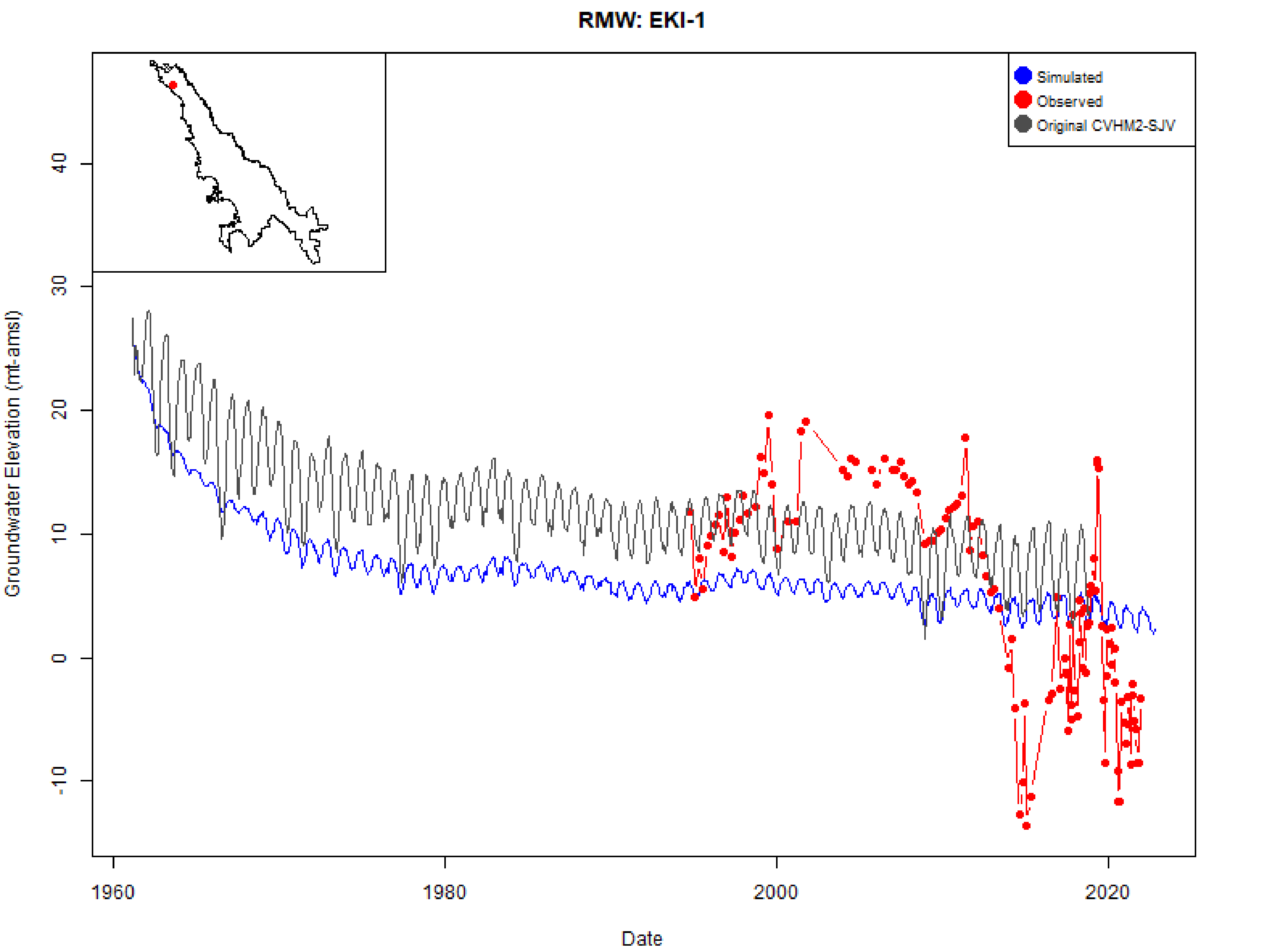
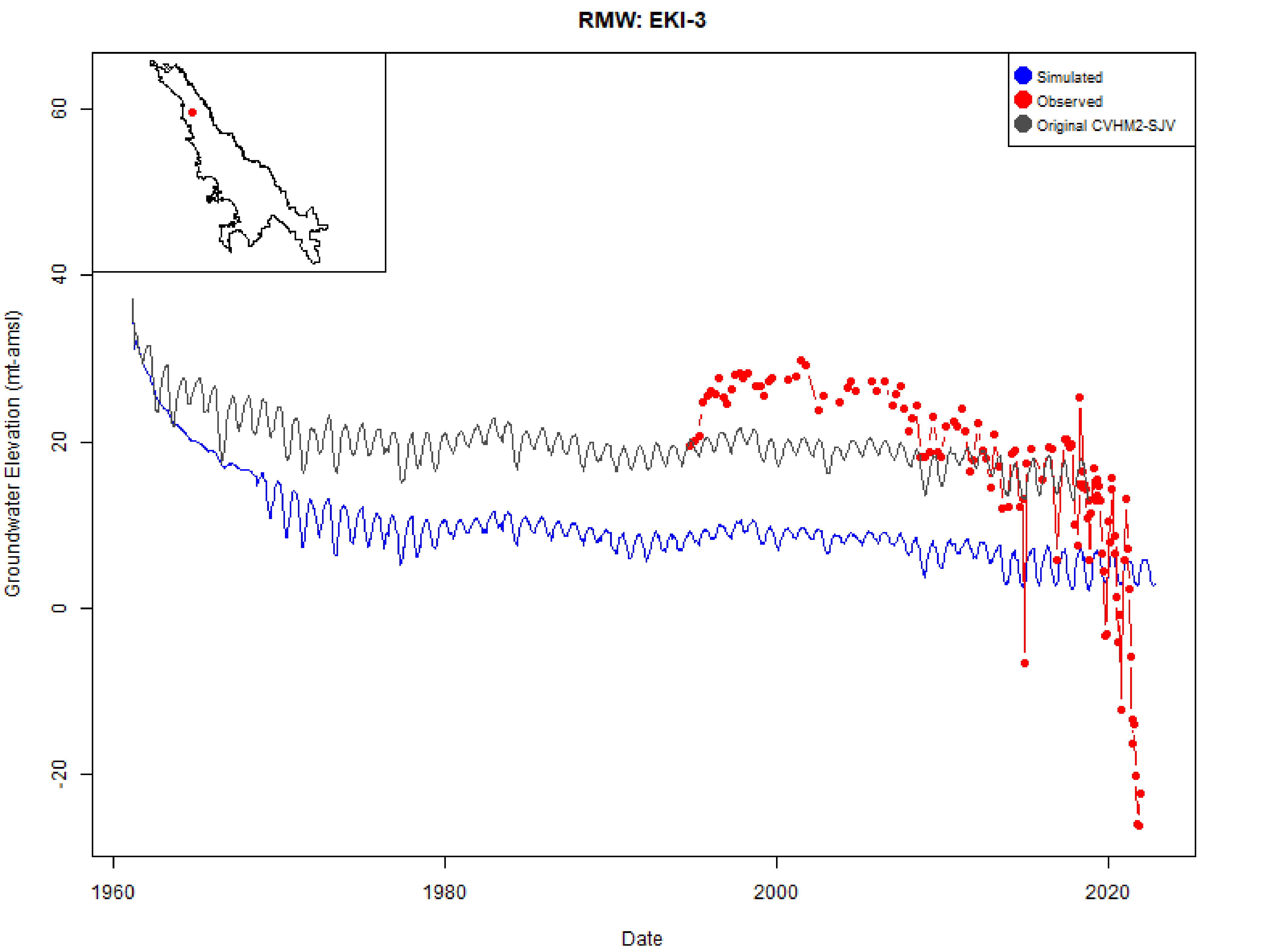
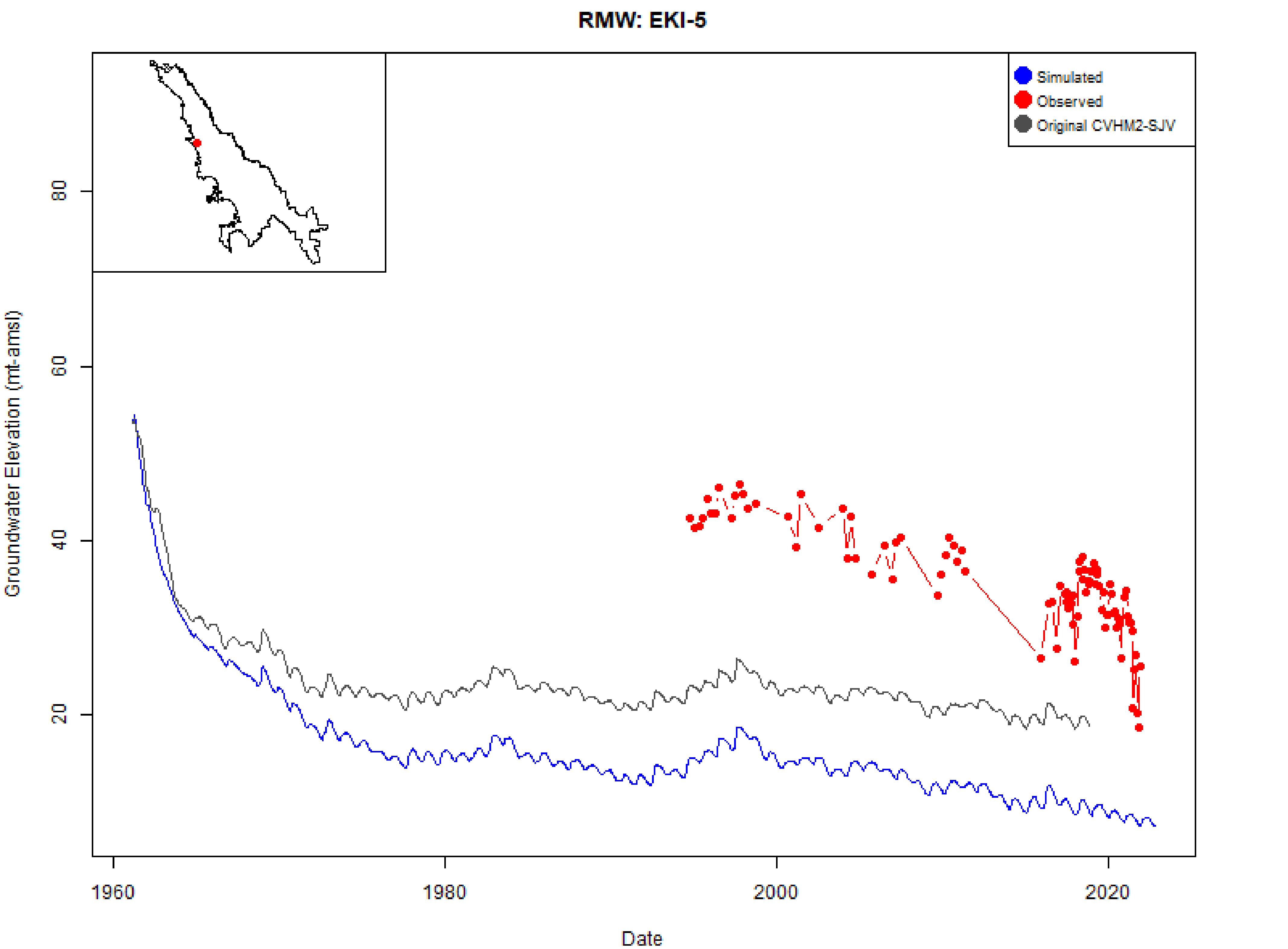
Delta-Mendota Subbasin
July 2024
C00041.09
Figure H-5

Attachment A

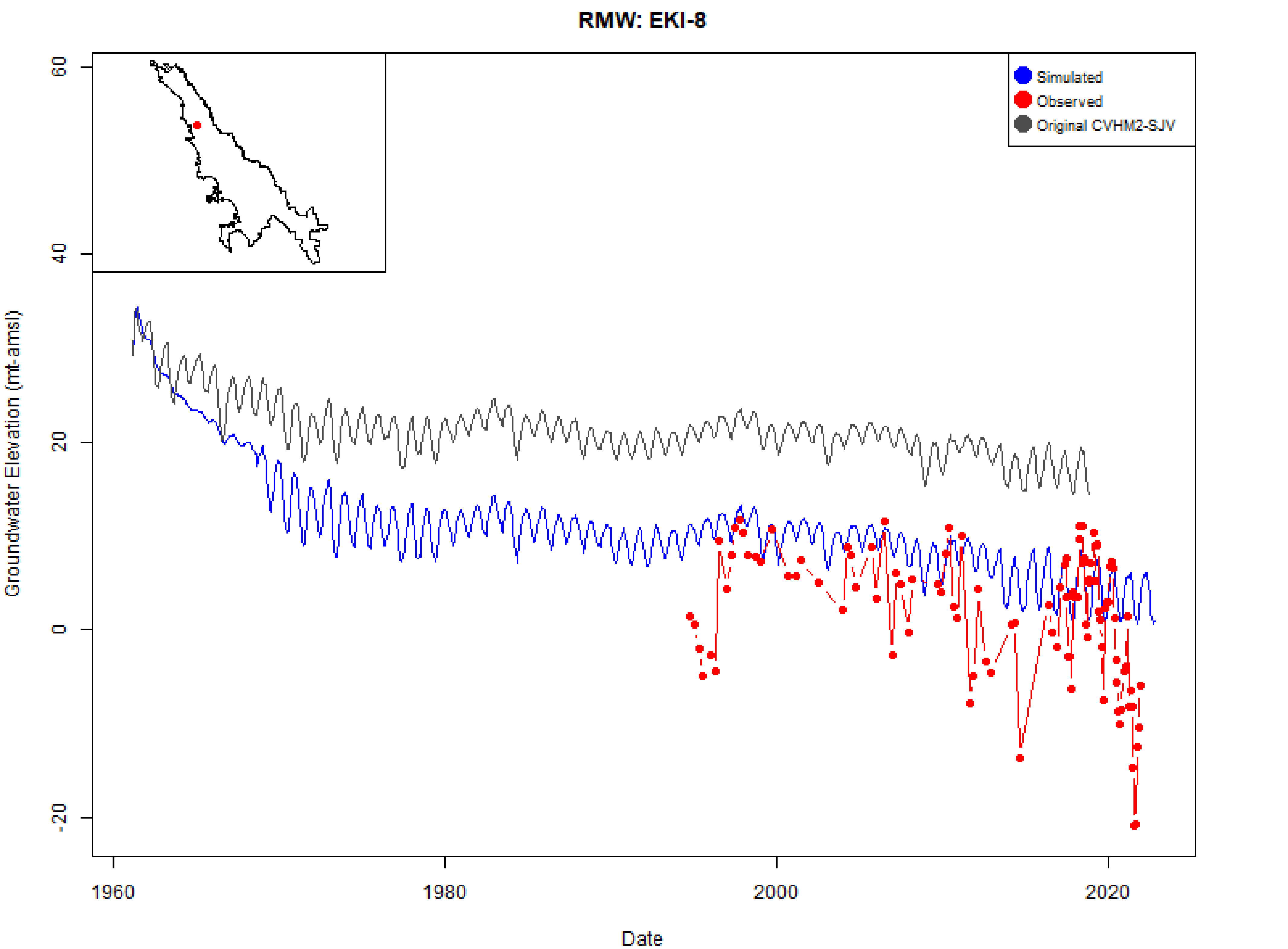


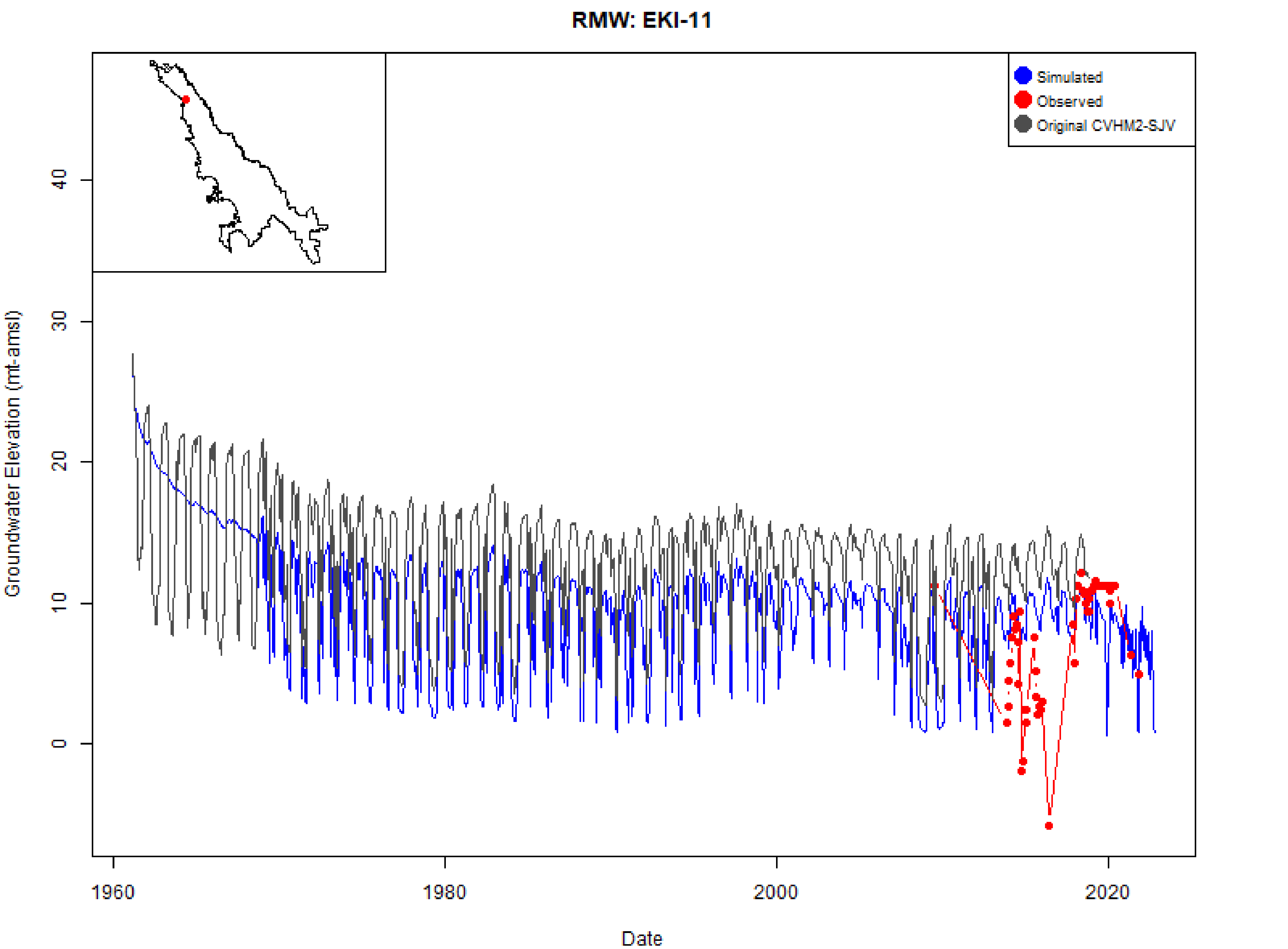
RMW: EKI-1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
-10
0
10
20
30
40
1960
1980
2000
2020
Date


RMW: EKI-3
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
60
40
20
0
-20
1960
1980
2000
2020
Date

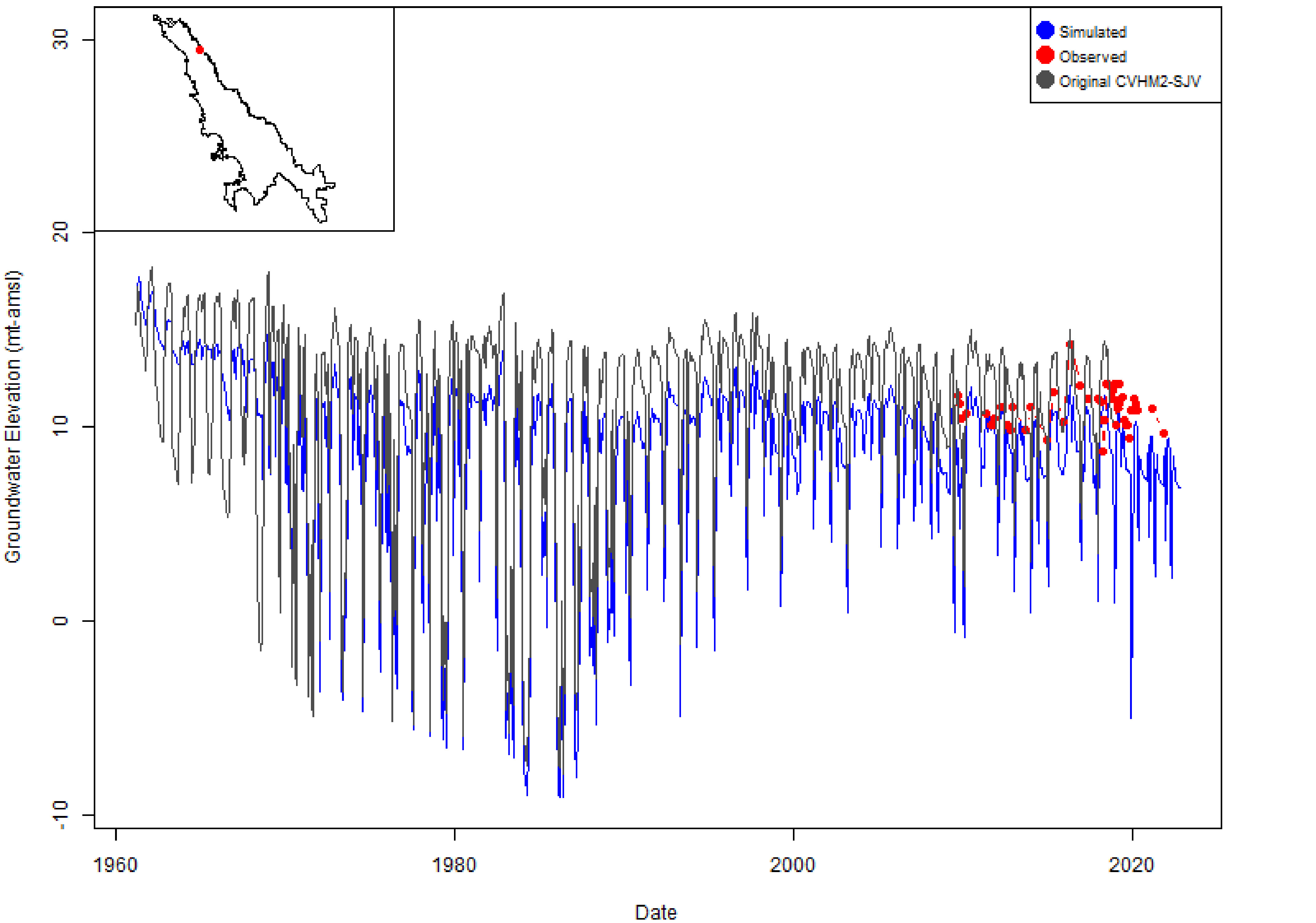


RMW: EKI-5
Simulated
Observed
Original CVHM2-SJV
80
60
40
20
Groundwater Elevation (mt-amsl)
1960
1980
2000
2020
Date

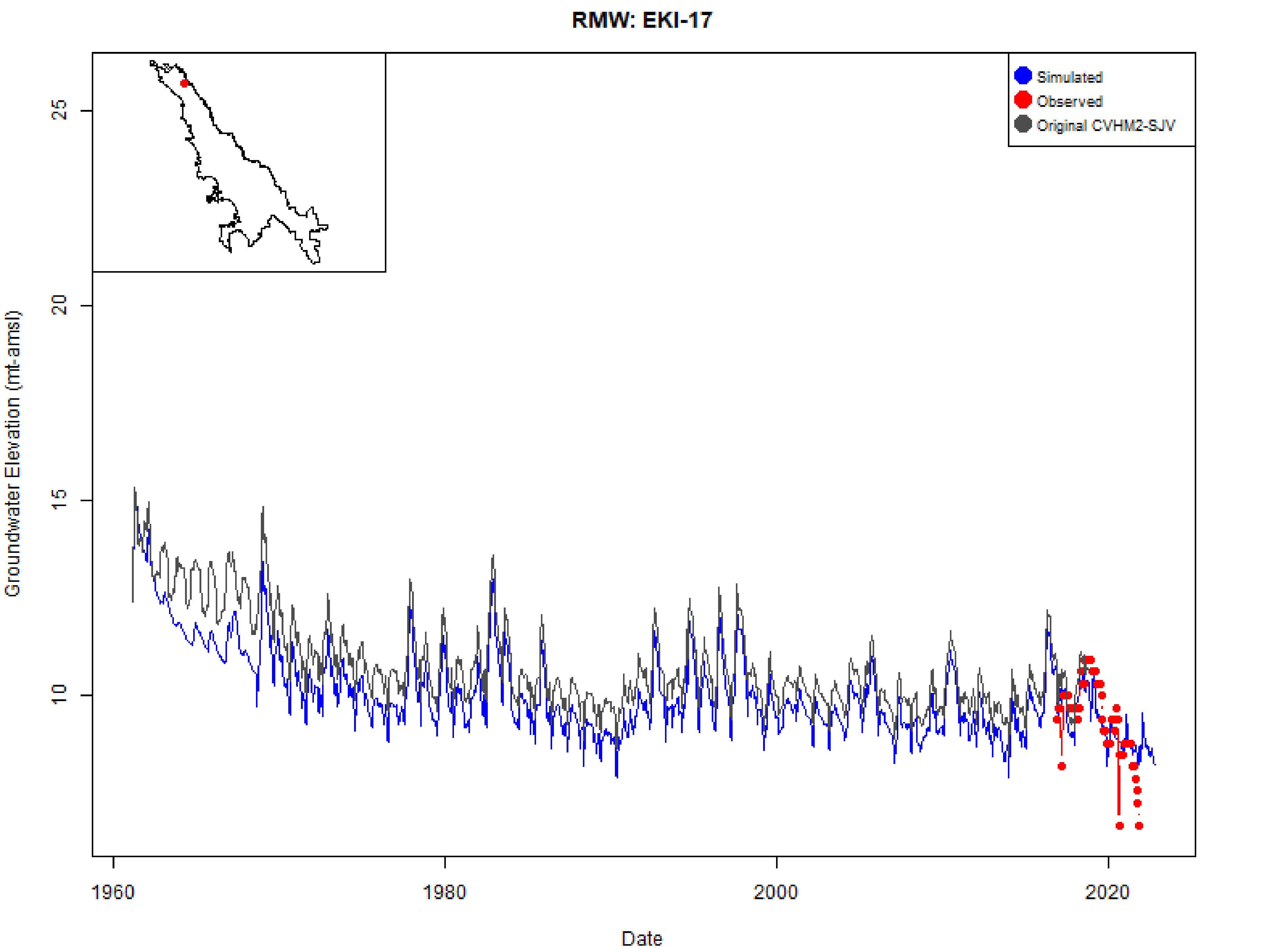

RMW: EKI-8
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
Date
60
40
20
0
-20
1960
1980
2000
2020

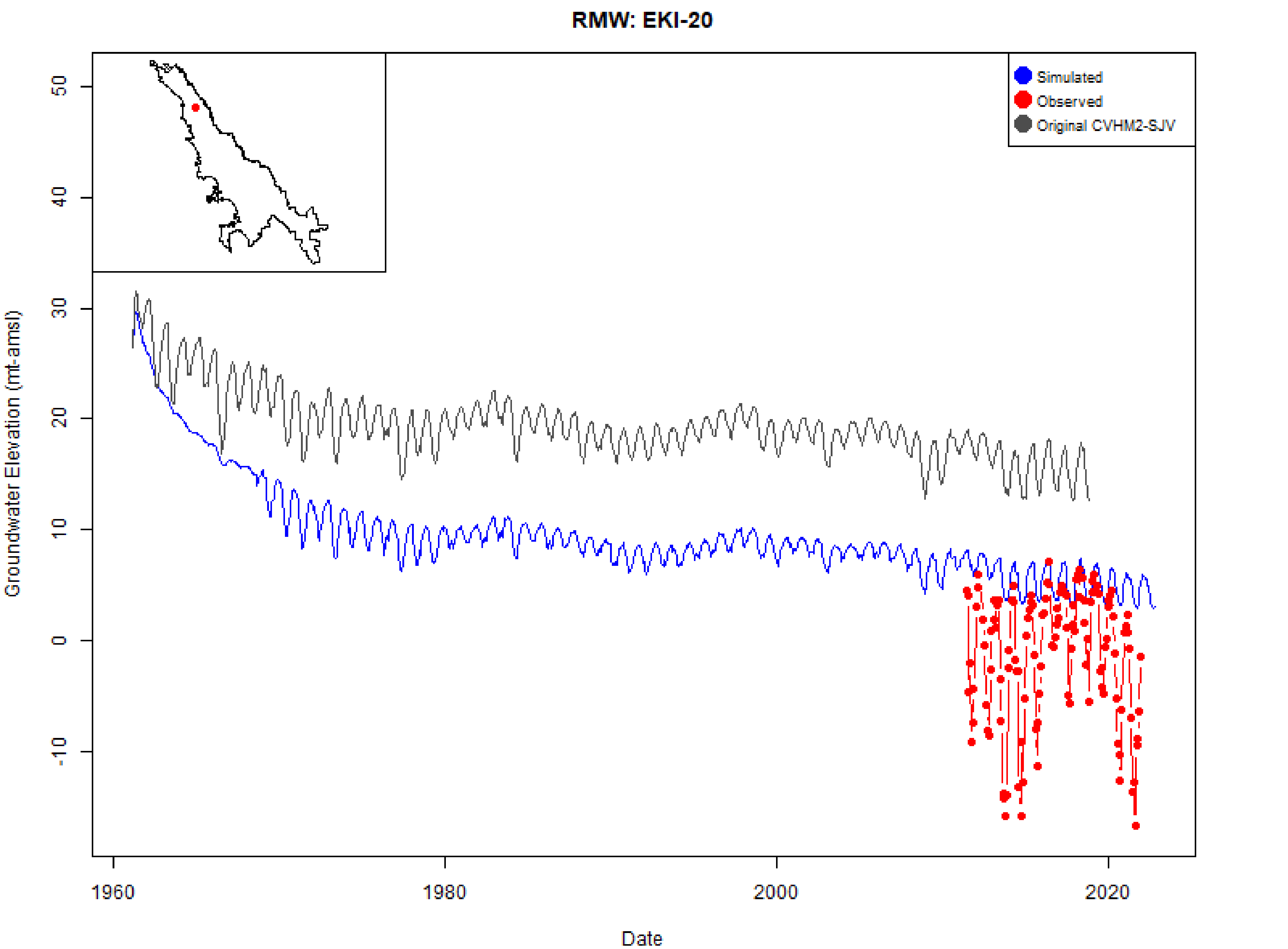

RMW: EKI-11
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
0
10
20
30
40
1960
1980
2000
2020
Date

RMW: EKI-12

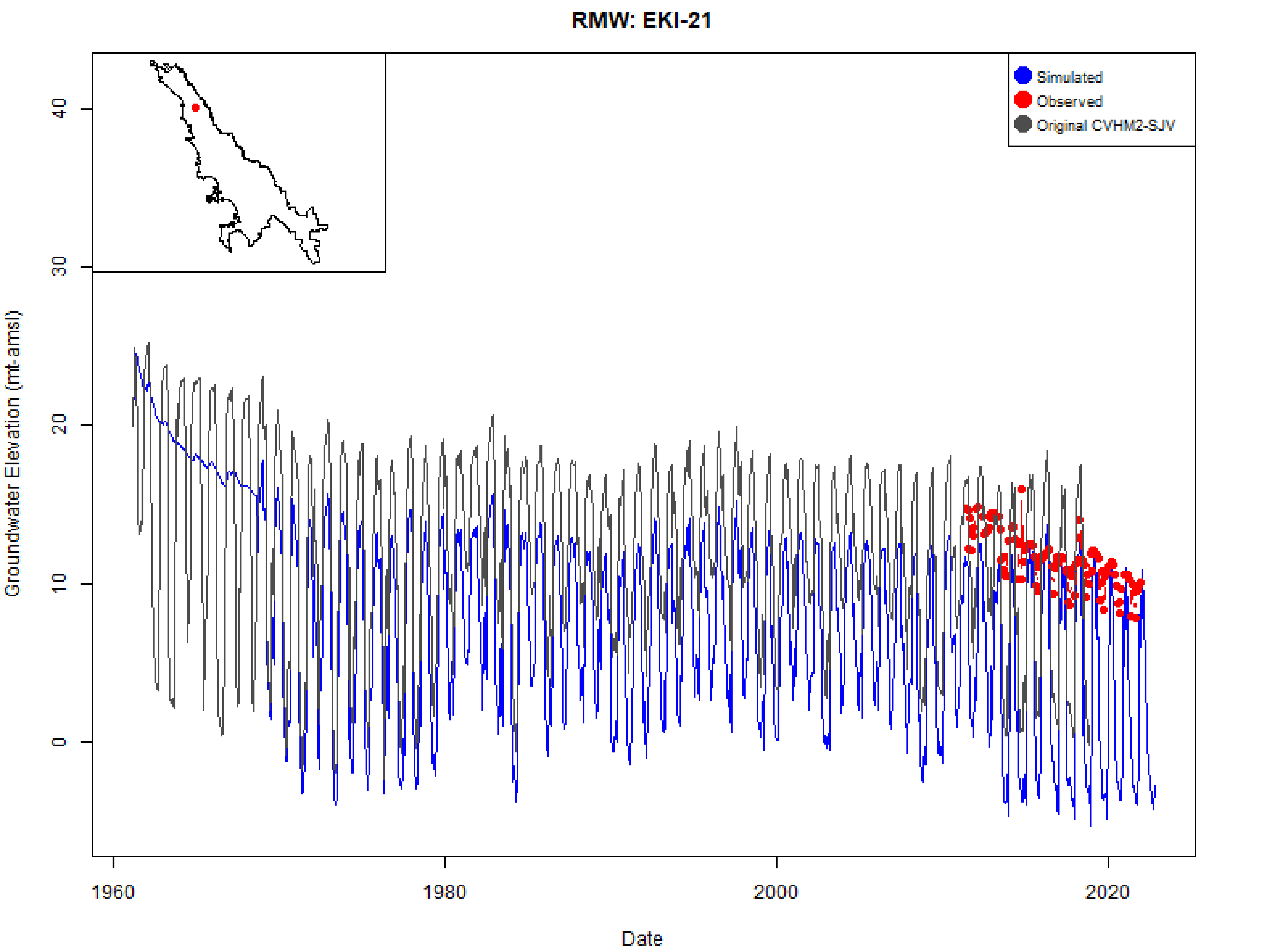


Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
30
20
10
0
-10
1960
1980
2000
2020
Date

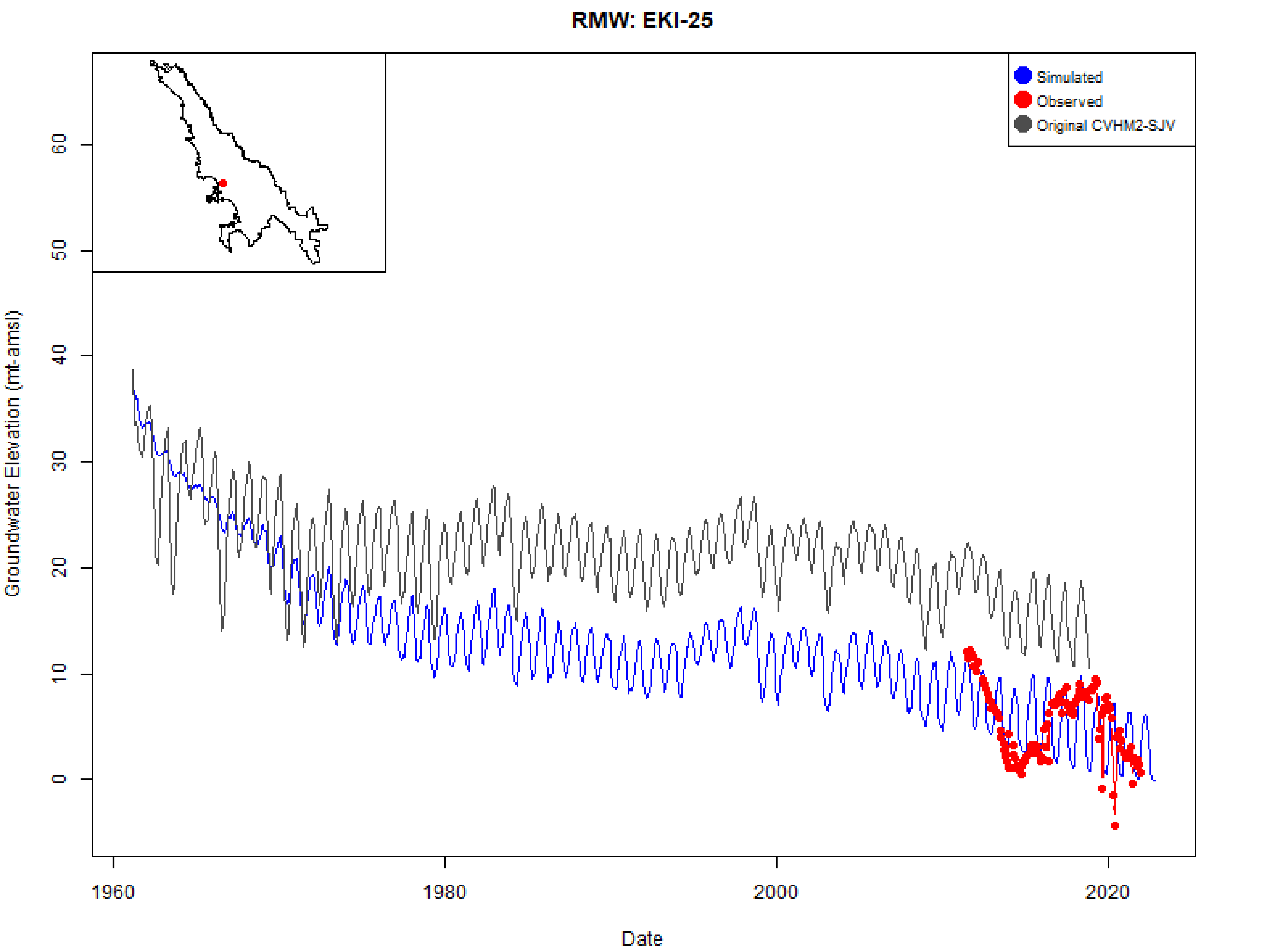

RMW: EKI-17
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
25
20
15
10
1960
1980
2000
2020
Date



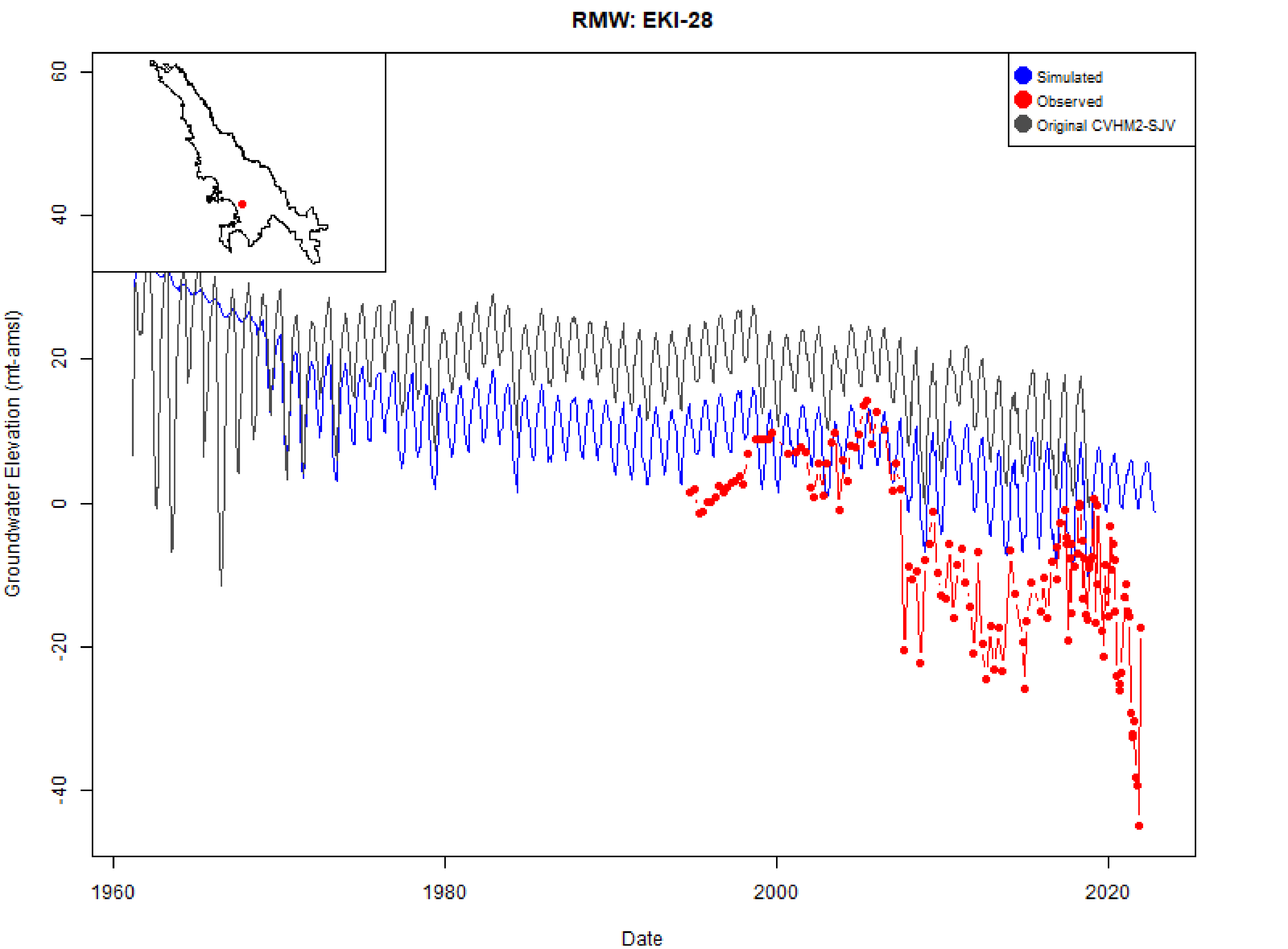
RMW: EKI-20
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
50
40
30
20
10
0
-10
1960
1980
2000
2020
Date



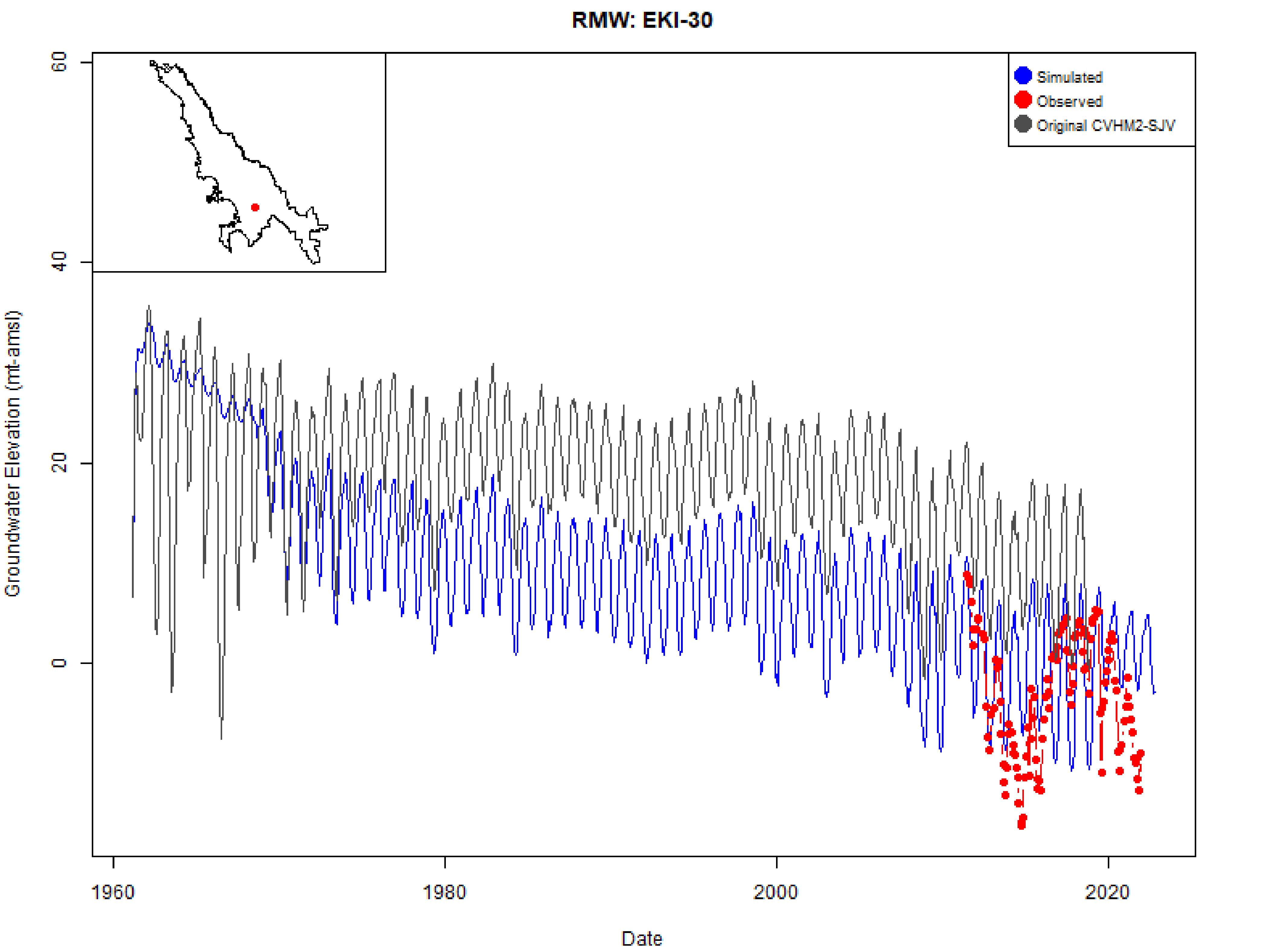
RMW: EKI-21
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
0
10
20
30
40
1960
1980
2000
2020
Date

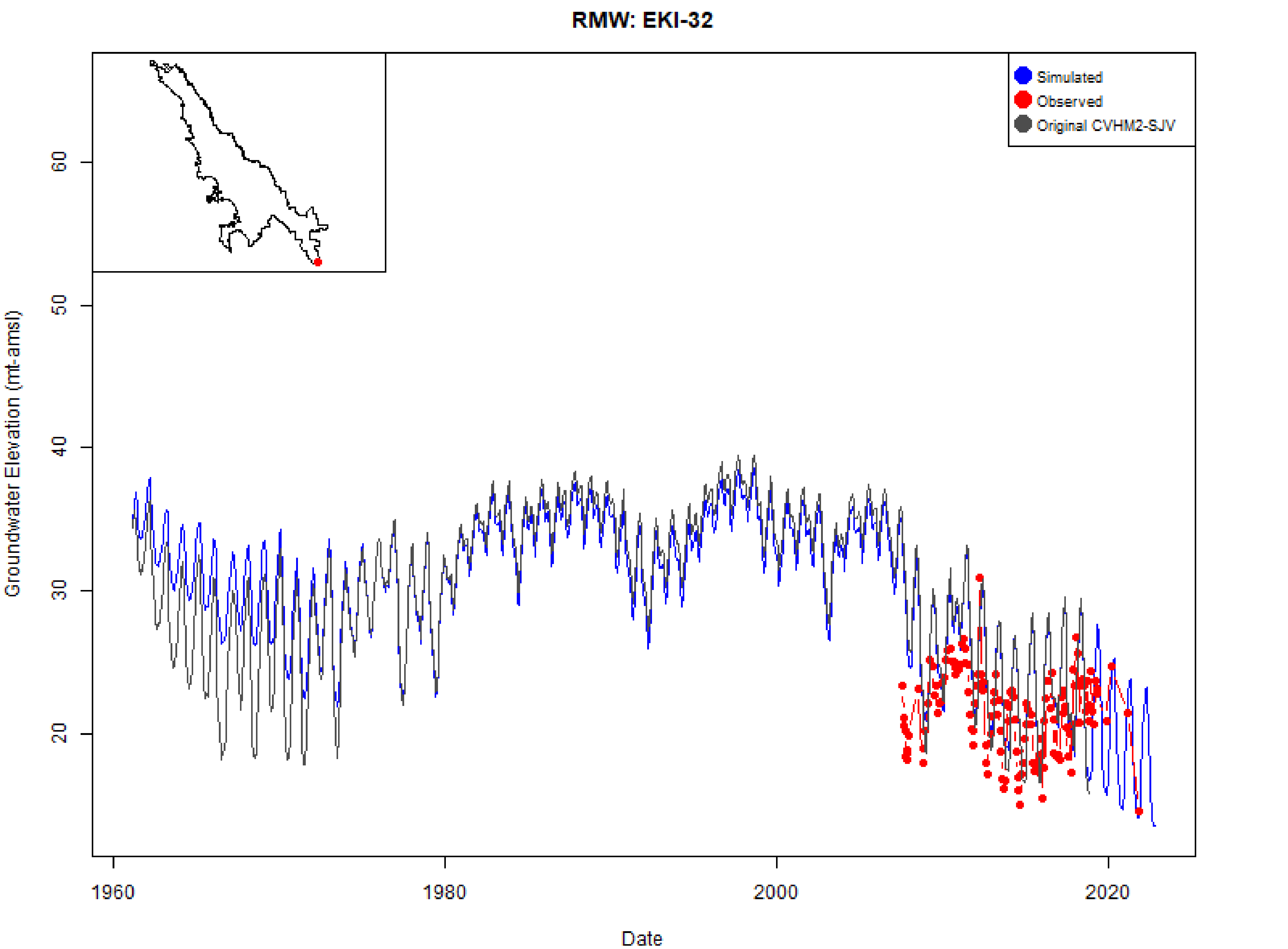


RMW: EKI-25
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
0
10
20
30
40
50
60
1960
1980
2000
2020
Date

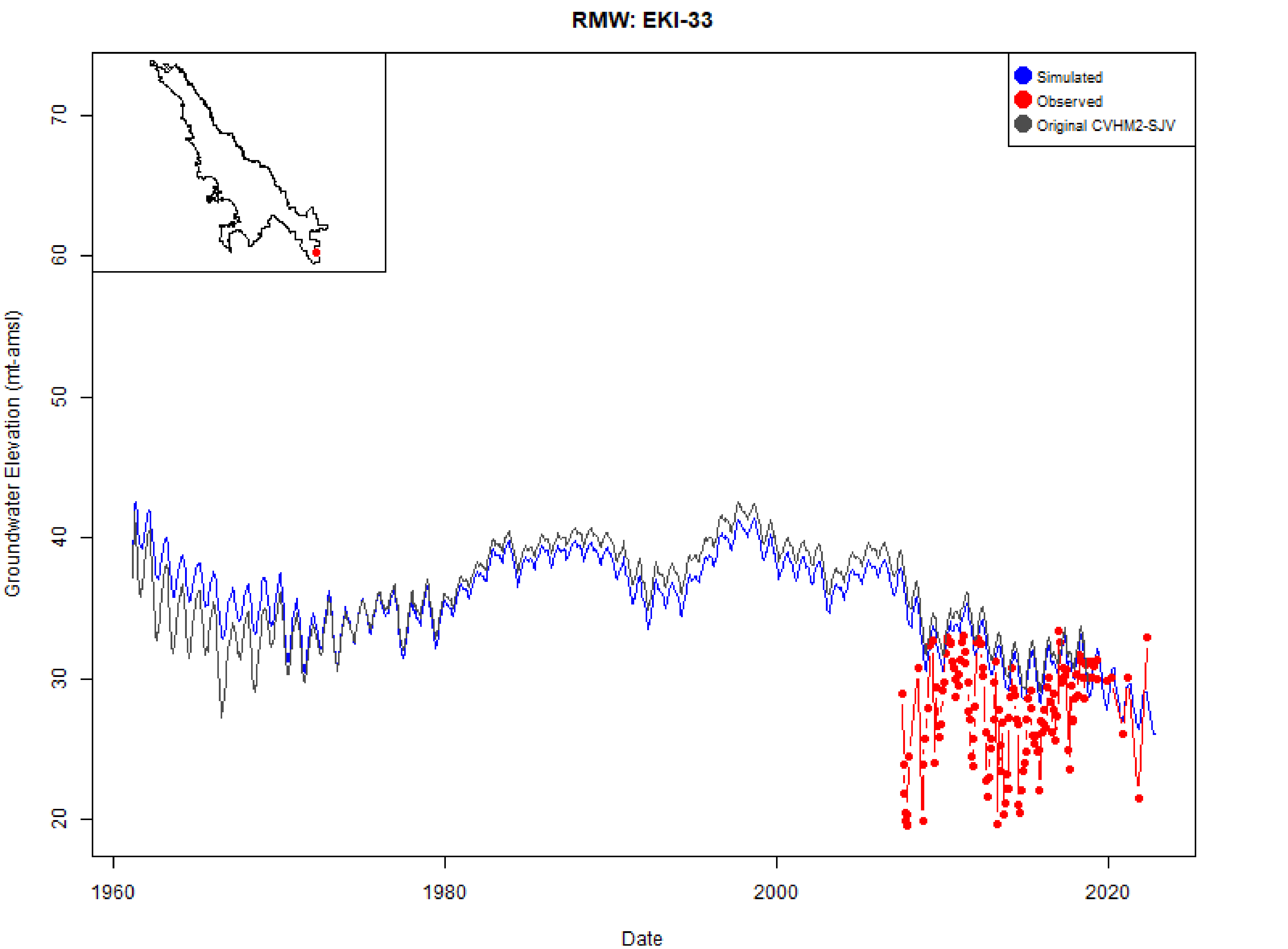


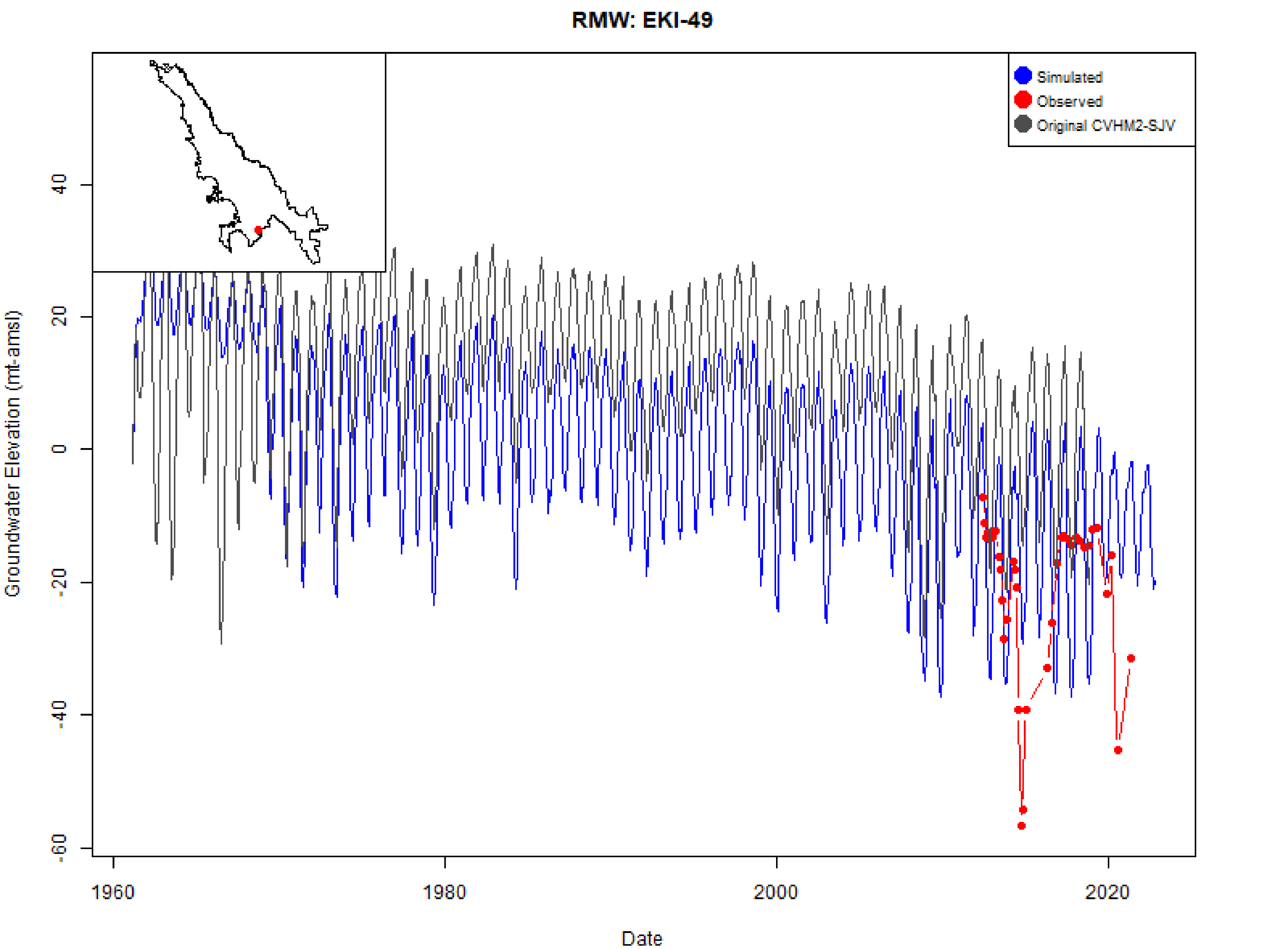
RMW: EKI-28
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
60
40
20
0
-20
-40
1960
1980
2000
2020
Date


RMW: EKI-30
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
60
40
20
0
1960
1980
2000
2020
Date

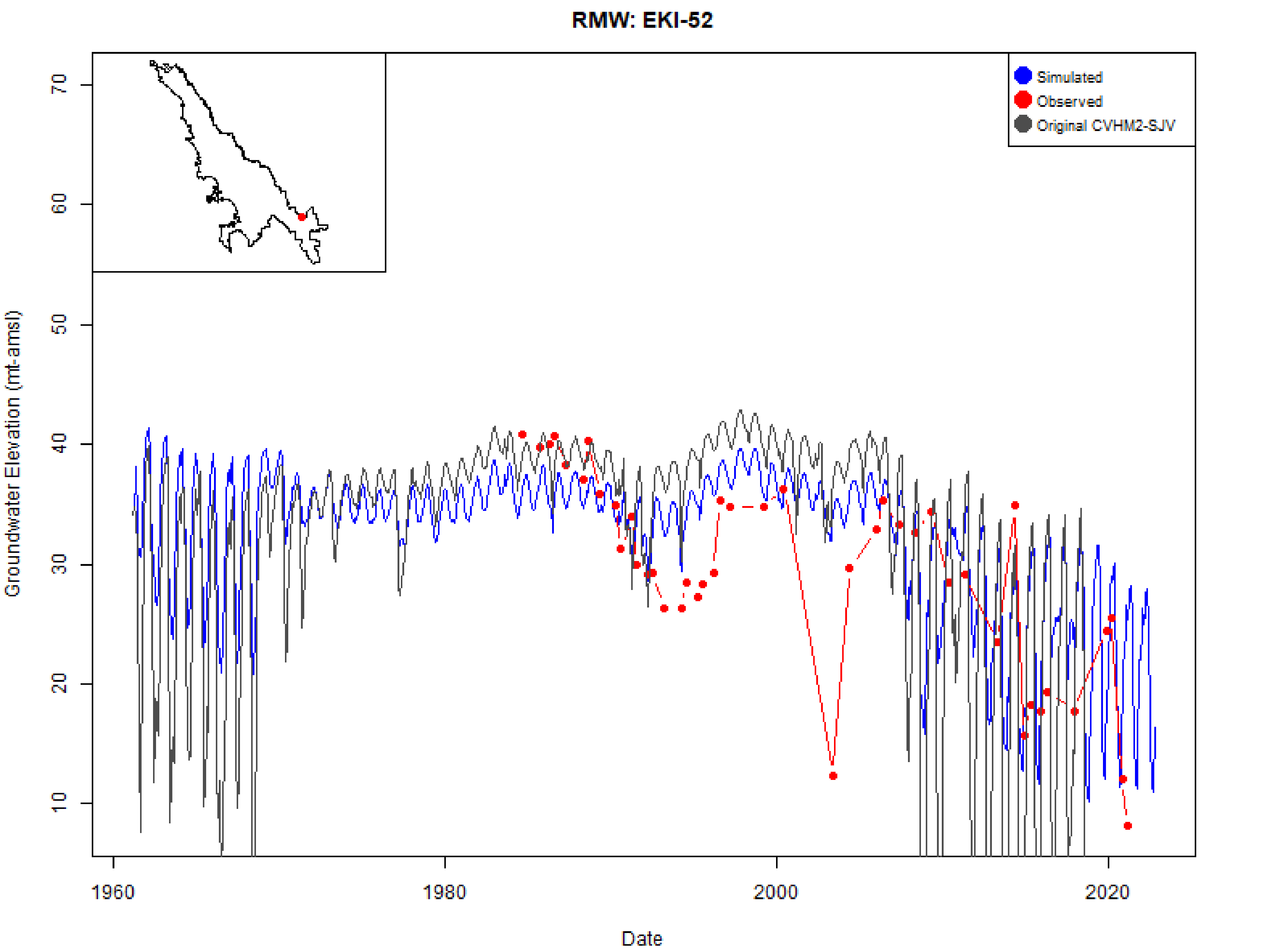


RMW: EKI-32
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
20
30
40
50
60
1960
1980
2000
2020
Date

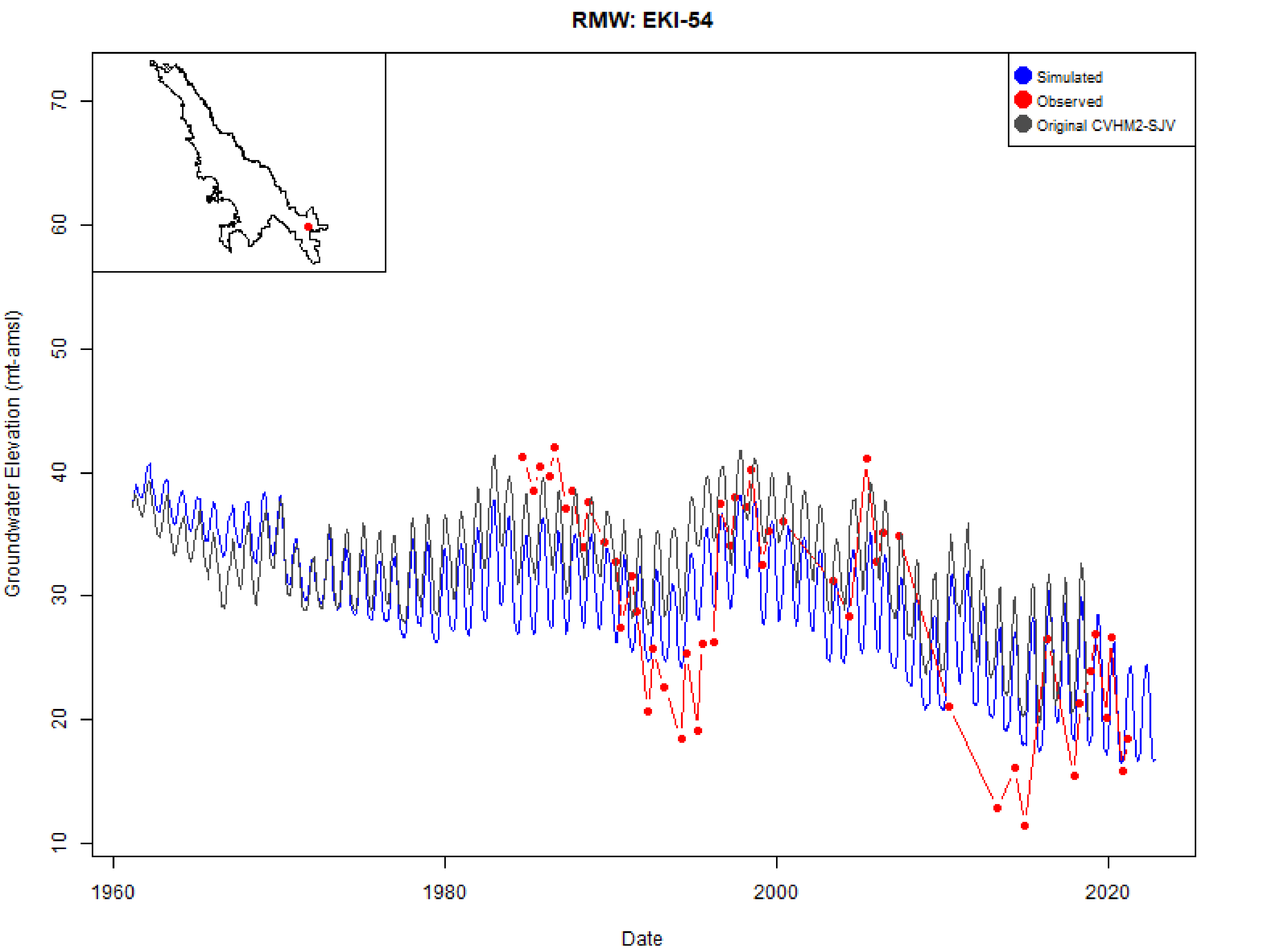

RMW: EKI-33
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
20
30
40
50
60
70
1960
1980
2000
2020
Date

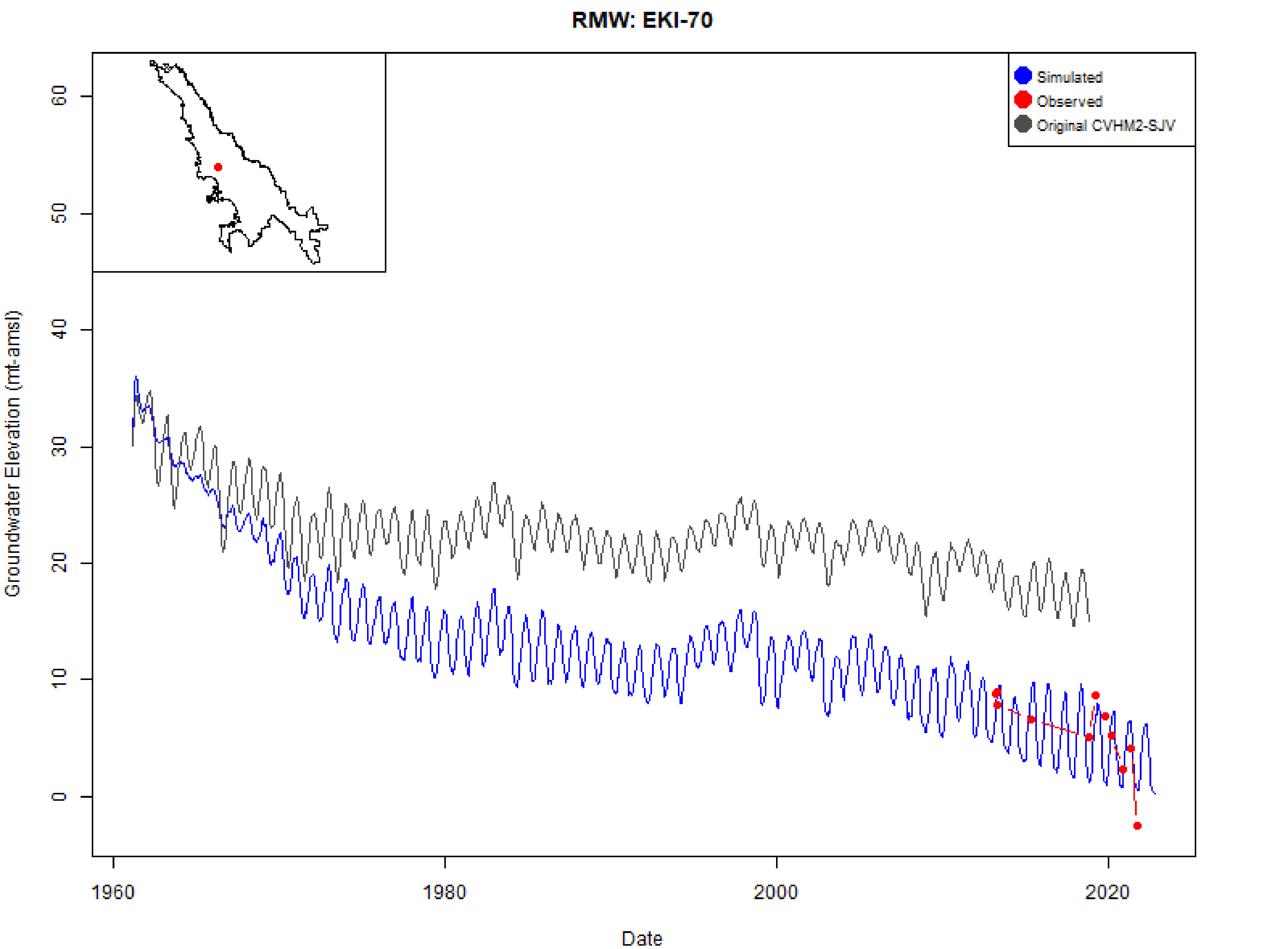


RMW: EKI-49
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
-60
-40
-20
0
20
40
1960
1980
2000
2020
Date

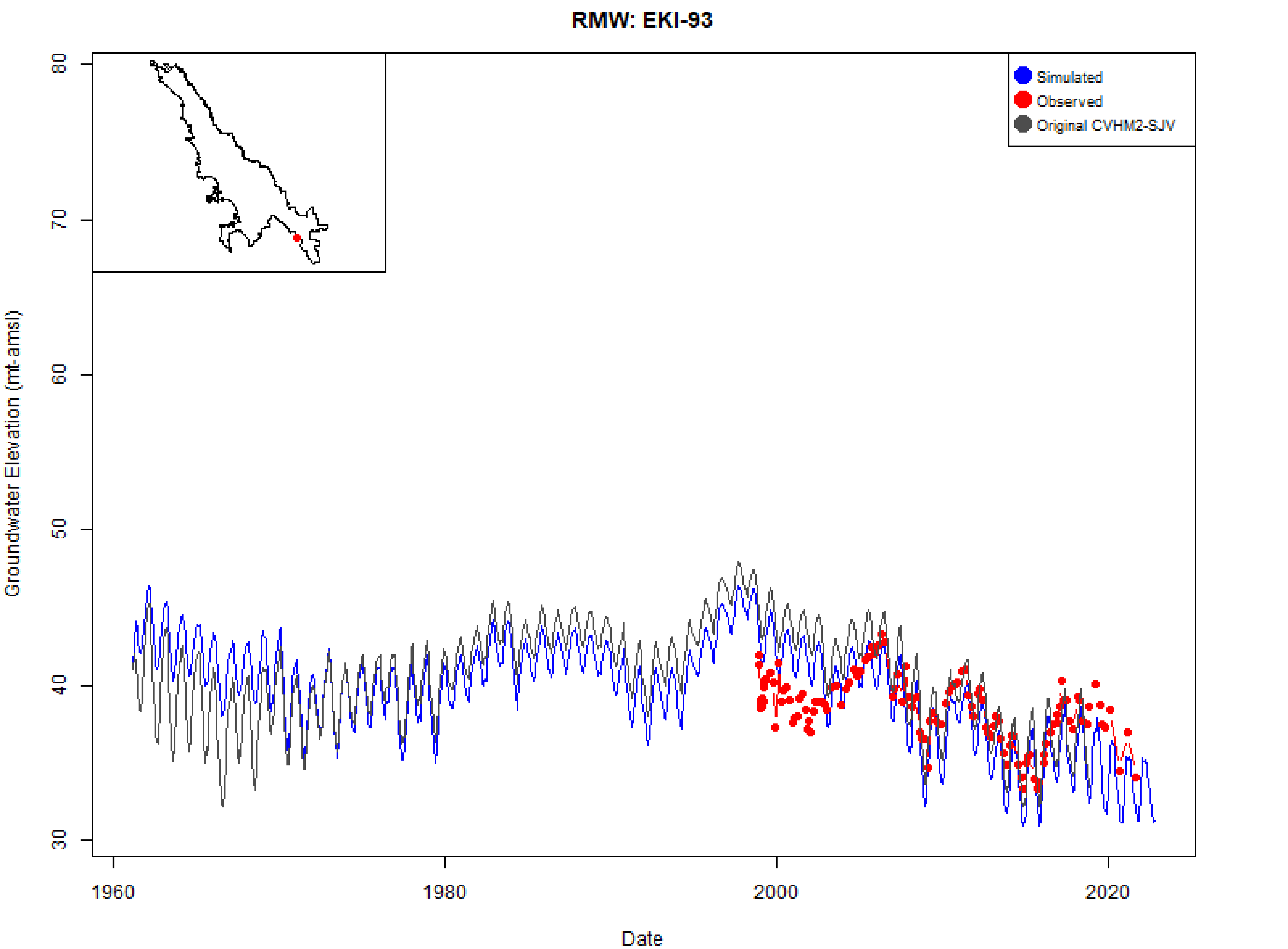


RMW: EKI-52
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
10
20
30
40
50
60
70
1960
1980
2000
2020
Date

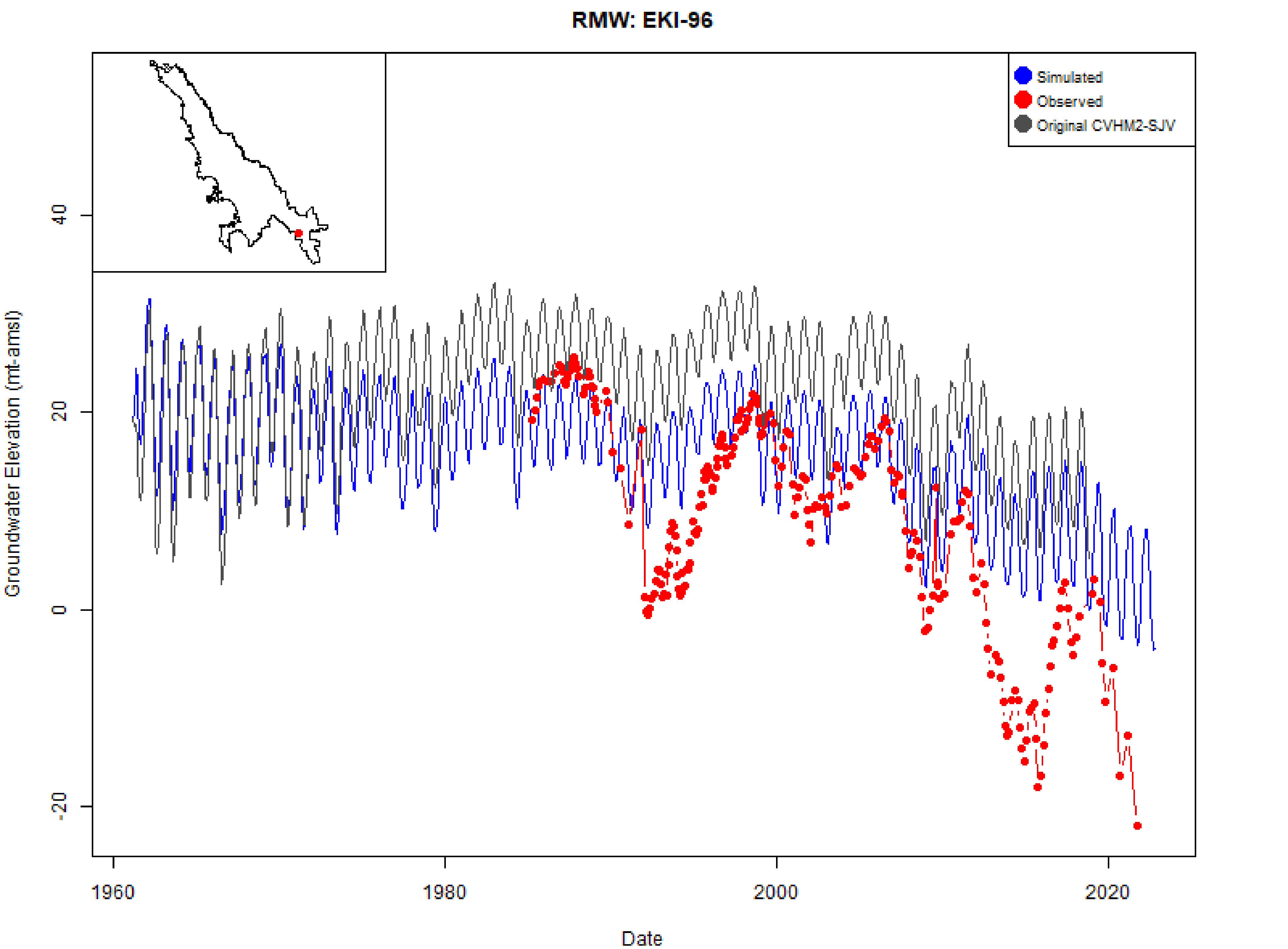

RMW: EKI-54
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
10
20
30
40
50
60
70
1960
1980
2000
2020
Date

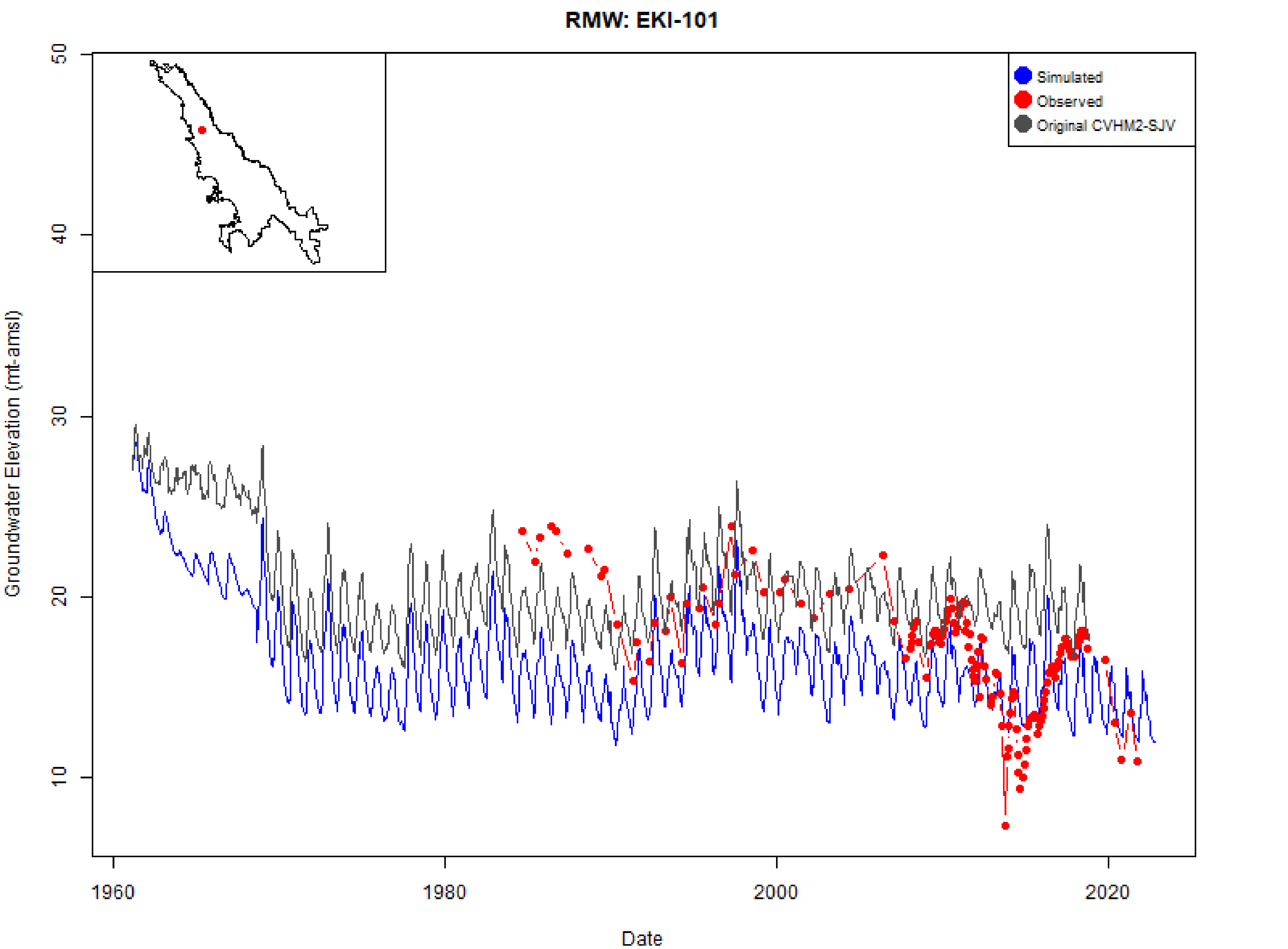


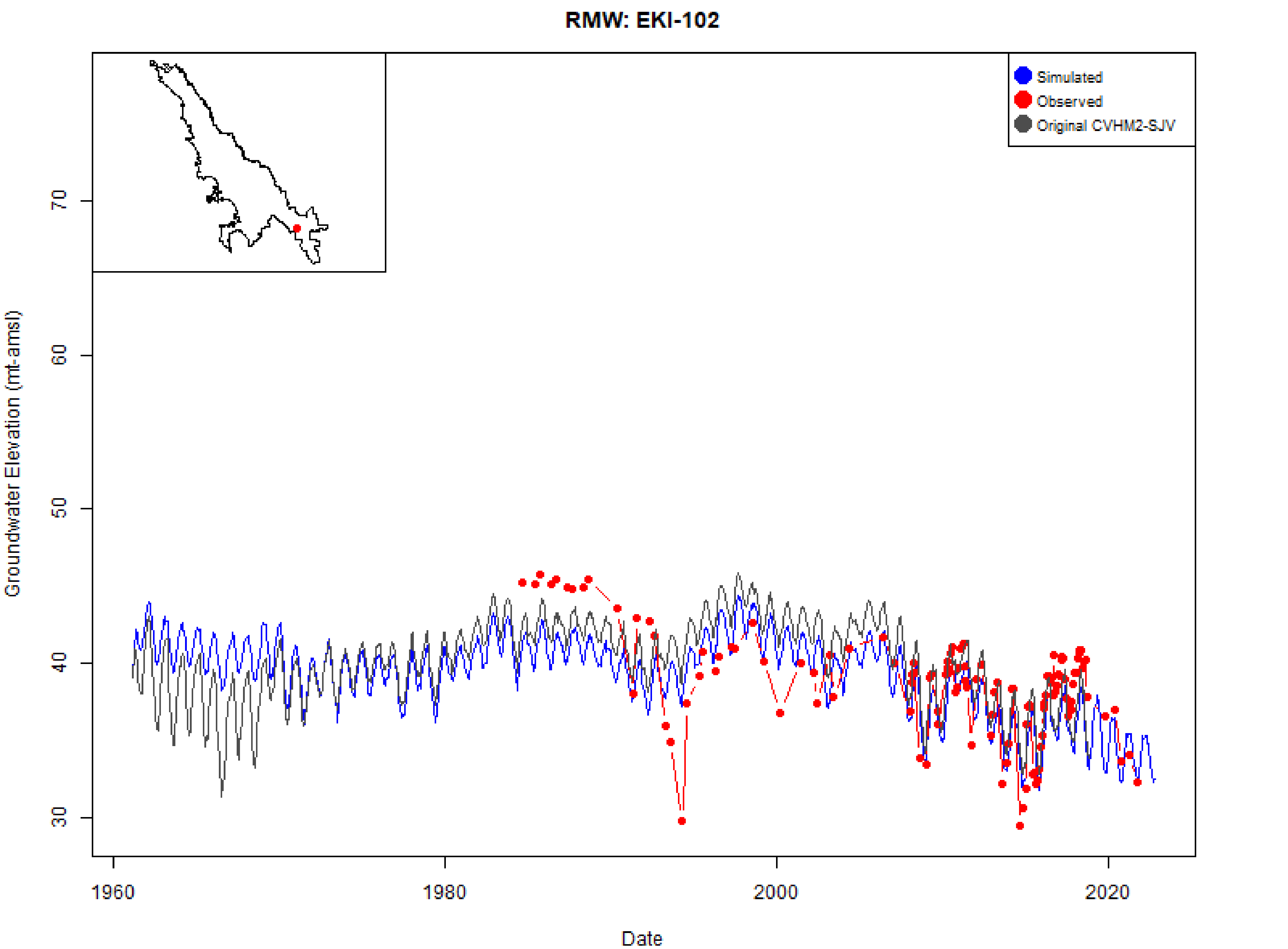
RMW: EKI-70
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
0
10
20
30
40
50
60
1960
1980
2000
2020
Date

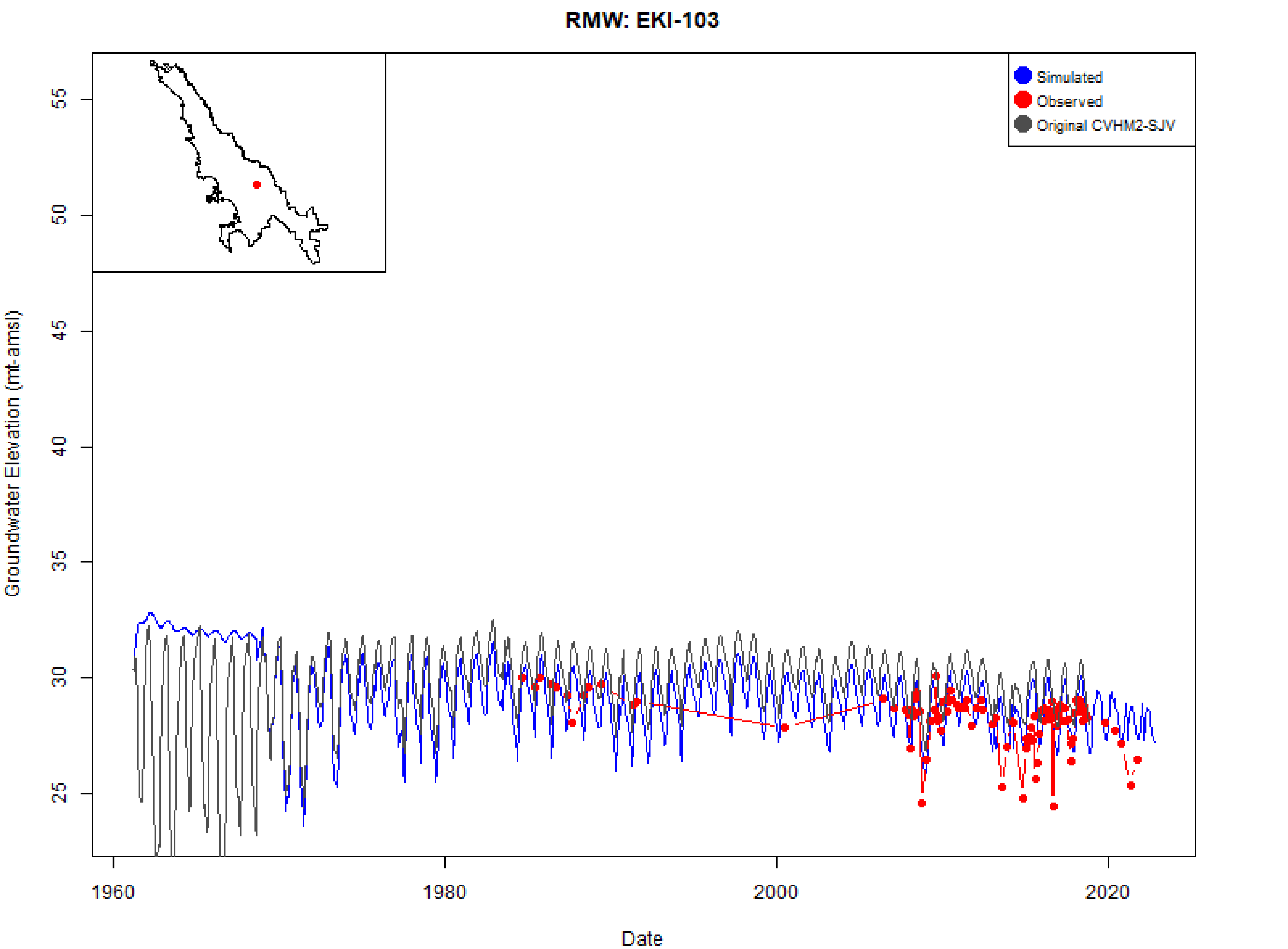


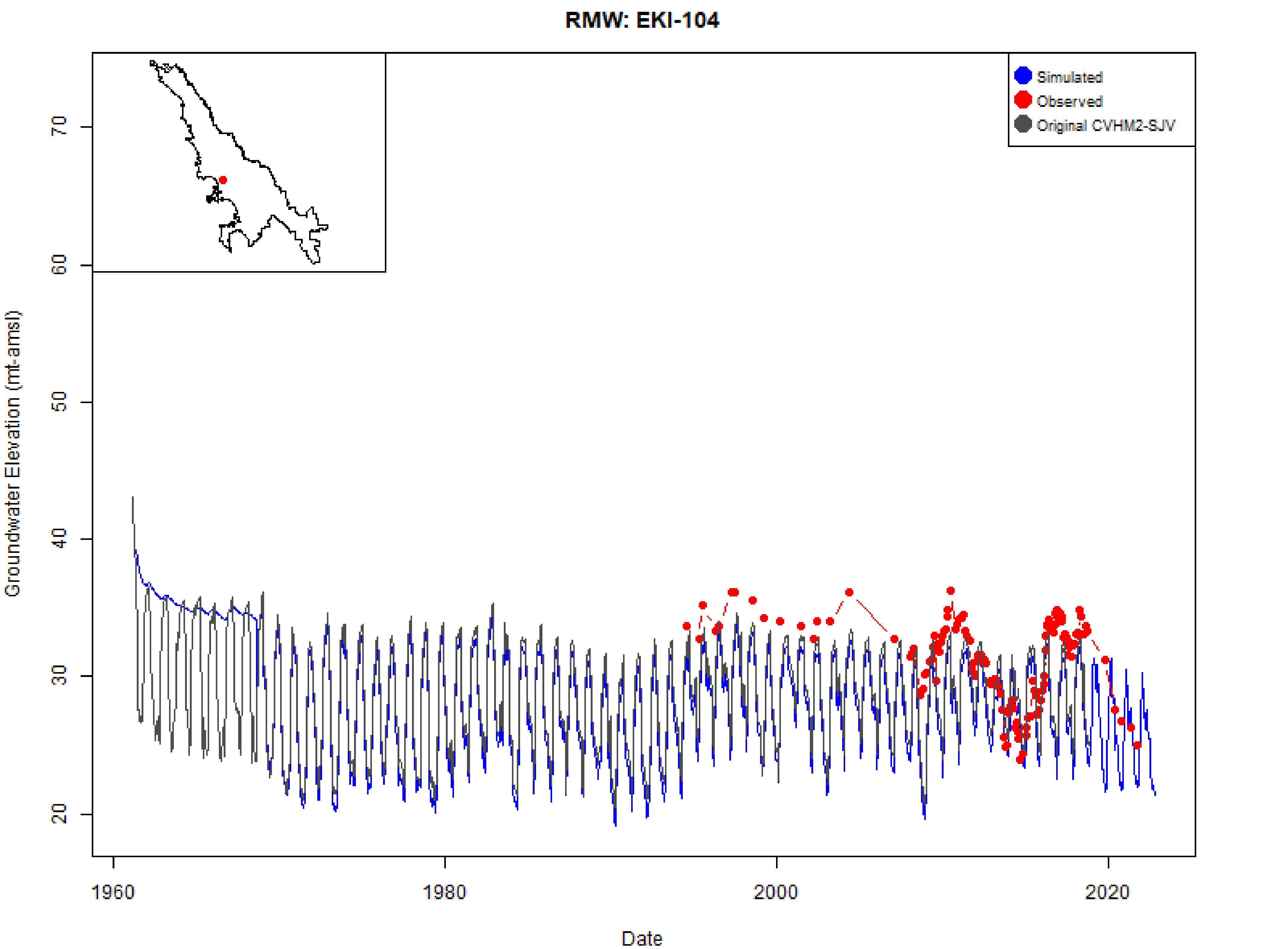
RMW: EKI-93
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
30
40
50
60
70
80
1960
1980
2000
2020
Date


RMW: EKI-96
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
40
20
0
-20
1960
1980
2000
2020
Date

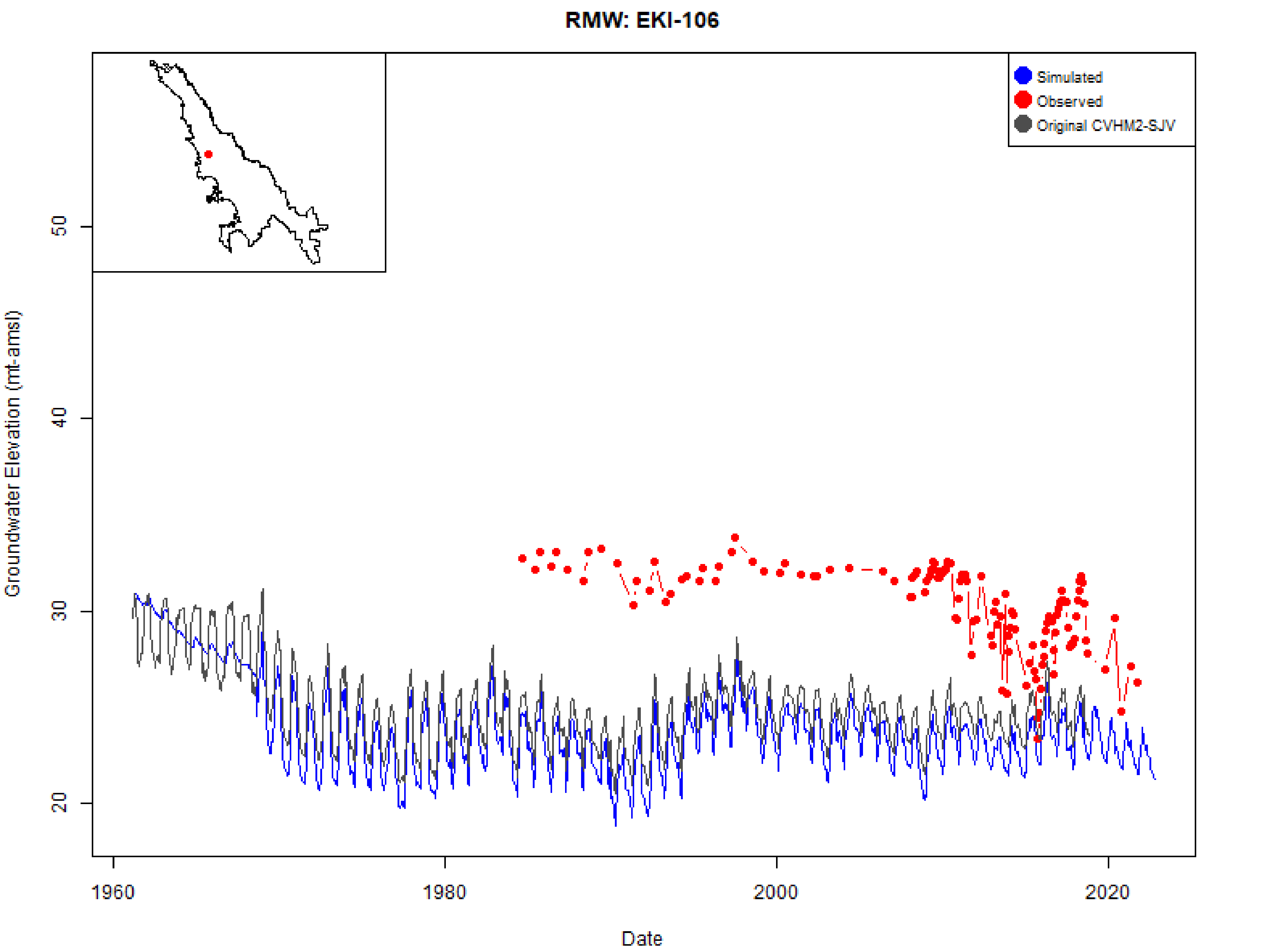

RMW: EKI-101
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
Date
10
20
30
40
50
1960
1980
2000
2020

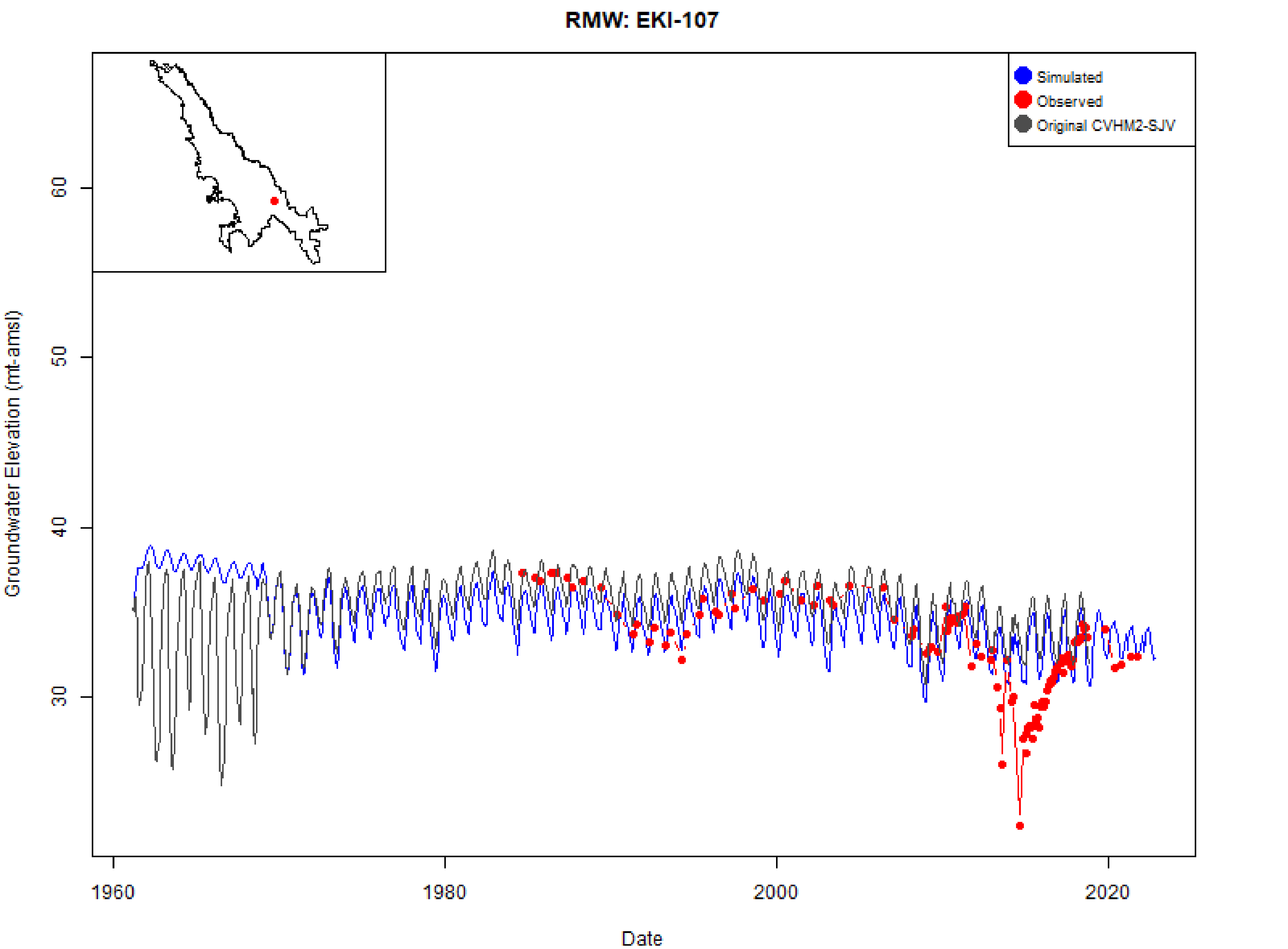

RMW: EKI-102
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
30
40
50
60
70
1960
1980
2000
2020
Date


RMW: EKI-103
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
25
30
35
40
45
50
55
1960
1980
2000
2020
Date

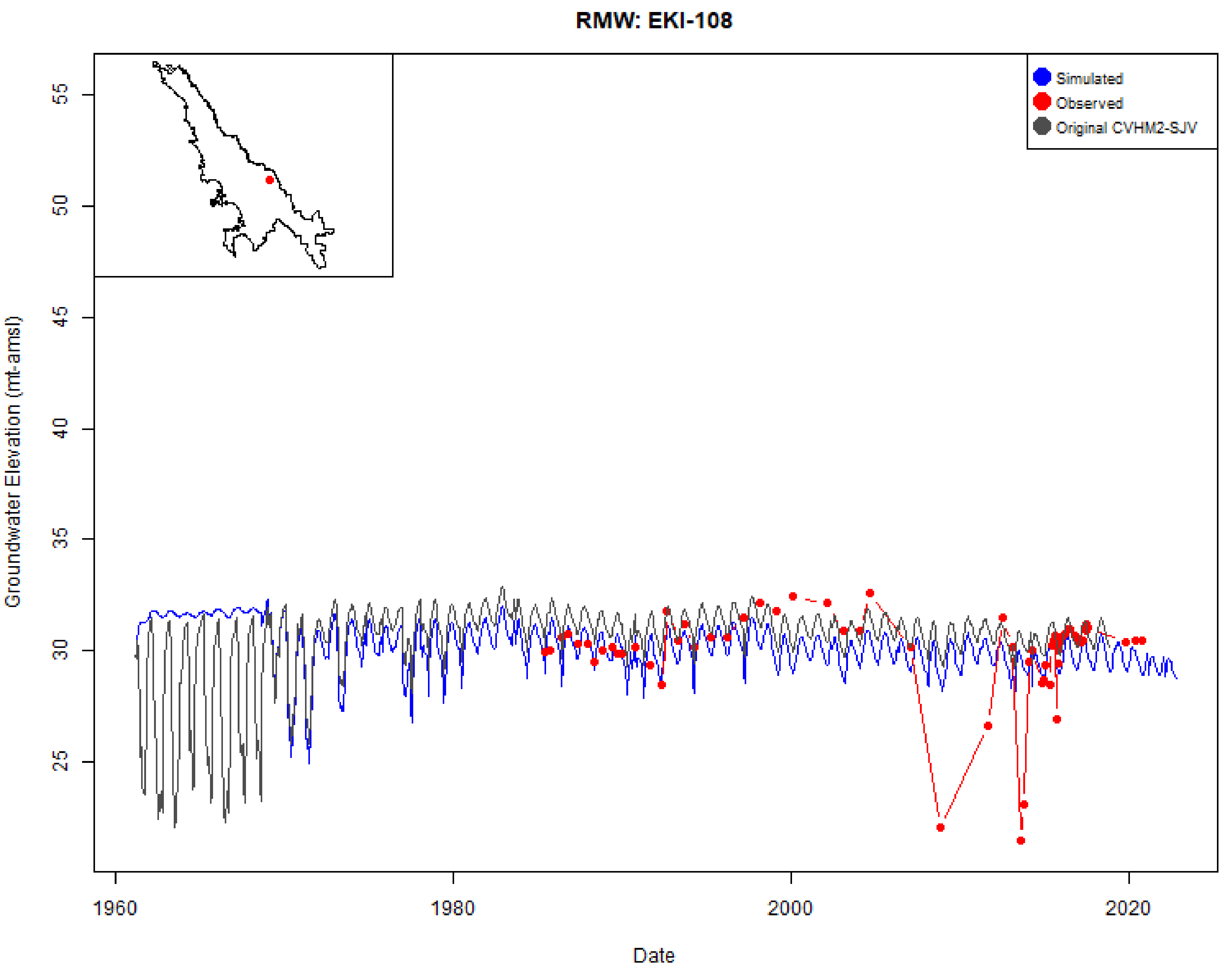


RMW: EKI-104
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
20
30
40
50
60
70
1960
1980
2000
2020
Date

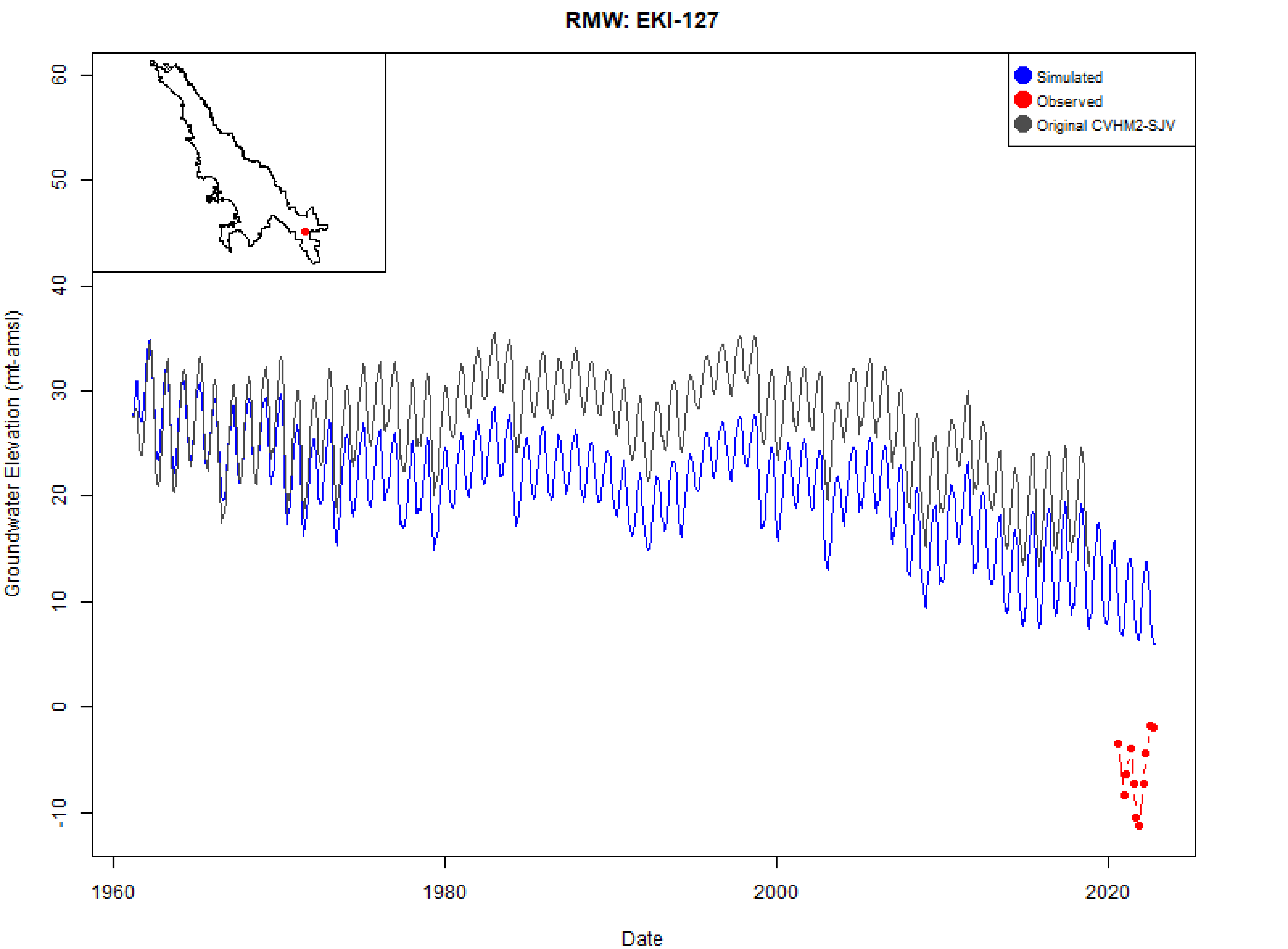

RMW: EKI-106
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
20
30
40
50
1960
1980
2000
2020
Date

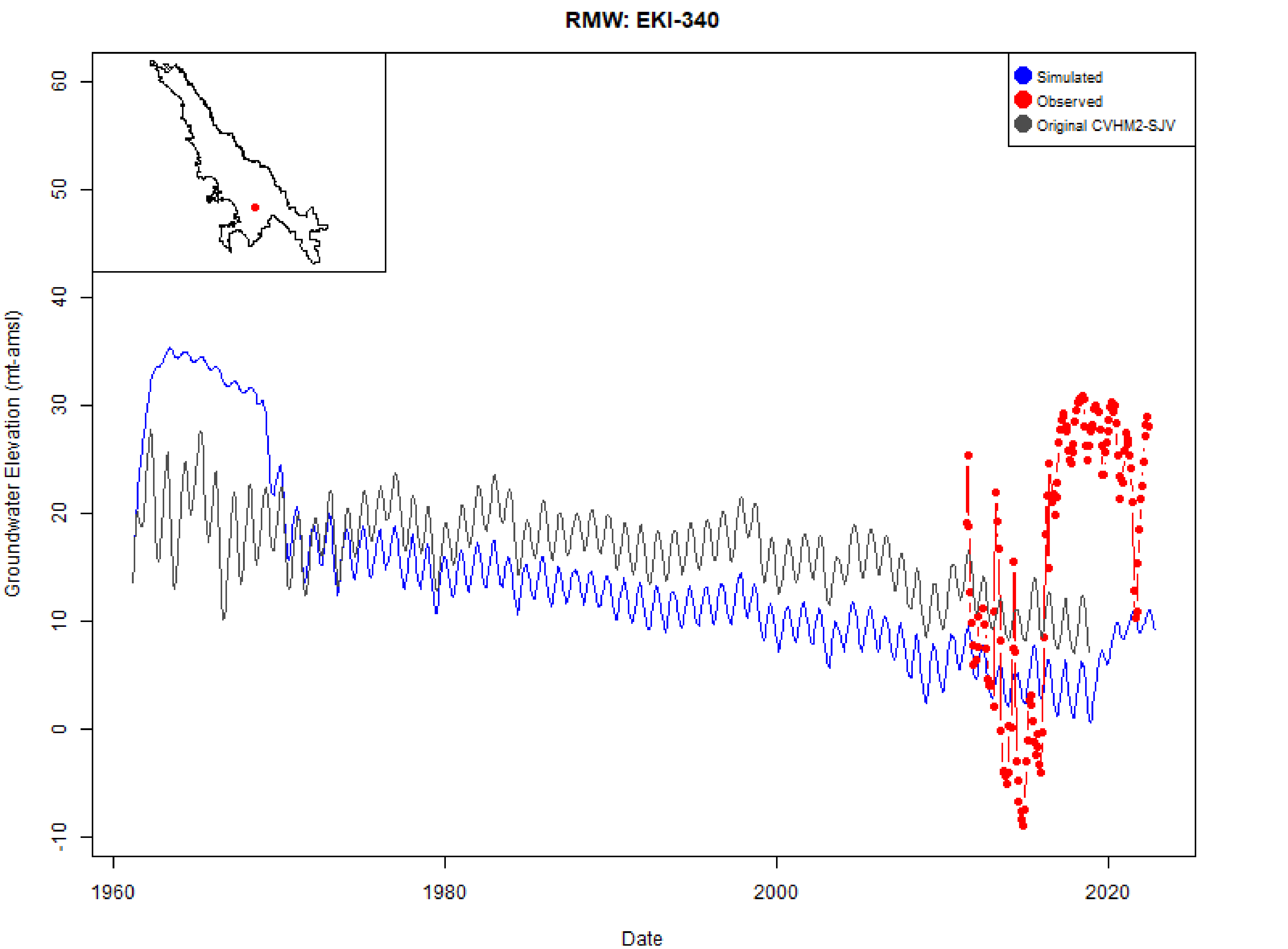


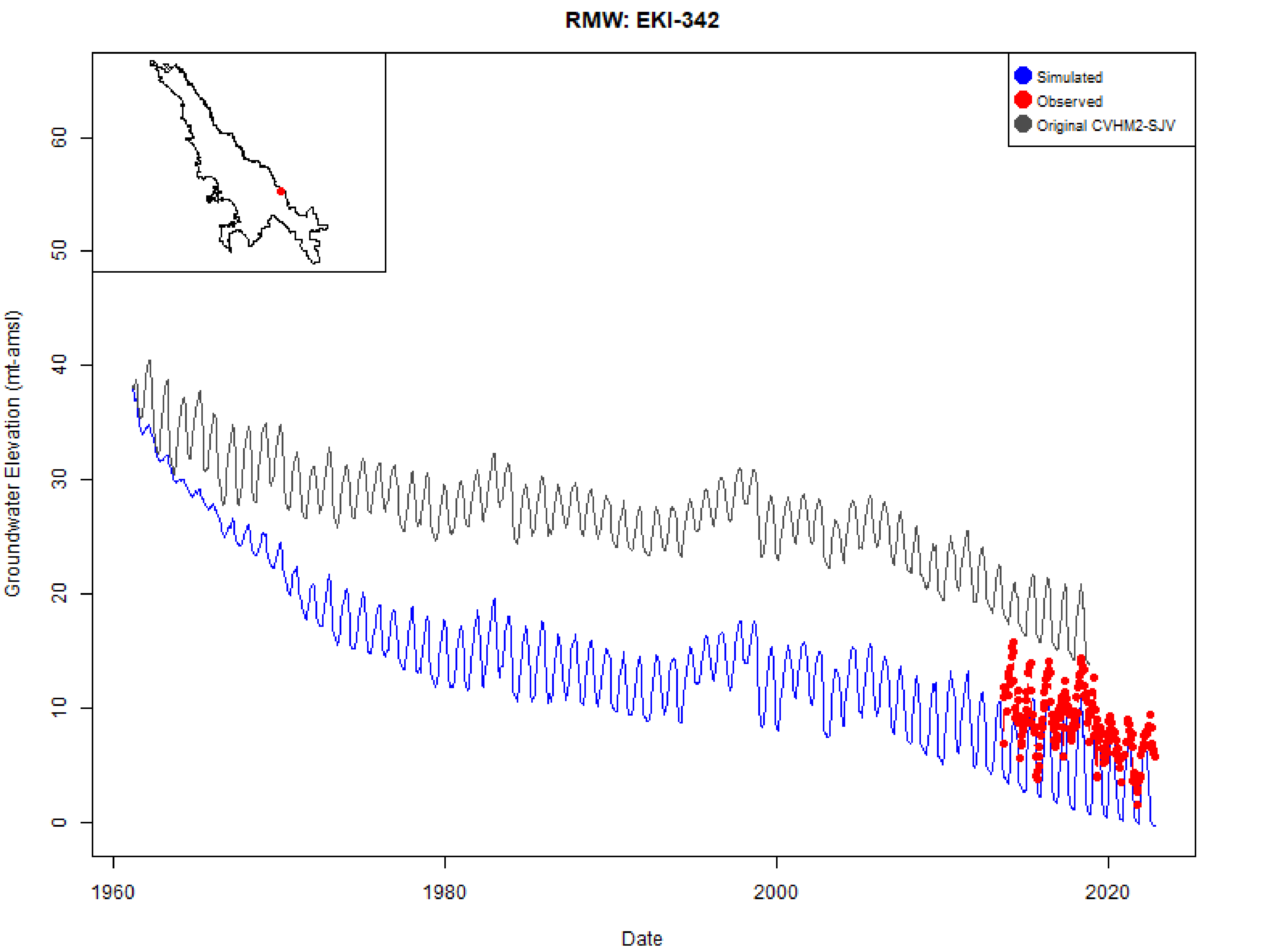
RMW: EKI-107
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
30
40
50
60
1960
1980
2000
2020
Date



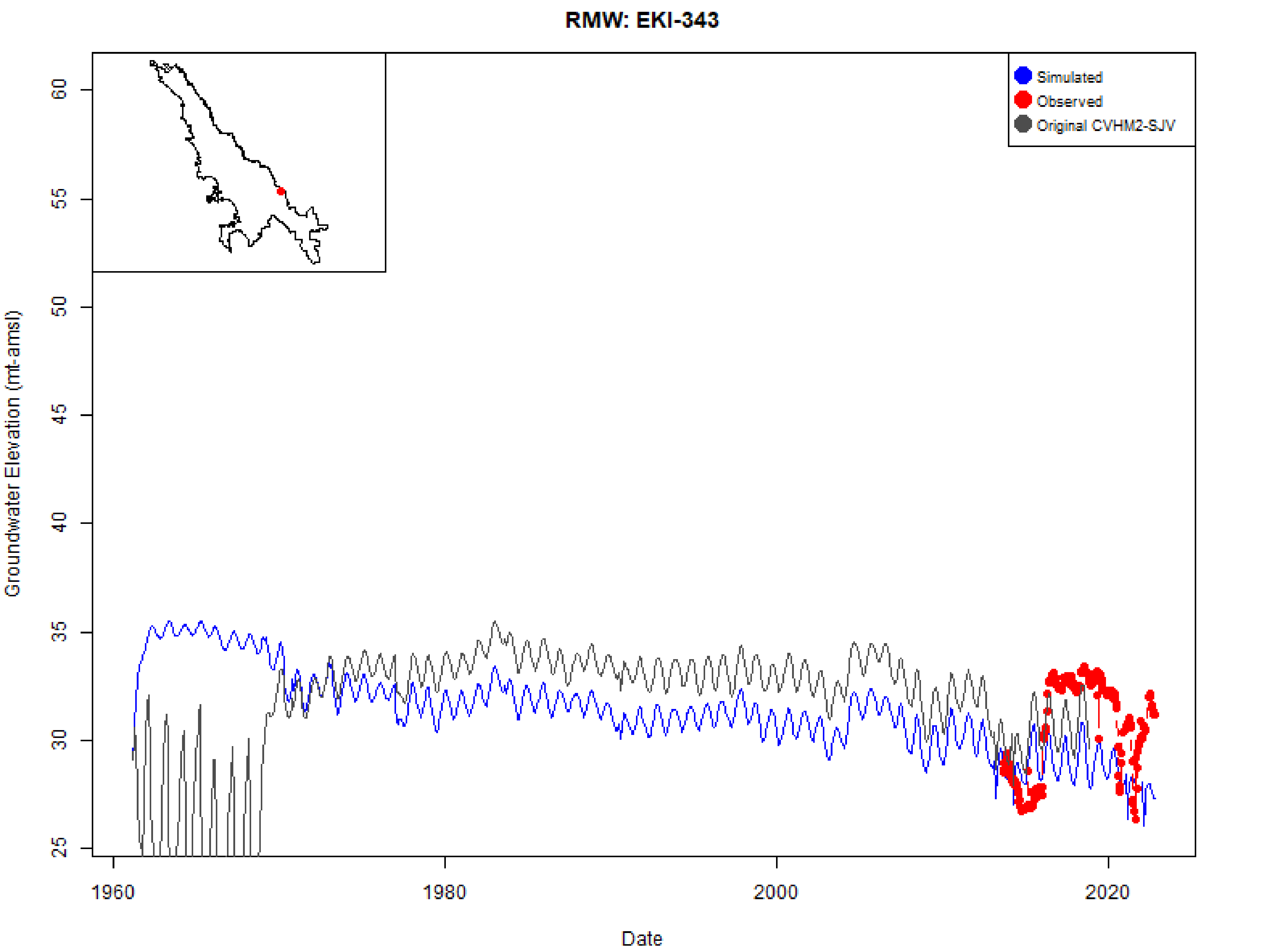
RMW: EKI-108
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
25
30
35
40
45
50
55
1960
1980
2000
2020
Date

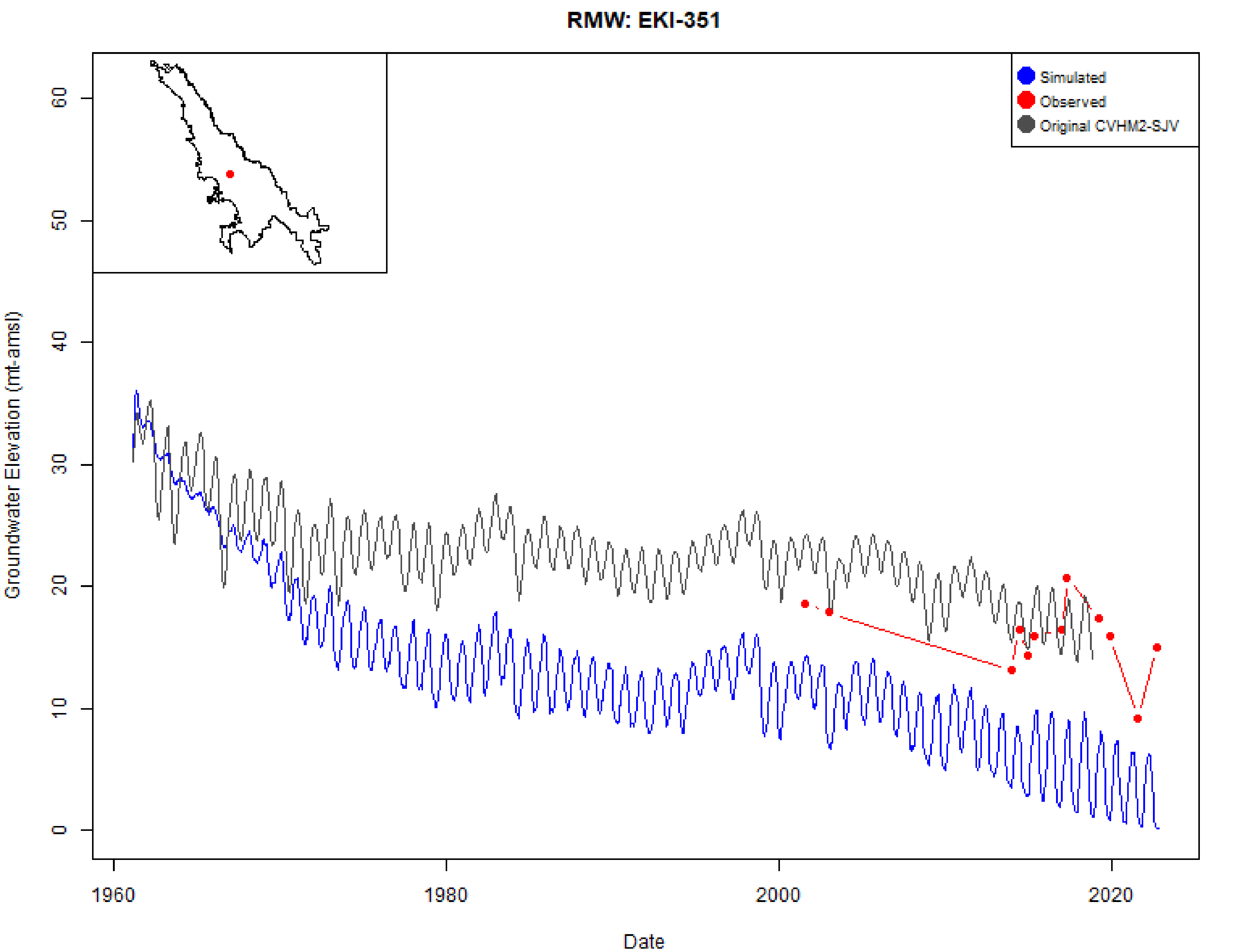

RMW: EKI-127
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
60
50
40
30
20
10
0
-10
1960
1980
2000
2020
Date

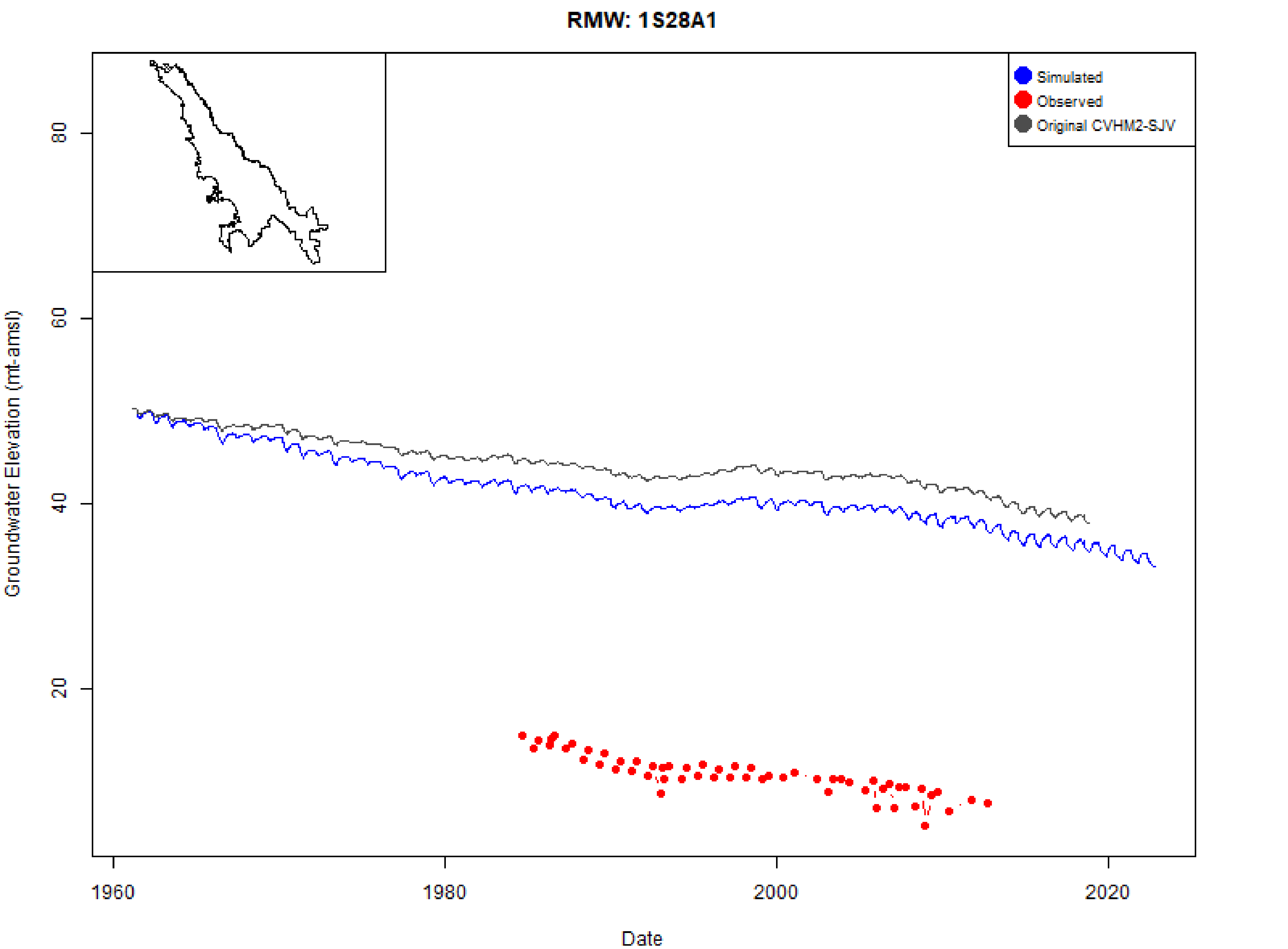

RMW: EKI-340
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
60
50
40
30
20
10
0
-10
1960
1980
2000
2020
Date

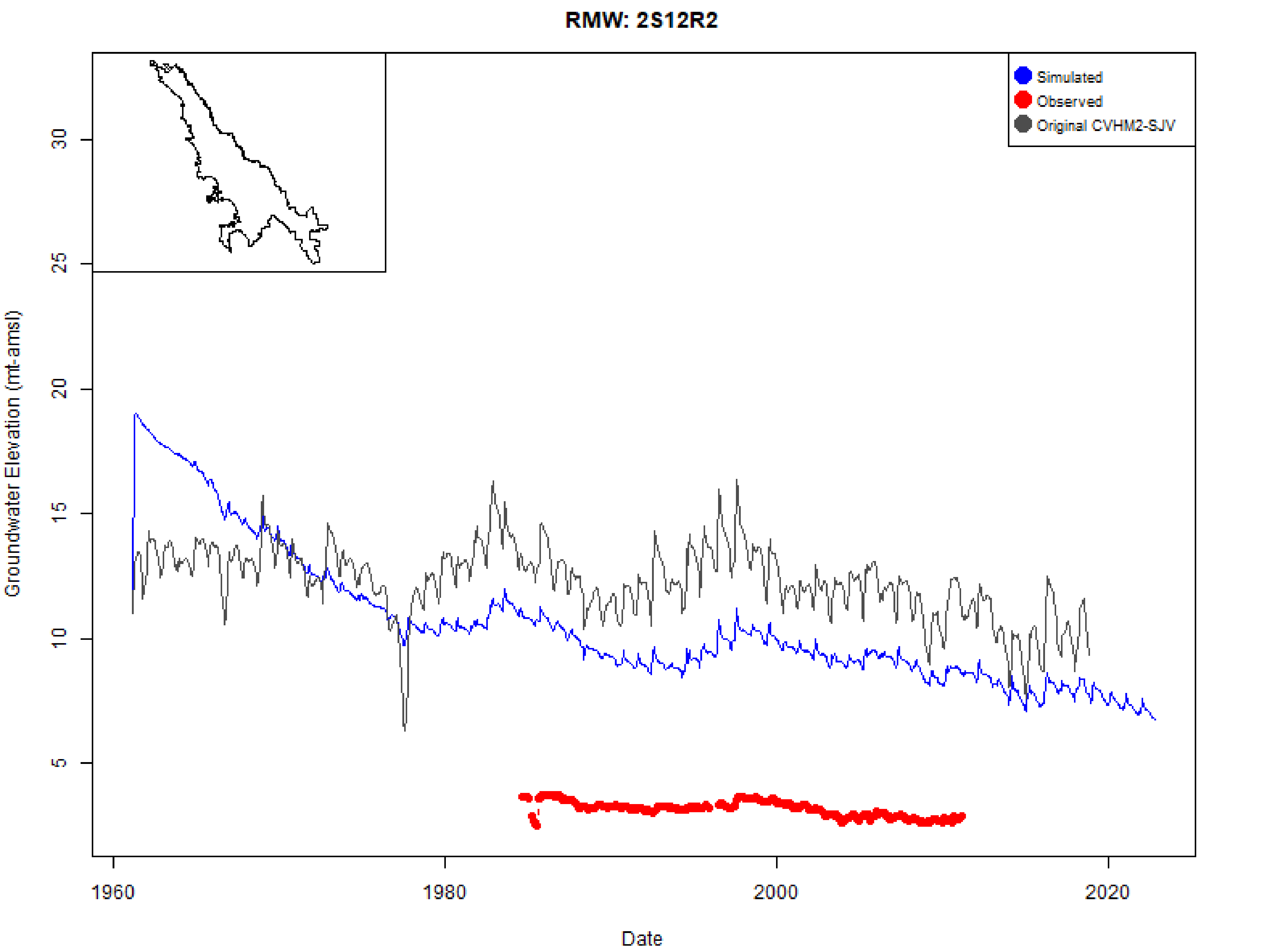


RMW: EKI-342
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
0
10
20
30
40
50
60
1960
1980
2000
2020
Date

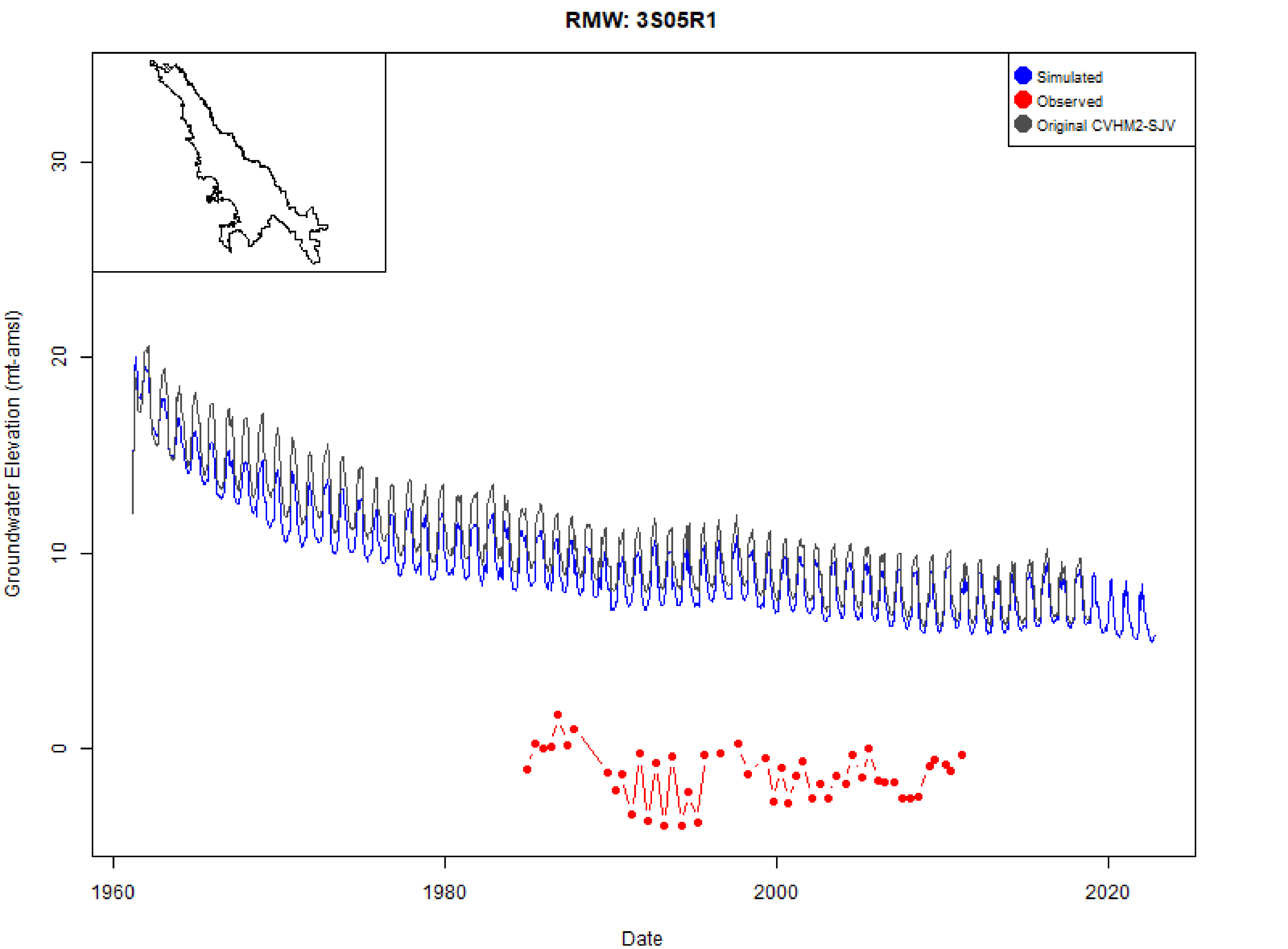

RMW: EKI-343
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
60
55
50
45
40
35
30
25
1960
1980
2000
2020
Date

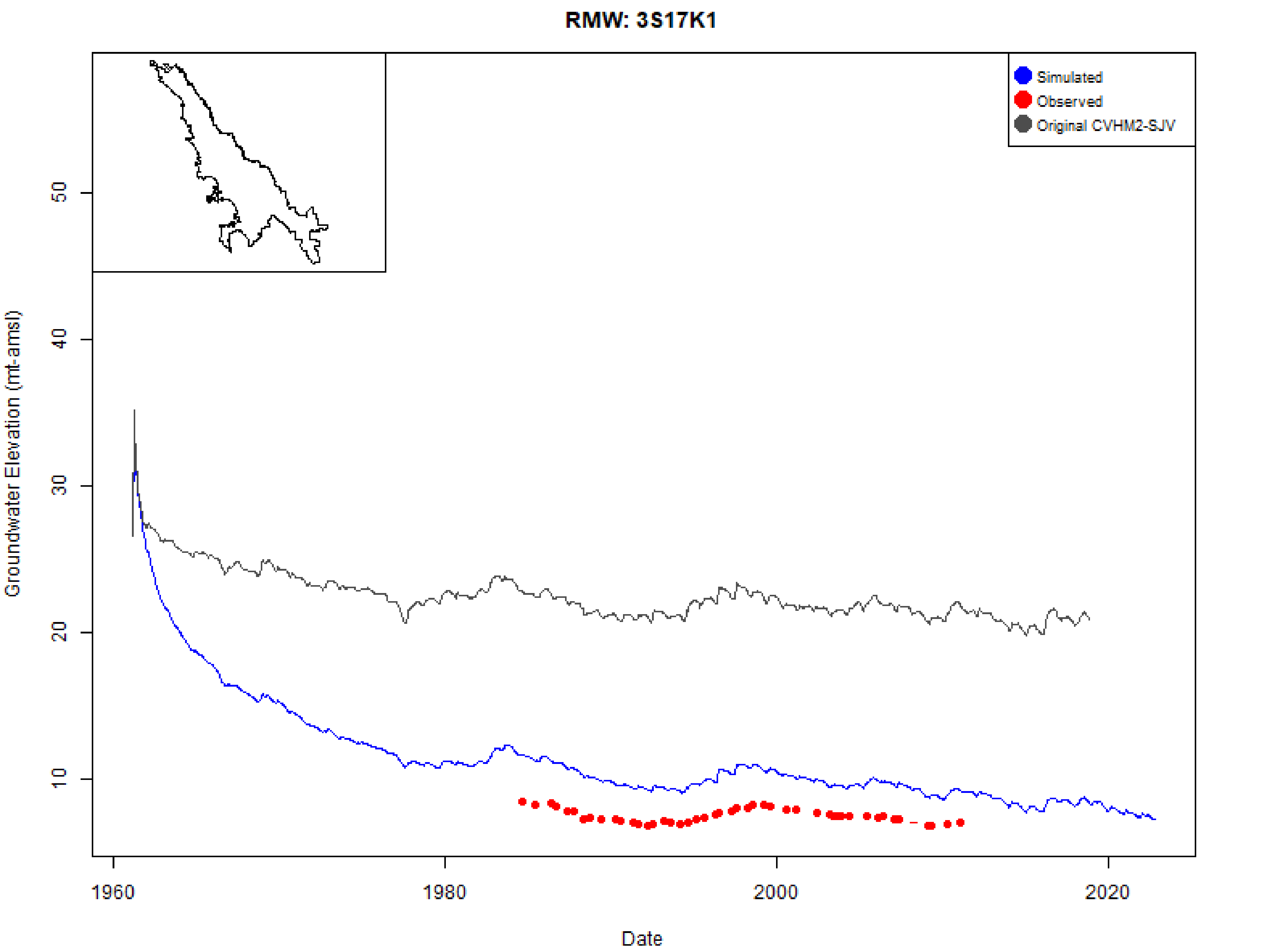

RMW: EKI-351
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
0
10
20
30
40
50
60
1960
1980
2000
2020
Date


RMW: 1S28A1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
80
60
40
20
1960
1980
2000
2020
Date

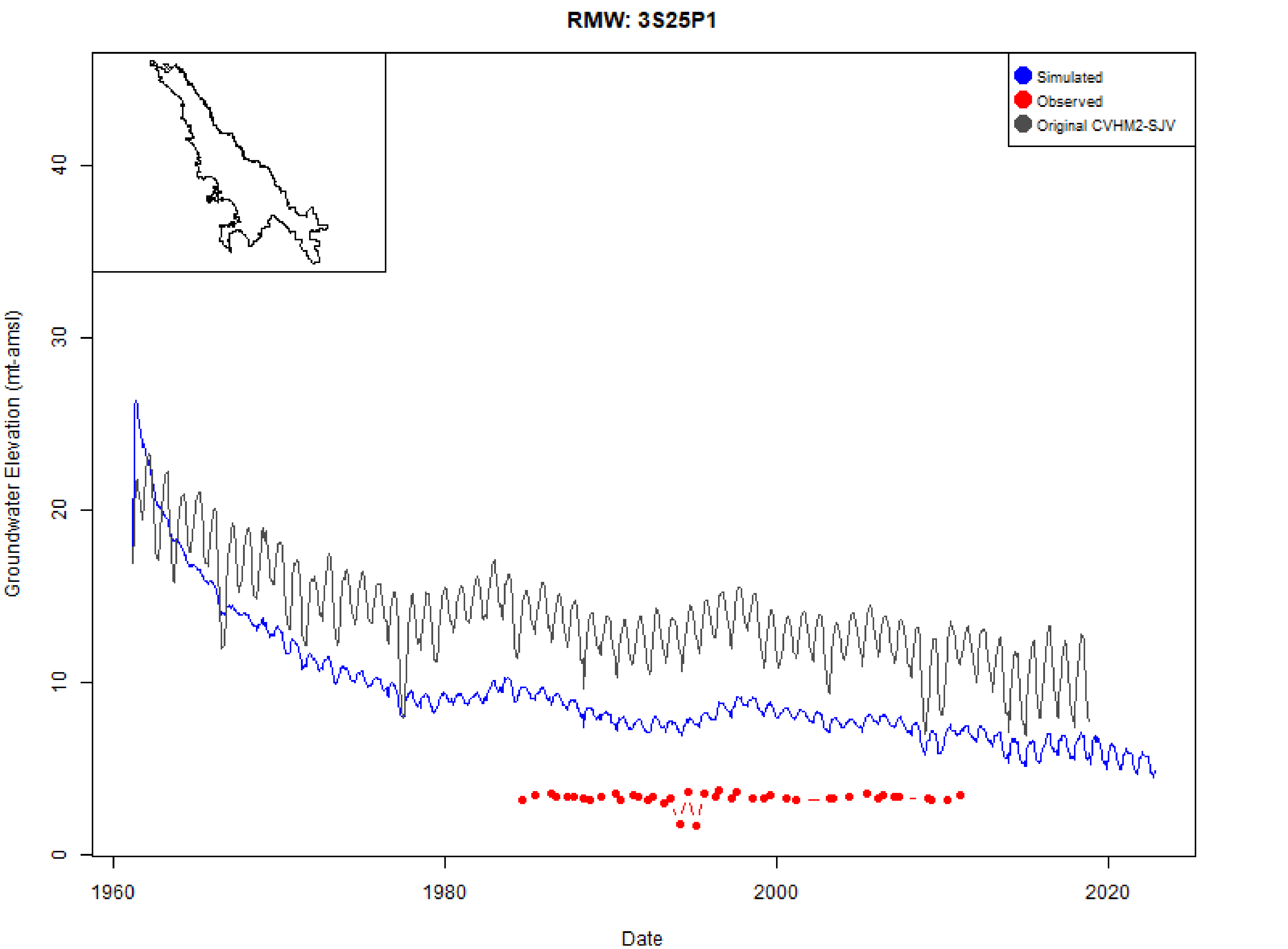


RMW: 2S12R2
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
5
10
15
20
25
30
1960
1980
2000
2020
Date

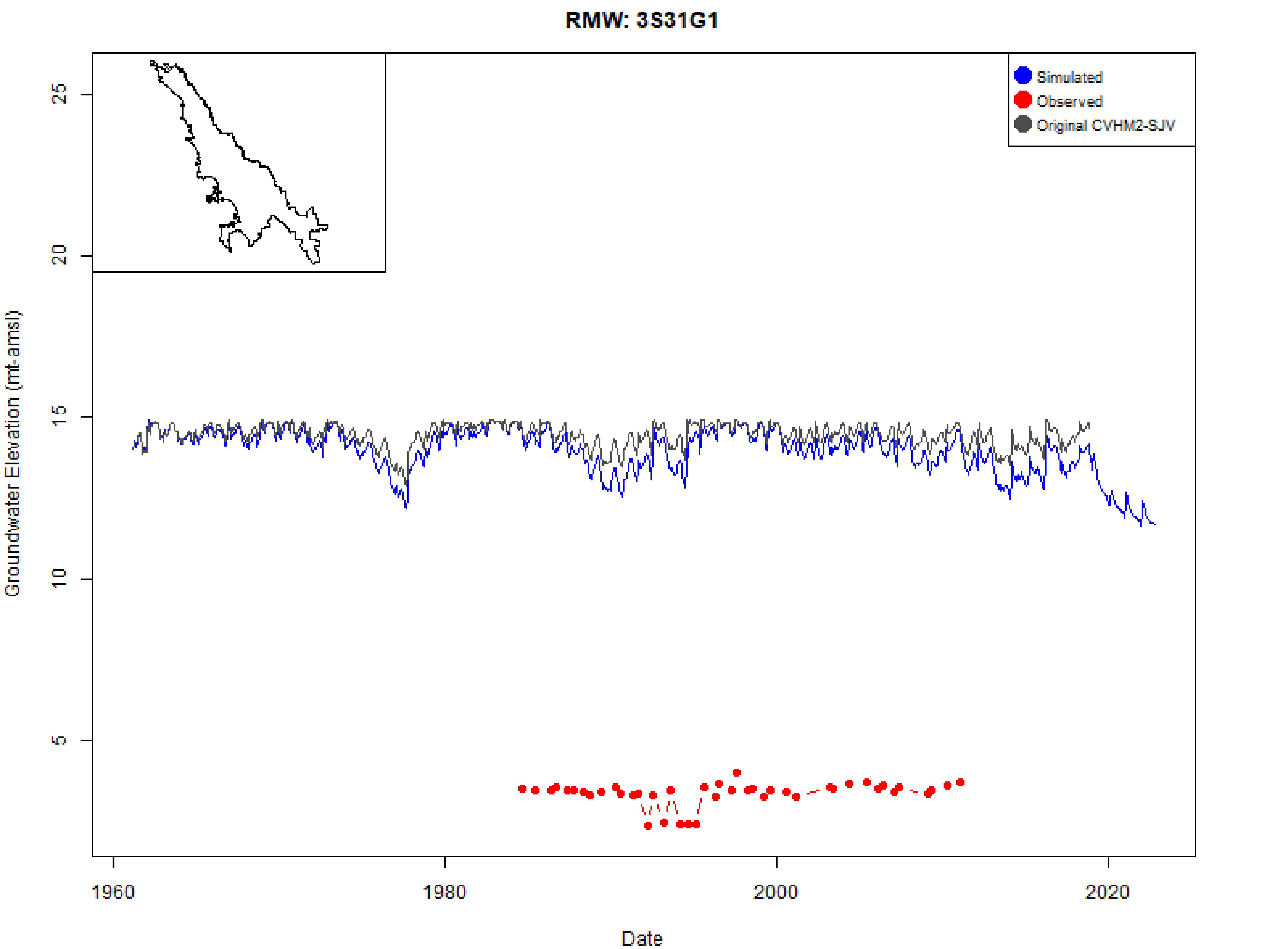

RMW: 3S05R1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
30
20
10
0
1960
1980
2000
2020
Date



RMW: 3S17K1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
10
20
30
40
50
1960
1980
2000
2020
Date

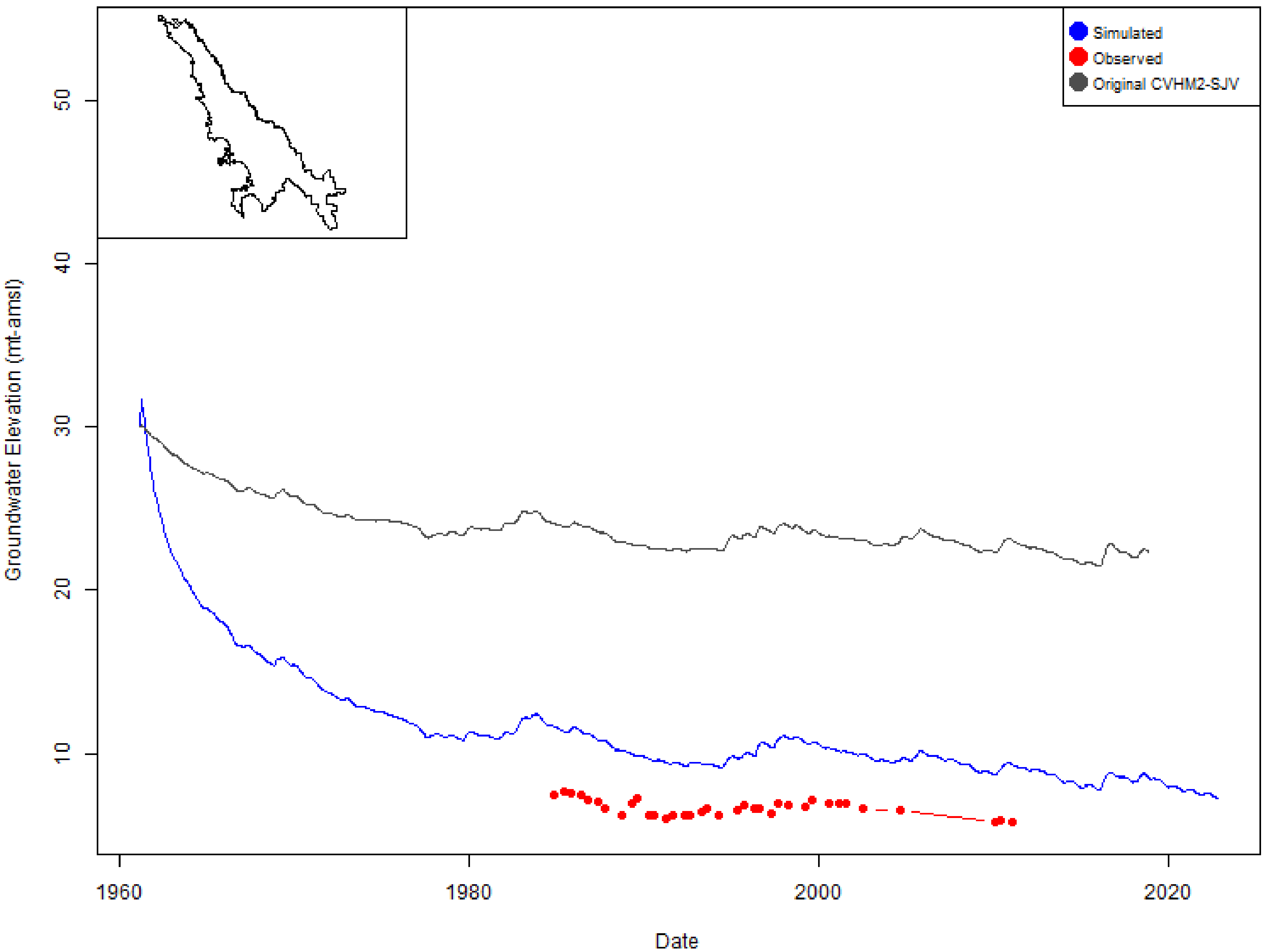


RMW: 3S25P1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
0
10
20
30
40
1960
1980
2000
2020
Date

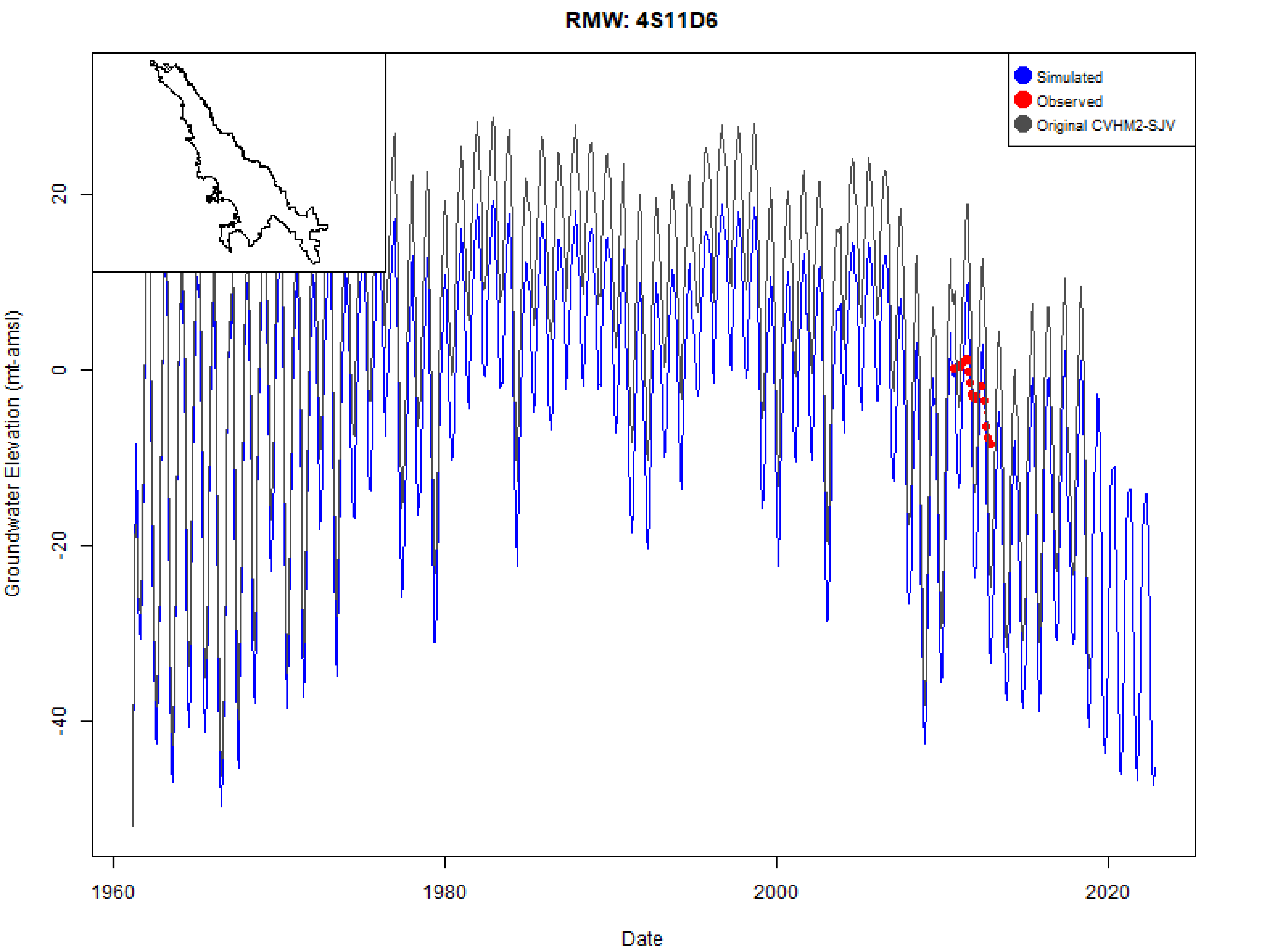


RMW: 3S31G1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
25
20
15
10
5
1960
1980
2000
2020
Date

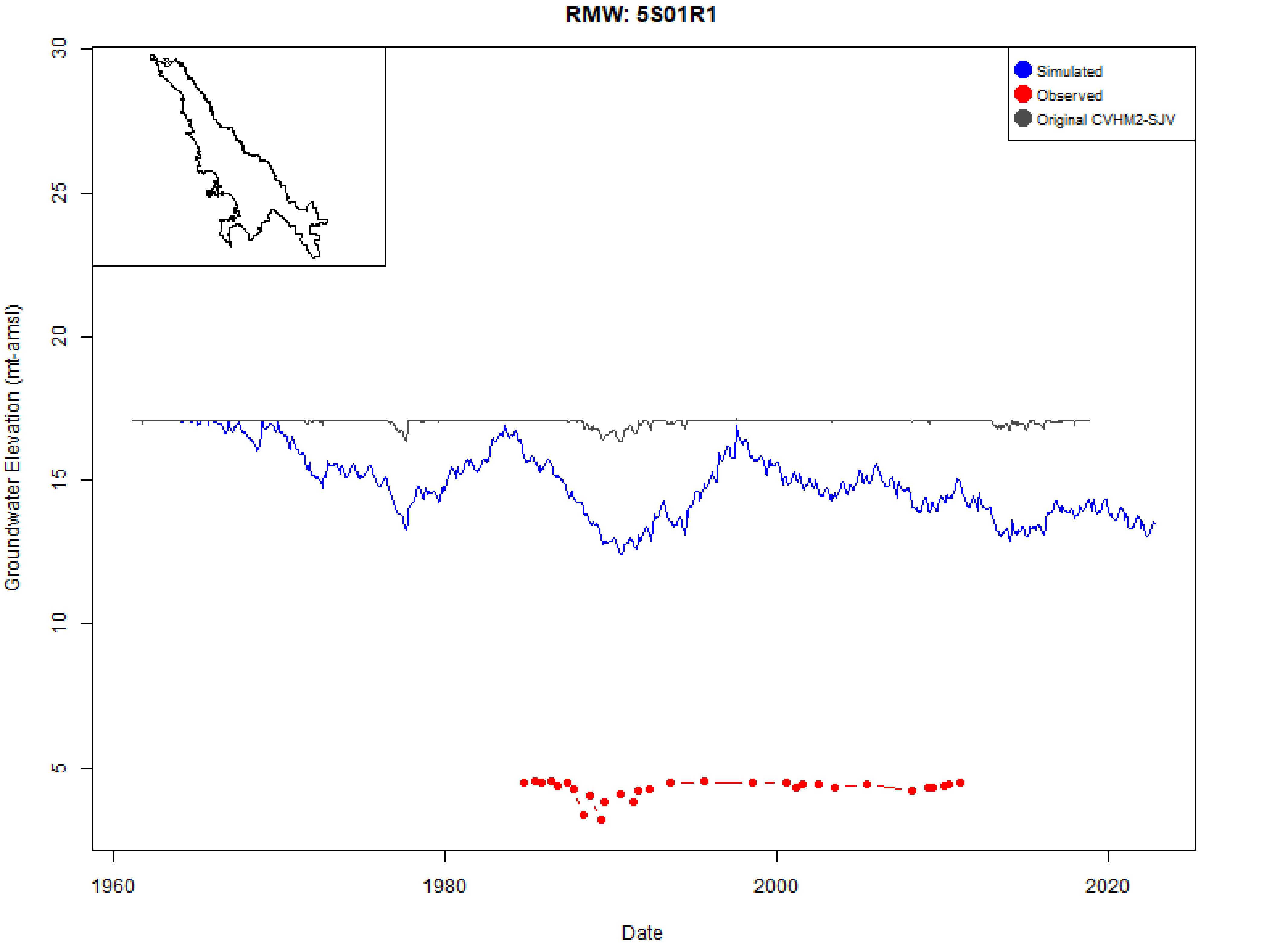
RMW: 4S08A1

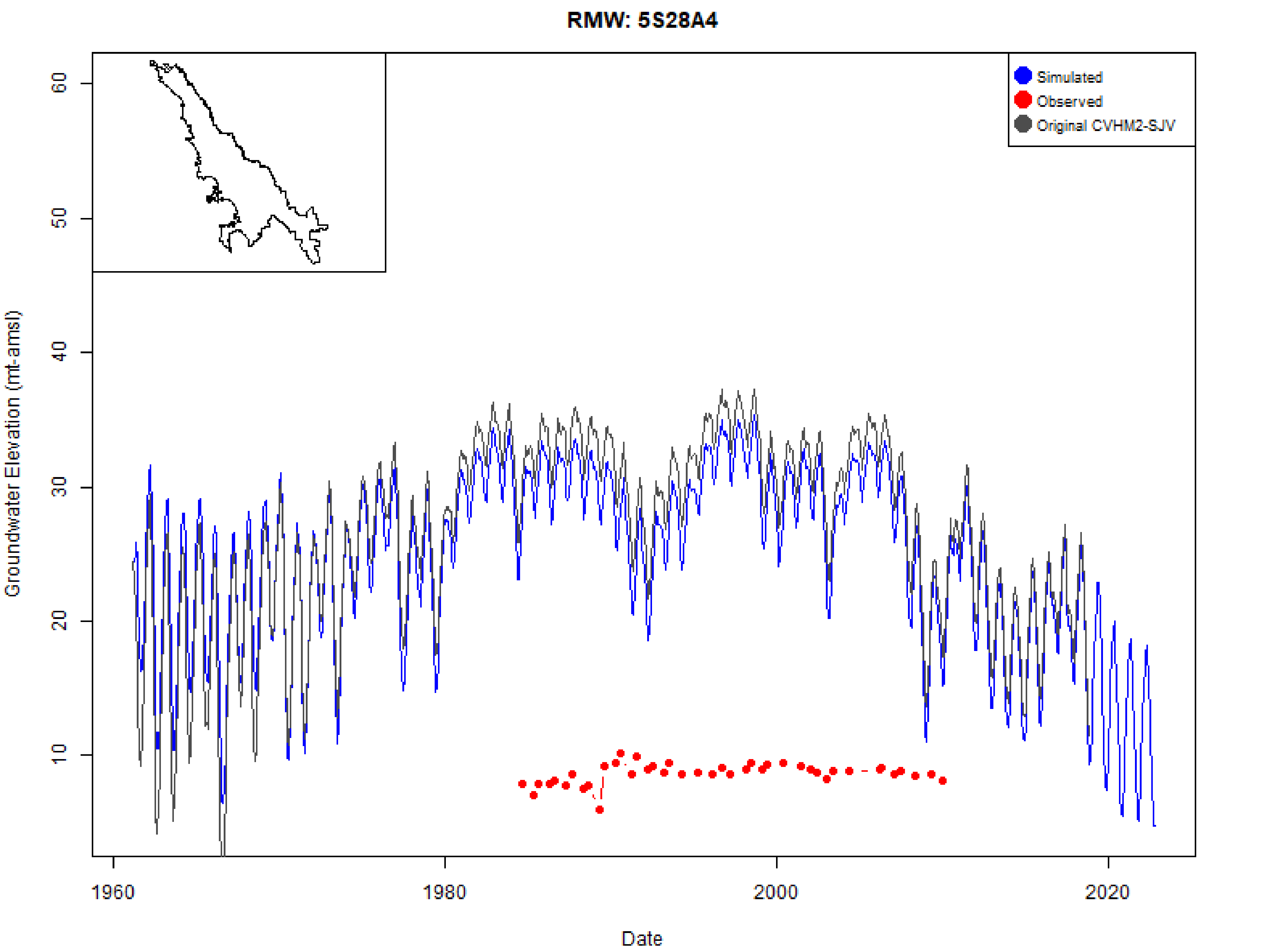


Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
10
20
30
40
50
1960
1980
2000
2020
Date

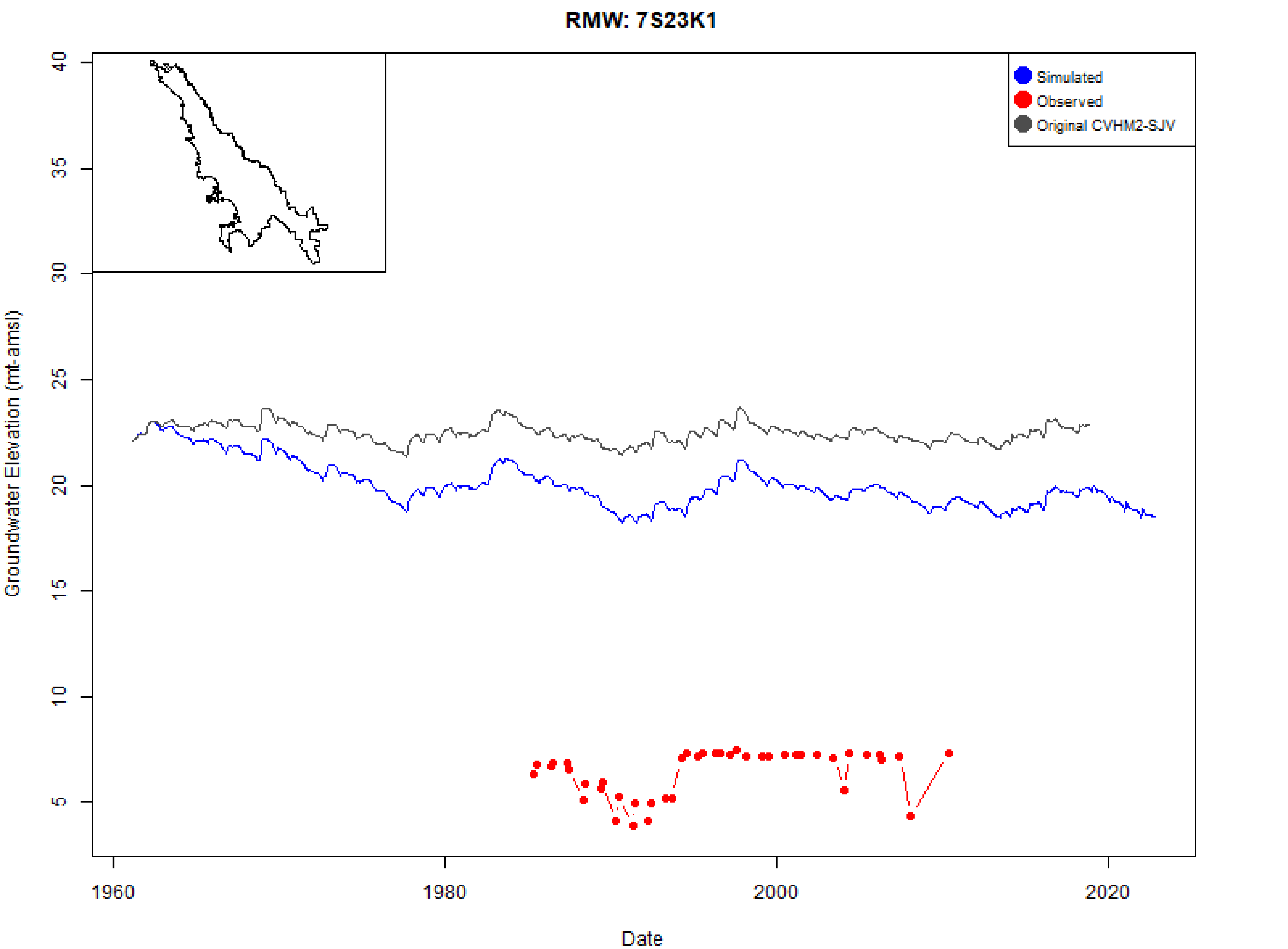


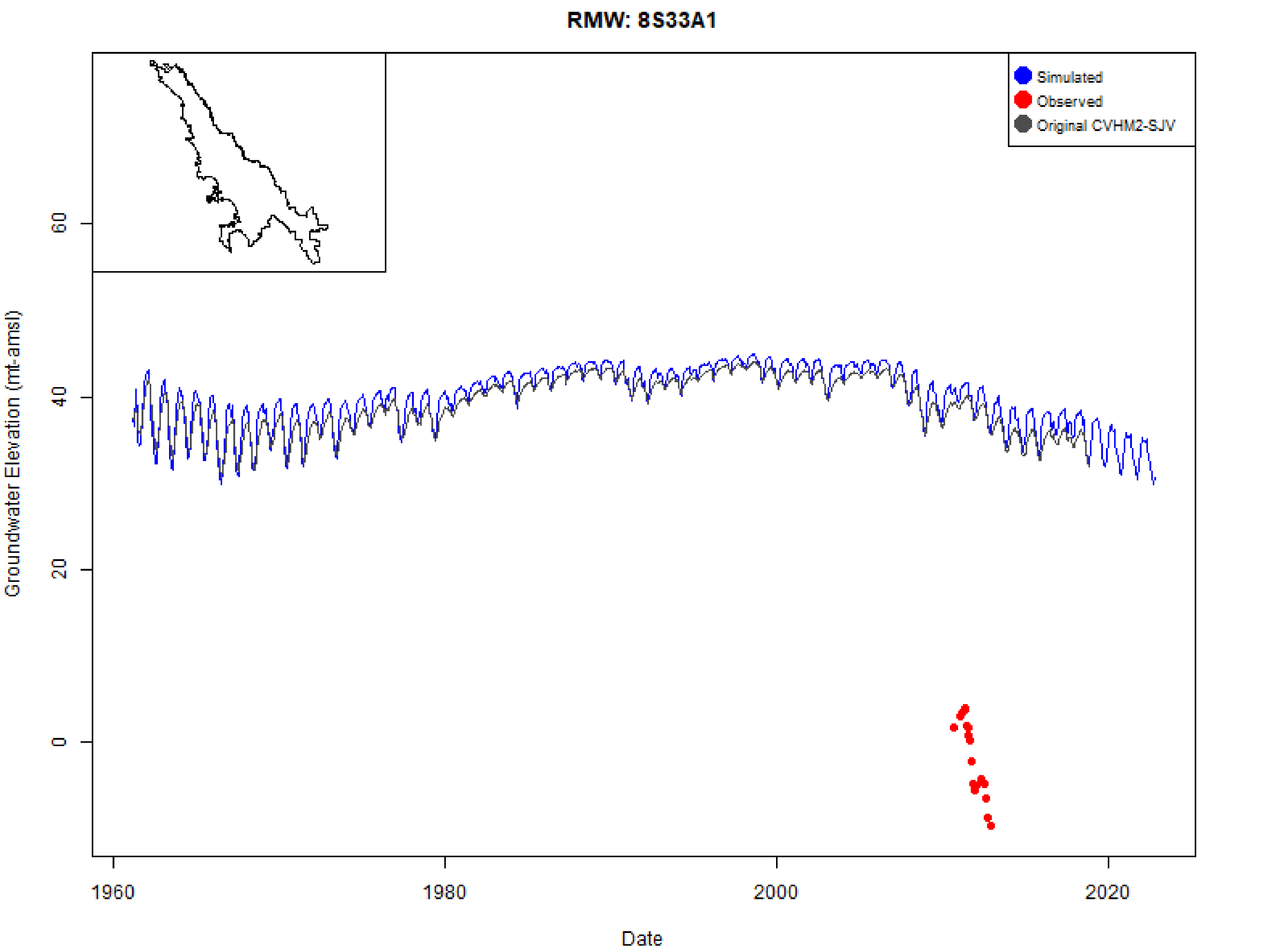
RMW: 4S11D6
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
20
0
-20
-40
1960
1980
2000
2020
Date

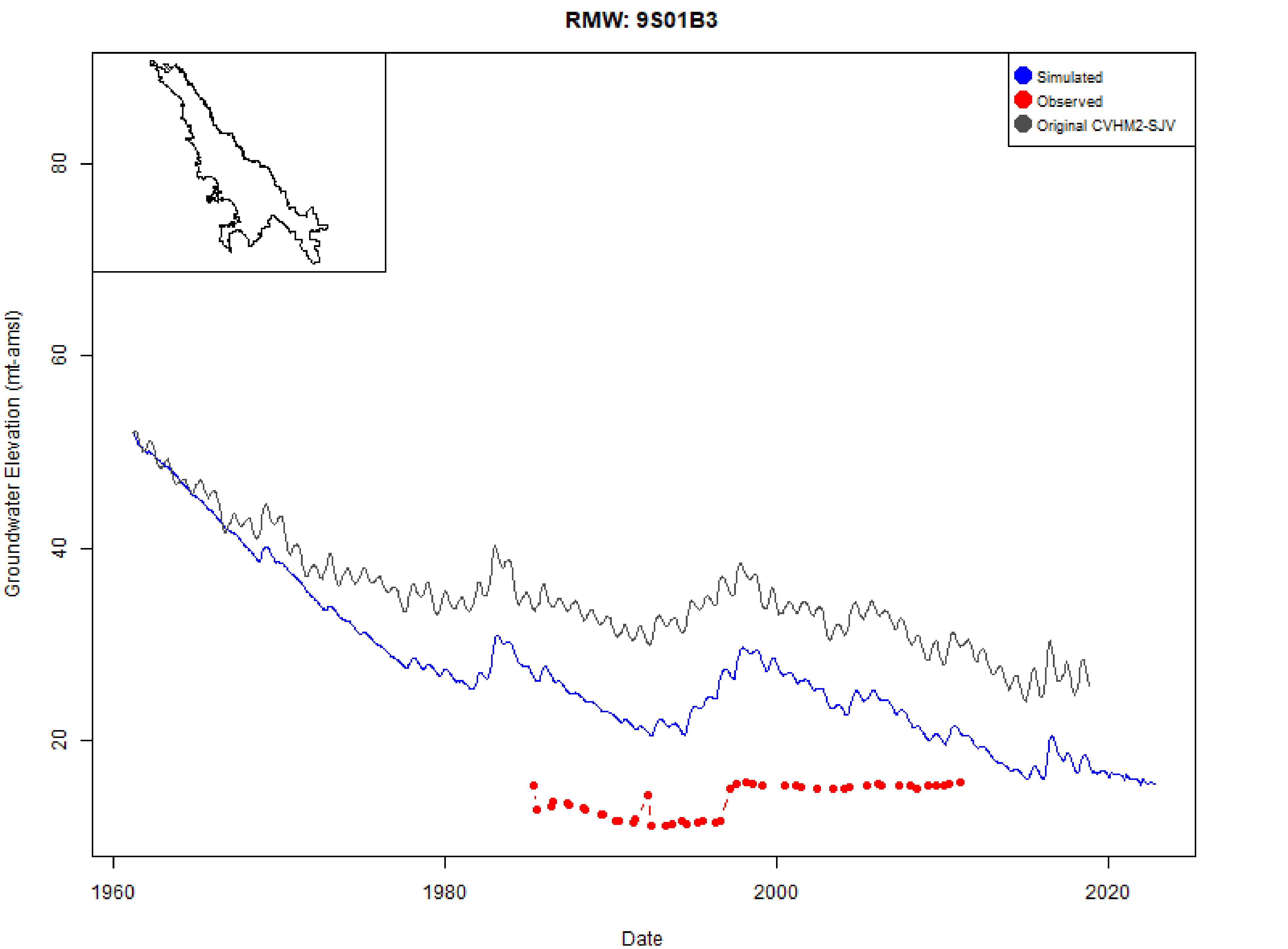

RMW: 5S01R1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
30
25
20
15
10
5
1960
1980
2000
2020
Date

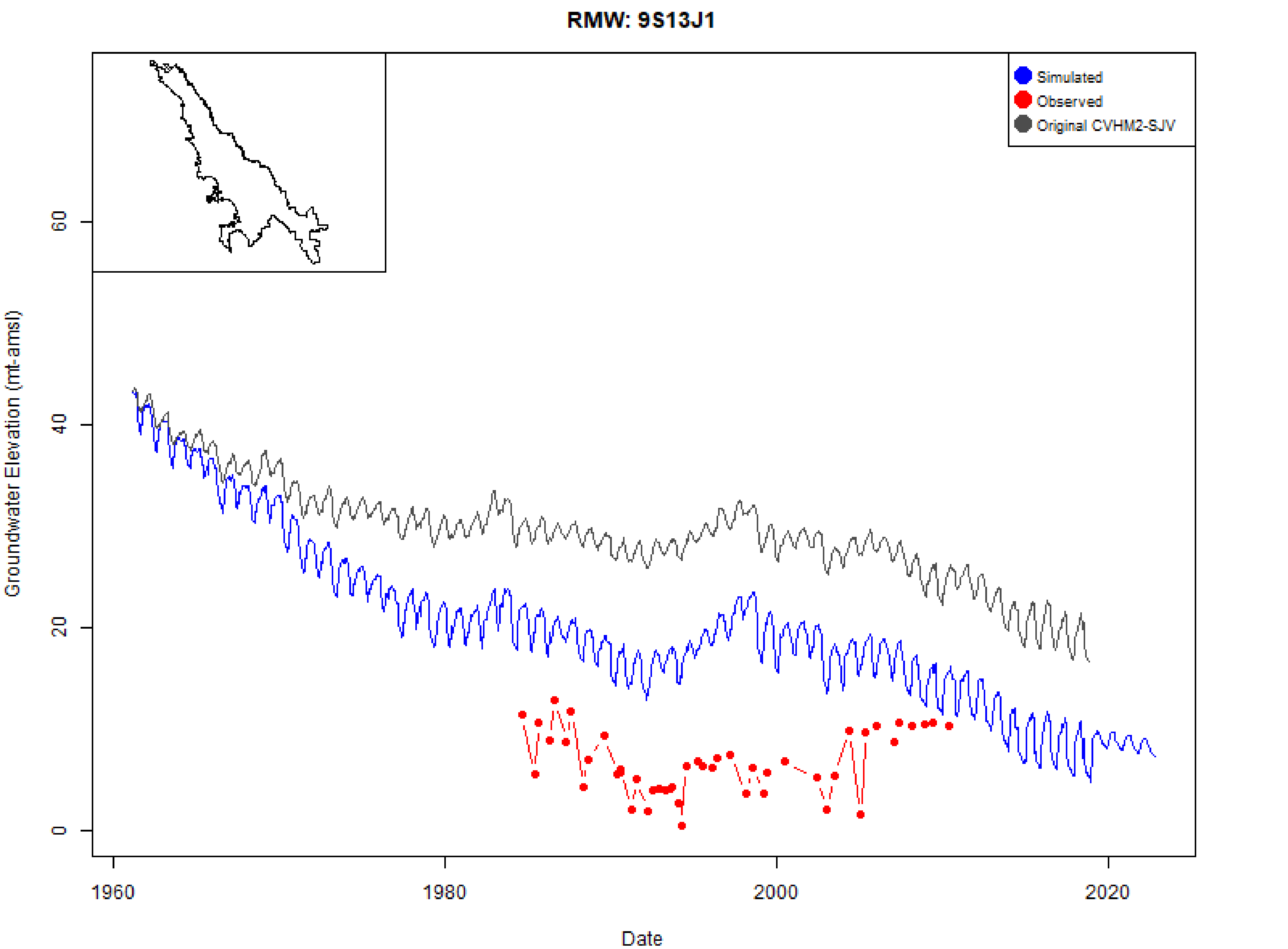


RMW: 5S28A4
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
10
20
30
40
50
60
1960
1980
2000
2020
Date

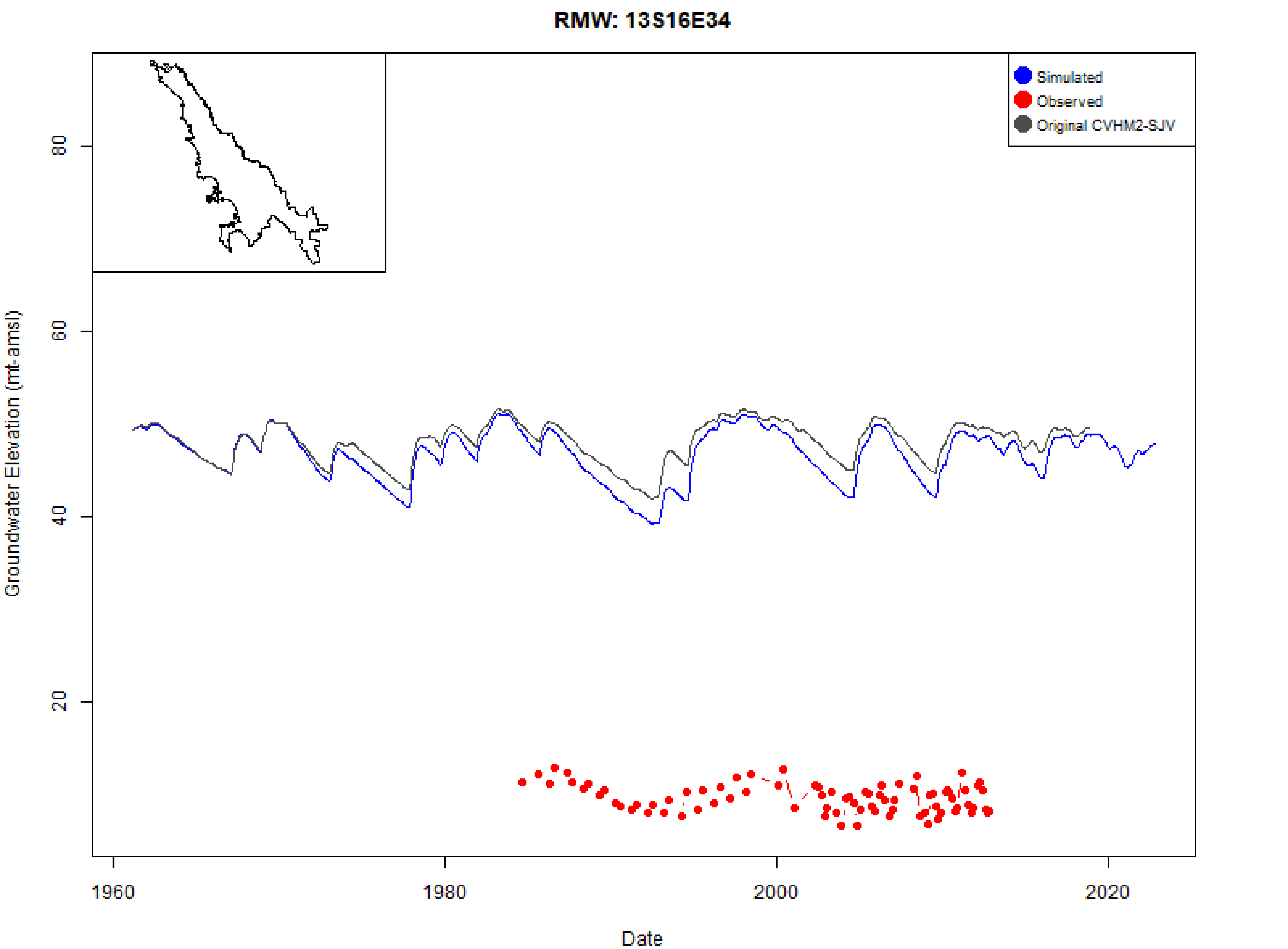

RMW: 7S23K1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
Date
40
35
30
25
20
15
10
5
1960
1980
2000
2020


RMW: 8S33A1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
0
20
40
60
1960
1980
2000
2020
Date

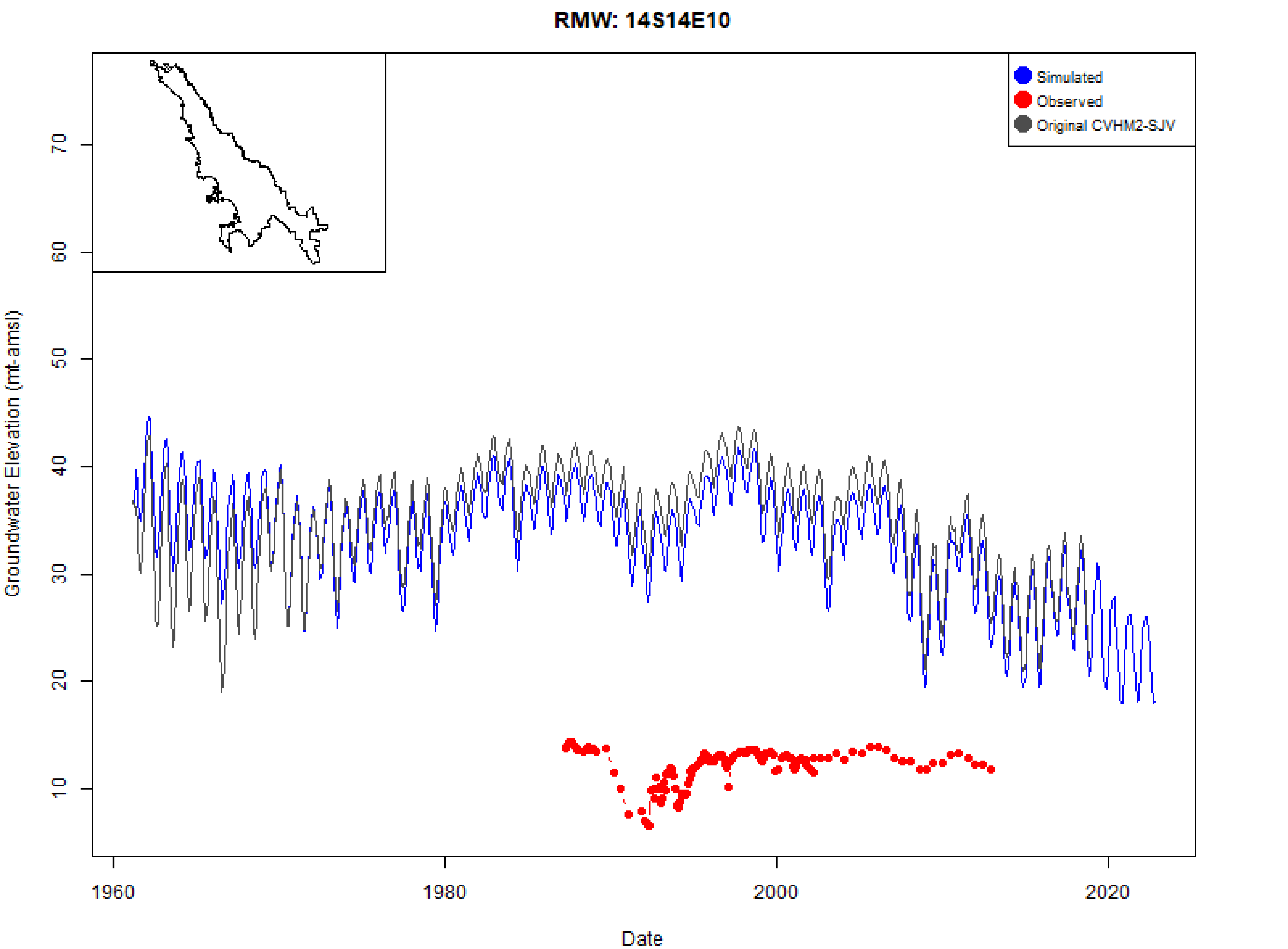

RMW: 9S01B3
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
80
60
40
20
1960
1980
2000
2020
Date



RMW: 9S13J1
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
0
20
40
60
1960
1980
2000
2020
Date



RMW: 13S16E34
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
80
60
40
20
1960
1980
2000
2020
Date



RMW: 14S14E10
Simulated
Observed
Original CVHM2-SJV
Groundwater Elevation (mt-amsl)
10
20
30
40
50
60
70
1960
1980
2000
2020
Date

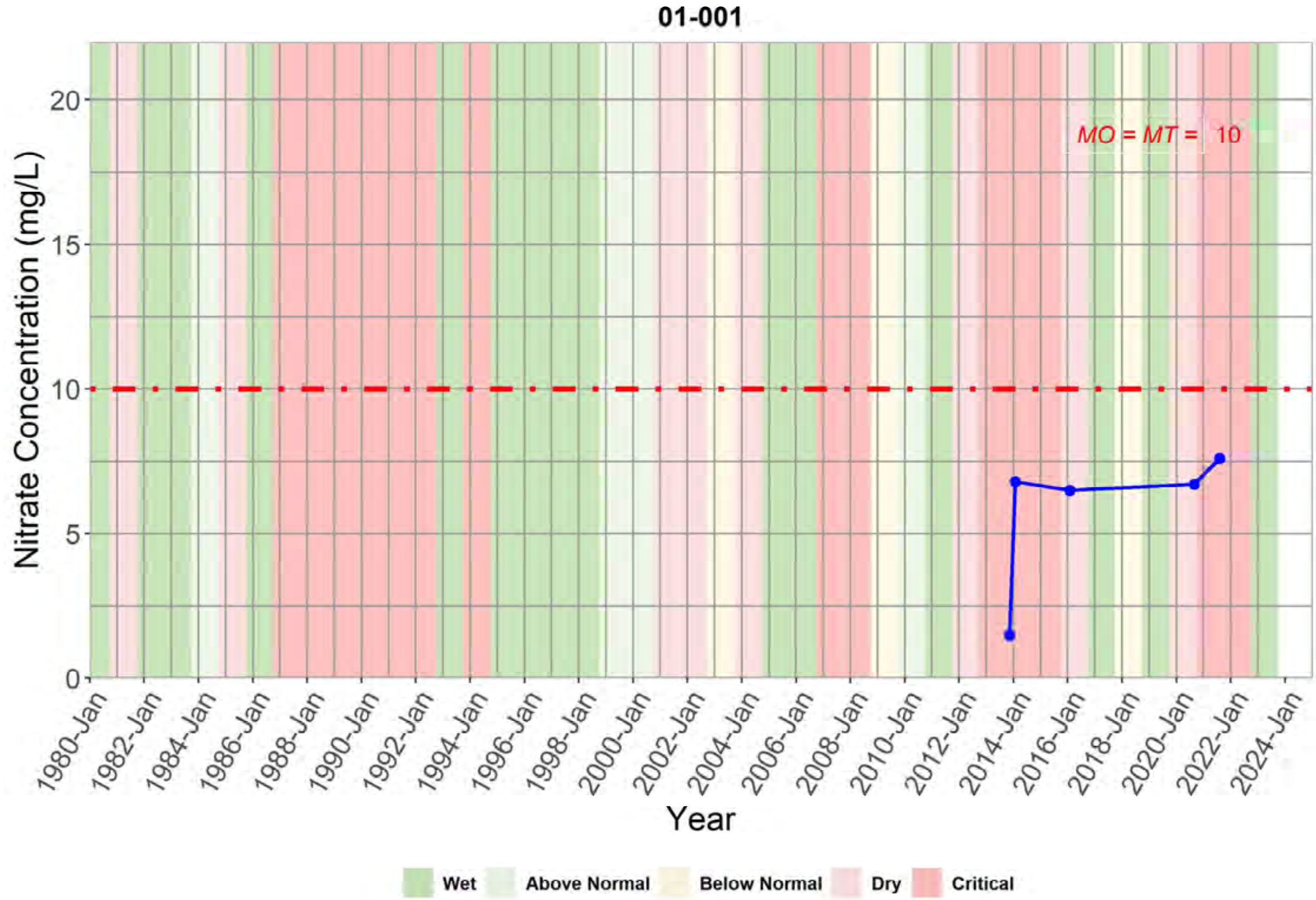
Appendix I

Concentrations, Trends, and Correlations of Constituents of Concern

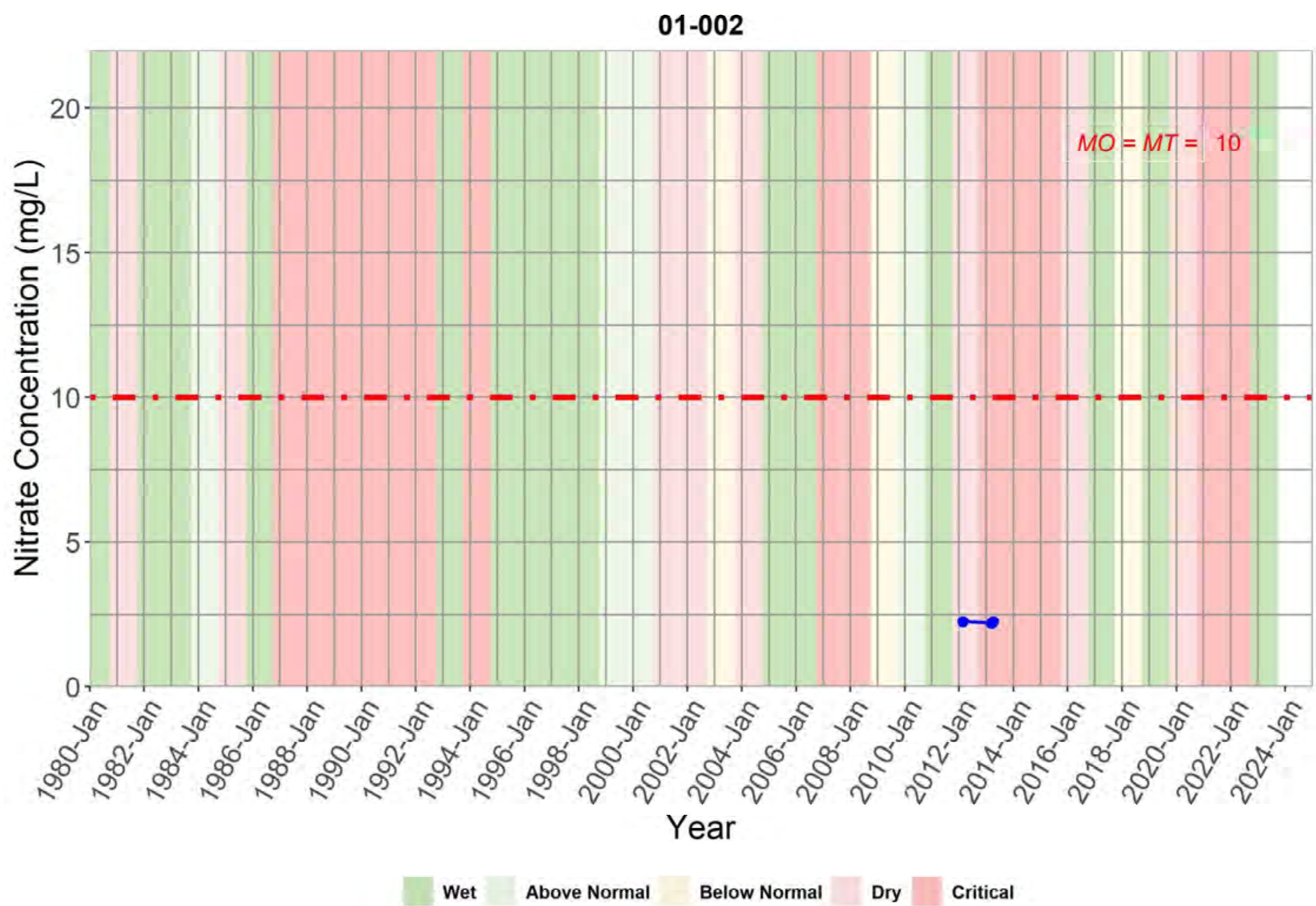
DELTA-MENDOTA SGMA

Appendix I-1

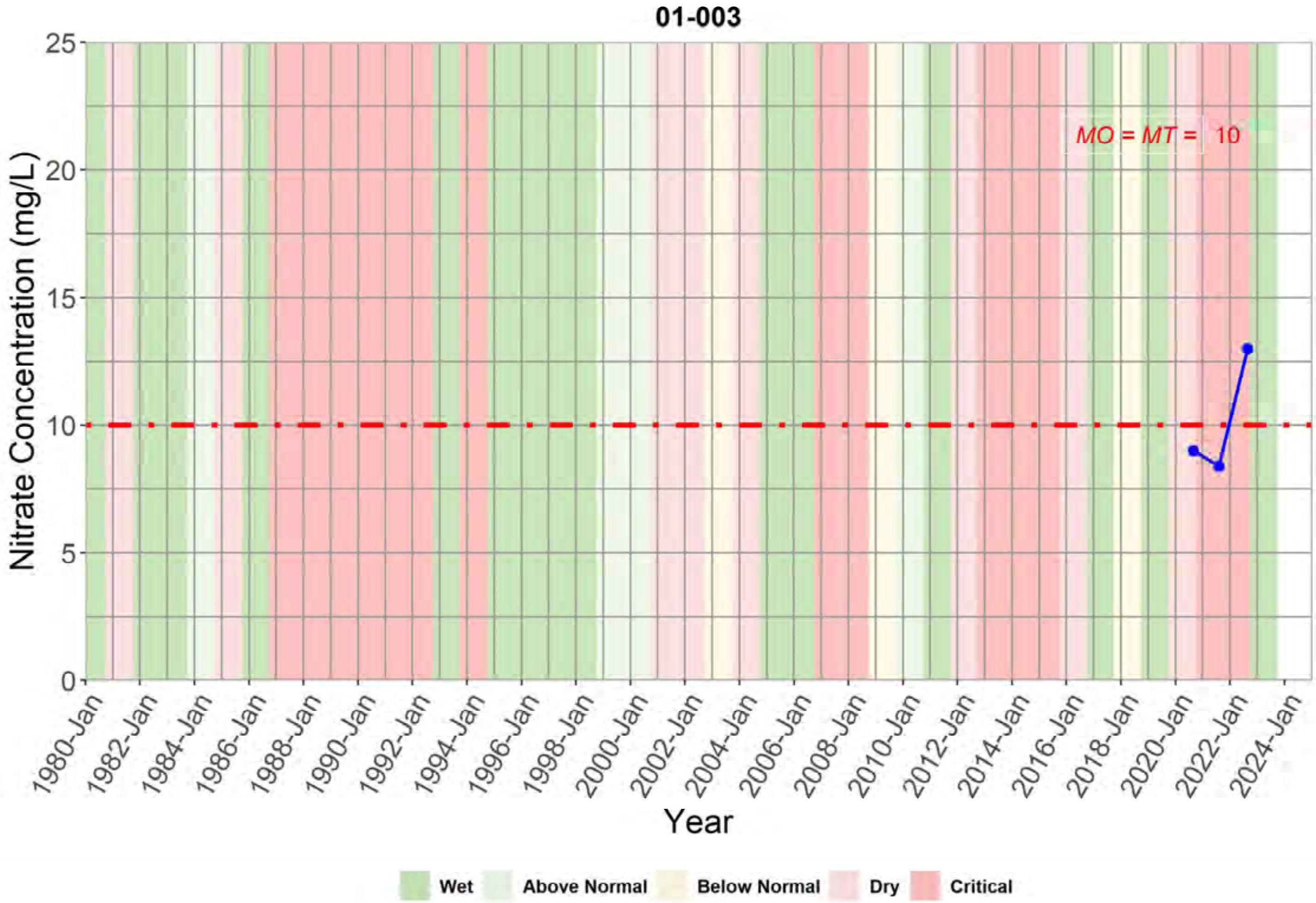
Chemographs for Constituents of Concern in Representative Monitoring Wells for Degraded Water Quality



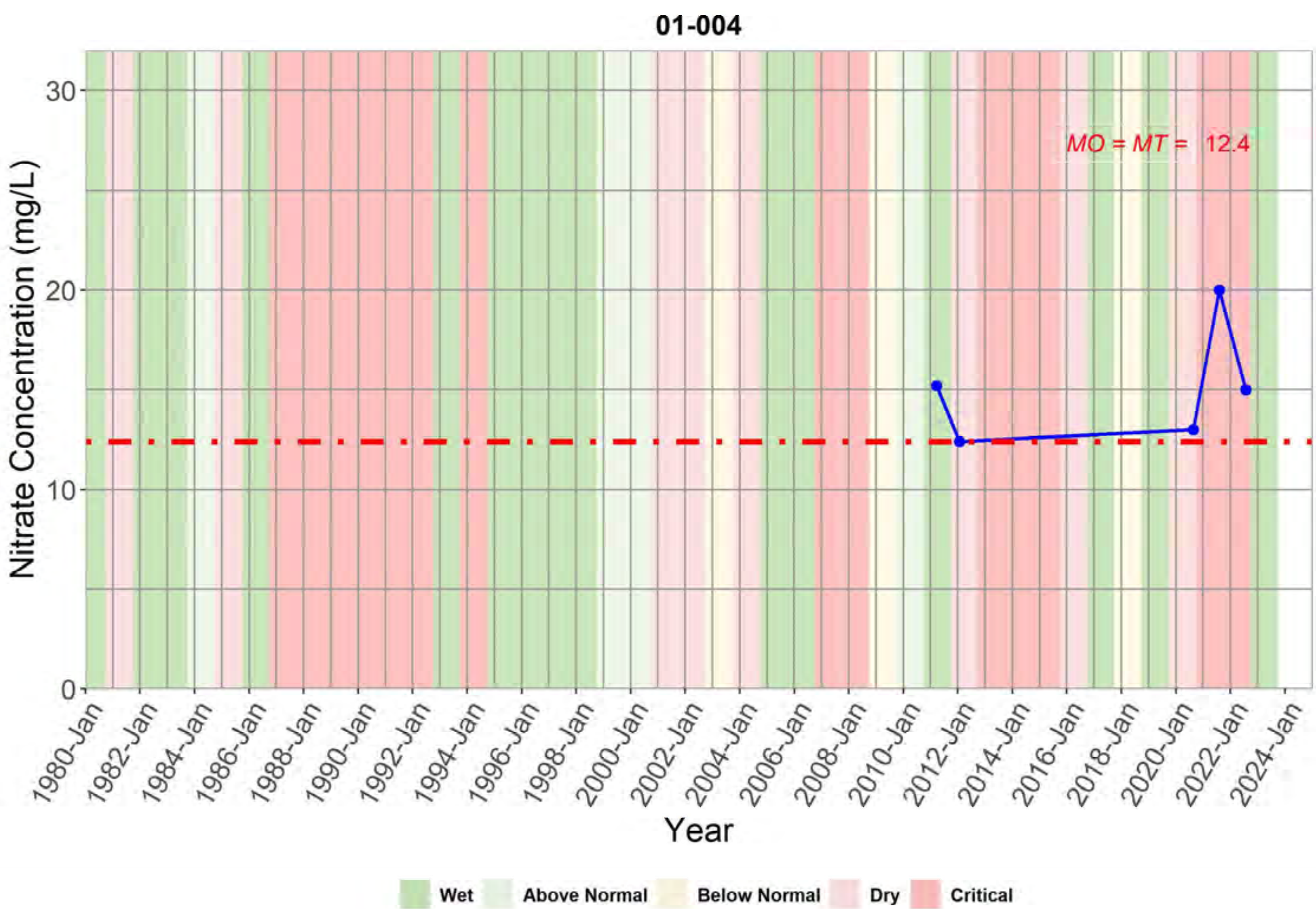
01-001
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



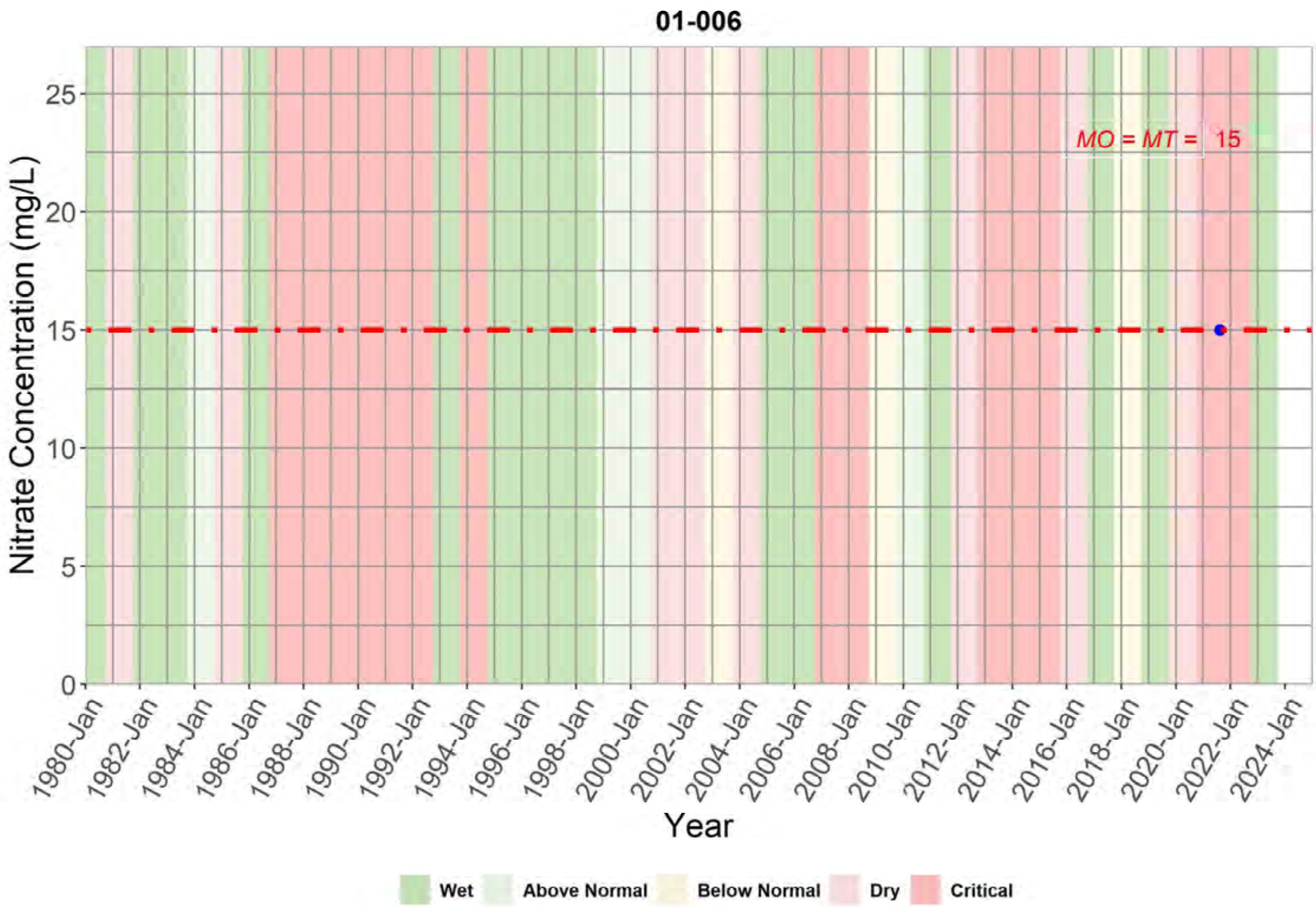
01-002
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



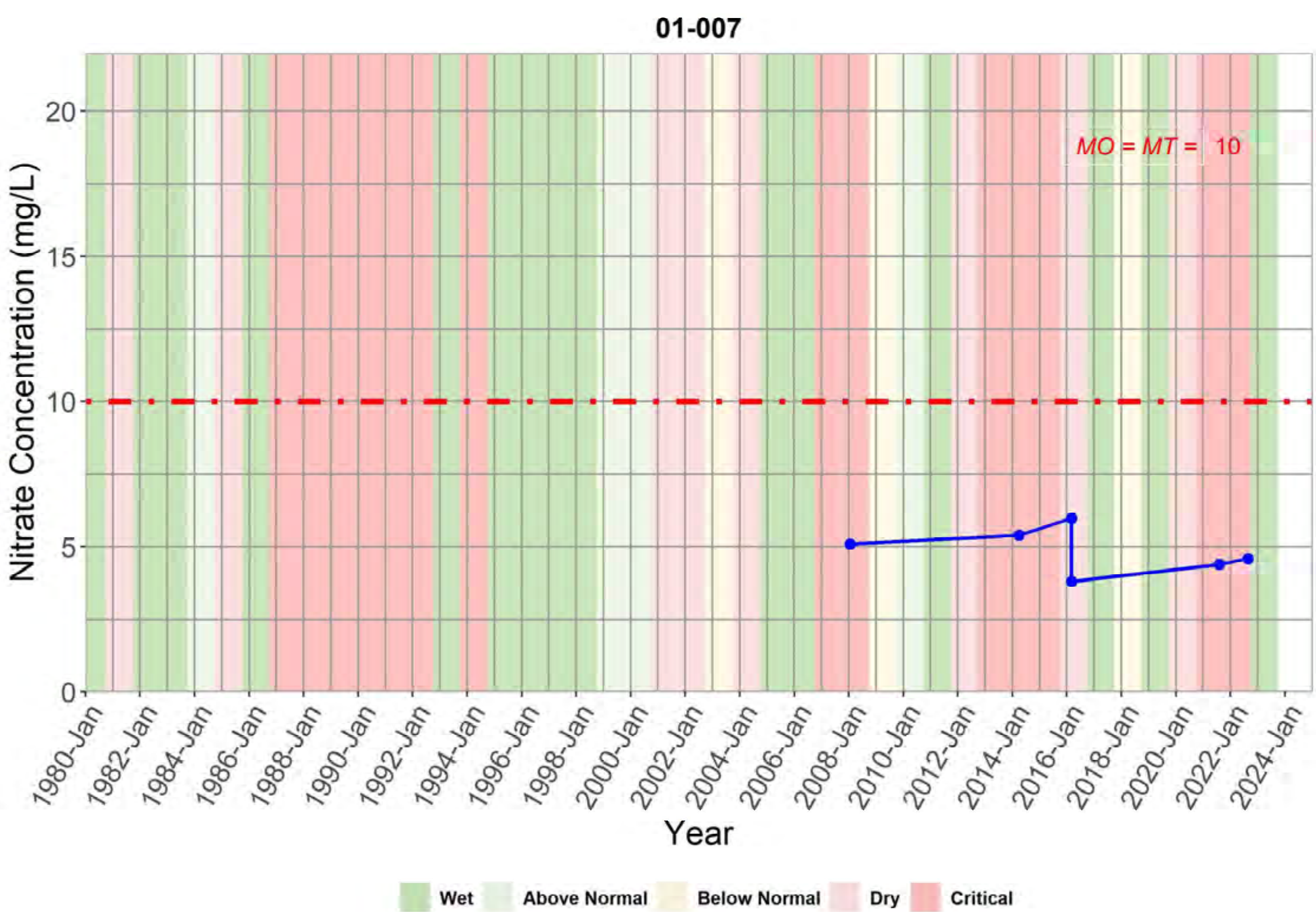
01-003
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
25
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



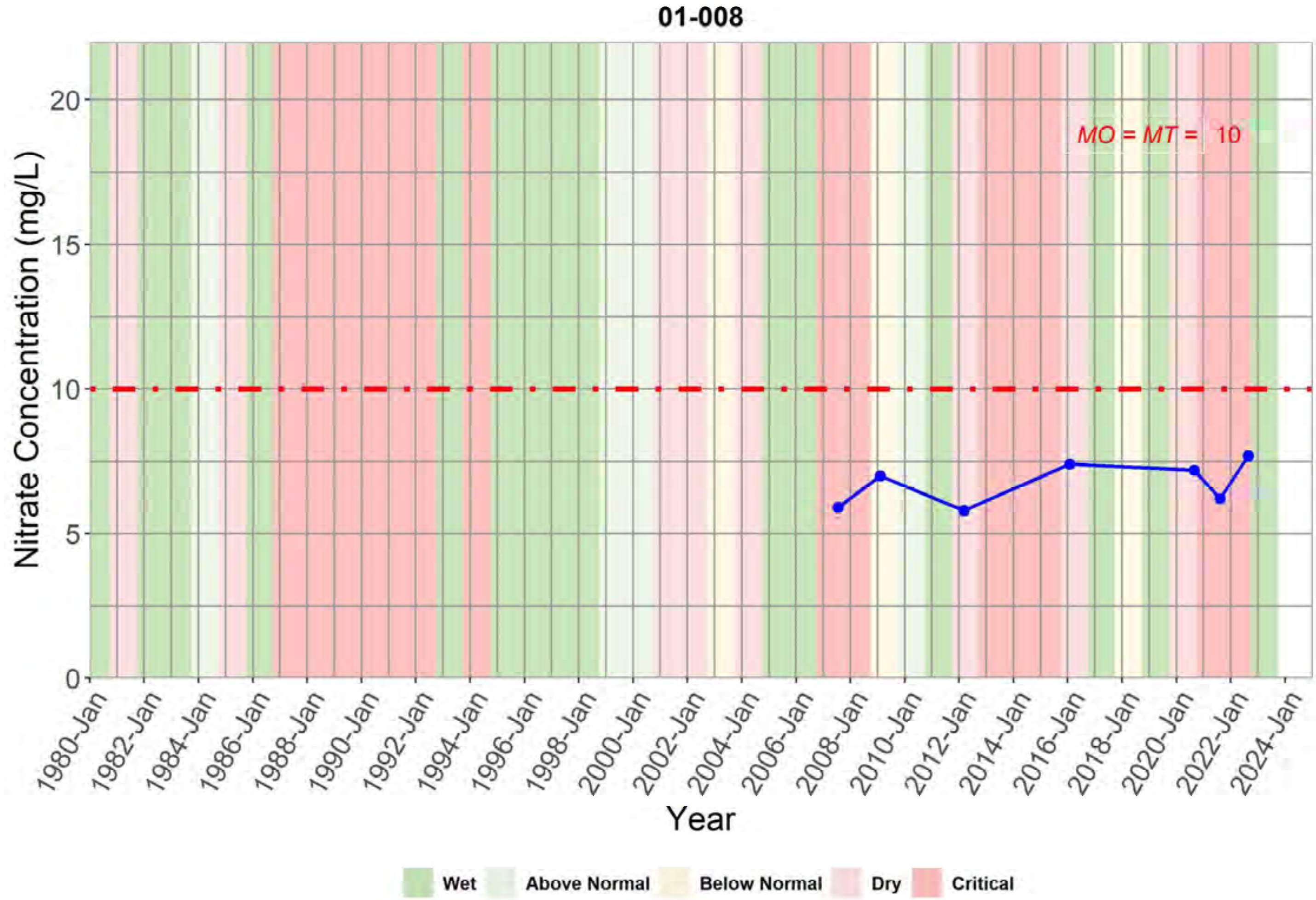
01-004
MO = MT = 12.4
Nitrate Concentration (mg/L)
0
10
20
30
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



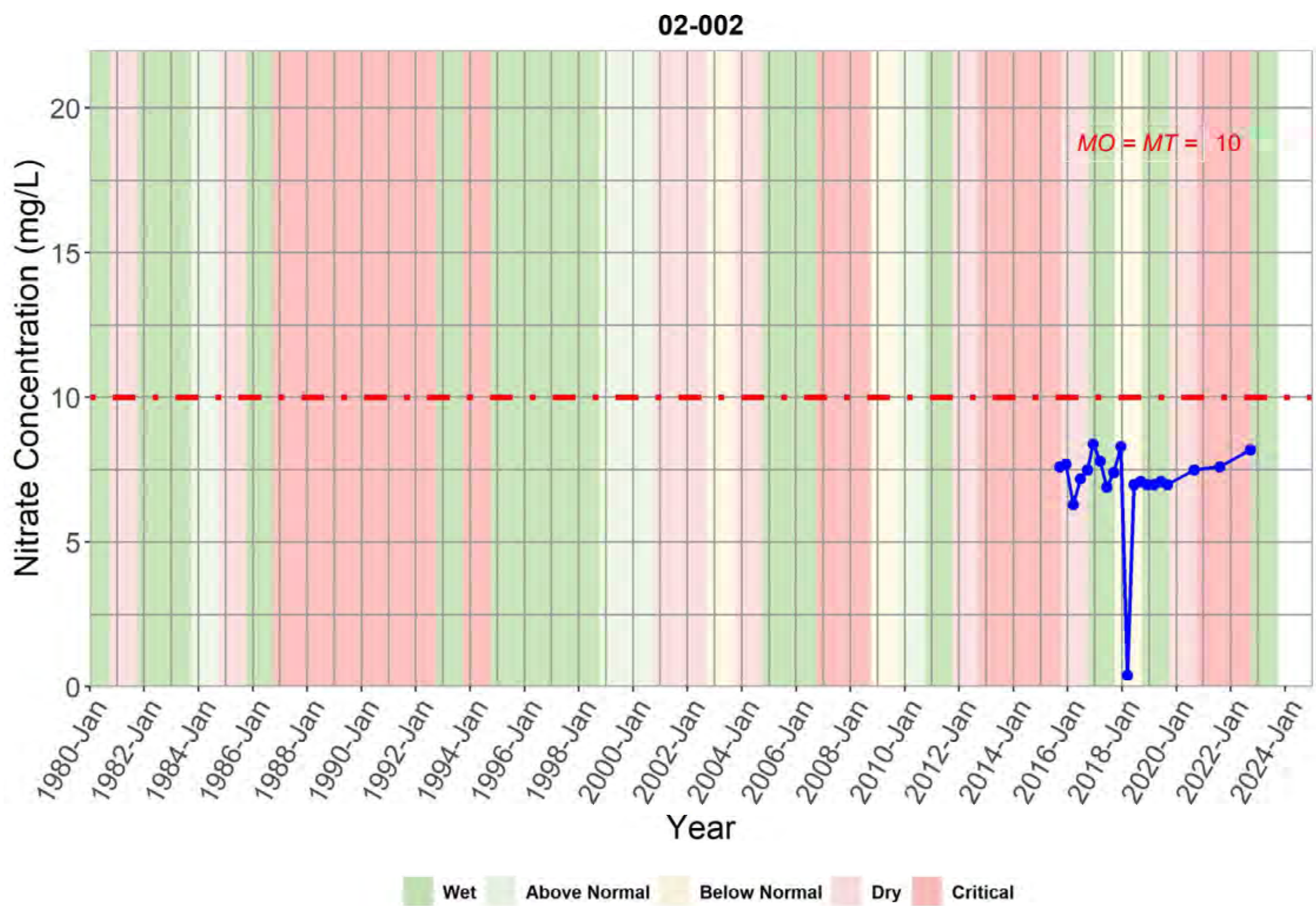
01-006
MO = MT = 15
Nitrate Concentration (mg/L)
0
5
10
15
20
25
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



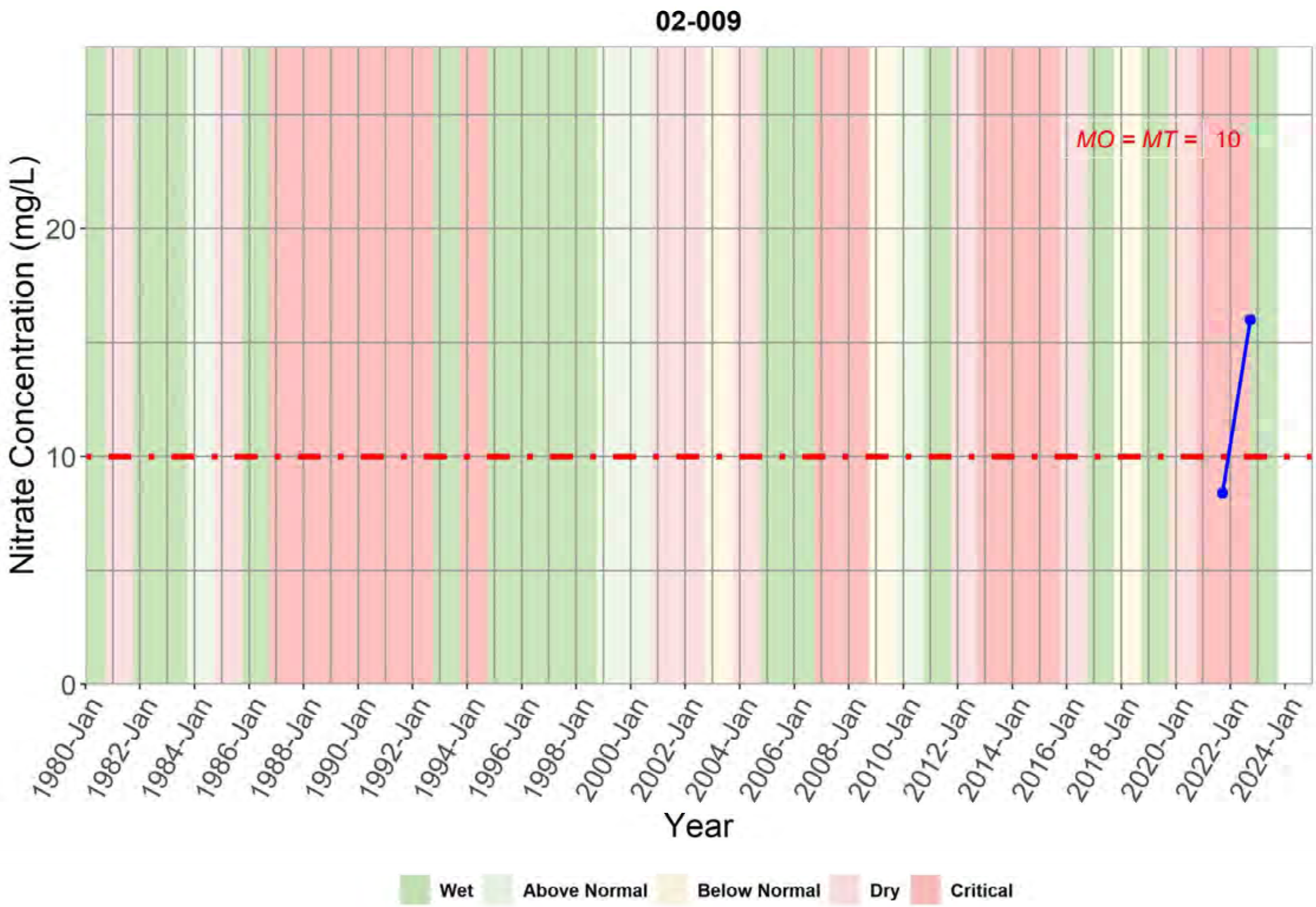
01-007
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

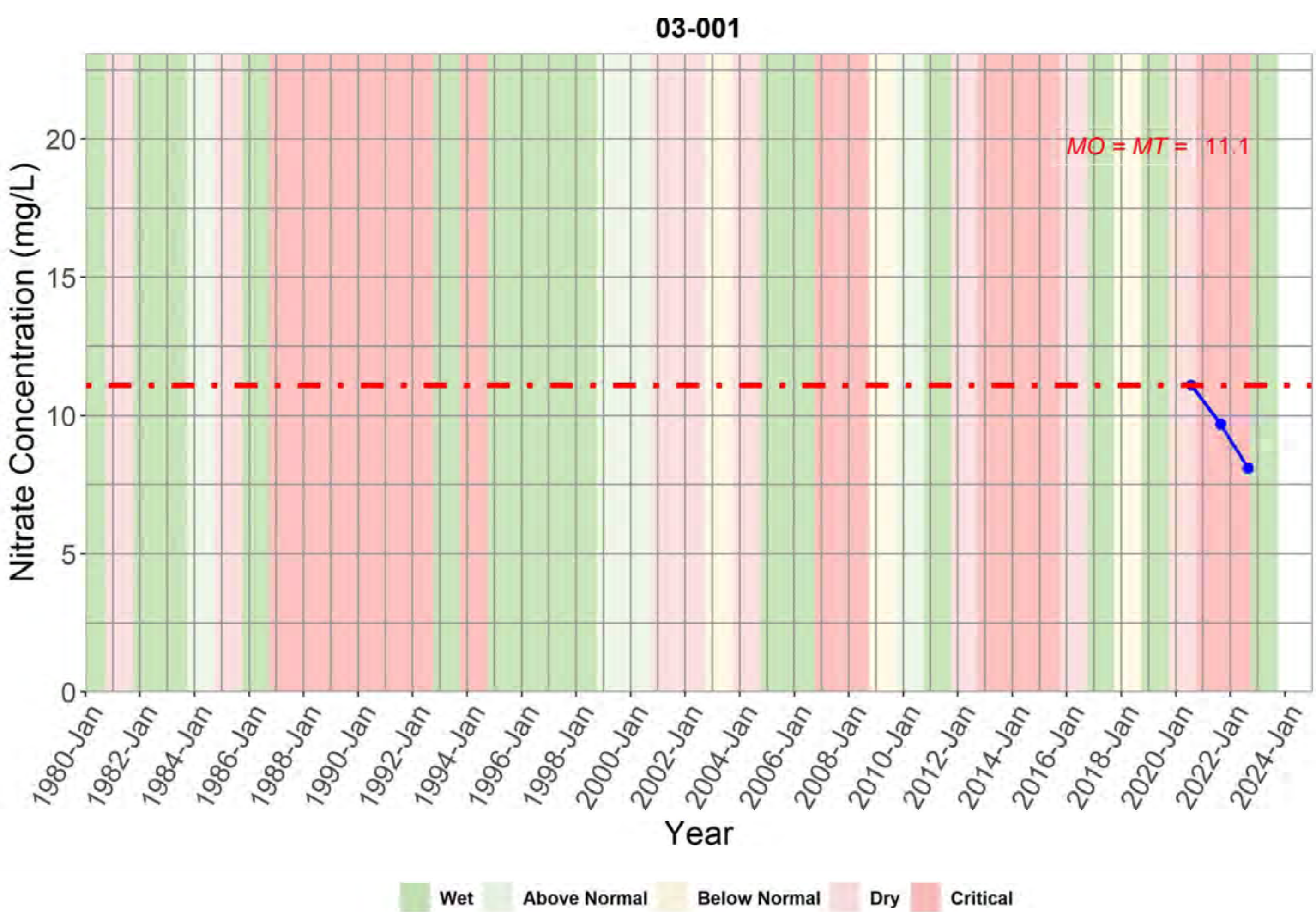


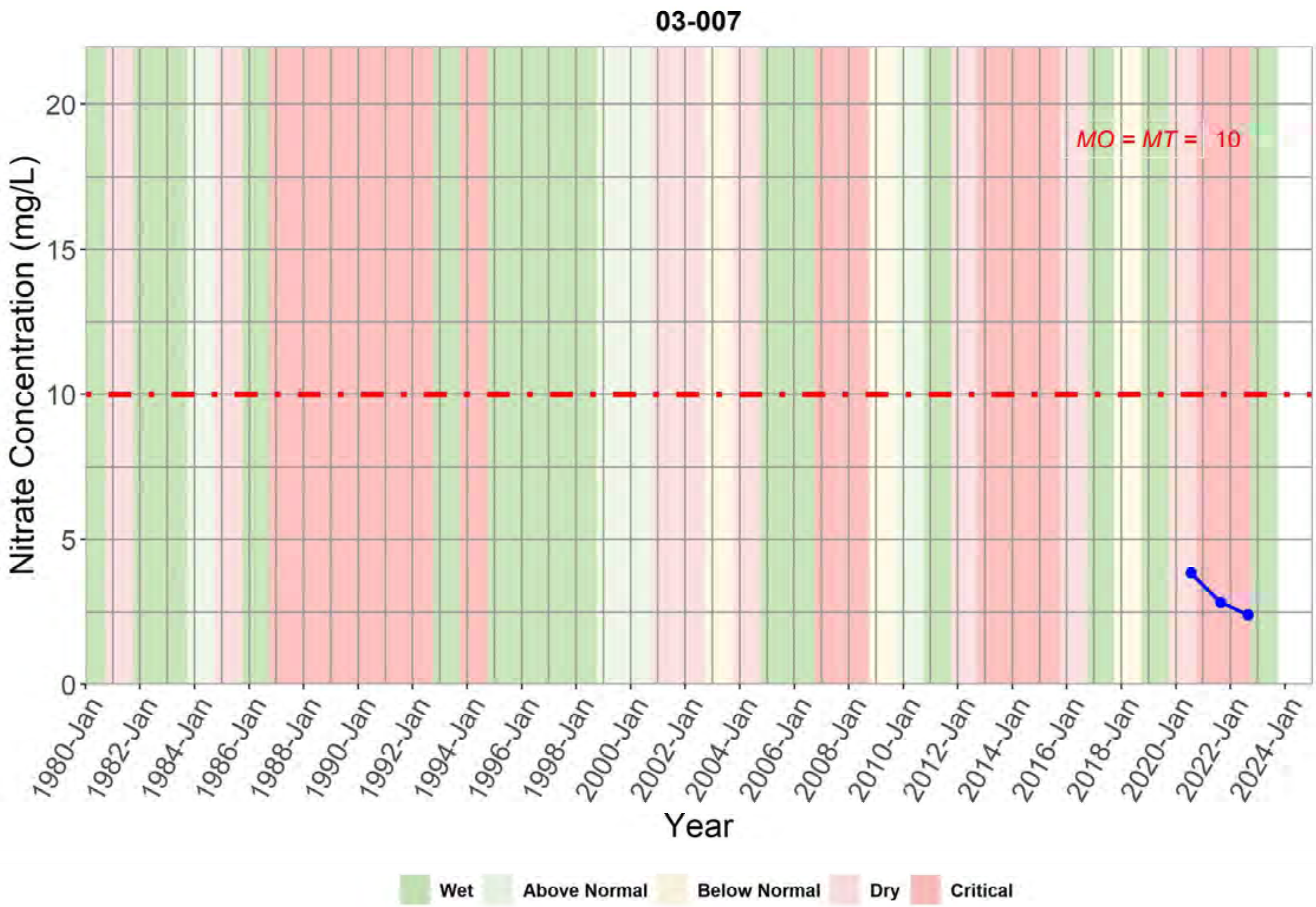
01-008
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

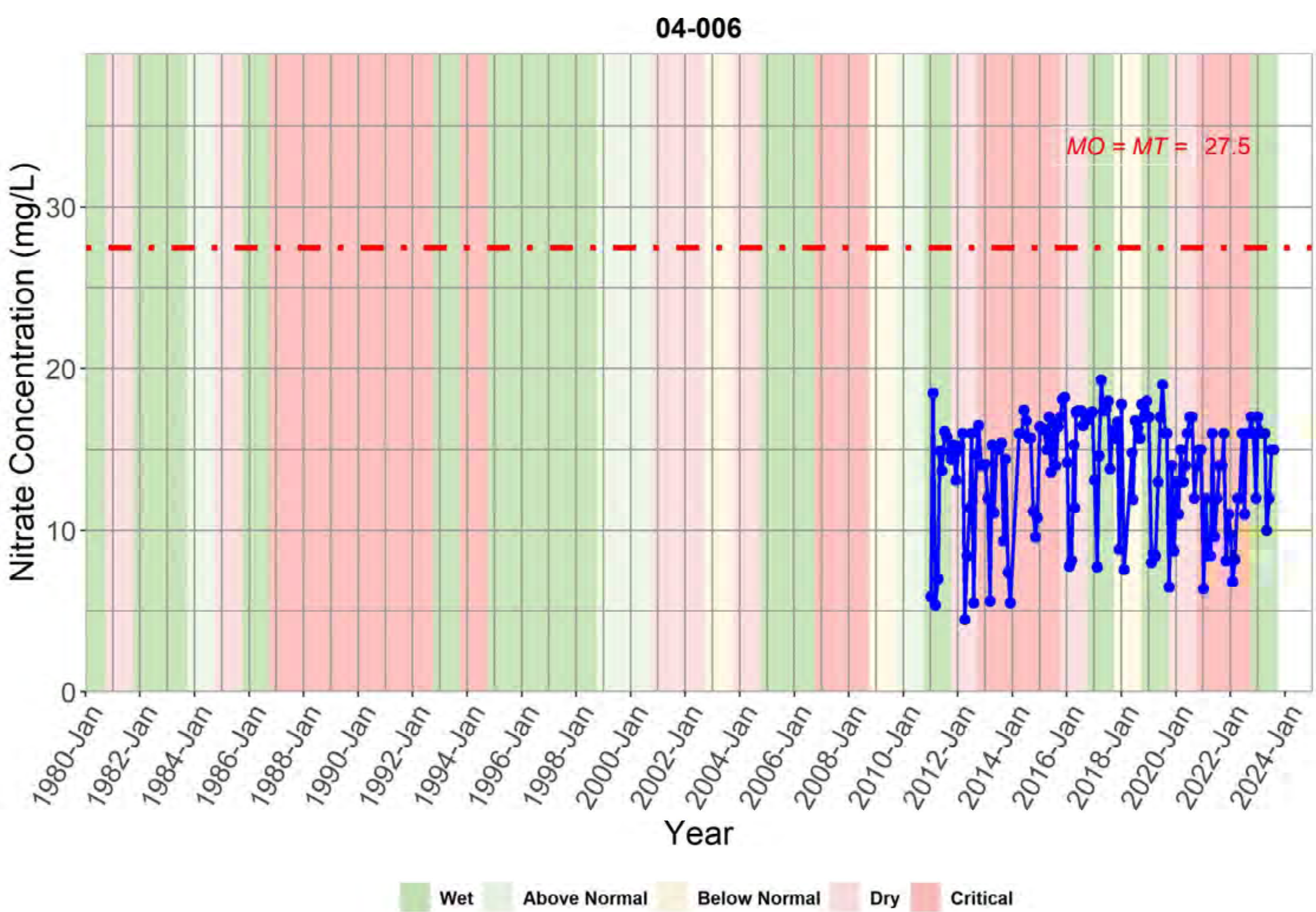


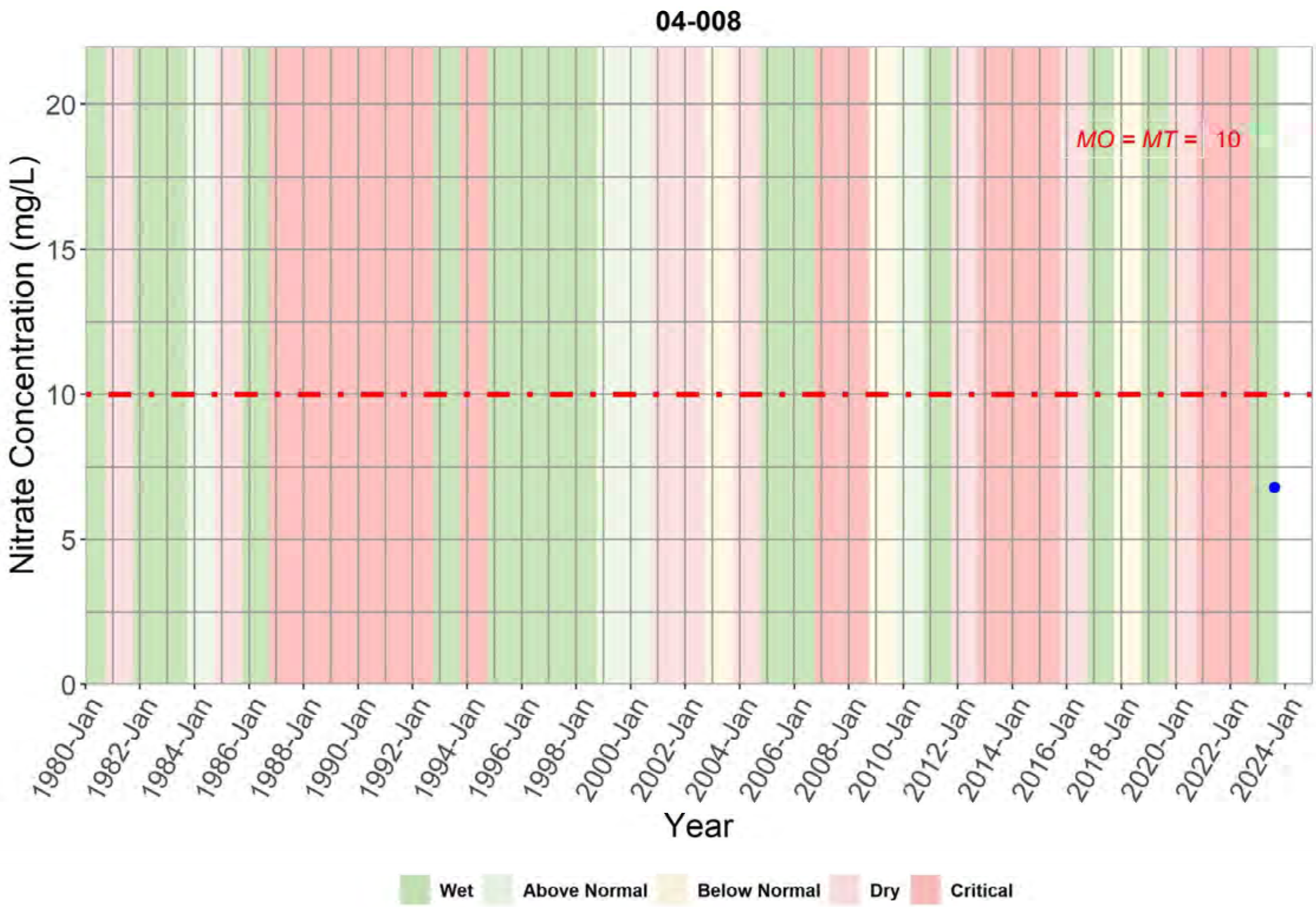
02-002
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

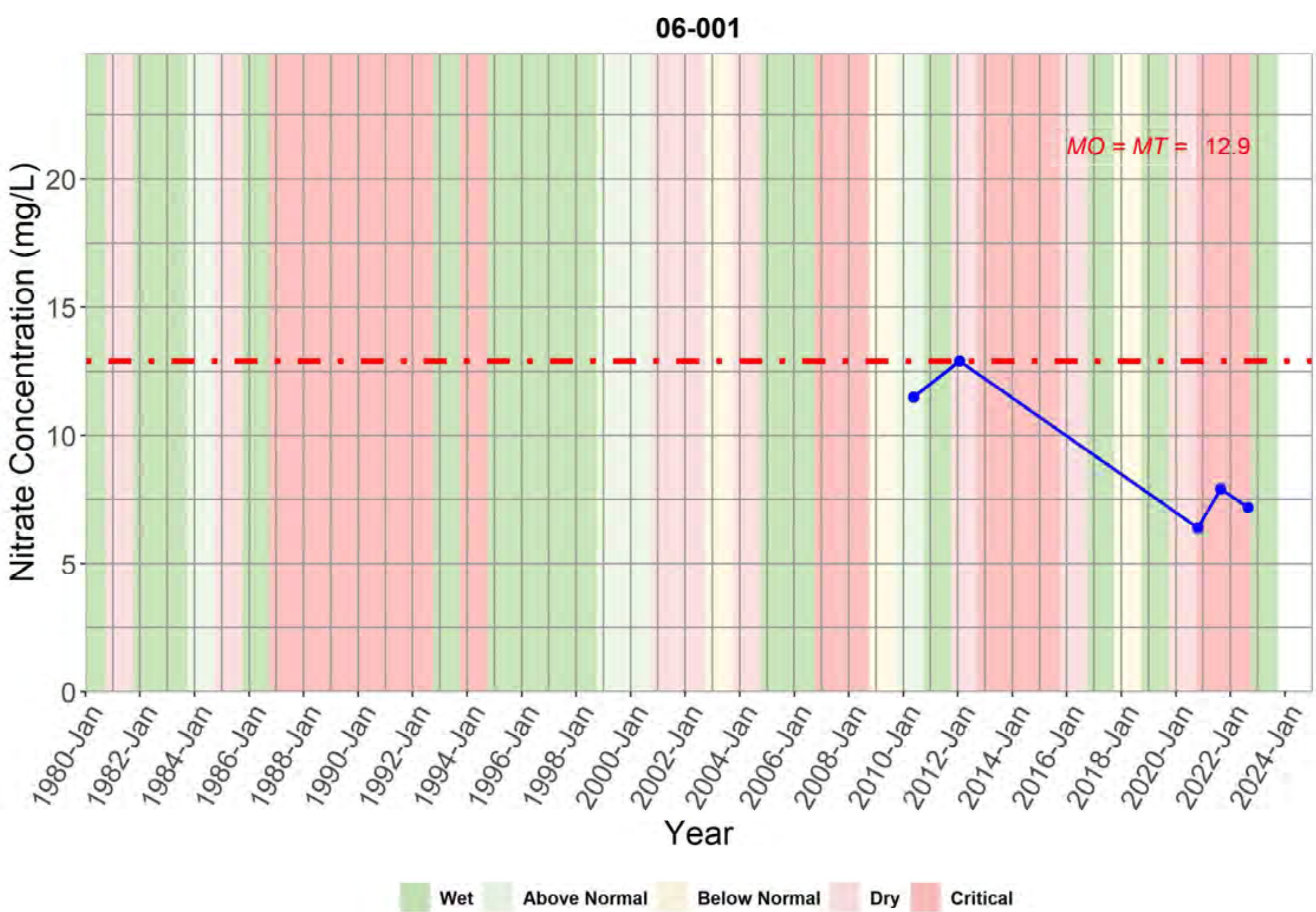

02-009
MO = MT = 10
Nitrate Concentration (mg/L)
0
10
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


03-001
MO = MT = 11.1
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


03-007
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


04-006
MO = MT = 27.5
Nitrate Concentration (mg/L)
0
10
20
30
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


04-008
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


06-001
MO = MT = 12.9
Nitrate Concentration (mg/L)
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5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
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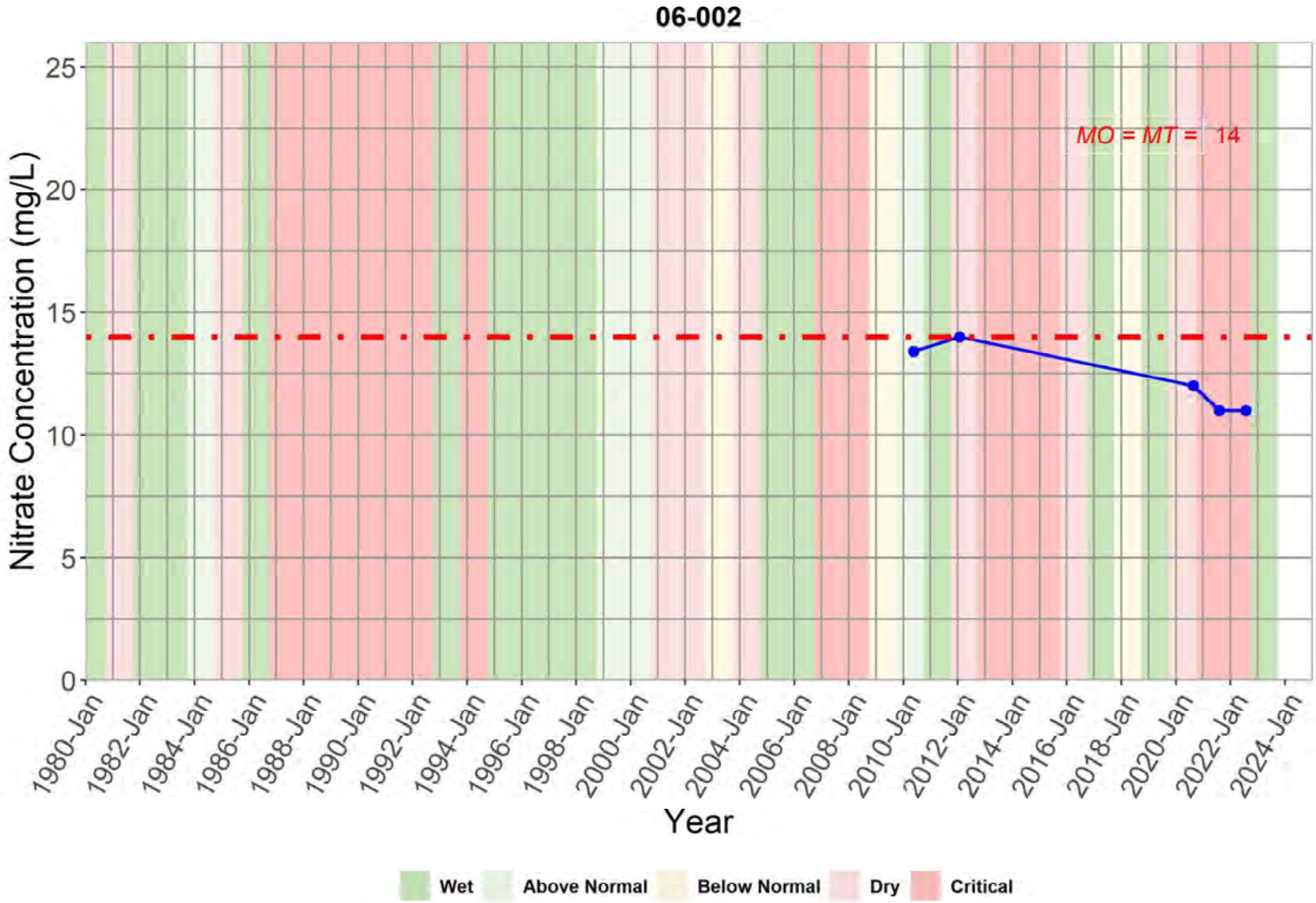
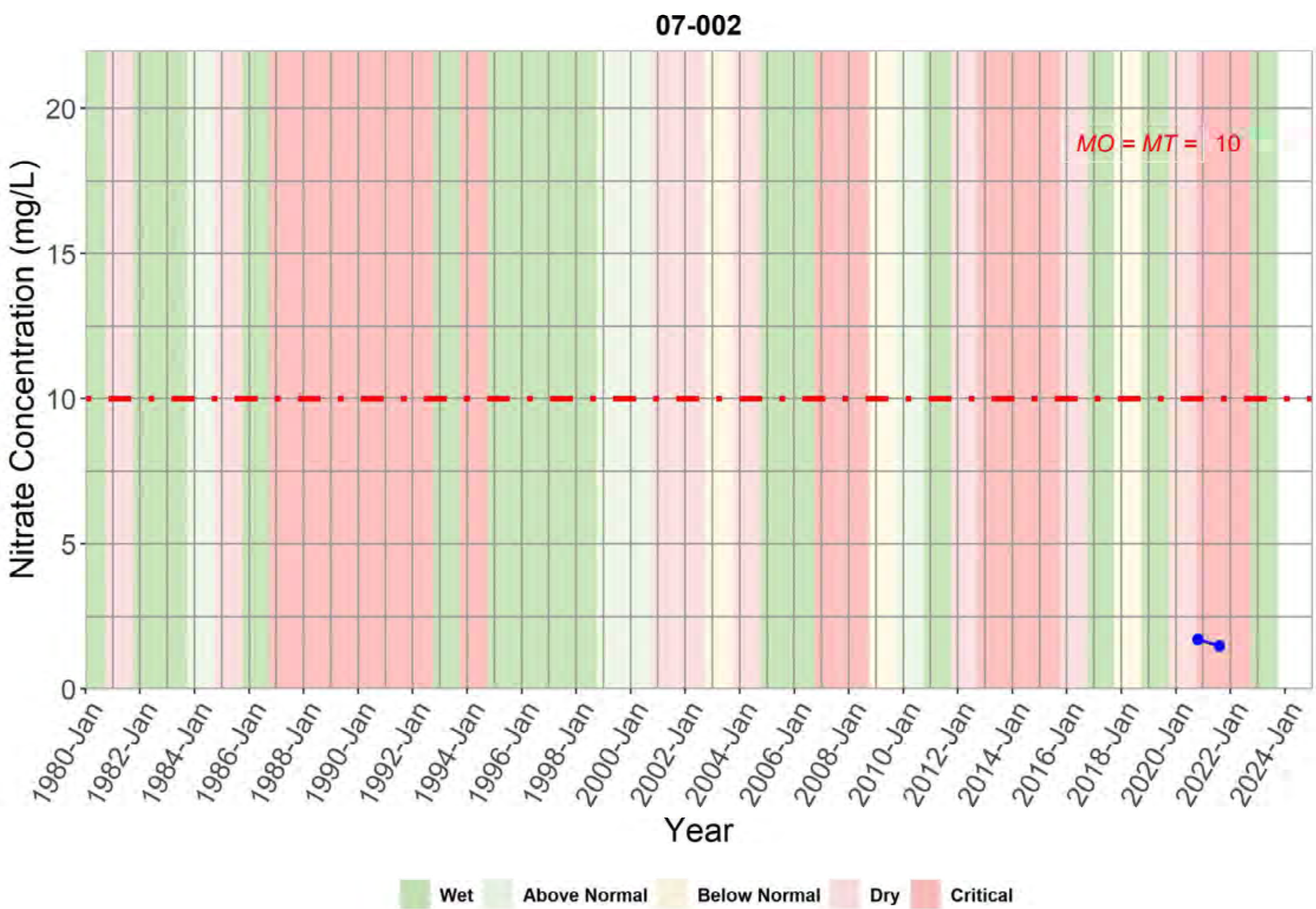
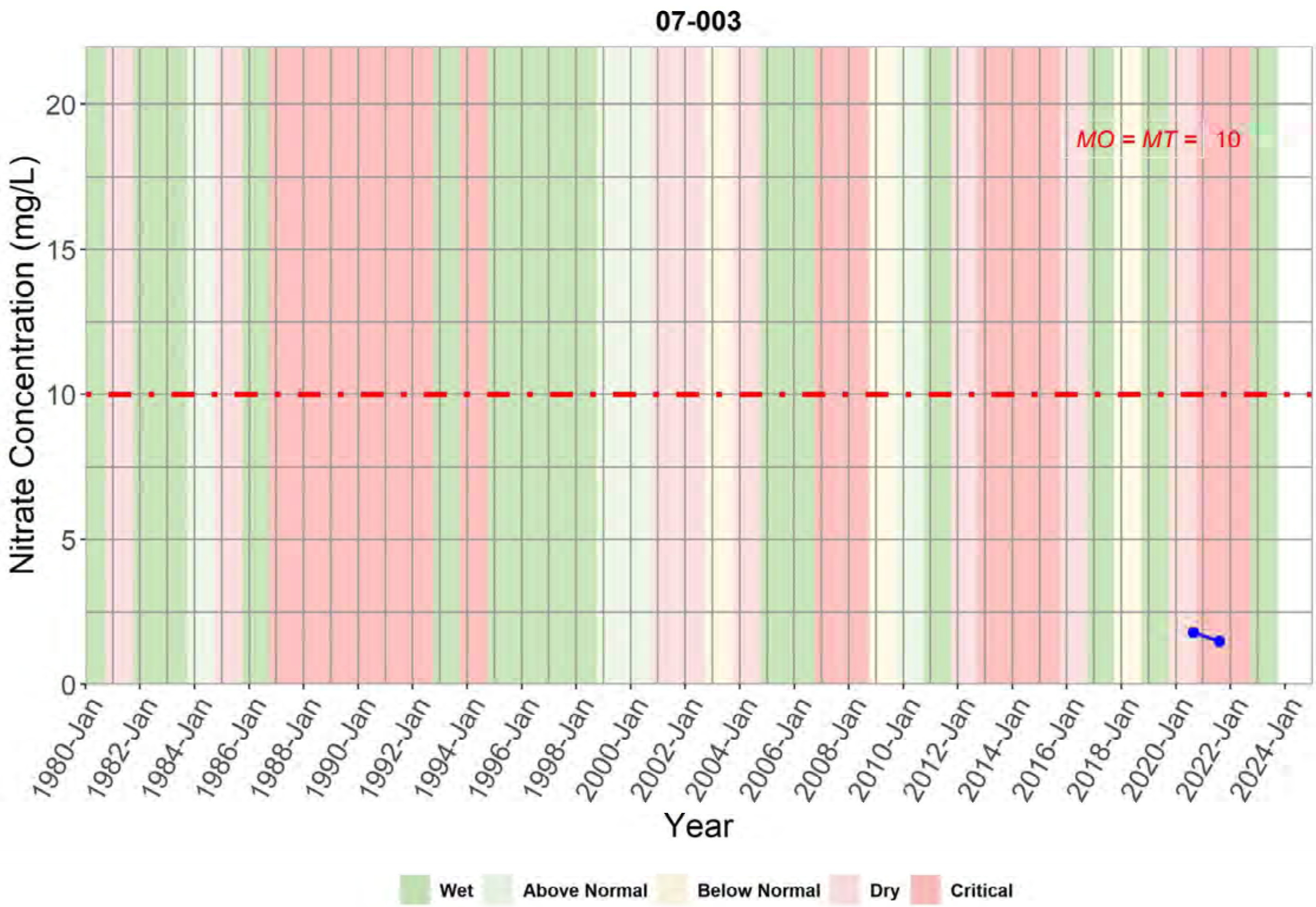
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

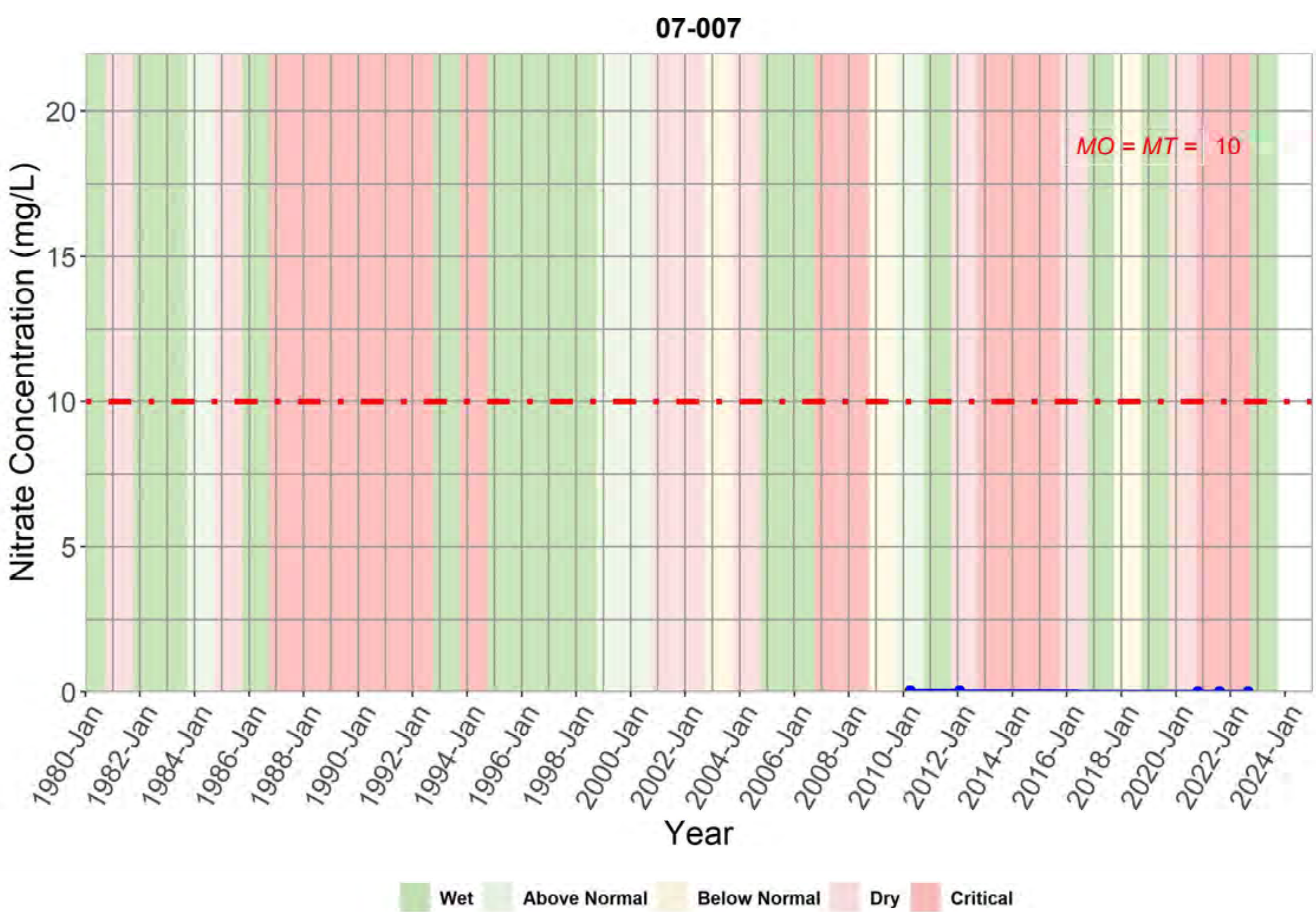


06-002
MO = MT = 14
Nitrate Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical



07-002
MO = MT = 10
Nitrate Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-003
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-007
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
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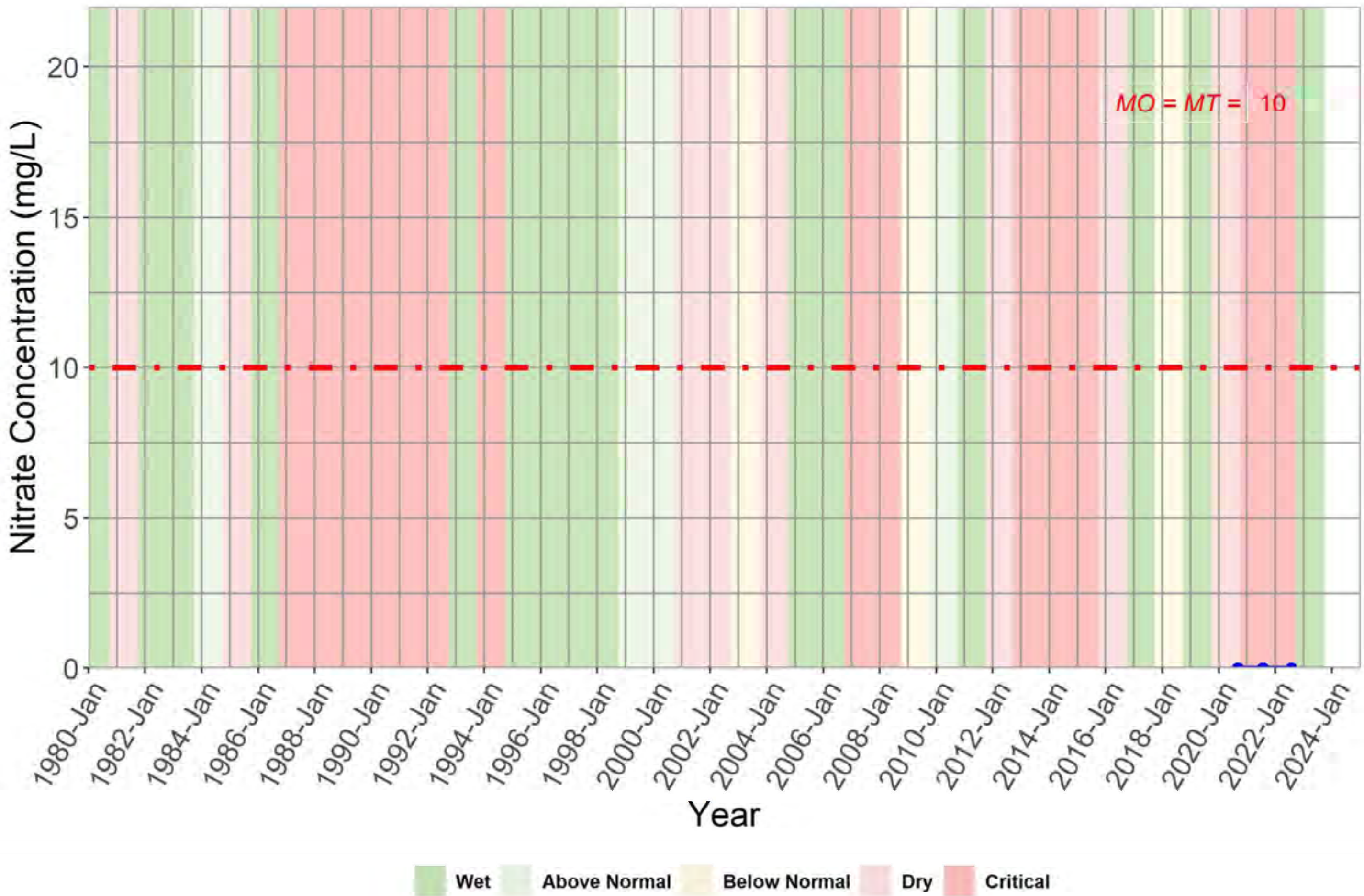
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

07-014


MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
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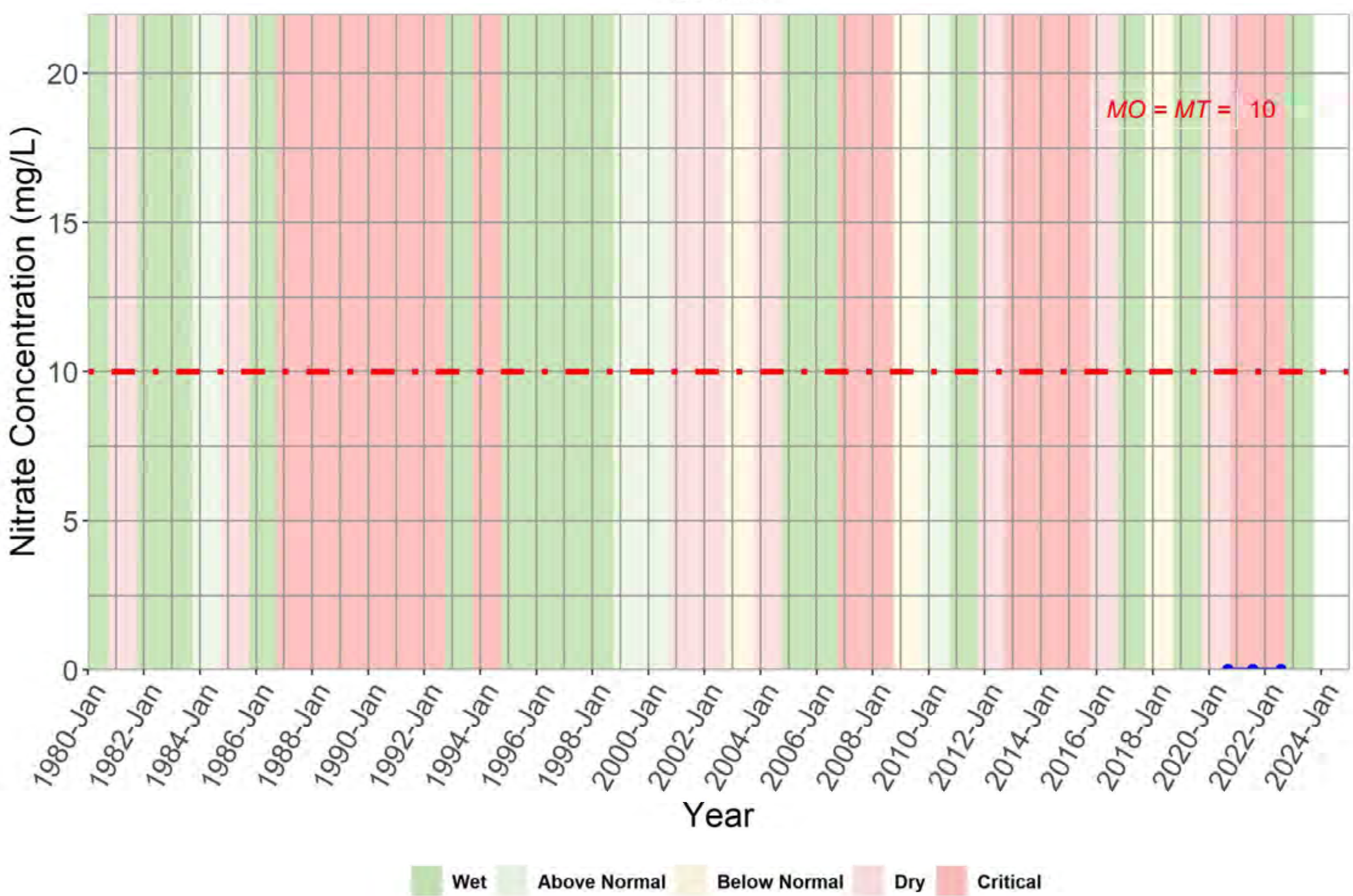
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

07-015


MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
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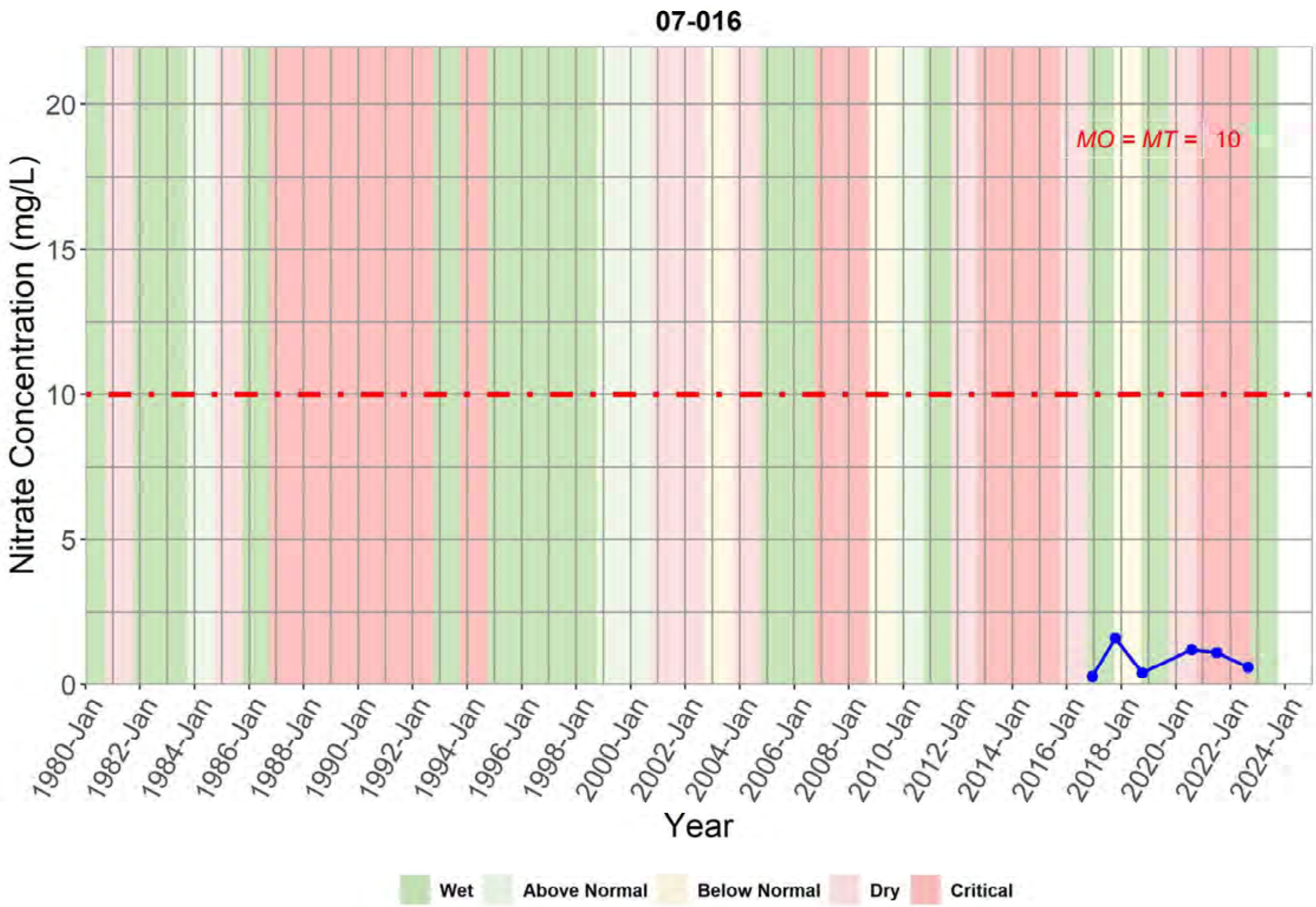
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical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MO = MT = 10
Nitrate Concentration (mg/L)
0
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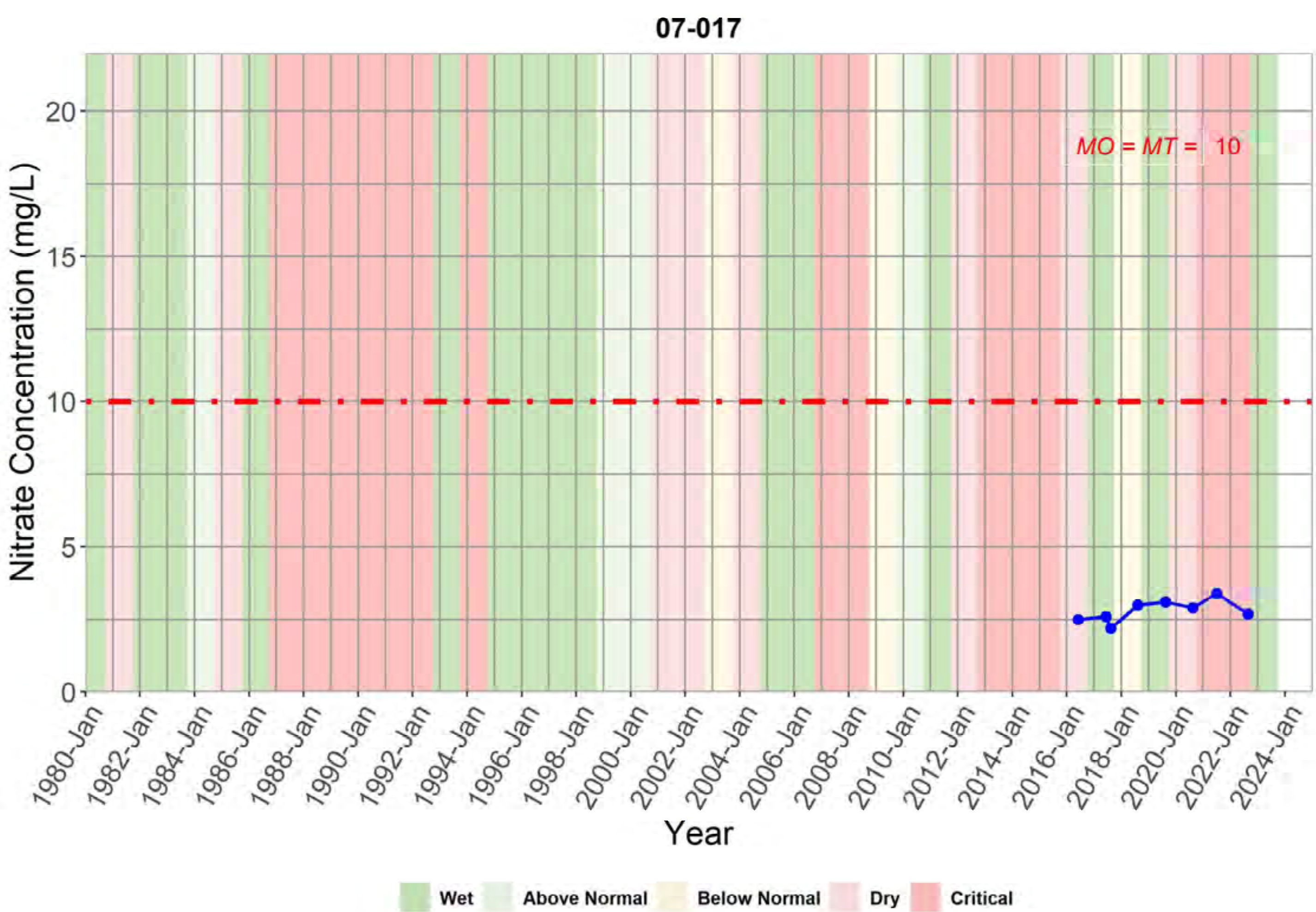
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-017
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
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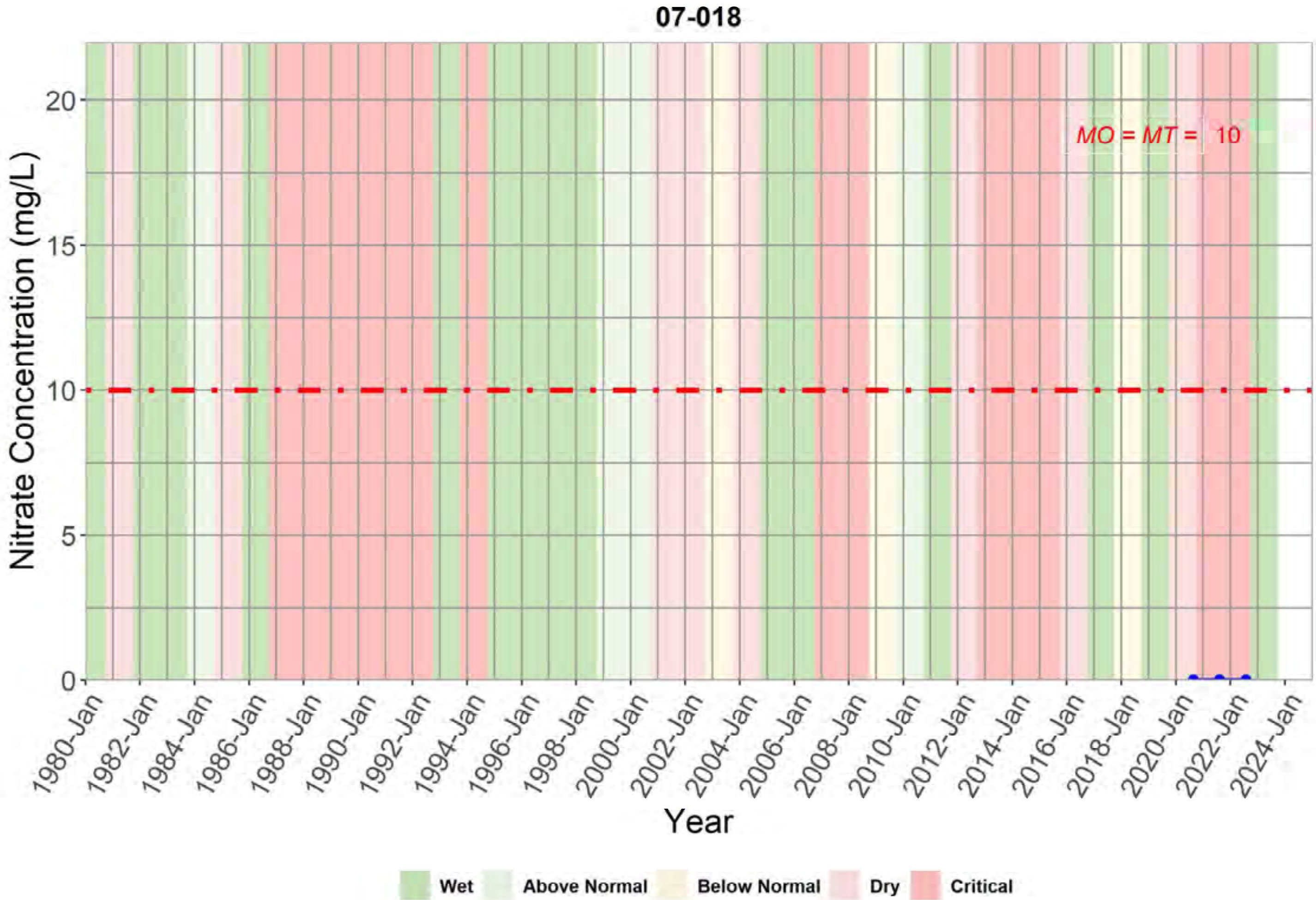
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-018
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
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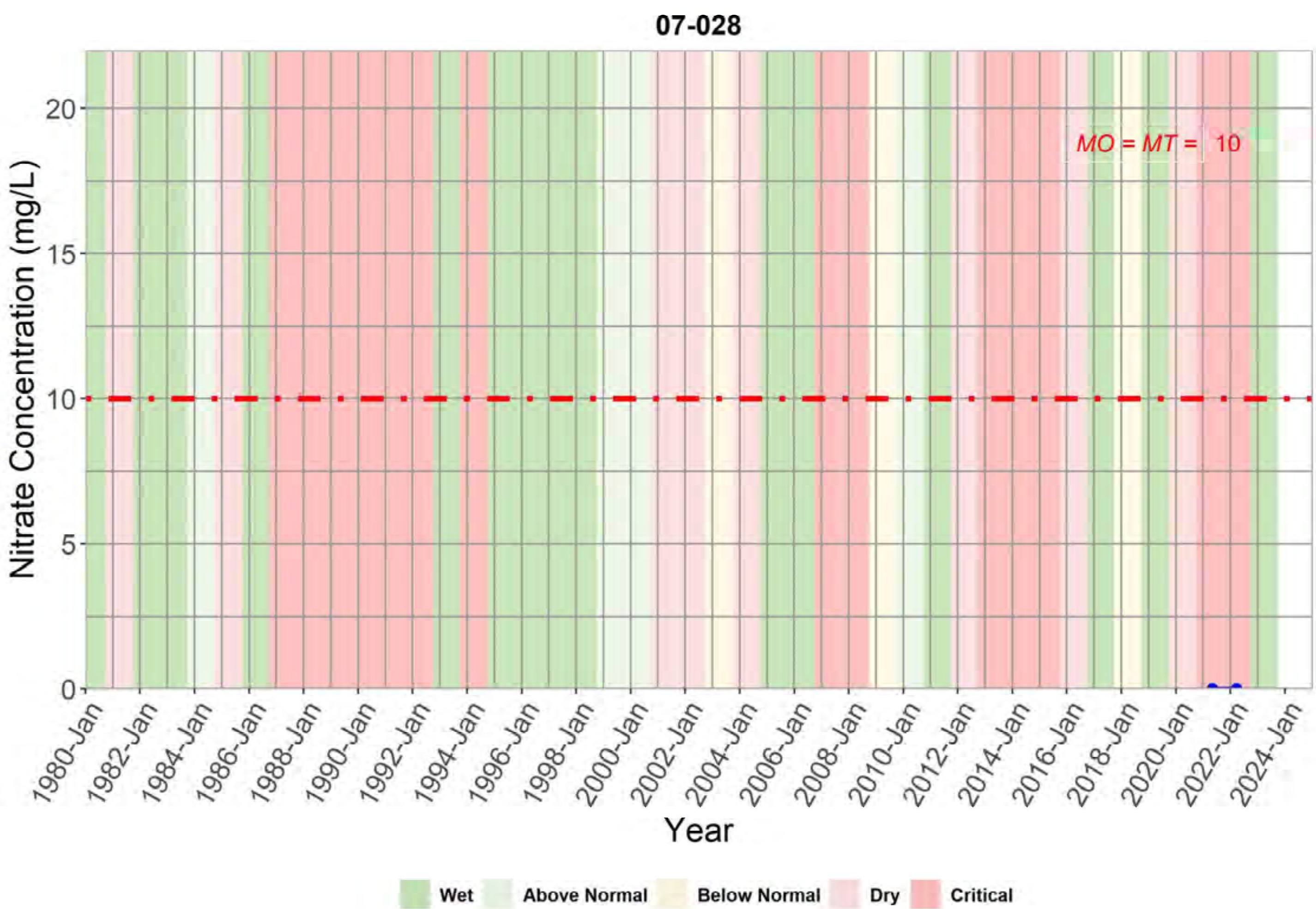
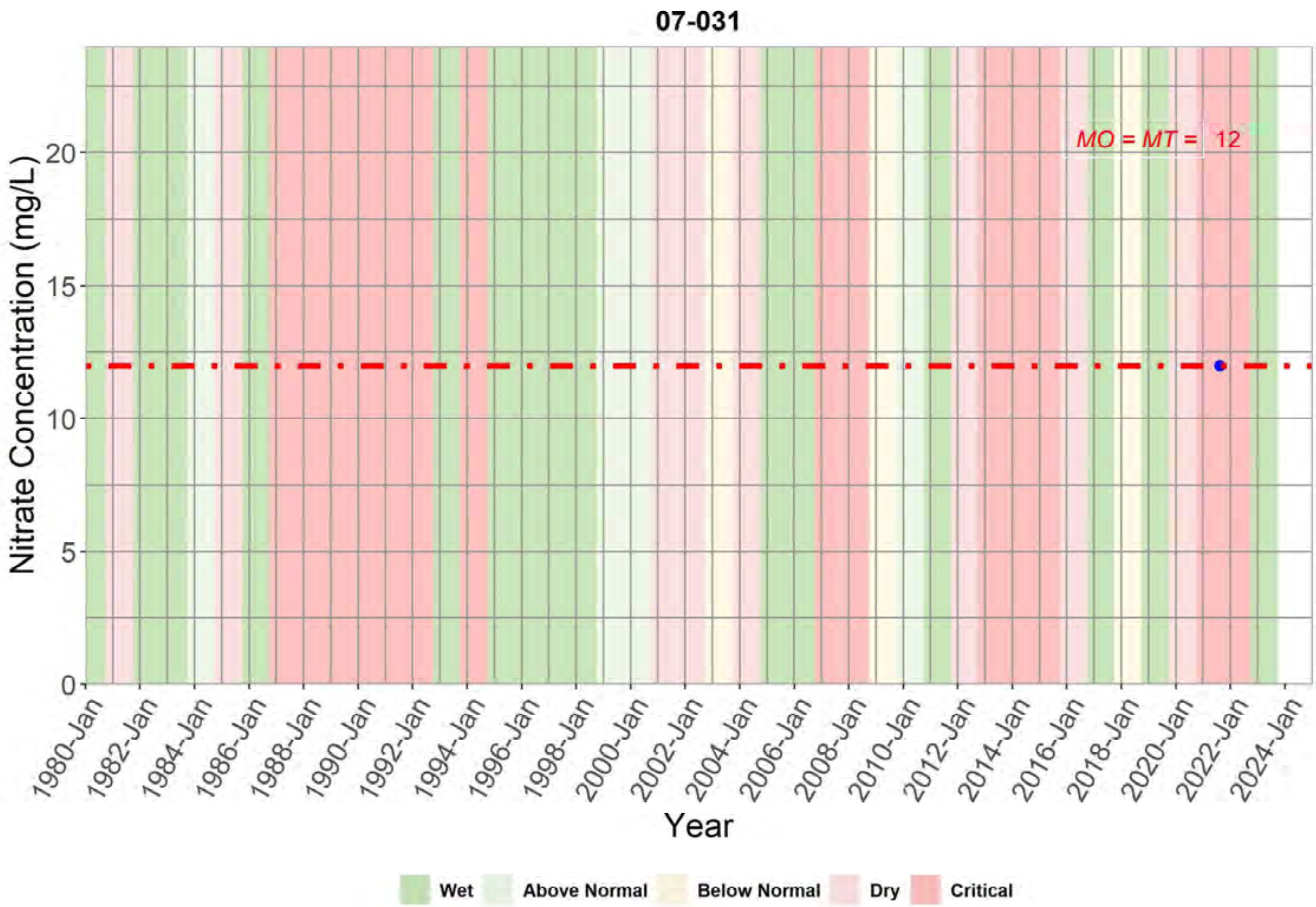
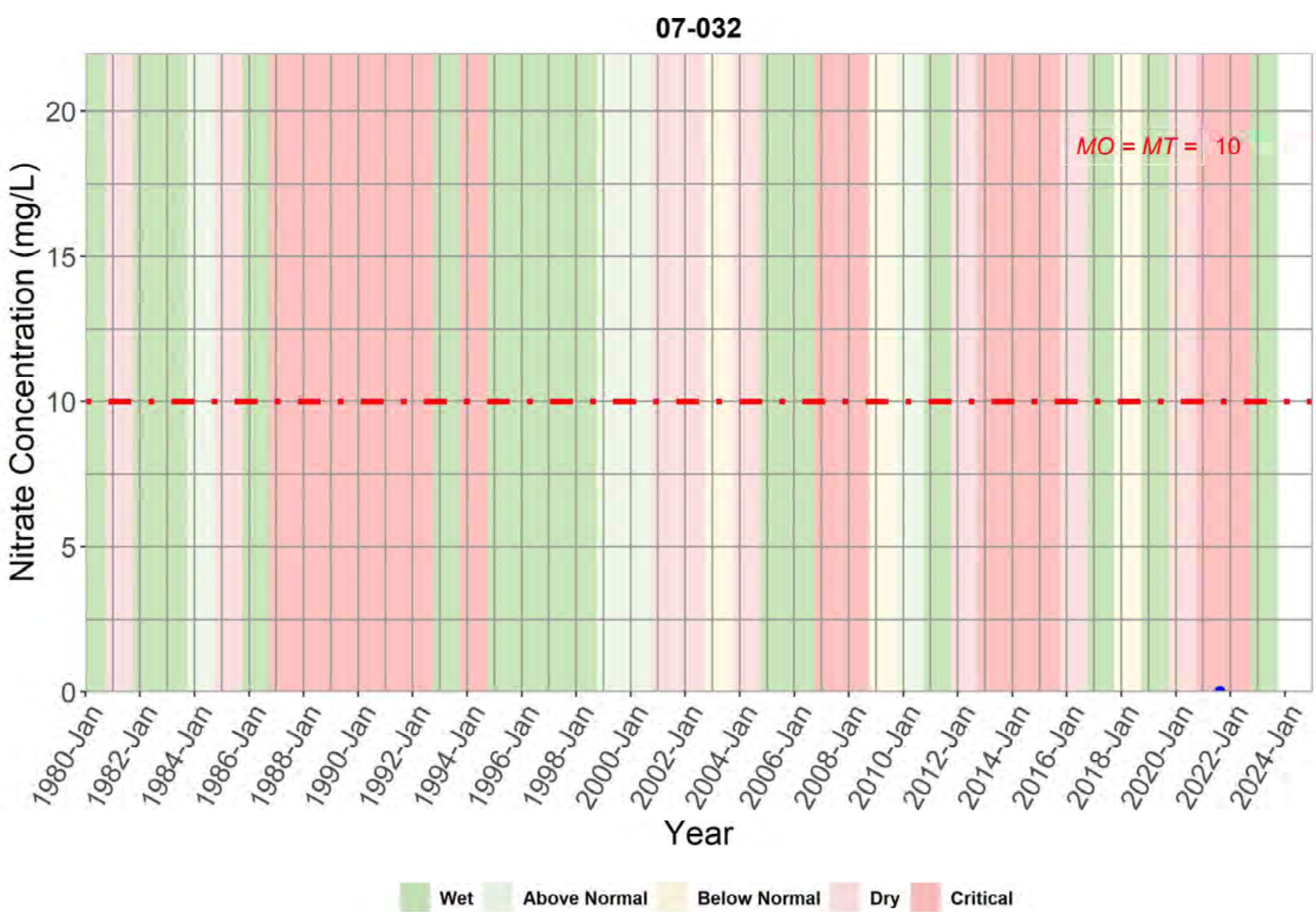
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

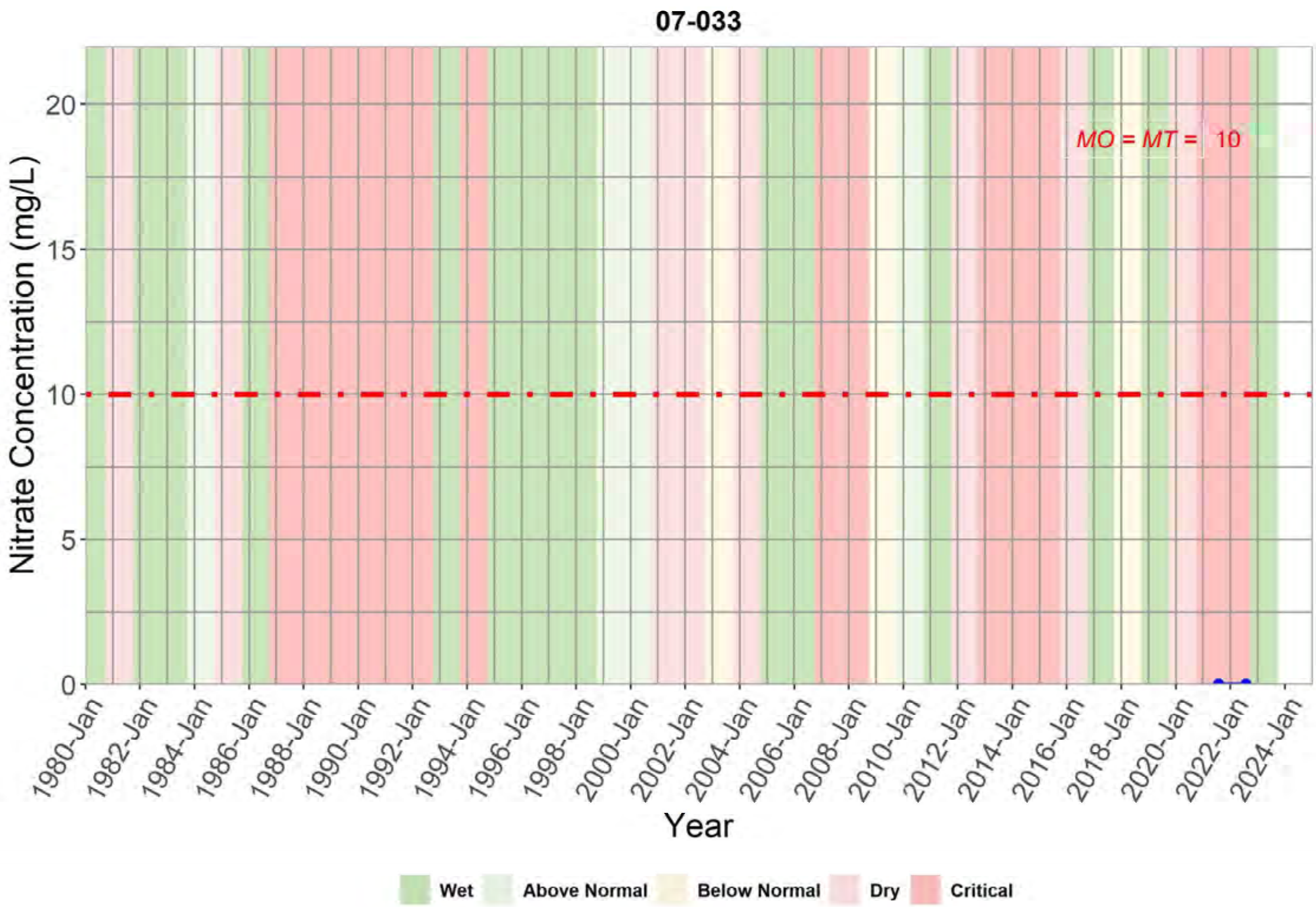

07-028
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

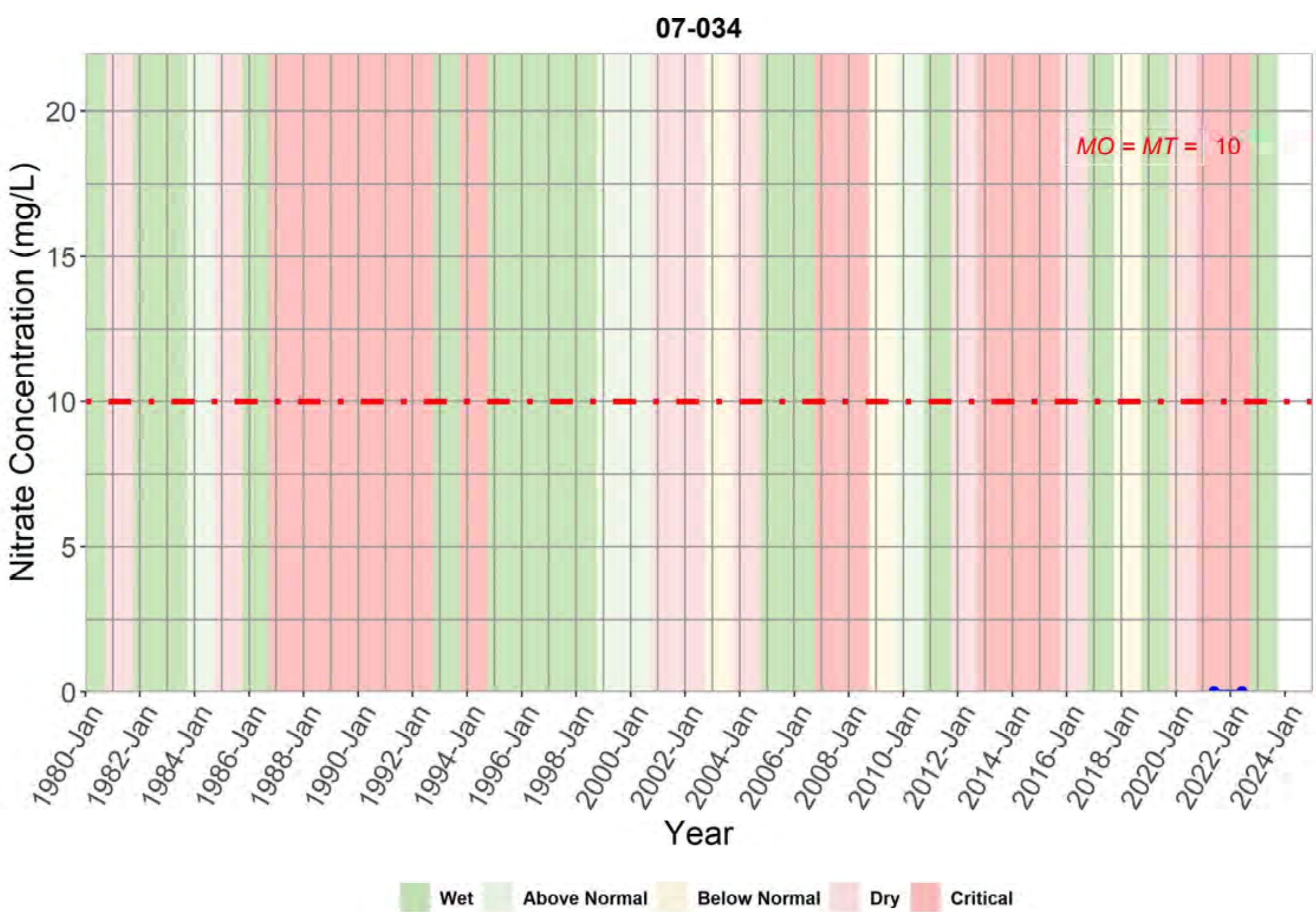


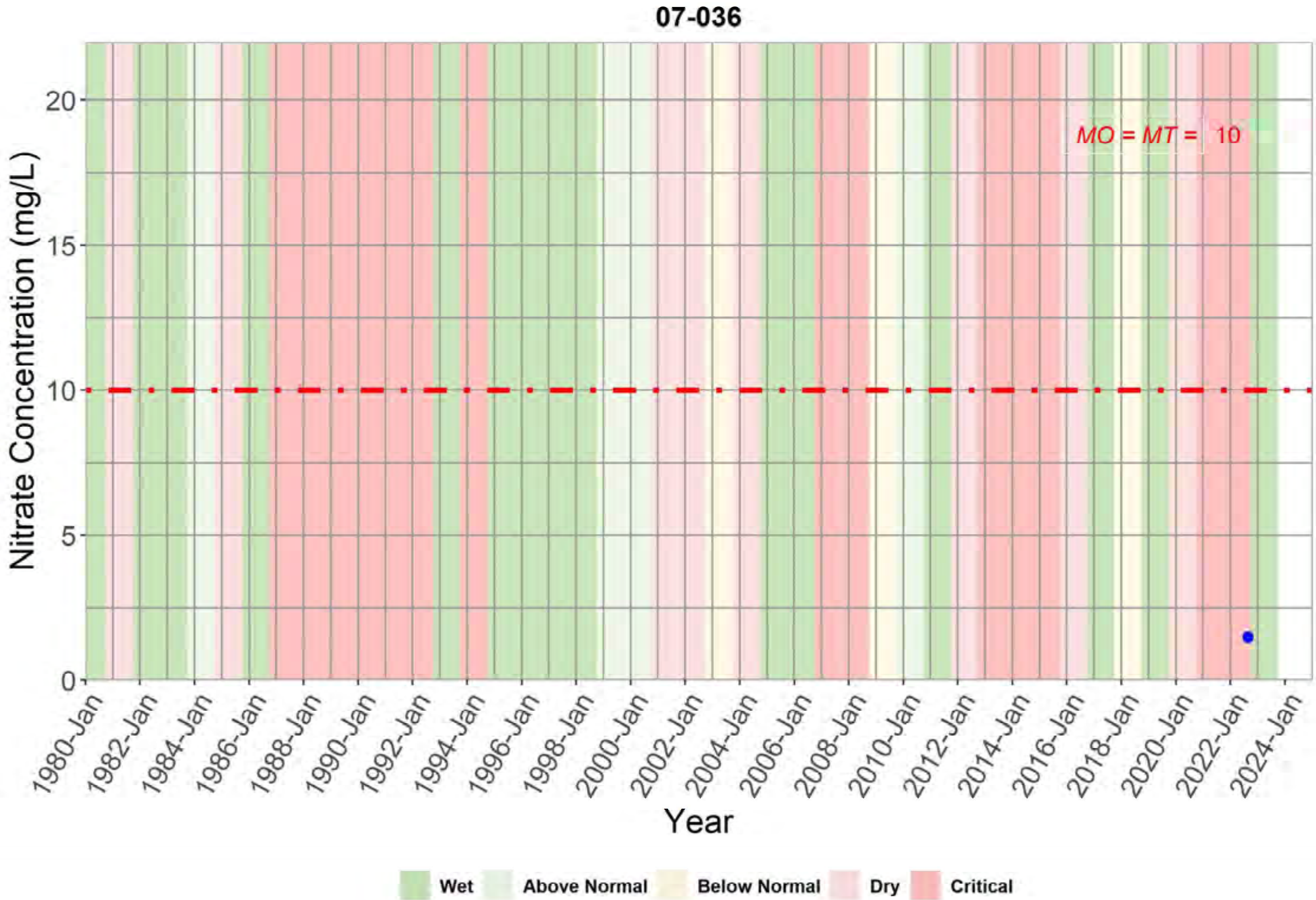
07-031
MO = MT = 12
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



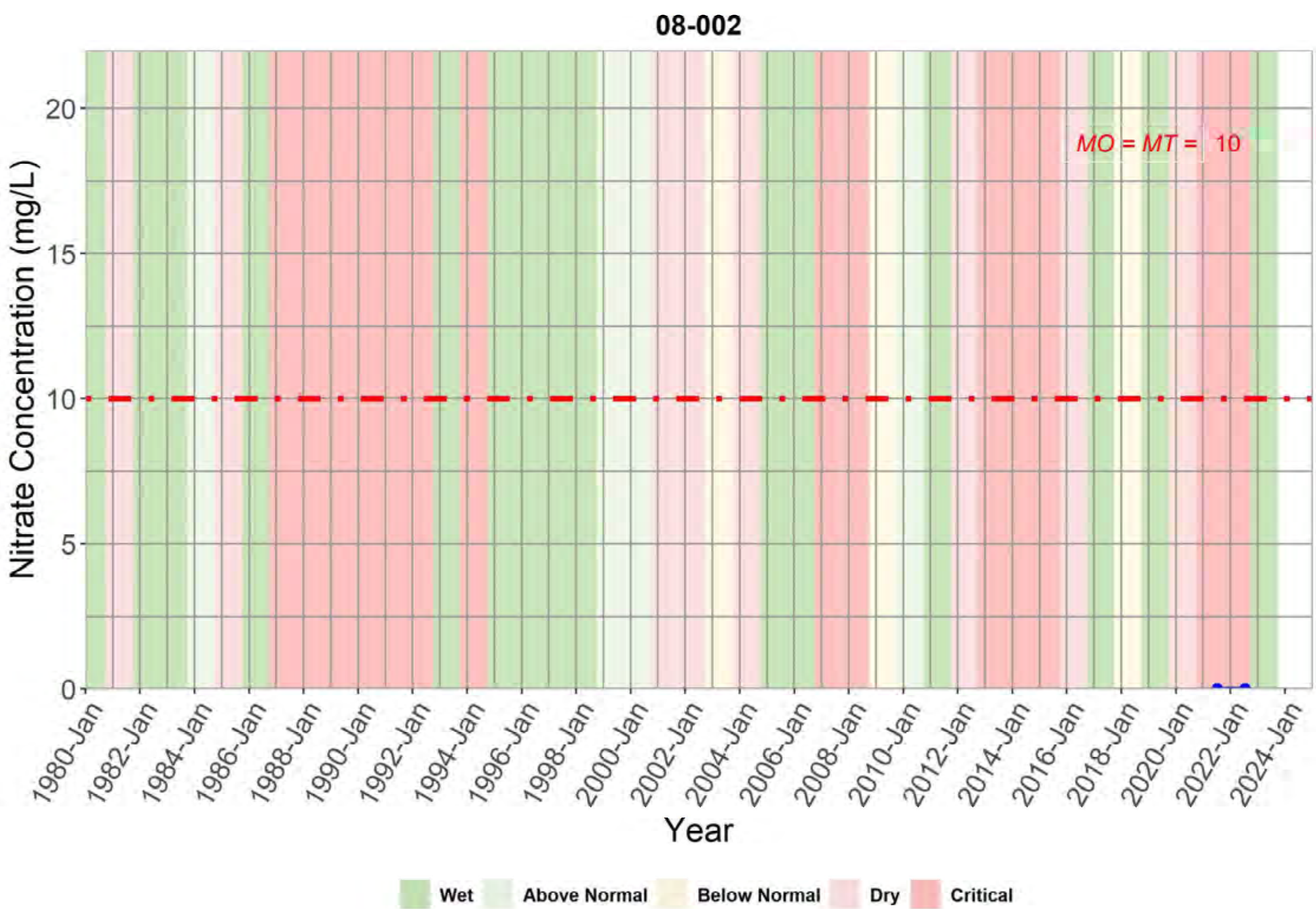
07-032
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-033
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

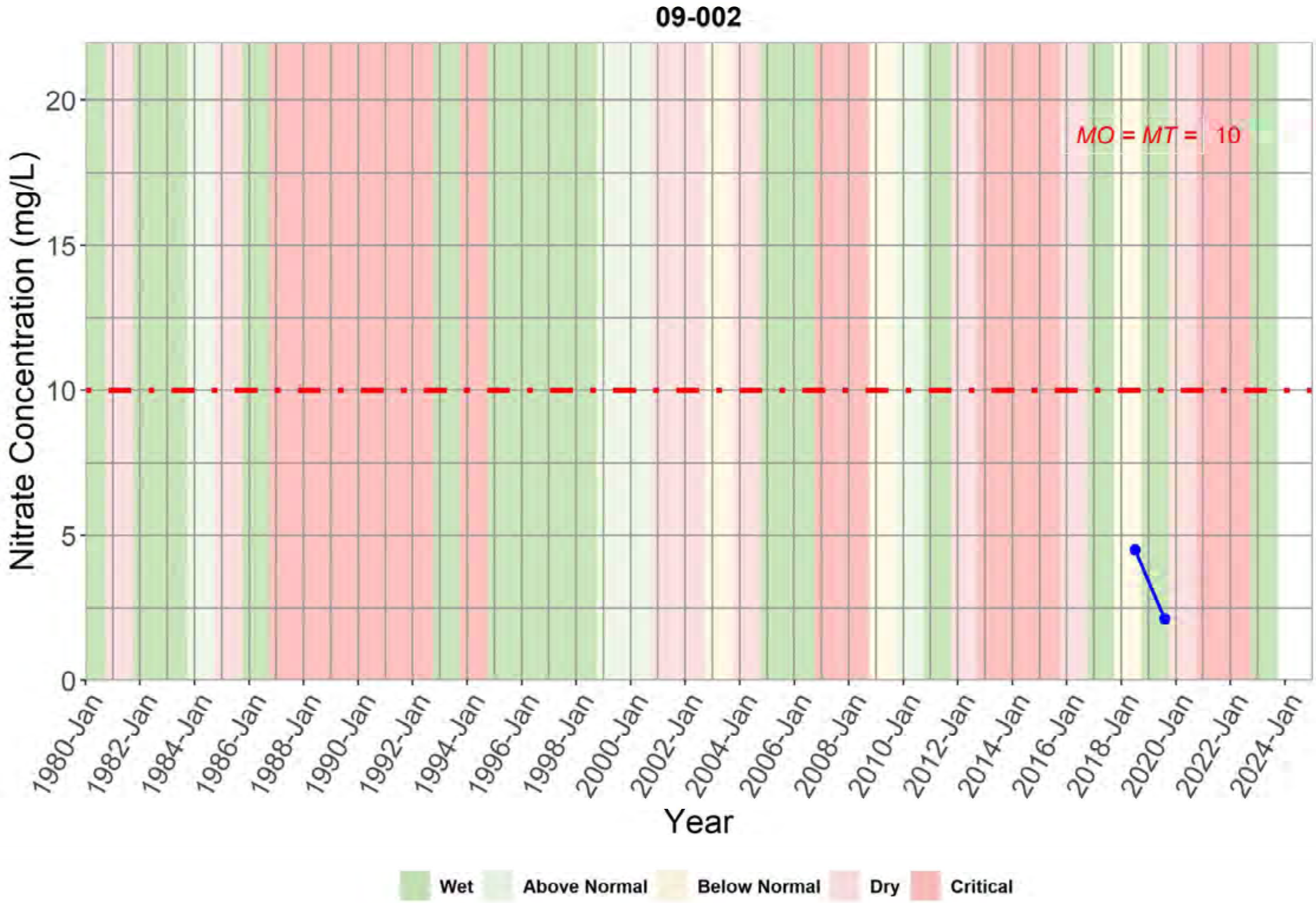

07-034
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

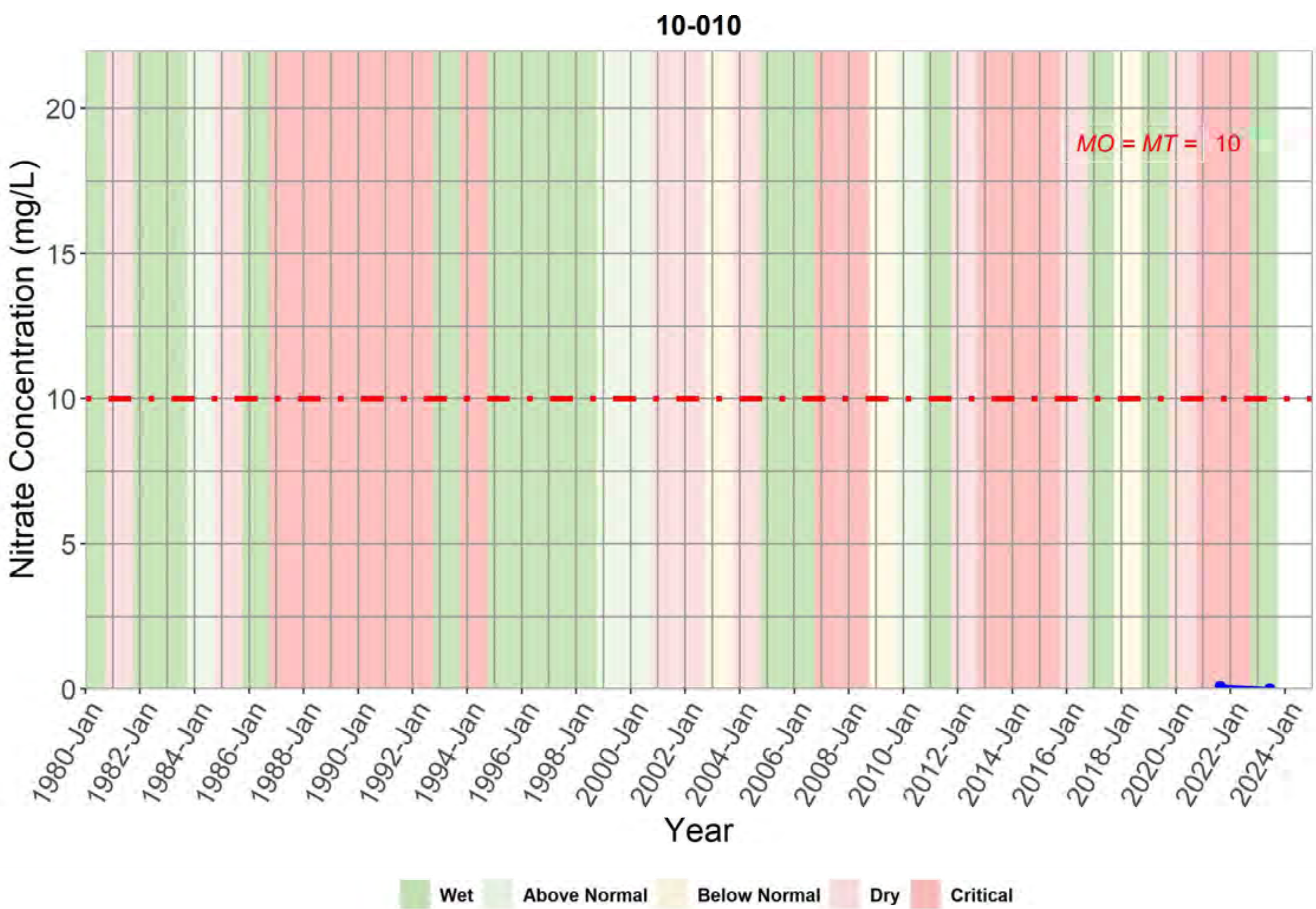


07-036
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

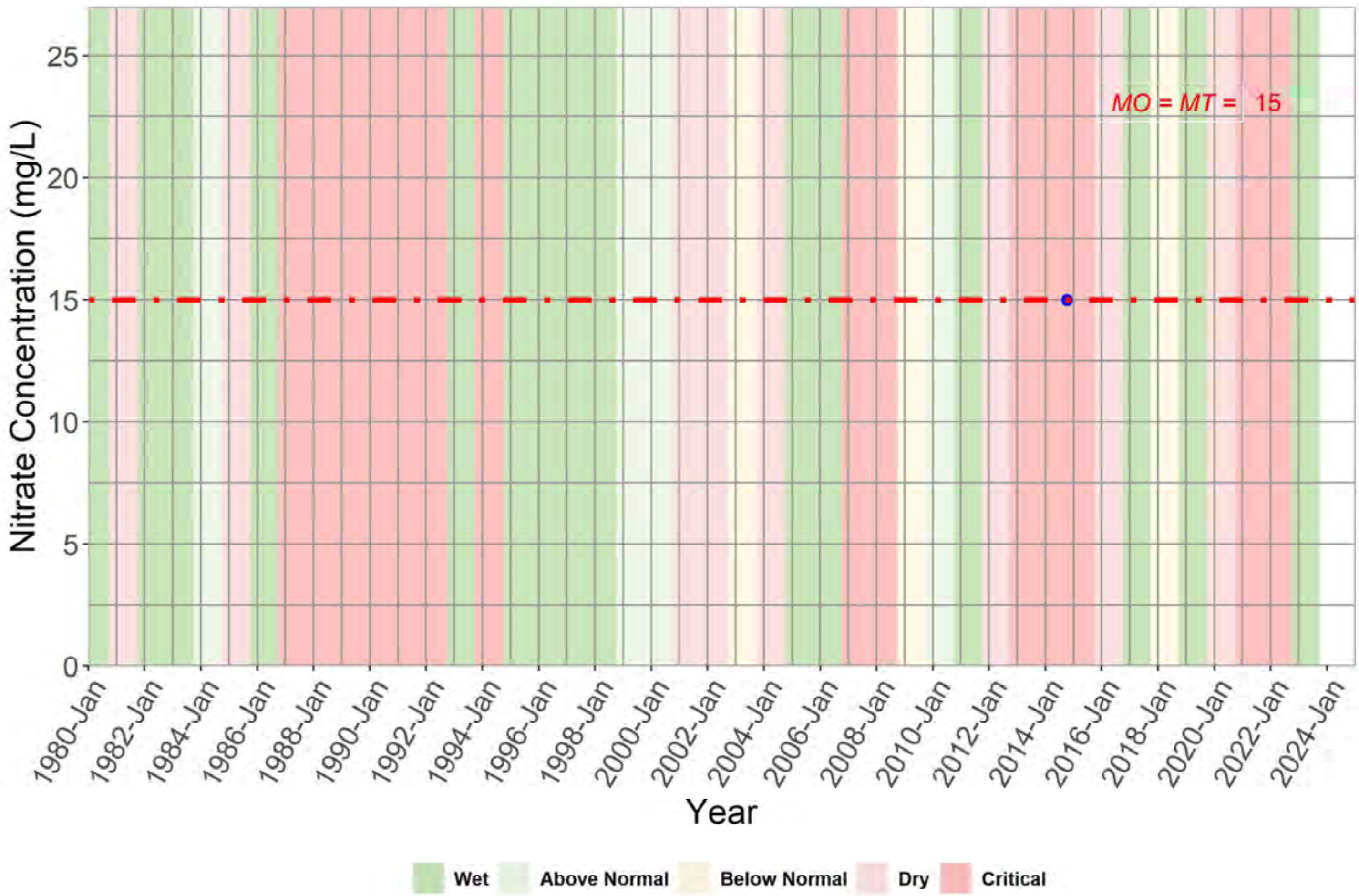


08-002
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

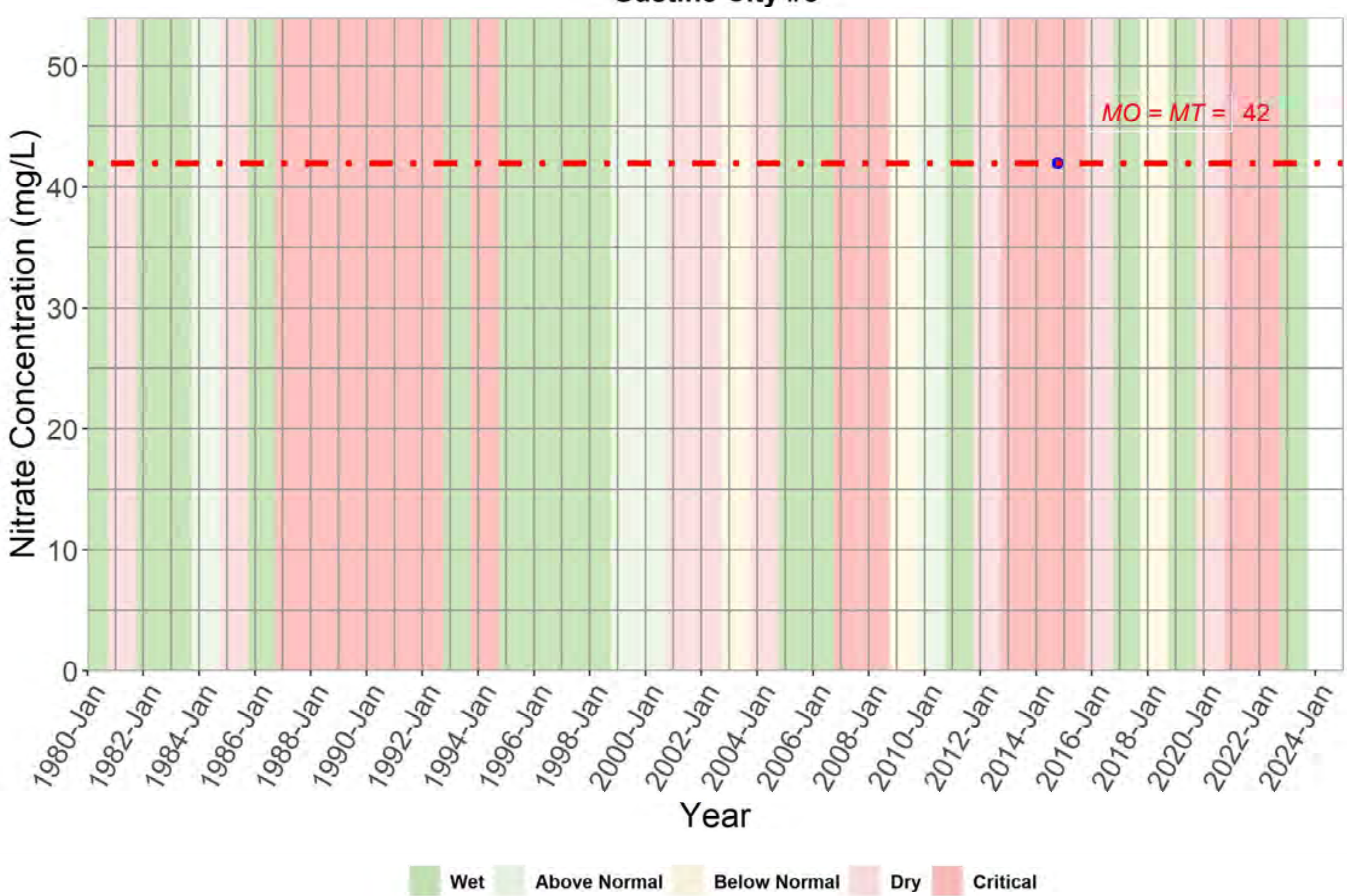

09-002
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

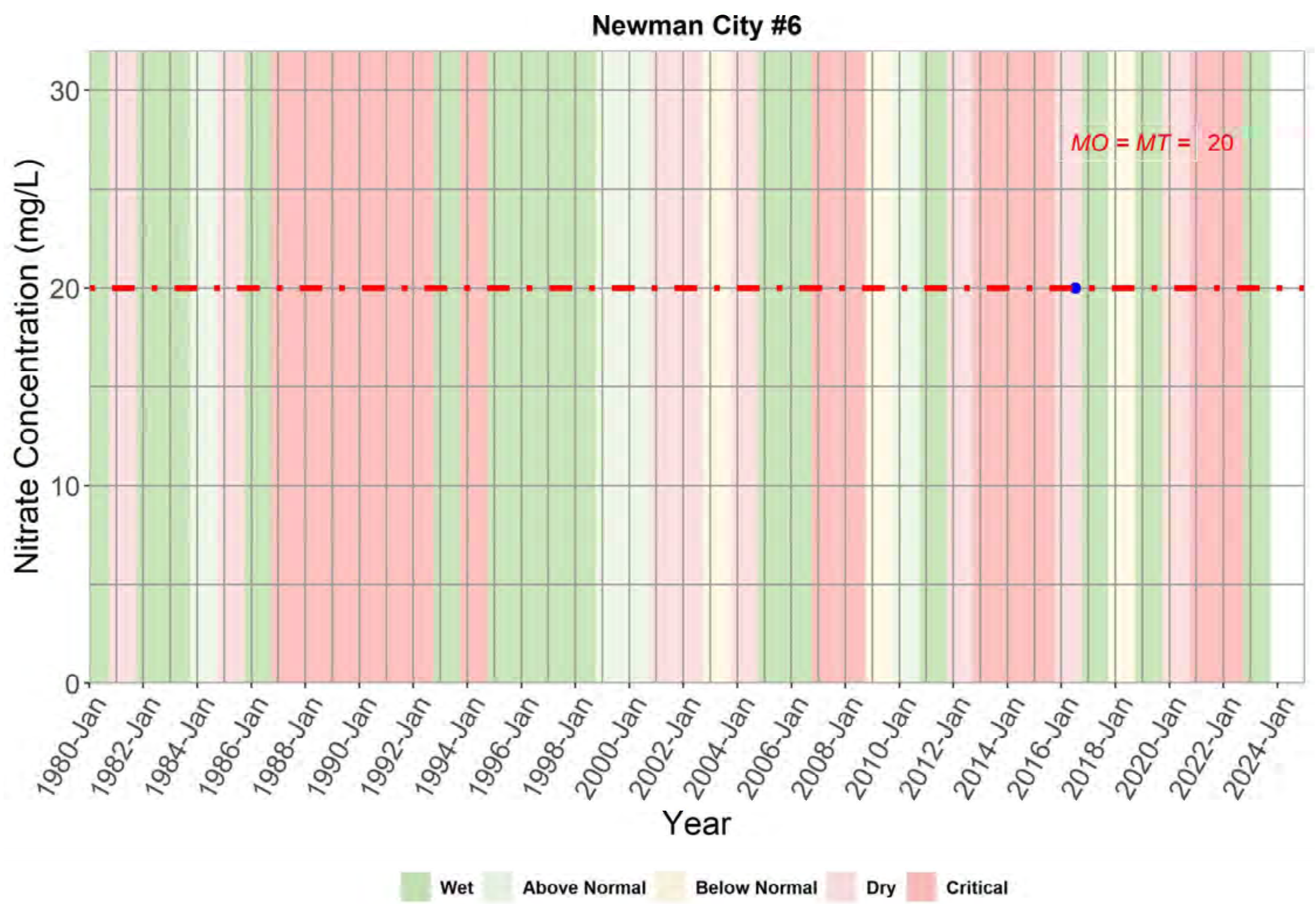

10-010
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

Gustine City #5

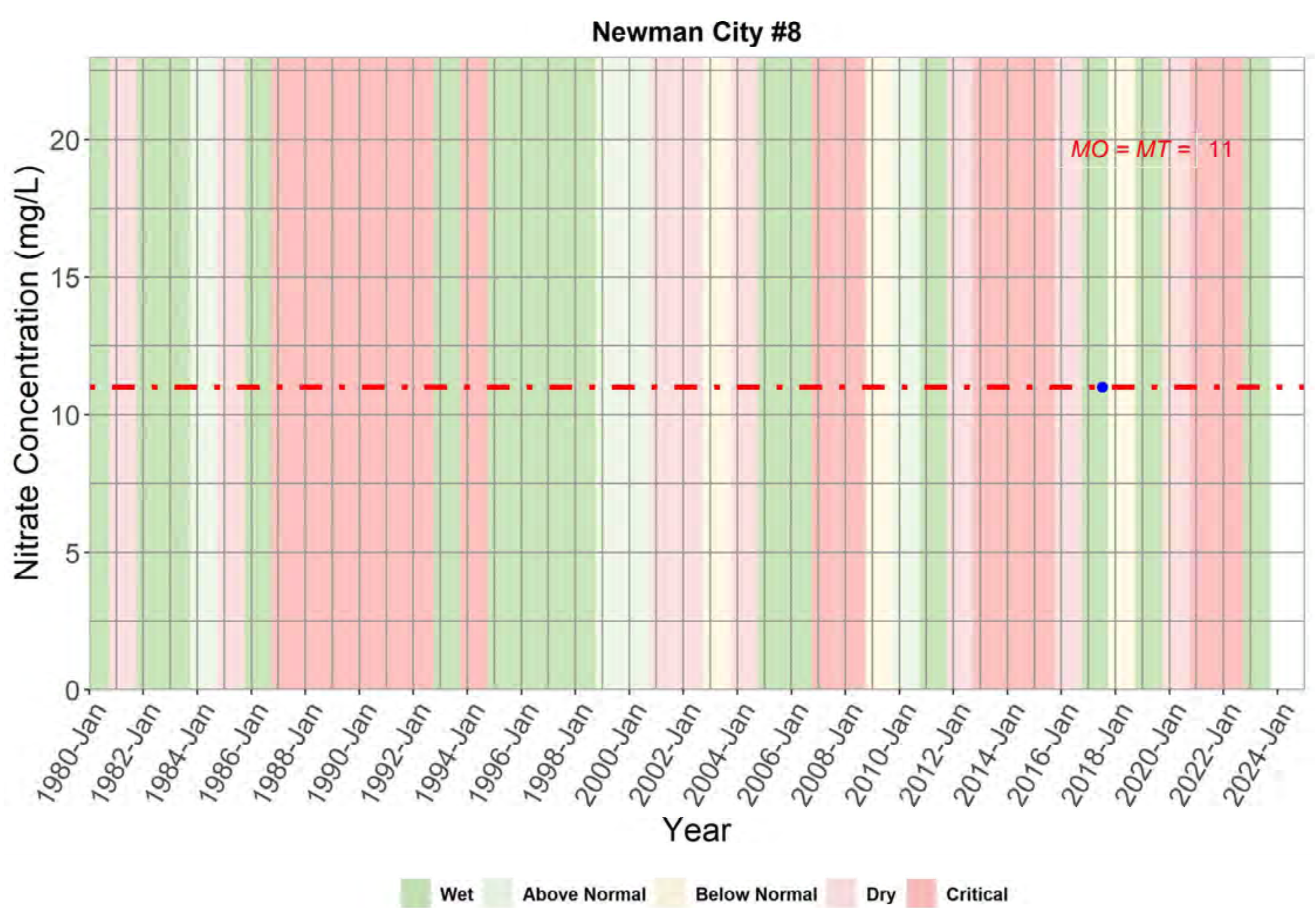


Gustine City #6

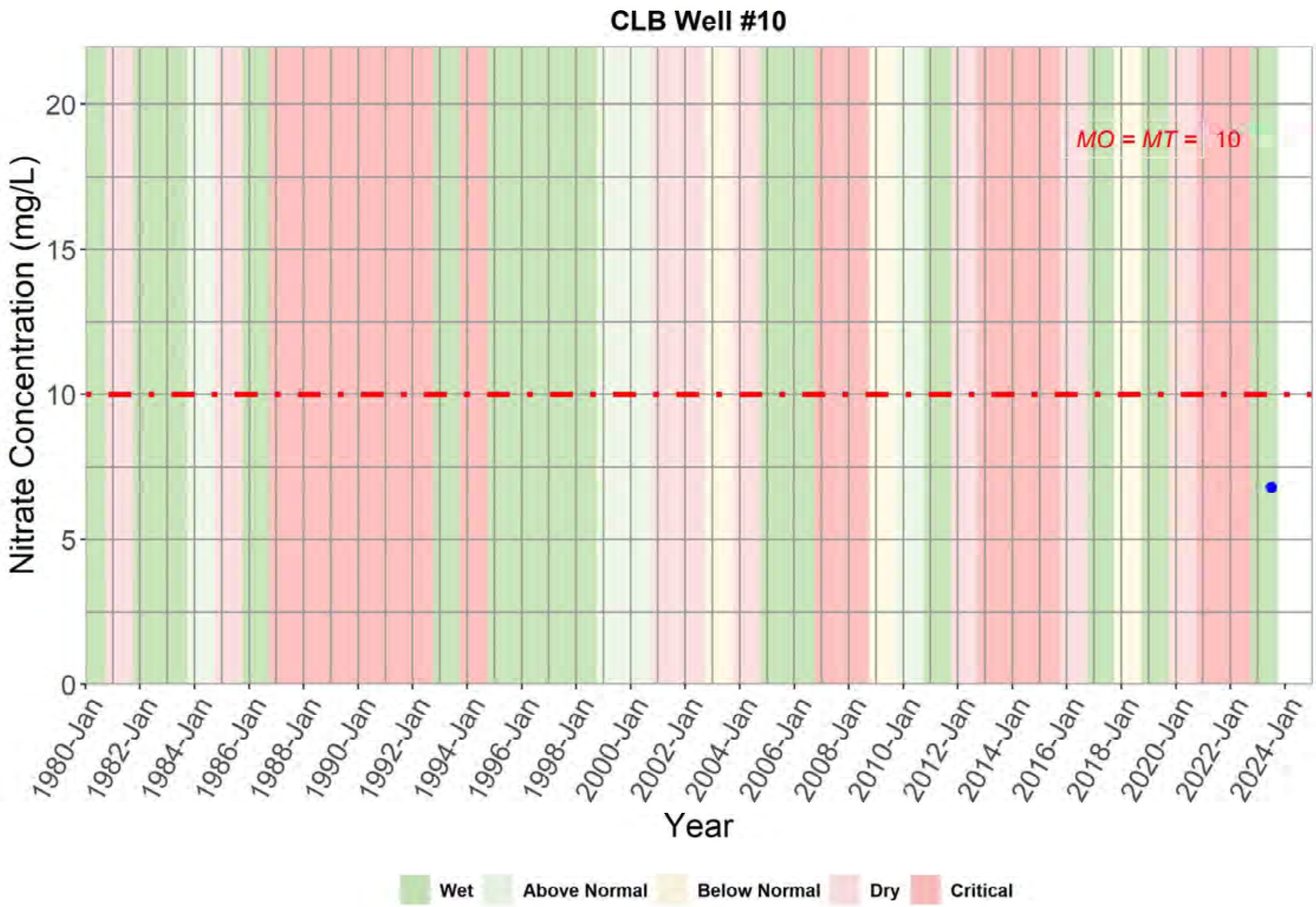


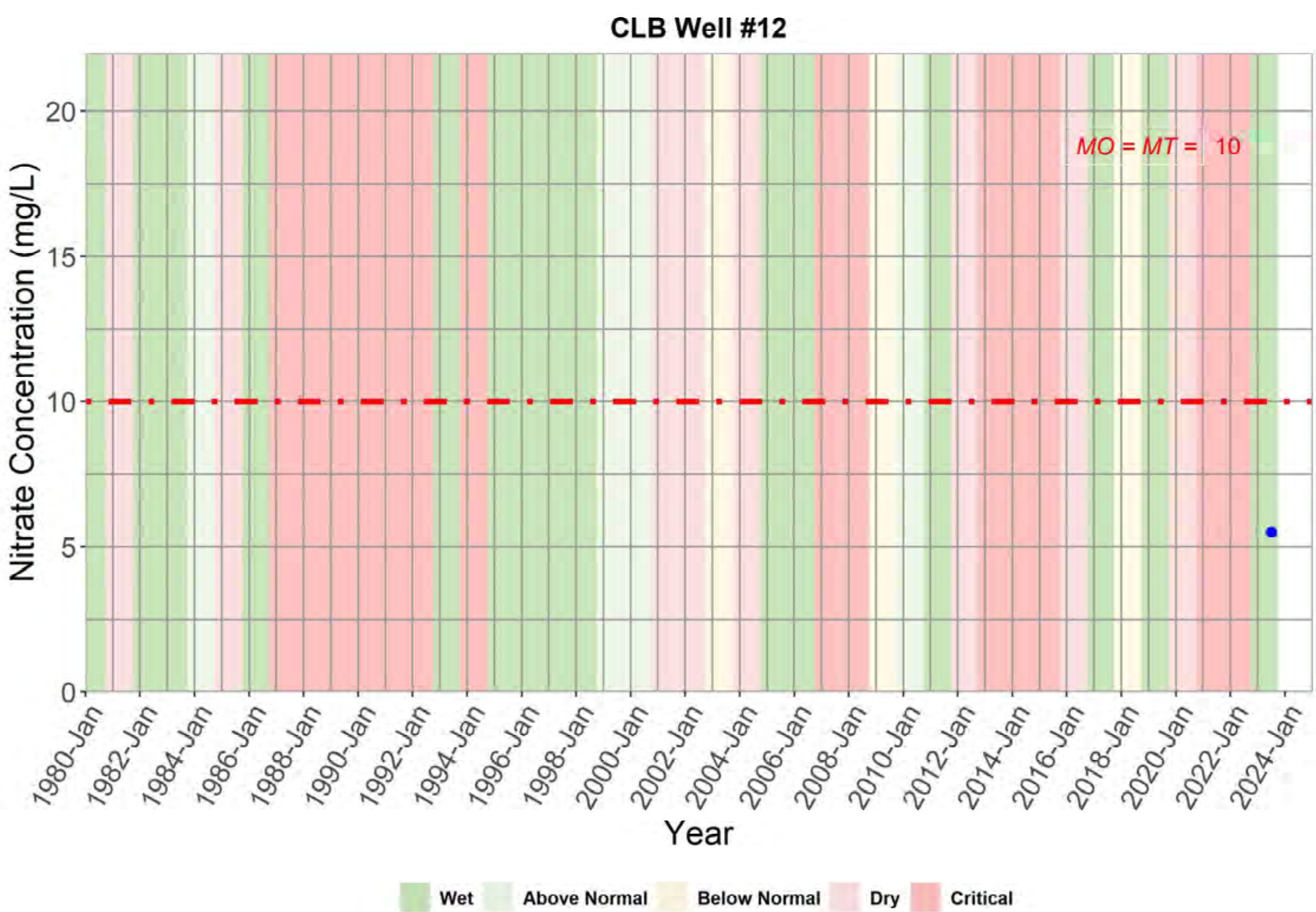


Newman City #6
MO = MT = 20
Nitrate Concentration (mg/L)
30
20
10
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

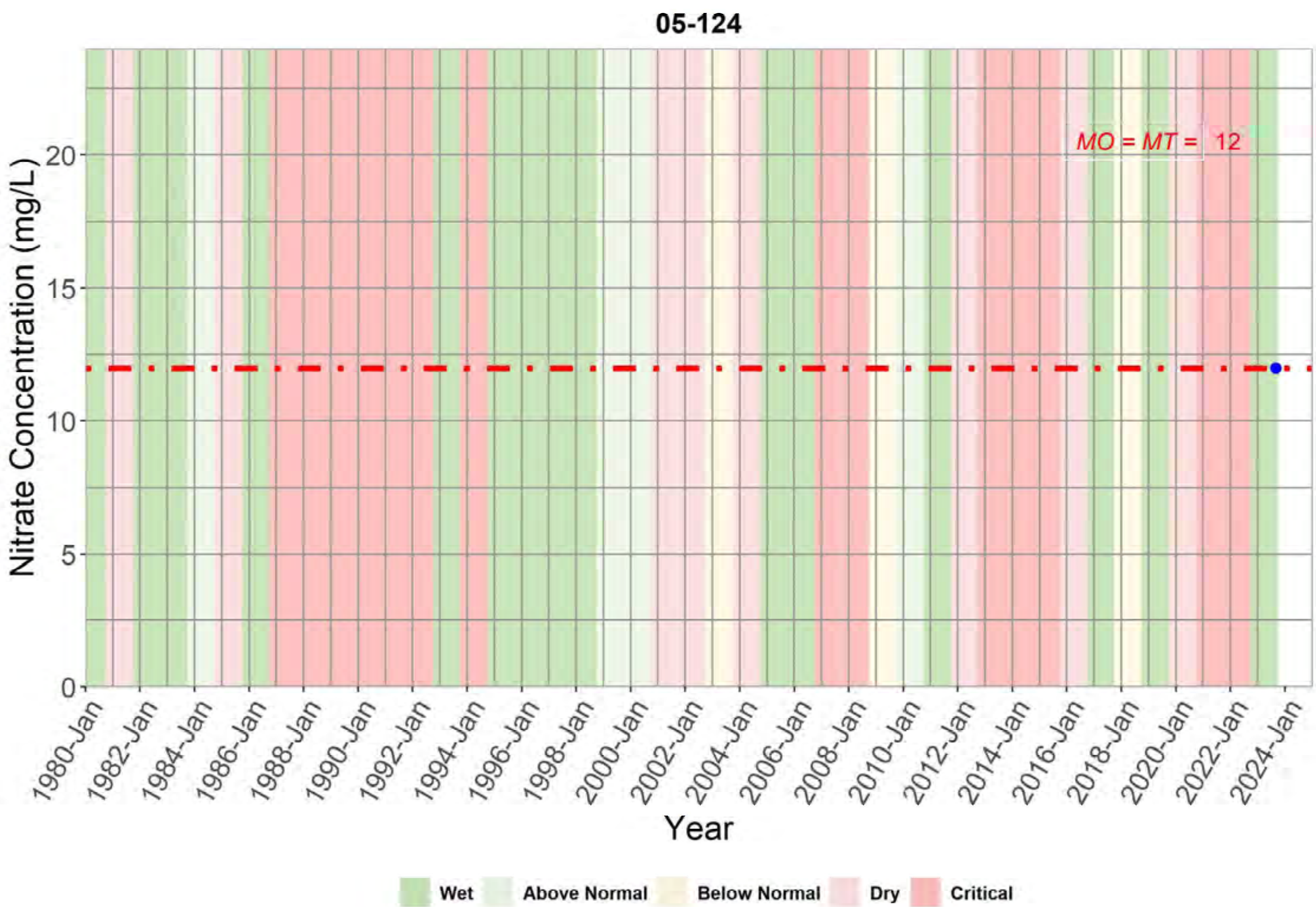


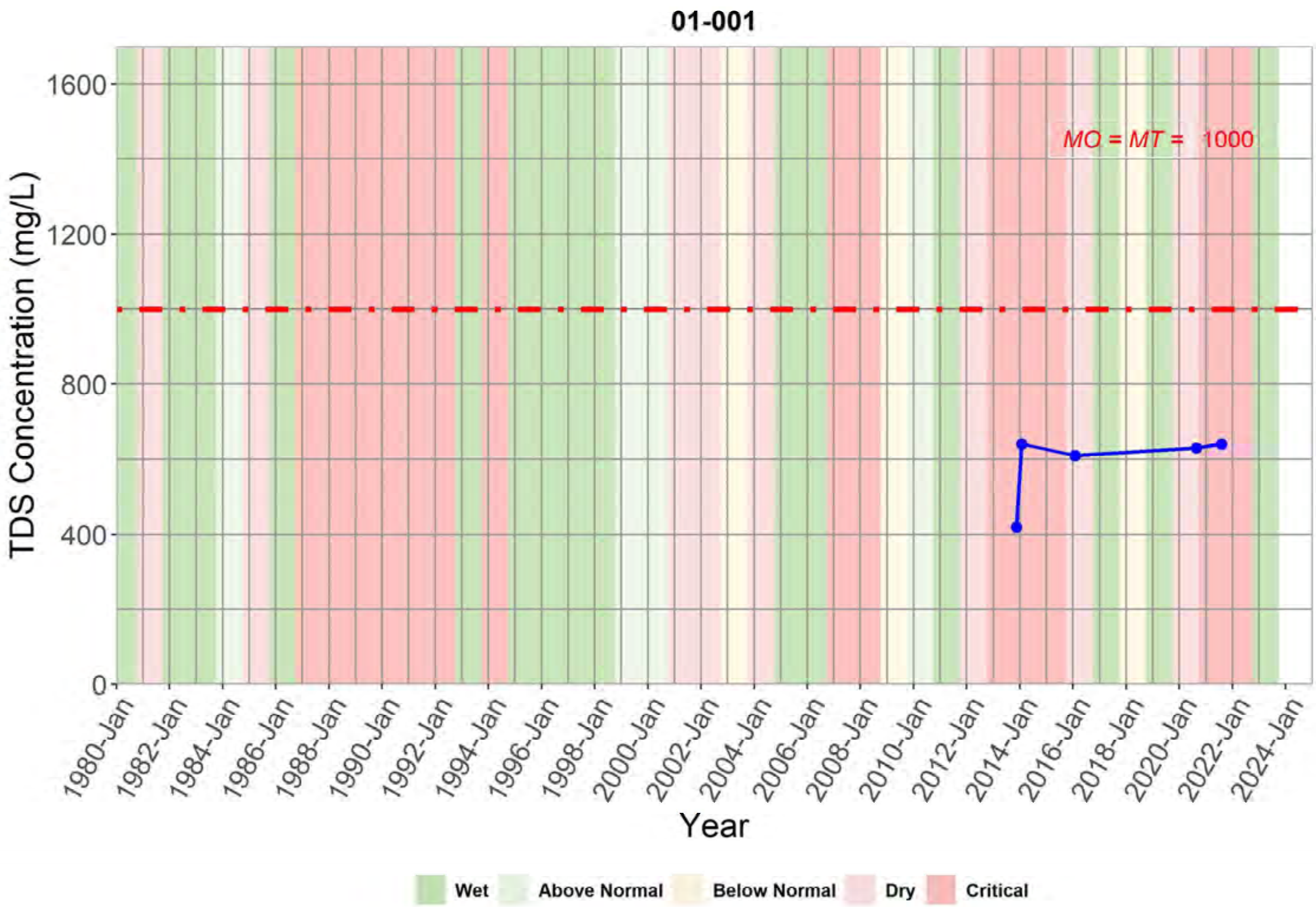
Newman City #8
MO = MT = 11
Nitrate Concentration (mg/L)
20
15
10
5
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

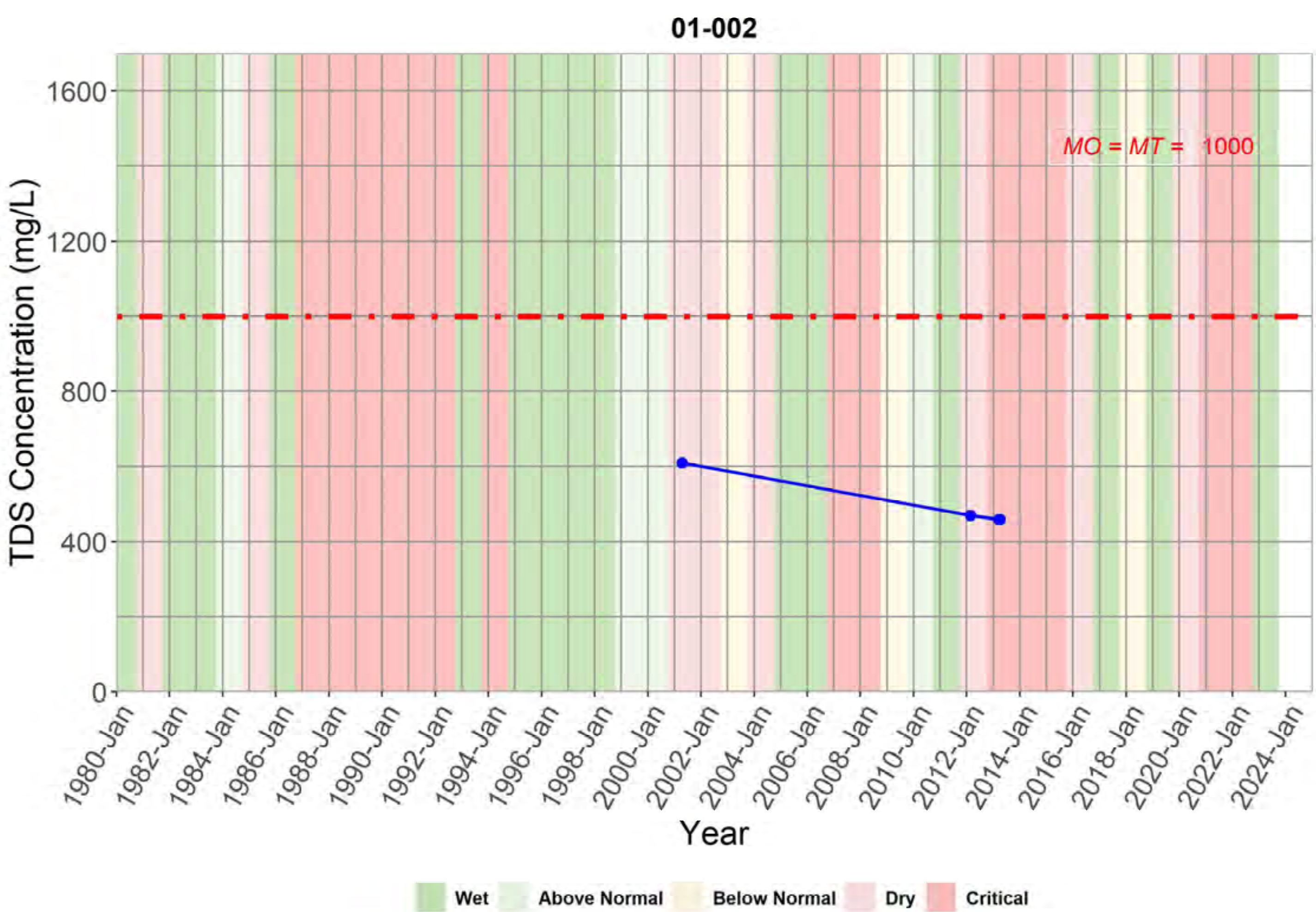

CLB Well #10
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

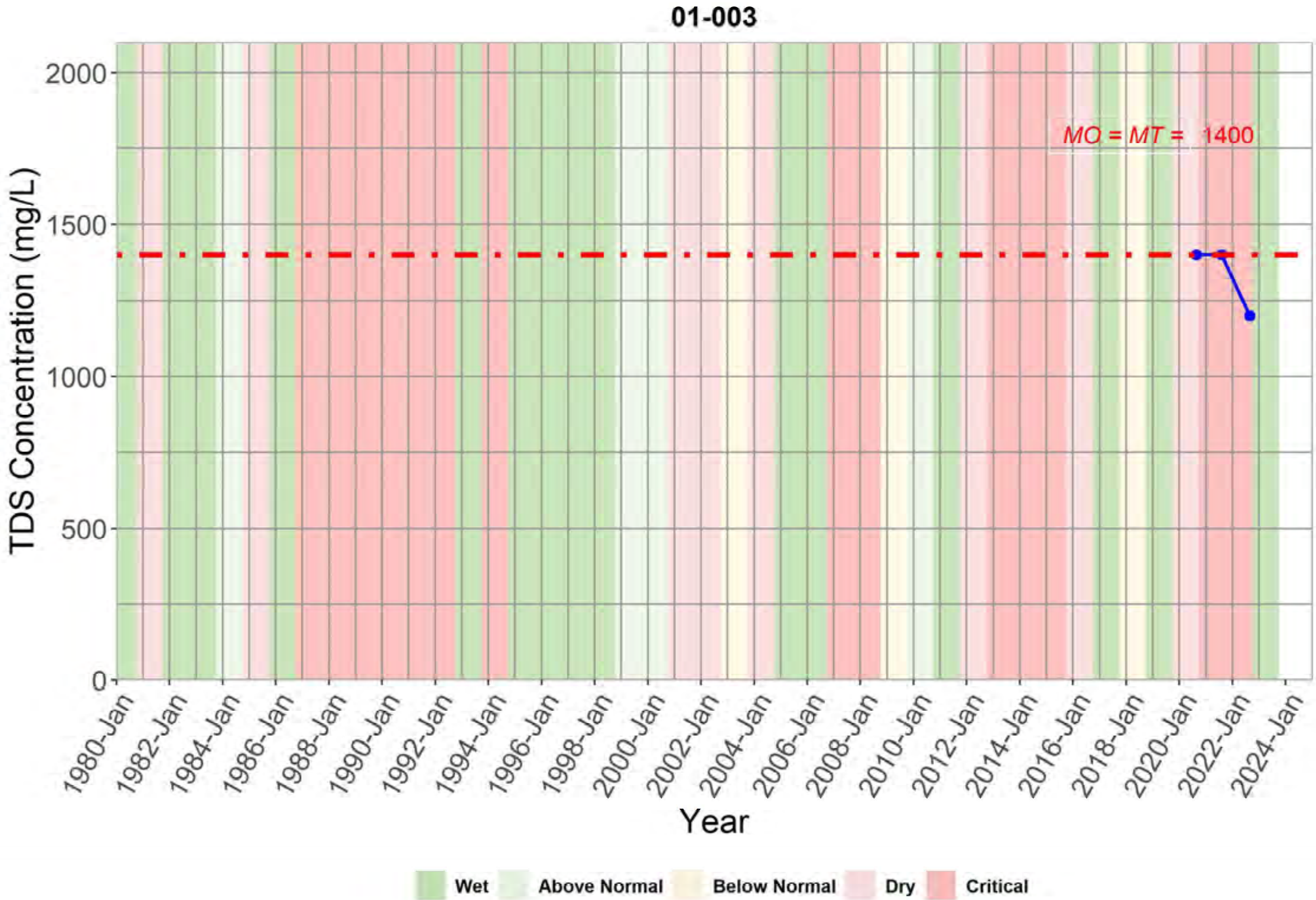

CLB Well #12
MO = MT = 10
Nitrate Concentration (mg/L)
0
5
10
15
20
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

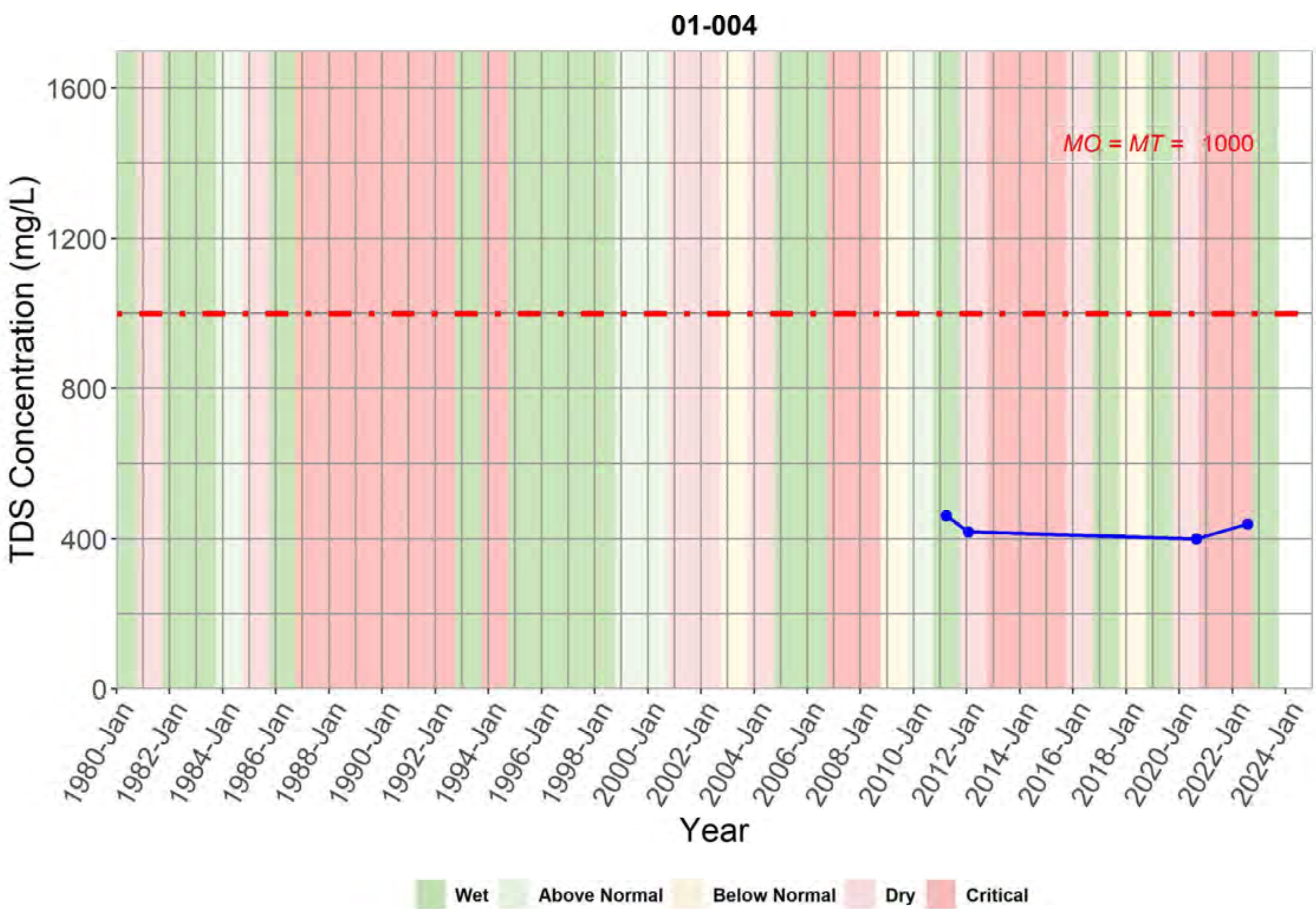

213 River Rd
MO = MT = 10
Nitrate Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical

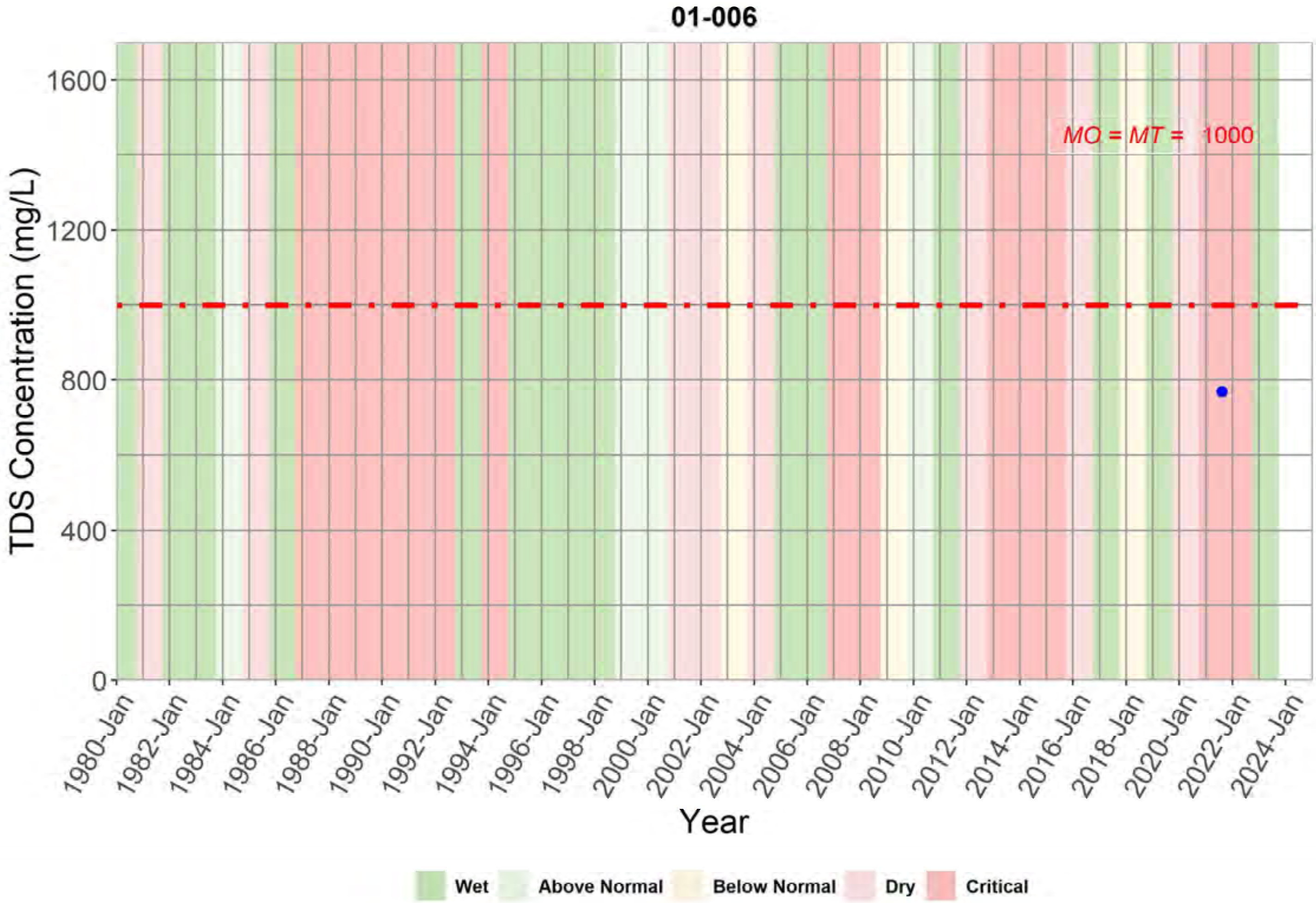

05-124
MO = MT = 12
Nitrate Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical

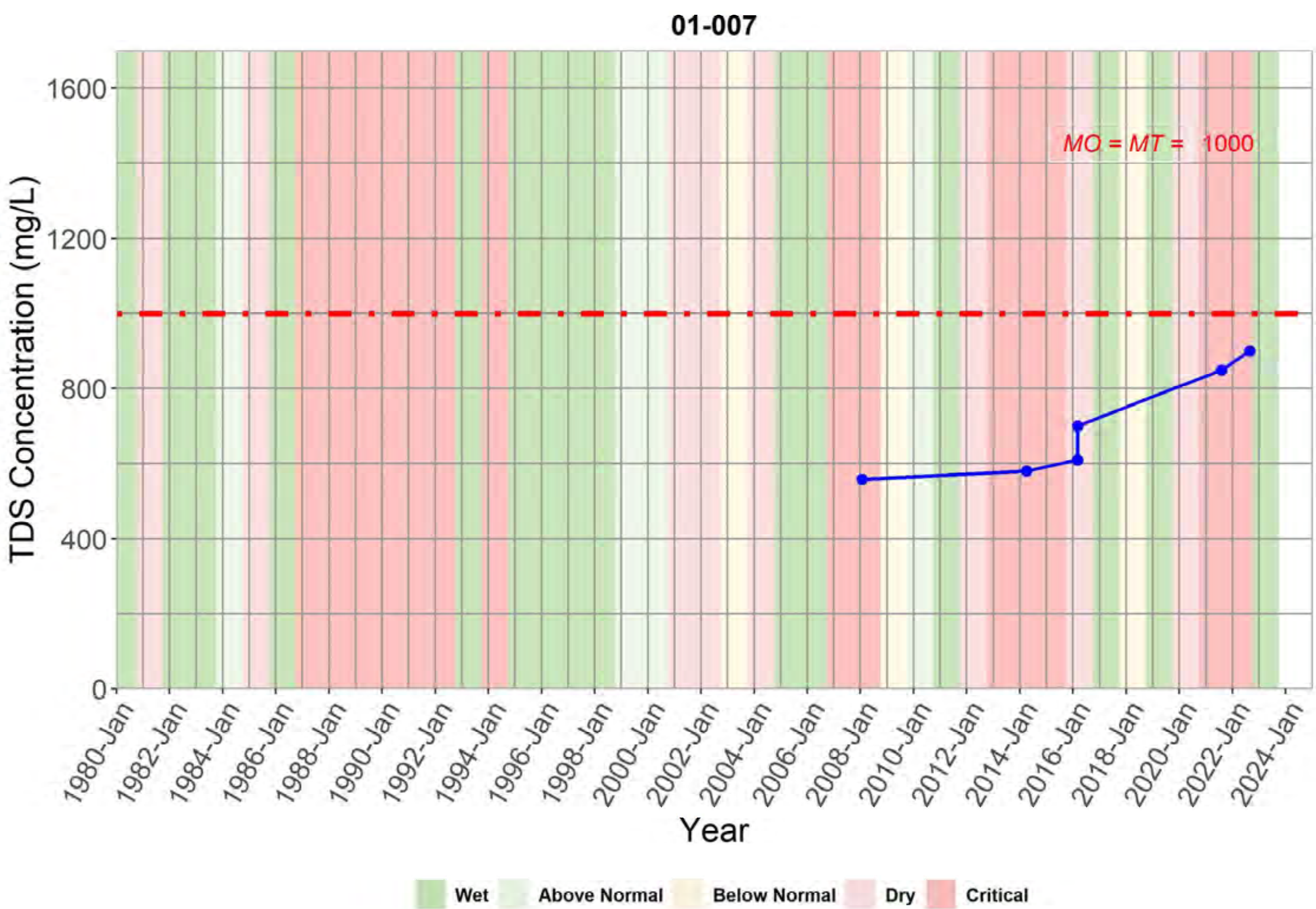

01-001
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

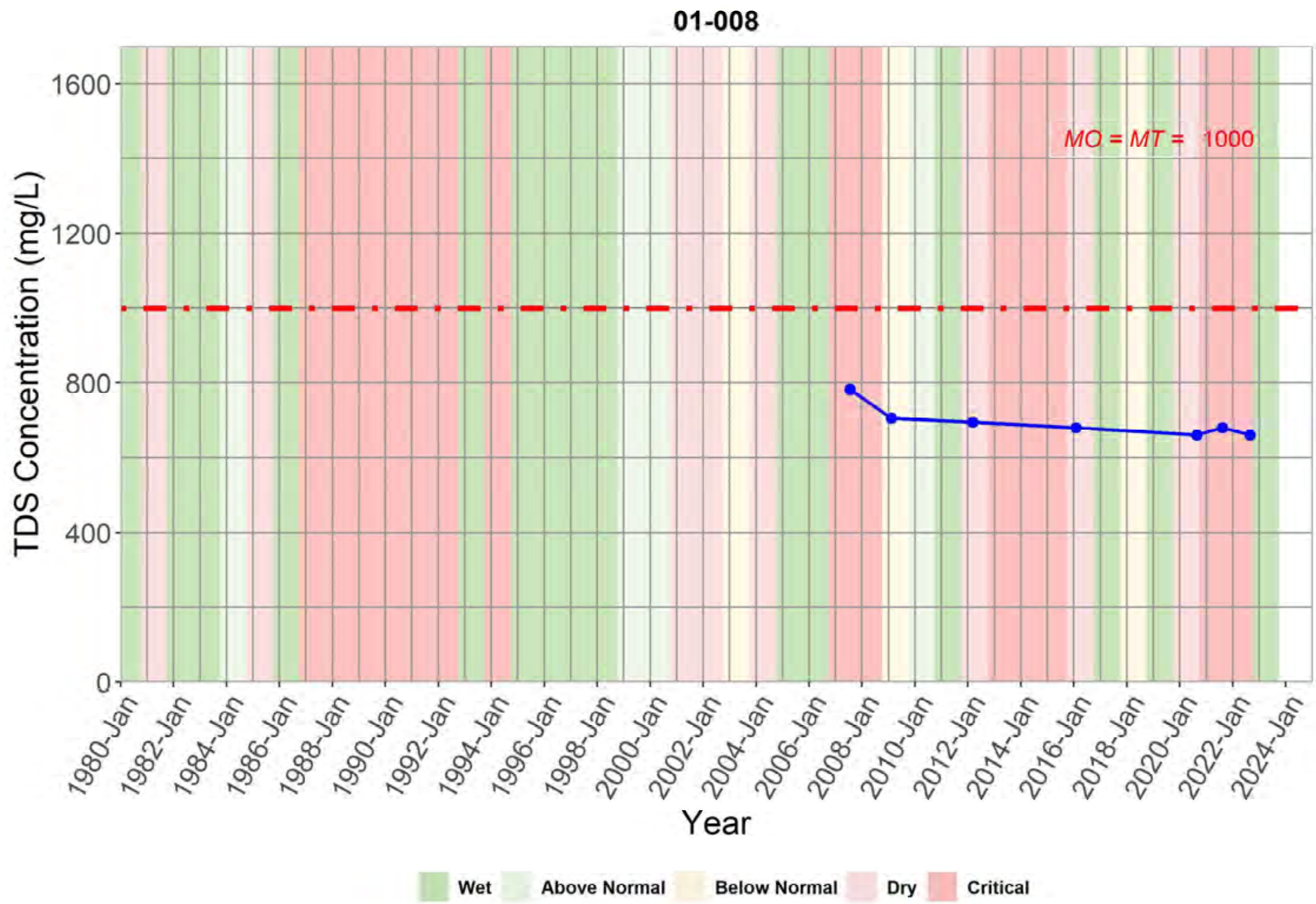

01-002
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


01-003
MO = MT = 1400
TDS Concentration (mg/L)
2000
1500
1000
500
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

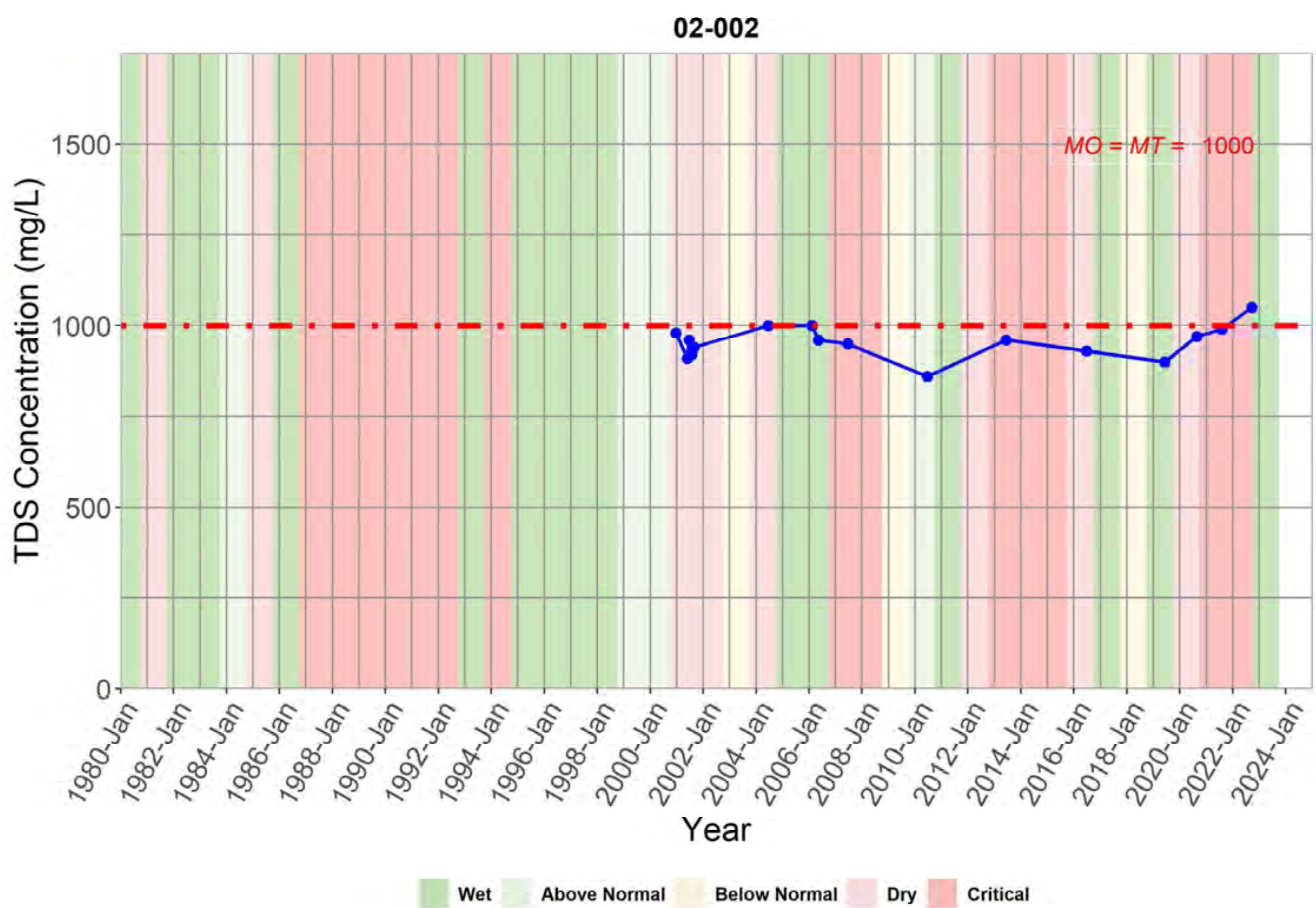

01-004
MO = MT = 1000
TDS Concentration (mg/L)
1600
1200
800
400
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


01-006
MO = MT = 1000
TDS Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical

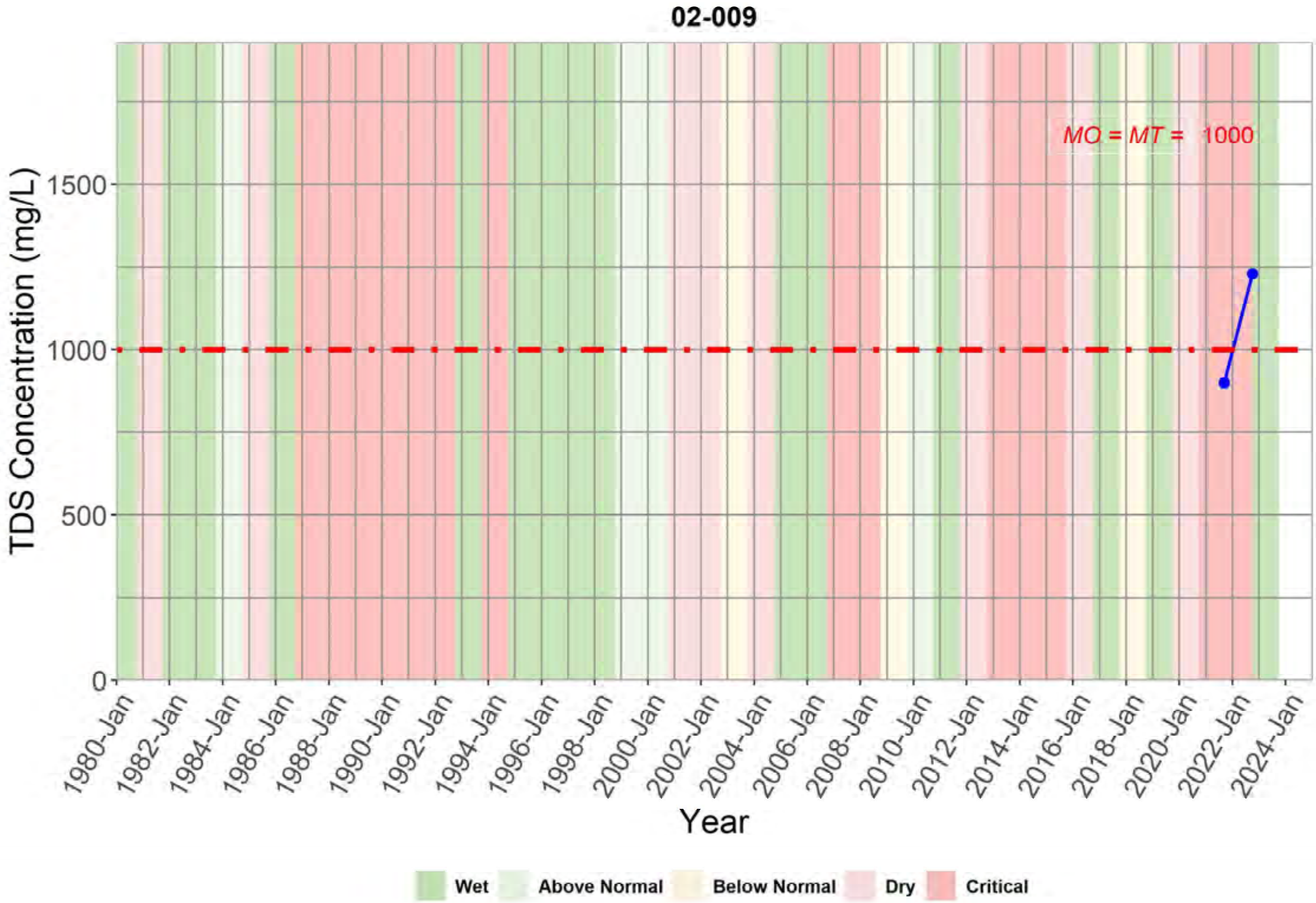

01-007
MO = MT = 1000
TDS Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical



01-008
MO = MT = 1000
TDS Concentration (mg/L)
1600
1200
800
400
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



02-002
MO = MT = 1000
TDS Concentration (mg/L)
1500
1000
500
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



02-009
MO = MT = 1000
TDS Concentration (mg/L)
0
500
1000
1500
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
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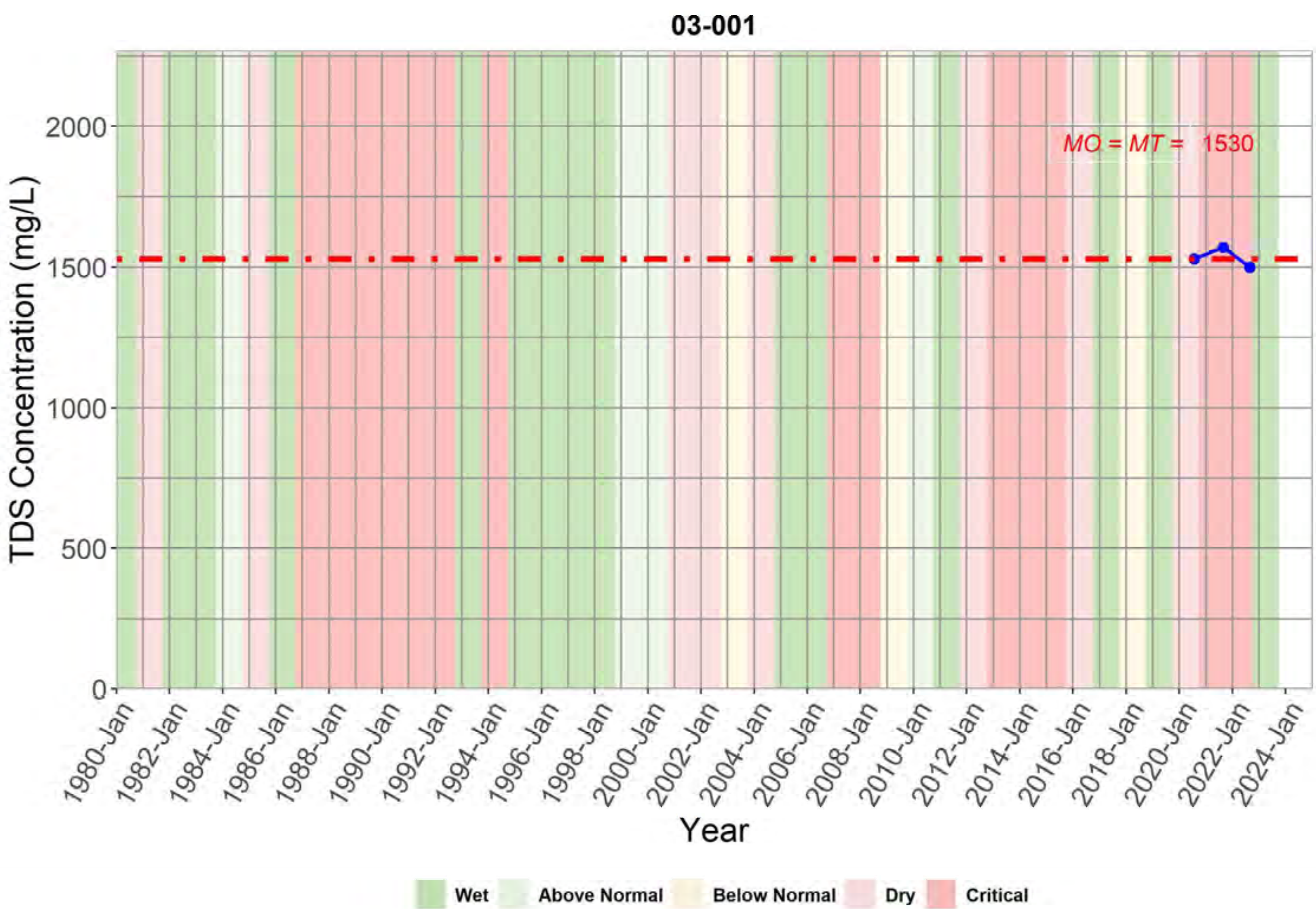
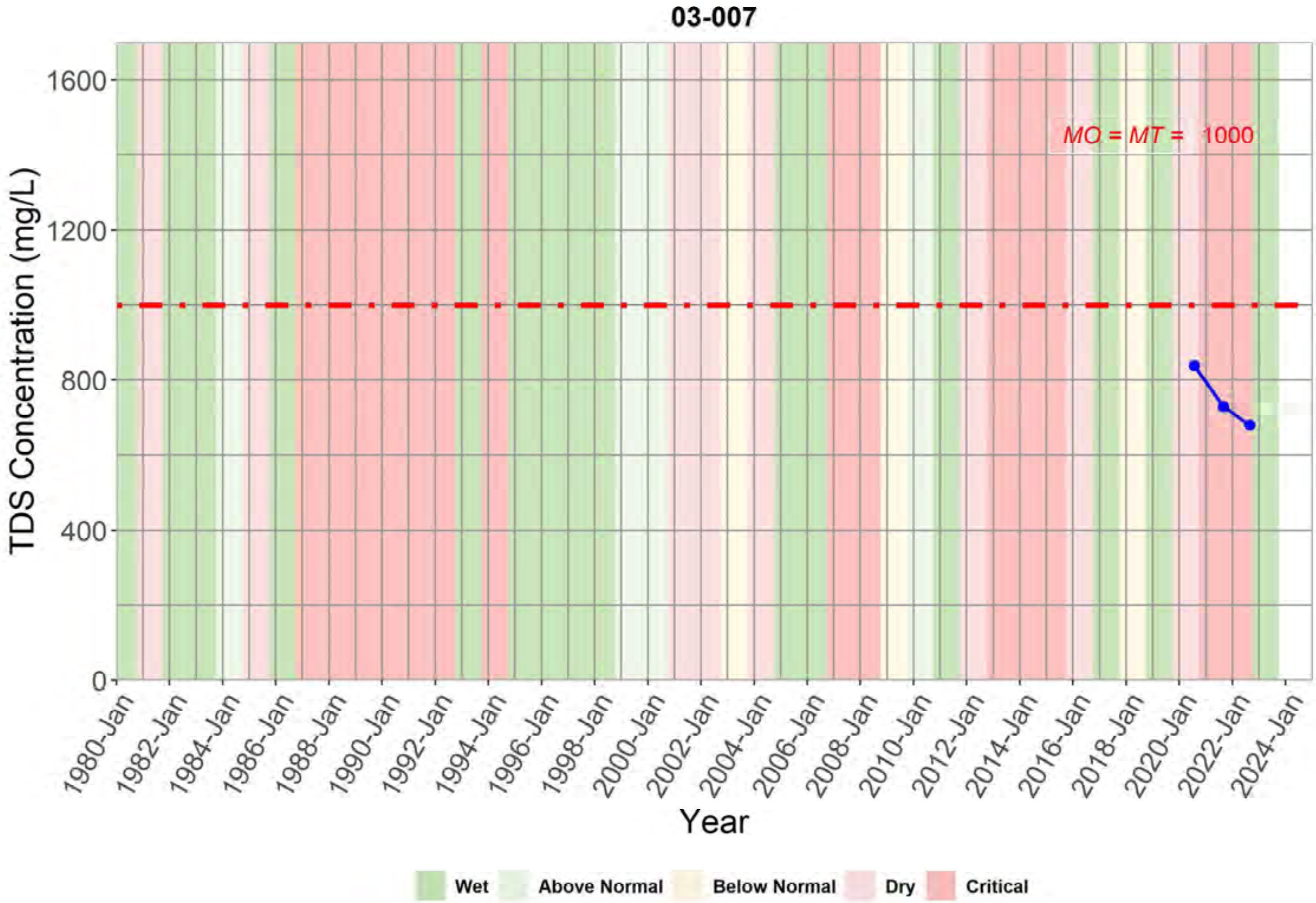
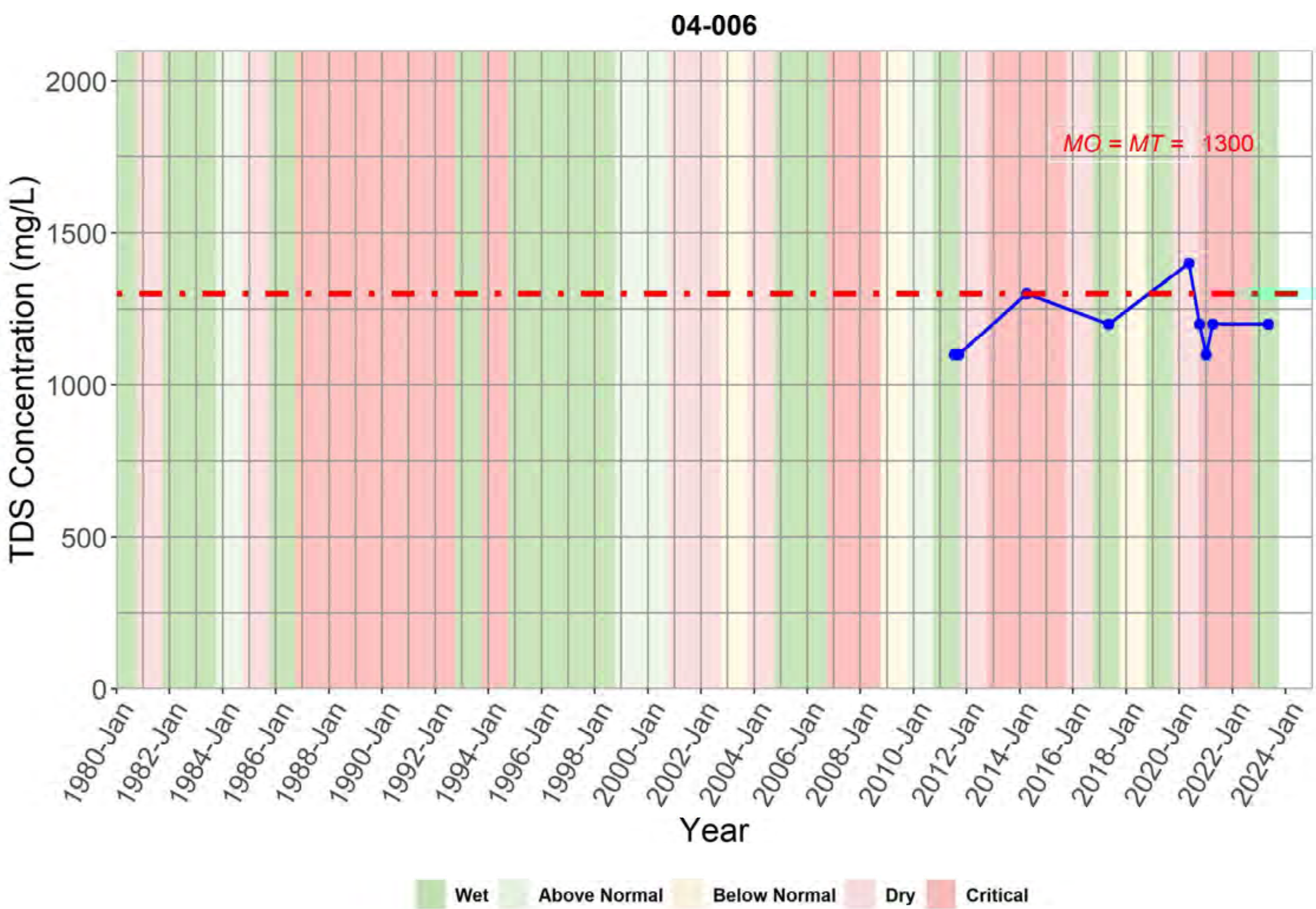
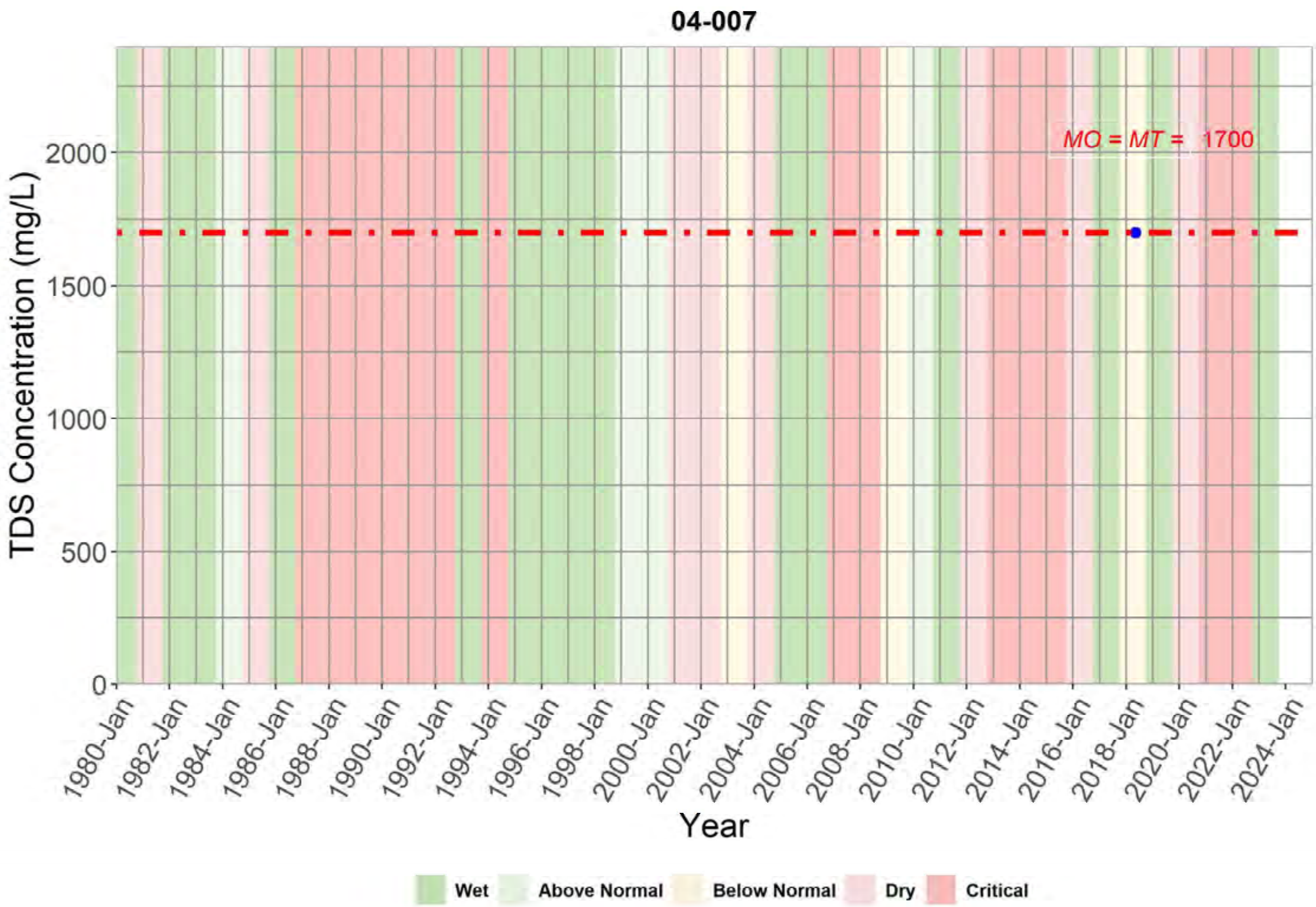
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



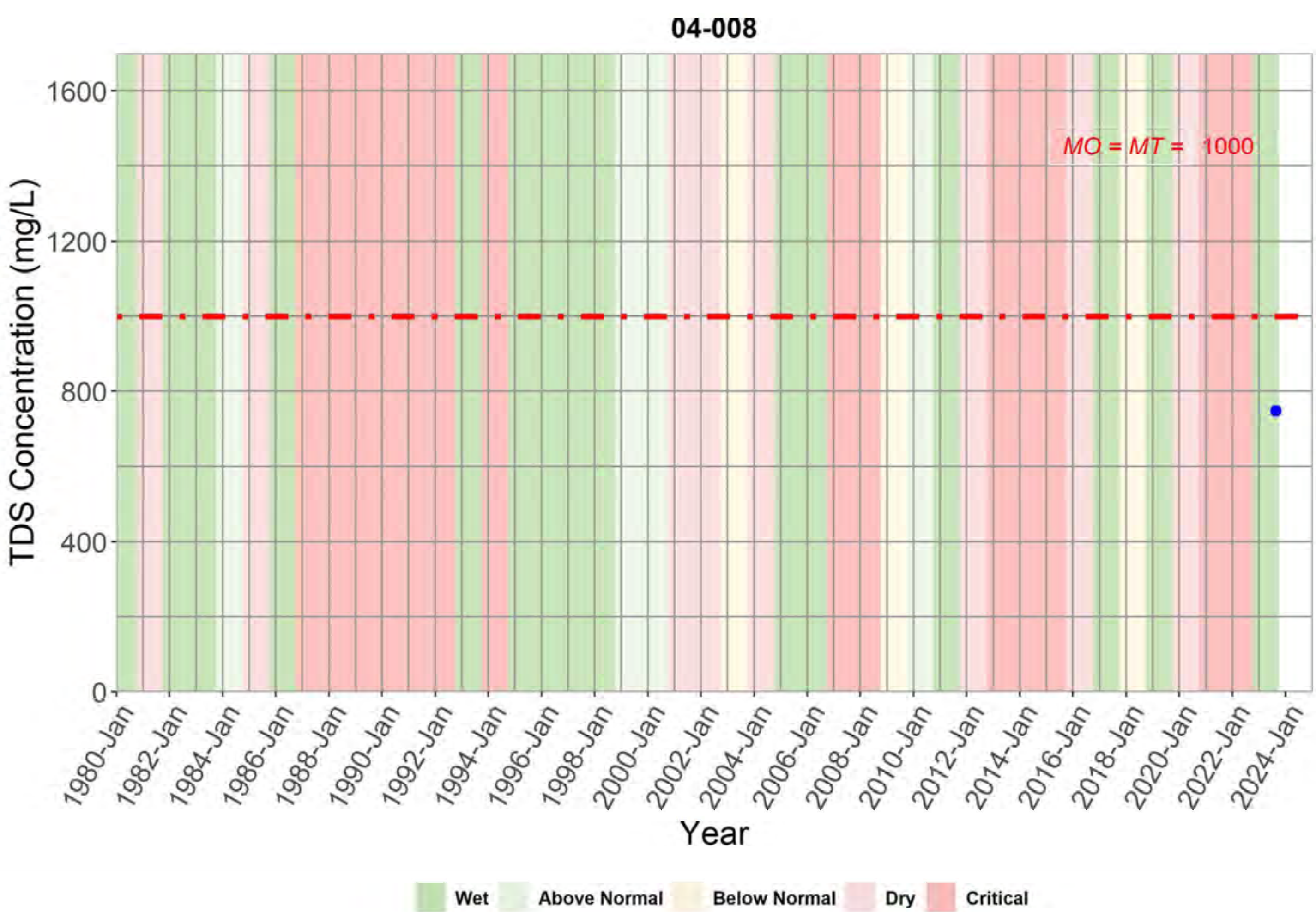
03-001
MO = MT = 1530
TDS Concentration (mg/L)
0
500
1000
1500
2000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


03-007
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

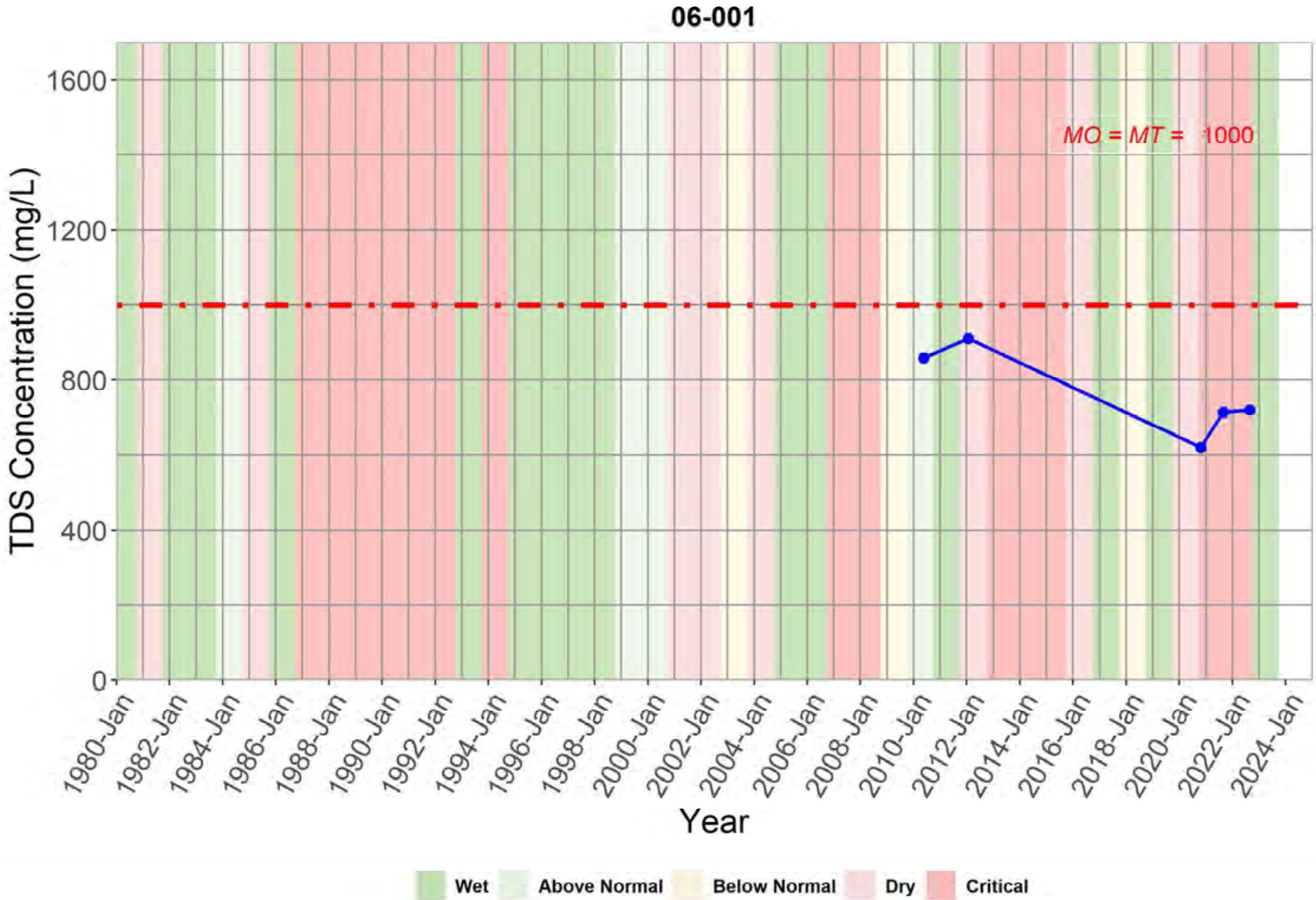

04-006
MO = MT = 1300
TDS Concentration (mg/L)
0
500
1000
1500
2000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

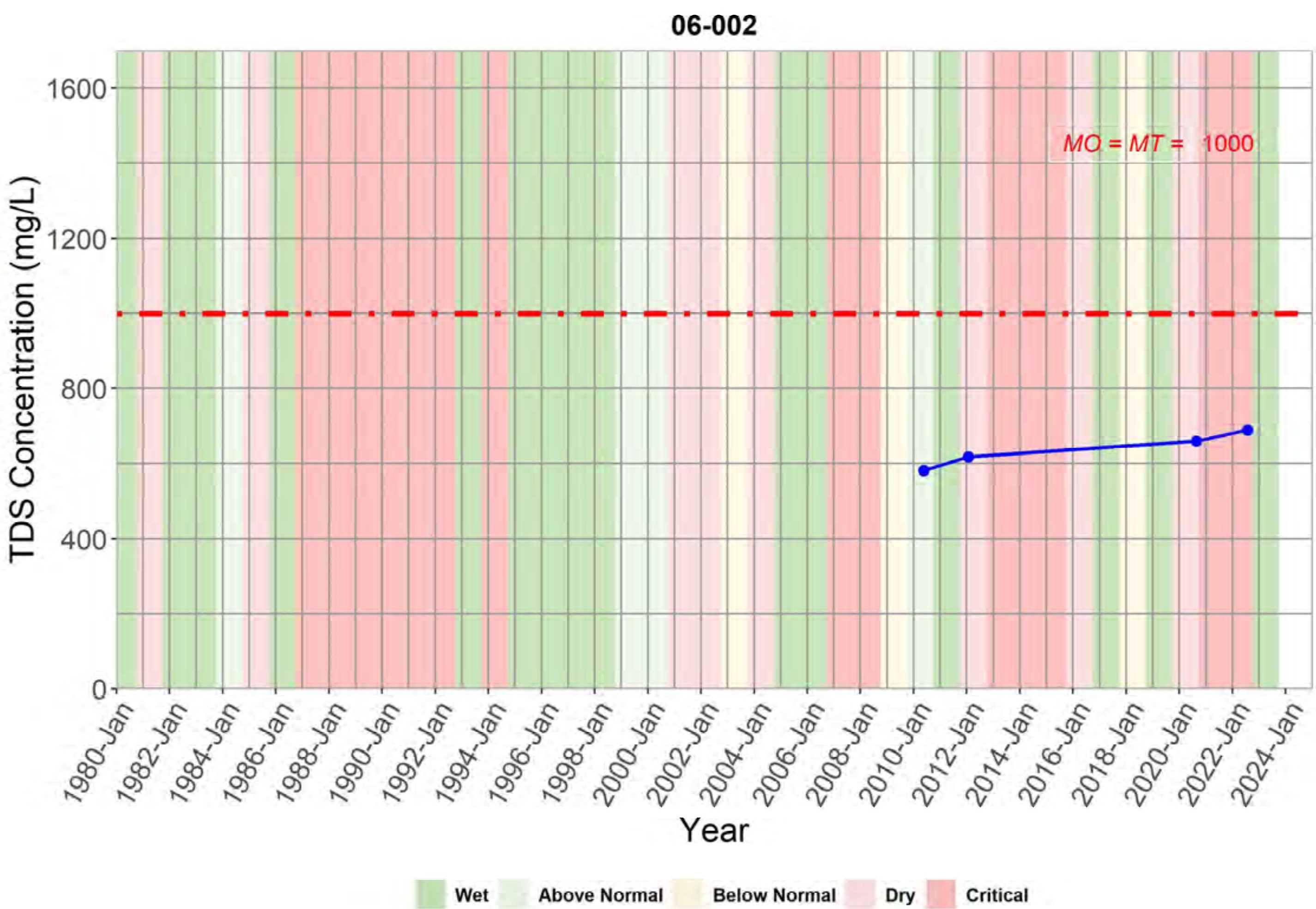


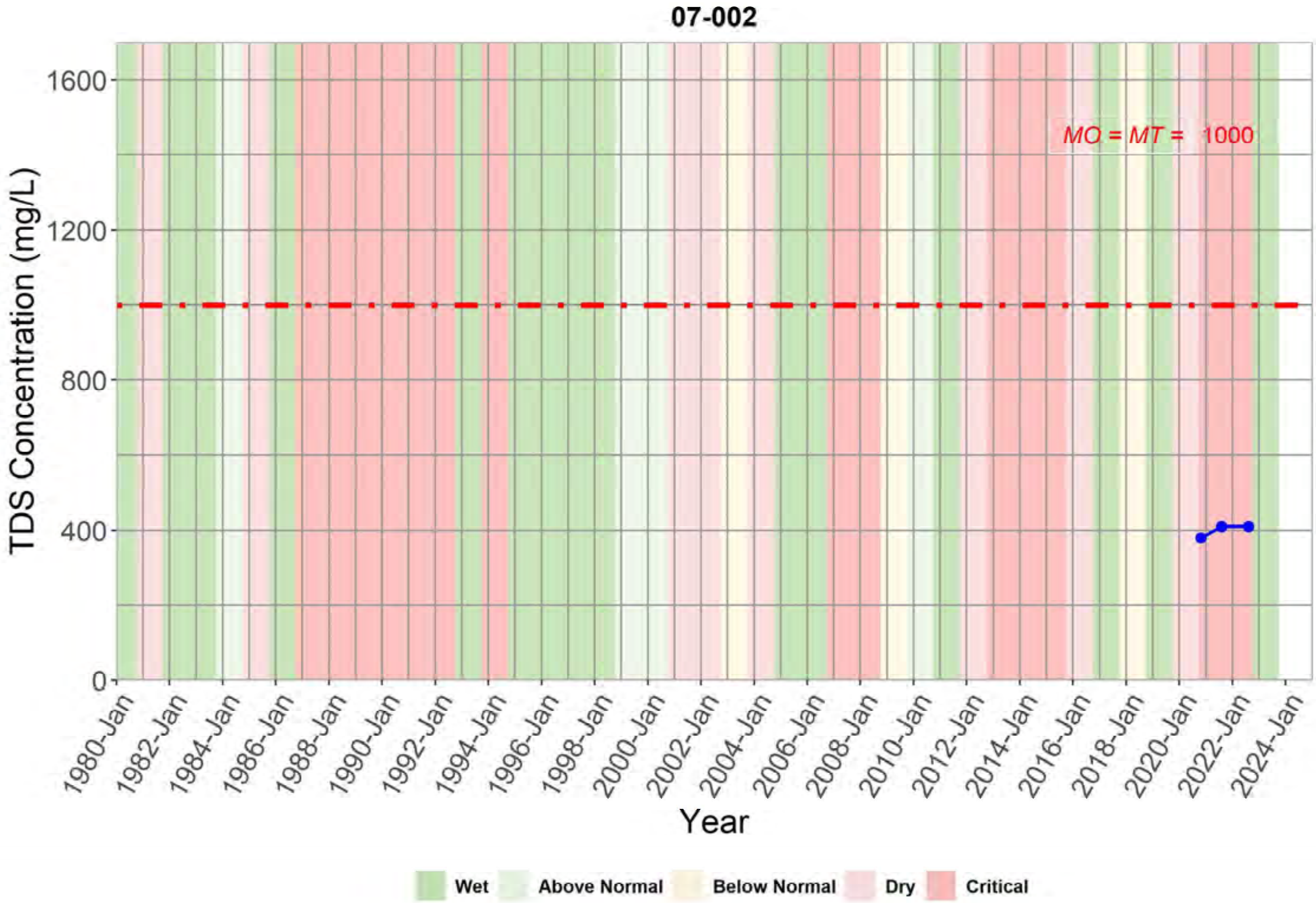
04-007
MO = MT = 1700
TDS Concentration (mg/L)
0
500
1000
1500
2000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



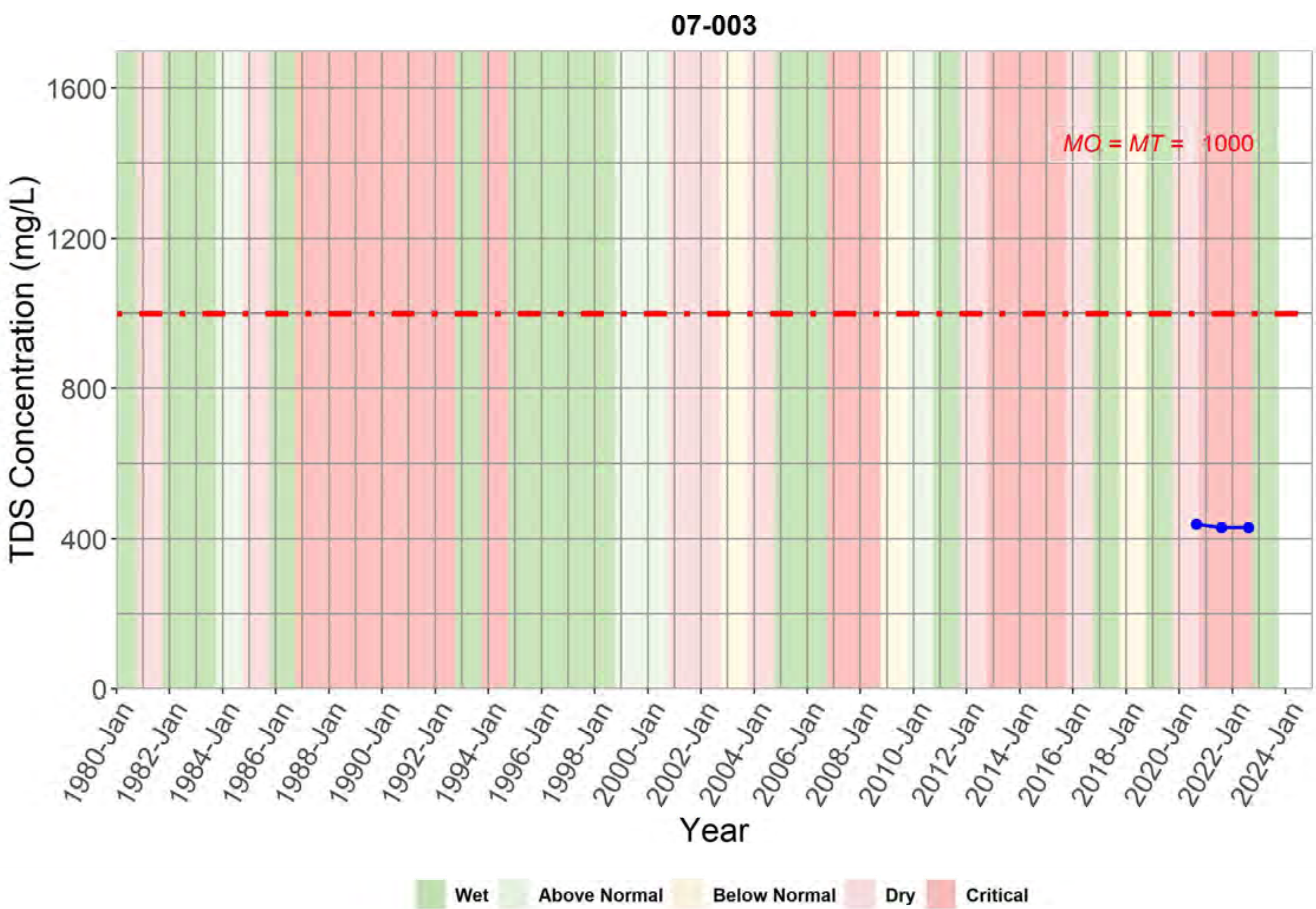
04-008
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


06-001
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


06-002
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

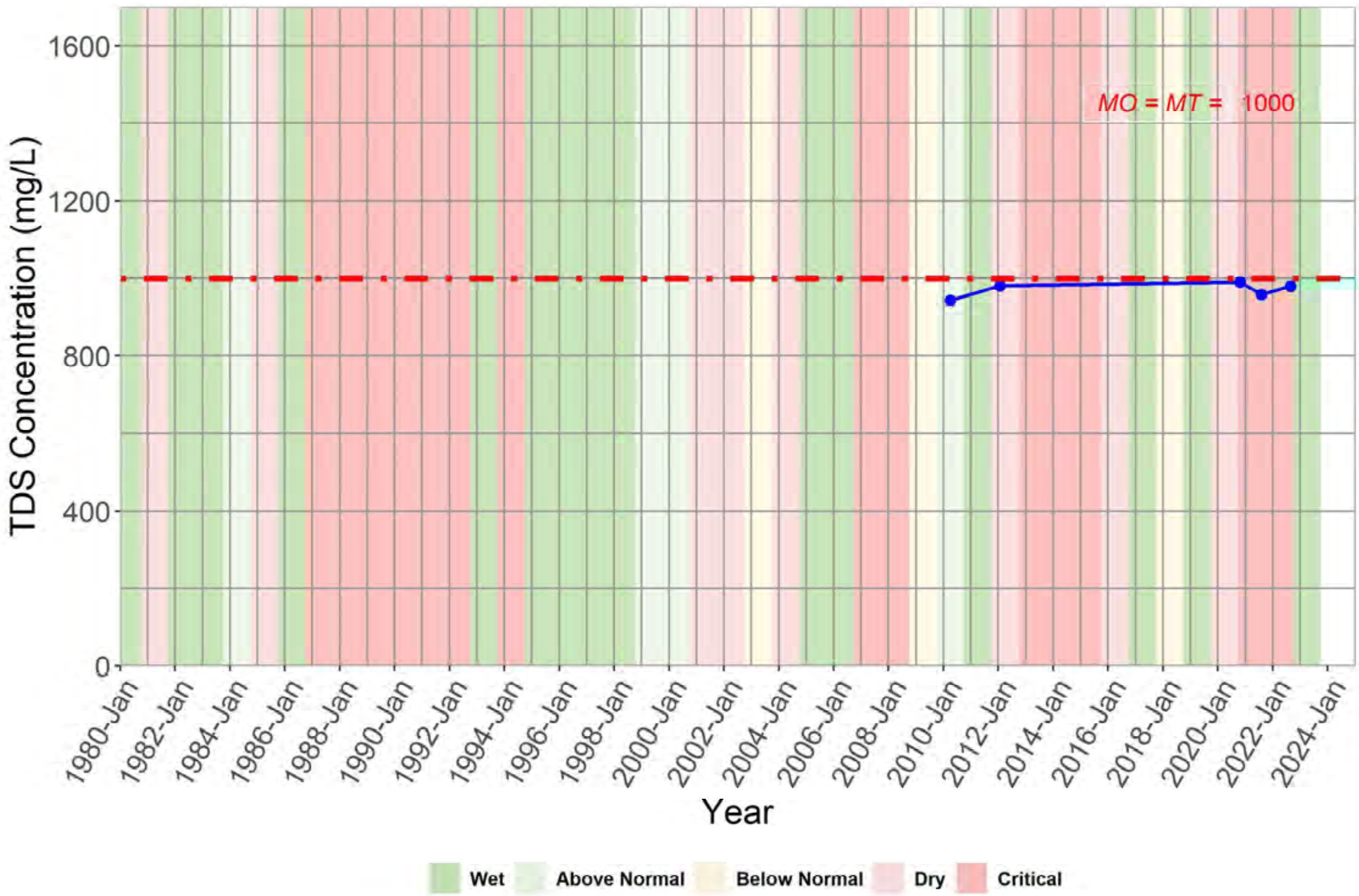


07-002
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
Year
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Wet
Above Normal
Below Normal
Dry
Critical

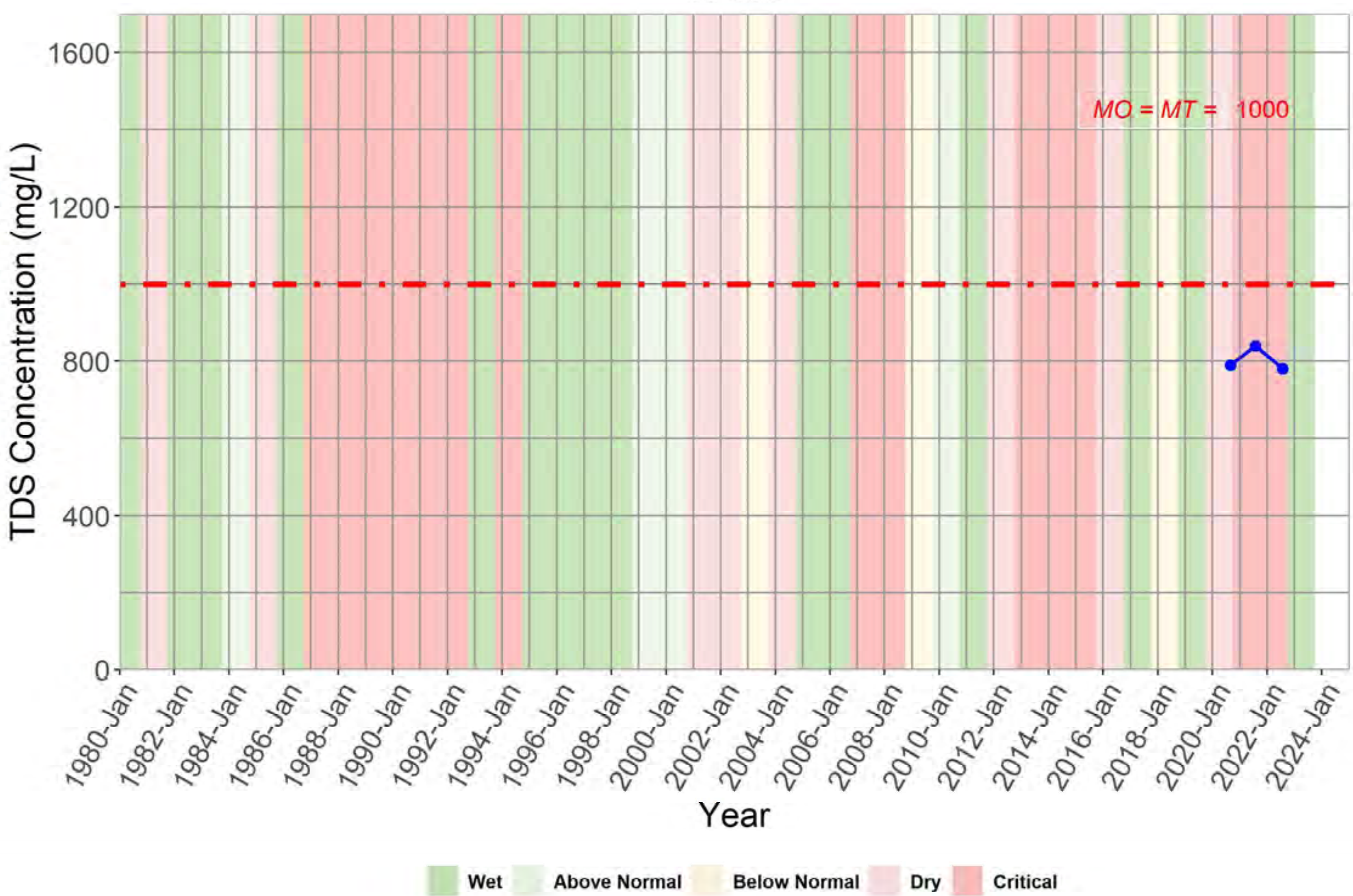


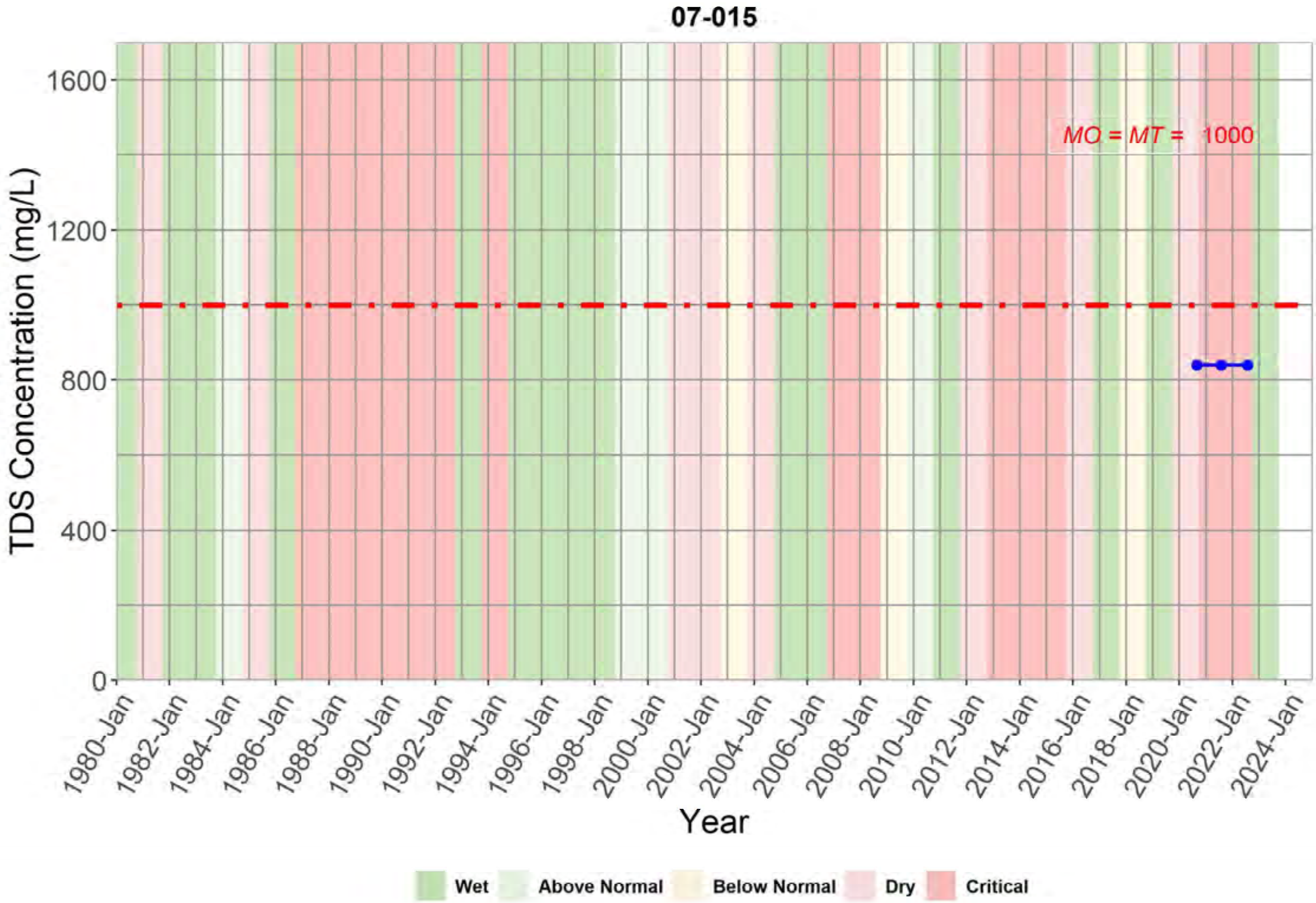
07-003
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
Year
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Wet
Above Normal
Below Normal
Dry
Critical

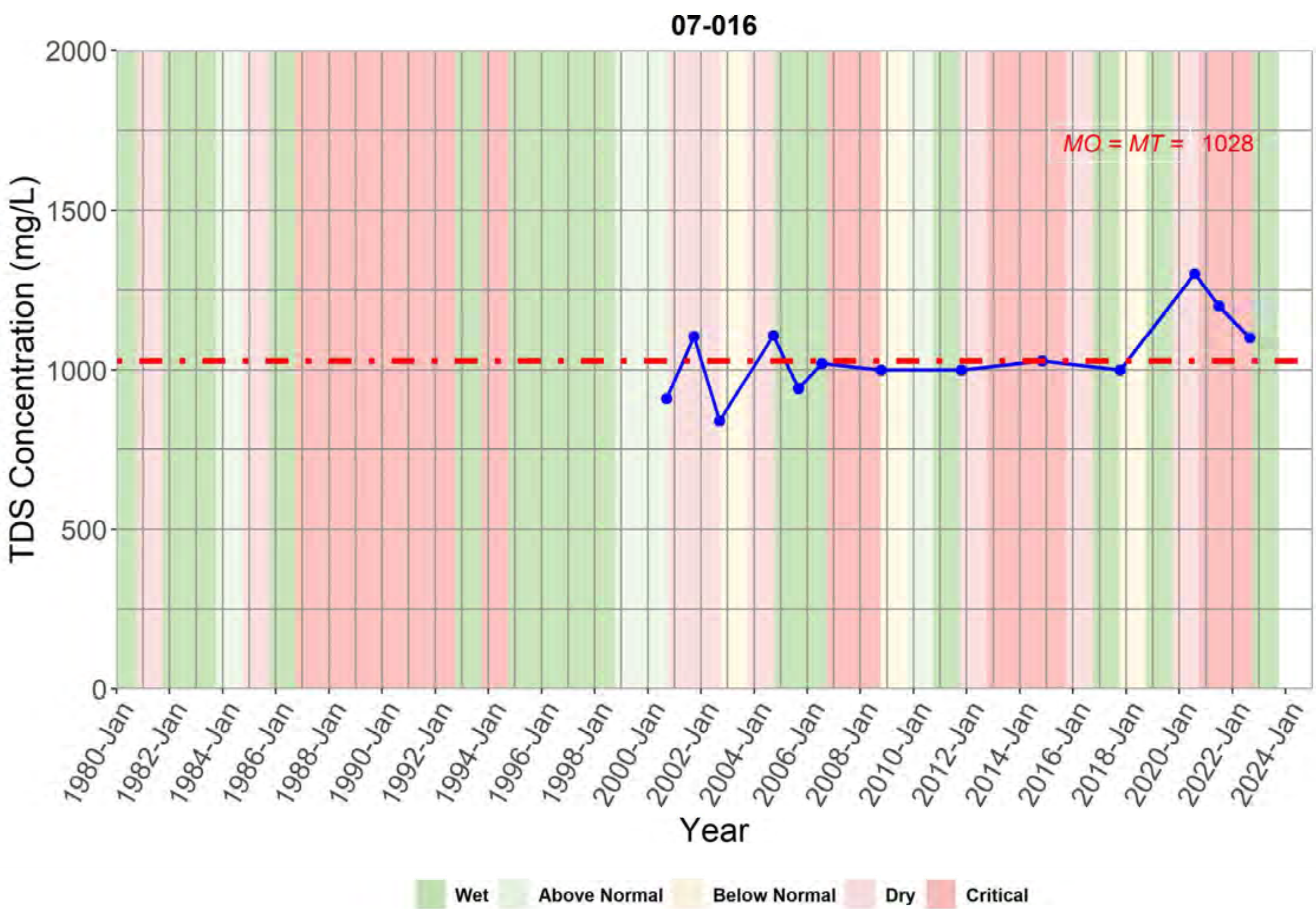
07-007

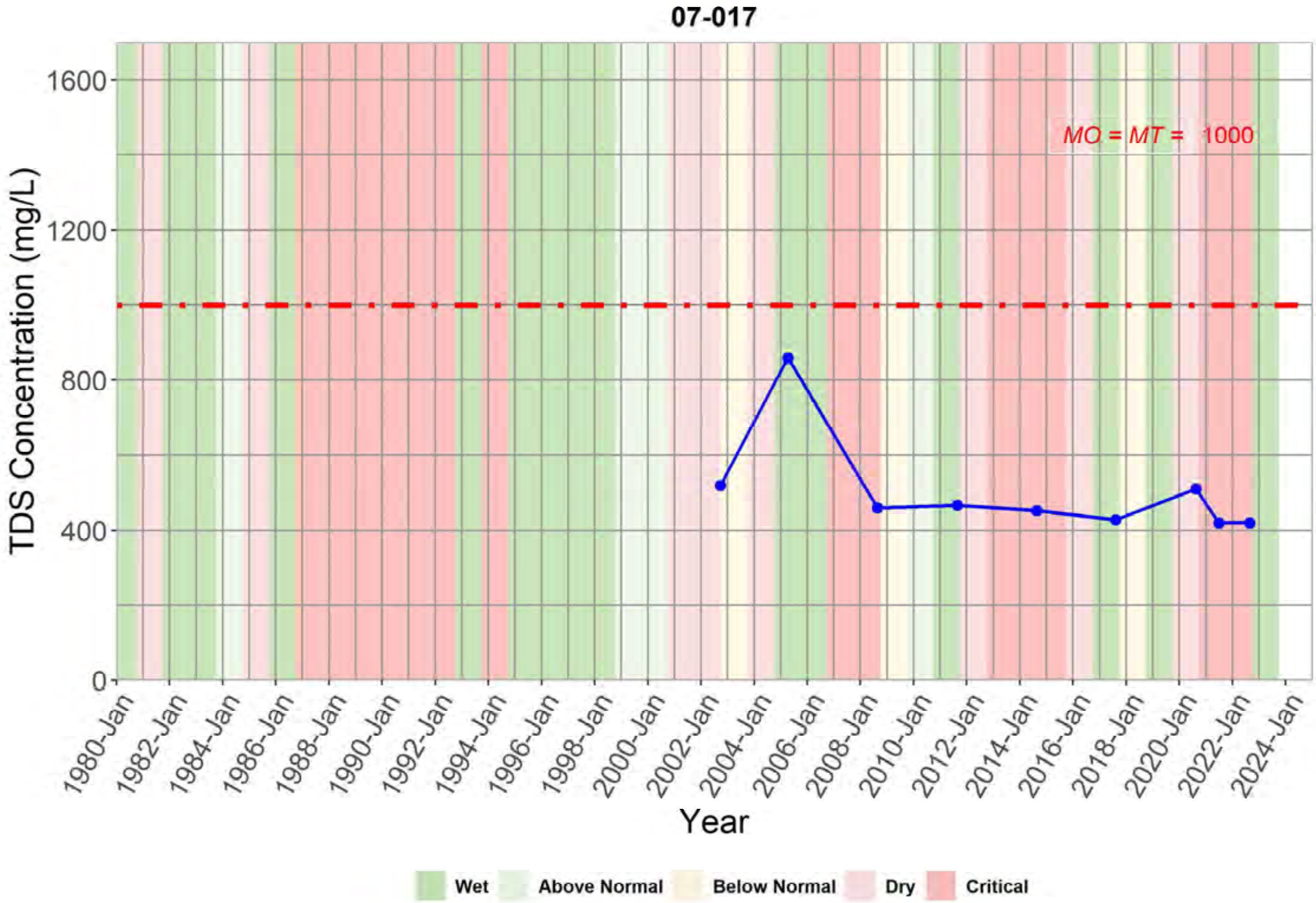

MO = MT = 1000
TDS Concentration (mg/L)
Year
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Wet
Above Normal
Below Normal
Dry
Critical

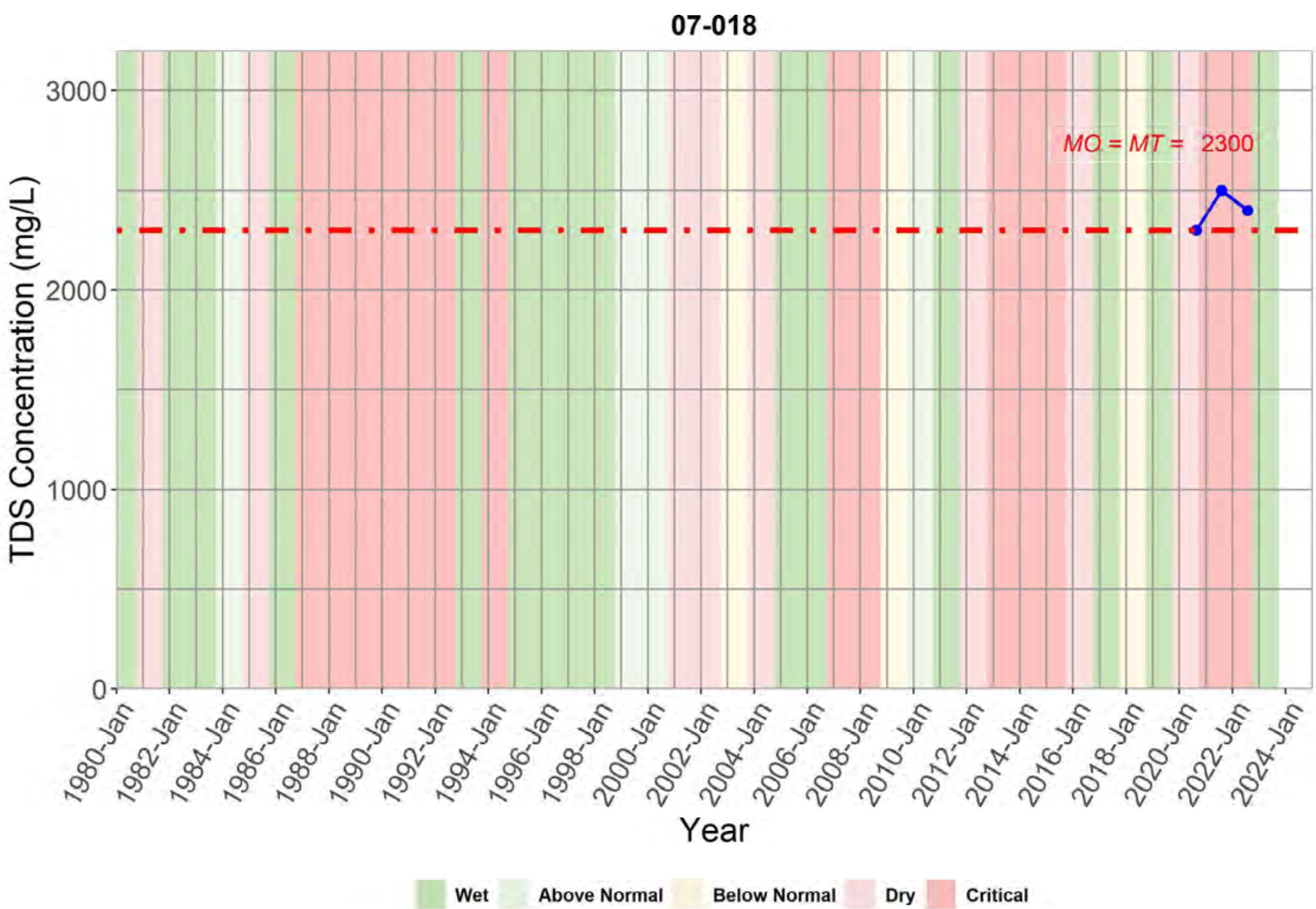
07-014

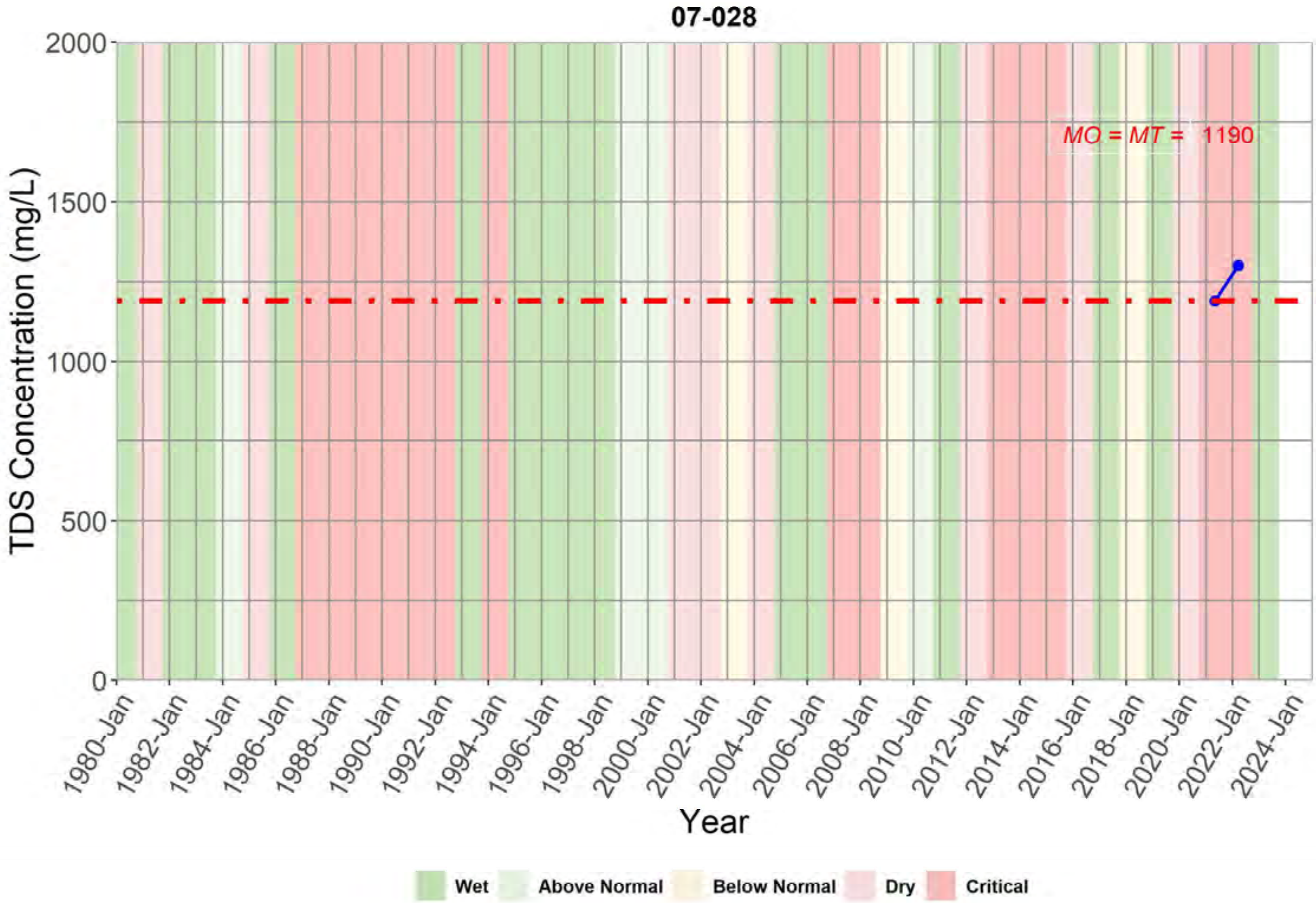

MO = MT = 1000
TDS Concentration (mg/L)
Year
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Wet
Above Normal
Below Normal
Dry
Critical


07-015
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

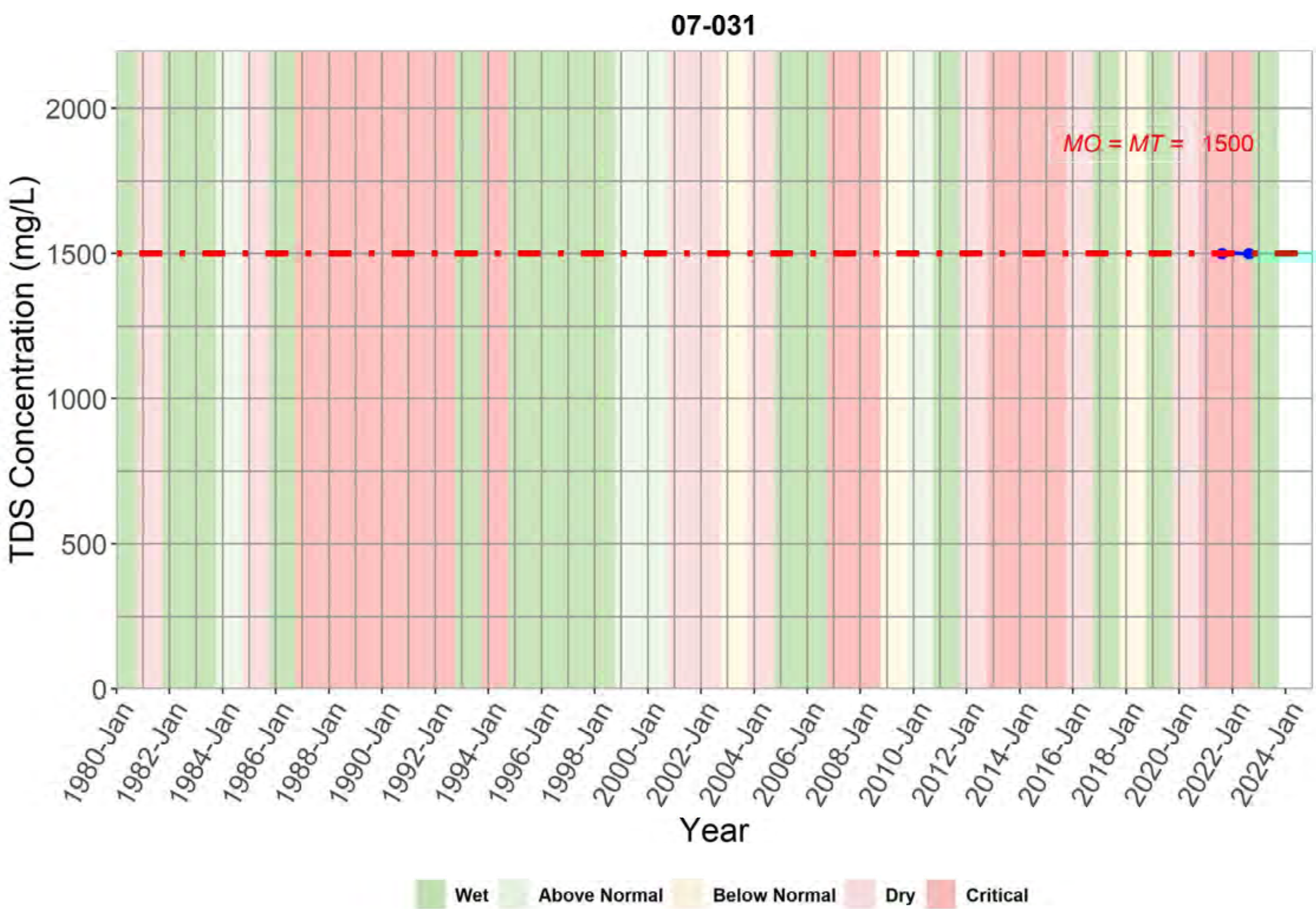

07-016
MO = MT = 1028
TDS Concentration (mg/L)
0
500
1000
1500
2000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-017
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

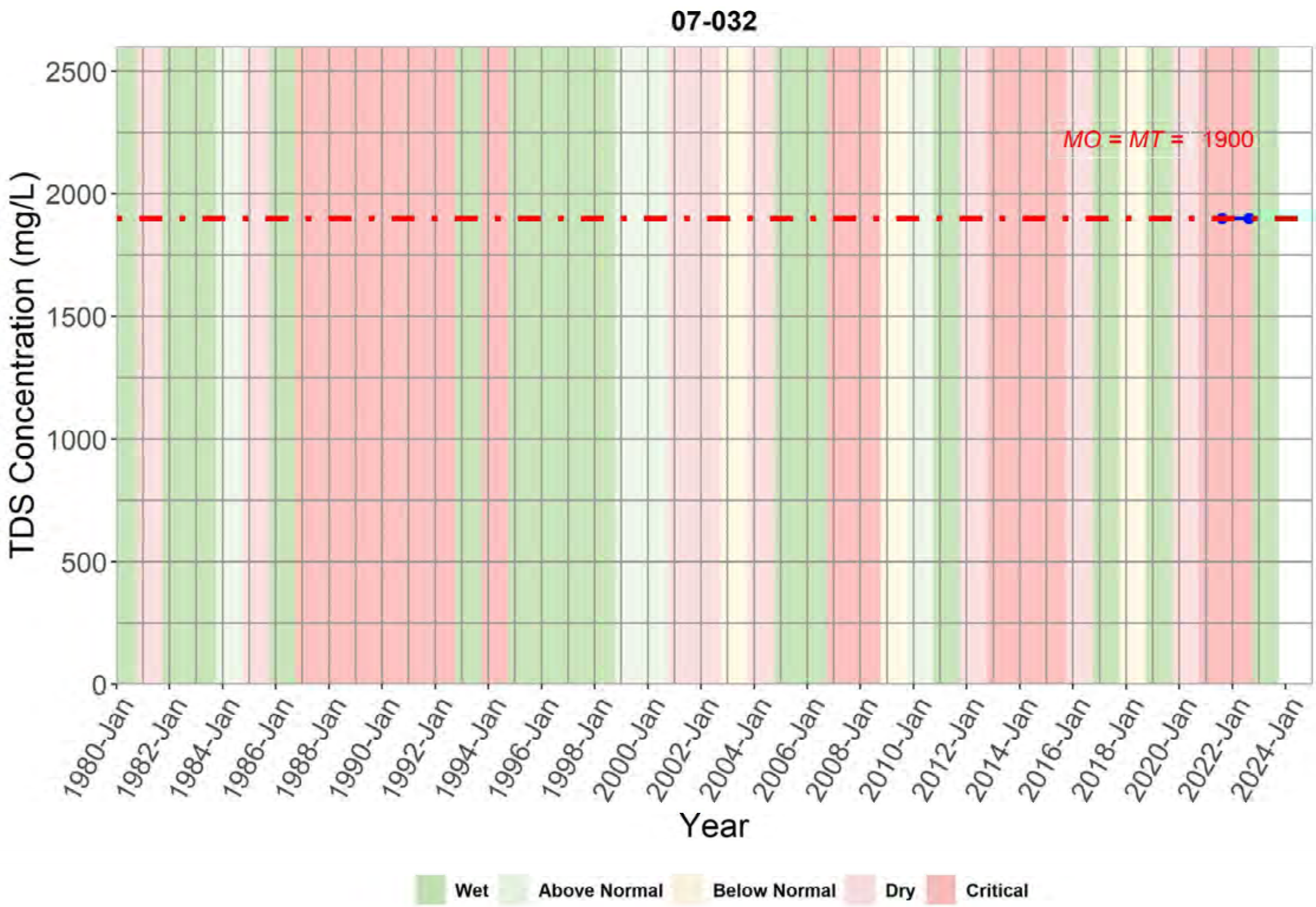

07-018
MO = MT = 2300
TDS Concentration (mg/L)
0
1000
2000
3000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

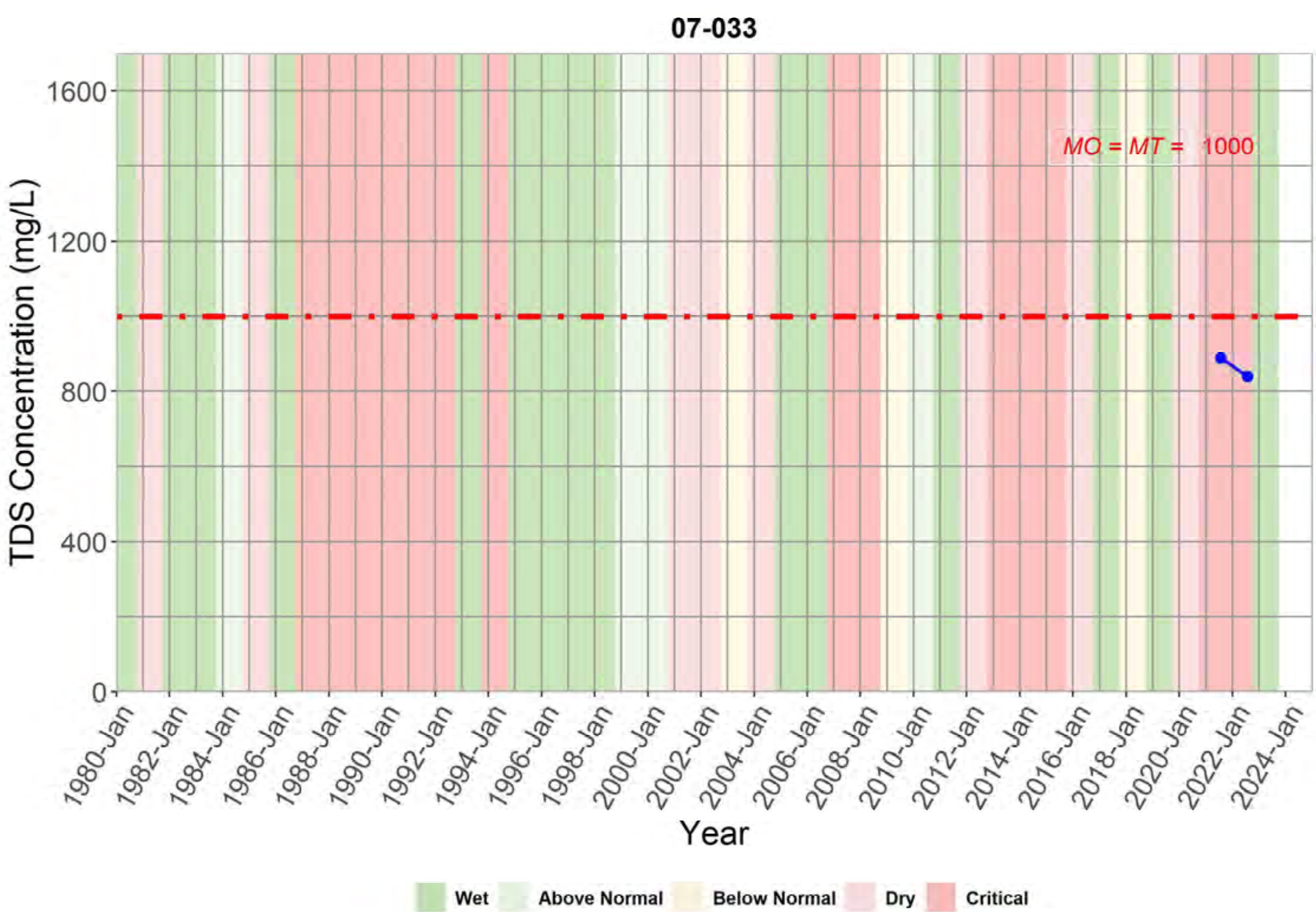


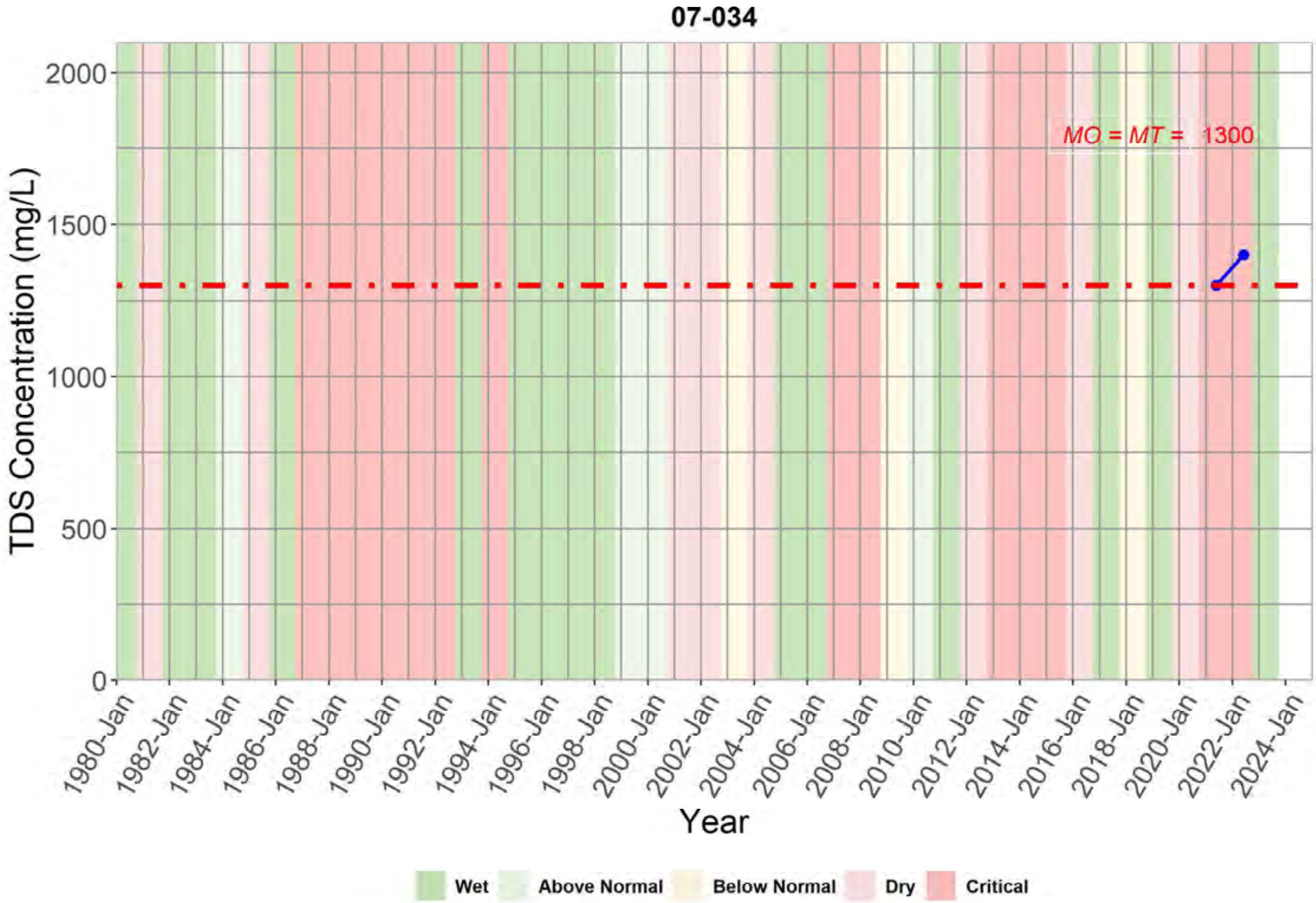
07-028
MO = MT = 1190
TDS Concentration (mg/L)
2000
1500
1000
500
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

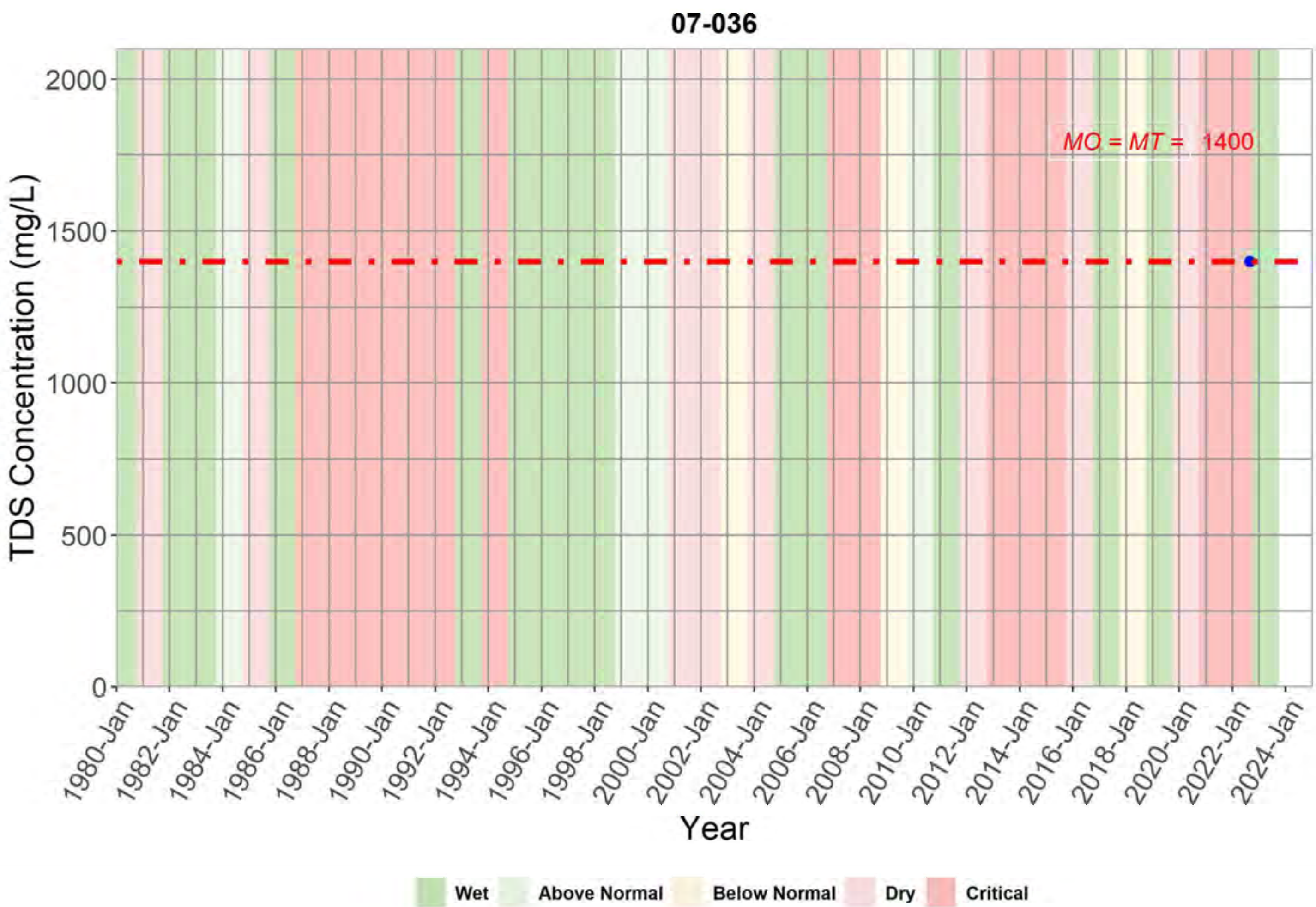


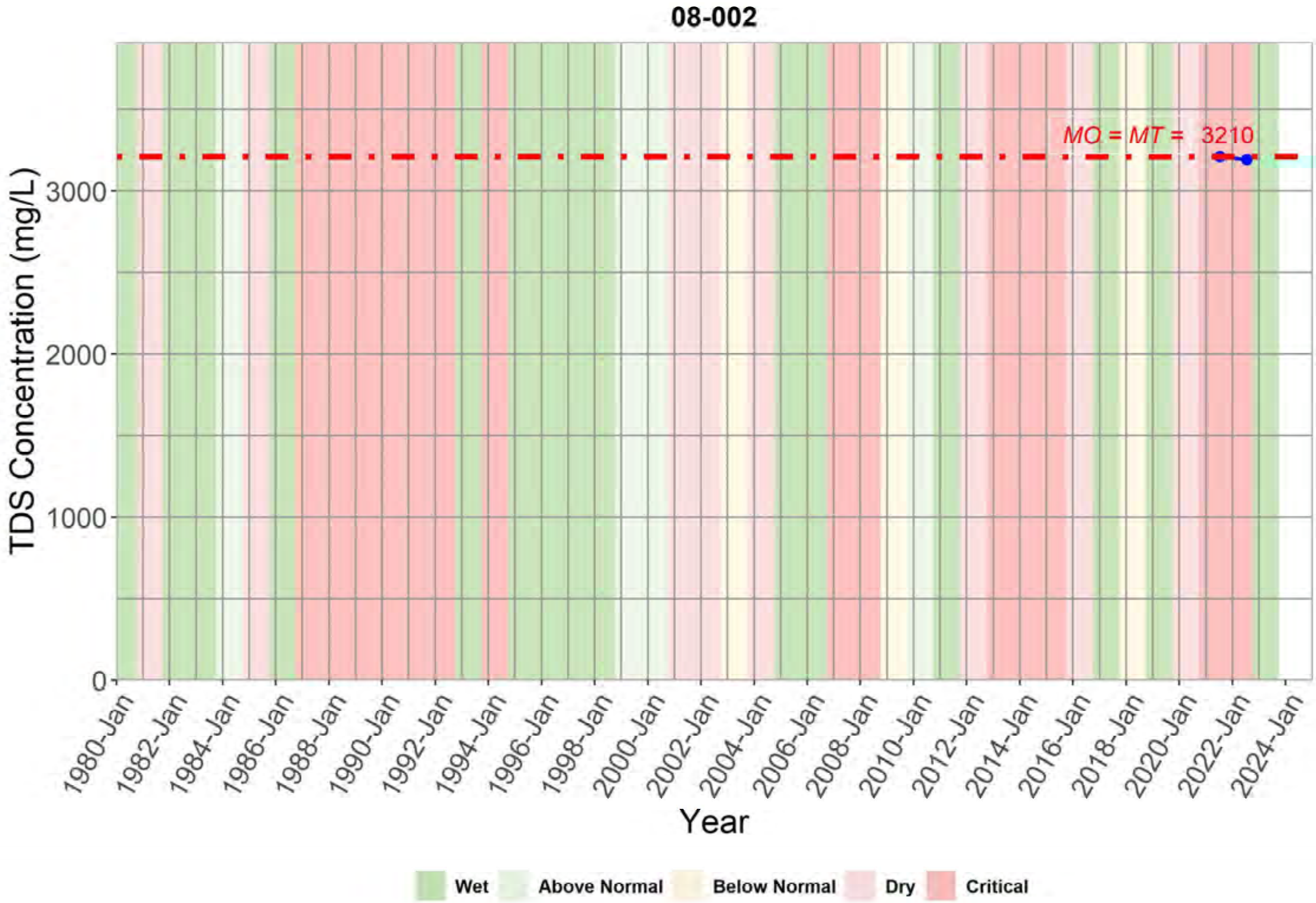
07-031
MO = MT = 1500
TDS Concentration (mg/L)
2000
1500
1000
500
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

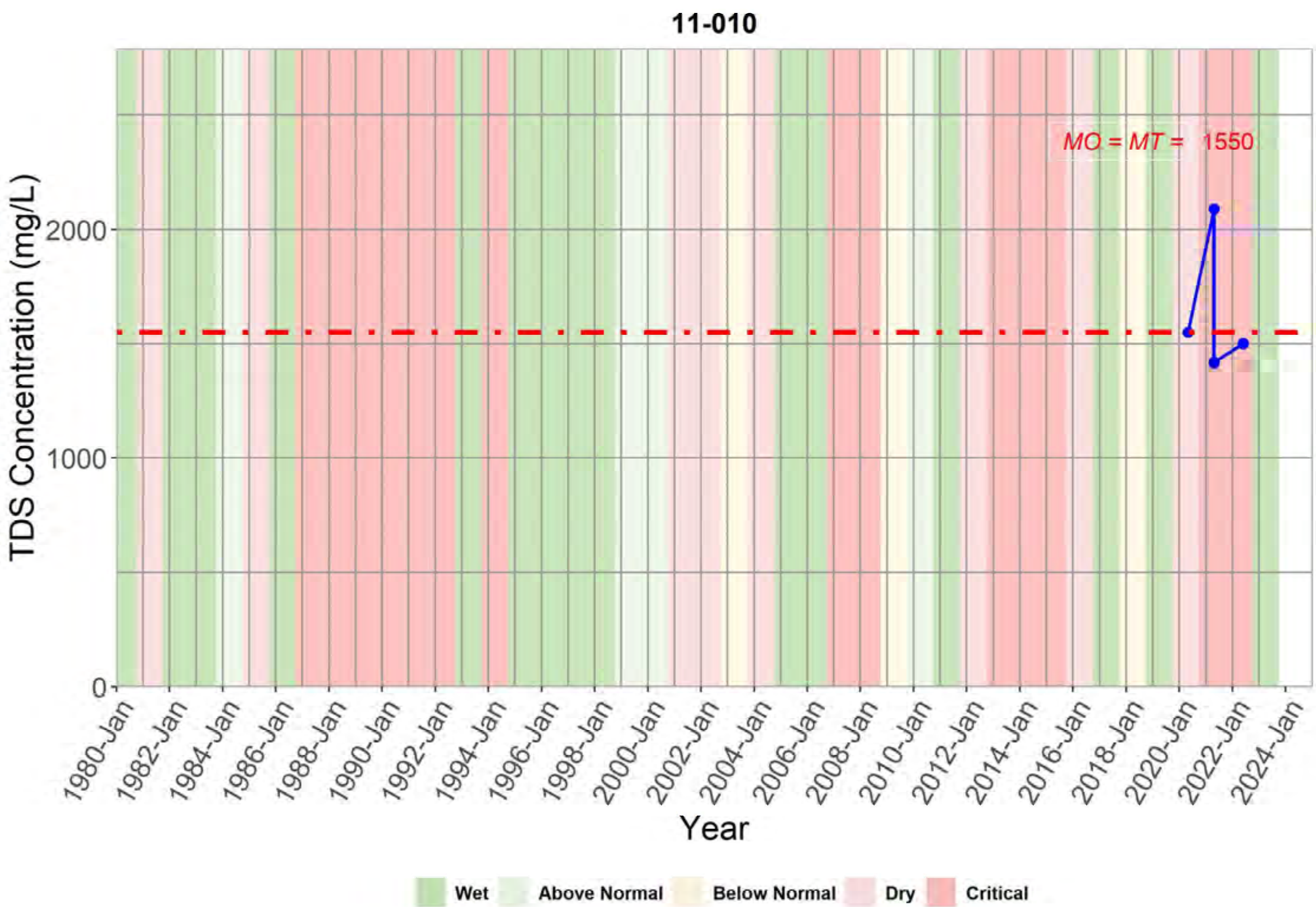

07-032
TDS Concentration (mg/L)
2500
2000
1500
1000
500
0
MO = MT = 1900
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

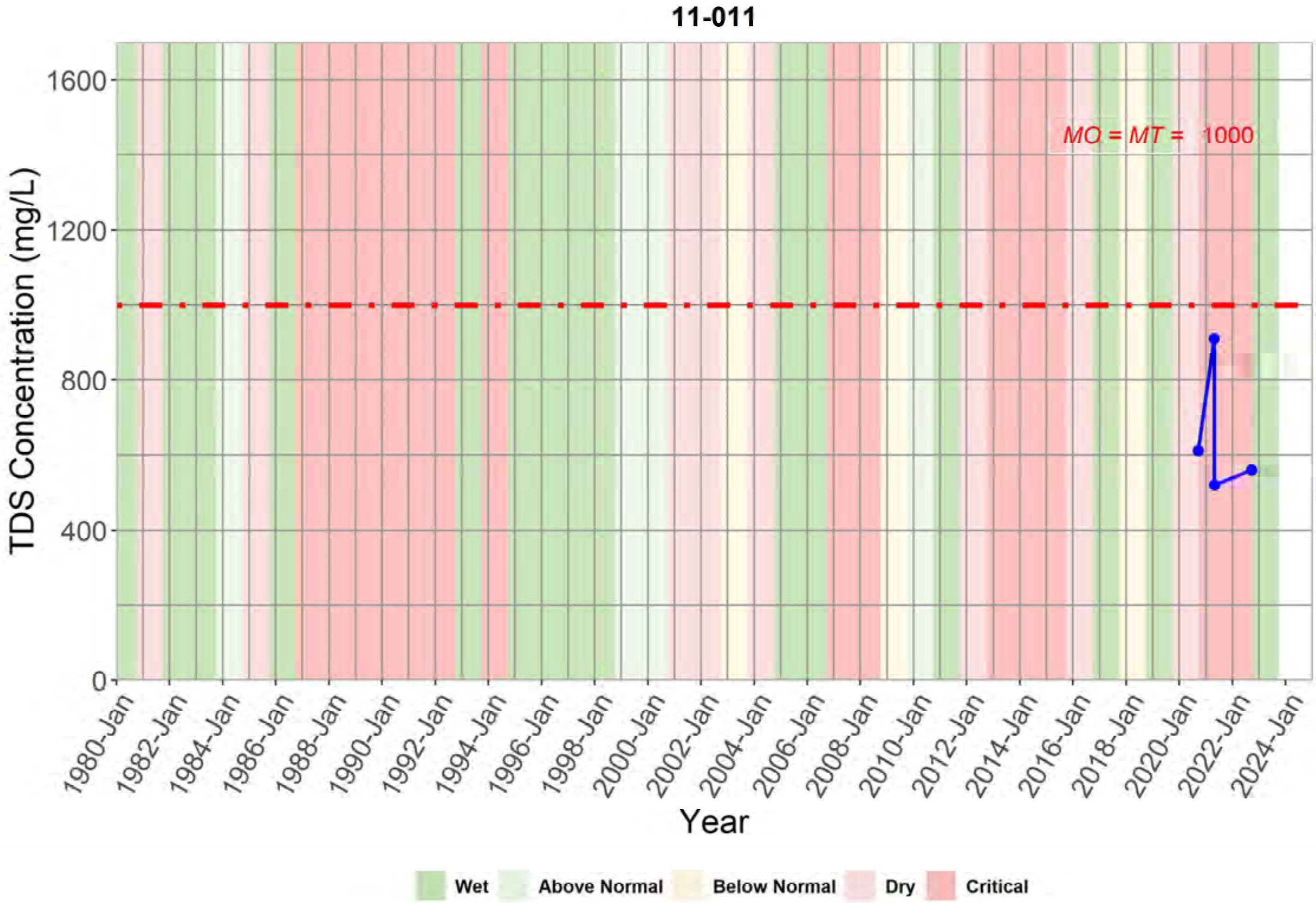

07-033
TDS Concentration (mg/L)
1600
1200
800
400
0
MO = MT = 1000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-034
MO = MT = 1300
TDS Concentration (mg/L)
0
500
1000
1500
2000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

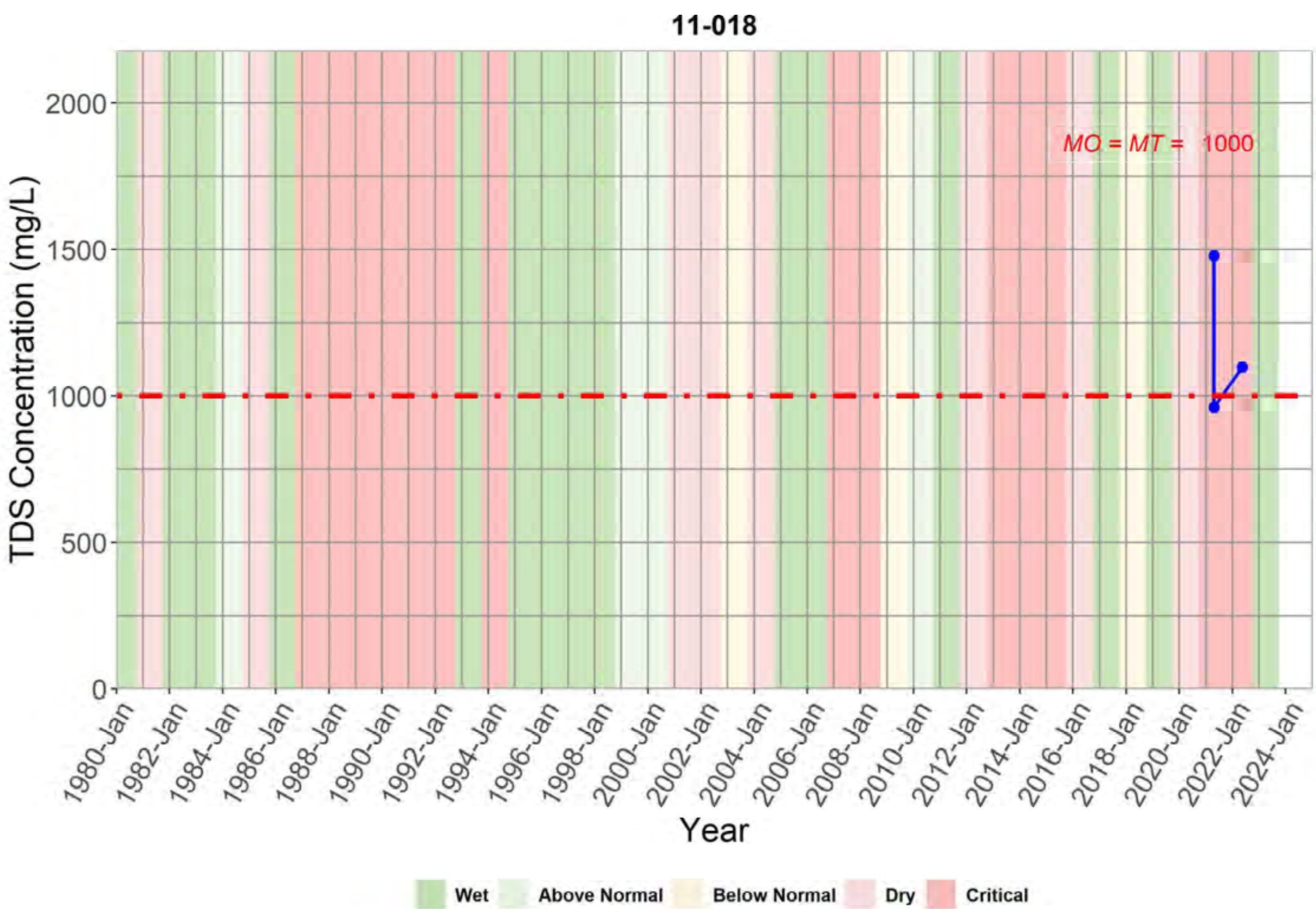

07-036
MO = MT = 1400
TDS Concentration (mg/L)
0
500
1000
1500
2000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


08-002
MO = MT = 3210
TDS Concentration (mg/L)
0
1000
2000
3000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

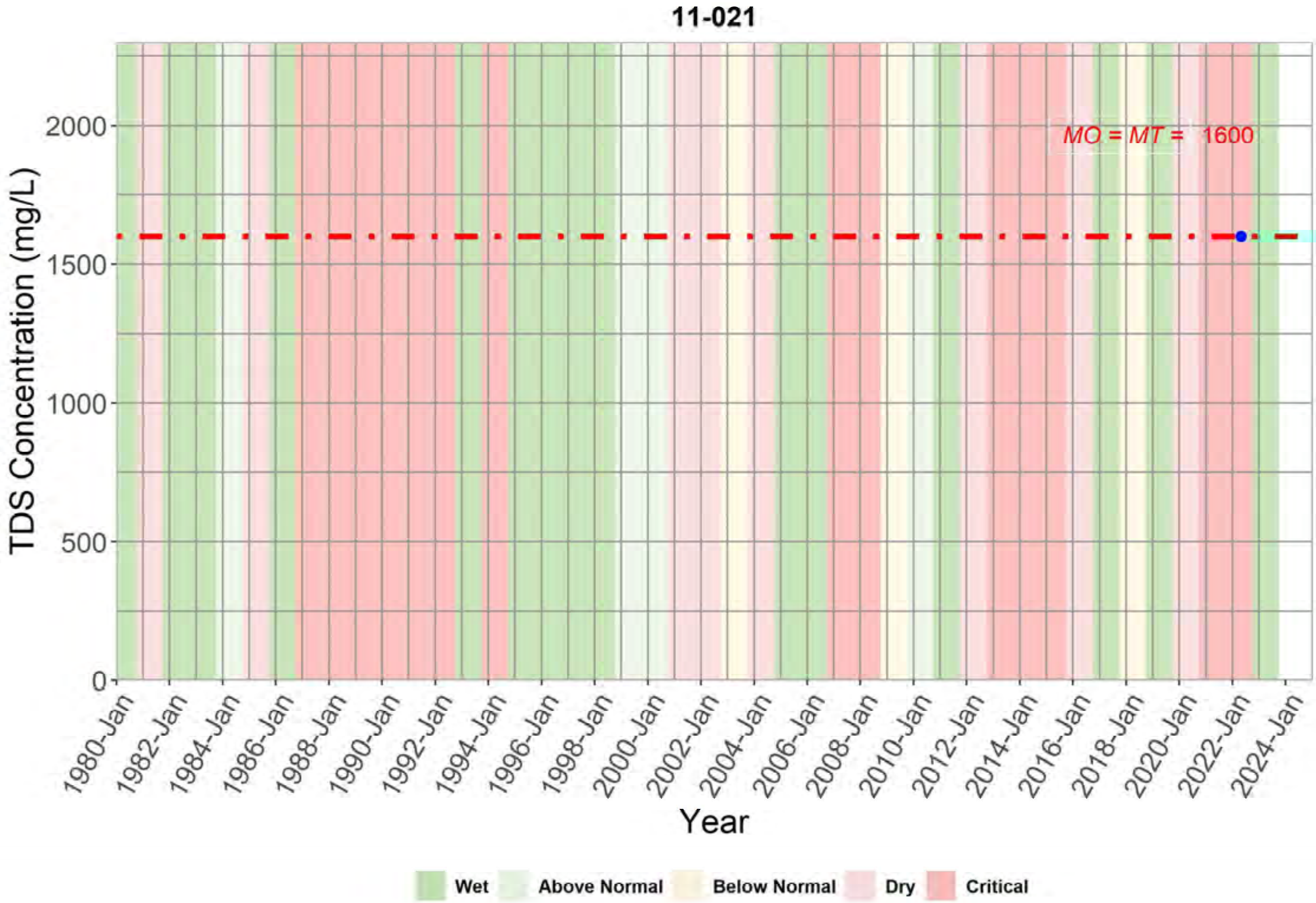

11-010
MO = MT = 1550
TDS Concentration (mg/L)
0
1000
2000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



11-011
MO = MT = 1000
TDS Concentration (mg/L)
1600
1200
800
400
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



11-018
MO = MT = 1000
TDS Concentration (mg/L)
2000
1500
1000
500
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


11-021
MO = MT = 1600
TDS Concentration (mg/L)
0
500
1000
1500
2000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
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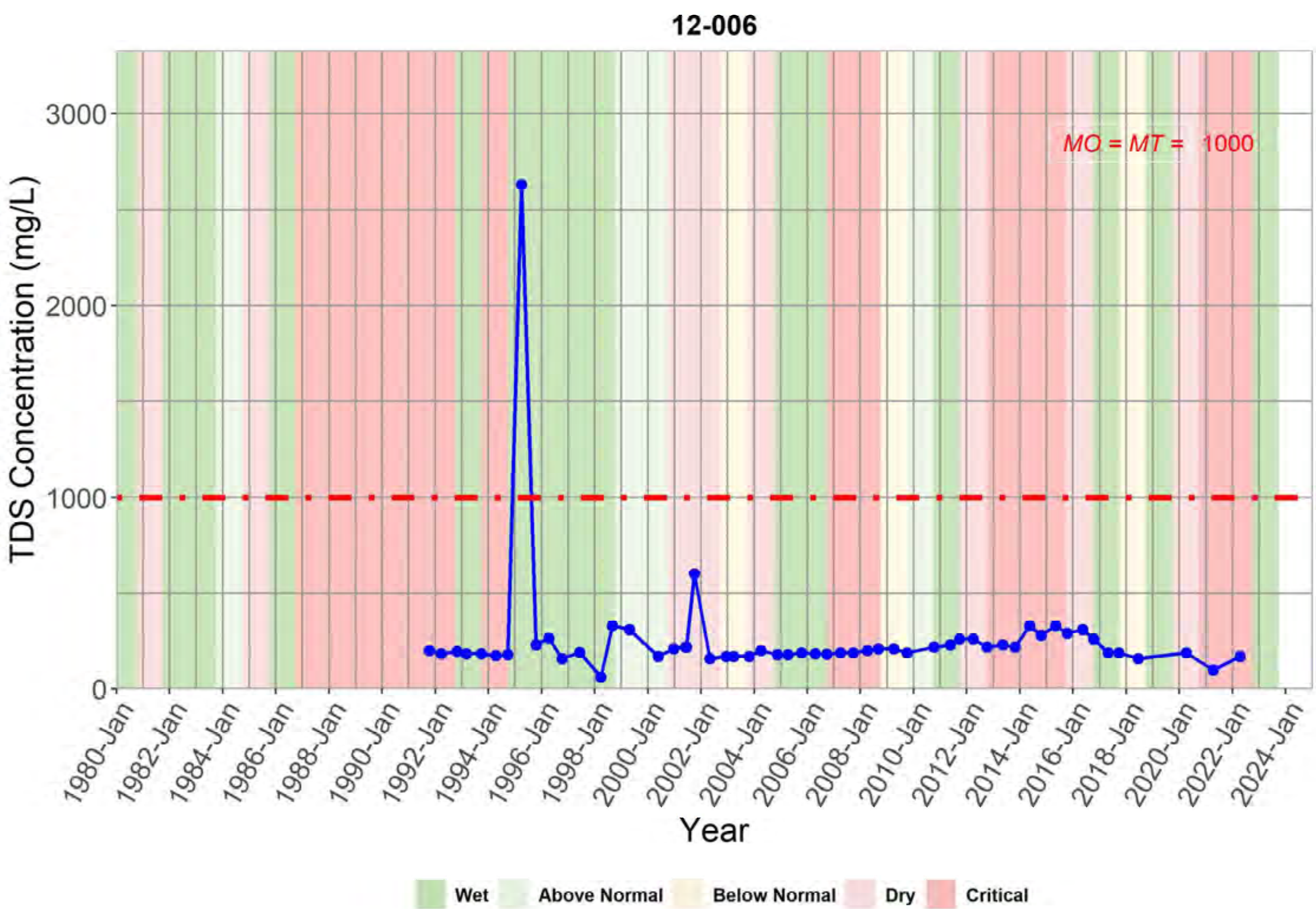
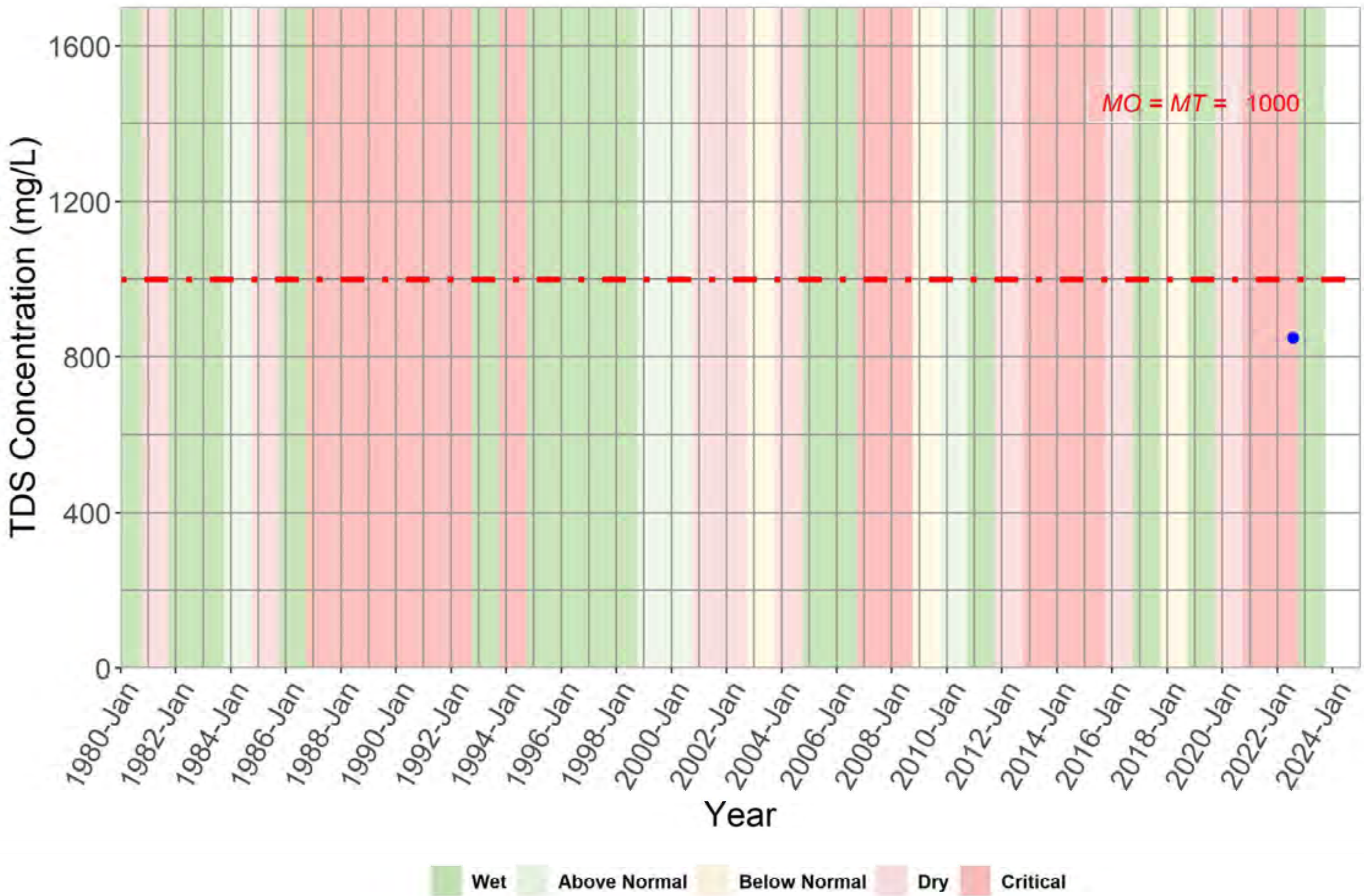
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

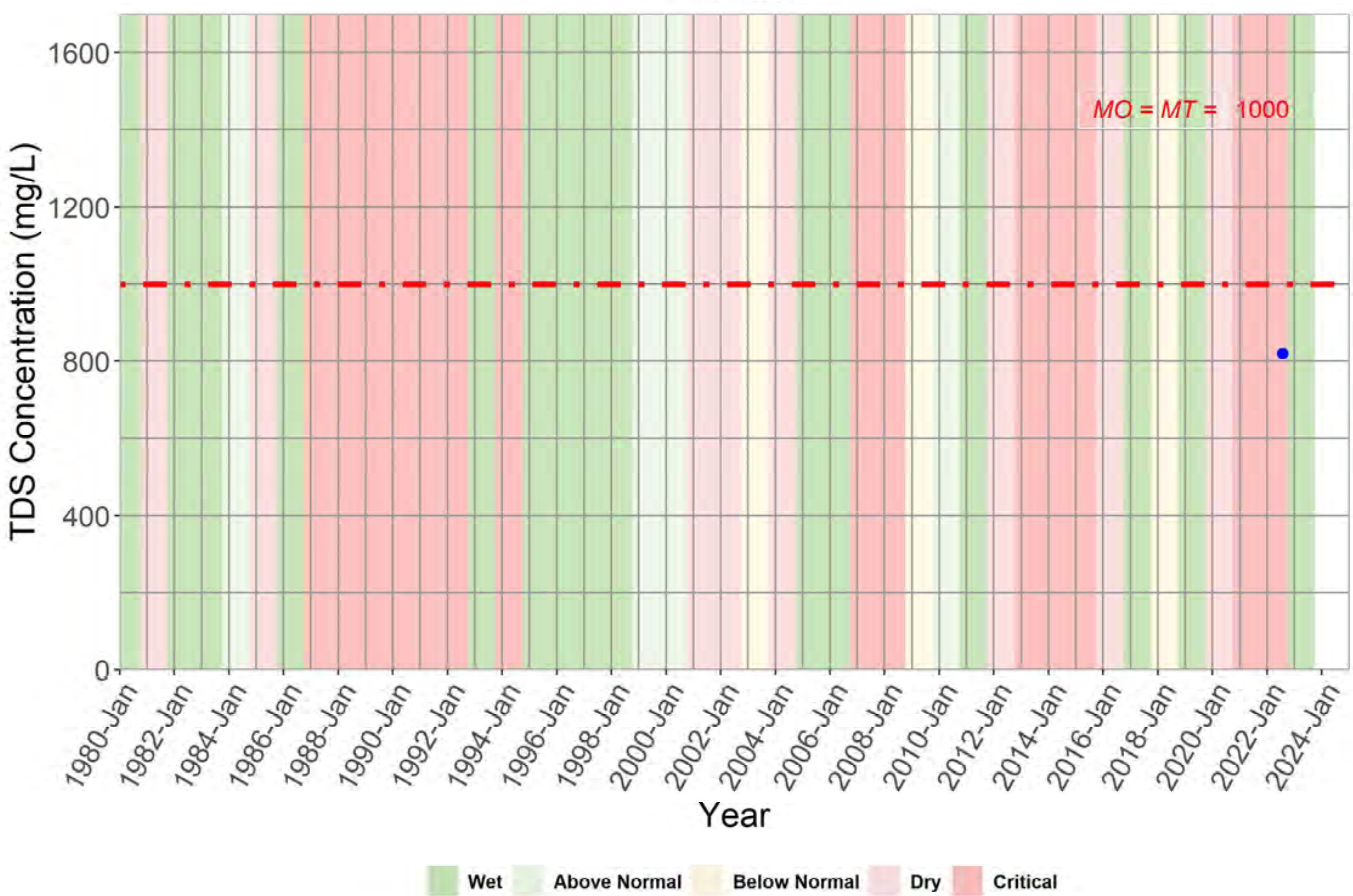

12-006
MO = MT = 1000
TDS Concentration (mg/L)
0
1000
2000
3000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

14-001

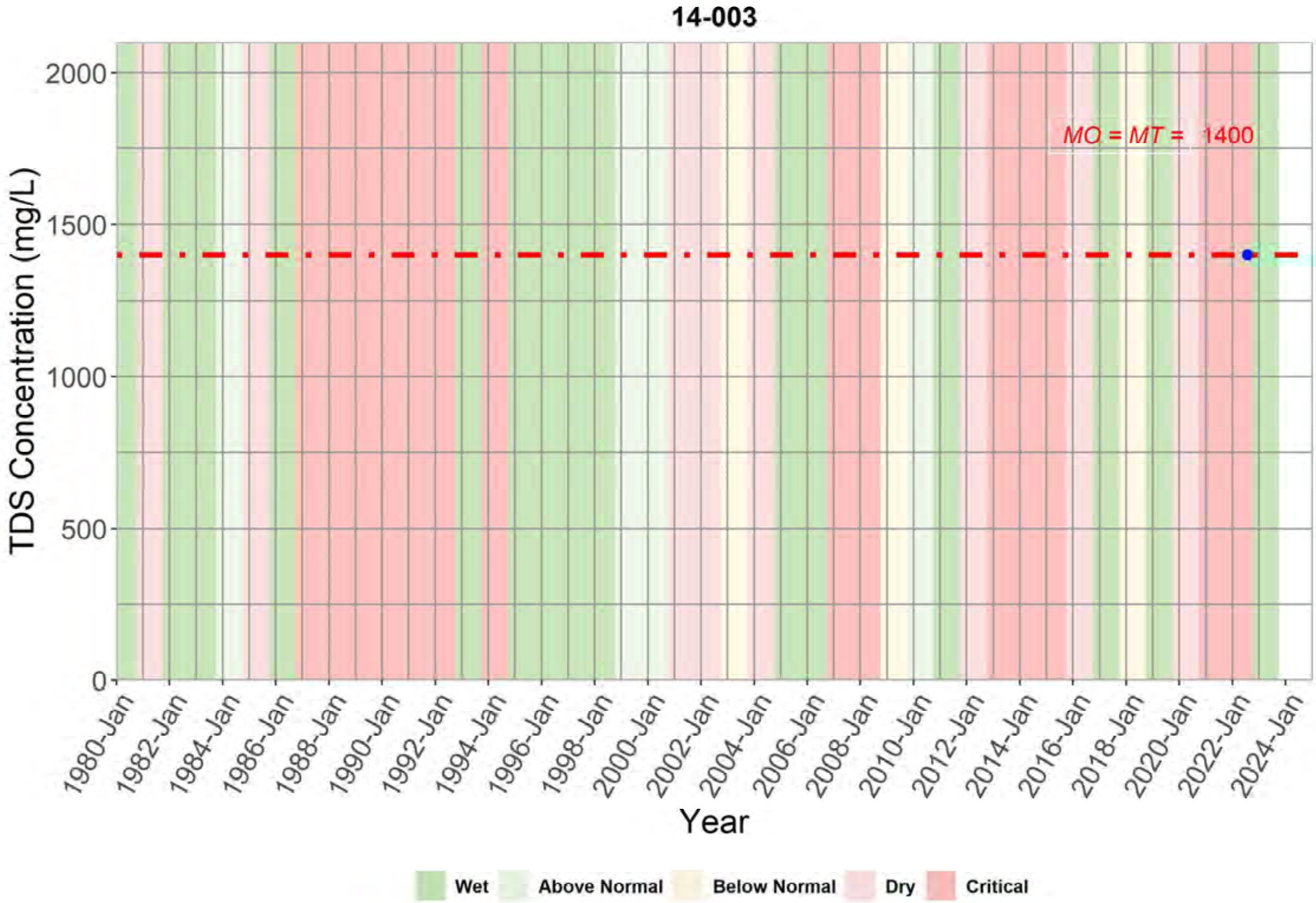


MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

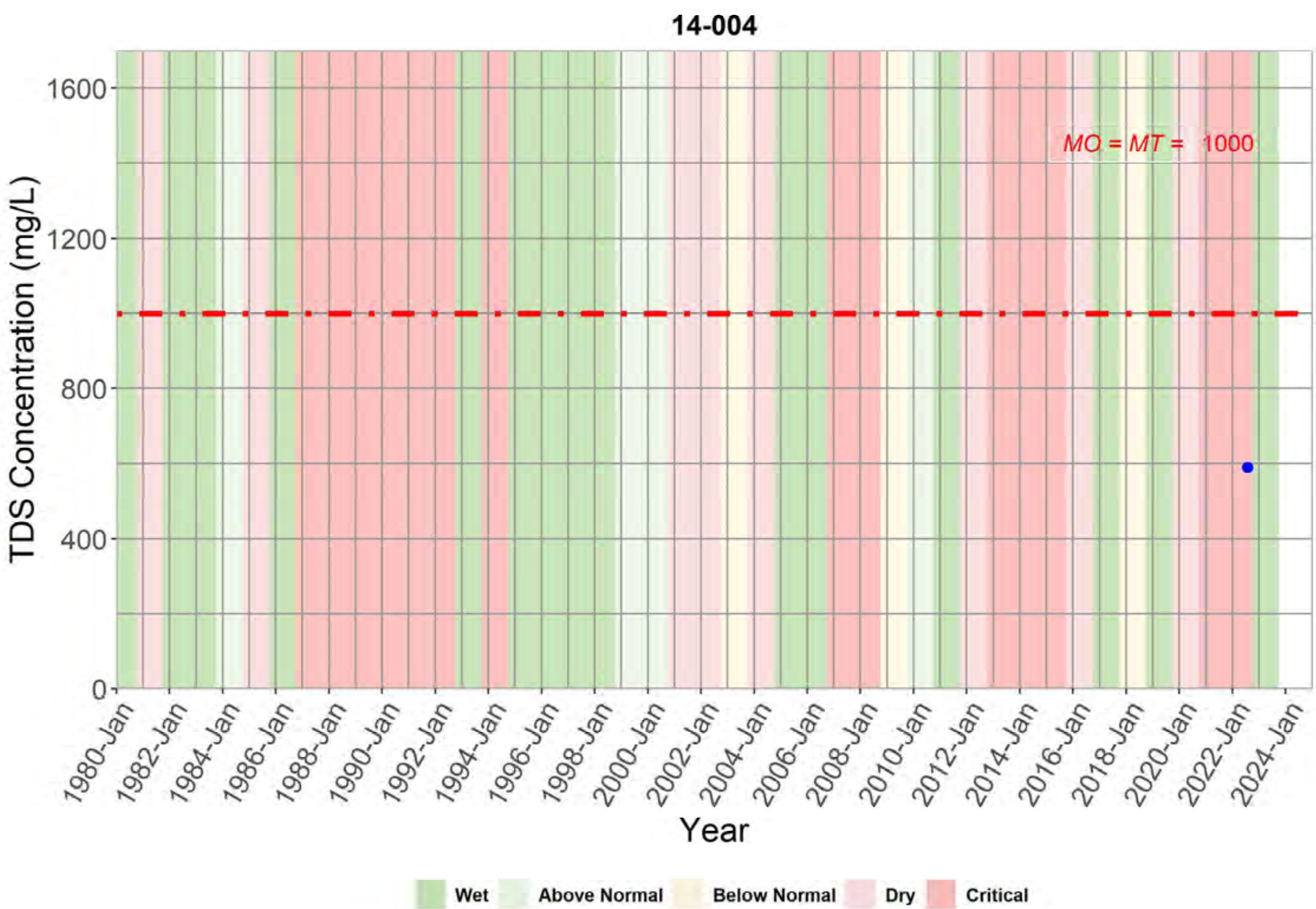
14-002



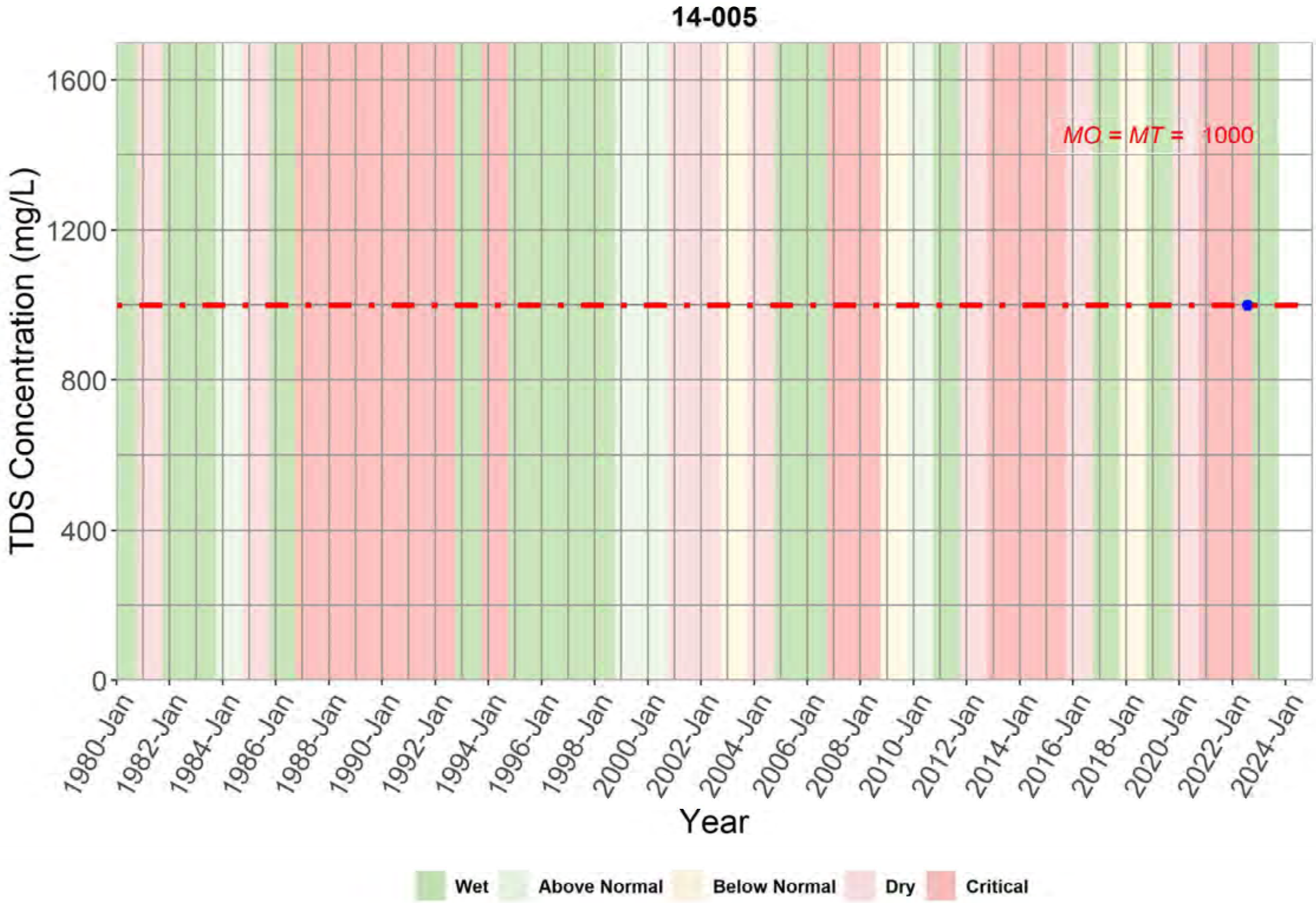
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

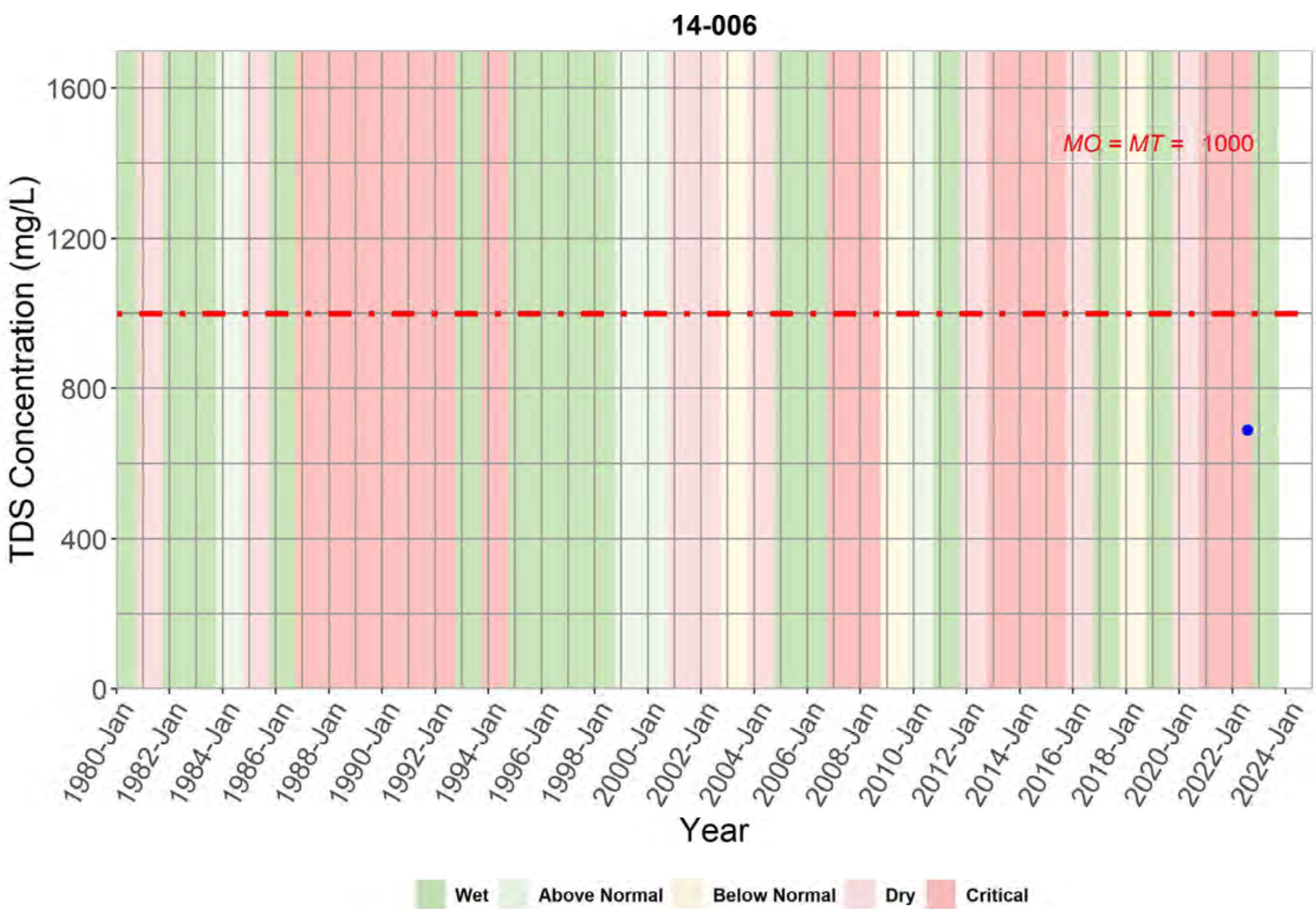


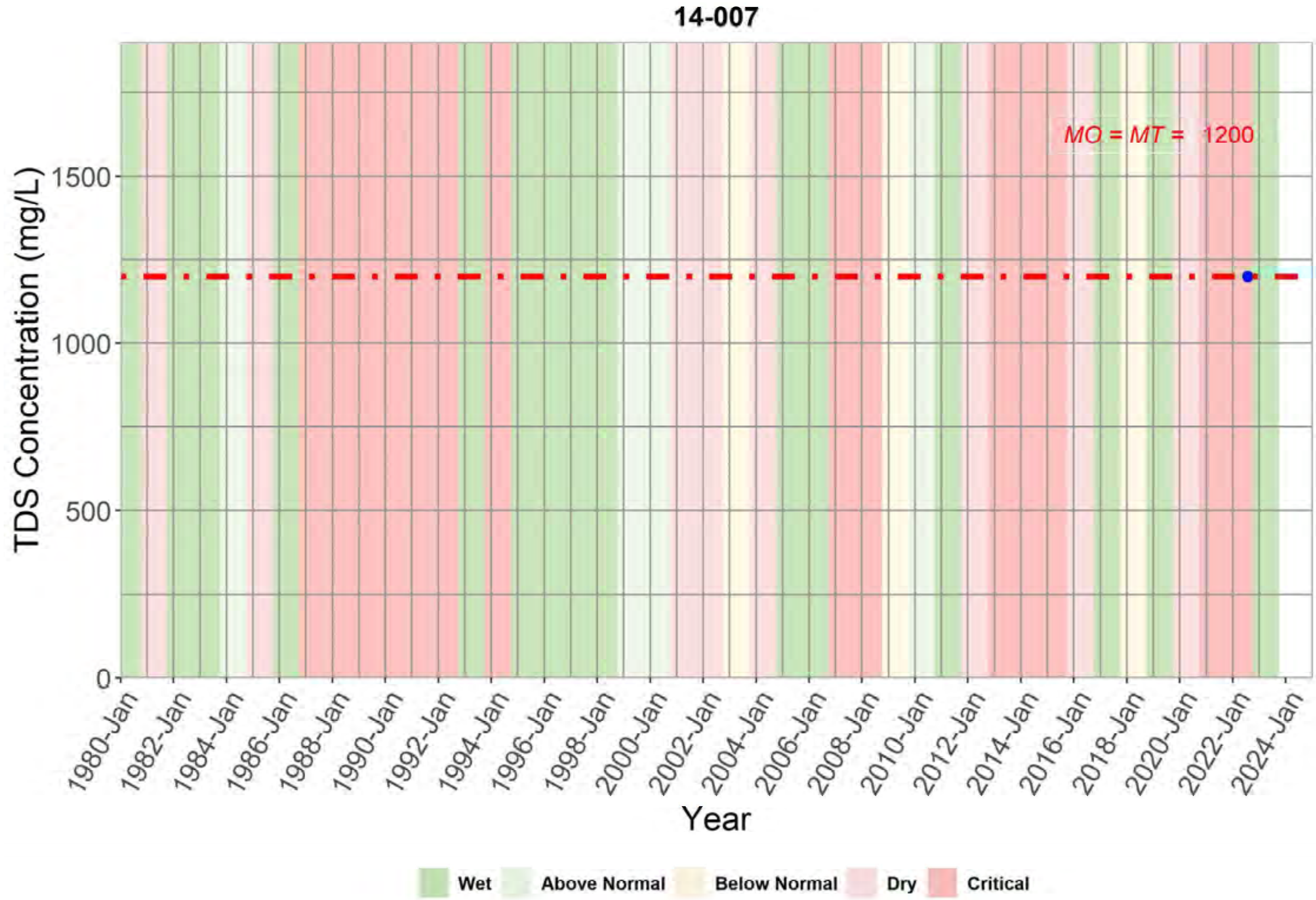
14-003
MO = MT = 1400
TDS Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical



14-004
MO = MT = 1000
TDS Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical


14-005
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


14-006
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


14-007
MO = MT = 1200
TDS Concentration (mg/L)
0
500
1000
1500
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
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2010-Jan
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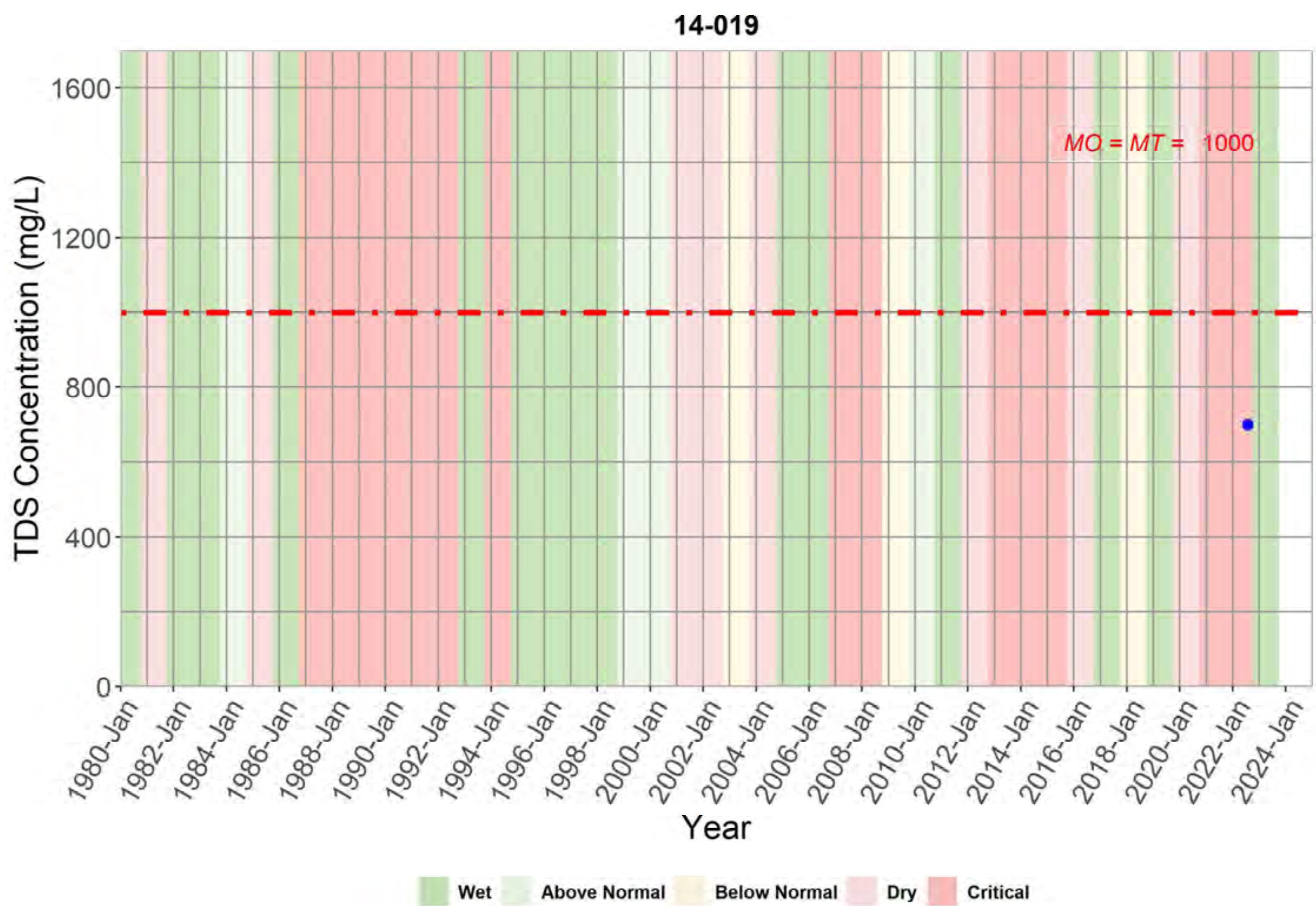
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


14-019
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
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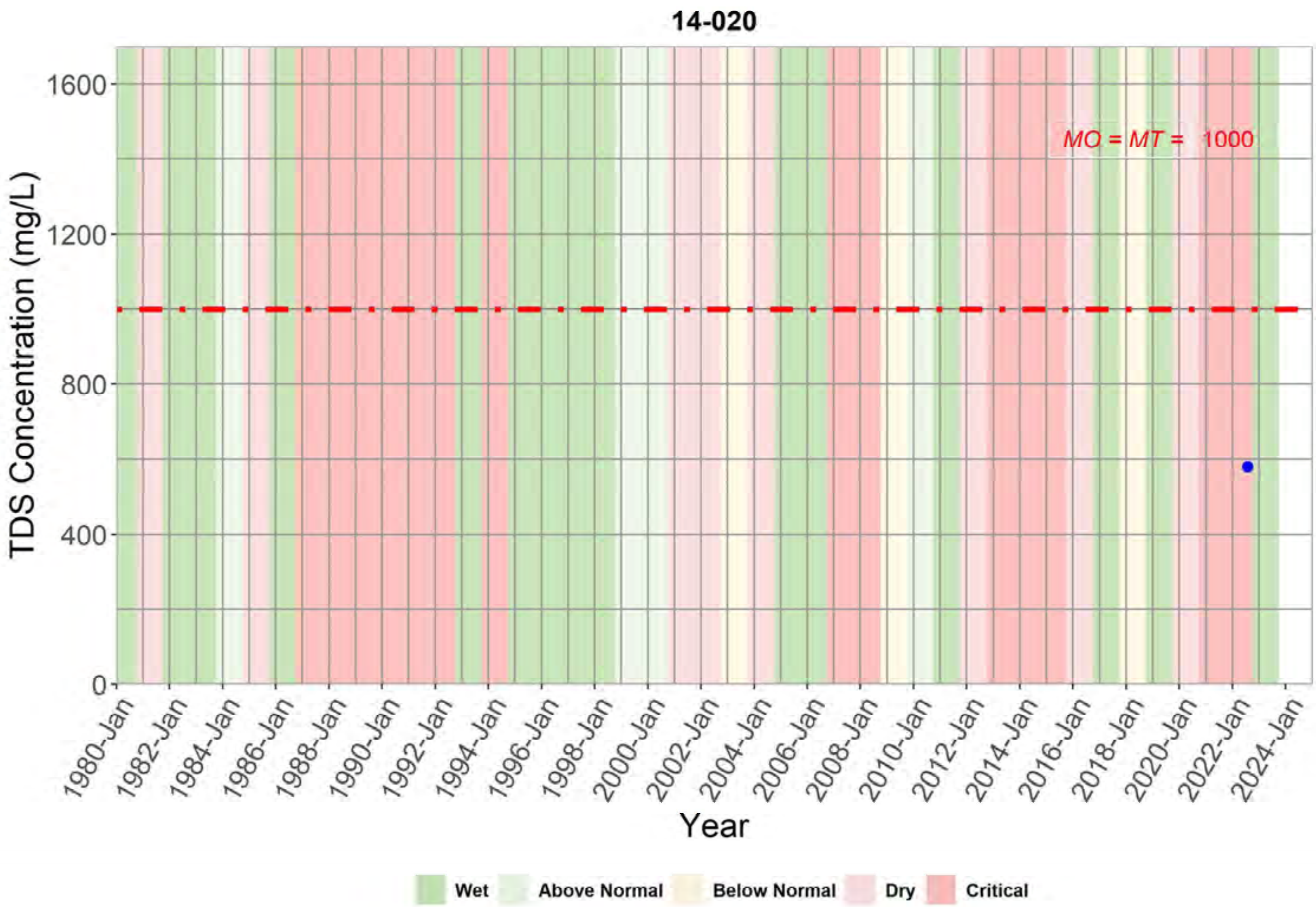
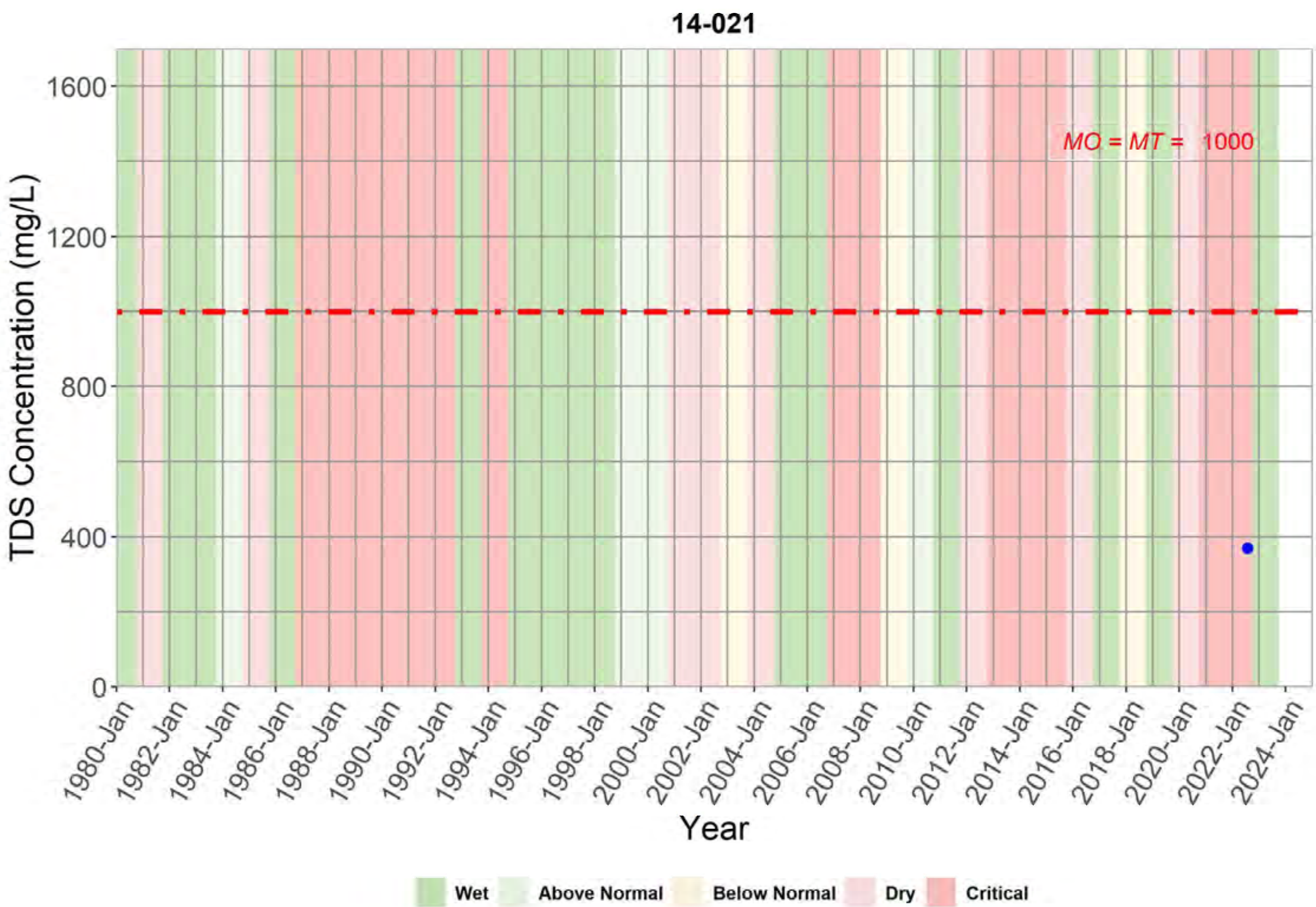
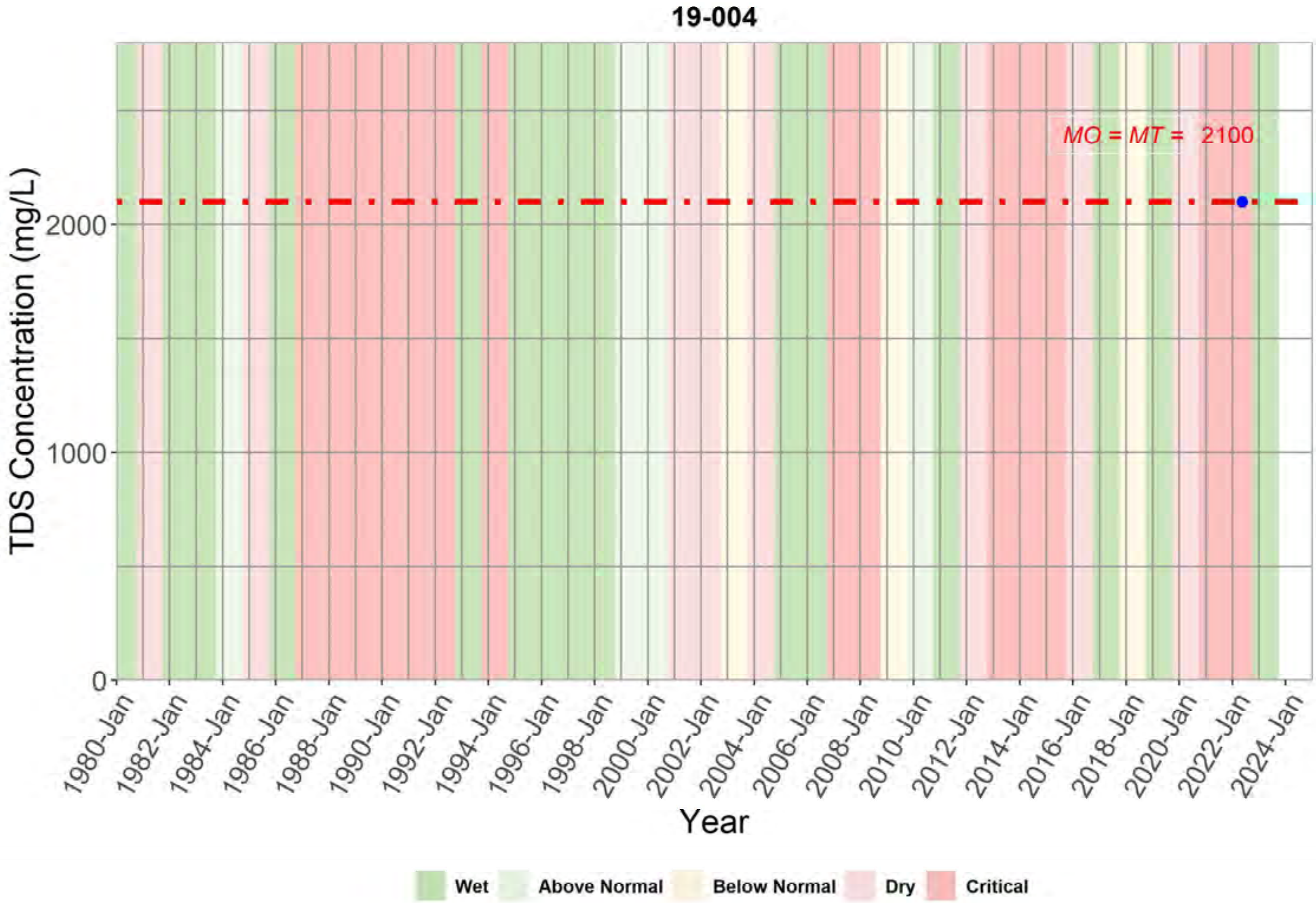
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


14-020
MO = MT = 1000
TDS Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical


14-021
MO = MT = 1000
TDS Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical


19-004
MO = MT = 2100
TDS Concentration (mg/L)
0
1000
2000
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
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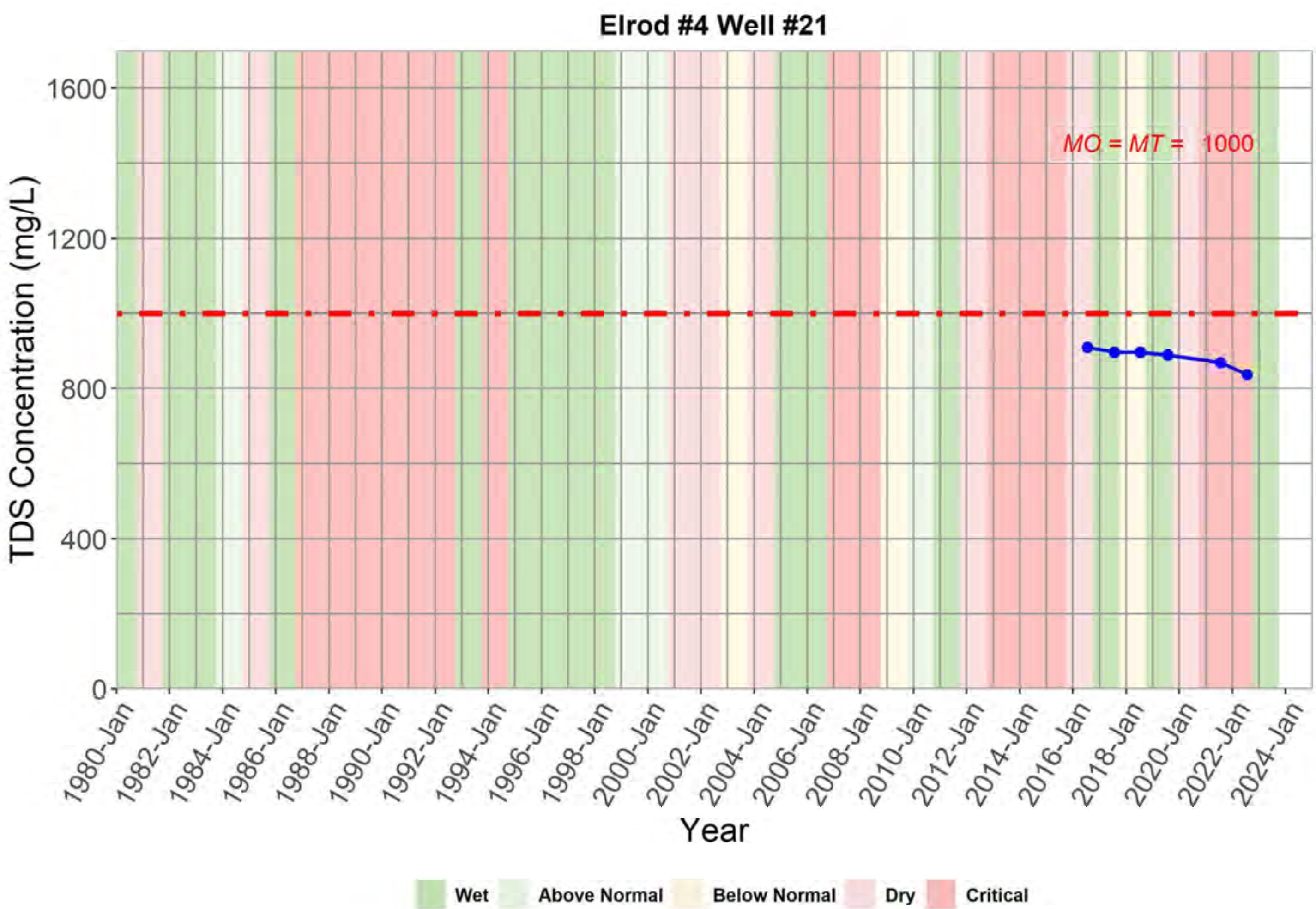
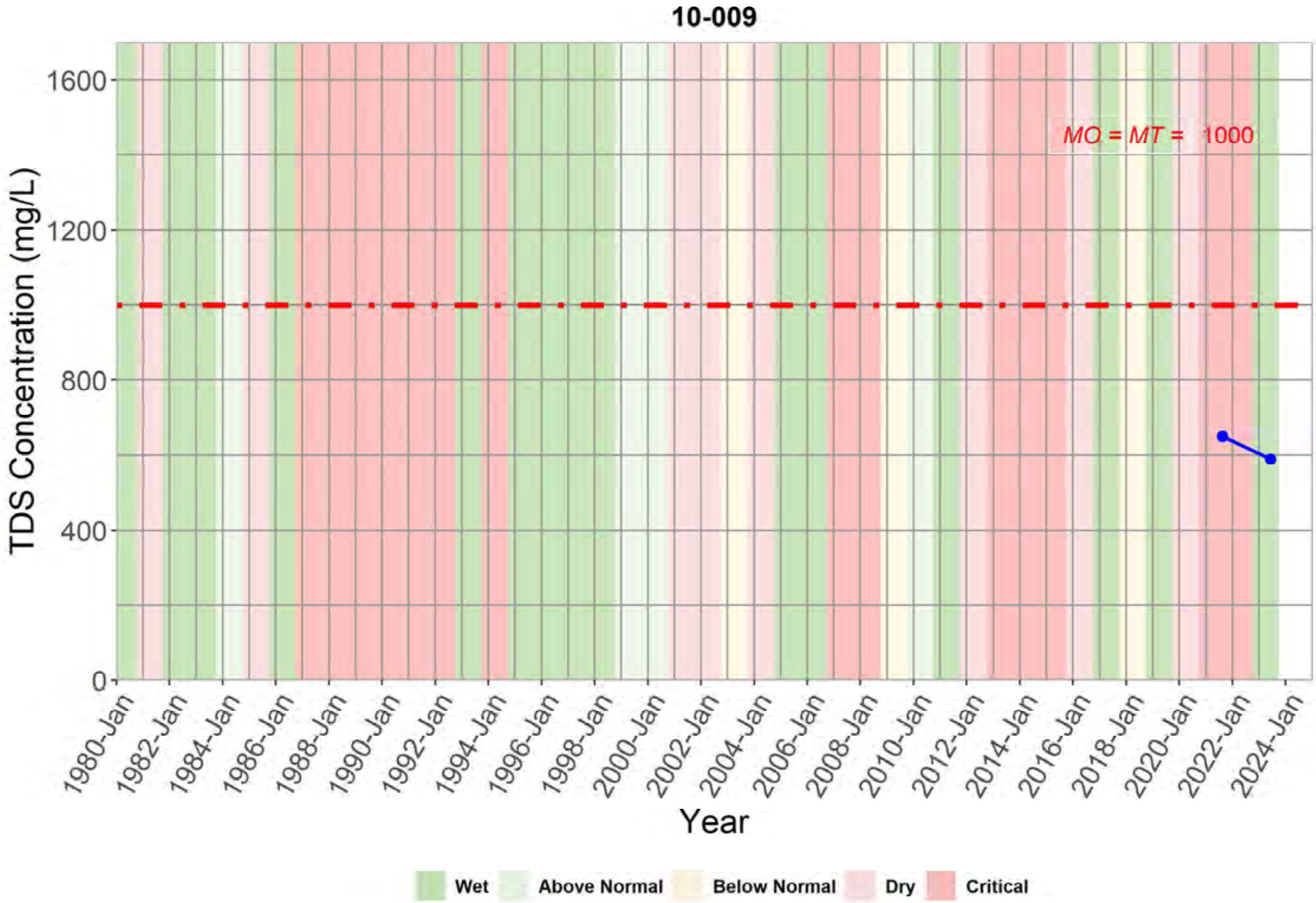
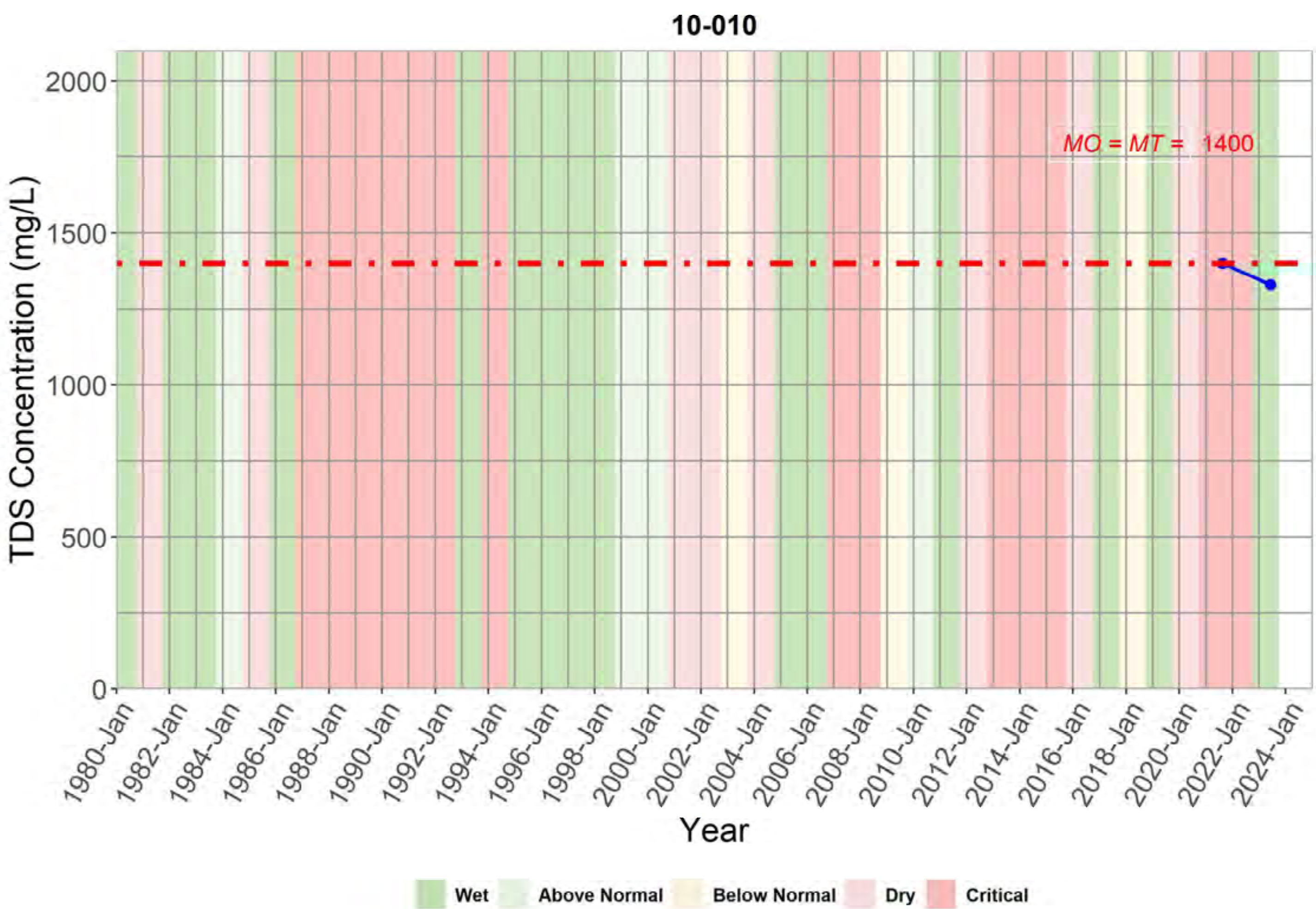
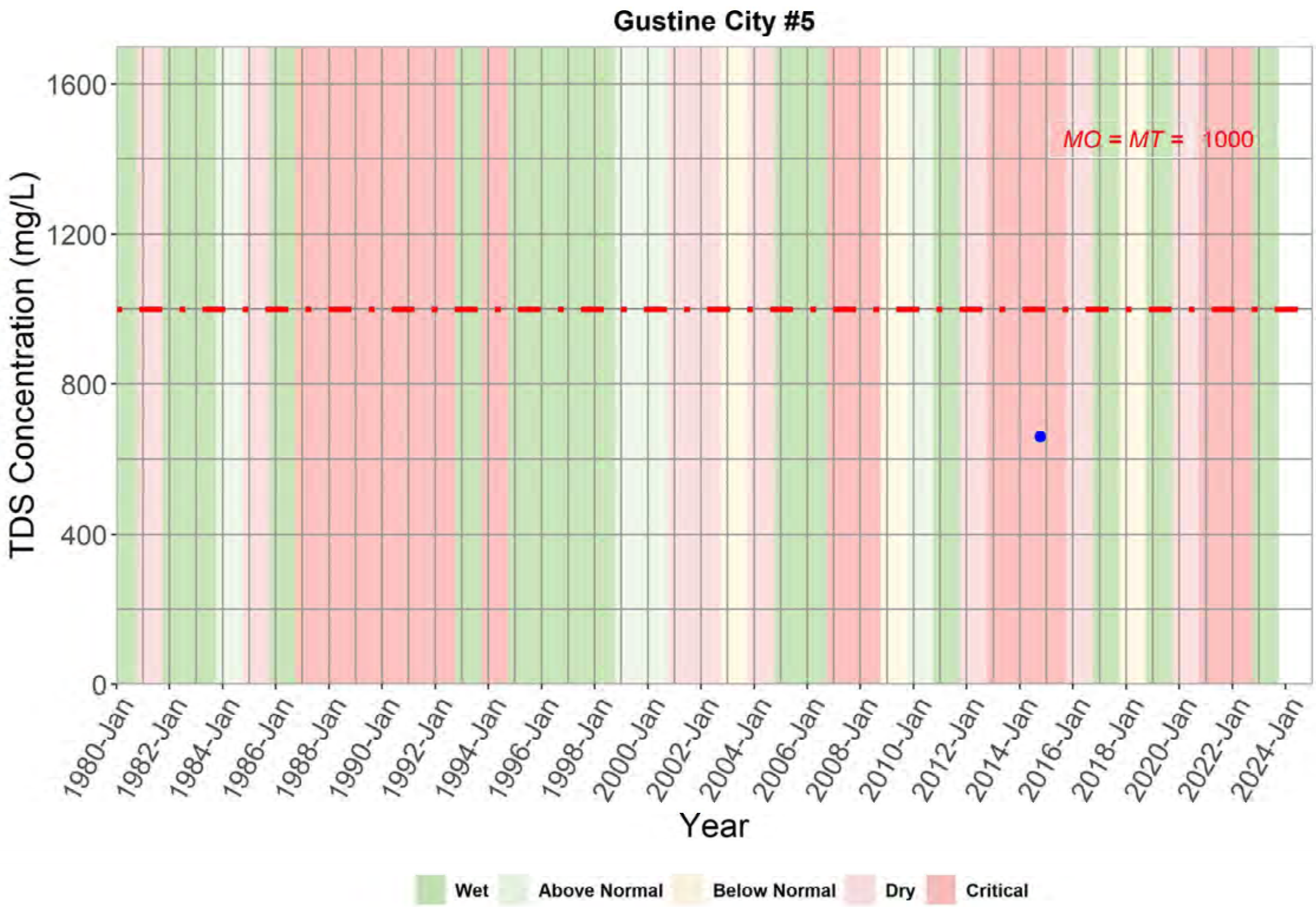
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

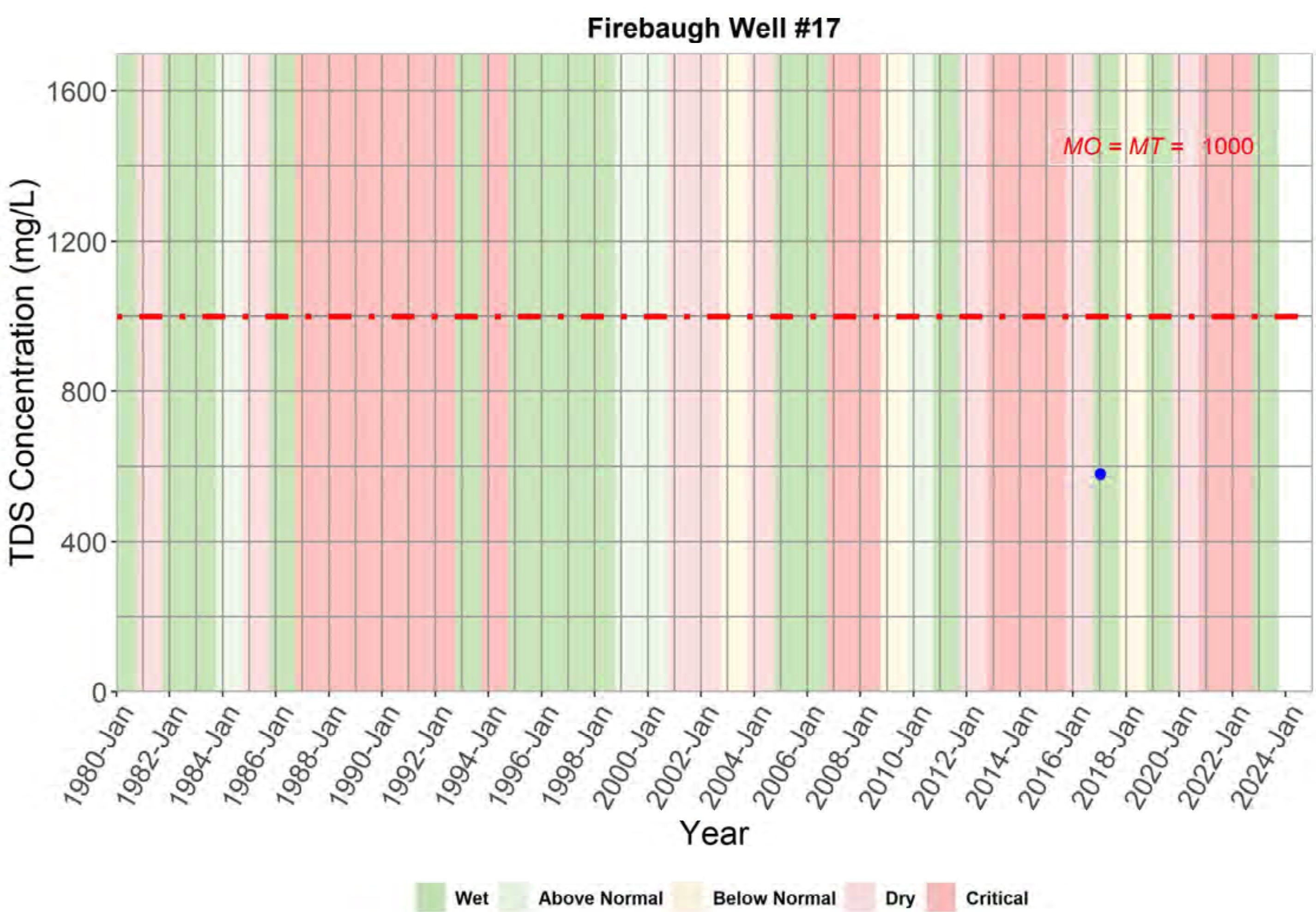

Elrod #4 Well #21
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


10-009
MO = MT = 1000
TDS Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical

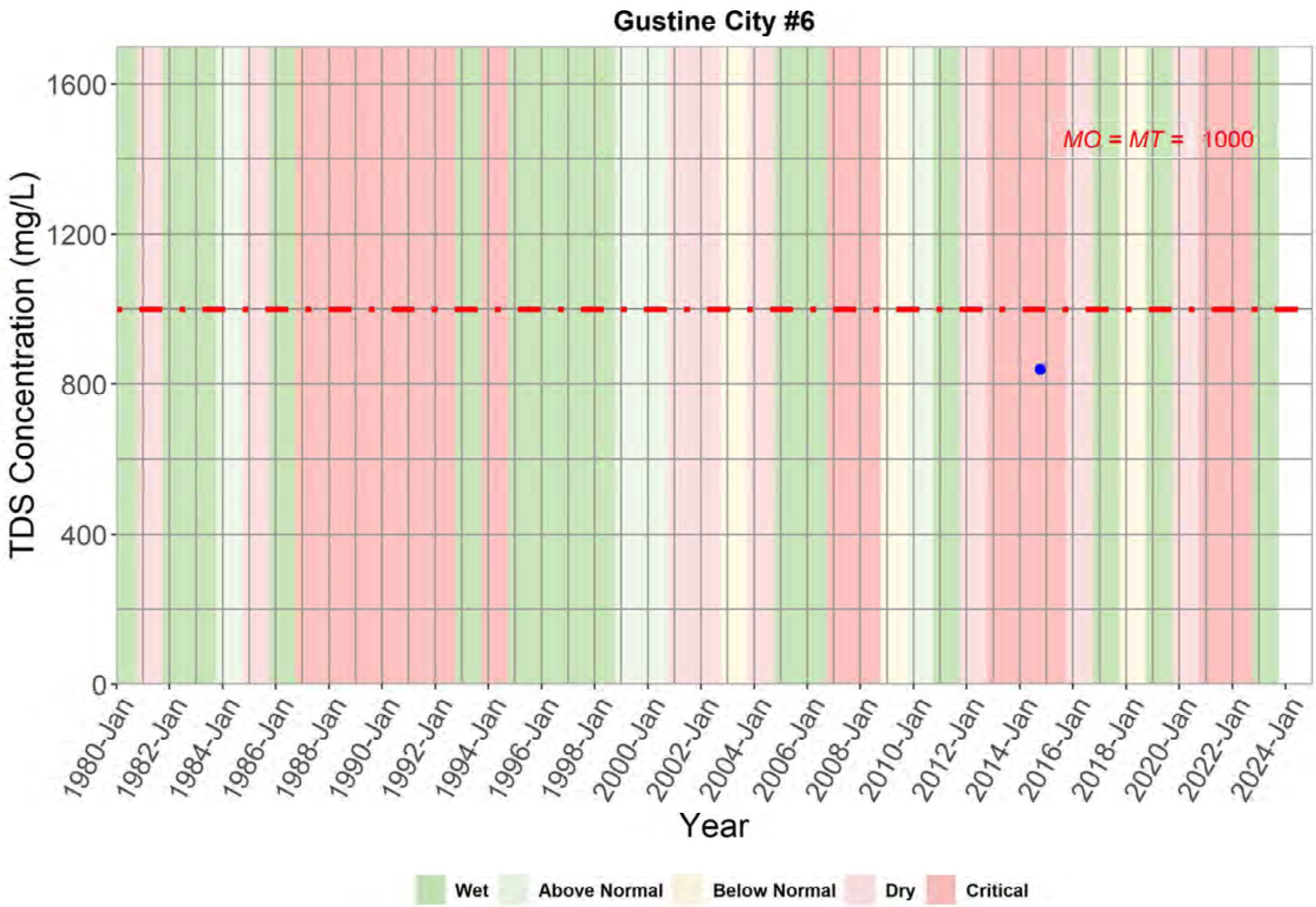

10-010
MO = MT = 1400
TDS Concentration (mg/L)
Year
Wet
Above Normal
Below Normal
Dry
Critical

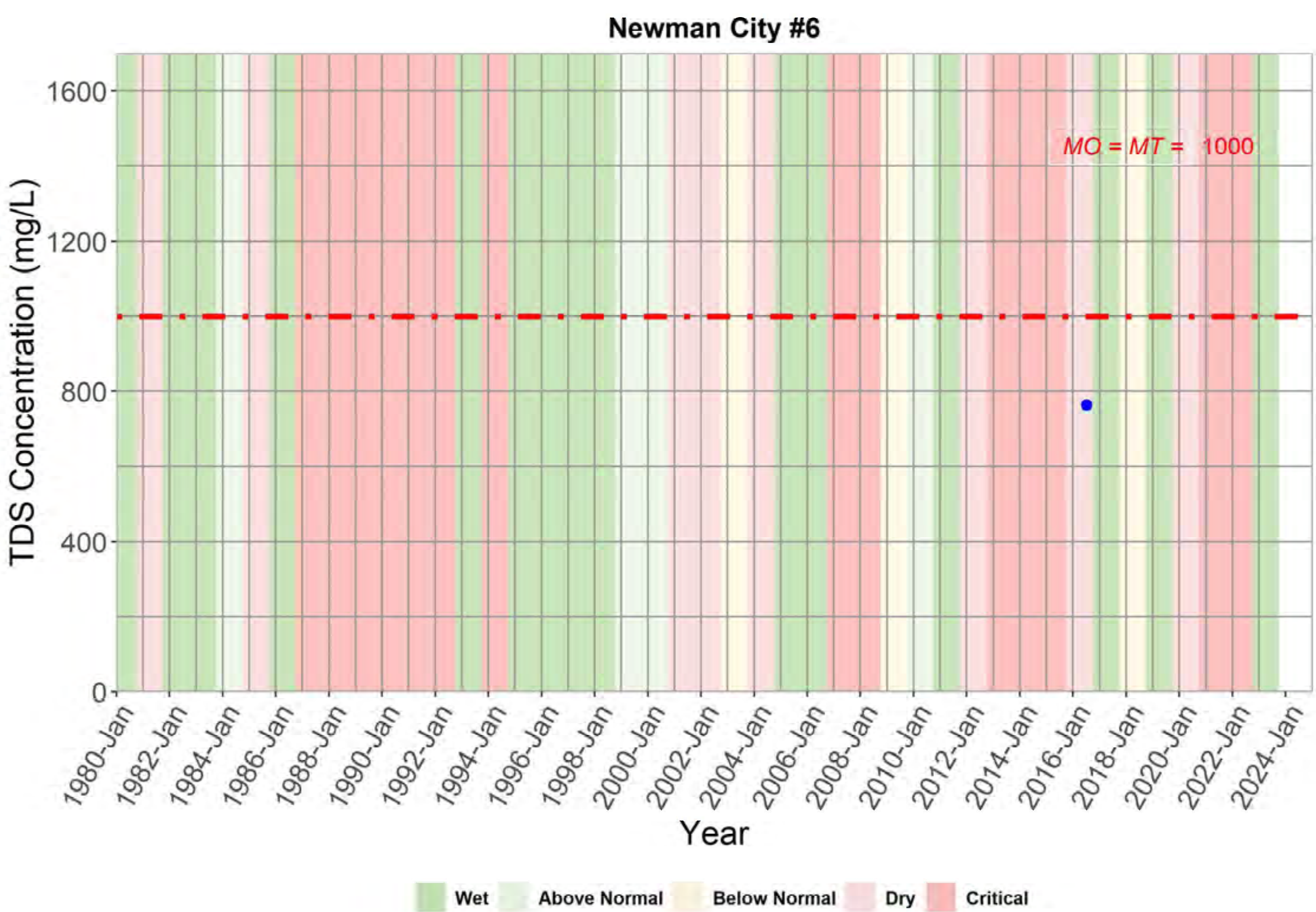


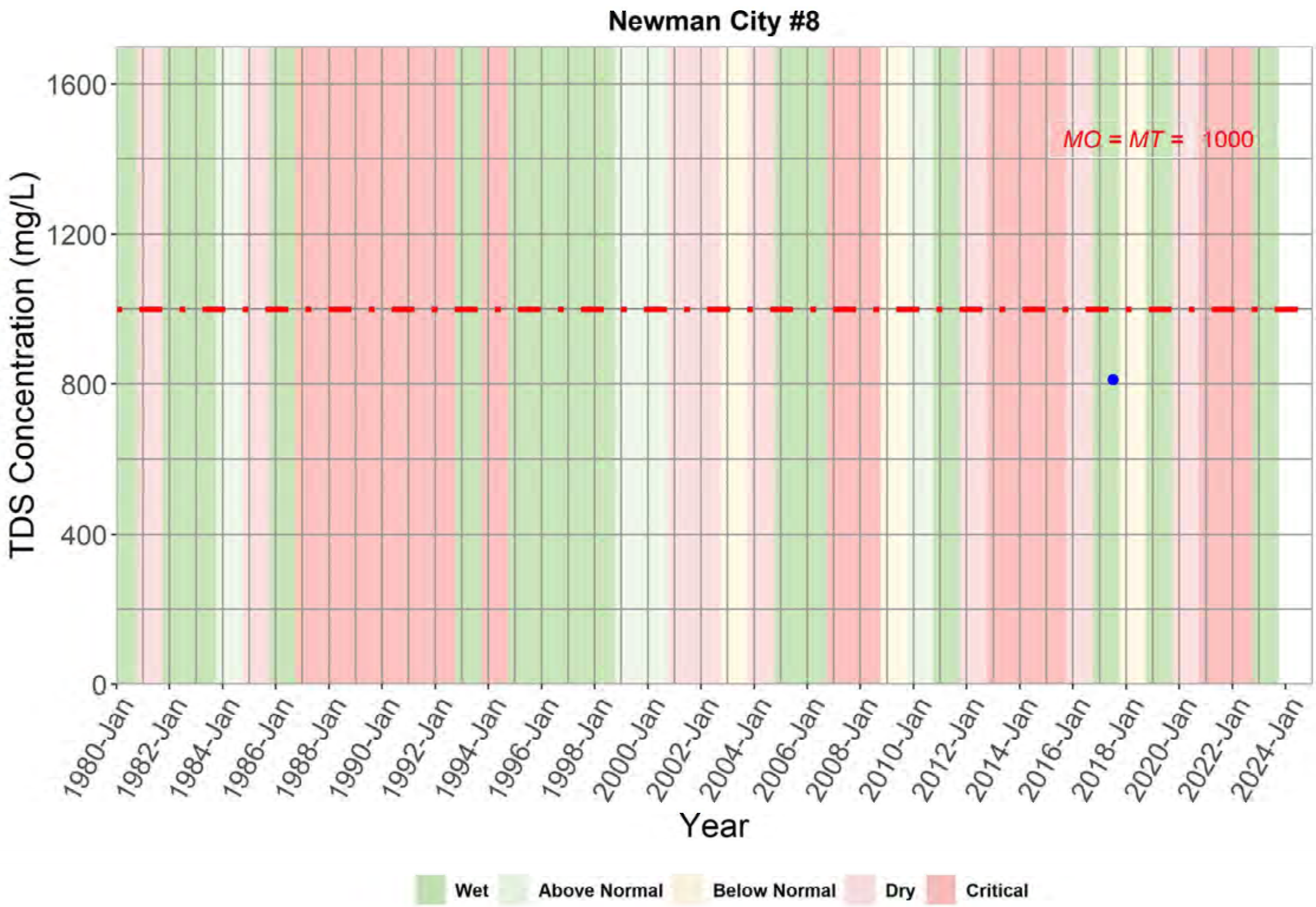
Gustine City #5
MO = MT = 1000
1600
1200
800
400
0
TDS Concentration (mg/L)
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



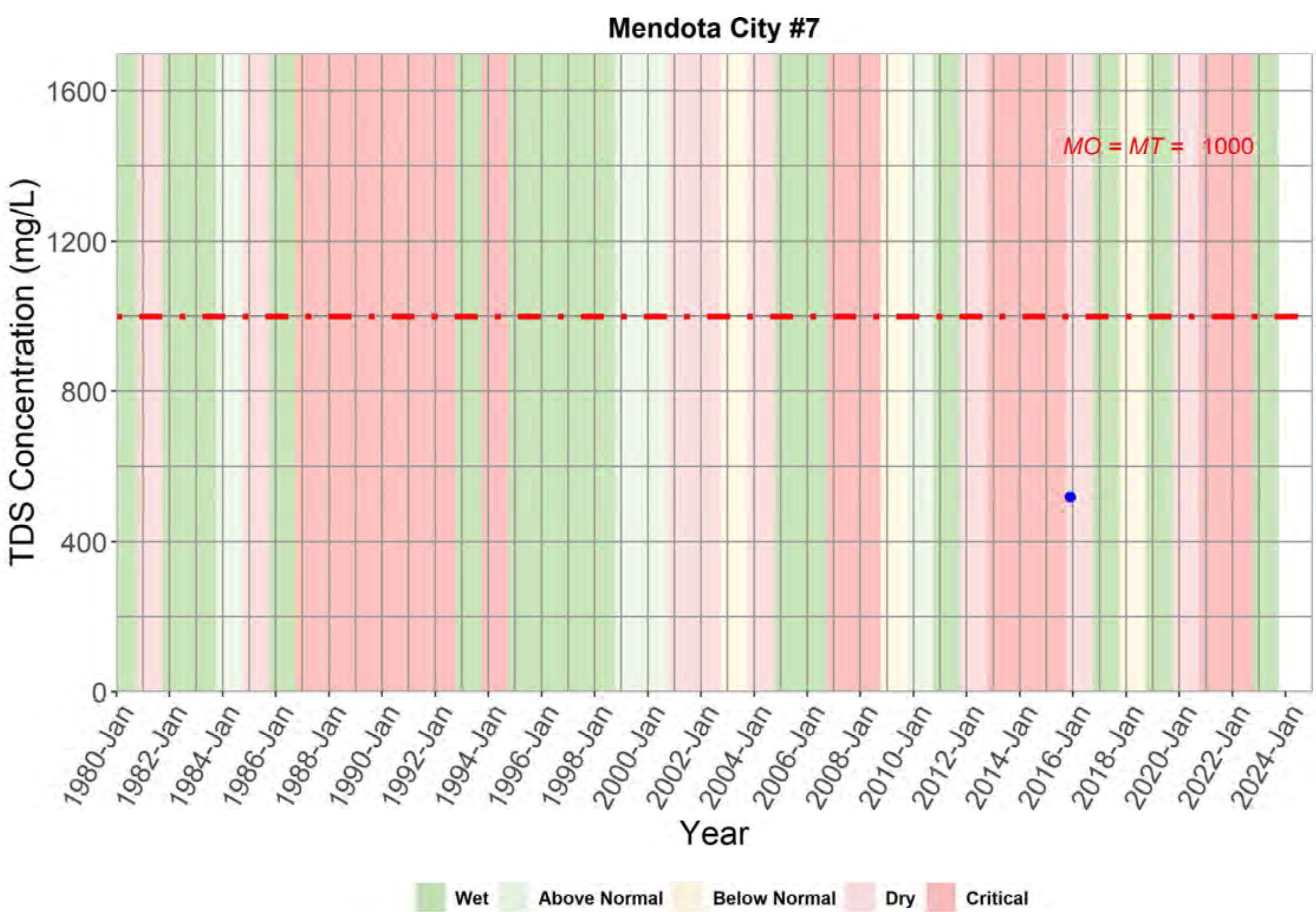
Firebaugh Well #17
MO = MT = 1000
1600
1200
800
400
0
TDS Concentration (mg/L)
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


Gustine City #6
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

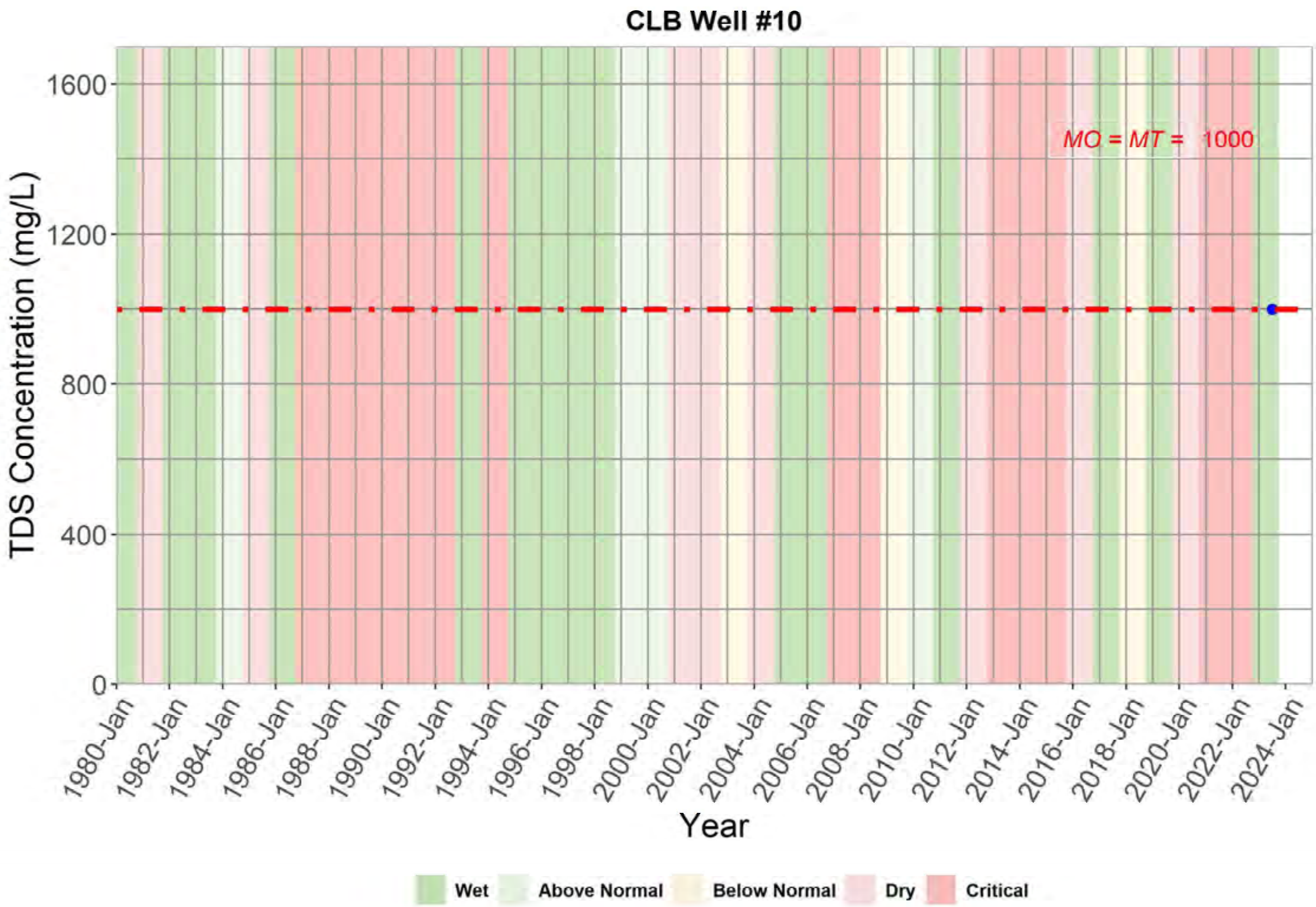

Newman City #6
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



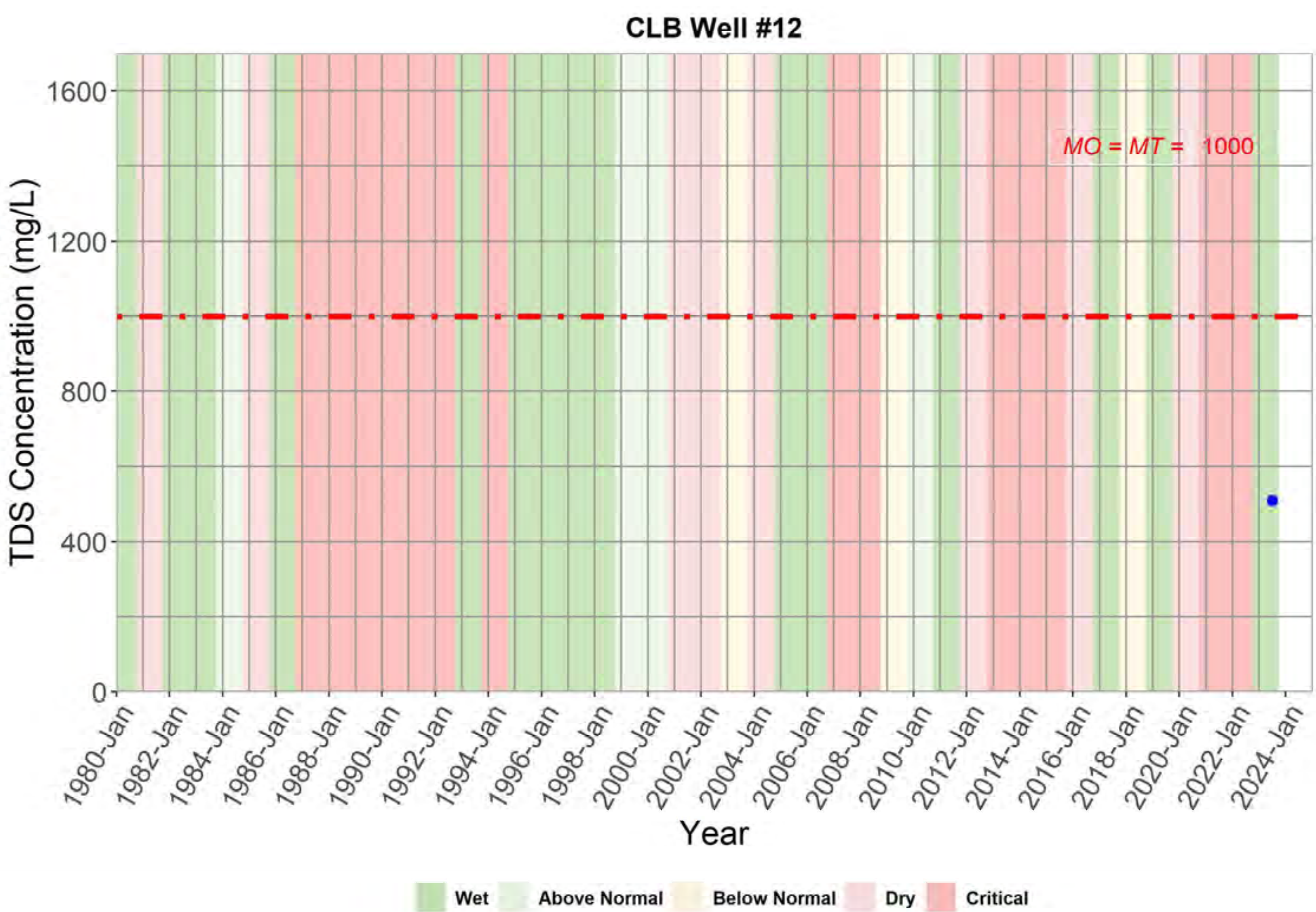
Newman City #8
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
Year
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Wet
Above Normal
Below Normal
Dry
Critical



Mendota City #7
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
Year
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Wet
Above Normal
Below Normal
Dry
Critical

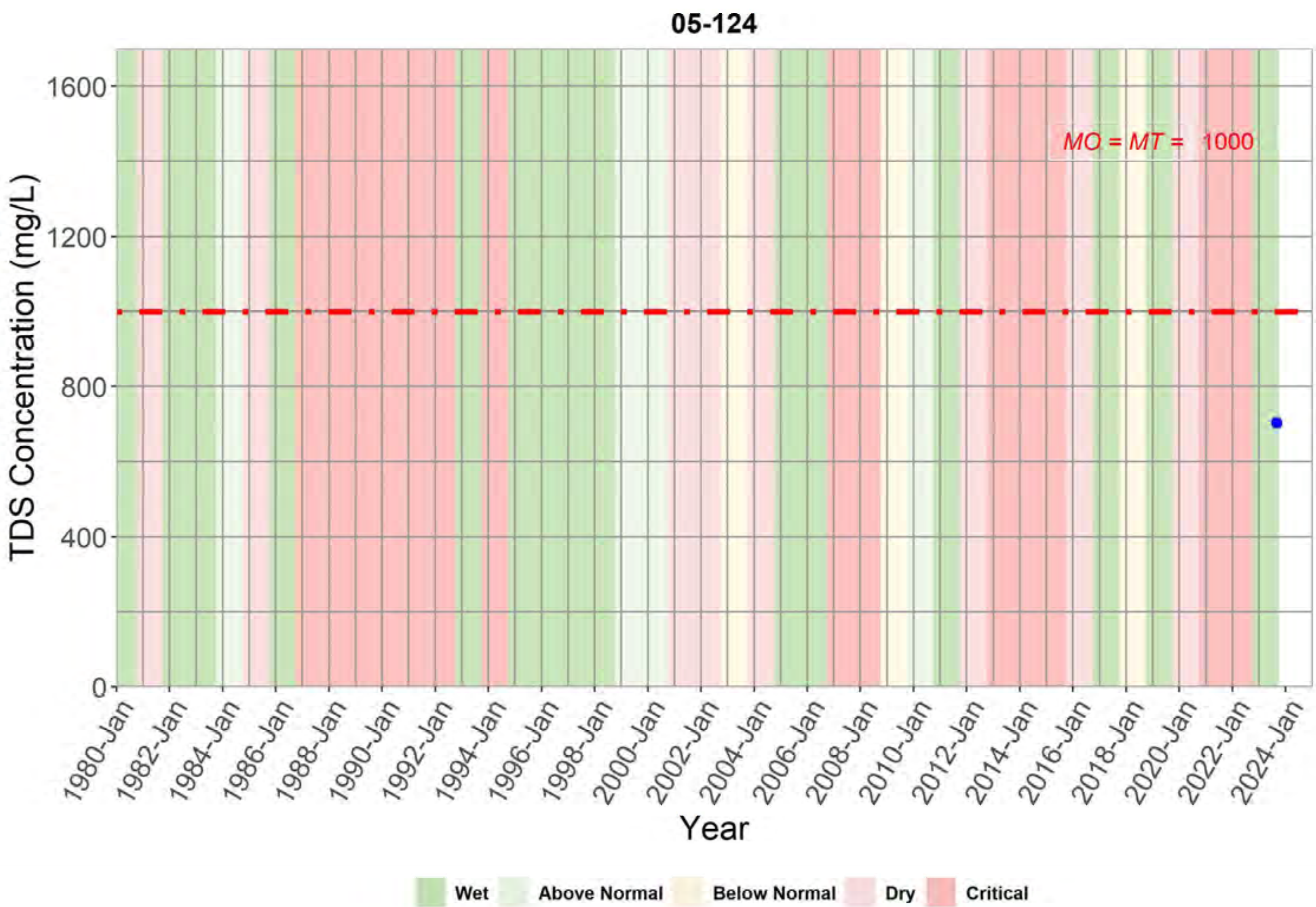


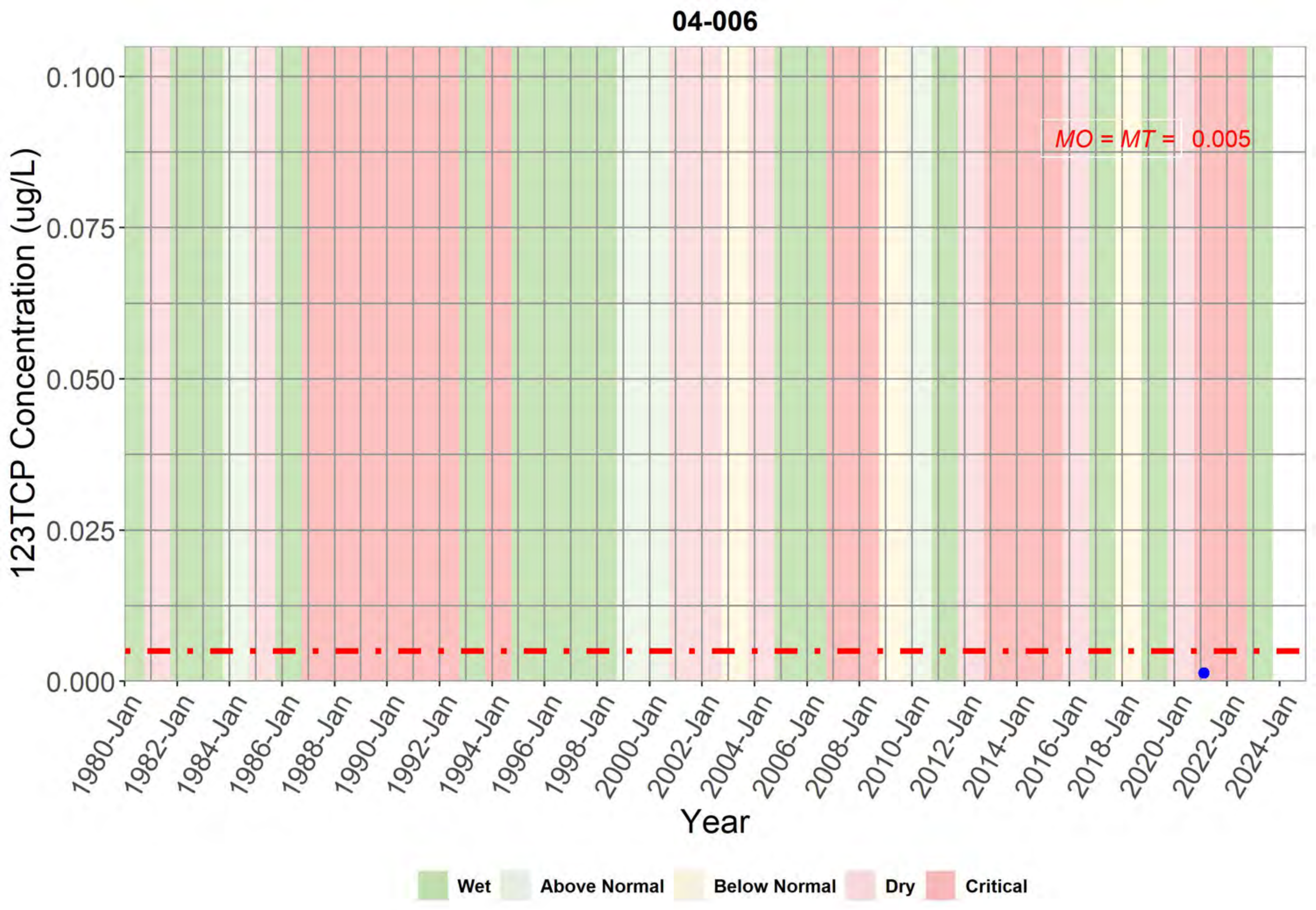
CLB Well #10
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

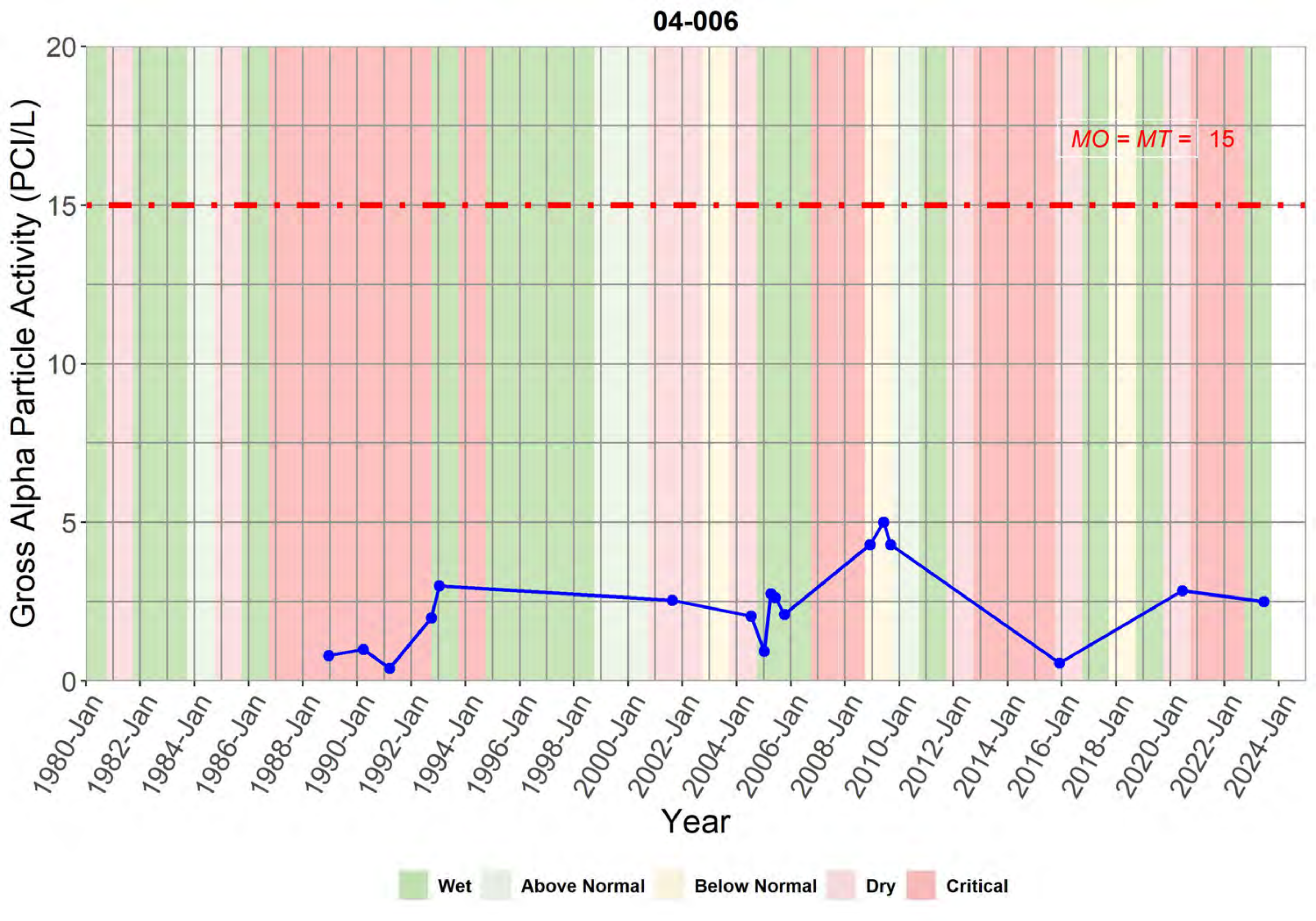


CLB Well #12
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

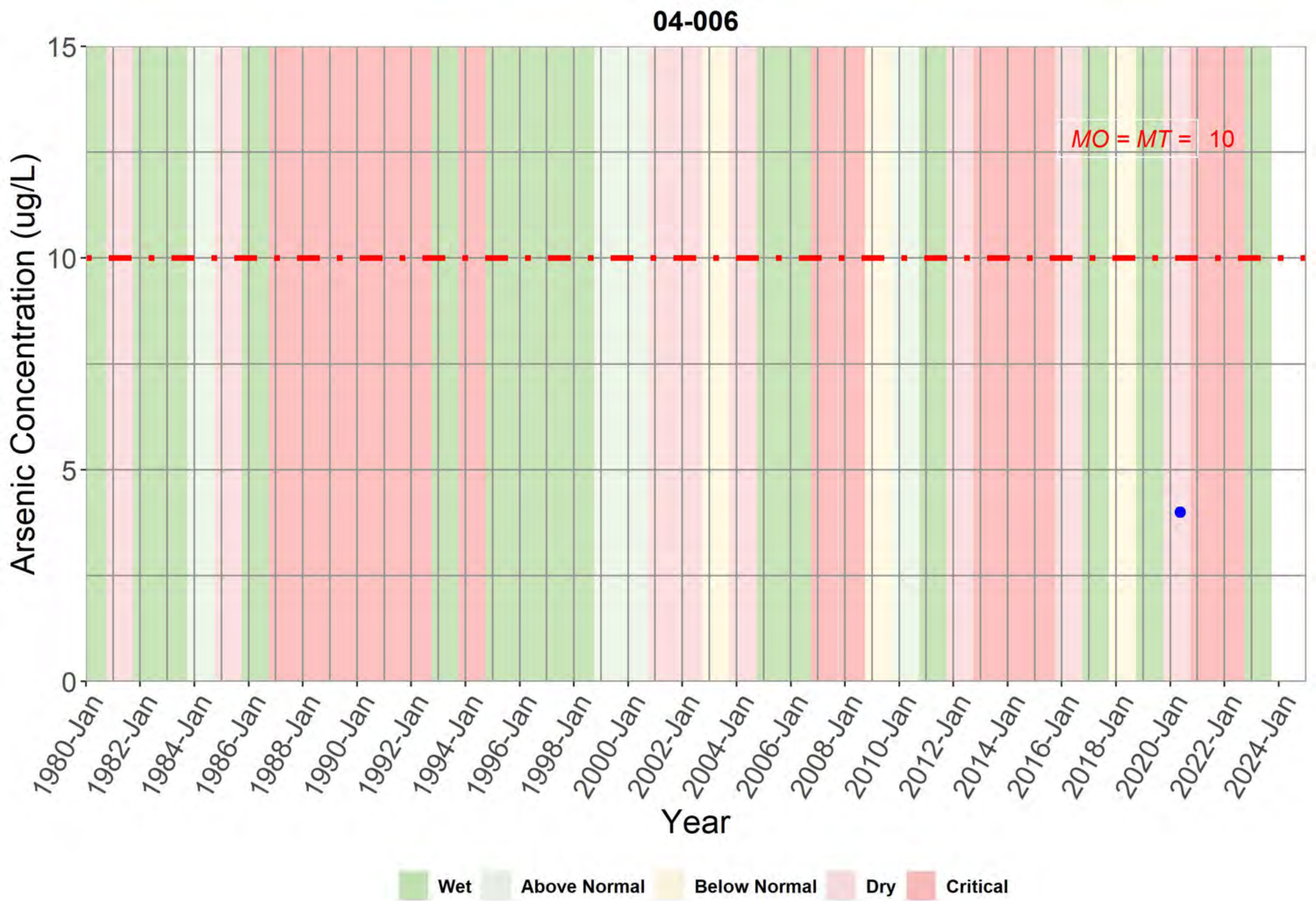

213 River Rd
MO = MT = 1160
TDS Concentration (mg/L)
0
500
1000
1500
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


05-124
MO = MT = 1000
TDS Concentration (mg/L)
0
400
800
1200
1600
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

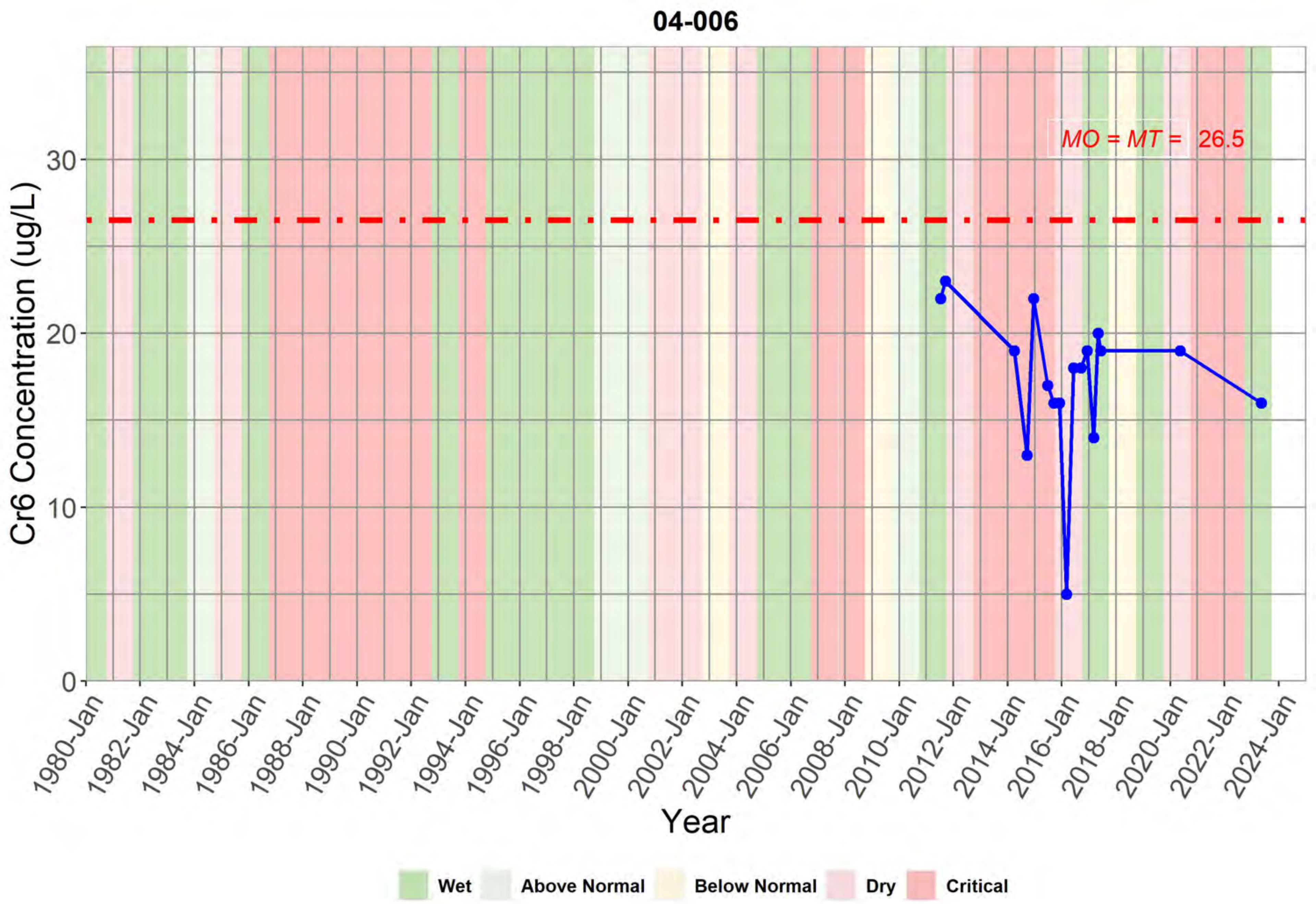

04-006
123TCP Concentration (ug/L)
0.100
0.075
0.050
0.025
0.000
MO = MT = 0.005
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



04-006
Gross Alpha Particle Activity (PCI/L)
MO = MT = 15
20
15
10
5
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical



04-006
MO = MT = 10
Arsenic Concentration (ug/L)
15
10
5
0
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical


04-006
MO = MT = 26.5
Cr6 Concentration (ug/L)
0
10
20
30
1980-Jan
1982-Jan
1984-Jan
1986-Jan
1988-Jan
1990-Jan
1992-Jan
1994-Jan
1996-Jan
1998-Jan
2000-Jan
2002-Jan
2004-Jan
2006-Jan
2008-Jan
2010-Jan
2012-Jan
2014-Jan
2016-Jan
2018-Jan
2020-Jan
2022-Jan
2024-Jan
Year
Wet
Above Normal
Below Normal
Dry
Critical

DELTA-MENDOTA SGMA

Appendix I-2

Water Quality Trends and Correlations with Groundwater Levels

Correlation Between Constituent of Concern Concentrations and Groundwater Elevations

Constituent of Concern	Aquifer	Water Quality Well	Water Level Well	Distance Between Wells (mi)	Months with Water Level and Concentration Data	Spearman's Rho	Spearman's p-value	Kendall's Tau	Kendall's p-value	Pearson's Linear Correlation	Pearson's p-value
1,2,3-Trichloropropane	Lower	CA5010007_002_002	375423N1211955W001	0.41	3	-1	0	-1	0.1172	-0.9841	0.1138
Arsenic	Upper	CA1010005_009_009	CCID 41	0.36	4	-0.8000	0.2000	-0.6667	0.1742	-0.7263	0.2737
		CA1010005_010_010	23-001	0.84	6	0.6377	0.1731	0.5521	0.1260	0.7209	0.1060
		CA1010005_014_014	23-001	0.91	7	0.3214	0.4821	0.3333	0.2931	0.4211	0.3468
		CA1010005_016_016	CCID 41	0.30	8	0.1437	0.7342	0.1818	0.5330	0.1081	0.7989
Gross Alpha Radioactivity	Upper	CA1010021_010_010	10-001	0.83	6	0.7714	0.0724	0.6000	0.0909	0.6597	0.1540
		CA1010021_011_011	10-001	0.60	5	0.6000	0.2848	0.4000	0.3272	0.4809	0.4122
		CA5000061_001_001	07S09E04R003M	0.63	3	-1.0000	0.0000	-1.0000	0.1172	-0.8629	0.3372
Hexavalent Chromium	Lower	CA5010013_005_005	Newman City #6	0.00	5	-0.5000	0.3910	-0.4000	0.3272	-0.3850	0.5222
		CA5010013_006_006	Newman City #6	0.42	5	-0.2000	0.7471	-0.2000	0.6242	-0.1362	0.8272
Nitrate as N	Upper	04-006	04-006	N/A	59	0.0058	0.9651	-0.0075	0.9368	-0.0387	0.7710
		CA2400175_001_001	07-017	0.35	5	-0.1000	0.8729	0.0000	1.0000	0.1051	0.8665
		CA2400175_002_002	07-017	0.35	6	-0.0286	0.9572	0.0667	0.8510	0.0385	0.9422
		CA2400201_001_001	07-017	0.00	5	0.2052	0.7406	0.1054	0.8005	0.5679	0.3179
		CA5000271_001_001	03-002	0.60	4	0.8000	0.2000	0.6667	0.1742	0.6272	0.3728
		CA5010017_005_005	03-002	0.63	4	0.4000	0.6000	0.3333	0.4969	0.6883	0.3117
		MW1S	CCID 63	0.90	4	0.8000	0.2000	0.6667	0.1742	0.9589	0.0411
		MW2S	CCID 63	0.57	4	0.8000	0.2000	0.6667	0.1742	0.7821	0.2179
		MW3S	CCID 63	0.54	4	-0.4000	0.6000	-0.3333	0.4969	-0.9172	0.0828
		MW4S	CCID 63	0.66	4	0.8000	0.2000	0.6667	0.1742	0.5792	0.4208
		MW5S	CCID 63	0.65	4	1.0000	0.0000	1.0000	0.0415	0.6336	0.3664
		MW1S	14-006	0.66	17	-0.0012	0.9963	0.0221	0.9016	0.0456	0.8621
		MW2S	14-006	0.88	20	0.4490	0.0470	0.2902	0.0742	0.4620	0.0403
		MW3D	14-006	0.50	6	0.0870	0.8699	0.1380	0.7021	-0.3789	0.4588
		MW3S	14-006	0.50	14	-0.1460	0.6184	-0.1356	0.5076	-0.3709	0.1916
		MW4D	14-006	0.50	5	0.8000	0.1041	0.6000	0.1416	0.7968	0.1065
		MW4S	14-006	0.50	15	-0.3184	0.2474	-0.2404	0.2149	-0.2332	0.4029
		MW5D	14-006	0.60	3	0.5000	0.6667	0.3333	0.6015	-0.0362	0.9769
		MW5S	14-006	0.60	17	0.2176	0.4016	0.1833	0.3176	0.0866	0.7411
		L10004020387-MMW-1A	13-003	0.39	8	0.0952	0.8225	0.0714	0.8046	0.3210	0.4382
		L10004020387-MMW-2A	13-003	0.22	7	0.7143	0.0713	0.5238	0.0985	0.5168	0.2350
		L10004020387-MMW-3A	13-003	0.21	5	0.1000	0.8729	0.0000	1.0000	0.4720	0.4221
		L10004020387-MMW-5A	13-003	0.31	8	-0.1205	0.7763	-0.1482	0.6152	0.0561	0.8951
		USGS-372101120583501	07S09E04R003M	0.20	4	0.4000	0.6000	0.3333	0.4969	-0.3108	0.6892
		USGS-372101120583502	07S09E04R003M	0.20	3	0.5000	0.6667	0.3333	0.6015	0.1575	0.8993

Correlation Between Constituent of Concern Concentrations and Groundwater Elevations

Constituent of Concern	Aquifer	Water Quality Well	Water Level Well	Distance Between Wells (mi)	Months with Water Level and Concentration Data	Spearman's Rho	Spearman's p-value	Kendall's Tau	Kendall's p-value	Pearson's Linear Correlation	Pearson's p-value
		USGS-372101120583503	07S09E04R003M	0.20	4	0.2000	0.8000	0	1	-0.3120	0.6880
	Lower	CA5000427_001_001	373887N1211126W001	0.28	4	-0.8000	0.2000	-0.6667	0.1742	-0.7643	0.2357
		CA5000427_002_002	373887N1211126W001	0.24	4	-0.4000	0.6000	-0.3333	0.4969	-0.2444	0.7556
		CA5010013_005_005	Newman City #6	0.00	9	-0.2500	0.5165	0	1	-0.1136	0.7711
		CA5010013_006_006	Newman City #6	0.42	9	-0.1674	0.6669	-0.0845	0.7532	-0.0847	0.8284
Total Dissolved Solids	Upper	01-005	01-005	N/A	3	0.5000	0.6667	0.3333	0.6015	0.7129	0.4948
		04-006	04-006	N/A	4	0.8333	0.1667	0.8000	0.1260	0.9459	0.0541
		07-003	07-003	N/A	3	0.8660	0.3333	0.8165	0.2207	0.7167	0.4913
		07-017	07-017	N/A	3	0.0000	1.0000	0.0000	1.0000	0.2662	0.8285
		10-001	10-001	N/A	4	-0.4000	0.6000	-0.3333	0.4969	-0.6441	0.3559
		10-003	10-001	0.00	4	-0.2000	0.8000	0	1	-0.6337	0.3663
		10-005	10-001	0.00	3	-0.5000	0.6667	-0.3333	0.6015	-0.7824	0.4280
		12-008	13-002	0.33	5	-0.2887	0.6376	-0.2582	0.5637	-0.2361	0.7022
		12-009	13-001	0.97	12	-0.7063	0.0102	-0.5152	0.0197	-0.7461	0.0053
		13-005	12-001	0.86	6	-1	0	-1	0	-0.8267	0.0424
		CA1010021_003_003	13-003	0.67	15	0.0198	0.9442	0.0000	1.0000	-0.0239	0.9325
		CA1010021_004_004	13-003	0.73	8	0.0482	0.9098	0.0000	1.0000	0.3817	0.3507
		CA1010021_010_010	10-001	0.83	57	0.1270	0.3467	0.0893	0.3370	0.0989	0.4642
		CA1010021_011_011	10-001	0.60	56	0.0777	0.5694	0.0448	0.6416	0.1716	0.2061
		CA2400201_001_001	07-017	0.00	3	-1	1	0	1	-0.6250	0.5702
		CA5010017_005_005	03-002	0.63	3	-0.5000	0.6667	-0.3333	0.6015	0.2097	0.8655
		Elrod #4 Well #21	Elrod #4 Well #21	N/A	6	0.6717	0.1440	0.5930	0.1129	0.7398	0.0928
		MW1S	CCID 63	0.90	4	0.8000	0.2000	0.6667	0.1742	0.9332	0.0668
		MW2S	CCID 63	0.57	4	1.0000	0.0000	1.0000	0.0415	0.7534	0.2466
		MW3S	CCID 63	0.54	4	0.4000	0.6000	0.3333	0.4969	-0.3294	0.6706
		MW4S	CCID 63	0.66	4	0.8000	0.2000	0.6667	0.1742	0.6729	0.3271
		MW5S	CCID 63	0.65	4	0.4000	0.6000	0.3333	0.4969	0.5215	0.4785
		MW1S	14-006	0.66	18	0	1	0	1	0.1986	0.4295
		MW2S	14-006	0.88	20	0.1527	0.5205	0.1210	0.4699	0.0985	0.6796
		MW3D	14-006	0.50	6	0.0000	1.0000	0.0000	1.0000	-0.0752	0.8874
		MW3S	14-006	0.50	14	0.2715	0.3477	0.1911	0.3491	0.3877	0.1708
		MW4D	14-006	0.50	5	-0.4000	0.5046	-0.4000	0.3272	-0.1433	0.8182
		MW4S	14-006	0.50	15	0.2865	0.3005	0.2125	0.2895	0.3797	0.1628
		MW5D	14-006	0.60	3	0.0000	1.0000	0.0000	1.0000	-0.0955	0.9391
		MW5S	14-006	0.60	17	0.0944	0.7186	0.0720	0.7023	0.0745	0.7762

Correlation Between Constituent of Concern Concentrations and Groundwater Elevations

Constituent of Concern	Aquifer	Water Quality Well	Water Level Well	Distance Between Wells (mi)	Months with Water Level and Concentration Data	Spearman's Rho	Spearman's p-value	Kendall's Tau	Kendall's p-value	Pearson's Linear Correlation	Pearson's p-value
		L10004020387-MMW-1A	13-003	0.39	8	-0.3713	0.3652	-0.3273	0.2618	-0.7082	0.0493
		L10004020387-MMW-2A	13-003	0.22	9	-0.2605	0.4984	0	0	0.0250	0.9491
		L10004020387-MMW-3A	13-003	0.21	9	0.7000	0.0358	1	0	0.4590	0.2140
		L10004020387-MMW-4	13-003	0.20	8	0.2994	0.4713	0.1818	0.5330	0.7571	0.0296
		L10004020387-MMW-5A	13-003	0.31	9	-0.6044	0.0847	-0.4125	0.1341	-0.7086	0.0326
		T10000000687-MW-14	04-006	0.95	10	0	1	0	0.5247	0.1240	0.7330
		T10000000687-MW-6	04-006	0.98	10	-0.5366	0.1098	-0.3865	0.1253	-0.4390	0.2043
		T10000000687-MW-9	04-006	0.98	10	0.0854	0.8146	0.0682	0.7868	0.1646	0.6496
	Lower	01-003	01-003	N/A	3	1	0	1	0.2207	0.9791	0.1304
		01-007	01-007	N/A	3	-1	1	0	1	-0.6330	0.5636
		01-008	01-008	N/A	3	0	1	0.0000	1.0000	0.3342	0.7831
		02-002	02-002	N/A	3	1.0000	0.0000	1.0000	0.1172	0.8885	0.3035
		06-001	06-001	N/A	3	-0.5000	0.6667	0	1	-0.9599	0.1809
		07-002	07-002	N/A	3	-0.8660	0.3333	-0.8165	0.2207	-0.9831	0.1170
		07-007	07-007	N/A	3	0.5000	0.6667	0.3333	0.6015	0.5488	0.6302
		07-016	07-016	N/A	5	1.0000	0.0000	1.0000	0.0143	0.9500	0.0133

Abbreviations:

CASGEM = California Statewide Groundwater Elevation Monitoring

COC = Constituent of Concern

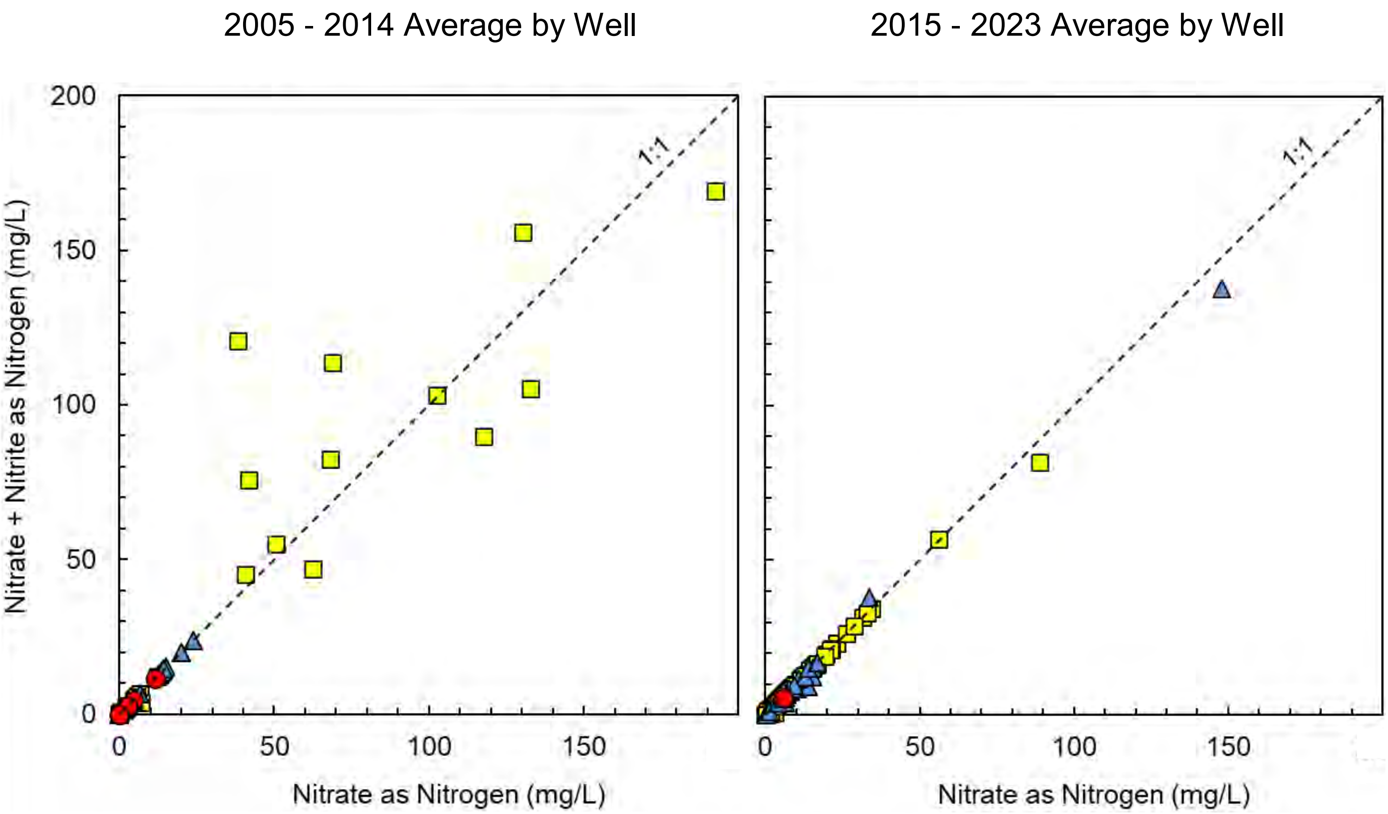
GAMA = Groundwater Ambient Monitoring and Assessment

mi = Miles

N = Nitrogen

Notes:

1. Correlations between groundwater surface elevation and concentrations of COCs were calculated for wells with at least four months in which concentration and water level measurements were taken and the COC was detected. Wells monitored by the GSAs and wells with data in the GAMA and CASGEM databases were considered. Wells with water quality but insufficient water level data were paired with the nearest well within one mile that had at least four months of water level measurements coinciding with the water quality measurements. In some cases, this resulted in the same water level well being paired with multiple water quality wells. Kendall's τ statistic, Spearman's ρ statistic, and Pearson's linear correlation, along with the associated p values, were calculated between the monthly average water level and concentration measurements.
2. Non-zero p values less than or equal to 0.05 may indicate statistically significant correlation. These values are highlighted in green.



Legend

- Multiple Aquifers or Unknown Aquifer
- Upper Aquifer
- Lower Aquifer

Abbreviations

mg/L = Milligrams per Liter

Notes

1. Average concentrations by well of nitrate vs nitrate + nitrite compared before and after enactment of SGMA on January 1, 2015.
2. Only wells within Delta-Mendota Subbasin, with both nitrate and nitrate + nitrate data during the period of interest, with less than 200 mg/L nitrate as nitrogen shown.
3. If accommodation or alternative format is needed for this figure, please contact the Plan Manager for assistance.

Sources

1. Concentrations obtained from GAMA Groundwater Information System. Includes monitoring wells and remediation sites.

Nitrate as Nitrogen Indicative of Nitrate Plus Nitrite in Basin Wells

Delta-Mendota Subbasin
July 2024
C00041.09

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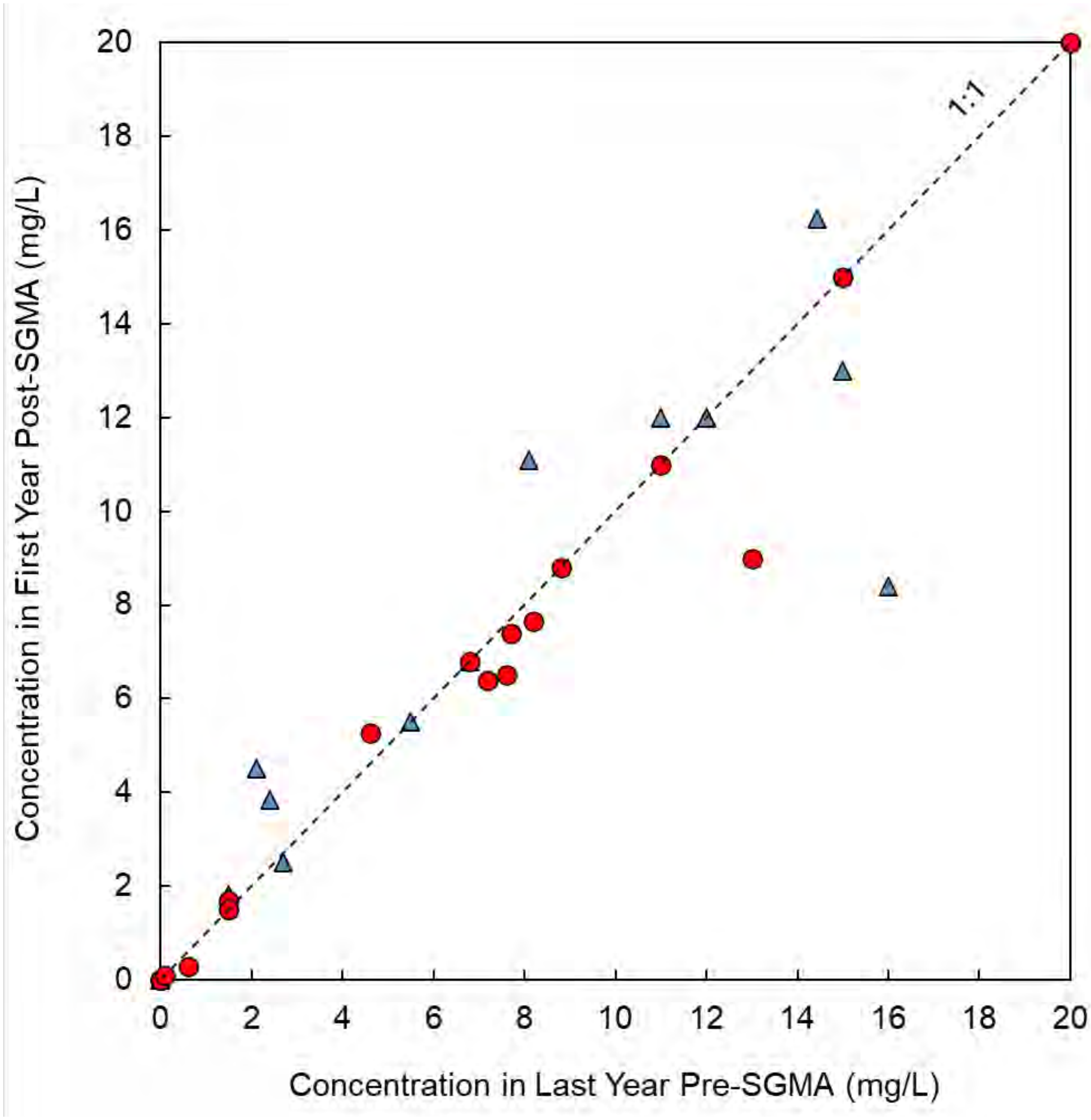

Legend

- Upper Aquifer
- Lower Aquifer

Abbreviations

mg/L = Milligrams per Liter

RMW-WQ = Representative Monitoring Well for Degraded Water Quality

Notes

1. Average concentrations in of nitrate in RMW-WQs measured during the latest year with data in the 2009 - 2014 period compared with same well's average concentration measured during the earliest year with data in the 2015 - 2020 period.
2. If accommodation or alternative format is needed for this figure, please contact the Plan Manager for assistance.

Similar Nitrate as Nitrogen in Representative Monitoring Wells Immediately Before and After Enactment of SGMA

Delta-Mendota Subbasin
July 2024
C00041.09

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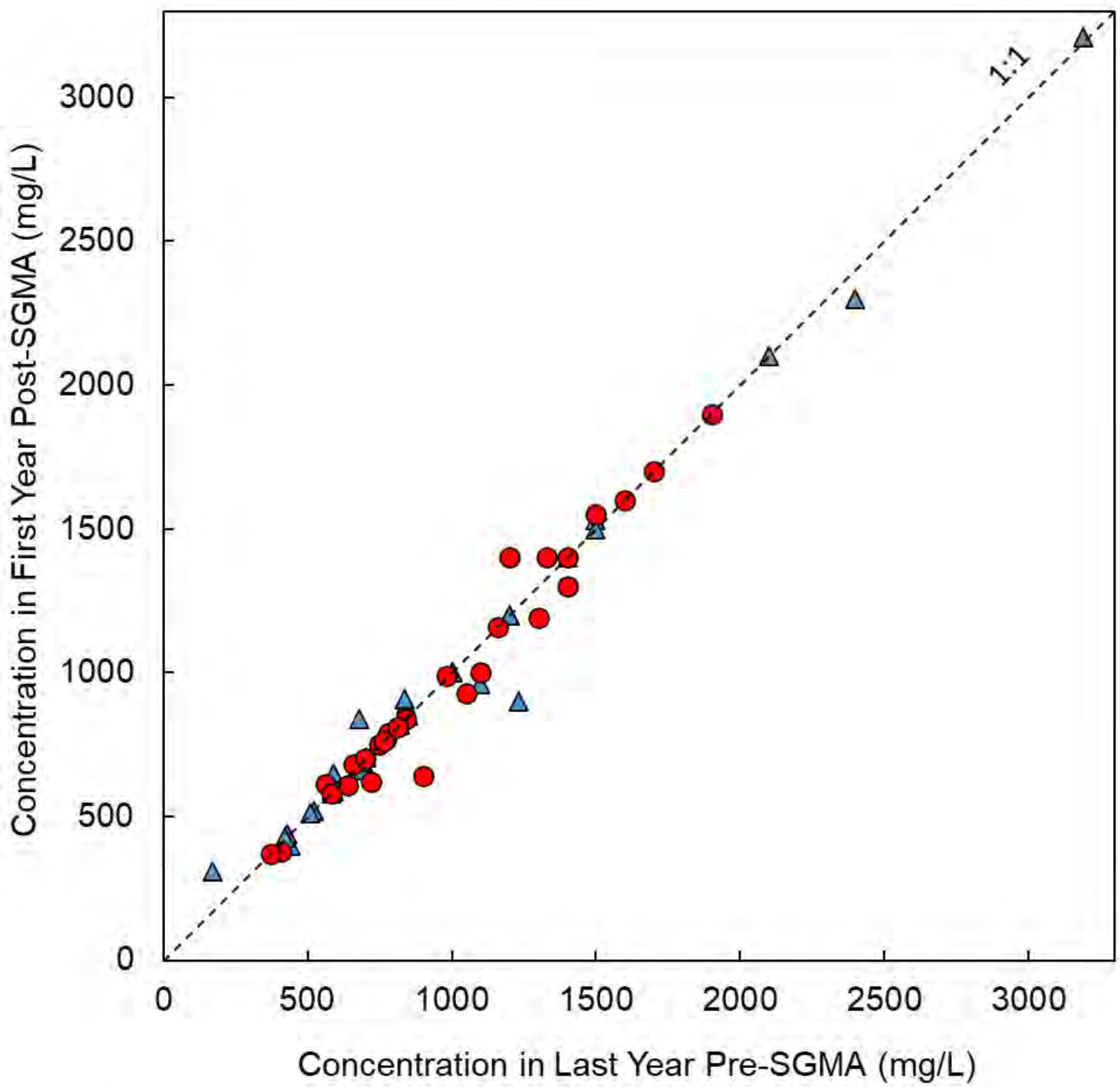

Legend

- Upper Aquifer
- Lower Aquifer

Abbreviations

mg/L = Milligrams per Liter

RMW-WQ = Representative Monitoring Well for Degraded Water Quality

Notes

1. Average concentrations in of total dissolved solids in RMW-WQs measured during the latest year with data in the 2009 - 2014 period compared with same well's average concentration measured during the earliest year with data in the 2015 - 2020 period.
2. If accommodation or alternative format is needed for this figure, please contact the Plan Manager for assistance.

Similar Total Dissolved Solids in Representative Monitoring Wells Immediately Before and After Enactment of SGMA

Delta-Mendota Subbasin
July 2024
C00041.09

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Appendix J

Freshwater Species in the Basin

Appendix J. Freshwater Species in the Basin

Scientific Name	Common Name	Group	Federal Protection Status	State Protection Status
Actinemys marmorata marmorata	Western Pond Turtle	Herps	N/A	Special Concern
Ambystoma californiense californiense	California Tiger Salamander	Herps	Threatened	Threatened
Anaxyrus boreas boreas	Boreal Toad	Herps	N/A	N/A
Spea hammondii	Western Spadefoot	Herps	Under Review in the Candidate or Petition Process	Special Concern
Thamnophis gigas	Giant Gartersnake	Herps	Threatened	Threatened
Thamnophis sirtalis sirtalis	Common Gartersnake	Herps	N/A	N/A
Castor canadensis	American Beaver	Mammals	N/A	N/A
Lontra canadensis canadensis	North American River Otter	Mammals	N/A	N/A
Neovison vison	American Mink	Mammals	N/A	N/A
Ondatra zibethicus	Common Muskrat	Mammals	N/A	N/A
Agelaius tricolor	Tricolored Blackbird	Birds	Bird of Conservation Concern	Special Concern
Aix sponsa	Wood Duck	Birds	N/A	N/A
Anas platyrhynchos	Mallard	Birds	N/A	N/A
Ardea alba	Great Egret	Birds	N/A	N/A
Ardea herodias	Great Blue Heron	Birds	N/A	N/A
Butorides virescens	Green Heron	Birds	N/A	N/A
Egretta thula	Snowy Egret	Birds	N/A	N/A
Empidonax traillii	Willow Flycatcher	Birds	Bird of Conservation Concern	Endangered
Geothlypis trichas trichas	Common Yellowthroat	Birds	N/A	N/A
Grus canadensis	Sandhill Crane	Birds	N/A	N/A
Megaceryle alcyon	Belted Kingfisher	Birds	N/A	N/A
Numenius americanus	Long-billed Curlew	Birds	N/A	N/A
Nycticorax nycticorax	Black-crowned Night-Heron	Birds	N/A	N/A
Plegadis chihi	White-faced Ibis	Birds	N/A	Watch list
Podilymbus podiceps	Pied-billed Grebe	Birds	N/A	N/A
Setophaga petechia	Yellow Warbler	Birds	N/A	N/A
Tachycineta bicolor	Tree Swallow	Birds	N/A	N/A
Tringa melanoleuca	Greater Yellowlegs	Birds	N/A	N/A
Chloropyron palmatum	N/A	Plants	Endangered	Special
Crassula aquatica	Water Pygmyweed	Plants	N/A	N/A
Elatine brachysperma	Shortseed Waterwort	Plants	N/A	N/A
Limosella acaulis	Southern Mudwort	Plants	N/A	N/A
Myosurus minimus	N/A	Plants	N/A	N/A
Plagiobothrys greenei	Greene's Popcorn-flower	Plants	N/A	N/A
Plagiobothrys humistratus	Dwarf Popcorn-flower	Plants	N/A	N/A
Psilocarphus tenellus	N/A	Plants	N/A	N/A
Rorippa palustris palustris	Bog Yellowcress	Plants	N/A	N/A
Anodonta californiensis	California Floater	Mollusks	N/A	Special
Margaritifera falcata	Western Pearlshell	Mollusks	N/A	Special
Catostomus occidentalis occidentalis	Sacramento sucker	Fishes	N/A	N/A
Cottus asper ssp. 1	Prickly sculpin	Fishes	N/A	N/A
Lampetra hubbsi	Kern brook lamprey	Fishes	N/A	Special Concern
Lavinia exilicauda exilicauda	Sacramento hitch	Fishes	N/A	Special
Mylopharodon conocephalus	Hardhead	Fishes	N/A	Special Concern
Oncorhynchus mykiss irideus	Coastal rainbow trout	Fishes	N/A	N/A
Oncorhynchus tshawytscha - CV fall	Central Valley fall Chinook salmon	Fishes	Species of Special Concern	Special Concern

Scientific Name	Common Name	Group	Federal Protection Status	State Protection Status
Oncorhynchus tshawytscha - CV late fall	Central Valley late fall Chinook salmon	Fishes	Species of Special Concern	N/A
Orthodon microlepidotus	Sacramento blackfish	Fishes	N/A	N/A
Ptychocheilus grandis	Sacramento pikeminnow	Fishes	N/A	N/A
Rana boylii	Foothill Yellow-legged Frog	Herps	Under Review in the Candidate or Petition Process	Special Concern
Rana draytonii	California Red-legged Frog	Herps	Threatened	Special Concern
Puccinellia simplex	Little Alkali Grass	Plants	N/A	N/A
Actitis macularius	Spotted Sandpiper	Birds	N/A	N/A
Aechmophorus clarkii	Clark's Grebe	Birds	N/A	N/A
Aechmophorus occidentalis	Western Grebe	Birds	N/A	N/A
Anas acuta	Northern Pintail	Birds	N/A	N/A
Anas americana	American Wigeon	Birds	N/A	N/A
Anas clypeata	Northern Shoveler	Birds	N/A	N/A
Anas crecca	Green-winged Teal	Birds	N/A	N/A
Anas cyanoptera	Cinnamon Teal	Birds	N/A	N/A
Anas discors	Blue-winged Teal	Birds	N/A	N/A
Anas strepera	Gadwall	Birds	N/A	N/A
Anser albifrons	Greater White-fronted Goose	Birds	N/A	N/A
Aythya affinis	Lesser Scaup	Birds	N/A	N/A
Aythya americana	Redhead	Birds	N/A	Special Concern
Aythya collaris	Ring-necked Duck	Birds	N/A	N/A
Aythya marila	Greater Scaup	Birds	N/A	N/A
Aythya valisineria	Canvasback	Birds	N/A	Special
Botaurus lentiginosus	American Bittern	Birds	N/A	N/A
Bucephala albeola	Bufflehead	Birds	N/A	N/A
Bucephala clangula	Common Goldeneye	Birds	N/A	N/A
Calidris alpina	Dunlin	Birds	N/A	N/A
Calidris minutilla	Least Sandpiper	Birds	N/A	N/A
Chen caerulescens	Snow Goose	Birds	N/A	N/A
Chen rossii	Ross's Goose	Birds	N/A	N/A
Chlidonias niger	Black Tern	Birds	N/A	Special Concern
Chroicocephalus philadelphia	Bonaparte's Gull	Birds	N/A	N/A
Cistothorus palustris palustris	Marsh Wren	Birds	N/A	N/A
Cygnus columbianus	Tundra Swan	Birds	N/A	N/A
Cypseloides niger	Black Swift	Birds	Bird of Conservation Concern	Special Concern
Fulica americana	American Coot	Birds	N/A	N/A
Gallinago delicata	Wilson's Snipe	Birds	N/A	N/A
Haliaeetus leucocephalus	Bald Eagle	Birds	Bird of Conservation Concern	Endangered
Himantopus mexicanus	Black-necked Stilt	Birds	N/A	N/A
Icteria virens	Yellow-breasted Chat	Birds	N/A	Special Concern
Limnodromus scolopaceus	Long-billed Dowitcher	Birds	N/A	N/A
Lophodytes cucullatus	Hooded Merganser	Birds	N/A	N/A
Mergus merganser	Common Merganser	Birds	N/A	N/A
Mergus serrator	Red-breasted Merganser	Birds	N/A	N/A
Numenius phaeopus	Whimbrel	Birds	N/A	N/A
Oxyura jamaicensis	Ruddy Duck	Birds	N/A	N/A
Pelecanus erythrorhynchos	American White Pelican	Birds	N/A	Special Concern

Appendix J. Freshwater Species in the Basin

Scientific Name	Common Name	Group	Federal Protection Status	State Protection Status
Phalacrocorax auritus	Double-crested Cormorant	Birds	N/A	N/A
Phalaropus tricolor	Wilson's Phalarope	Birds	N/A	N/A
Pluvialis squatarola	Black-bellied Plover	Birds	N/A	N/A
Podiceps nigricollis	Eared Grebe	Birds	N/A	N/A
Porzana carolina	Sora	Birds	N/A	N/A
Rallus limicola	Virginia Rail	Birds	N/A	N/A
Recurvirostra americana	American Avocet	Birds	N/A	N/A
Riparia riparia	Bank Swallow	Birds	N/A	Threatened
Tringa semipalmata	Willet	Birds	N/A	N/A
Branchinecta lynchi	Vernal Pool Fairy Shrimp	Crustaceans	Threatened	Special
Lepidurus packardi	Vernal Pool Tadpole Shrimp	Crustaceans	Endangered	Special
Pseudacris regilla	Northern Pacific Chorus Frog	Herps	N/A	N/A
Cotula coronopifolia	N/A	Plants	N/A	N/A
Eryngium vaseyi vallicola	N/A	Plants	N/A	N/A
Eryngium vaseyi vaseyi	Vasey's Coyote-thistle	Plants	N/A	N/A
Juncus xiphioides	Iris-leaf Rush	Plants	N/A	N/A
Pilularia americana	N/A	Plants	N/A	N/A
Plantago elongata elongata	Slender Plantain	Plants	N/A	N/A
Salix gooddingii	Goodding's Willow	Plants	N/A	N/A
Schoenoplectus acutus occidentalis	Hardstem Bulrush	Plants	N/A	N/A
Schoenoplectus americanus	Three-square Bulrush	Plants	N/A	N/A
Archoplites interruptus	Sacramento perch	Fishes	N/A	Special Concern
Lavinia symmetricus symmetricus	Central California roach	Fishes	N/A	Special Concern
Pogonichthys macrolepidotus	Sacramento splittail	Fishes	N/A	Special Concern
Ammannia coccinea	Scarlet Ammannia	Plants	N/A	N/A
Bacopa eisenii	Gila River Water-hyssop	Plants	N/A	N/A
Arundo donax	N/A	Plants	N/A	N/A
Calidris mauri	Western Sandpiper	Birds	N/A	N/A
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	Birds	N/A	Special Concern
Dendrocygna bicolor	Fulvous Whistling-Duck	Birds	N/A	Special Concern
Gallinula chloropus	Common Moorhen	Birds	N/A	N/A
Ischnura cervula	Pacific Forktail	Insects & other inverts	N/A	N/A
Eleocharis macrostachya	Creeping Spikerush	Plants	N/A	N/A
Elodea canadensis	Broad Waterweed	Plants	N/A	N/A
Juncus acuminatus	Sharp-fruit Rush	Plants	N/A	N/A
Lasthenia ferrisiae	Ferris' Goldfields	Plants	N/A	Special
Ludwigia peploides peploides	N/A	Plants	N/A	N/A
Persicaria hydropiperoides	N/A	Plants	N/A	N/A
Persicaria lapathifolia	N/A	Plants	N/A	N/A
Potamogeton diversifolius	Water-thread Pondweed	Plants	N/A	N/A
Potamogeton nodosus	Longleaf Pondweed	Plants	N/A	N/A
Potamogeton pusillus pusillus	Slender Pondweed	Plants	N/A	N/A
Psilocarphus brevissimus brevissimus	Dwarf Woolly-heads	Plants	N/A	N/A
Rotala ramosior	Toothcup	Plants	N/A	N/A
Acipenser transmontanus	White sturgeon	Fishes	N/A	Special
Capnia hitchcocki	Arroyo Snowfly	Insects & other inverts	N/A	N/A

Scientific Name	Common Name	Group	Federal Protection Status	State Protection Status
Mesocapnia bulbosa	Bulbous Snowfly	Insects & other inverts	N/A	N/A
Acipenser medirostris ssp. 1	Southern green sturgeon	Fishes	Threatened	Special Concern
Entosphenus tridentata ssp. 1	Pacific lamprey	Fishes	N/A	Special
Gasterosteus aculeatus microcephalus	Inland threespine stickleback	Fishes	N/A	Special
Hysterocarpus traskii traskii	Sacramento tule perch	Fishes	N/A	Special
Oncorhynchus mykiss - CV	Central Valley steelhead	Fishes	Threatened	Special
Branchinecta mesovallensis	Midvalley Fairy Shrimp	Crustaceans	N/A	Special
Linderiella occidentalis	California Fairy Shrimp	Crustaceans	N/A	Special
Taricha torosa	Coast Range Newt	Herps	N/A	Special Concern
Thamnophis couchii	Sierra Gartersnake	Herps	N/A	N/A
Castilleja campestris succulenta	Fleshy Owl's-clover	Plants	Threatened	Endangered
Eryngium spinosepalum	Spiny Sepaled Coyote-thistle	Plants	N/A	Special
Orcuttia inaequalis	San Joaquin Valley Orcutt Grass	Plants	Threatened	Endangered
Orcuttia pilosa	Hairy Orcutt Grass	Plants	Endangered	Endangered
Tuctoria greenei	Green's Awnless Orcutt Grass	Plants	Endangered	Rare
Tringa solitaria	Solitary Sandpiper	Birds	N/A	N/A
Ablabesmyia spp.	Ablabesmyia spp.	Insects & other inverts	N/A	N/A
Agapetus malleatus	A Caddisfly	Insects & other inverts	N/A	N/A
Baetidae fam.	Baetidae fam.	Insects & other inverts	N/A	N/A
Baetis spp.	Baetis spp.	Insects & other inverts	N/A	N/A
Baetis tricaudatus	A Mayfly	Insects & other inverts	N/A	N/A
Callibaetis spp.	Callibaetis spp.	Insects & other inverts	N/A	N/A
Centroptilum spp.	Centroptilum spp.	Insects & other inverts	N/A	N/A
Chironomidae fam.	Chironomidae fam.	Insects & other inverts	N/A	N/A
Chironomus spp.	Chironomus spp.	Insects & other inverts	N/A	N/A
Corixidae fam.	Corixidae fam.	Insects & other inverts	N/A	N/A
Cricotopus spp.	Cricotopus spp.	Insects & other inverts	N/A	N/A
Cryptotendipes spp.	Cryptotendipes spp.	Insects & other inverts	N/A	N/A
Dicrotendipes spp.	Dicrotendipes spp.	Insects & other inverts	N/A	N/A
Eubrianax edwardsii	N/A	Insects & other inverts	N/A	N/A
Eukiefferiella spp.	Eukiefferiella spp.	Insects & other inverts	N/A	N/A
Fallceon spp.	Fallceon spp.	Insects & other inverts	N/A	N/A
Heptageniidae fam.	Heptageniidae fam.	Insects & other inverts	N/A	N/A
Hetaerina americana	American Rubyspot	Insects & other inverts	N/A	N/A
Hydropsyche spp.	Hydropsyche spp.	Insects & other inverts	N/A	N/A
Laccobius spp.	Laccobius spp.	Insects & other inverts	N/A	N/A
Laccophilus spp.	Laccophilus spp.	Insects & other inverts	N/A	N/A
Leptoceridae fam.	Leptoceridae fam.	Insects & other inverts	N/A	N/A
Limnophyes spp.	Limnophyes spp.	Insects & other inverts	N/A	N/A
Mideopsis spp.	Mideopsis spp.	Insects & other inverts	N/A	N/A
Nanocladius spp.	Nanocladius spp.	Insects & other inverts	N/A	N/A
Nectopsyche spp.	Nectopsyche spp.	Insects & other inverts	N/A	N/A
Parakiefferiella spp.	Parakiefferiella spp.	Insects & other inverts	N/A	N/A
Paratendipes spp.	Paratendipes spp.	Insects & other inverts	N/A	N/A
Phaenopsectra spp.	Phaenopsectra spp.	Insects & other inverts	N/A	N/A
Polypedilum spp.	Polypedilum spp.	Insects & other inverts	N/A	N/A

Scientific Name	Common Name	Group	Federal Protection Status	State Protection Status
Procladius spp.	Procladius spp.	Insects & other inverts	N/A	N/A
Pseudochironomus spp.	Pseudochironomus spp.	Insects & other inverts	N/A	N/A
Pseudosmittia spp.	Pseudosmittia spp.	Insects & other inverts	N/A	N/A
Rheotanytarsus spp.	Rheotanytarsus spp.	Insects & other inverts	N/A	N/A
Robackia spp.	Robackia spp.	Insects & other inverts	N/A	N/A
Serratella micheneri	A Mayfly	Insects & other inverts	N/A	N/A
Sigara spp.	Sigara spp.	Insects & other inverts	N/A	N/A
Simulium spp.	Simulium spp.	Insects & other inverts	N/A	N/A
Stenochironomus spp.	Stenochironomus spp.	Insects & other inverts	N/A	N/A
Tanytarsus spp.	Tanytarsus spp.	Insects & other inverts	N/A	N/A
Tipulidae fam.	Tipulidae fam.	Insects & other inverts	N/A	N/A
Tramea lacerata	Black Saddlebags	Insects & other inverts	N/A	N/A
Tricoryhyphes spp.	Tricoryhyphes spp.	Insects & other inverts	N/A	N/A
Tropisternus spp.	Tropisternus spp.	Insects & other inverts	N/A	N/A
Lymnaea spp.	Lymnaea spp.	Mollusks	N/A	N/A
Menetus spp.	Menetus spp.	Mollusks	N/A	N/A
Physa spp.	Physa spp.	Mollusks	N/A	N/A
Sphaeriidae fam.	Sphaeriidae fam.	Mollusks	N/A	N/A
Cicendia quadrangularis	Oregon Microcala	Plants	N/A	N/A
Cyperus erythrorhizos	Red-root Flatsedge	Plants	N/A	N/A
Downingia cuspidata	Toothed Calicoflower	Plants	N/A	N/A
Eleocharis acicularis acicularis	Least Spikerush	Plants	N/A	N/A
Epilobium cleistogamum	Cleistogamous Spike-primrose	Plants	N/A	N/A
Gratiola ebracteata	Bractless Hedge-hyssop	Plants	N/A	N/A
Lasthenia fremontii	Fremont's Goldfields	Plants	N/A	N/A
Mimulus latidens	Broad-tooth Monkeyflower	Plants	N/A	N/A
Mimulus tricolor	Tricolor Monkeyflower	Plants	N/A	N/A
Oenanthe sarmentosa	Water-parsley	Plants	N/A	N/A
Phalaris arundinacea	Reed Canarygrass	Plants	N/A	N/A
Plagiobothrys acanthocarpus	Adobe Popcorn-flower	Plants	N/A	N/A
Plagiobothrys distantiflorus	California Popcorn-flower	Plants	N/A	N/A
Plagiobothrys undulatus	N/A	Plants	N/A	N/A
Salix exigua exigua	Narrowleaf Willow	Plants	N/A	N/A
Veronica anagallis-aquatica	N/A	Plants	N/A	N/A
Cottus gulosus	Riffle sculpin	Fishes	N/A	Special
Thamnophis atratus atratus	Santa Cruz Gartersnake	Herps	N/A	N/A
Thamnophis elegans elegans	Mountain Gartersnake	Herps	N/A	N/A
Paraleptophlebia associata	A Mayfly	Insects & other inverts	N/A	N/A
Baccharis salicina	N/A	Plants	N/A	N/A
Eryngium castrense	Great Valley Eryngo	Plants	N/A	N/A
Phacelia distans	N/A	Plants	N/A	N/A
Lampetra ayersi	River lamprey	Fishes	N/A	Special Concern
Lampetra richardsoni	Western brook lamprey	Fishes	N/A	N/A
Branchinecta longiantenna	Longhorn Fairy Shrimp	Crustaceans	Endangered	Special
Thamnophis hammondii hammondii	Two-striped Gartersnake	Herps	N/A	Special Concern
Branchinecta lindahli	Versatile Fairy Shrimp	Crustaceans	N/A	N/A

Appendix J. Freshwater Species in the Basin

Scientific Name	Common Name	Group	Federal Protection Status	State Protection Status
Eleocharis atropurpurea	Purple Spikerush	Plants	N/A	N/A
Lemna aequinoctialis	Lesser Duckweed	Plants	N/A	N/A
Lepidium jaredii jaredii	Jared's Pepper-grass	Plants	N/A	Special
Phyla nodiflora	Common Frog-fruit	Plants	N/A	N/A
Branchinecta conservatio	Conservancy Fairy Shrimp	Crustaceans	Endangered	Special
Chloropyron molle hispidum	N/A	Plants	N/A	Special
Eryngium racemosum	Delta Coyote-thistle	Plants	N/A	Endangered
Navarretia prostrata	Prostrate Navarretia	Plants	N/A	Special
Bolboschoenus glaucus	N/A	Plants	N/A	N/A
Ceratophyllum demersum	Common Hornwort	Plants	N/A	N/A
Downingia pulchella	Flat-face Downingia	Plants	N/A	N/A
Eleocharis quadrangulata	N/A	Plants	N/A	N/A
Lemna gibba	Inflated Duckweed	Plants	N/A	N/A
Najas guadalupensis guadalupensis	Southern Naiad	Plants	N/A	N/A
Paspalum distichum	Joint Paspalum	Plants	N/A	N/A
Persicaria pensylvanica	N/A	Plants	N/A	N/A
Pogogyne zizyphoroides	N/A	Plants	N/A	N/A
Stuckenia pectinata	N/A	Plants	N/A	N/A
Zannichellia palustris	Horned Pondweed	Plants	N/A	N/A
Vireo bellii pusillus	Least Bell's Vireo	Birds	Endangered	Endangered
Pandion haliaetus	Osprey	Birds	N/A	Watch list
Vireo bellii	Bell's Vireo	Birds	N/A	N/A
Pyrgulopsis diablensis	Diablo Range Pyrg	Mollusks	N/A	Special
Typha domingensis	Southern Cattail	Plants	N/A	N/A
Ischnura denticollis	Black-fronted Forktail	Insects & other inverts	N/A	N/A
Crypsis vaginiflora	N/A	Plants	N/A	N/A
Cyperus squarrosus	Awned Cyperus	Plants	N/A	N/A
Echinodorus berteroi	Upright Burhead	Plants	N/A	N/A
Elatine californica	California Waterwort	Plants	N/A	N/A
Eleocharis coloradoensis	N/A	Plants	N/A	N/A
Eragrostis hypnoides	Teal Lovegrass	Plants	N/A	N/A
Hydrocotyle verticillata verticillata	Whorled Marsh-pennywort	Plants	N/A	N/A
Lipocarpha micrantha	Dwarf Bulrush	Plants	N/A	N/A
Lythrum californicum	California Loosestrife	Plants	N/A	N/A
Persicaria maculosa	N/A	Plants	N/A	N/A
Ruppia cirrhosa	Widgeon-grass	Plants	N/A	N/A
Wolffiella lingulata	Tongue Bogmat	Plants	N/A	N/A
Neostapfia colusana	Colusa Grass	Plants	Threatened	Endangered
Potamogeton foliosus foliosus	Leafy Pondweed	Plants	N/A	N/A

Abbreviations:
CV = Central Valley
fam. = family
N/A = not applicable
ssp. = several species

Notes:
1. The species on this list, including their statuses listed, are provided as of April 2015.
2. "ssp." implies more than one unknown species within a known genus. In "ssp. 1" the "1" is often used to distinguish different subspecies within a species when they have not been formally described and given distinct names.
3. "fam" implied family in the hierarchical taxonomic ranks.

Sources:
https://www.groundwaterresourcehub.org/where-we-work/california/beneficial-users/

Appendix K

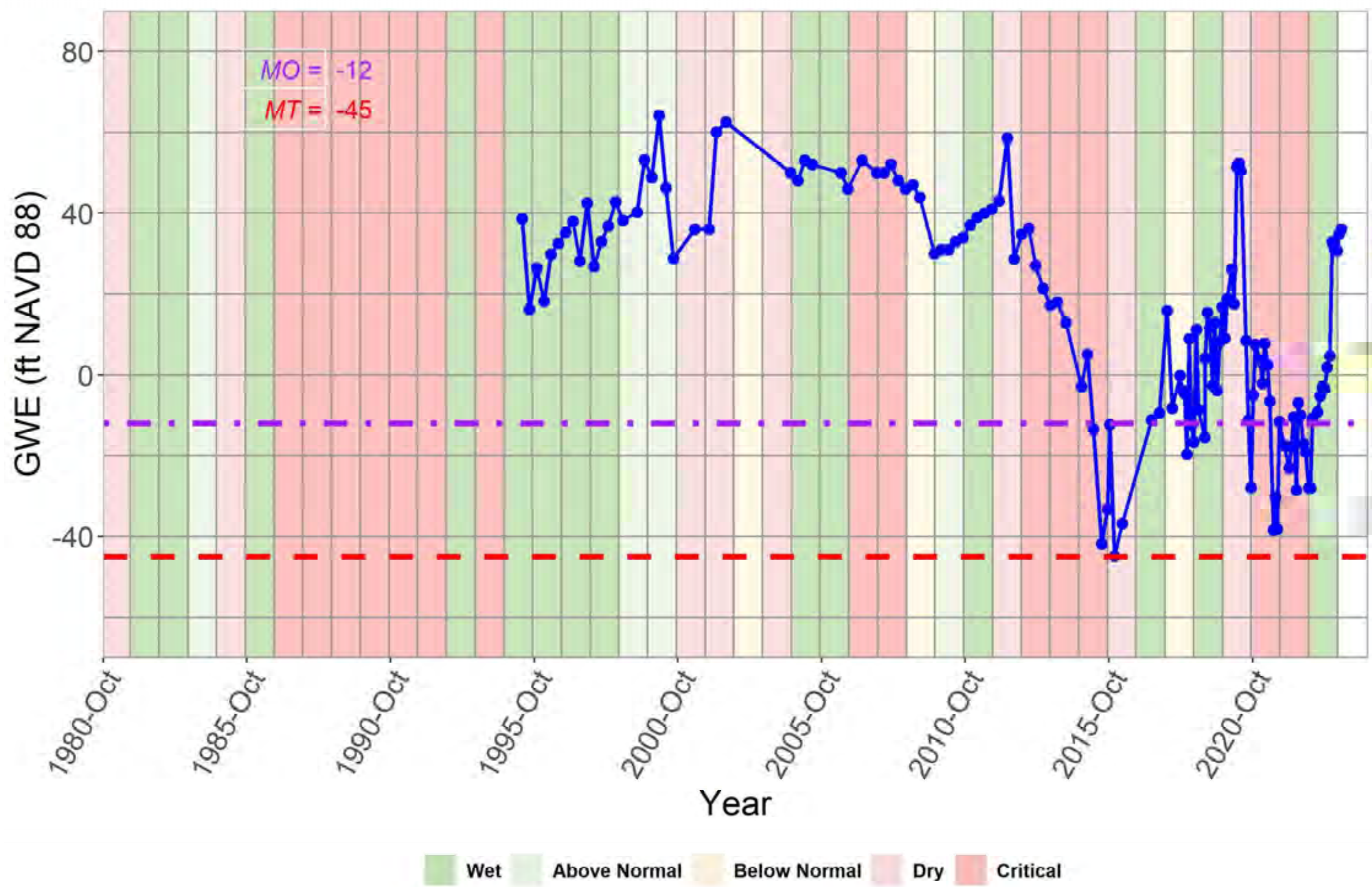
Hydrographs for Representative Monitoring Wells for Chronic Lowering of Groundwater Levels (RMW-WLs) and Other Water Level Analyses

DELTA-MENDOTA SGMA

Appendix K-1

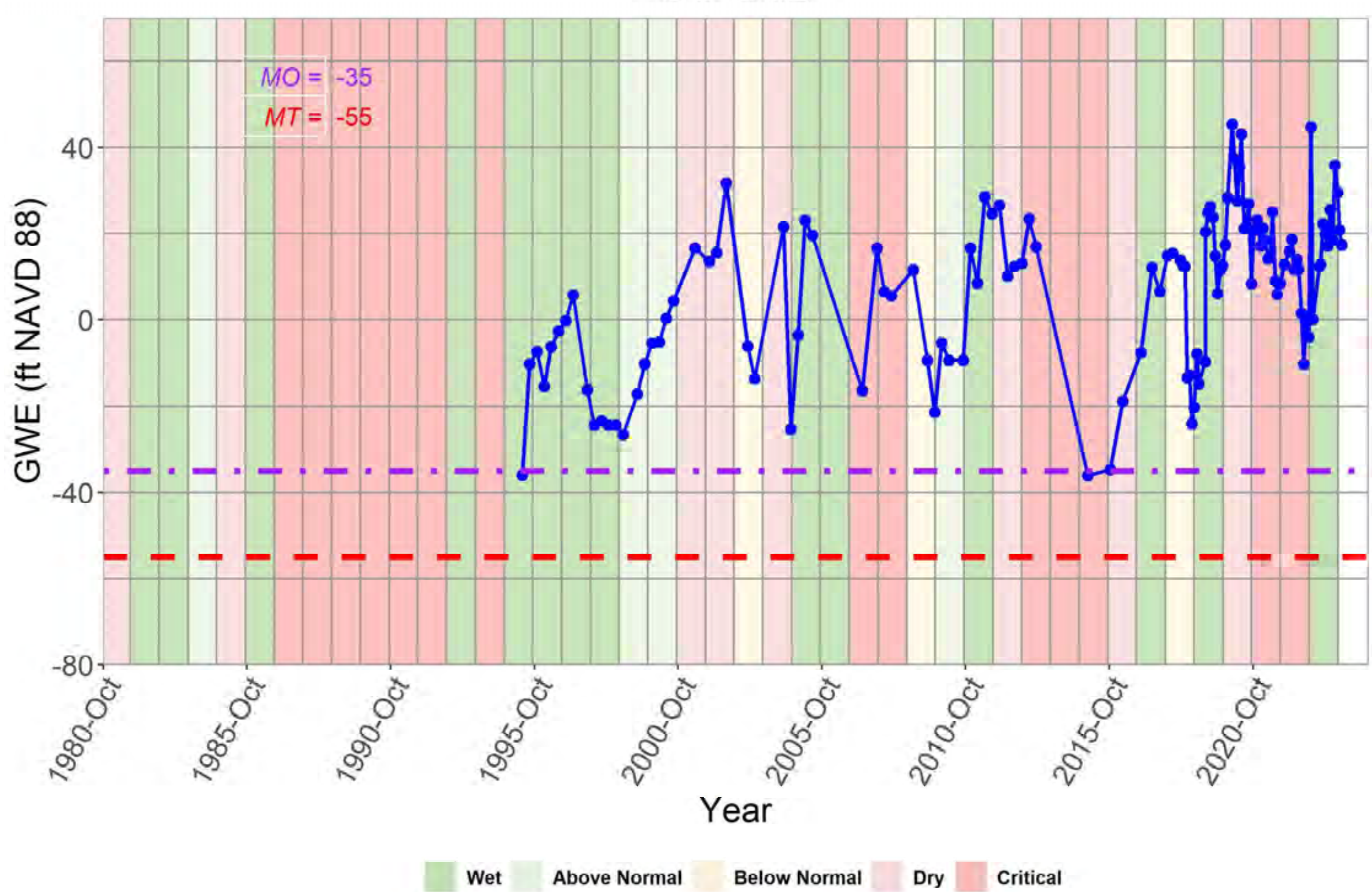
RMW-WL Hydrographs

01-001



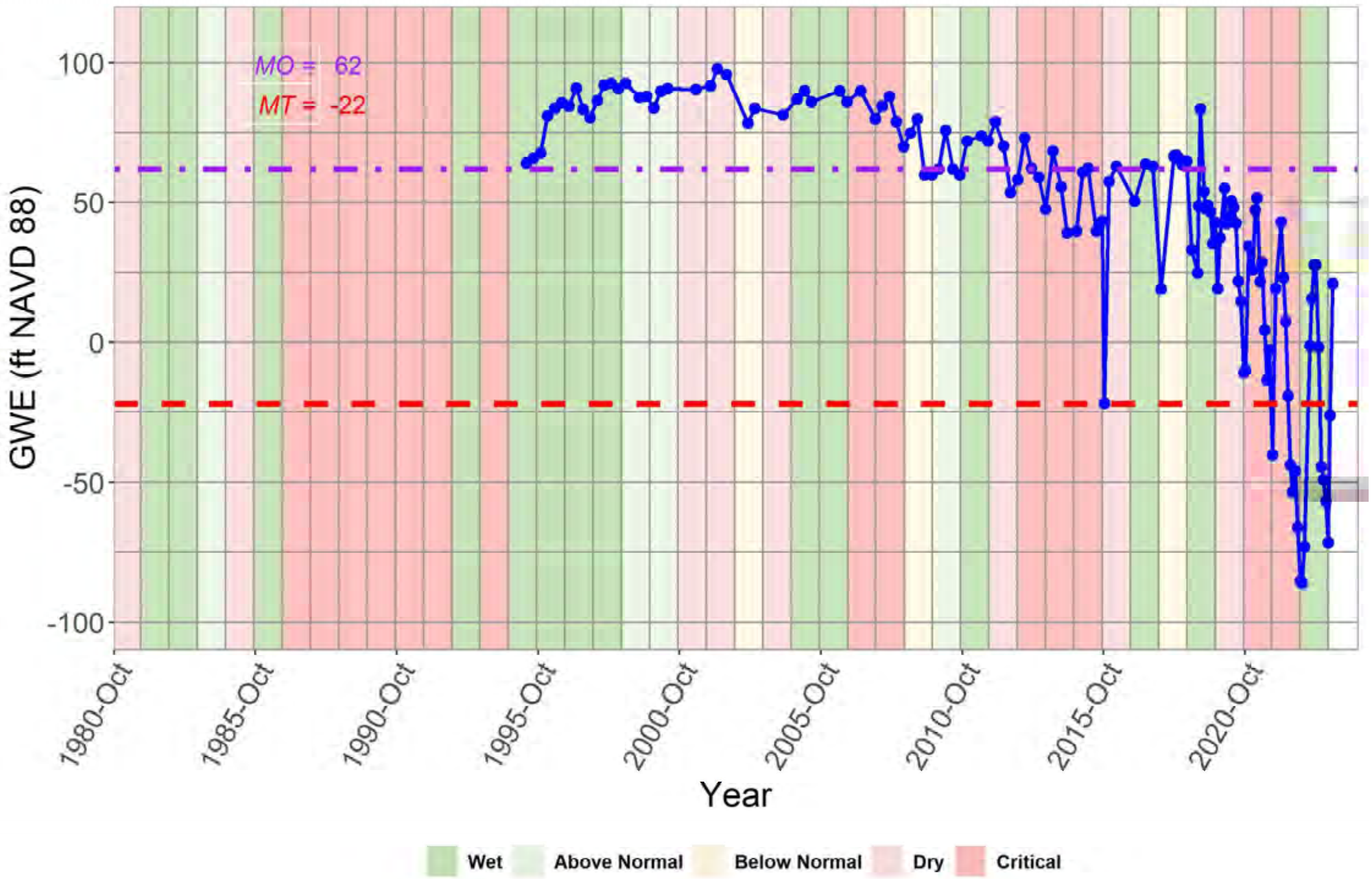
MO = -12
MT = -45
80
40
0
-40
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

01-002



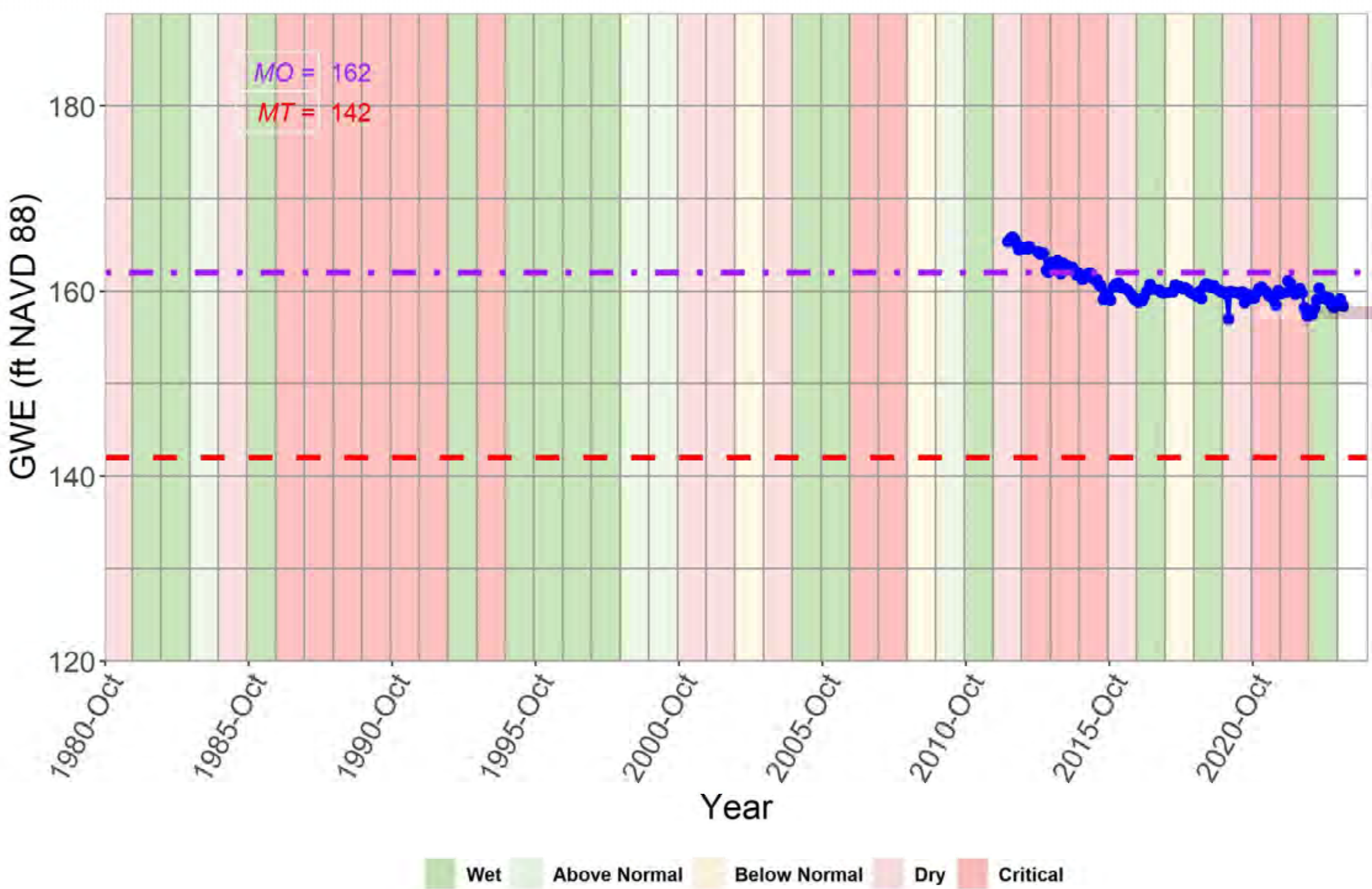
MO = -35
MT = -55
40
0
-40
-80
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

01-003



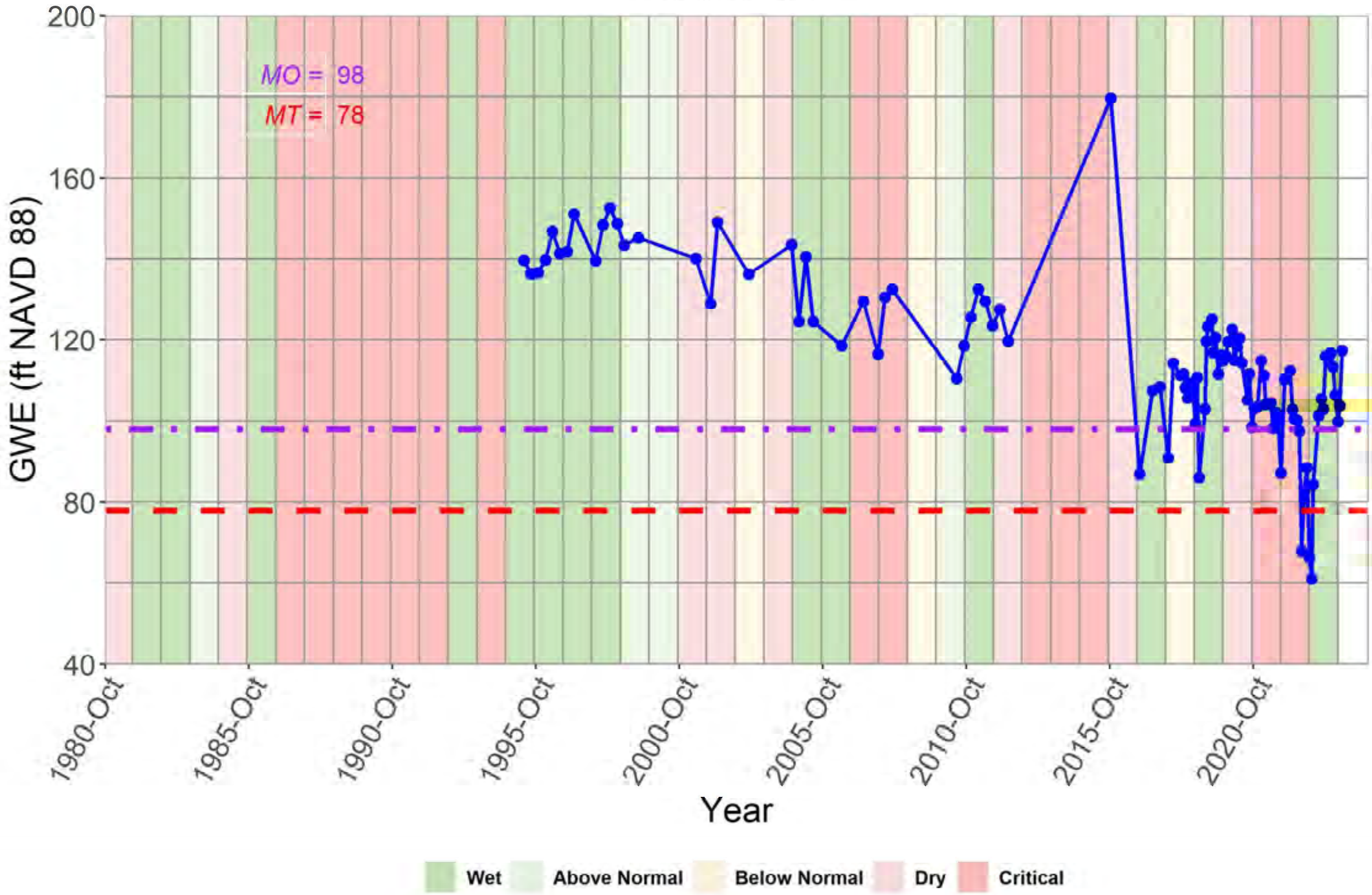
MO = 62
MT = -22
100
50
0
-50
-100
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

01-004



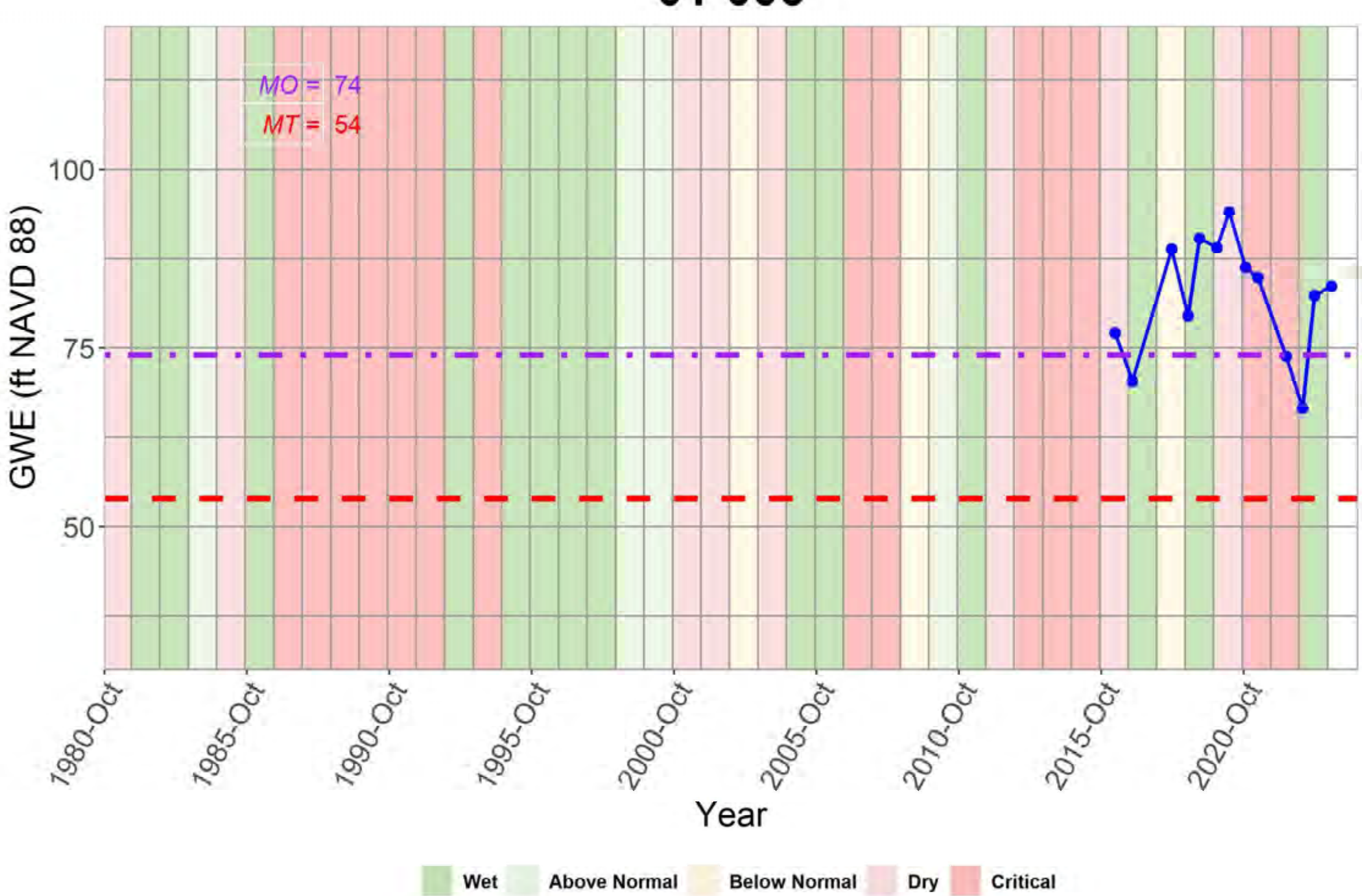
MO = 162
MT = 142
180
160
140
120
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

01-005



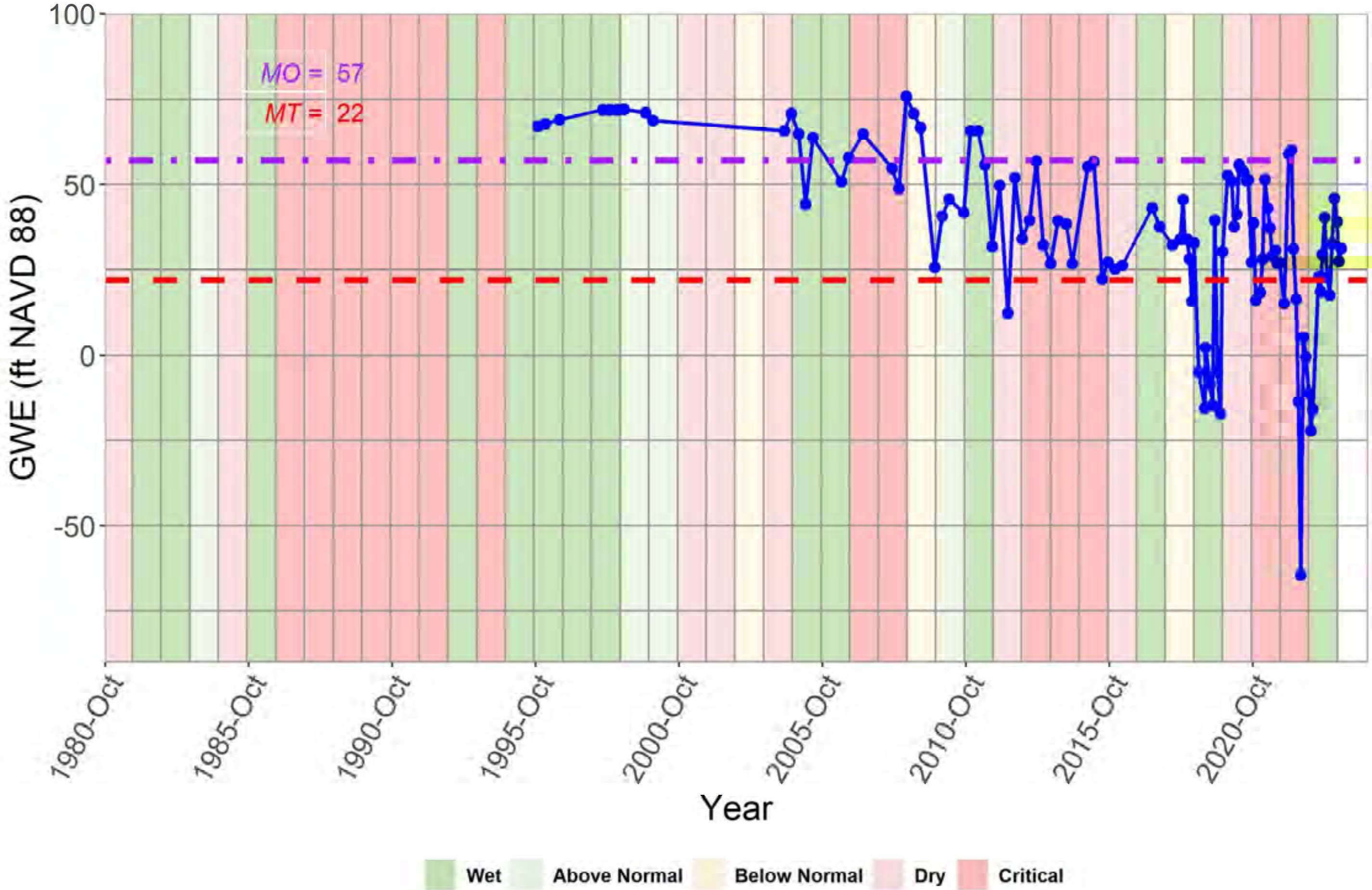
MO = 98
MT = 78
GWE (ft NAVD 88)
200
160
120
80
40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

01-006



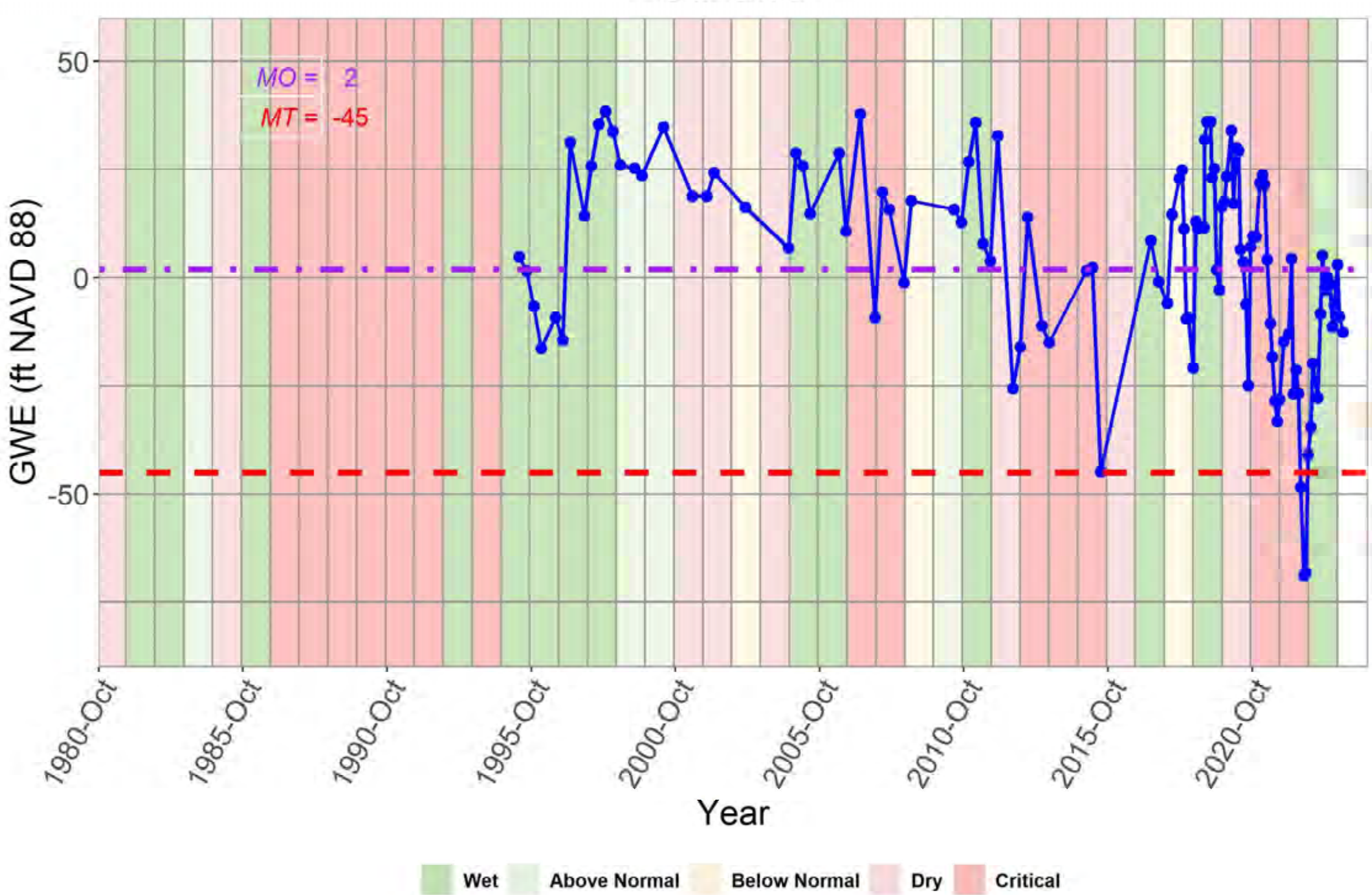
MO = 74
MT = 54
GWE (ft NAVD 88)
100
75
50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

01-007



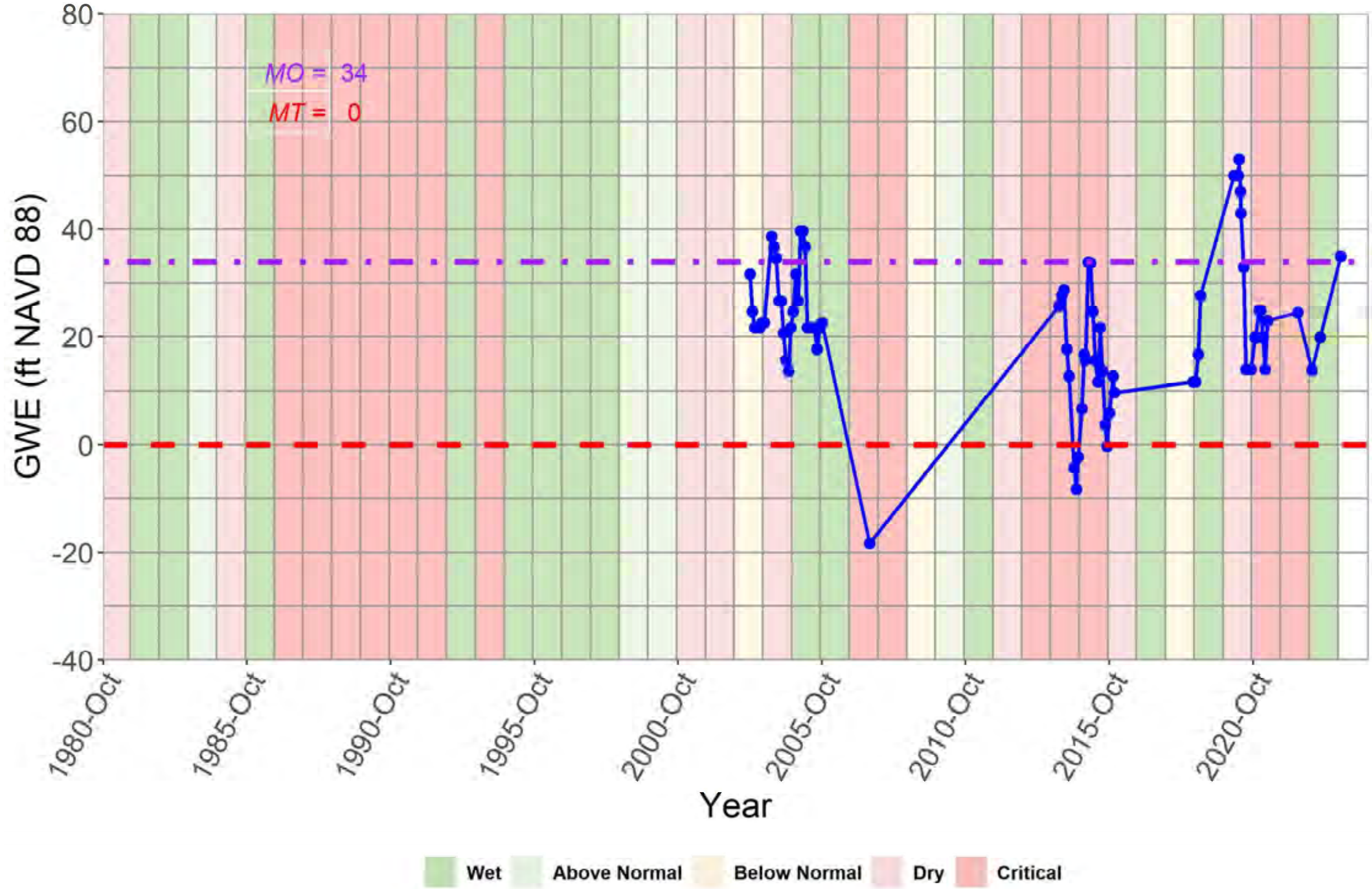
MO = 57
MT = 22
GWE (ft NAVD 88)
100
50
0
-50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

01-008



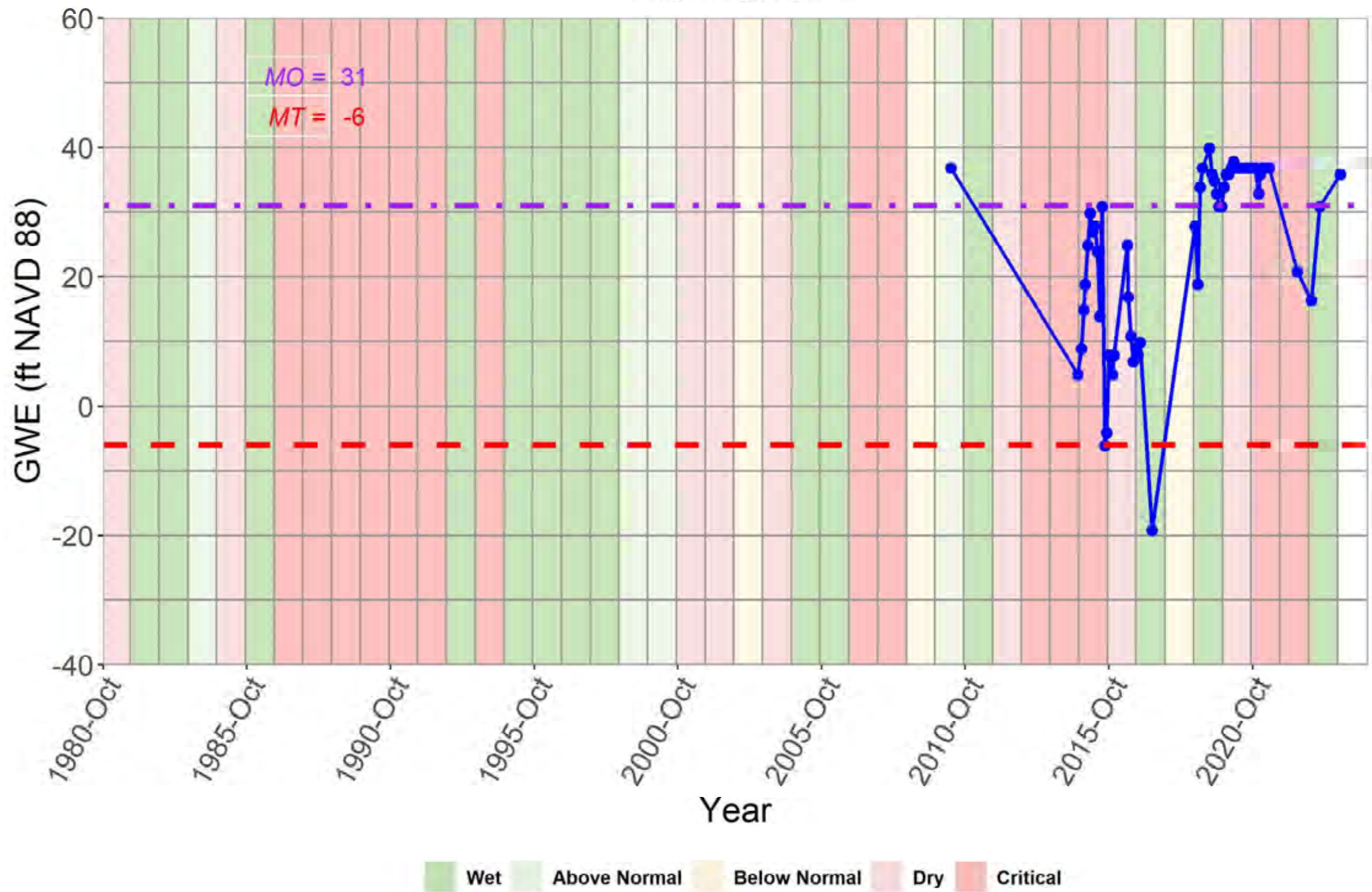
MO = 2
MT = -45
GWE (ft NAVD 88)
50
0
-50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

02-002

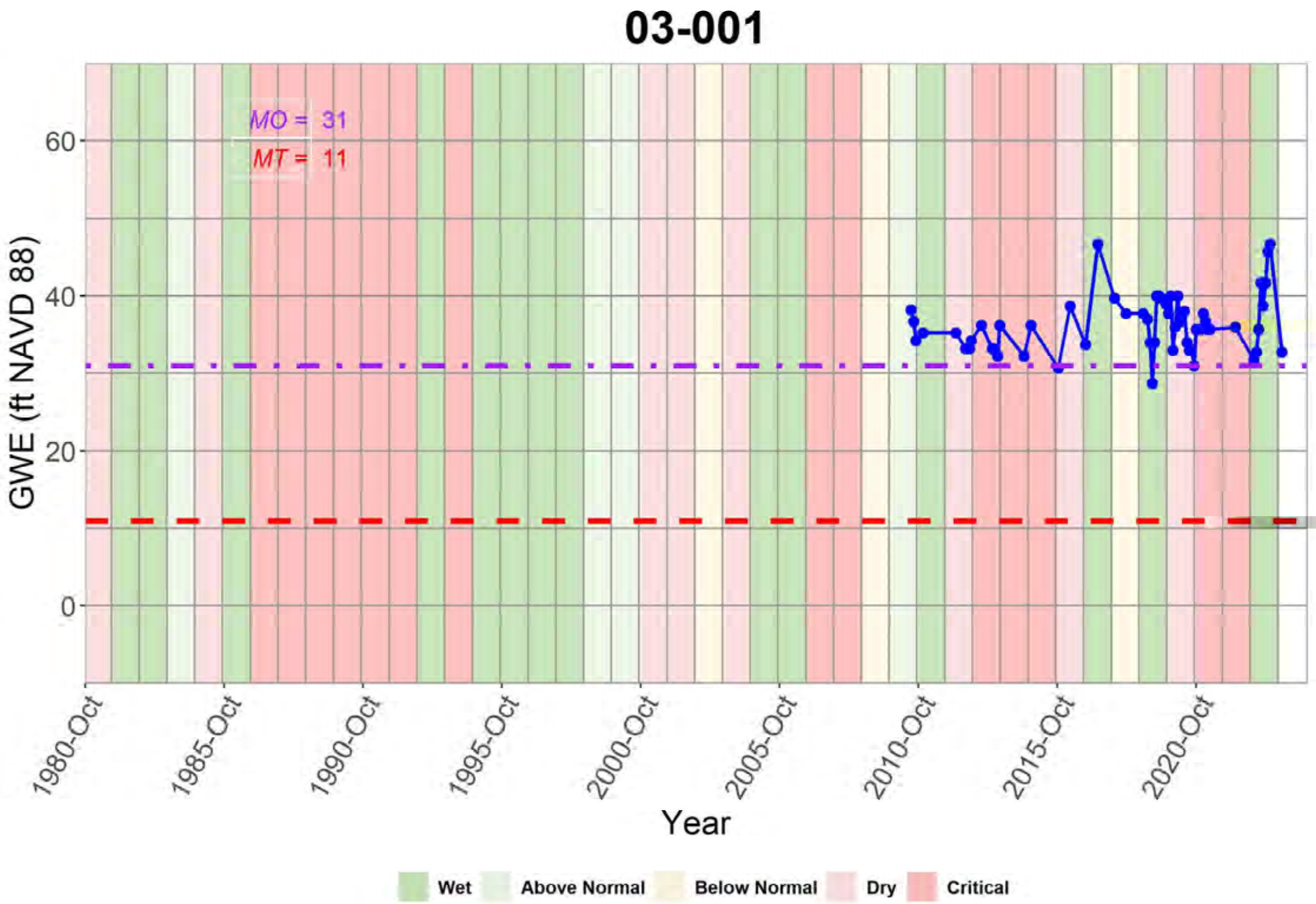


MO = 34
MT = 0
GWE (ft NAVD 88)
80
60
40
20
0
-20
-40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

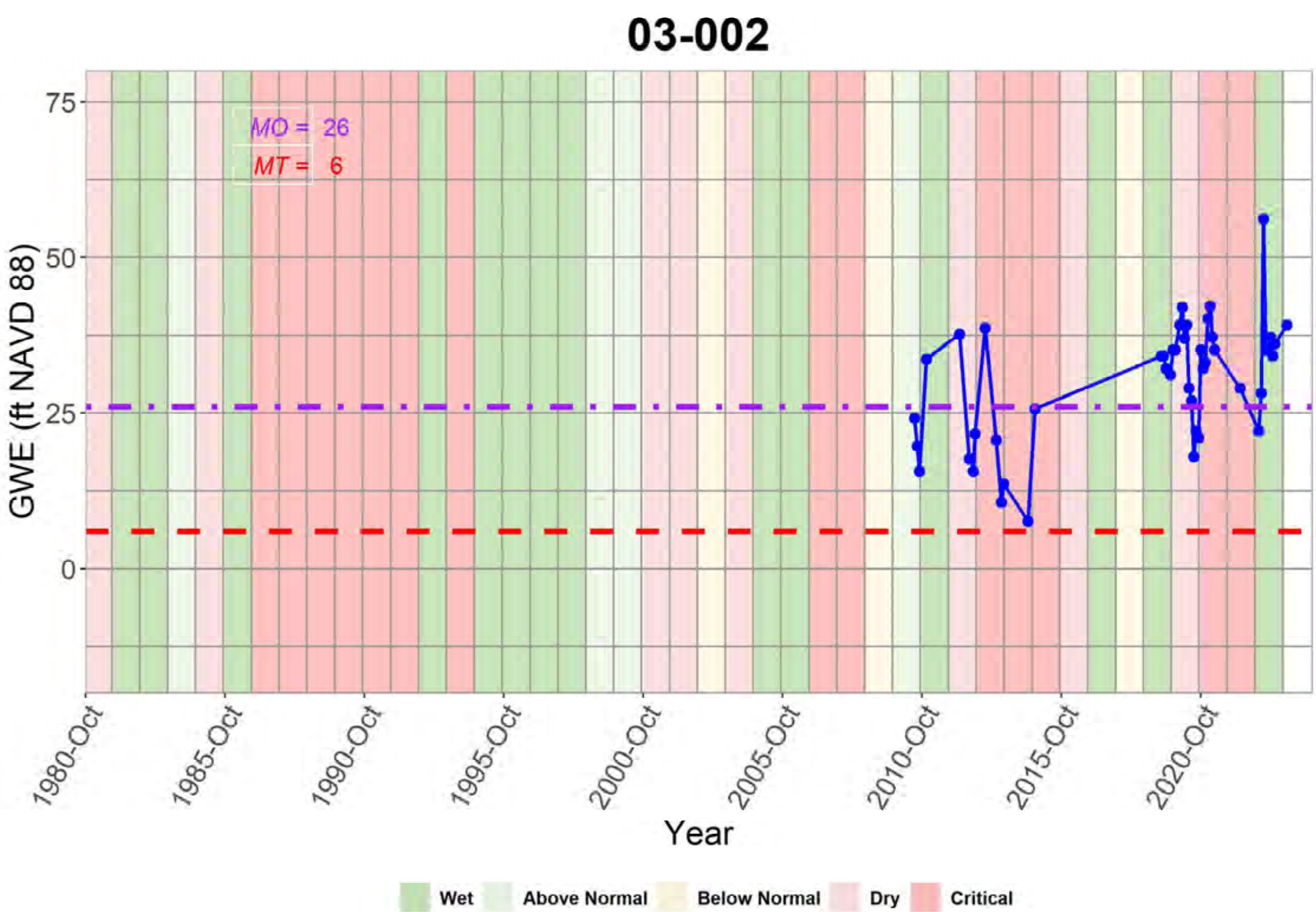
02-009



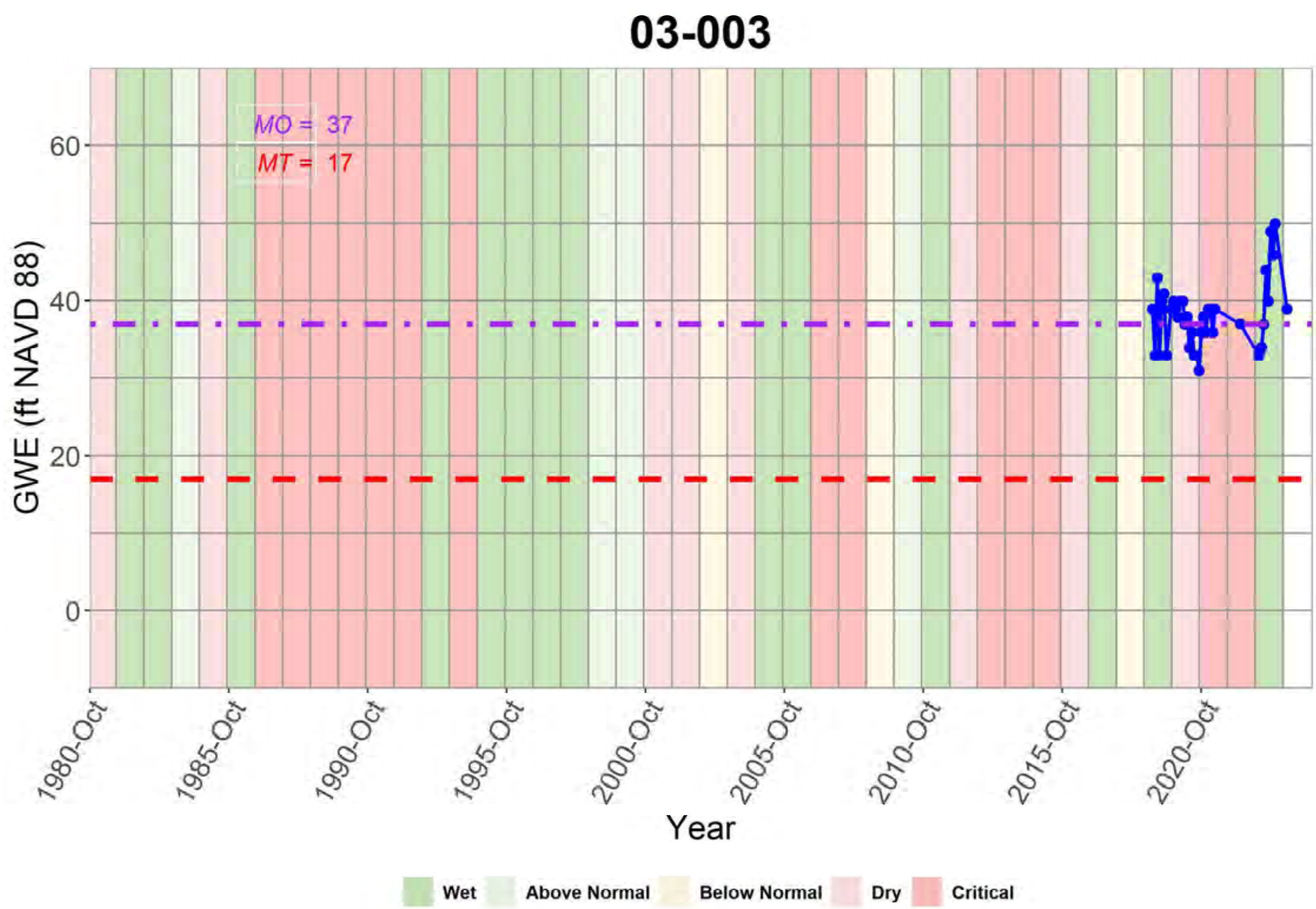
MO = 31
MT = -6
GWE (ft NAVD 88)
60
40
20
0
-20
-40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

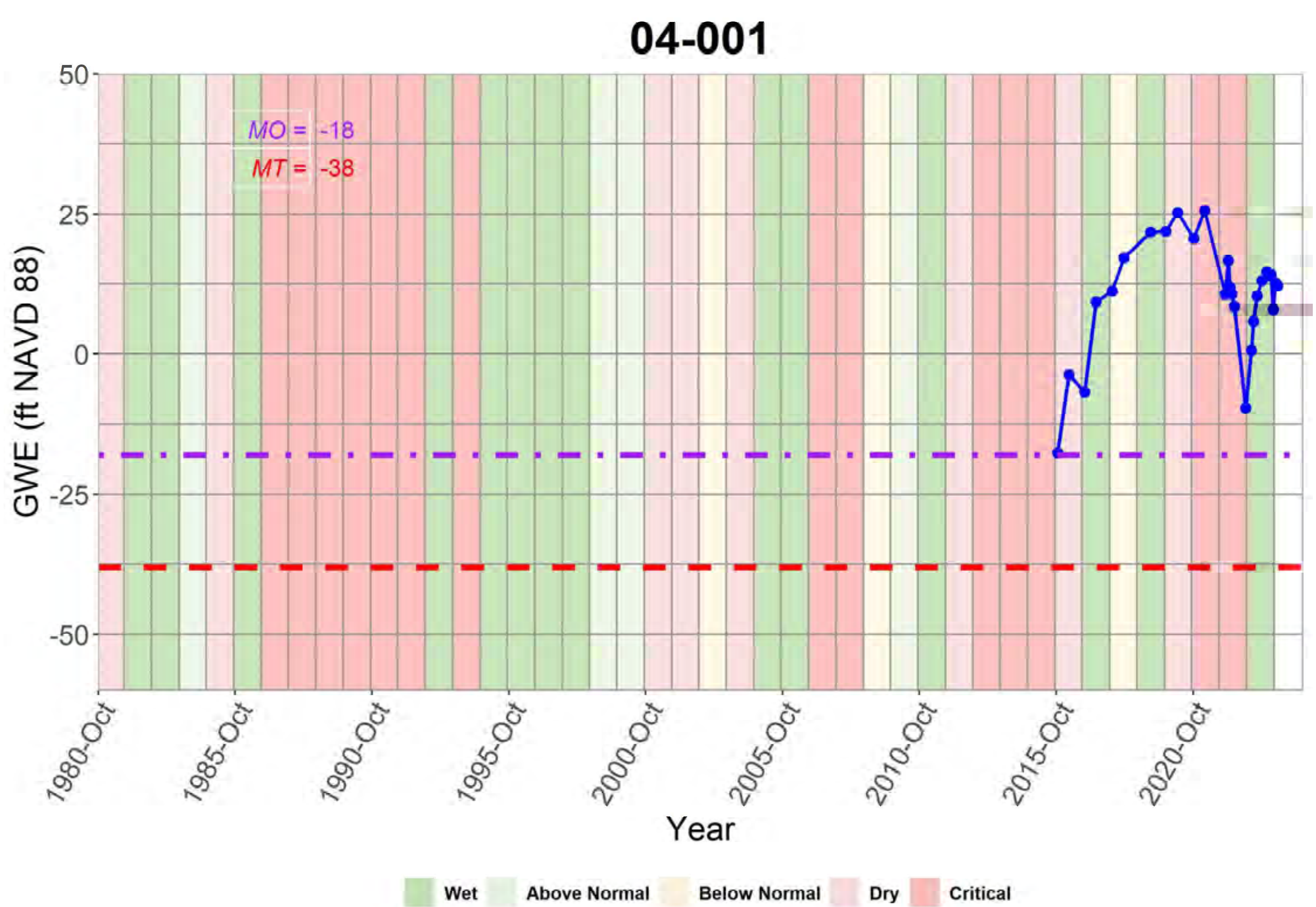


03-001
MO = 31
MT = 11
GWE (ft NAVD 88)
60
40
20
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

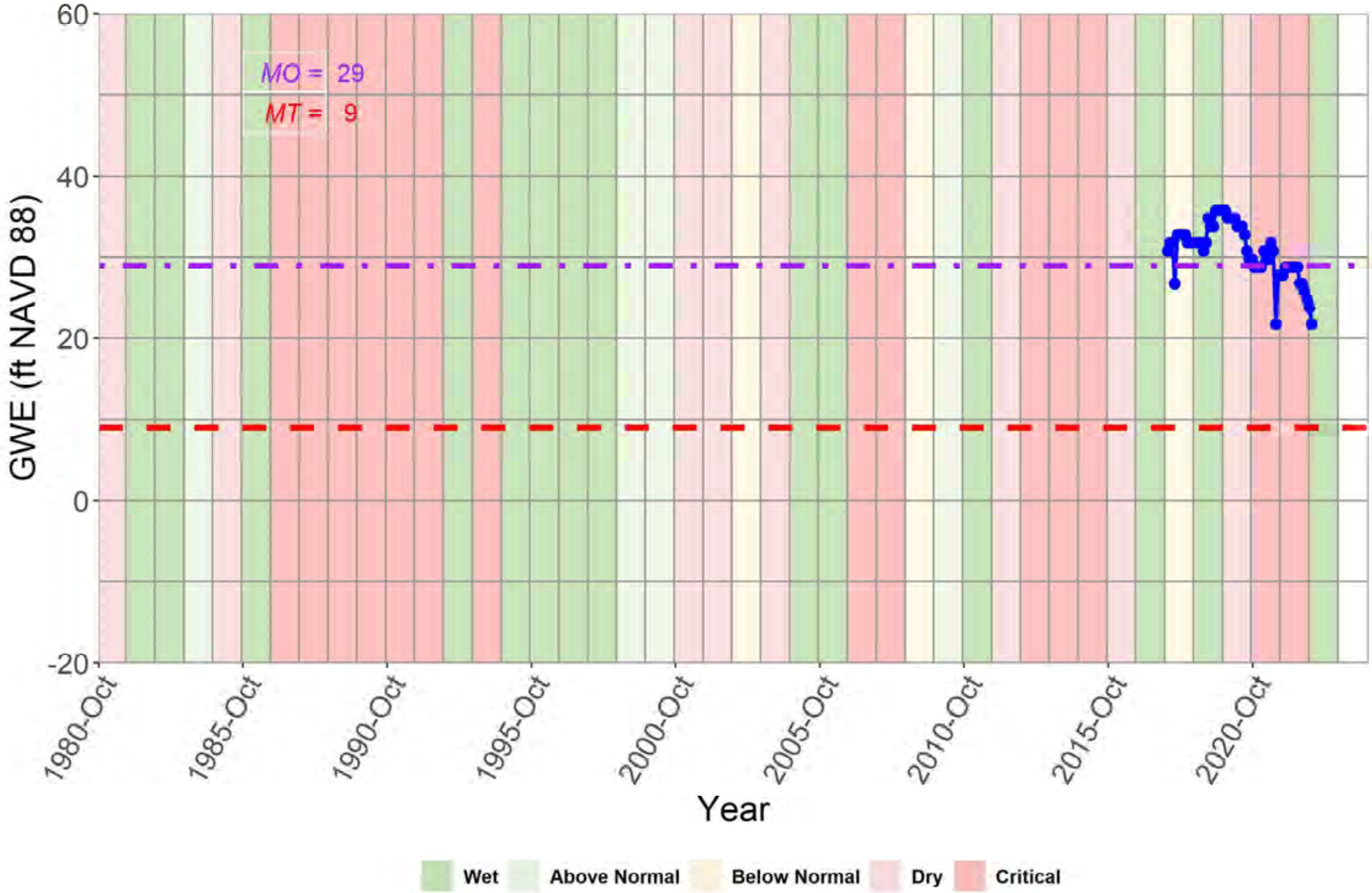


03-002
MO = 26
MT = 6
GWE (ft NAVD 88)
75
50
25
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

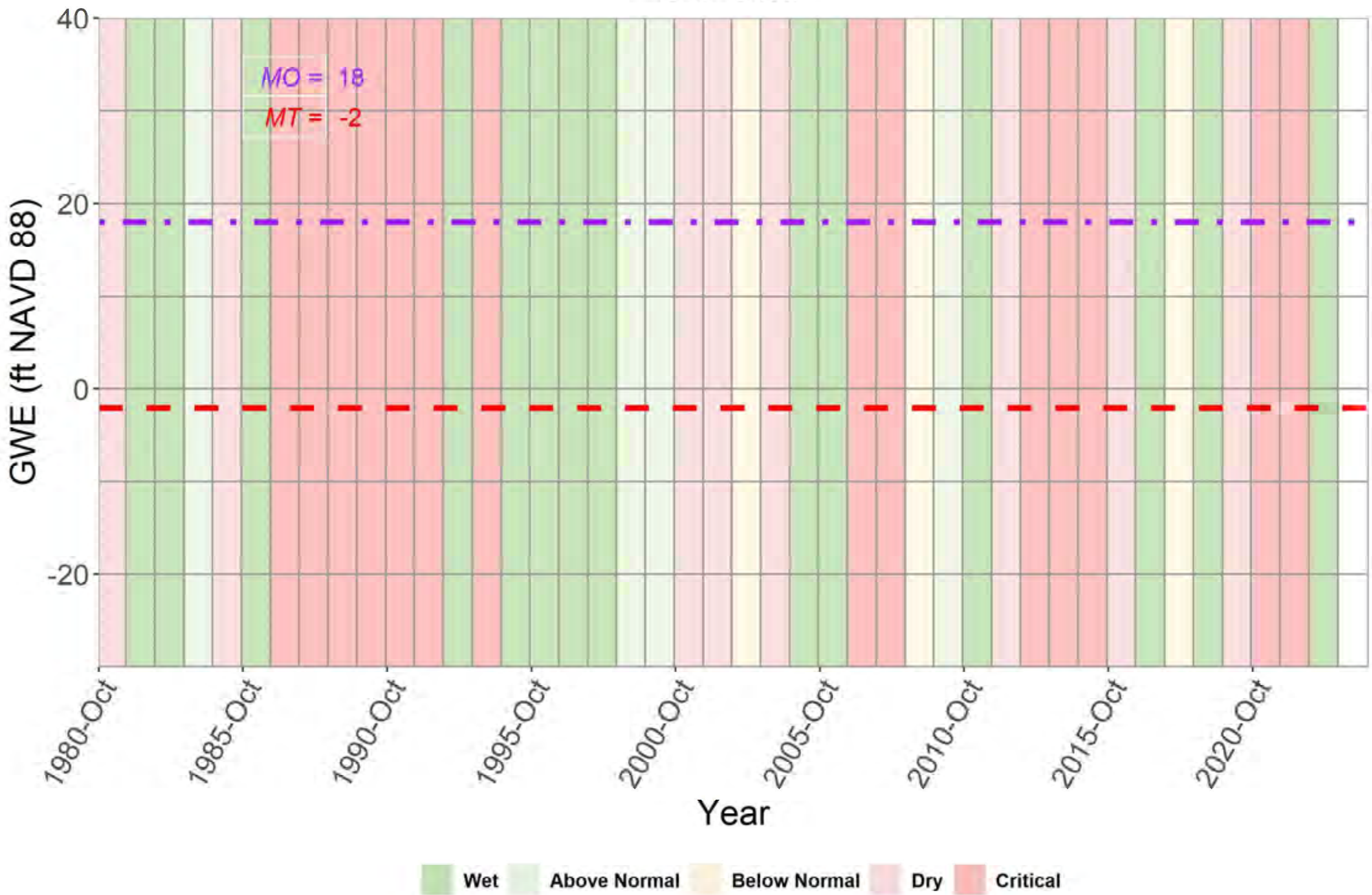

03-003
MO = 37
MT = 17
60
40
20
0
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

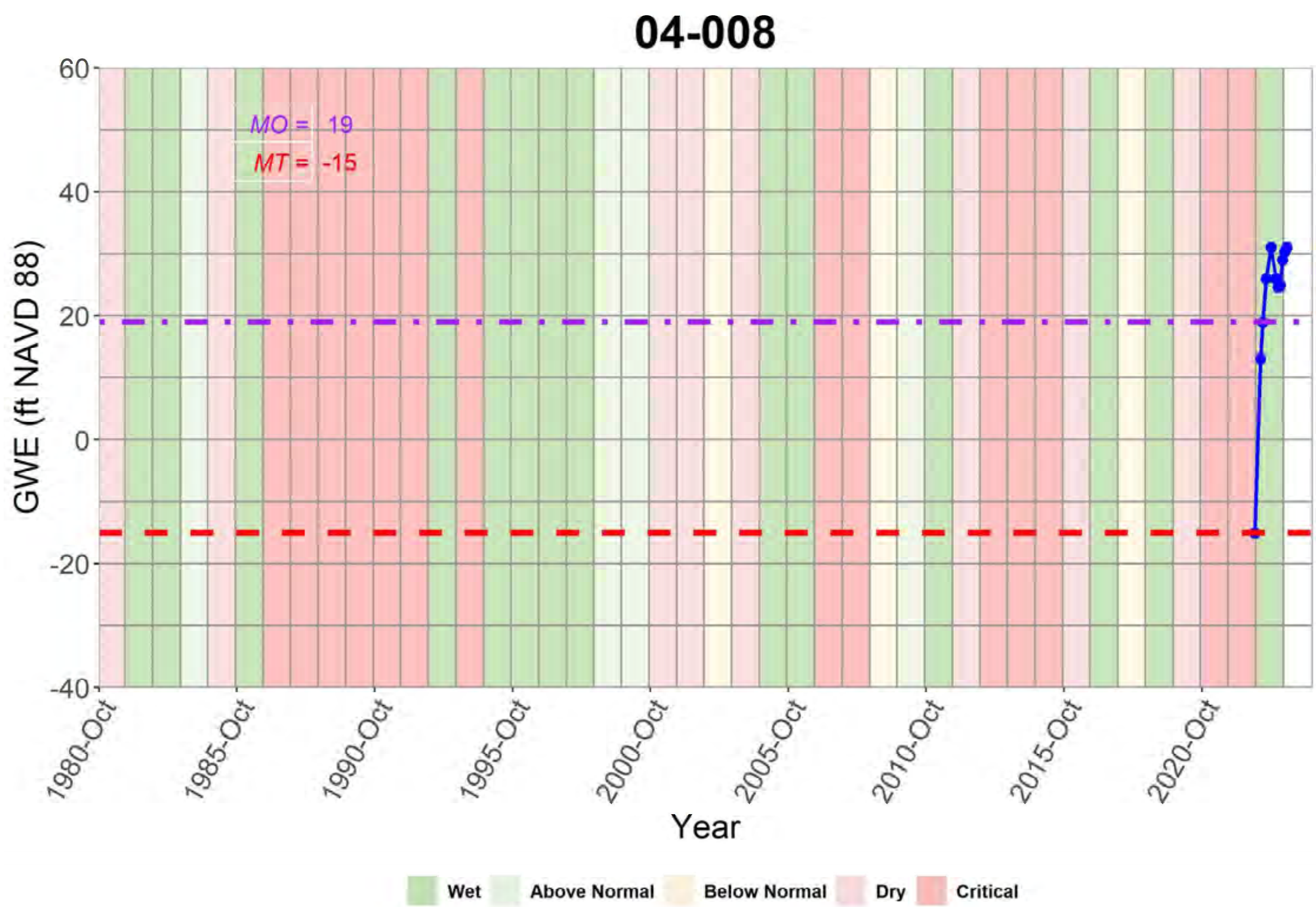

04-001
MO = -18
MT = -38
50
25
0
-25
-50
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

04-006

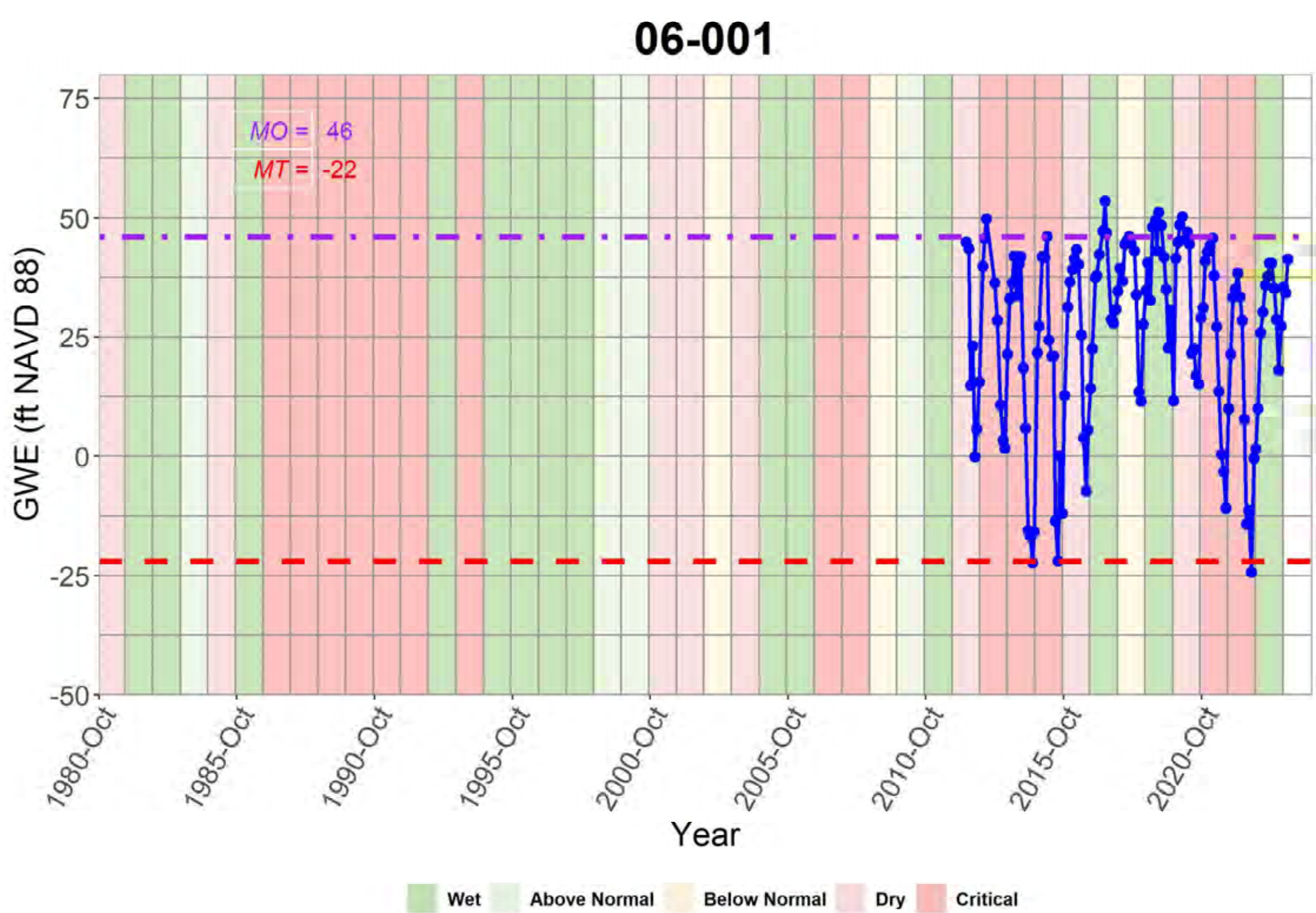

MO = 29
MT = 9
GWE (ft NAVD 88)
60
40
20
0
-20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

04-007

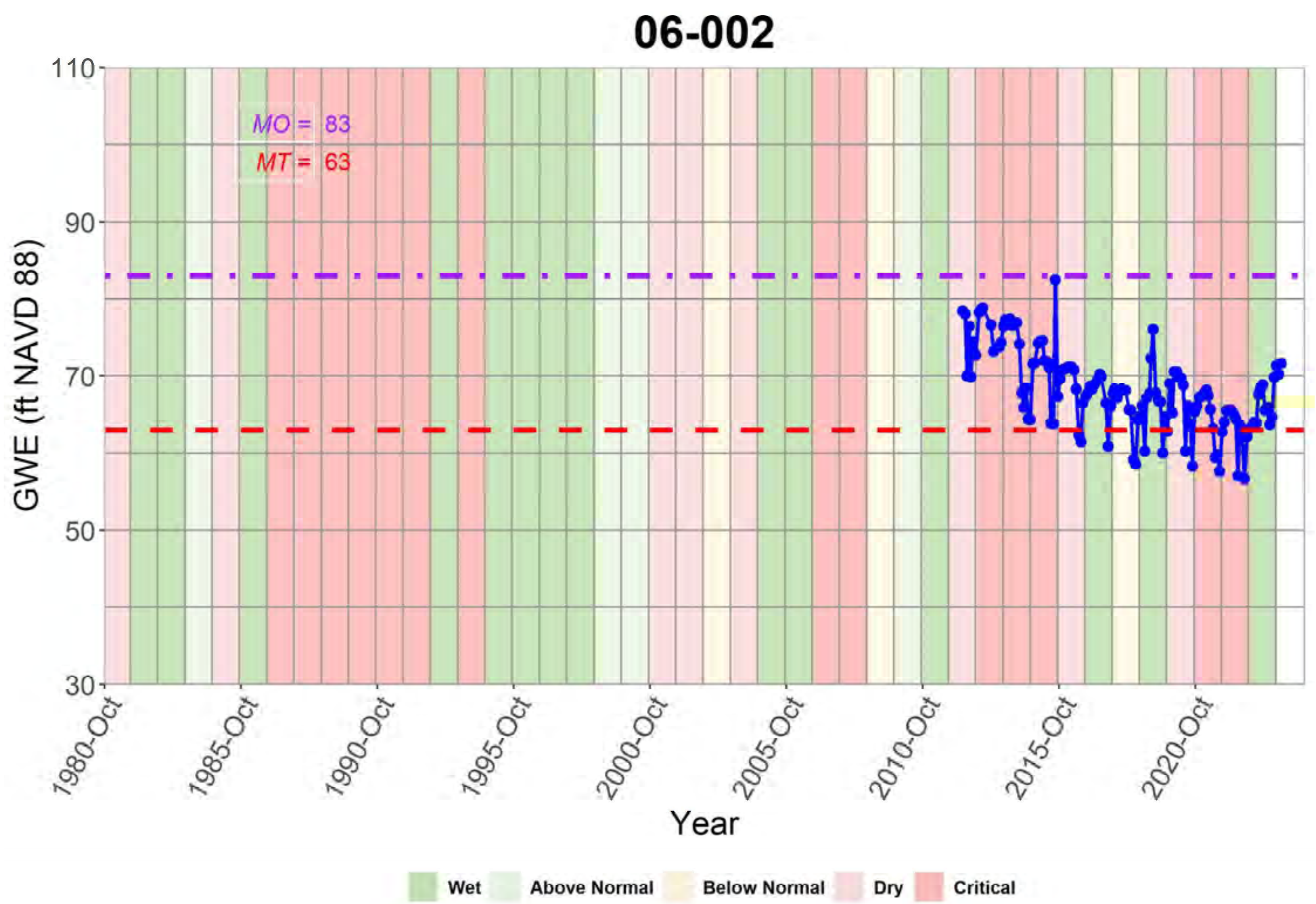

MO = 18
MT = -2
GWE (ft NAVD 88)
40
20
0
-20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

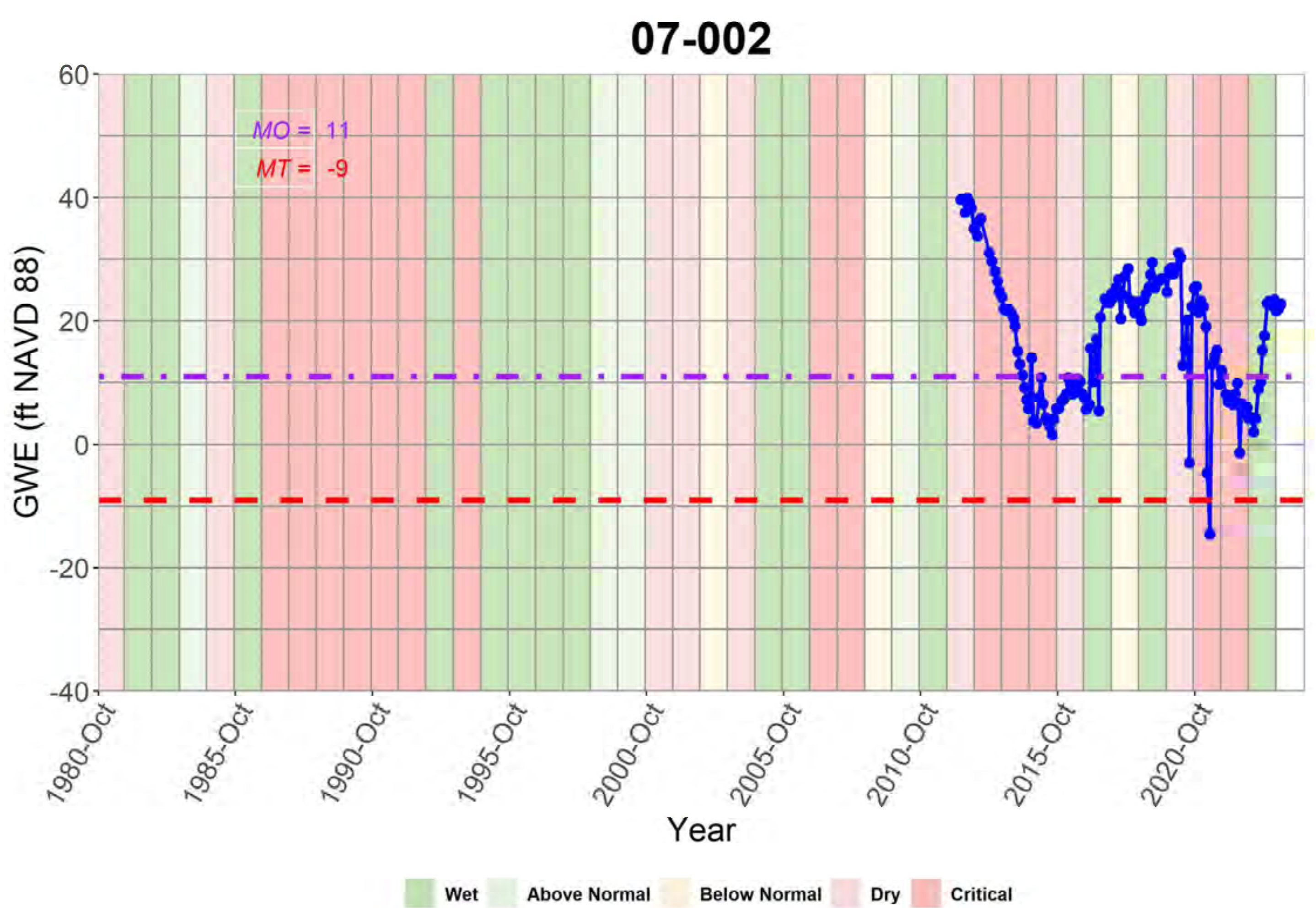


04-008
MO = 19
MT = -15
GWE (ft NAVD 88)
60
40
20
0
-20
-40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

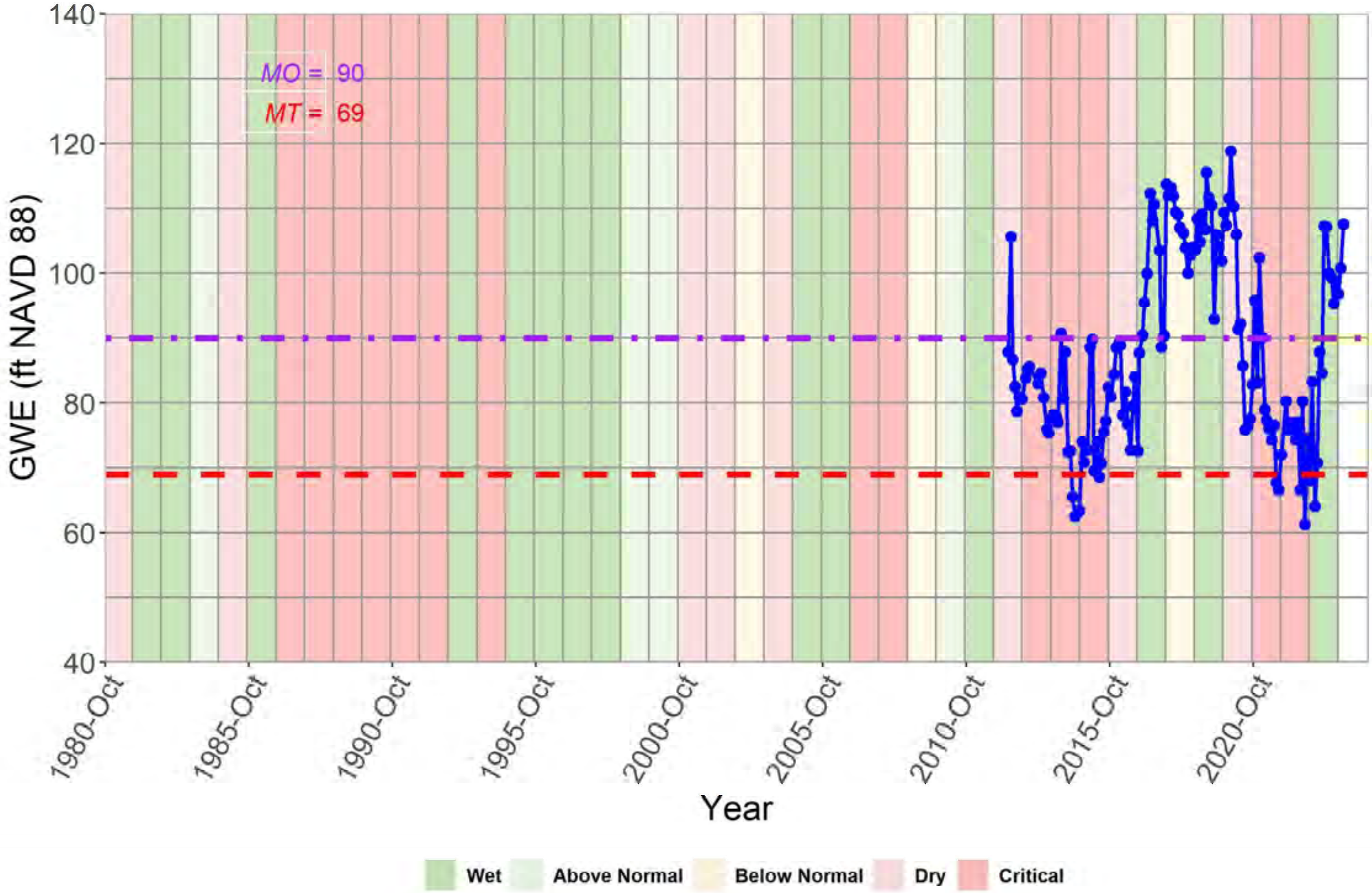


06-001
MO = 46
MT = -22
GWE (ft NAVD 88)
75
50
25
0
-25
-50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

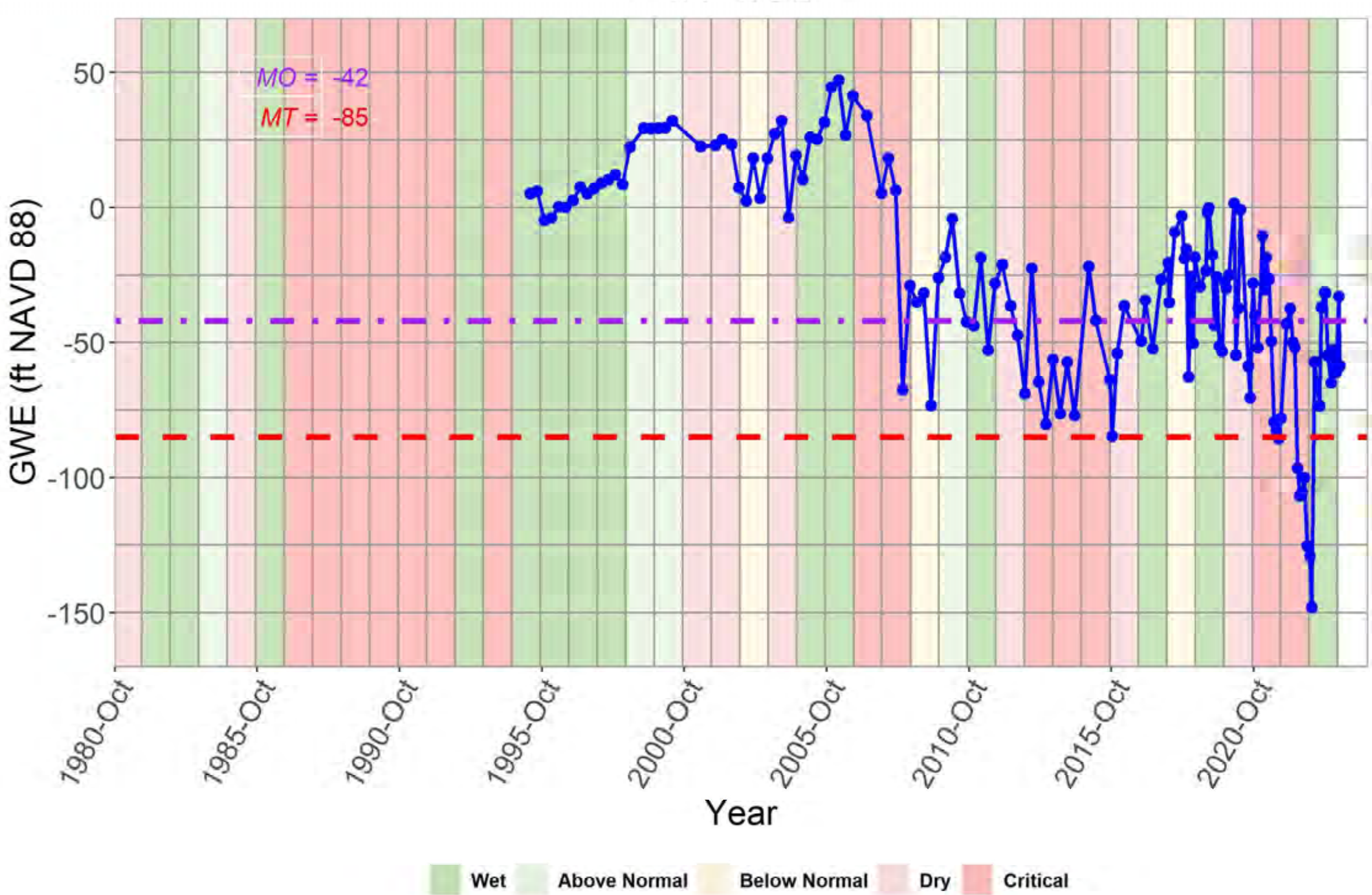

06-002
MO = 83
MT = 63
GWE (ft NAVD 88)
110
90
70
50
30
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

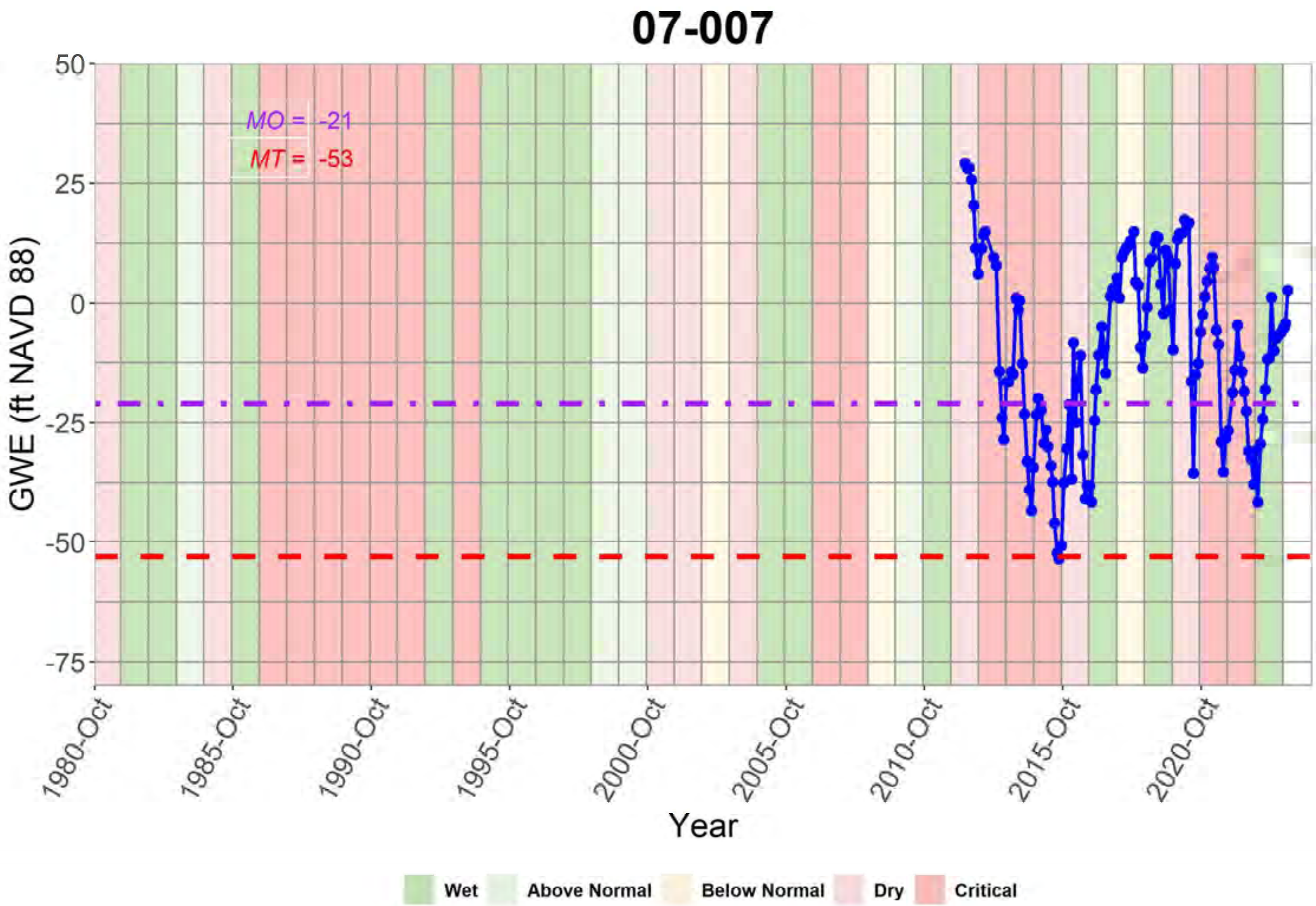

07-002
MO = 11
MT = -9
GWE (ft NAVD 88)
60
40
20
0
-20
-40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

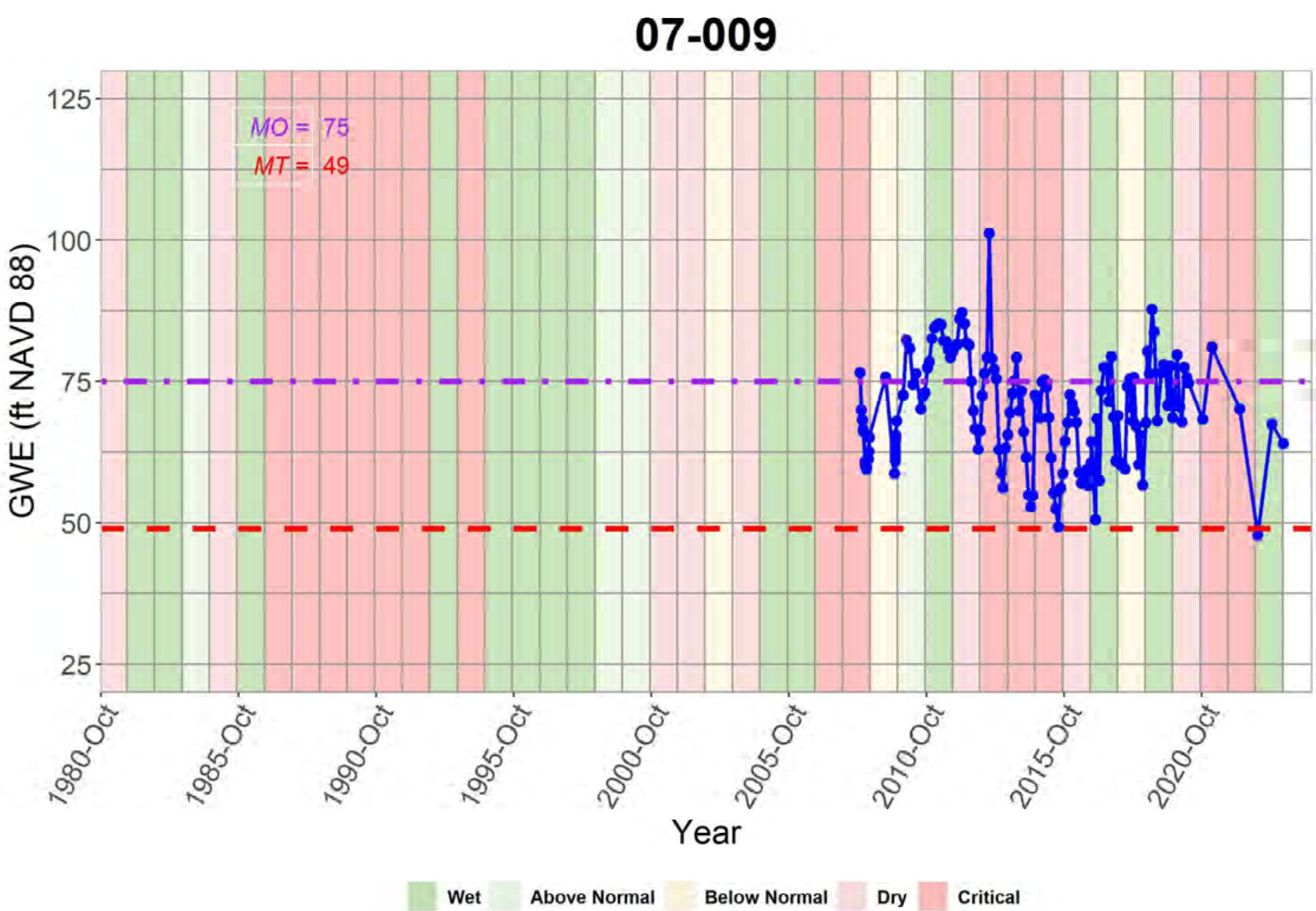
07-003

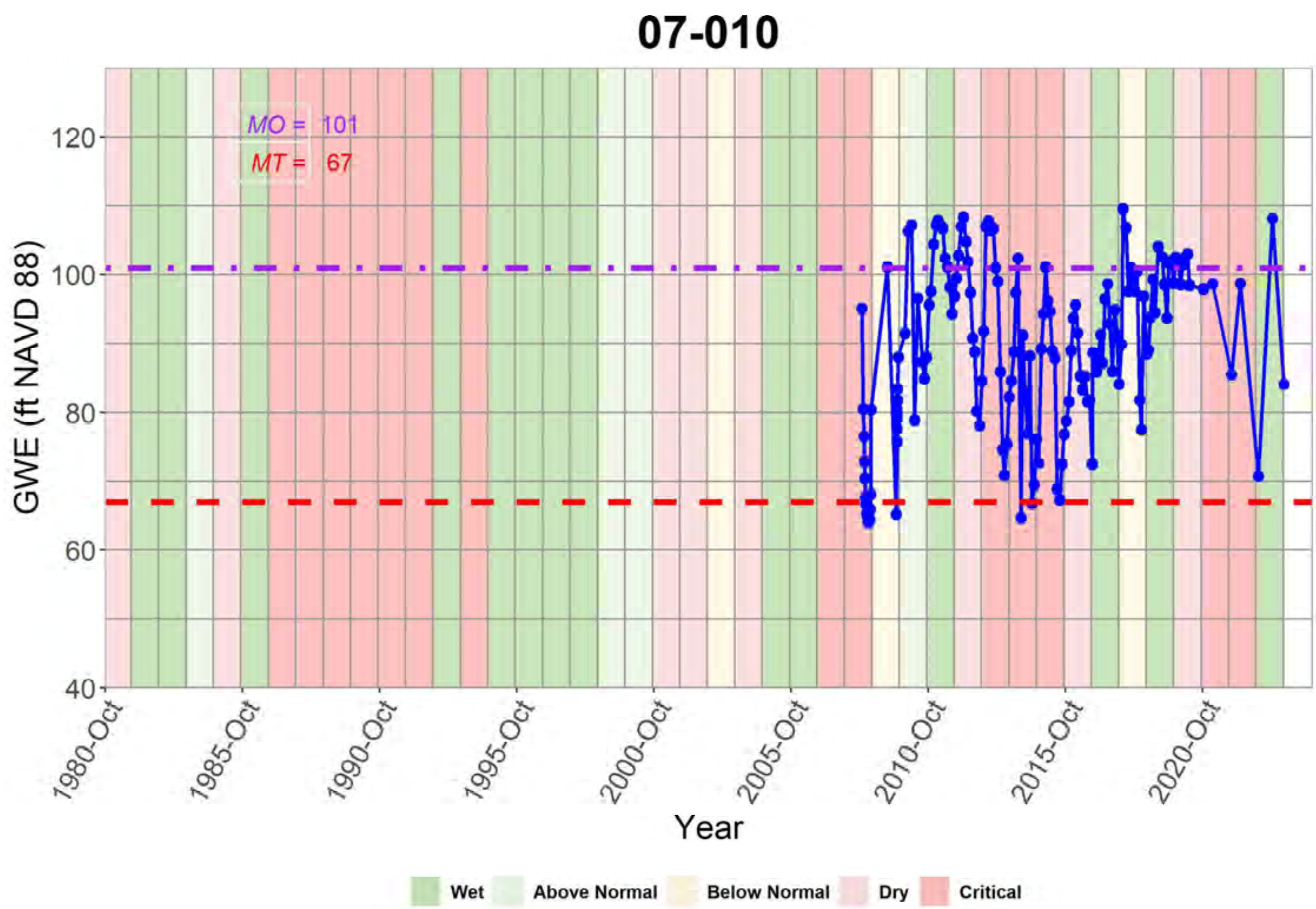

MO = 90
MT = 69
140
120
100
80
60
40
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

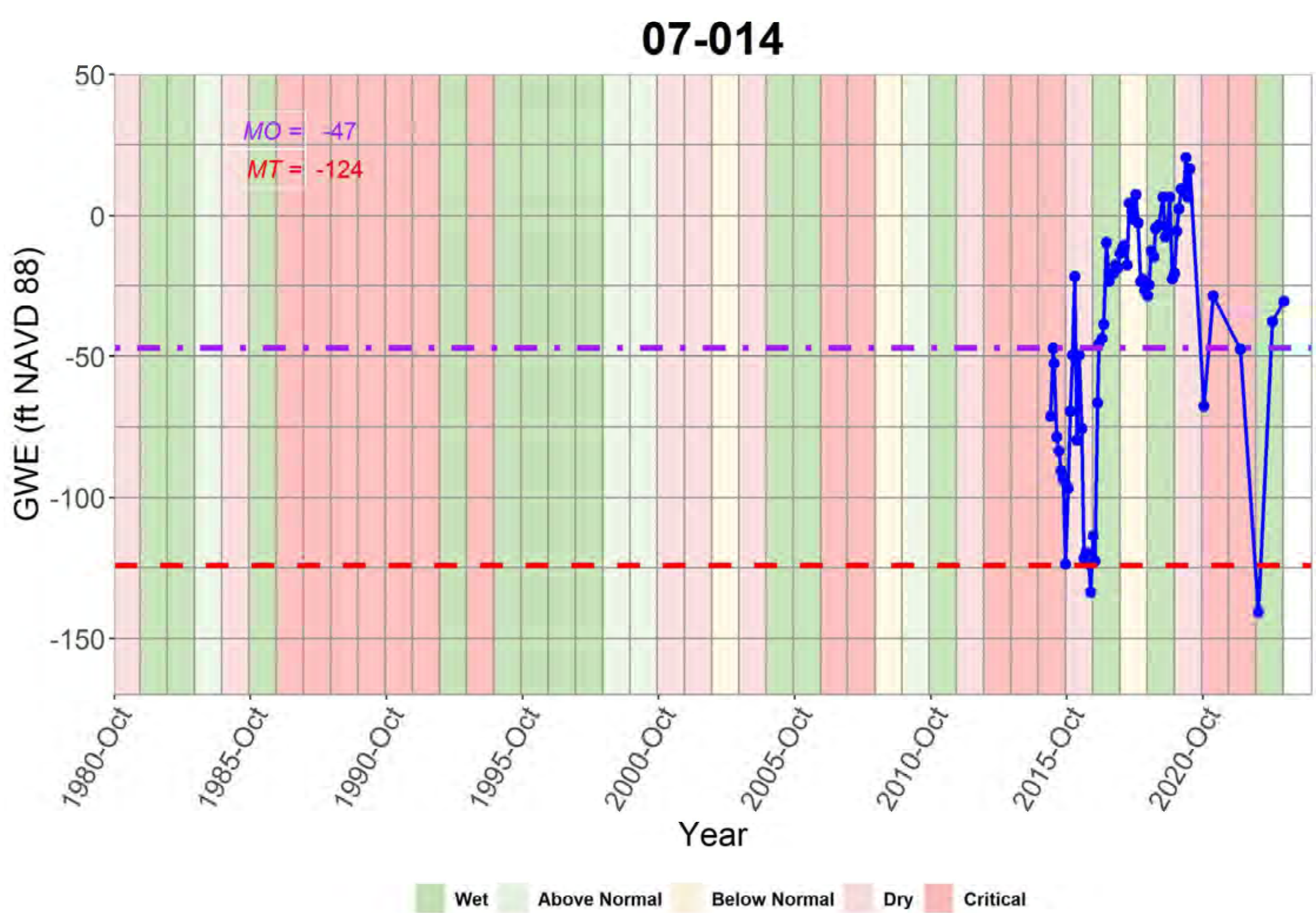
07-005


MO = -42
MT = -85
50
0
-50
-100
-150
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

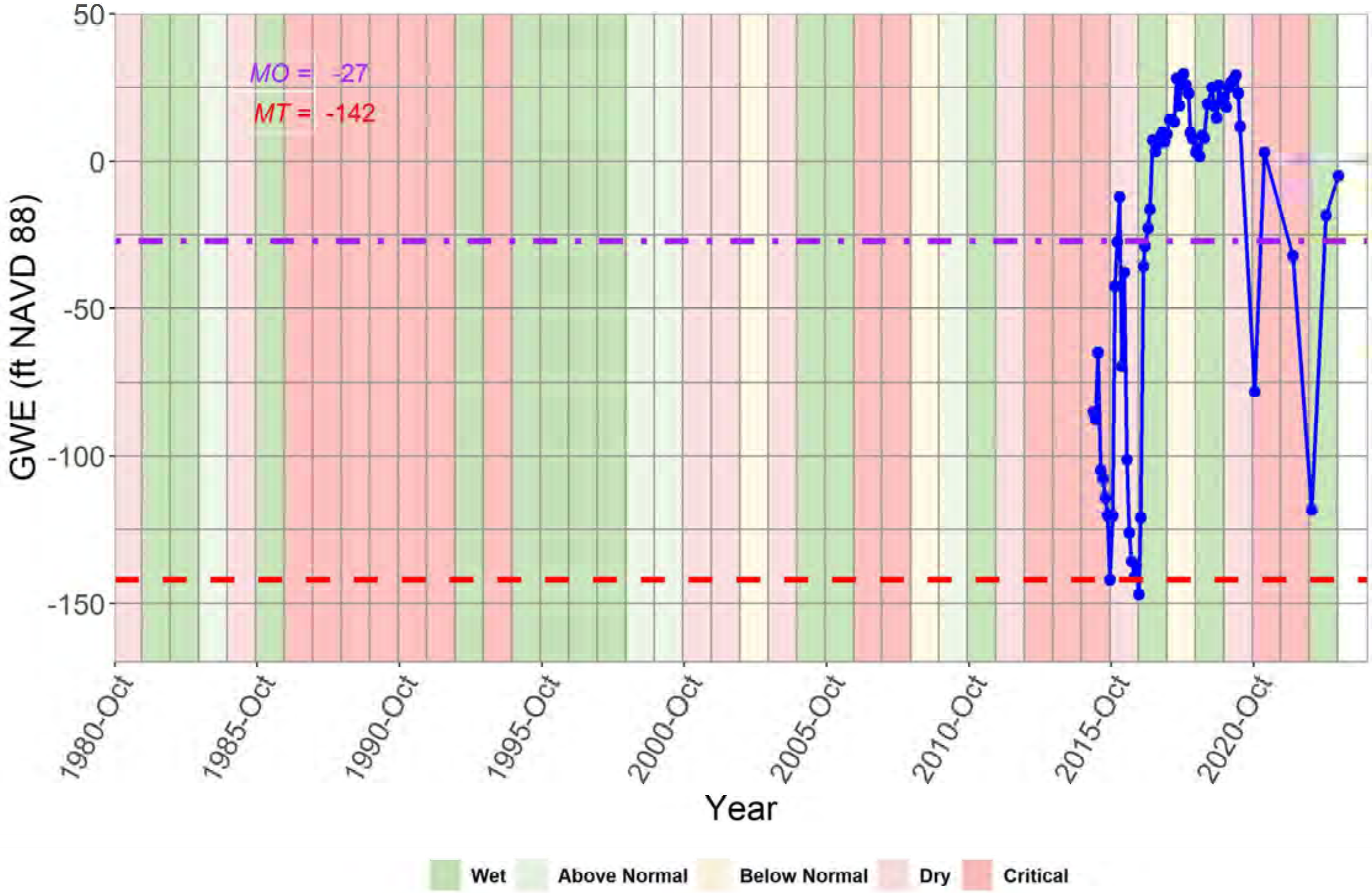

07-007
MO = -21
MT = -53
GWE (ft NAVD 88)
50
25
0
-25
-50
-75
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-009
MO = 75
MT = 49
GWE (ft NAVD 88)
125
100
75
50
25
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-010
MO = 101
MT = 67
GWE (ft NAVD 88)
120
100
80
60
40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

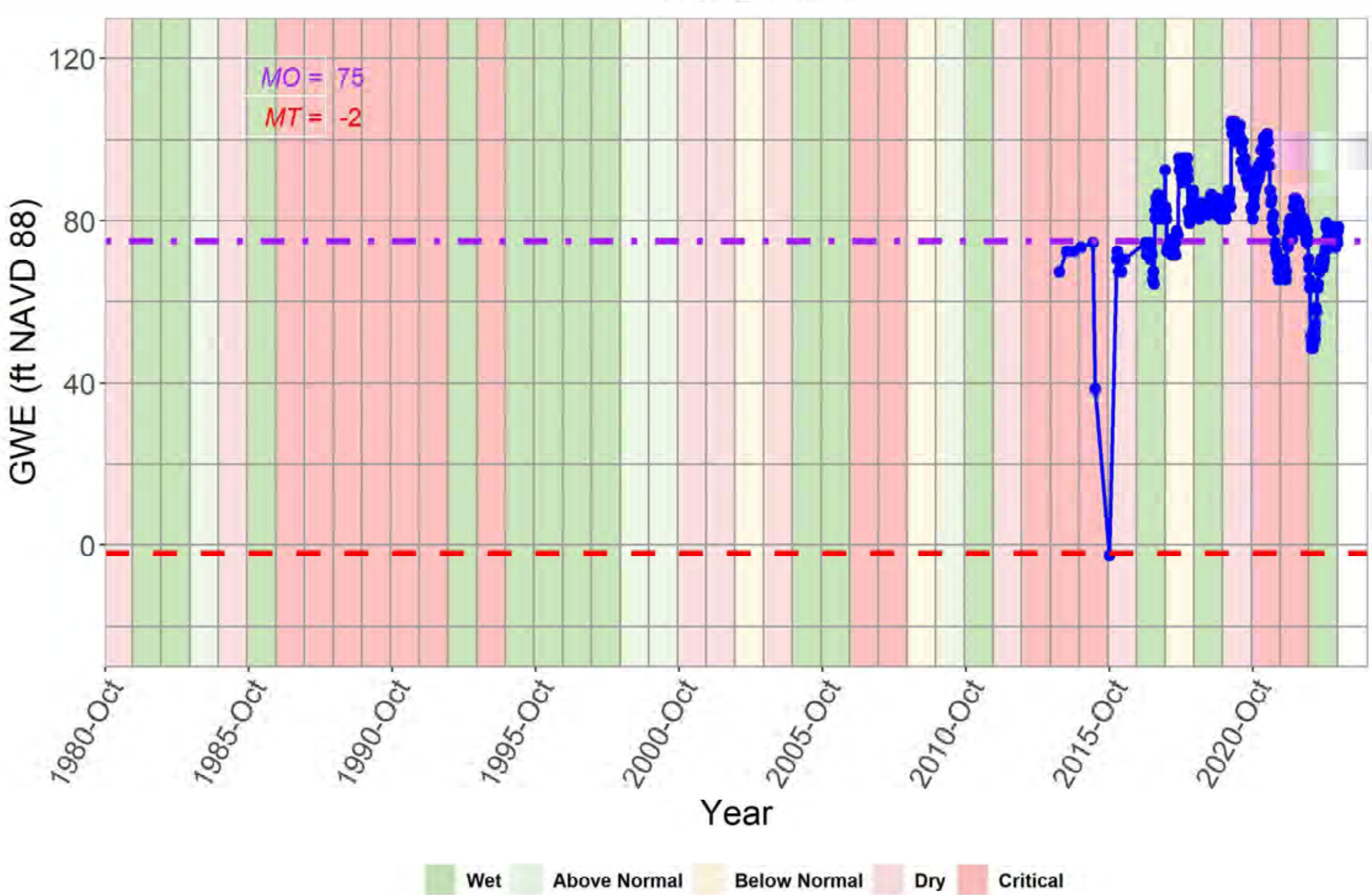

07-014
MO = -47
MT = -124
GWE (ft NAVD 88)
50
0
-50
-100
-150
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

07-015



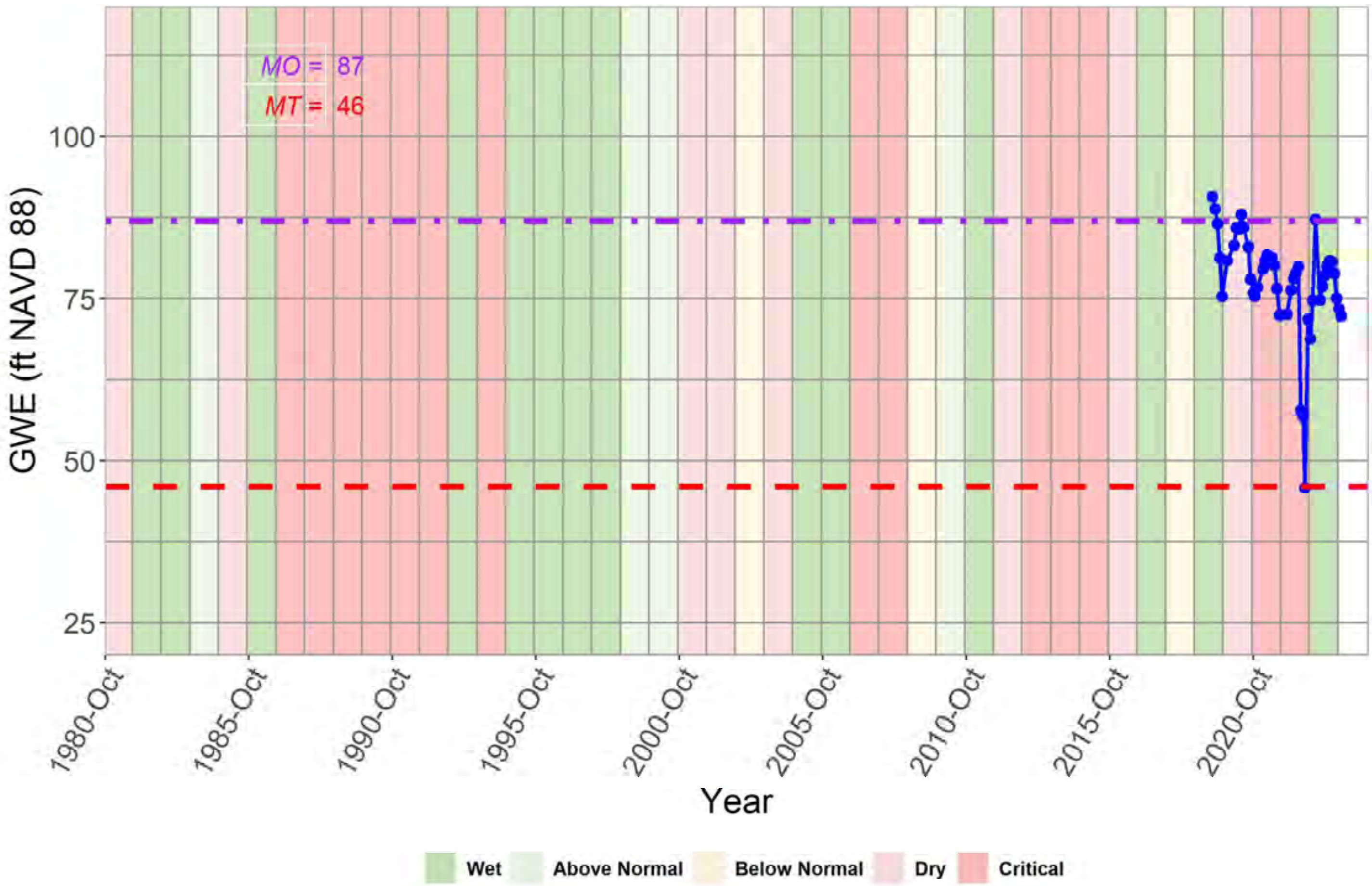
MO = -27
MT = -142
GWE (ft NAVD 88)
50
0
-50
-100
-150
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

07-016

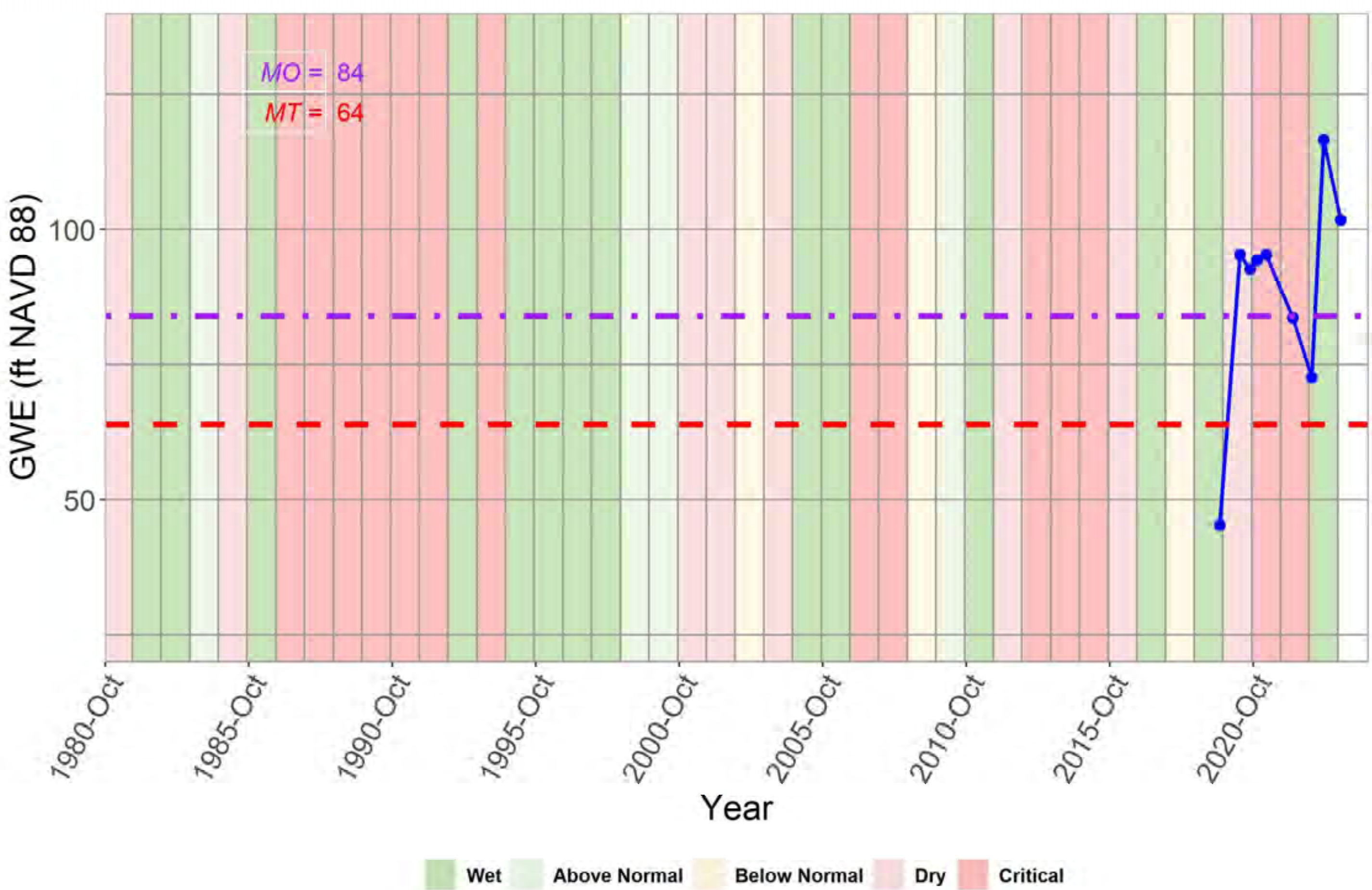


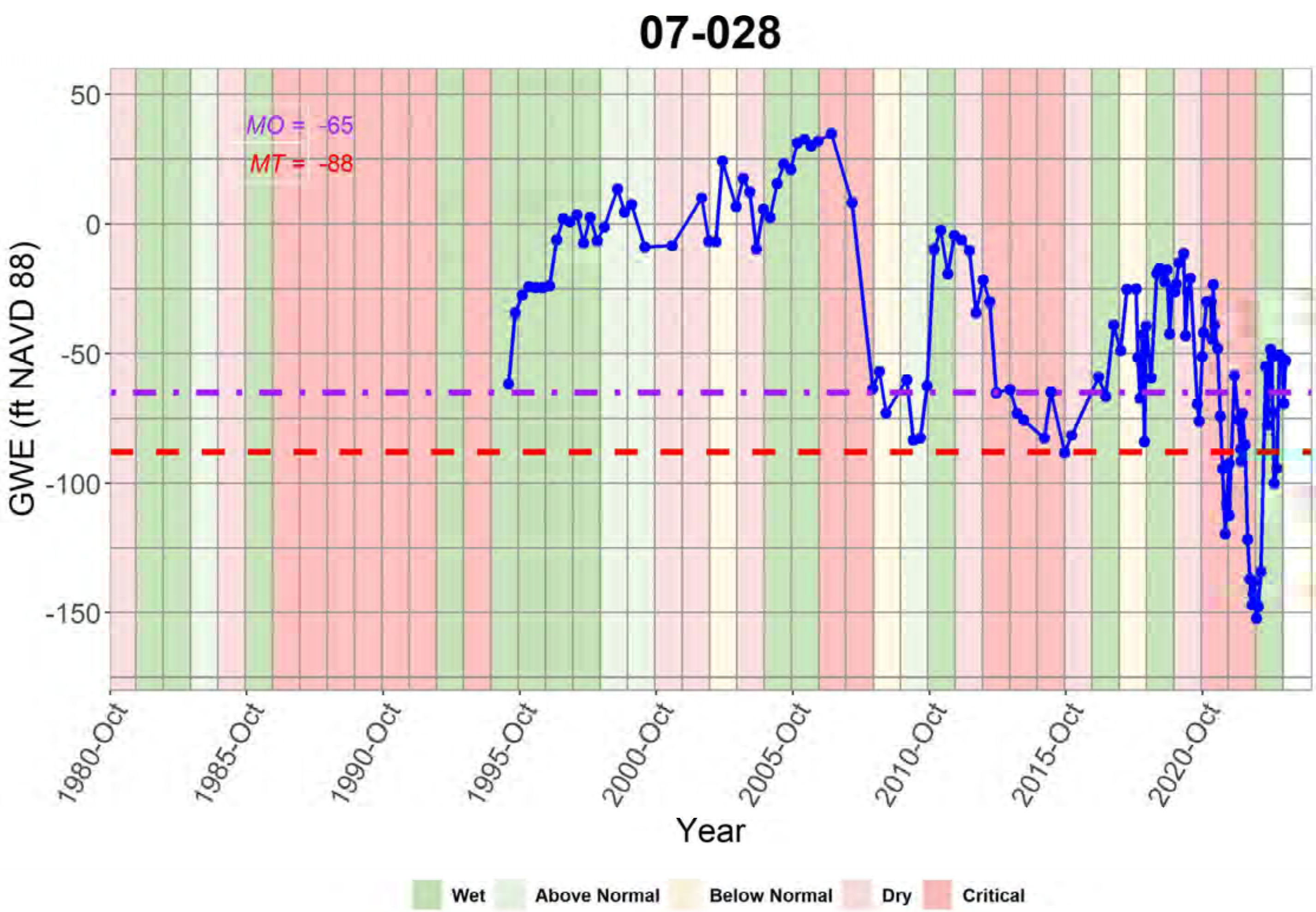
MO = 75
MT = -2
GWE (ft NAVD 88)
120
80
40
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

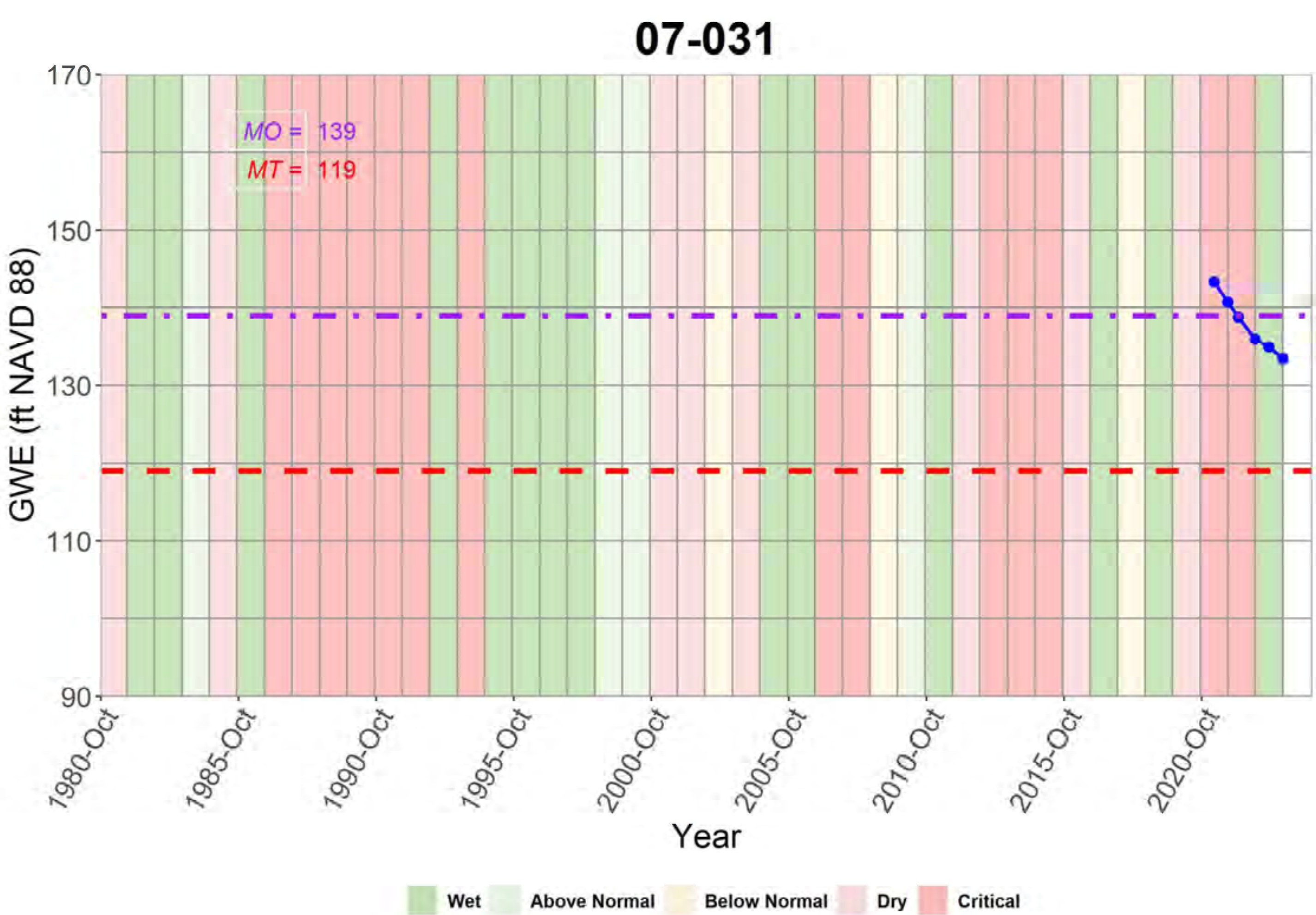
07-017

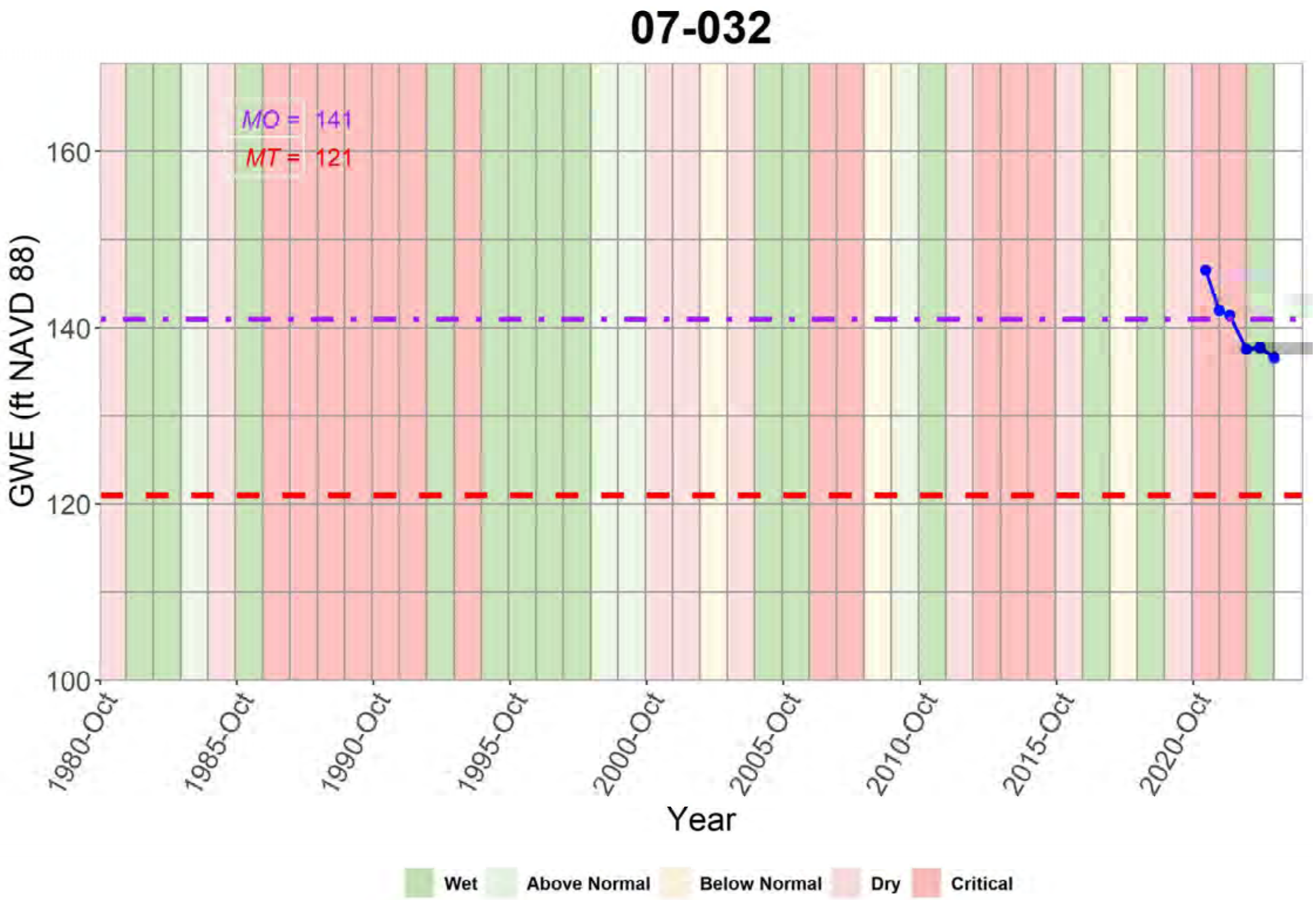

MO = 87
MT = 46
GWE (ft NAVD 88)
100
75
50
25
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

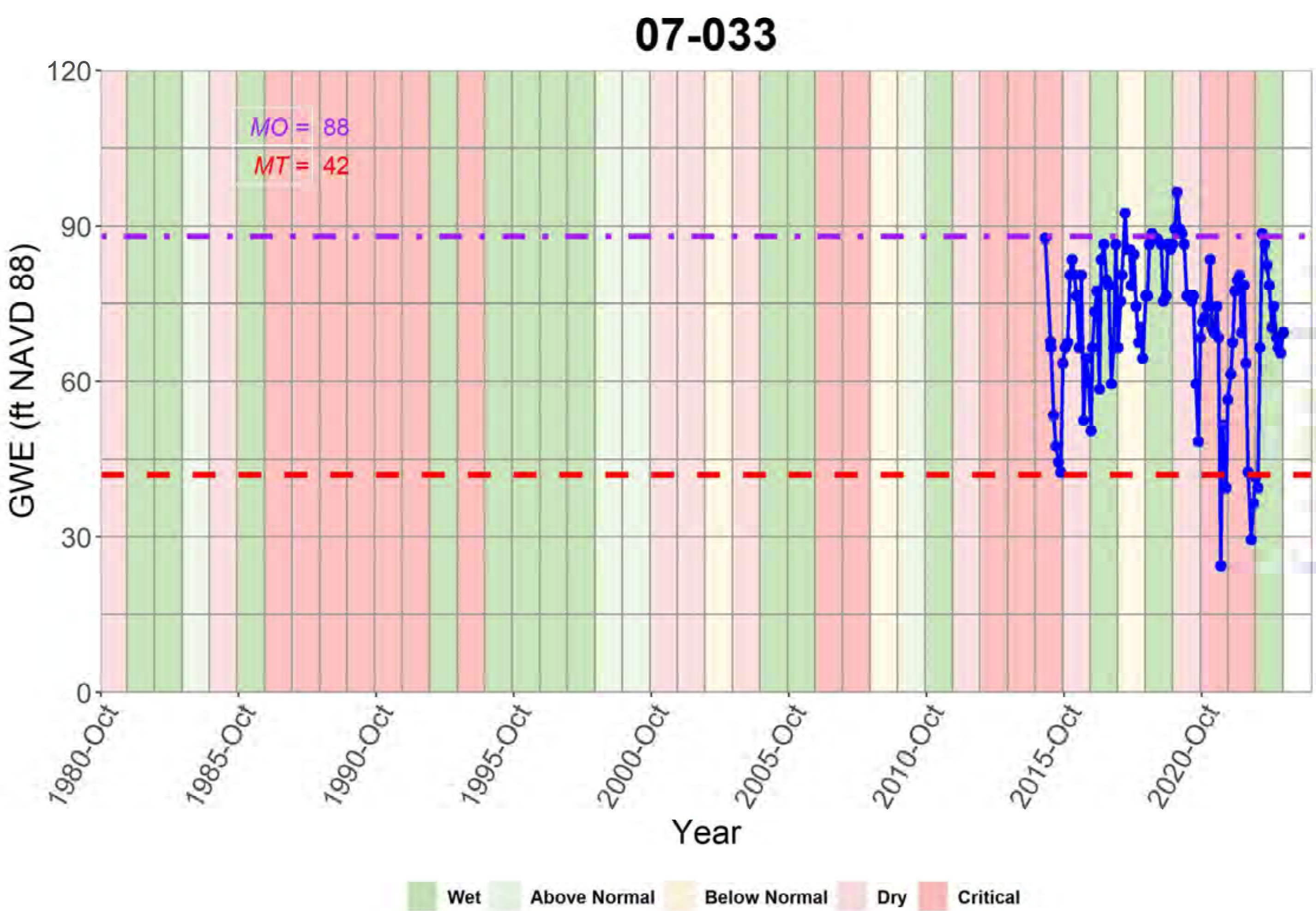
07-018

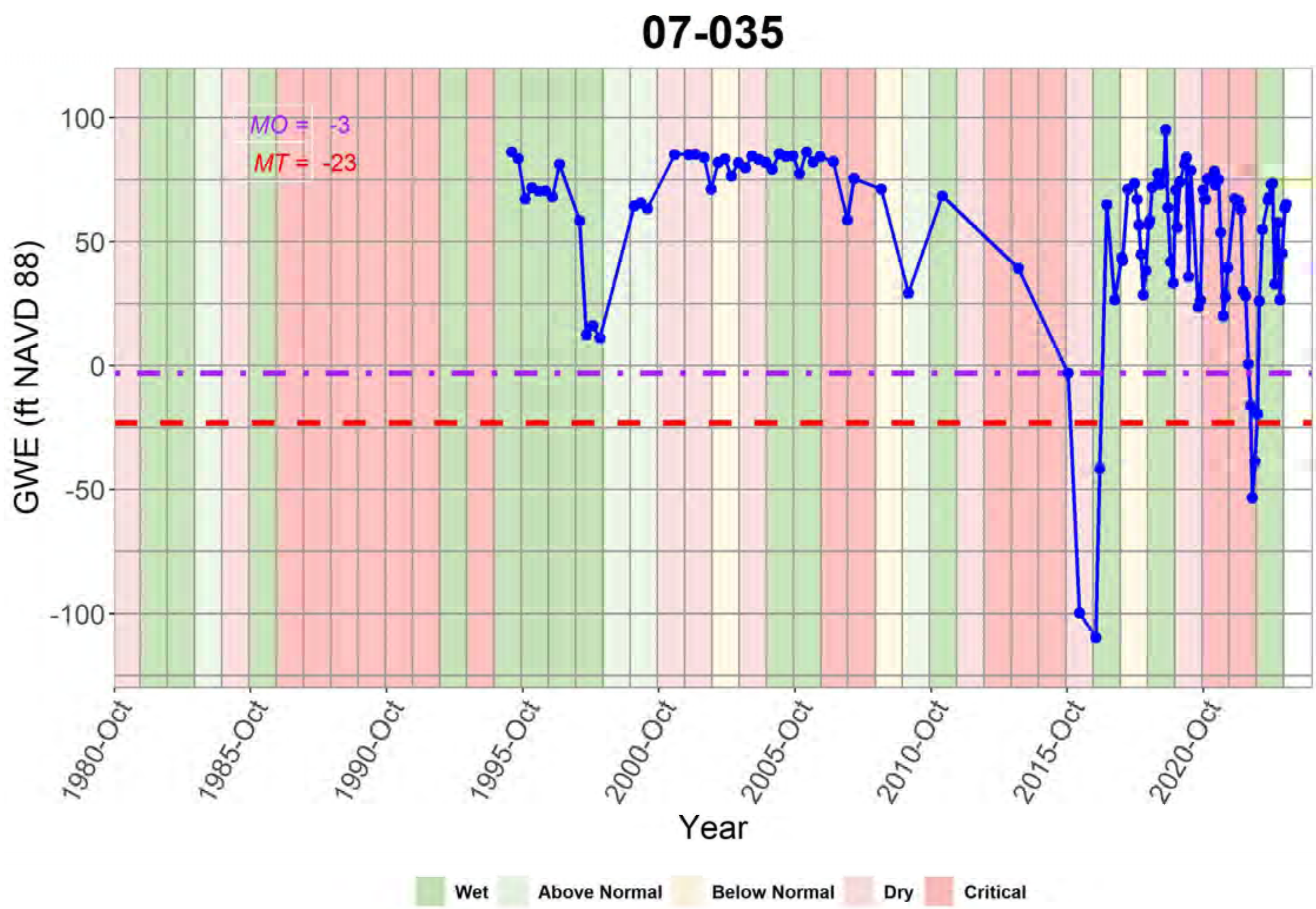

MO = 84
MT = 64
GWE (ft NAVD 88)
100
50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-028
MO = -65
MT = -88
GWE (ft NAVD 88)
50
0
-50
-100
-150
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

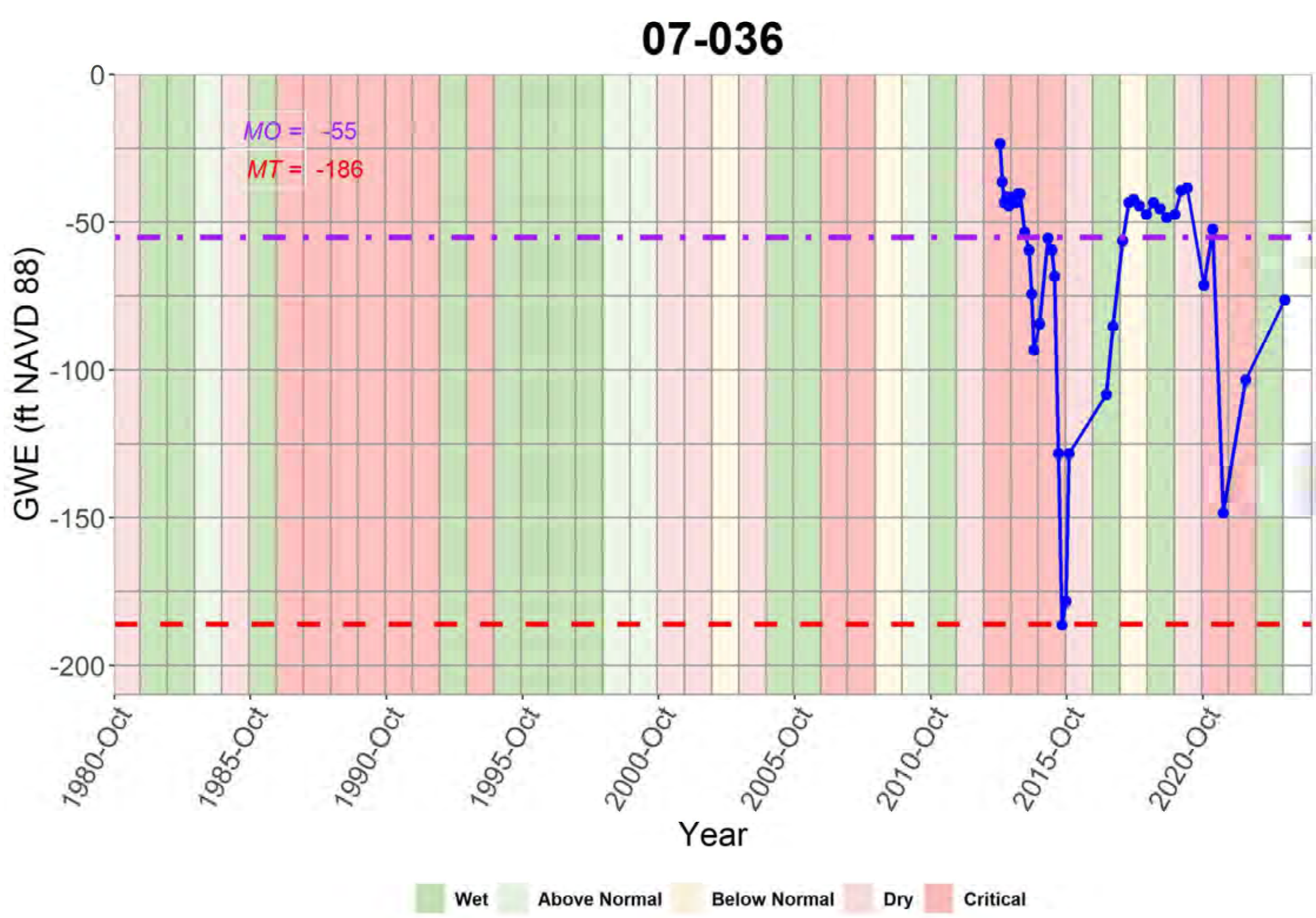

07-031
MO = 139
MT = 119
GWE (ft NAVD 88)
170
150
130
110
90
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-032
MO = 141
MT = 121
GWE (ft NAVD 88)
160
140
120
100
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

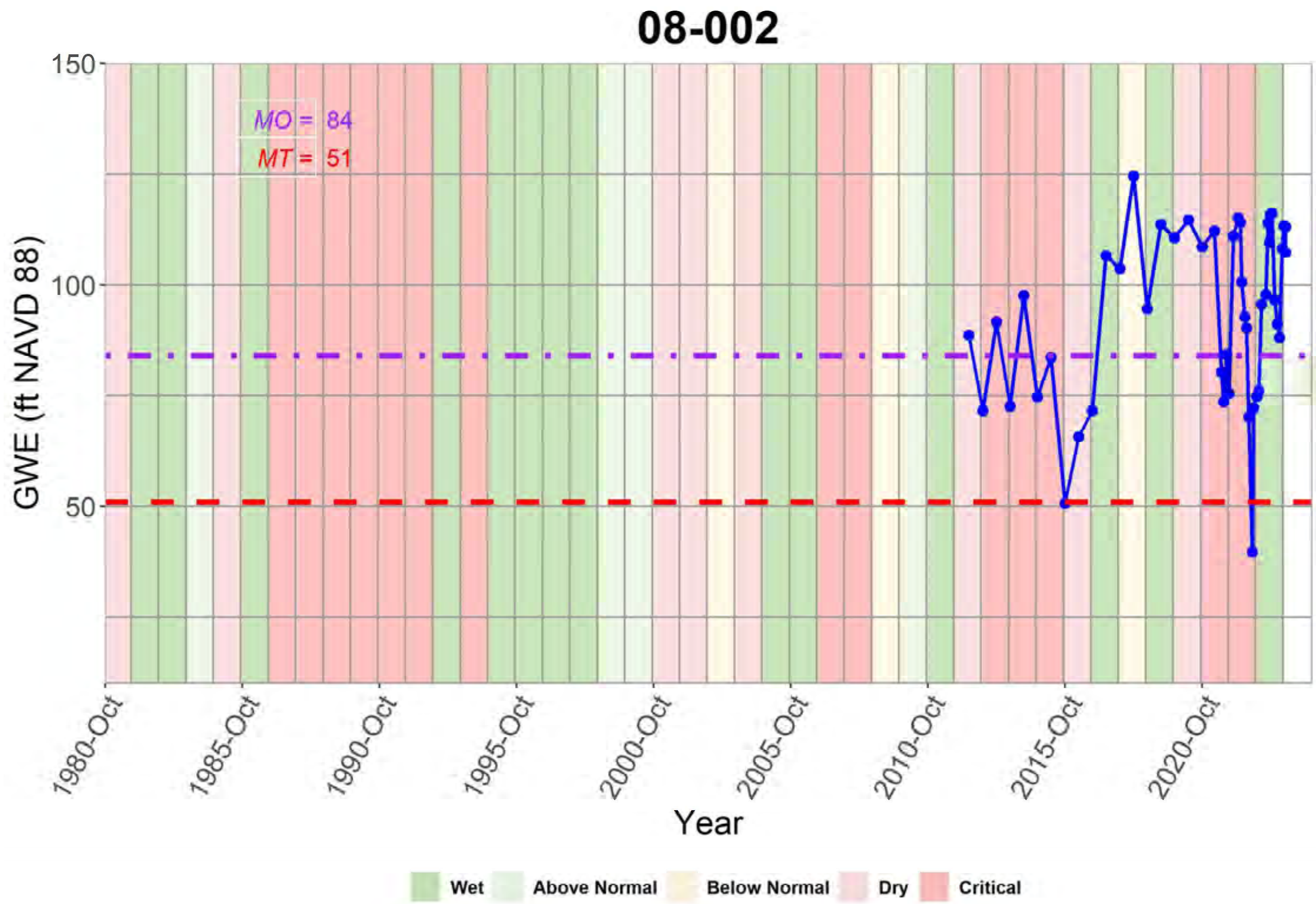

07-033
MO = 88
MT = 42
GWE (ft NAVD 88)
120
90
60
30
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical



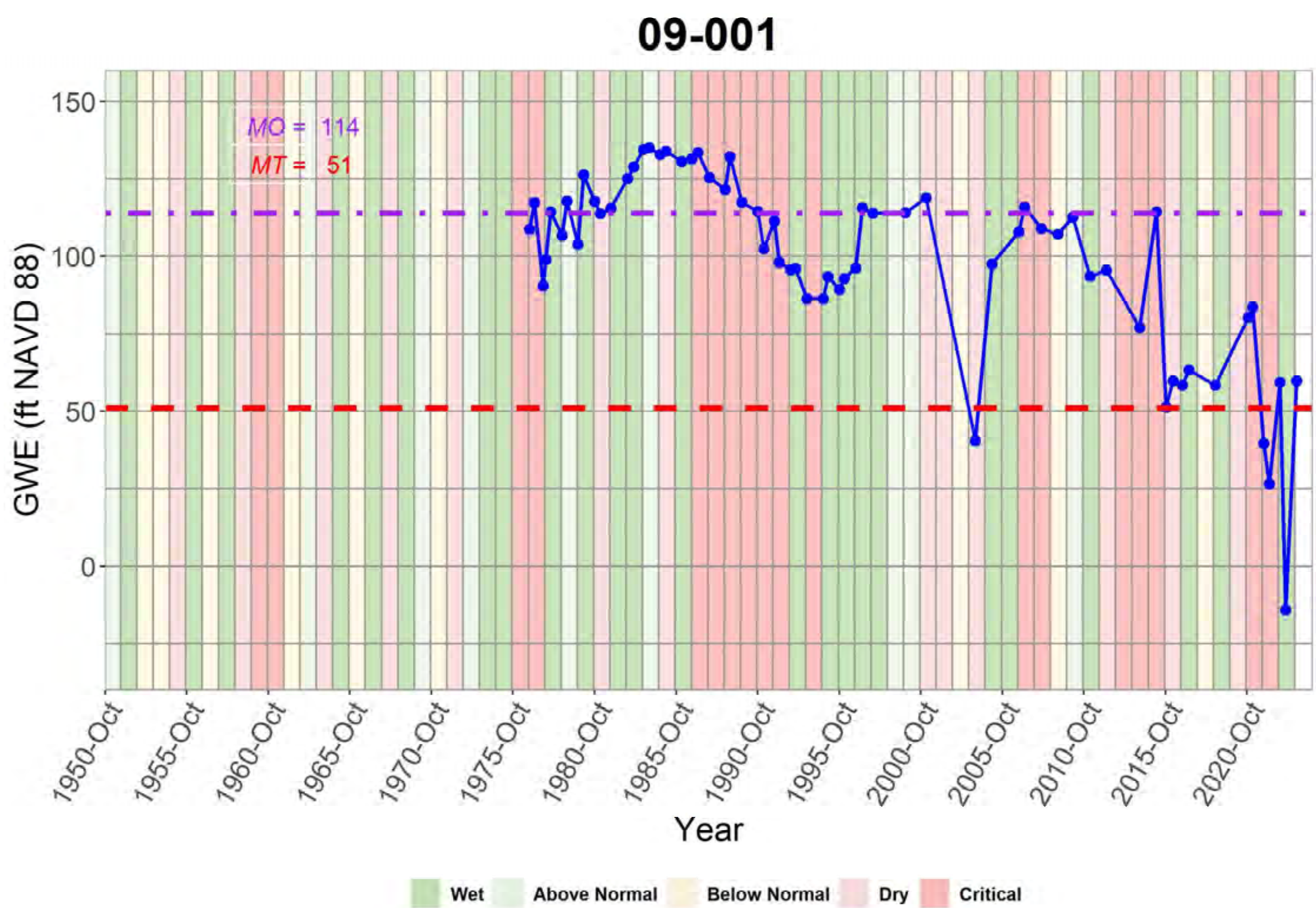
07-035
MO = -3
MT = -23
GWE (ft NAVD 88)
100
50
0
-50
-100
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical



07-036
MO = -55
MT = -186
GWE (ft NAVD 88)
0
-50
-100
-150
-200
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

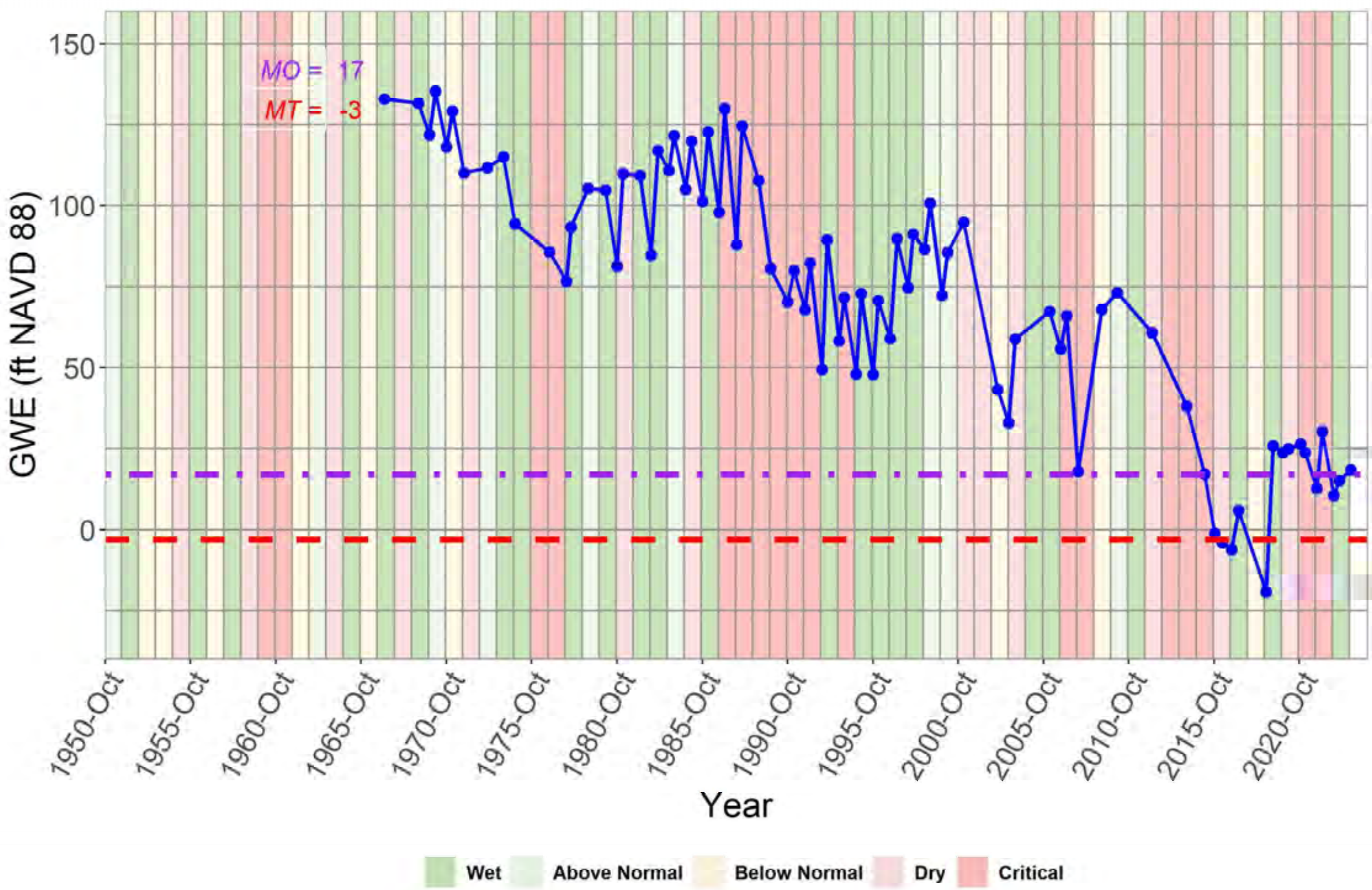


08-002
MO = 84
MT = 51
GWE (ft NAVD 88)
150
100
50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

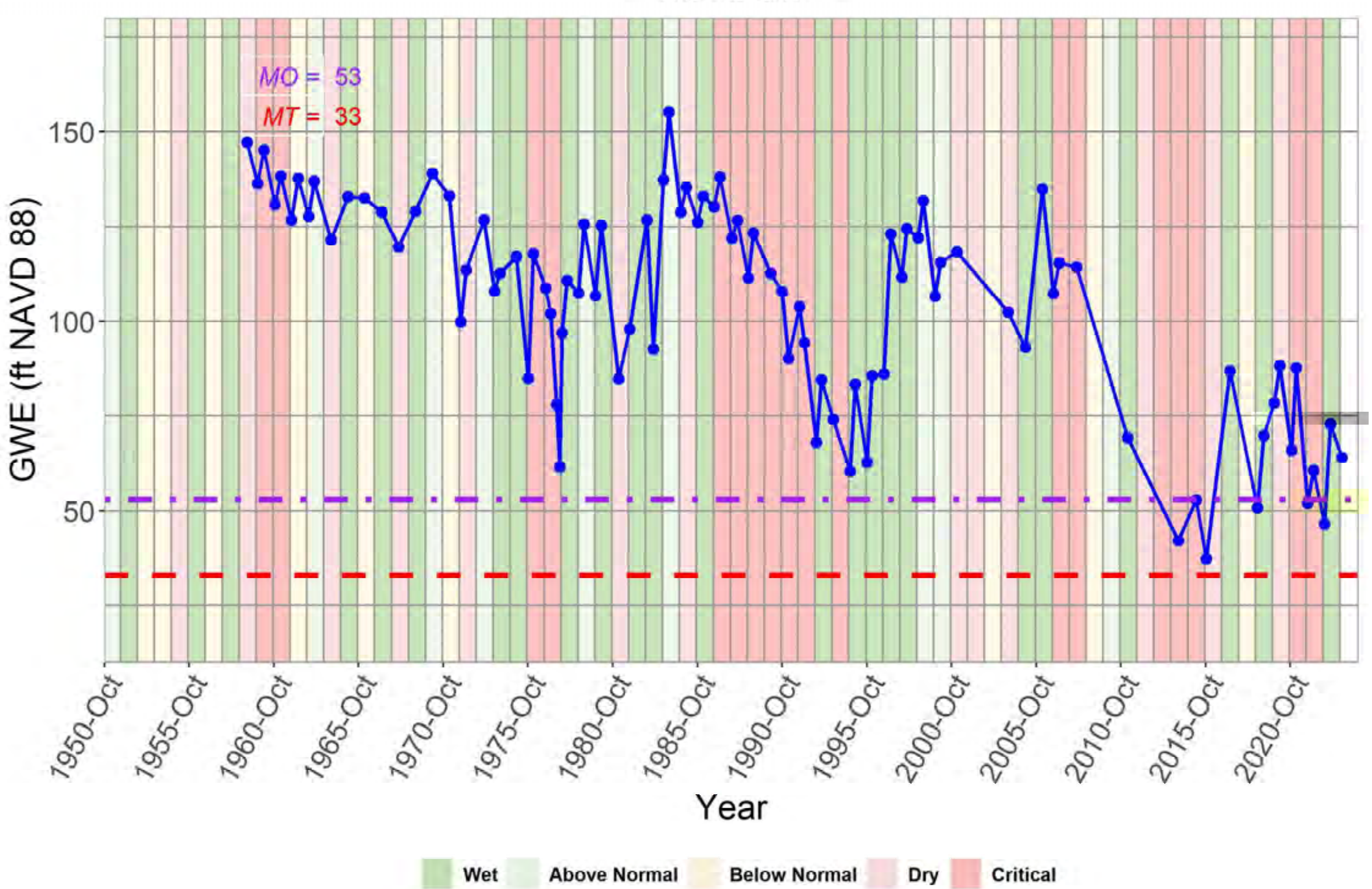


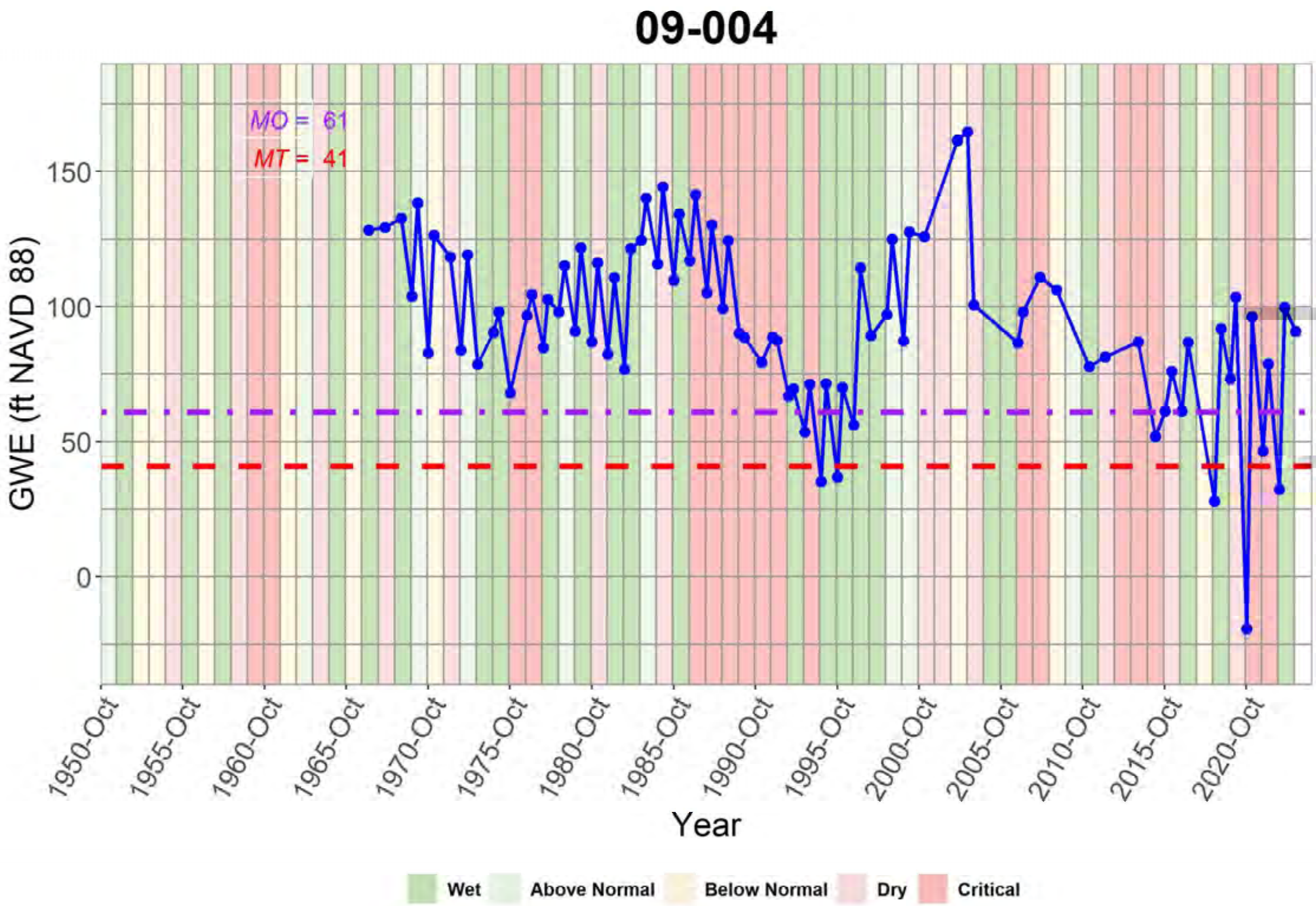
09-001
MO = 114
MT = 51
GWE (ft NAVD 88)
150
100
50
0
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

09-002

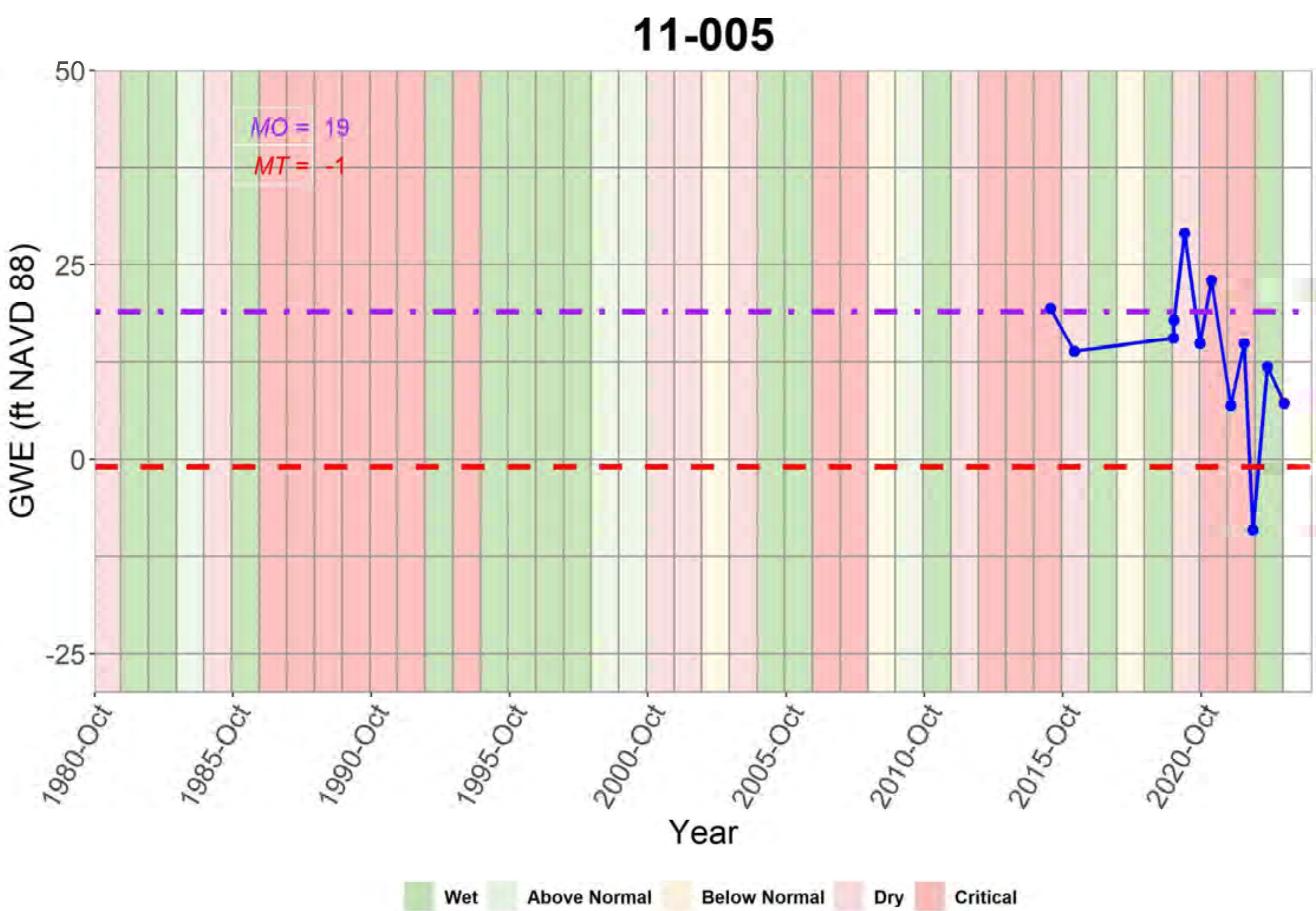

MO = 17
MT = -3
GWE (ft NAVD 88)
150
100
50
0
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

09-003

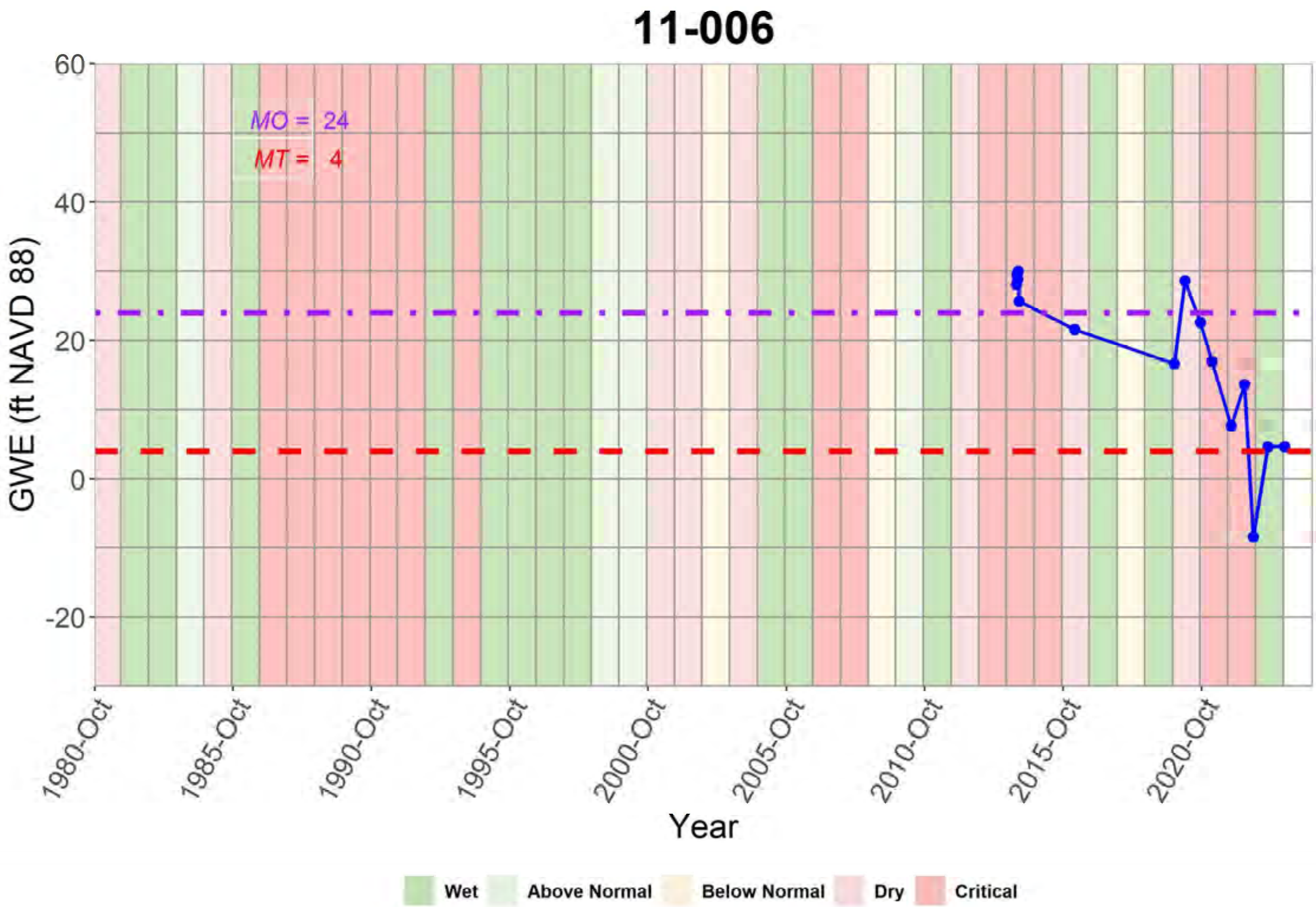

MO = 53
MT = 33
GWE (ft NAVD 88)
150
100
50
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

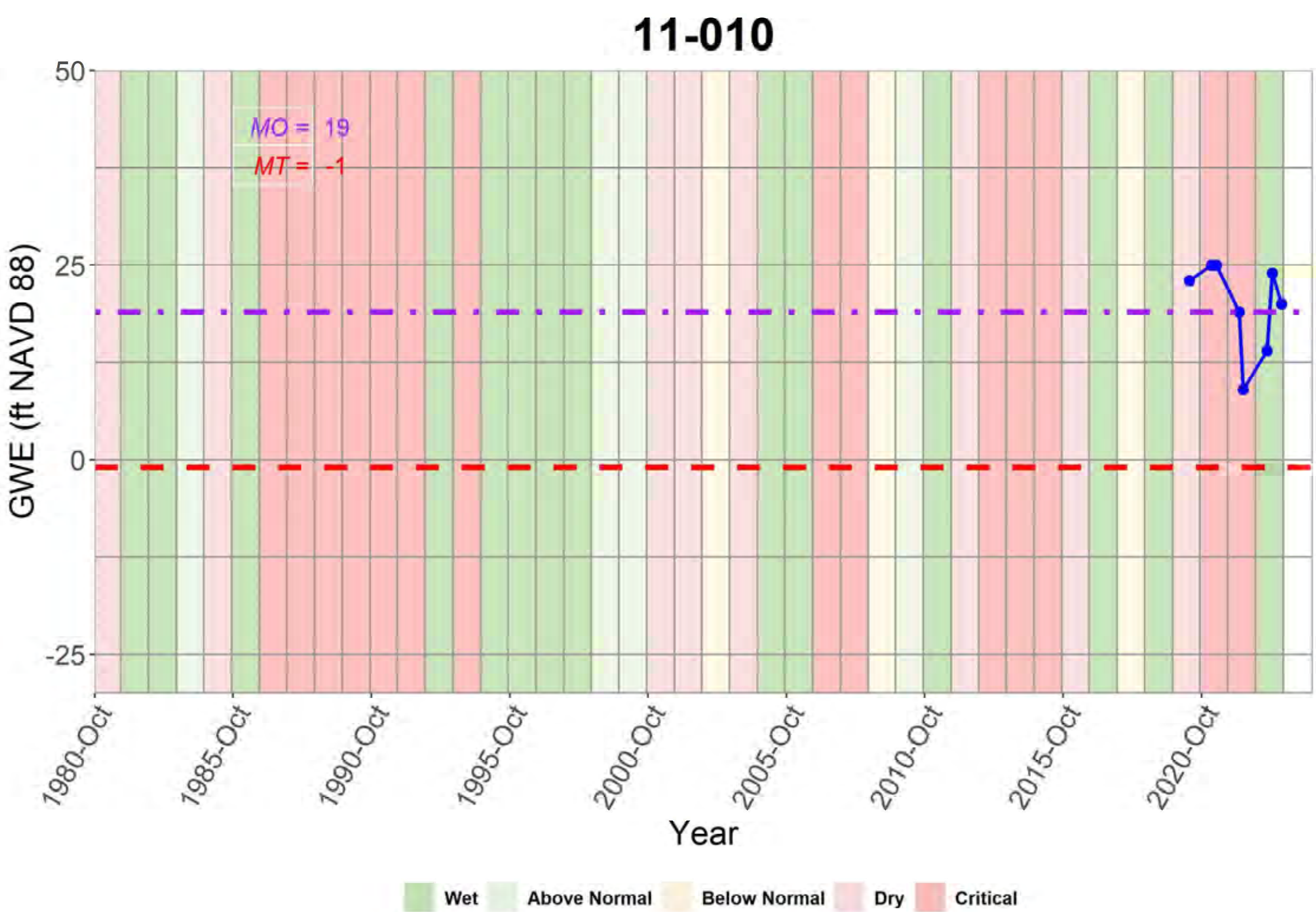


09-004
MO = 61
MT = 41
GWE (ft NAVD 88)
150
100
50
0
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

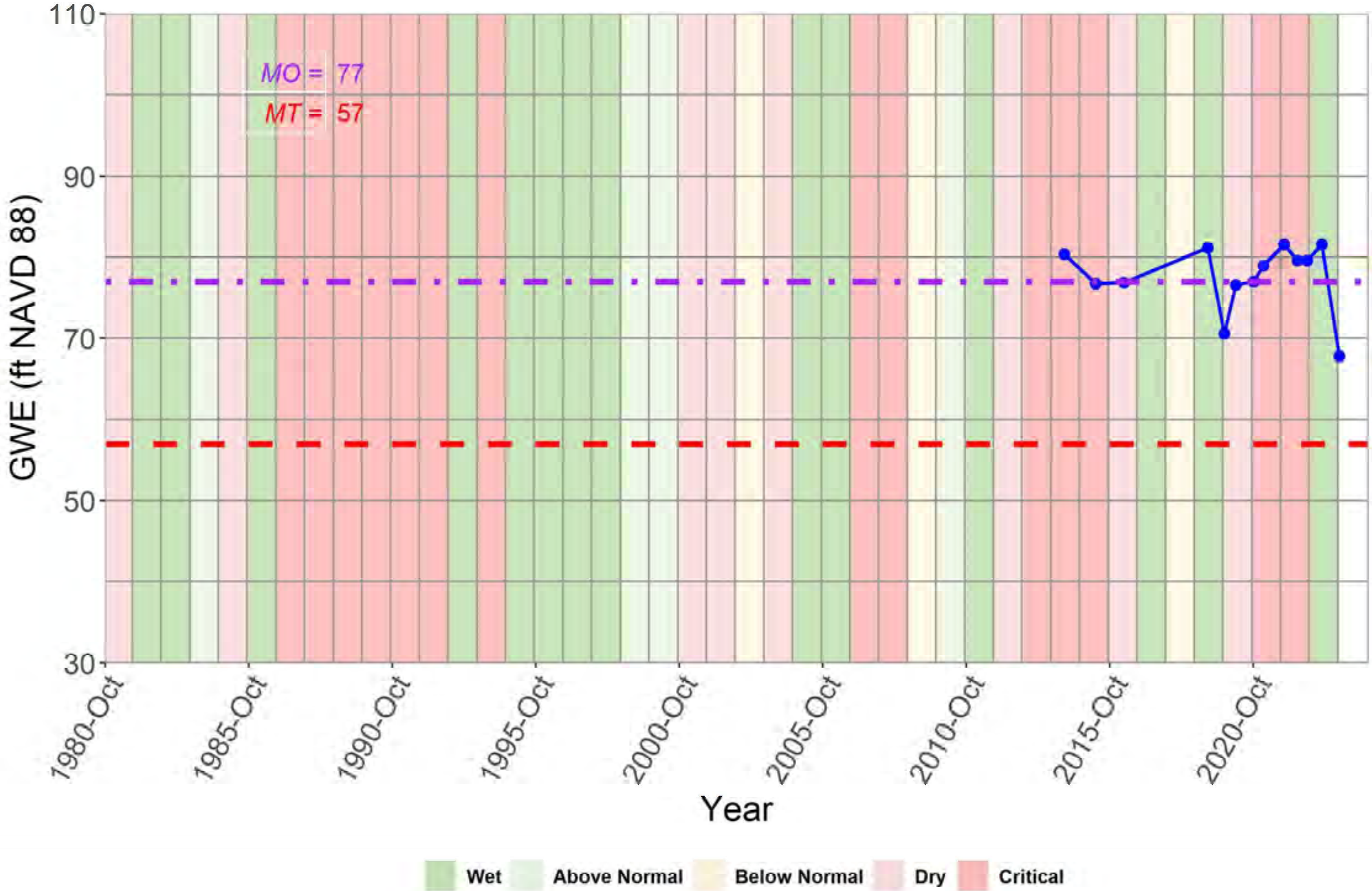


11-005
MO = 19
MT = -1
GWE (ft NAVD 88)
50
25
0
-25
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

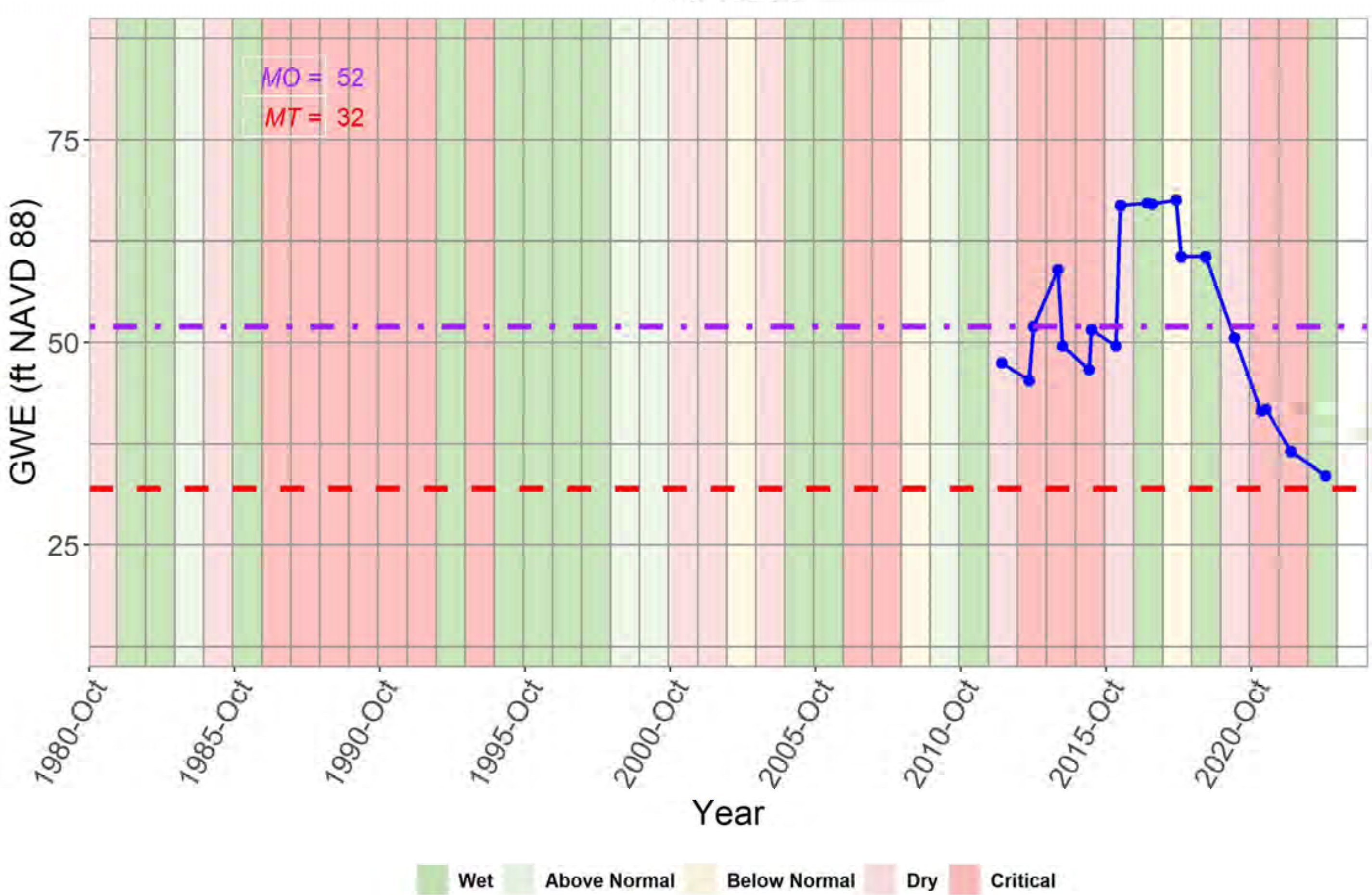

11-006
MO = 24
MT = 4
GWE (ft NAVD 88)
60
40
20
0
-20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

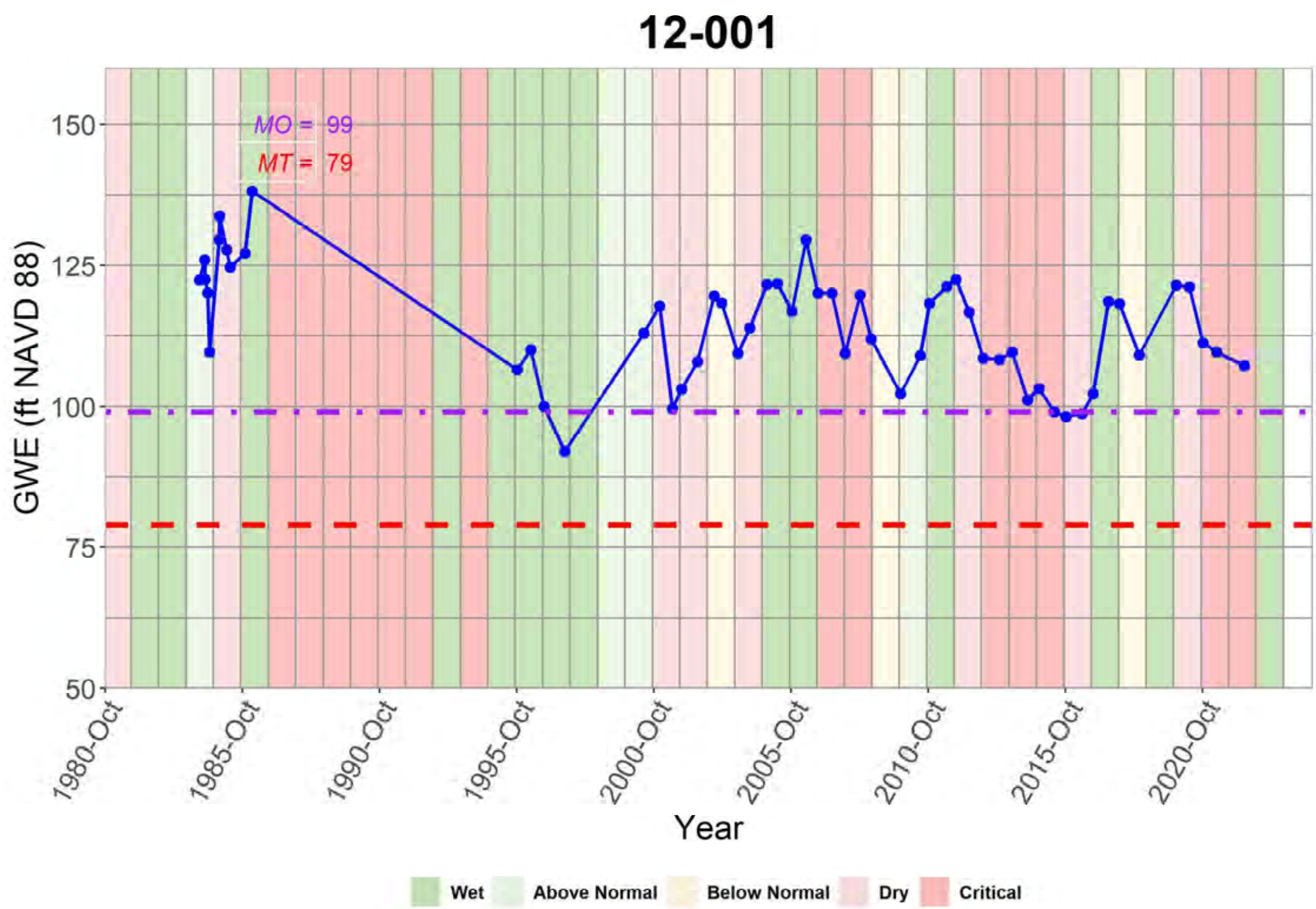

11-010
MO = 19
MT = -1
GWE (ft NAVD 88)
50
25
0
-25
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

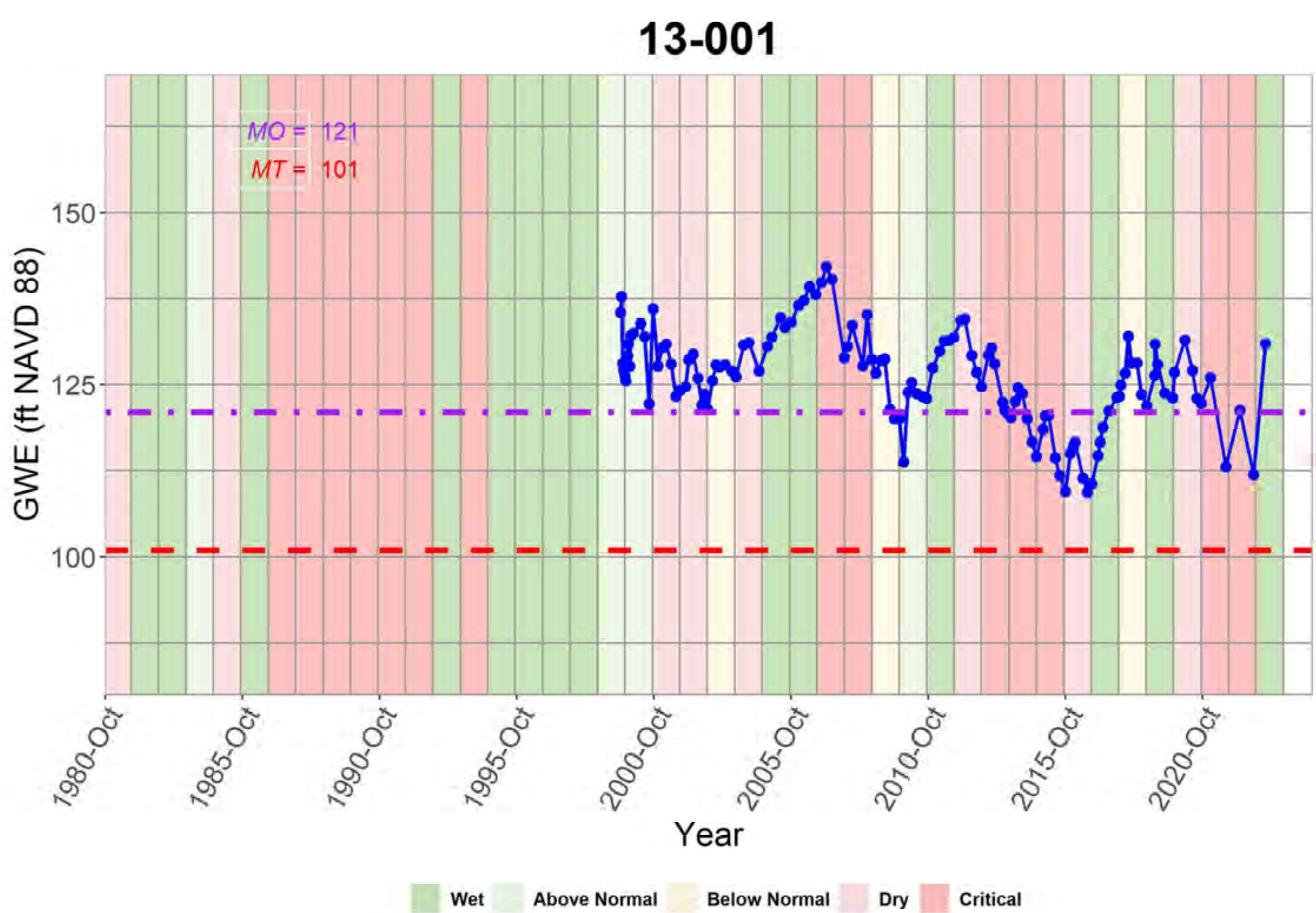
11-013


MO = 77
MT = 57
GWE (ft NAVD 88)
110
90
70
50
30
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

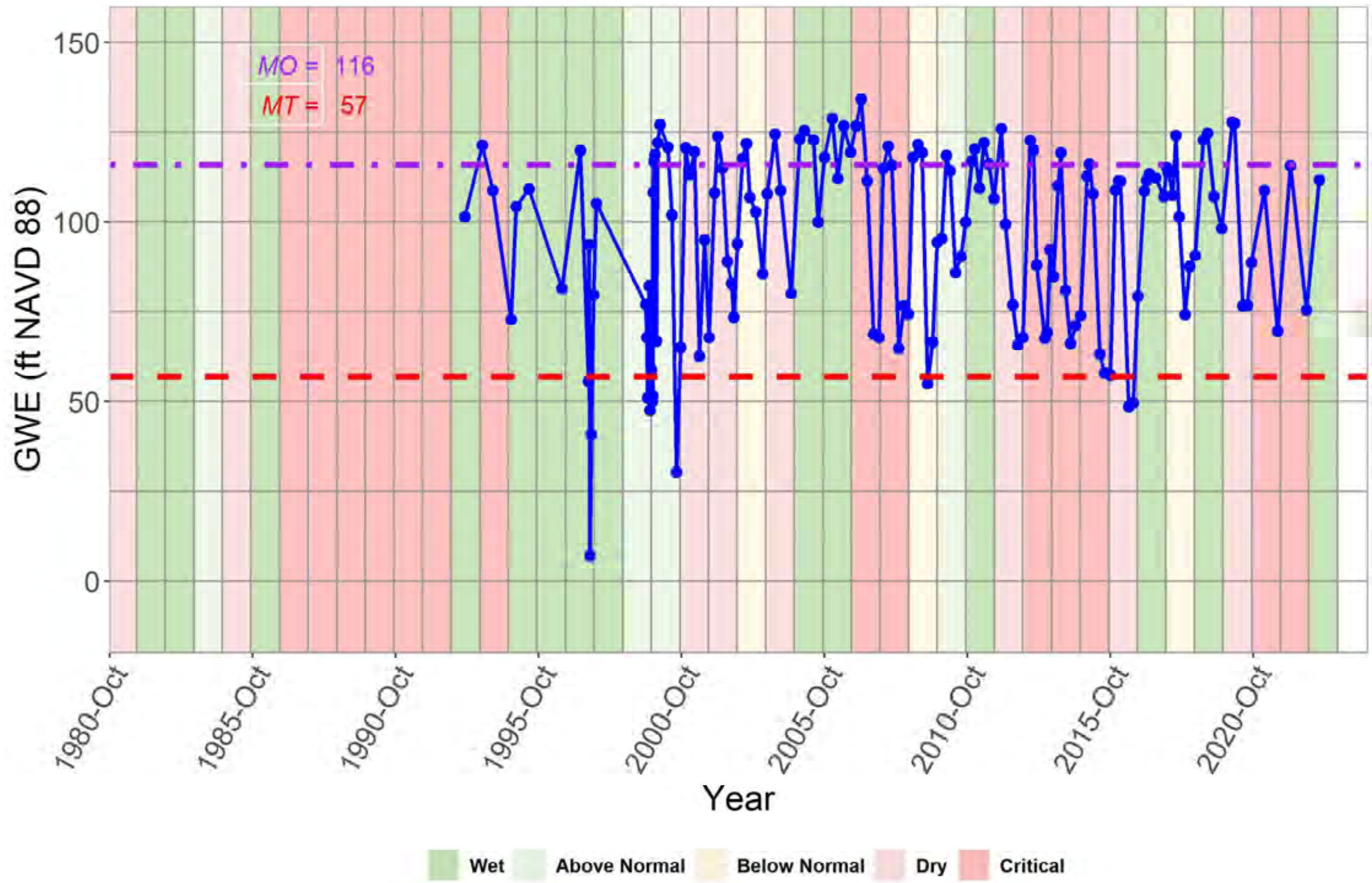
11-021


MO = 52
MT = 32
GWE (ft NAVD 88)
75
50
25
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

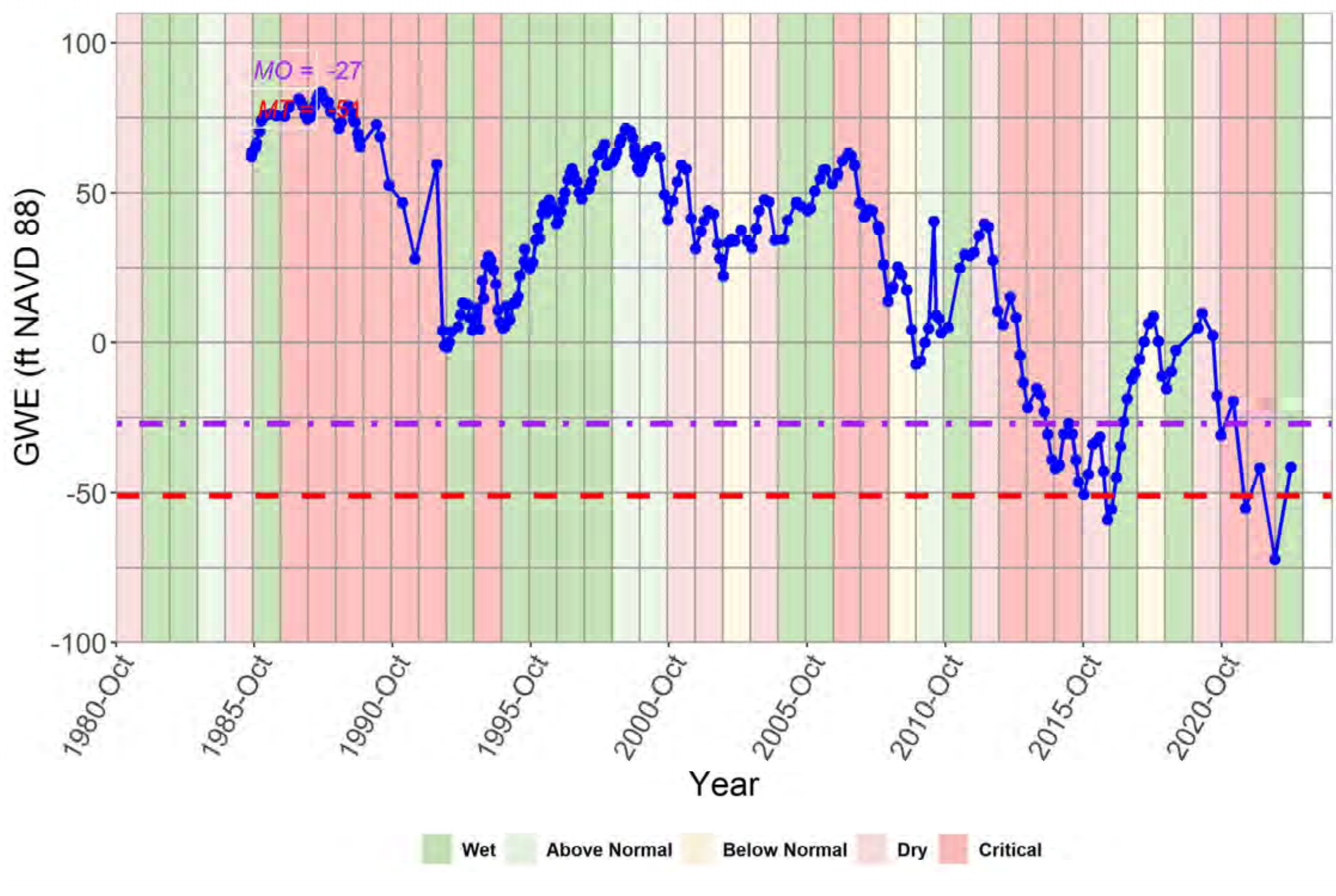

12-001
MO = 99
MT = 79
GWE (ft NAVD 88)
150
125
100
75
50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

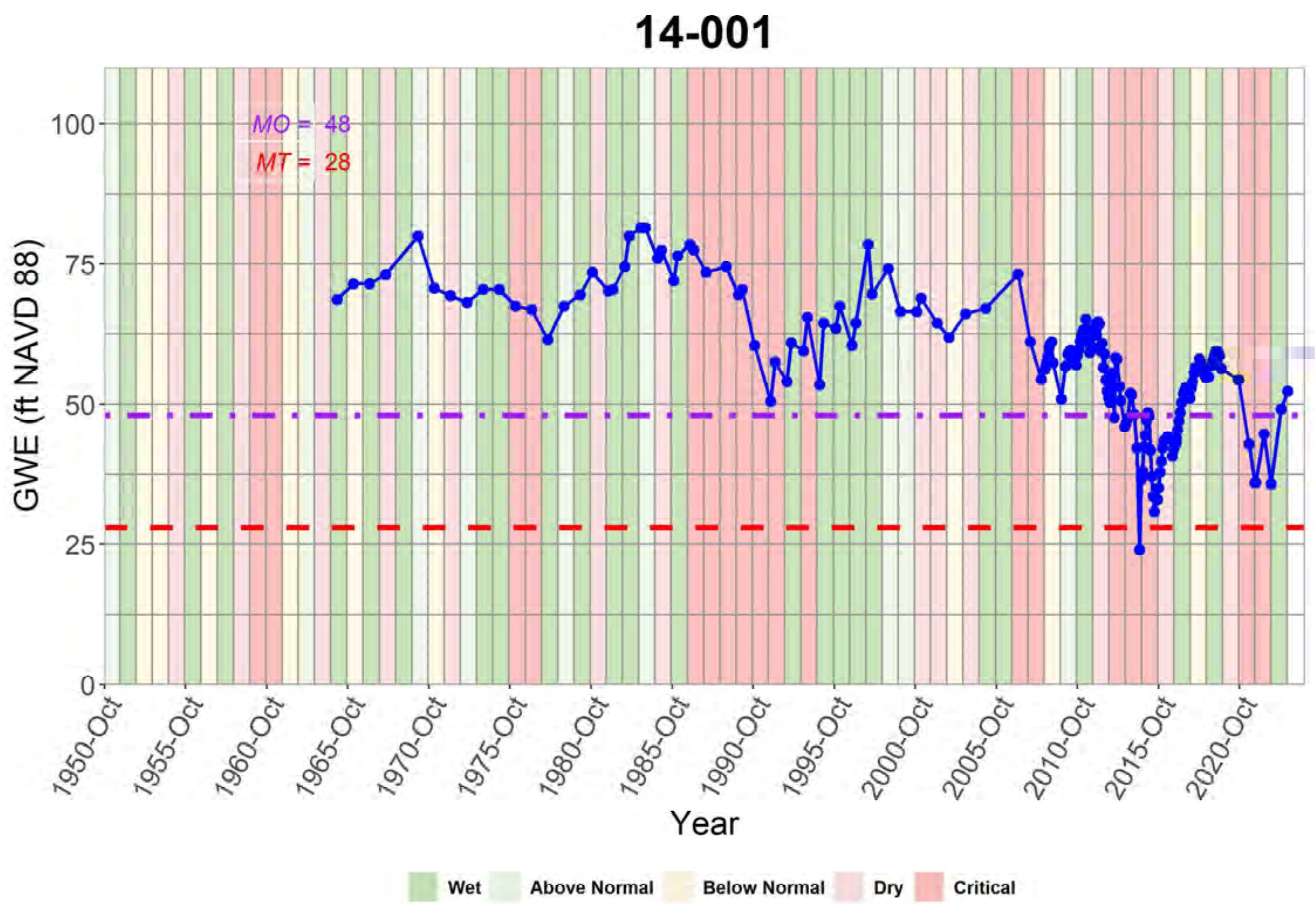

13-001
MO = 121
MT = 101
GWE (ft NAVD 88)
150
125
100
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

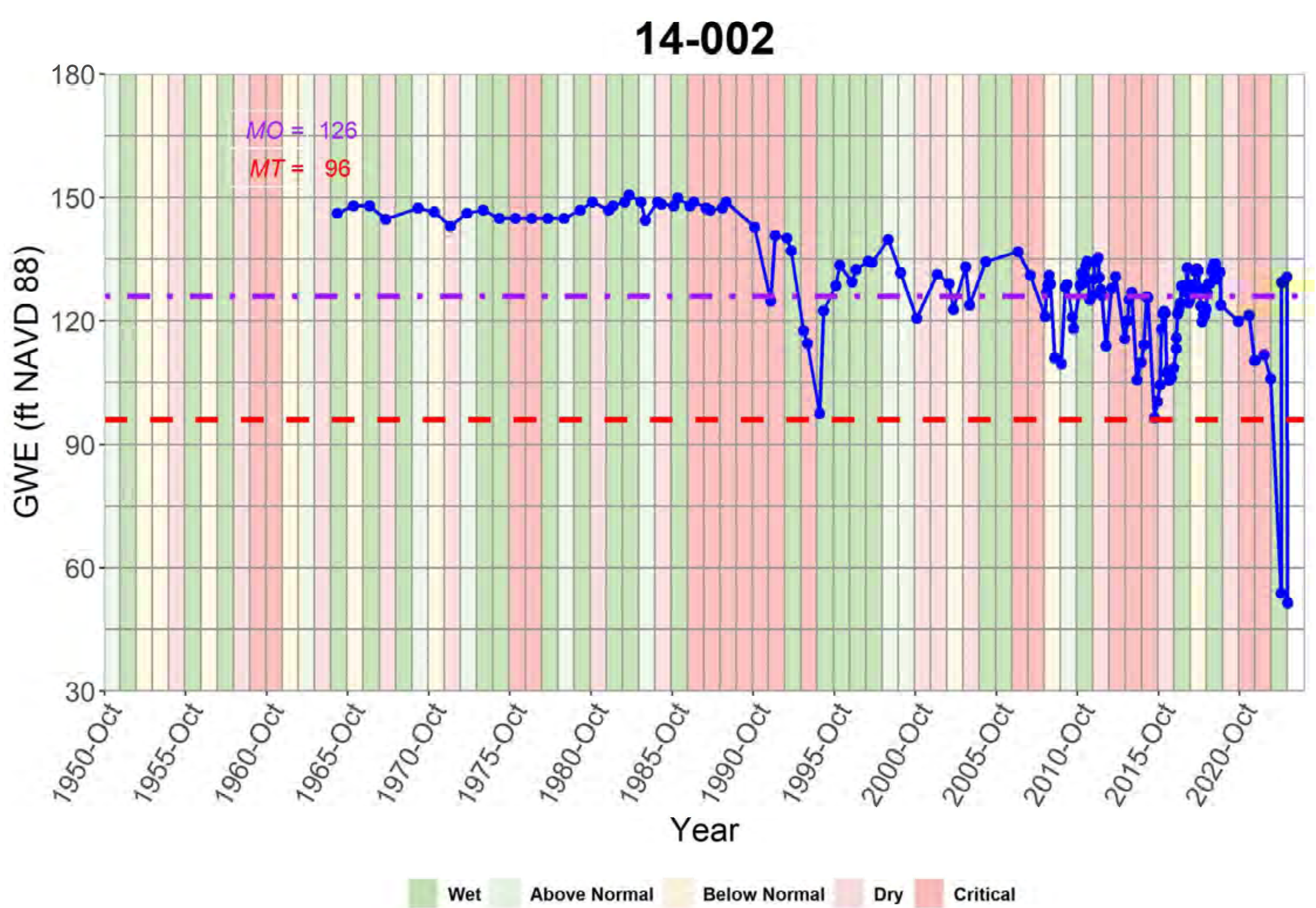
13-003


MO = 116
MT = 57
150
100
50
0
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

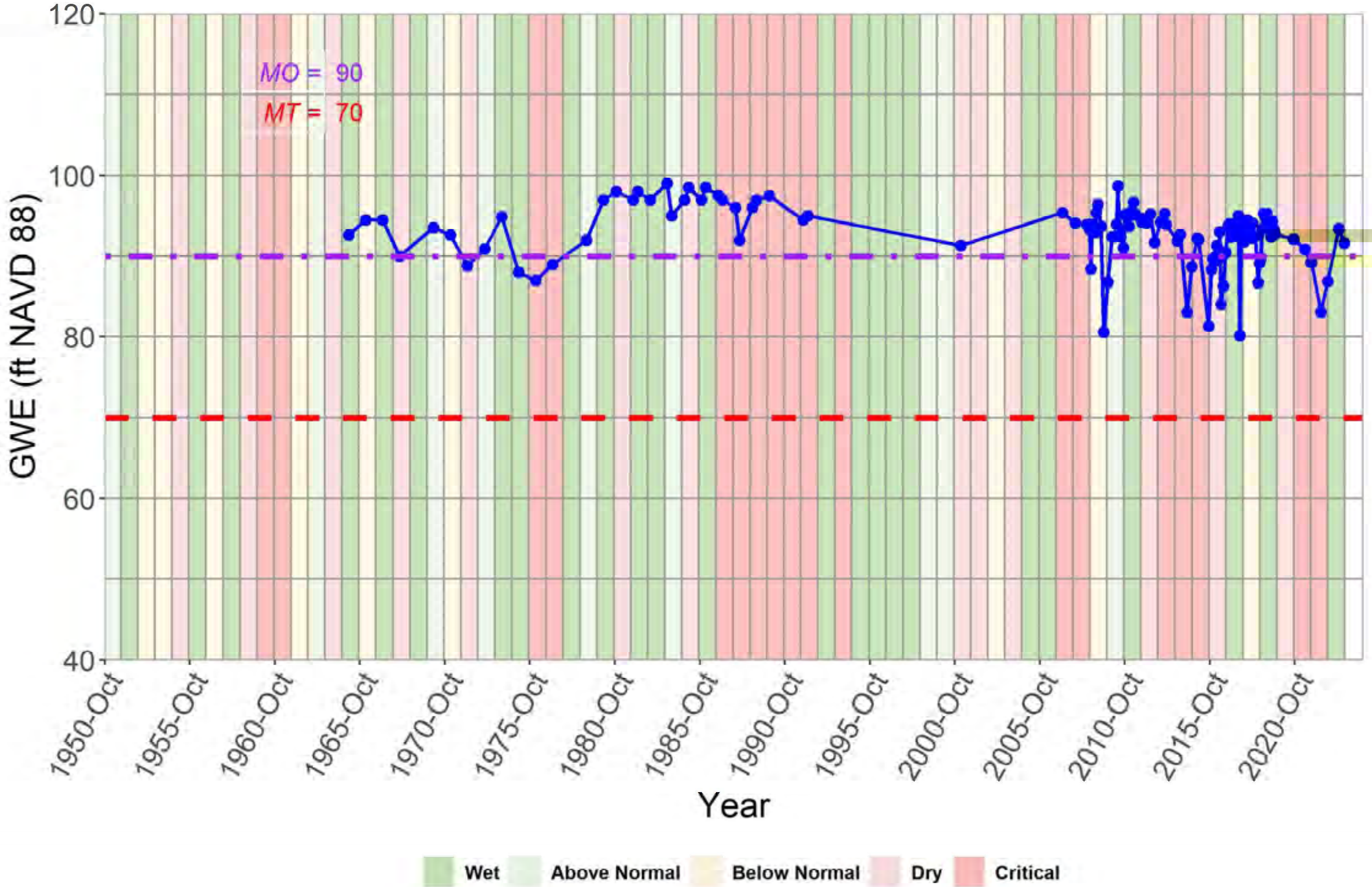
13-004


MO = -27
100
50
0
-50
-100
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


14-001
MO = 48
MT = 28
GWE (ft NAVD 88)
100
75
50
25
0
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

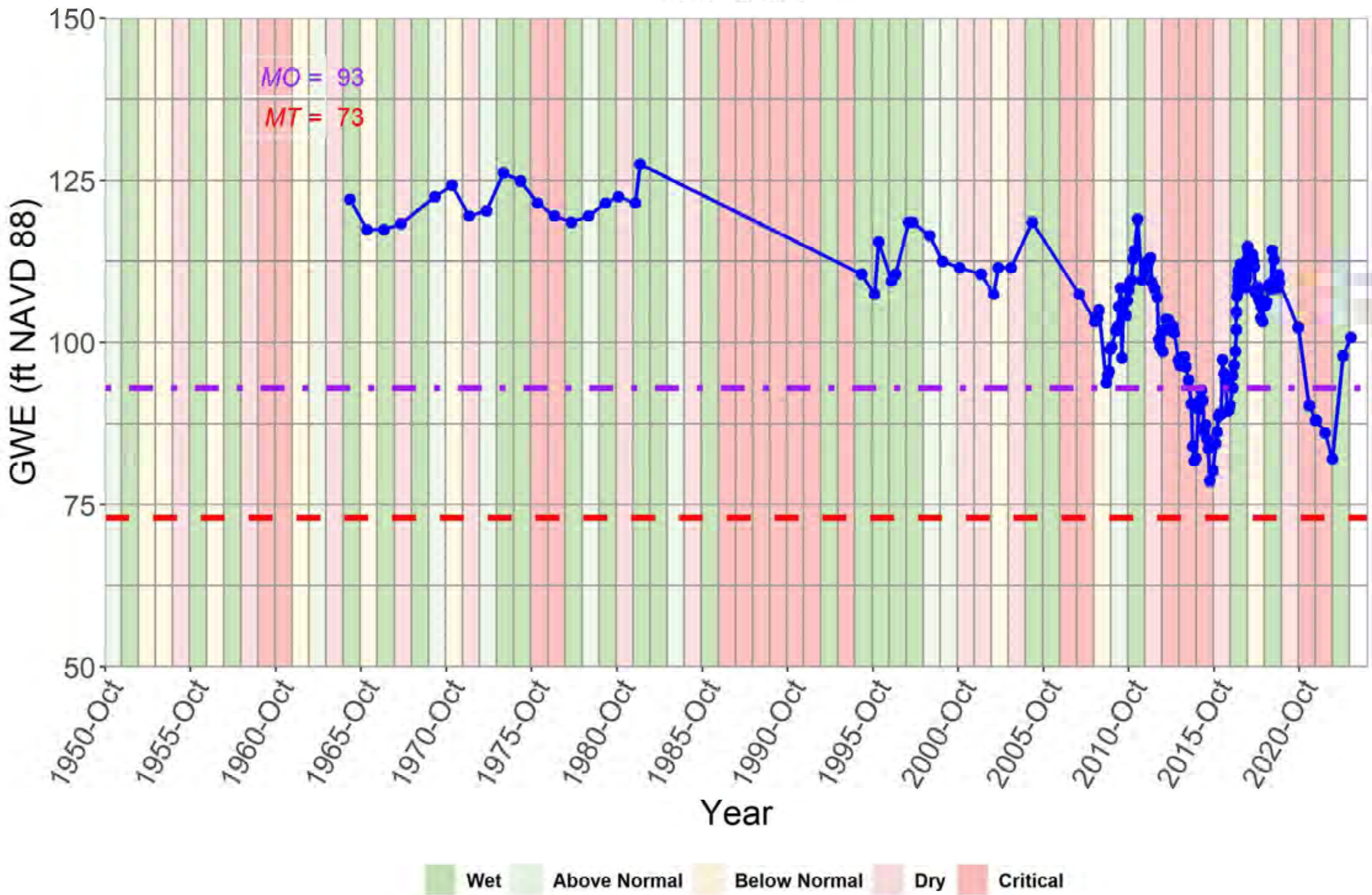

14-002
MO = 126
MT = 96
GWE (ft NAVD 88)
180
150
120
90
60
30
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

14-003

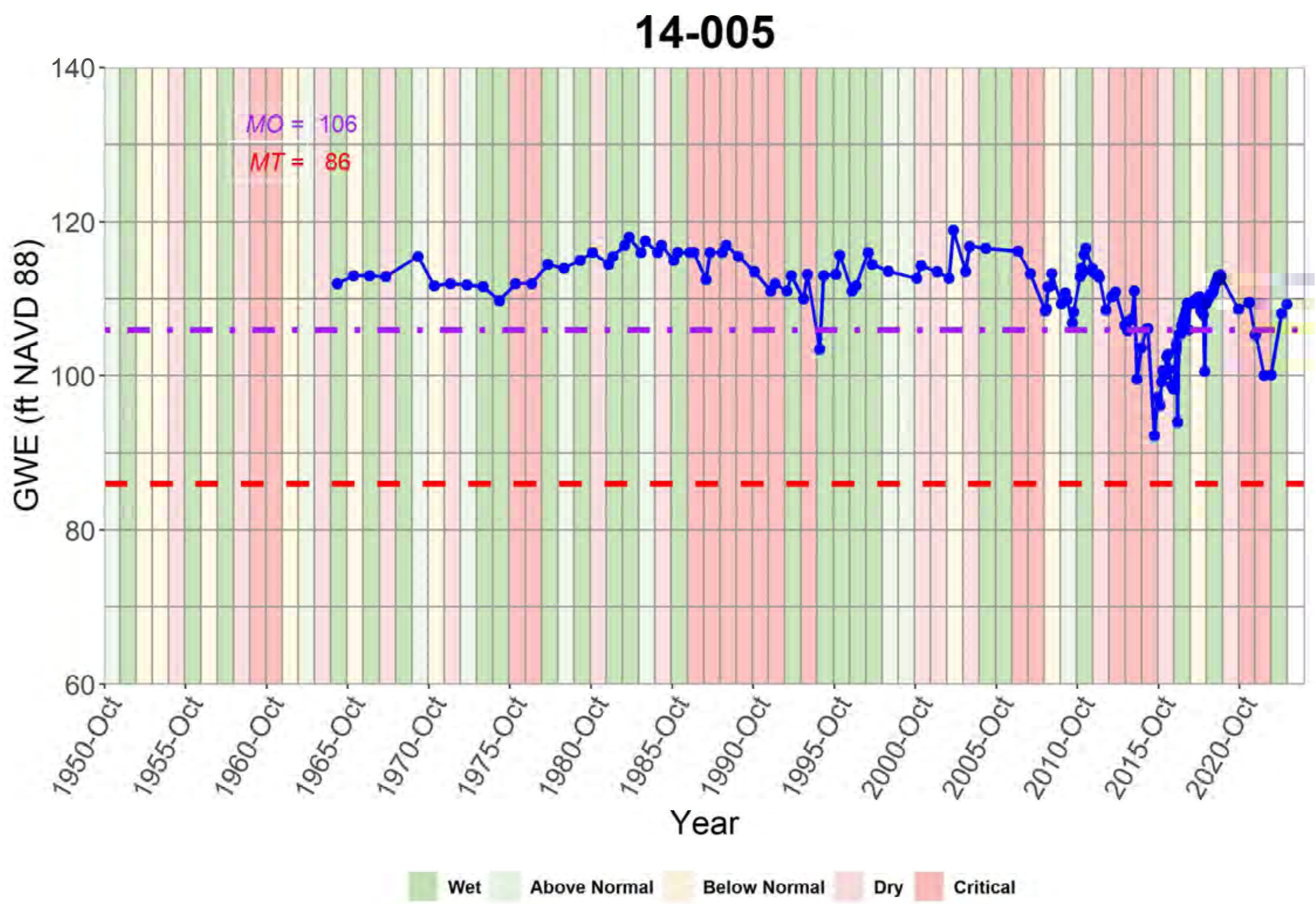


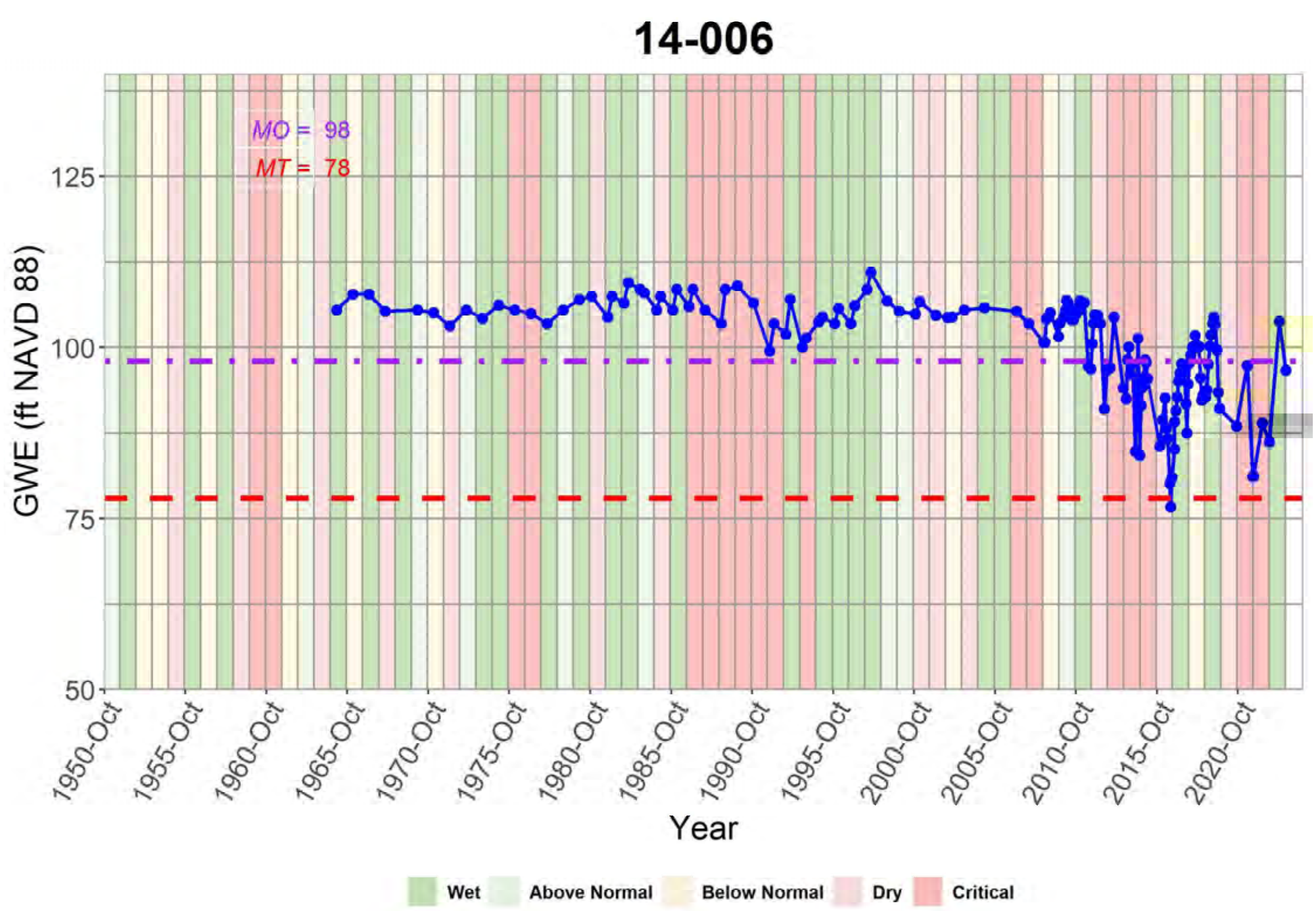
MO = 90
MT = 70
GWE (ft NAVD 88)
120
100
80
60
40
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

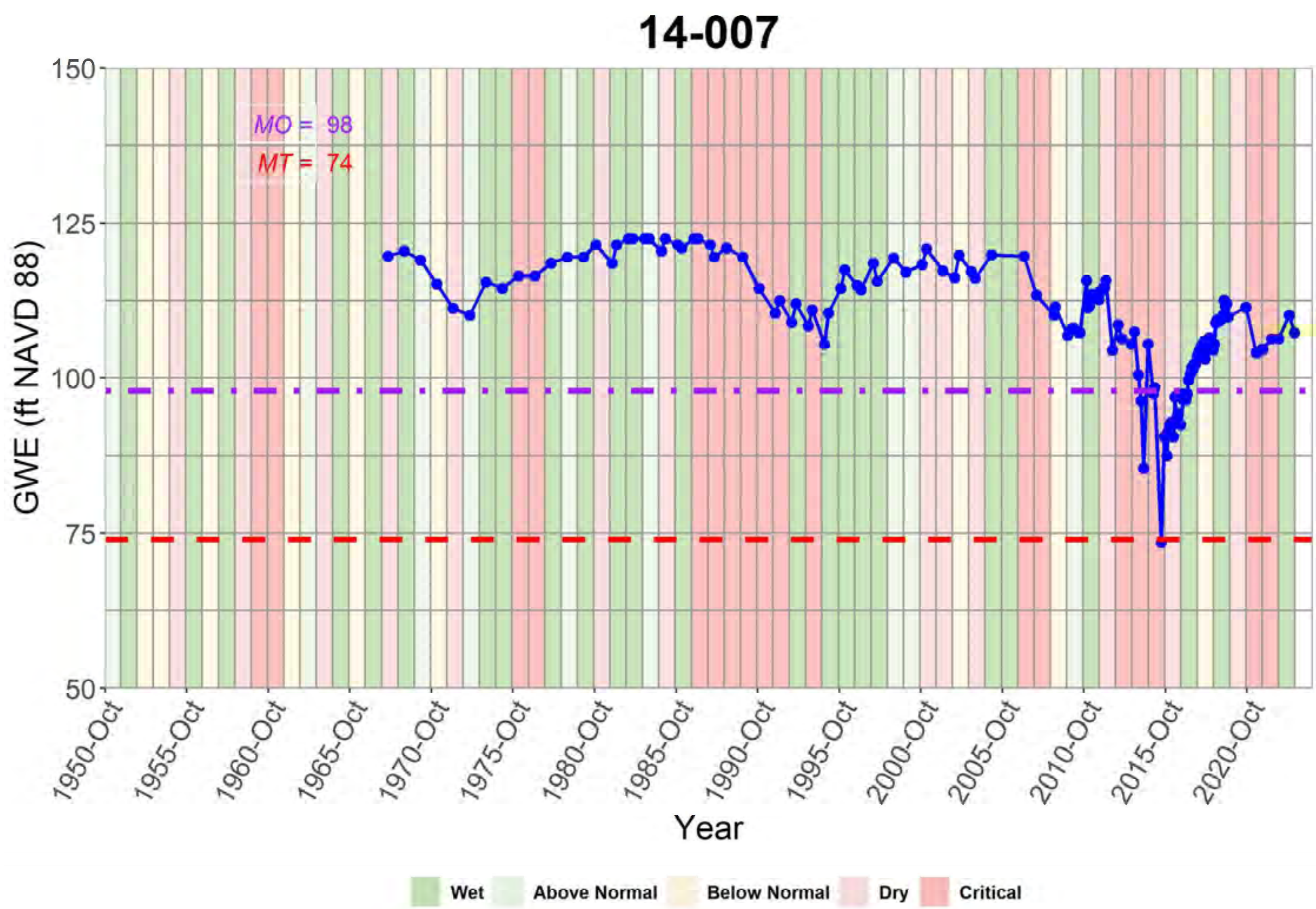
14-004

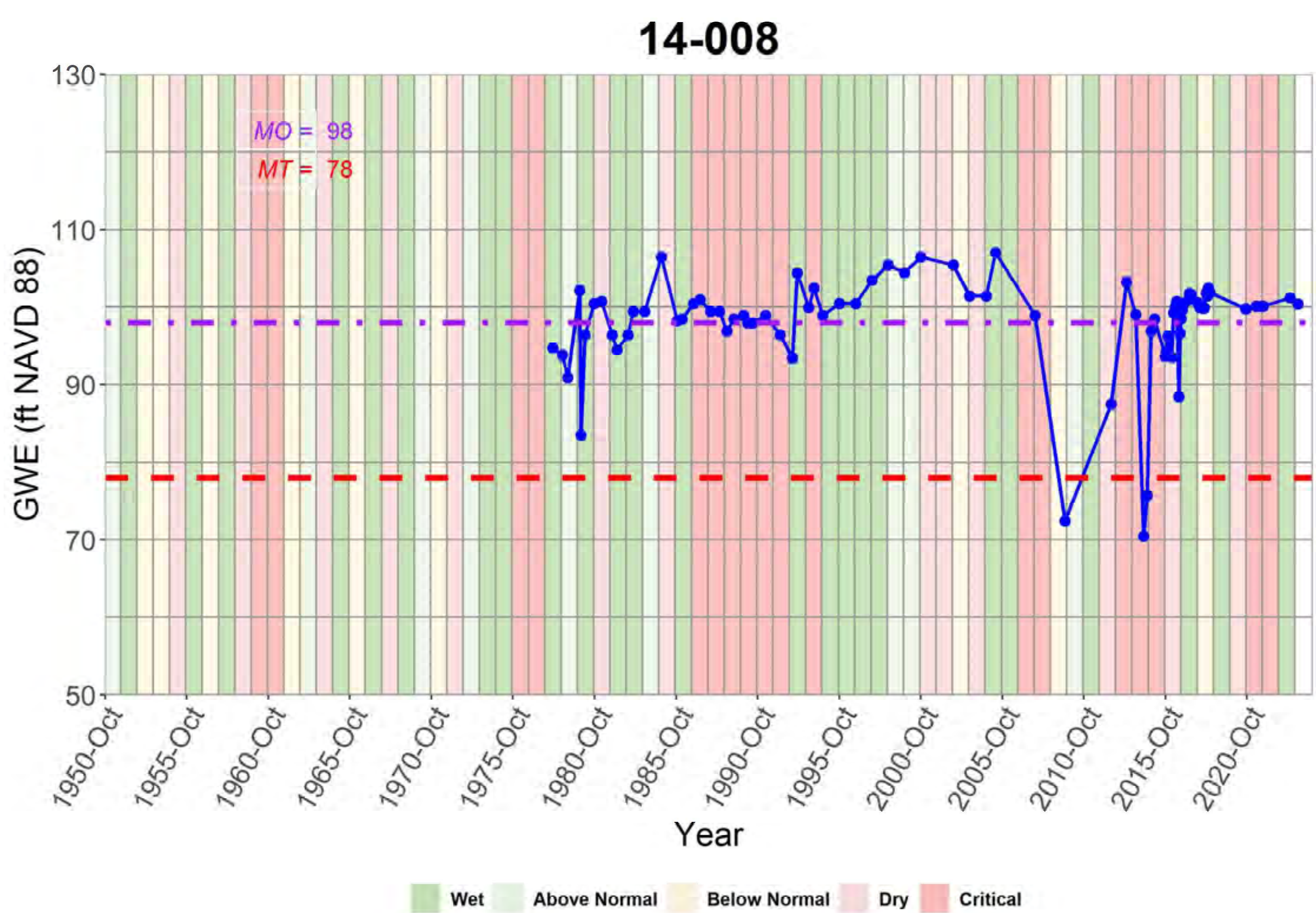


MO = 93
MT = 73
GWE (ft NAVD 88)
150
125
100
75
50
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

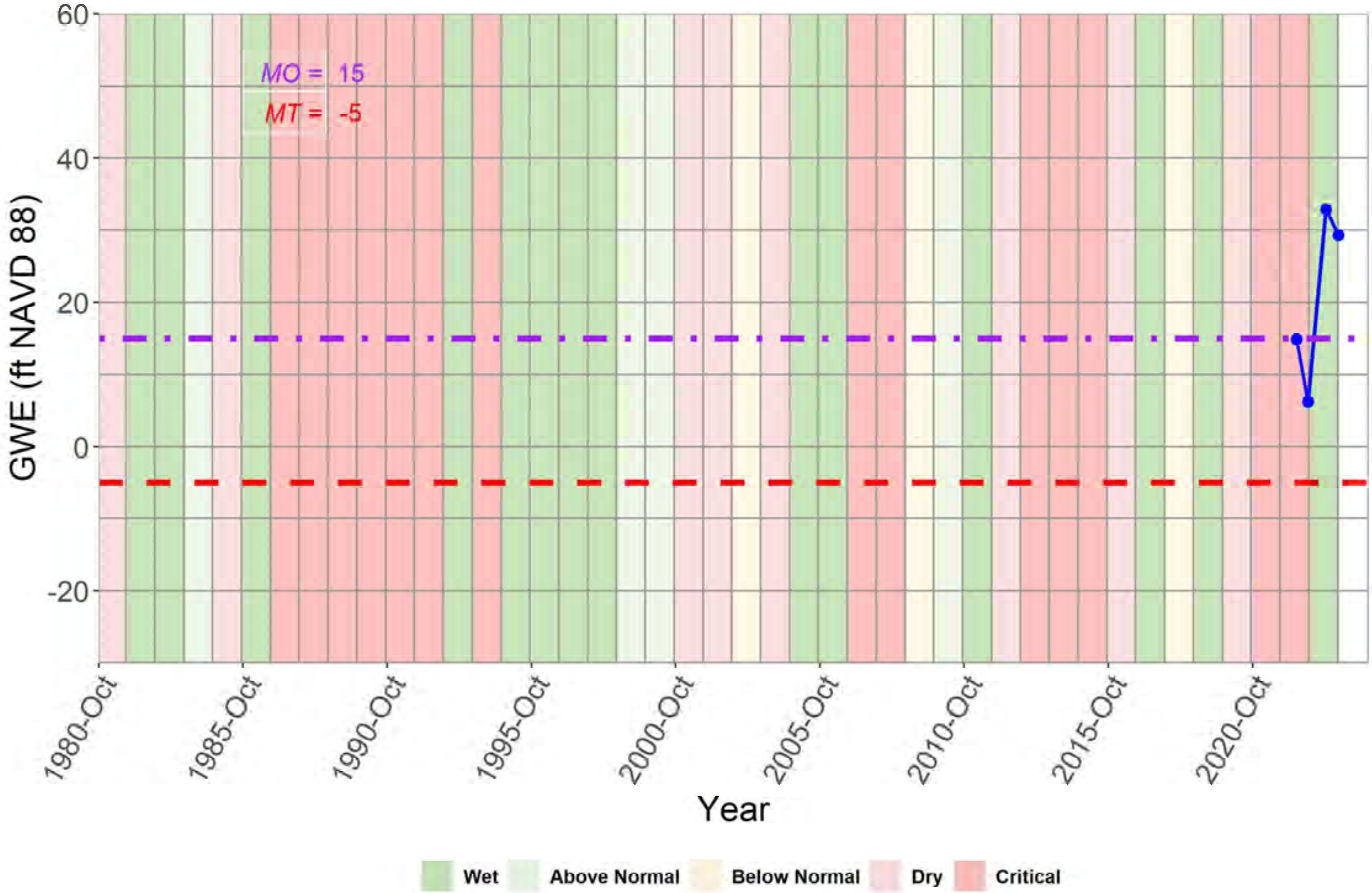

14-005
MO = 106
MT = 86
GWE (ft NAVD 88)
140
120
100
80
60
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


14-006
MO = 98
MT = 78
GWE (ft NAVD 88)
125
100
75
50
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


14-007
MO = 98
MT = 74
GWE (ft NAVD 88)
150
125
100
75
50
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

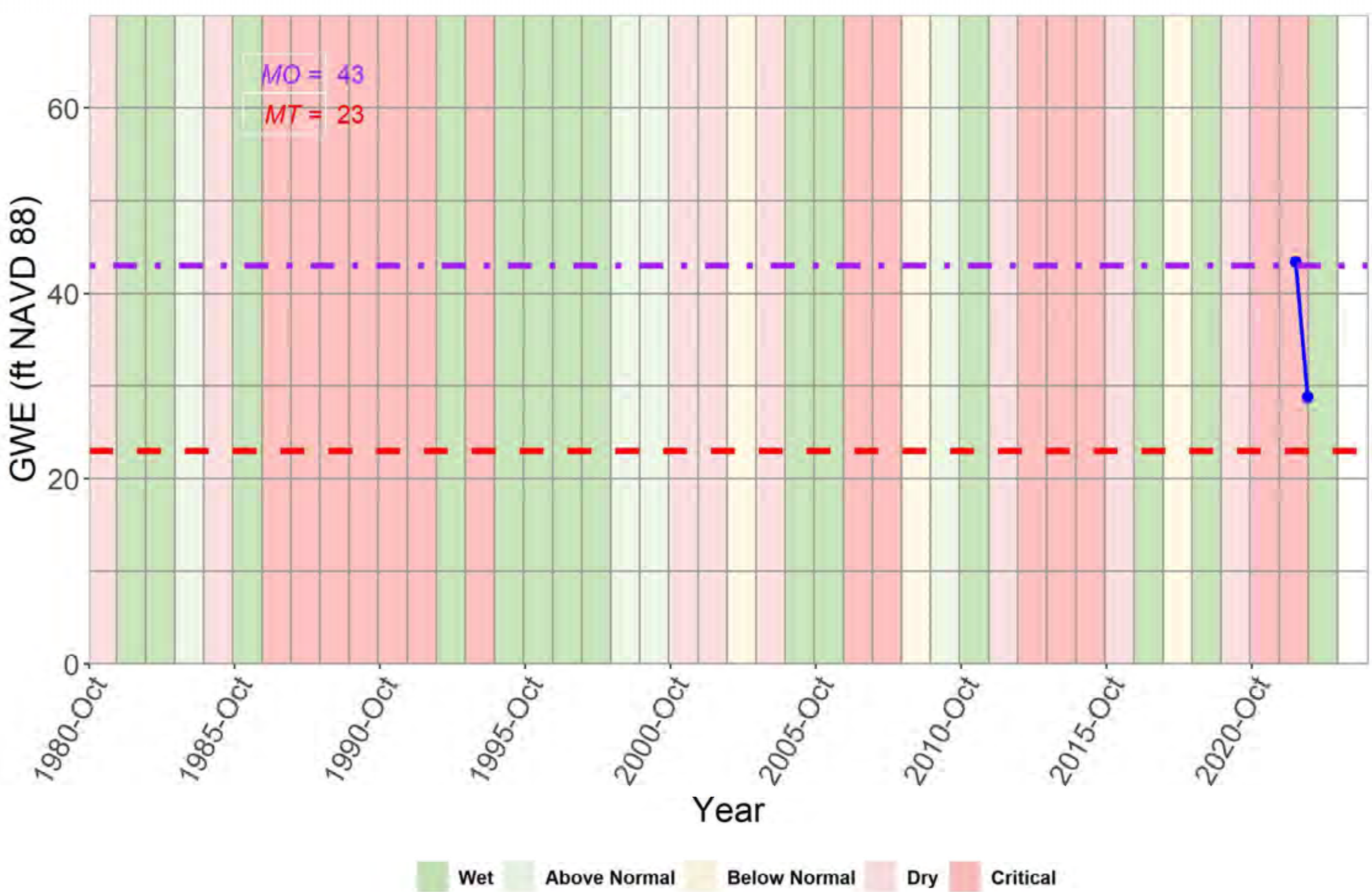

14-008
MO = 98
MT = 78
GWE (ft NAVD 88)
130
110
90
70
50
1950-Oct
1955-Oct
1960-Oct
1965-Oct
1970-Oct
1975-Oct
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

14-019



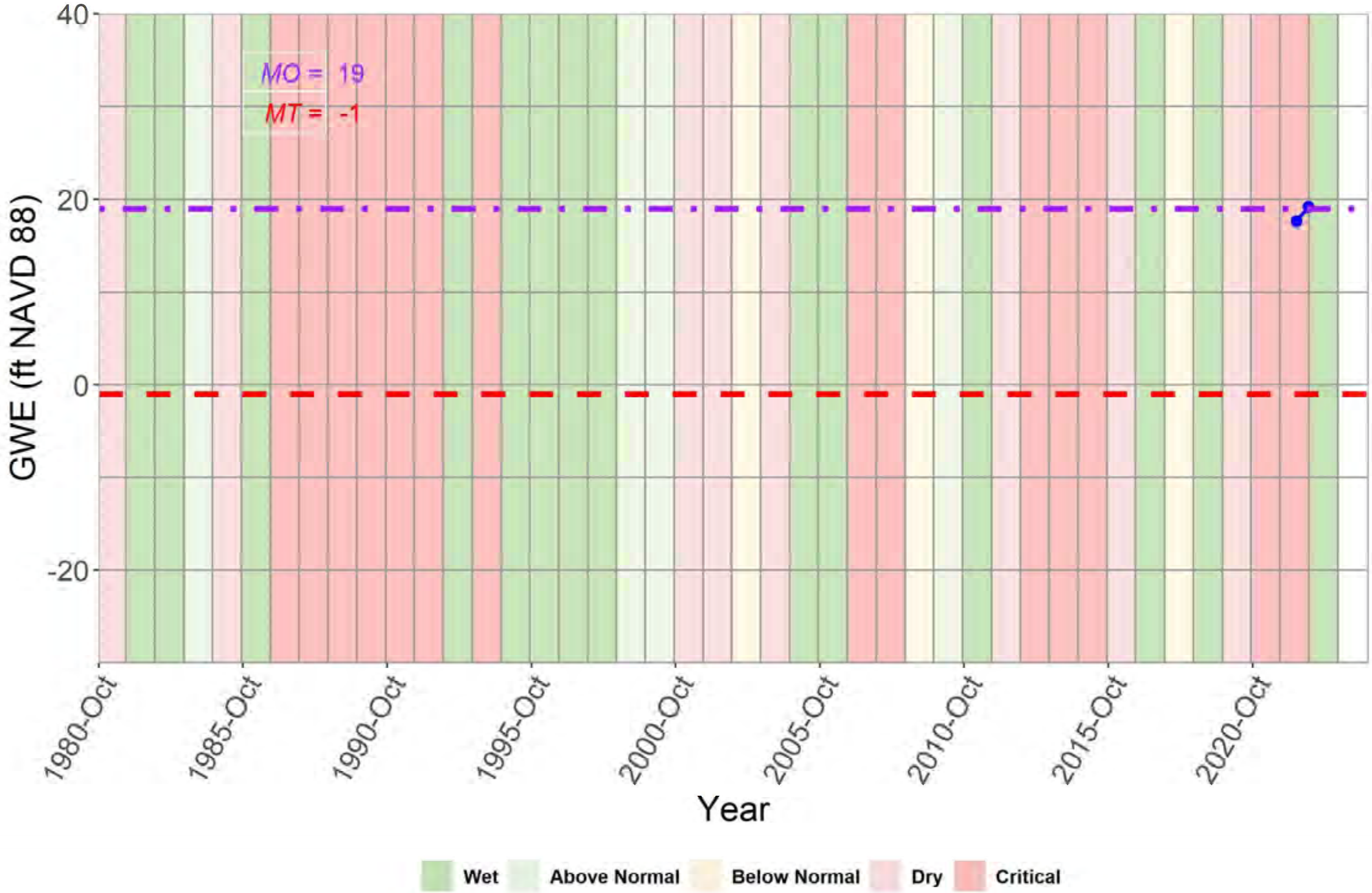
MO = 15
MT = -5
GWE (ft NAVD 88)
60
40
20
0
-20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

14-020

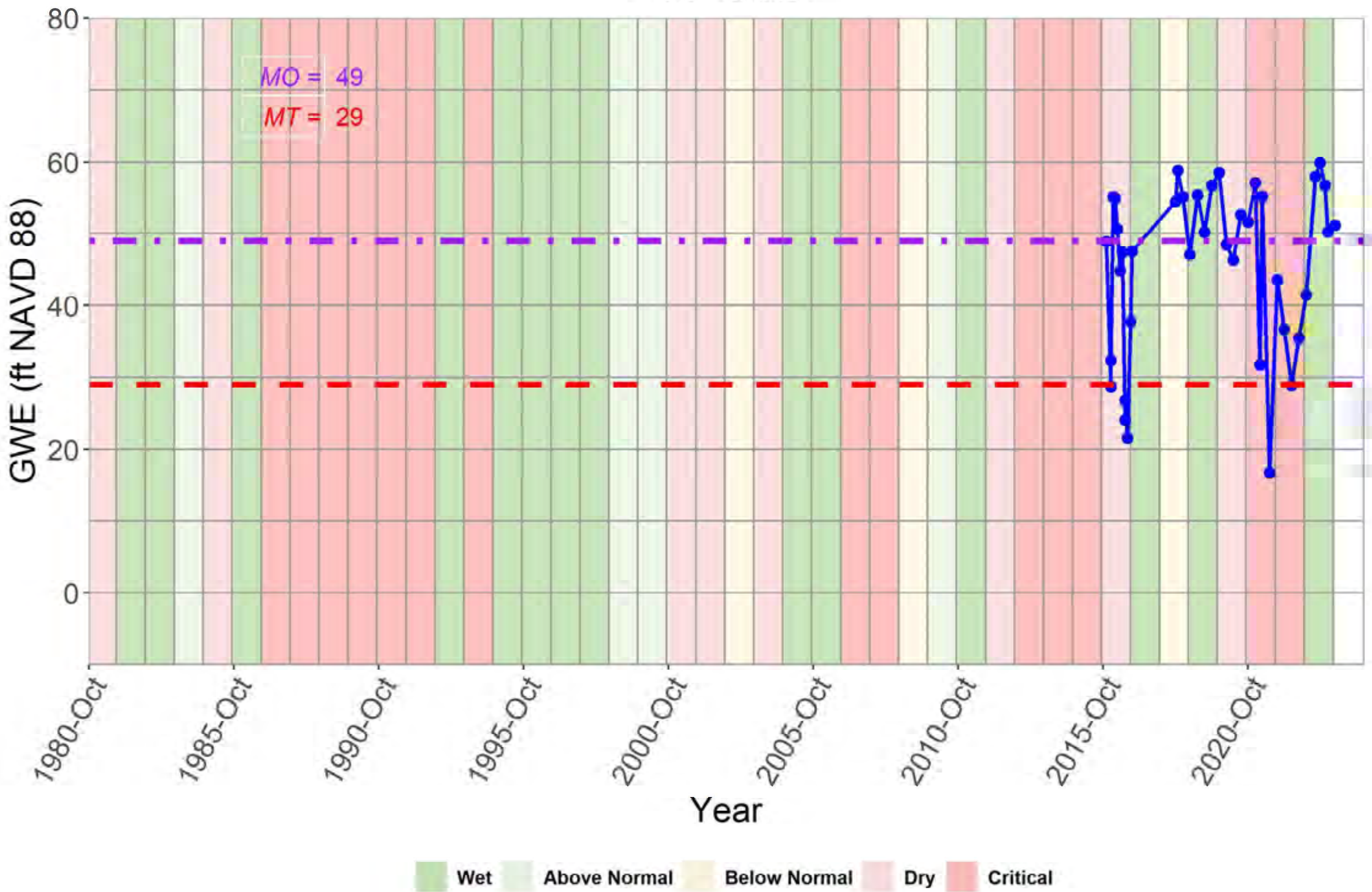


MO = 43
MT = 23
GWE (ft NAVD 88)
60
40
20
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

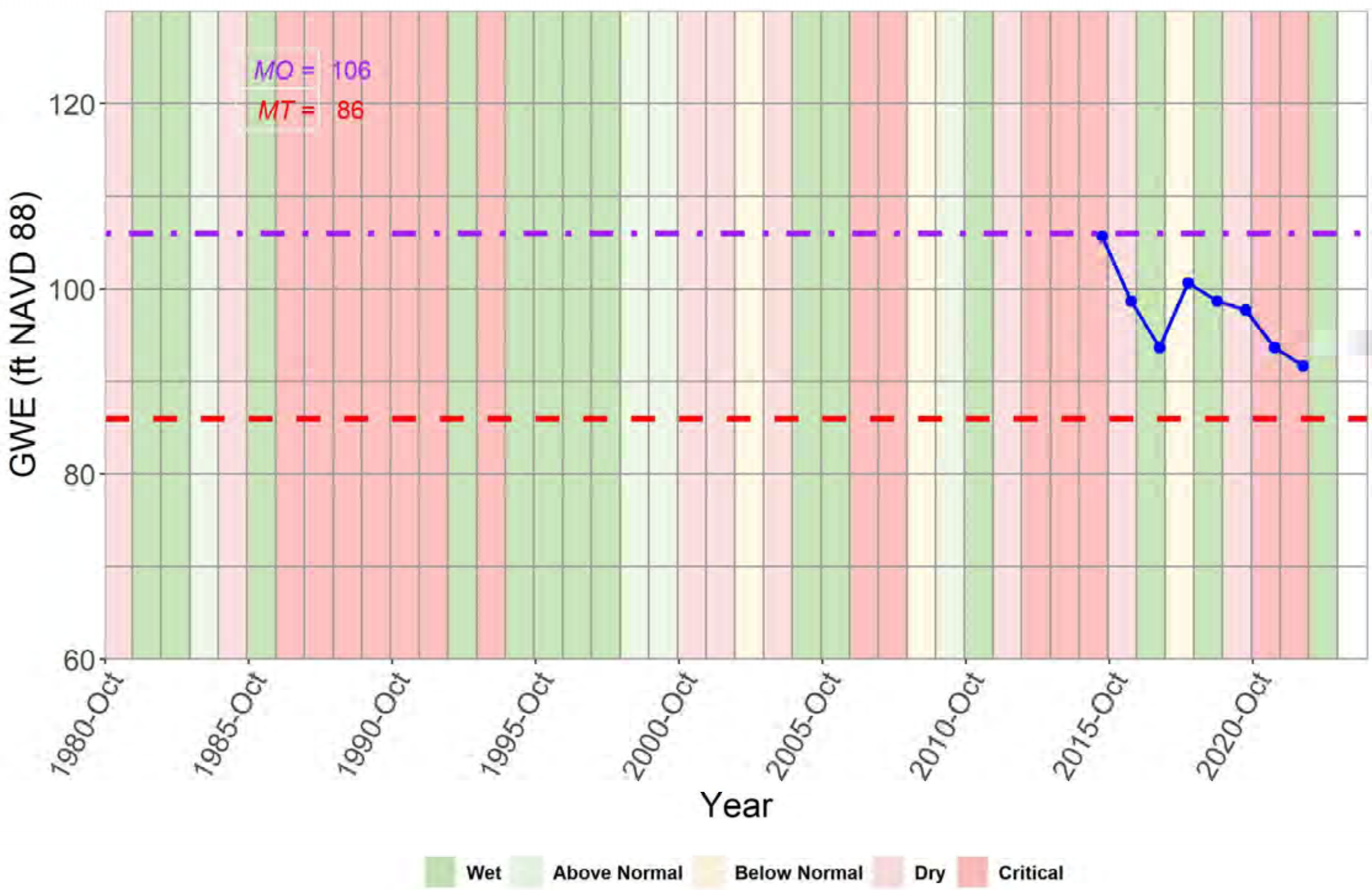
14-021


MO = 19
MT = -1
40
20
0
-20
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

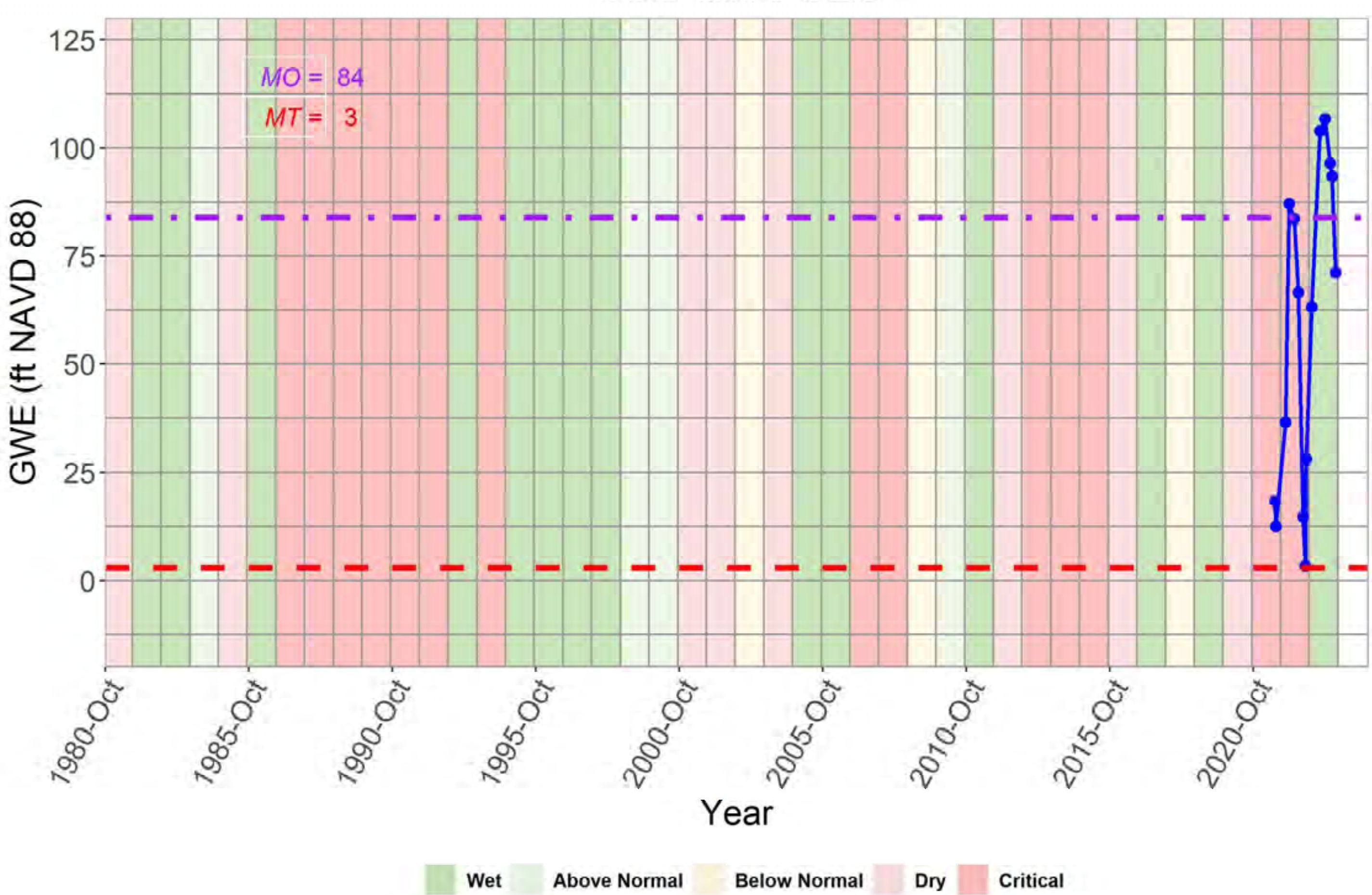
19-002

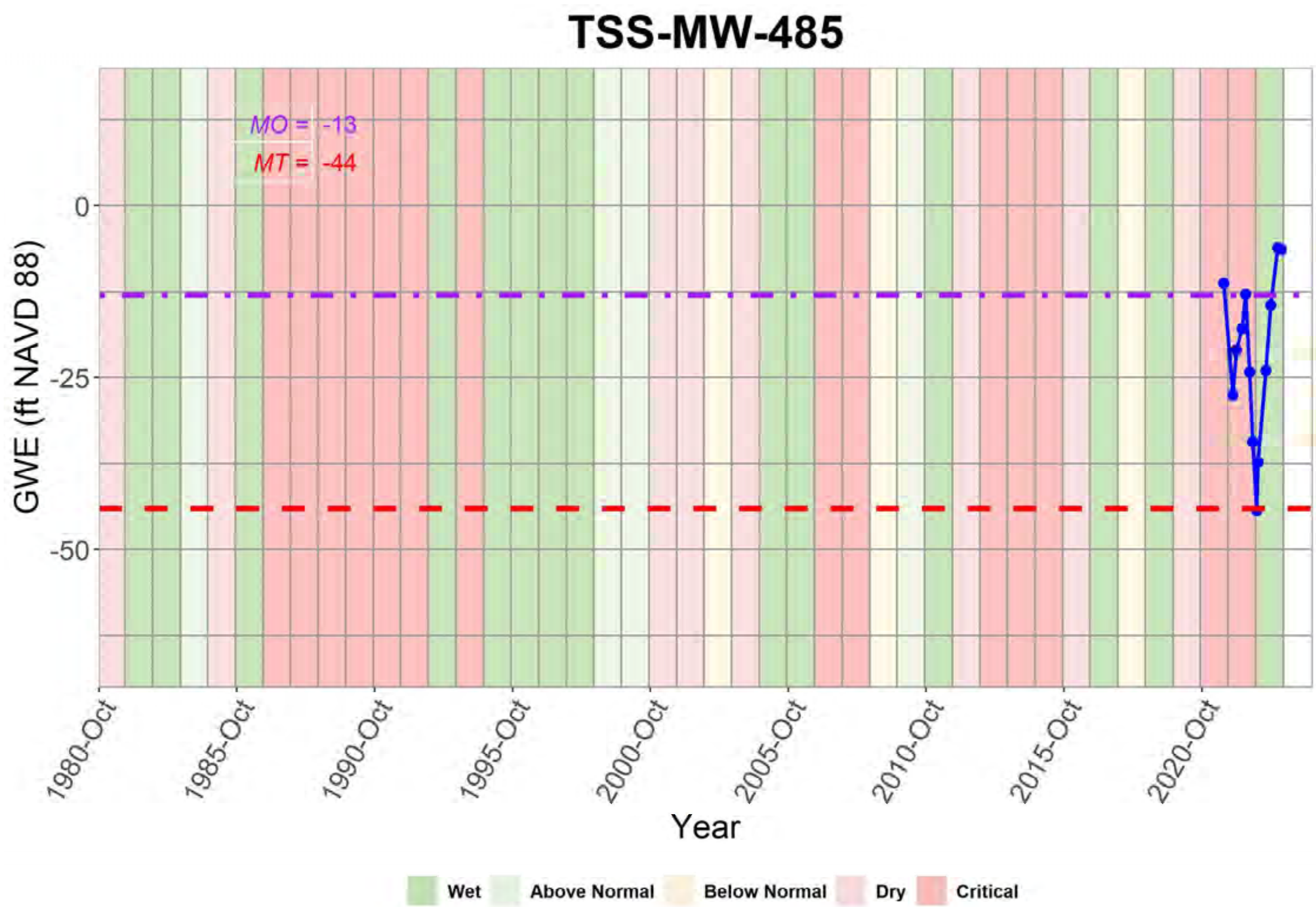

MO = 49
MT = 29
80
60
40
20
0
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

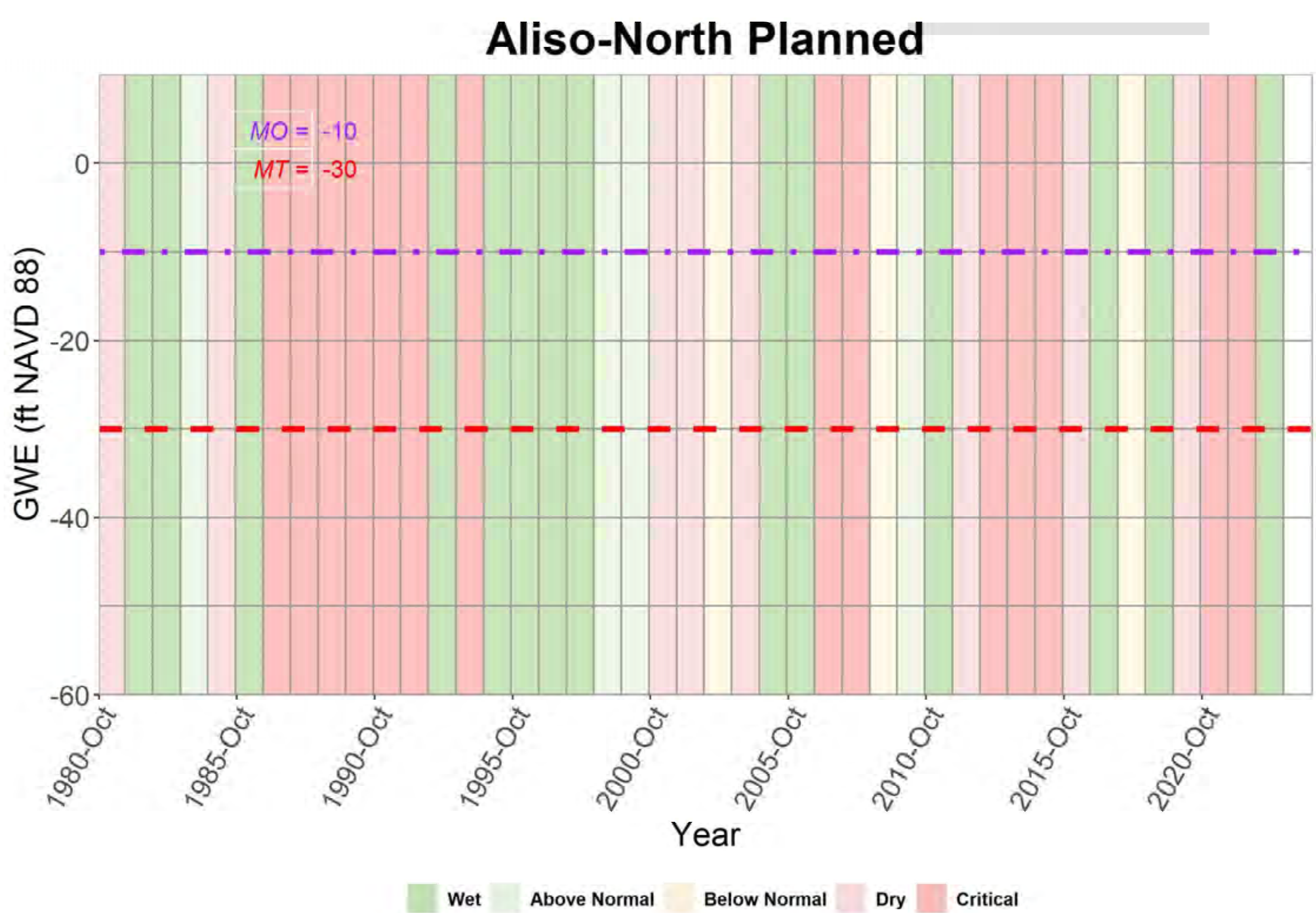
Elrod #4 Well #21



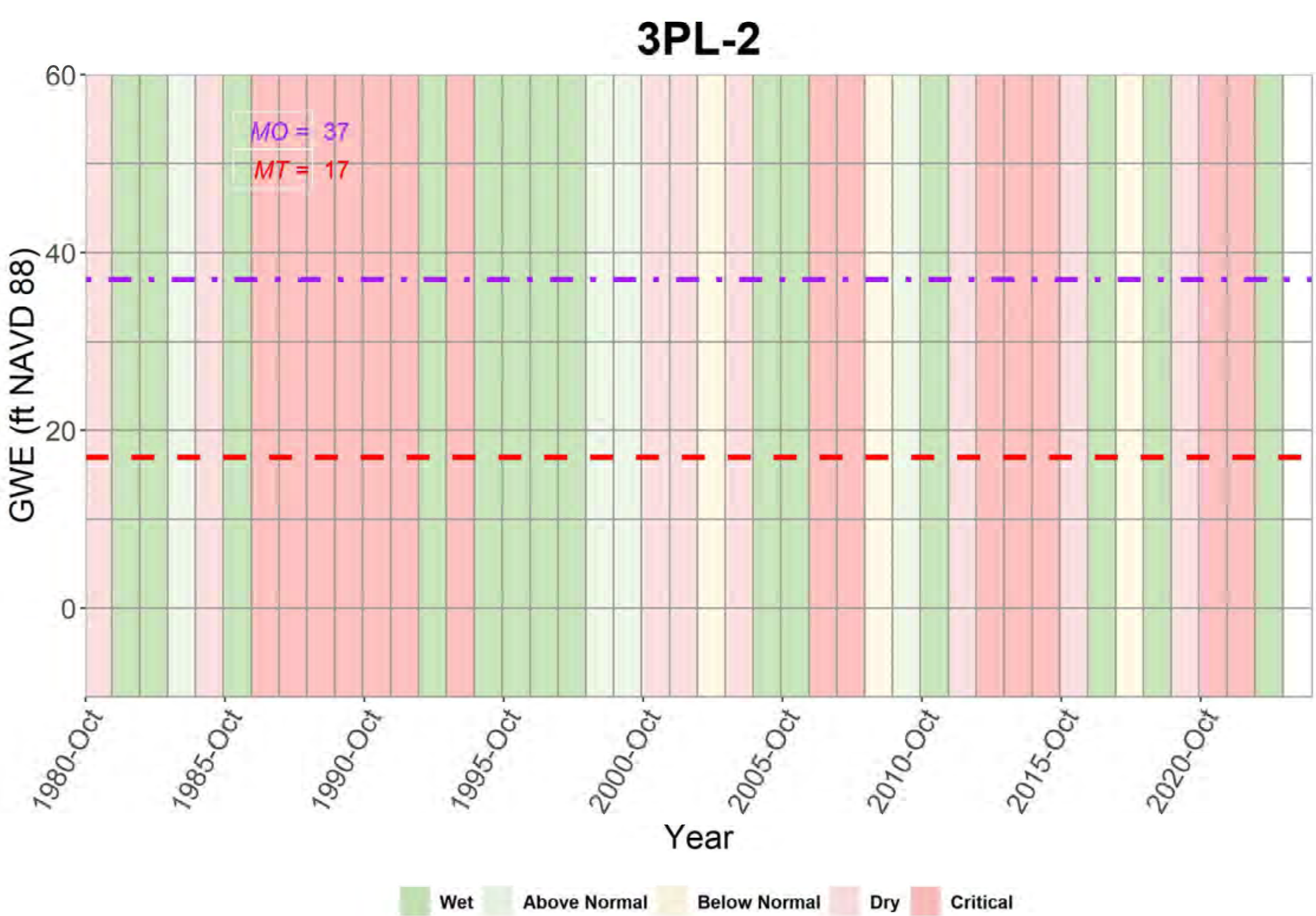
TSS-MW-325



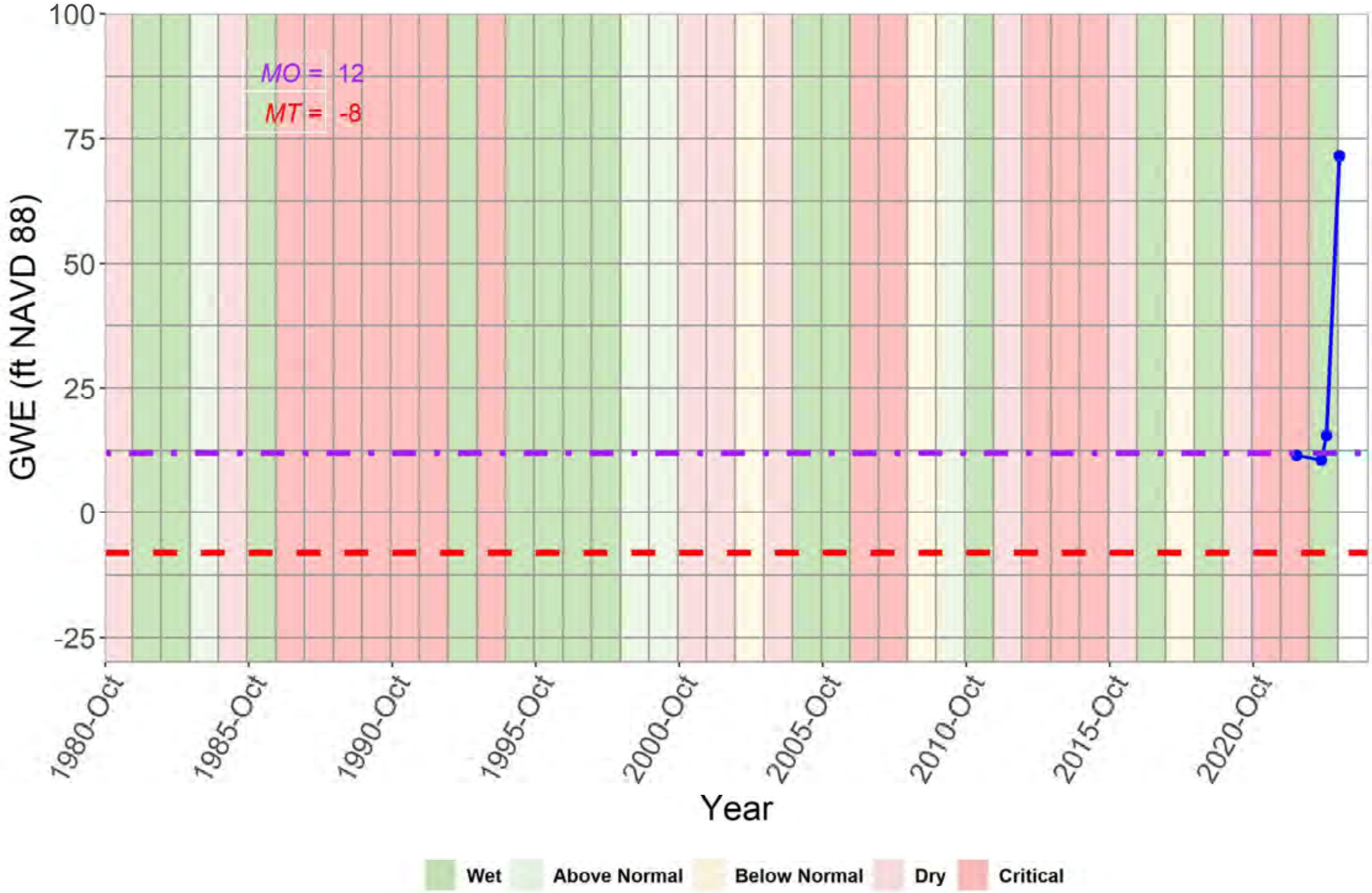

TSS-MW-485
MO = -13
MT = -44
0
-25
-50
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


Aliso-North Planned
MO = -10
MT = -30
0
-20
-40
-60
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

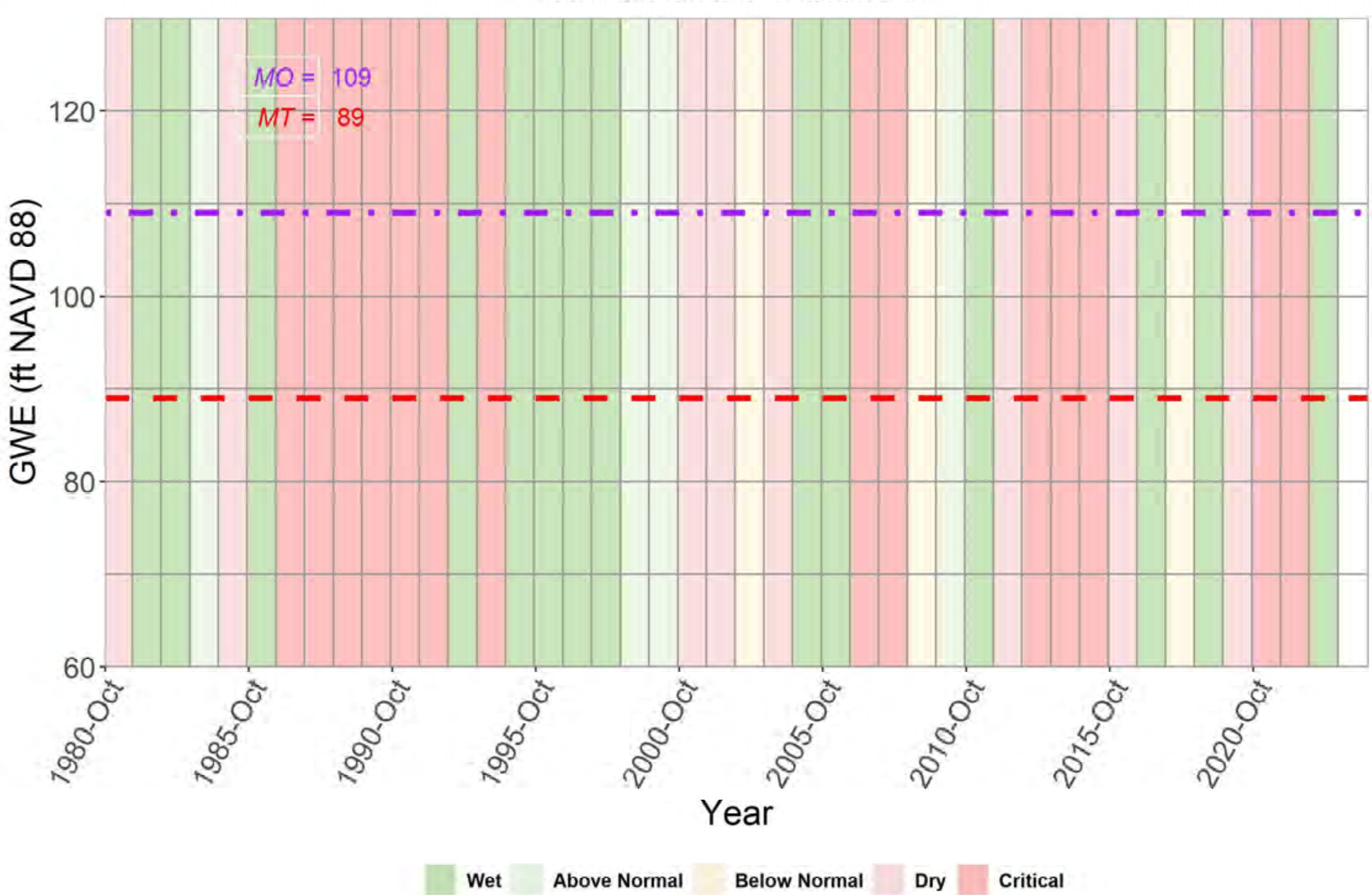

Aliso-South Planned
MO = -1
MT = -21
GWE (ft NAVD 88)
20
0
-20
-40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

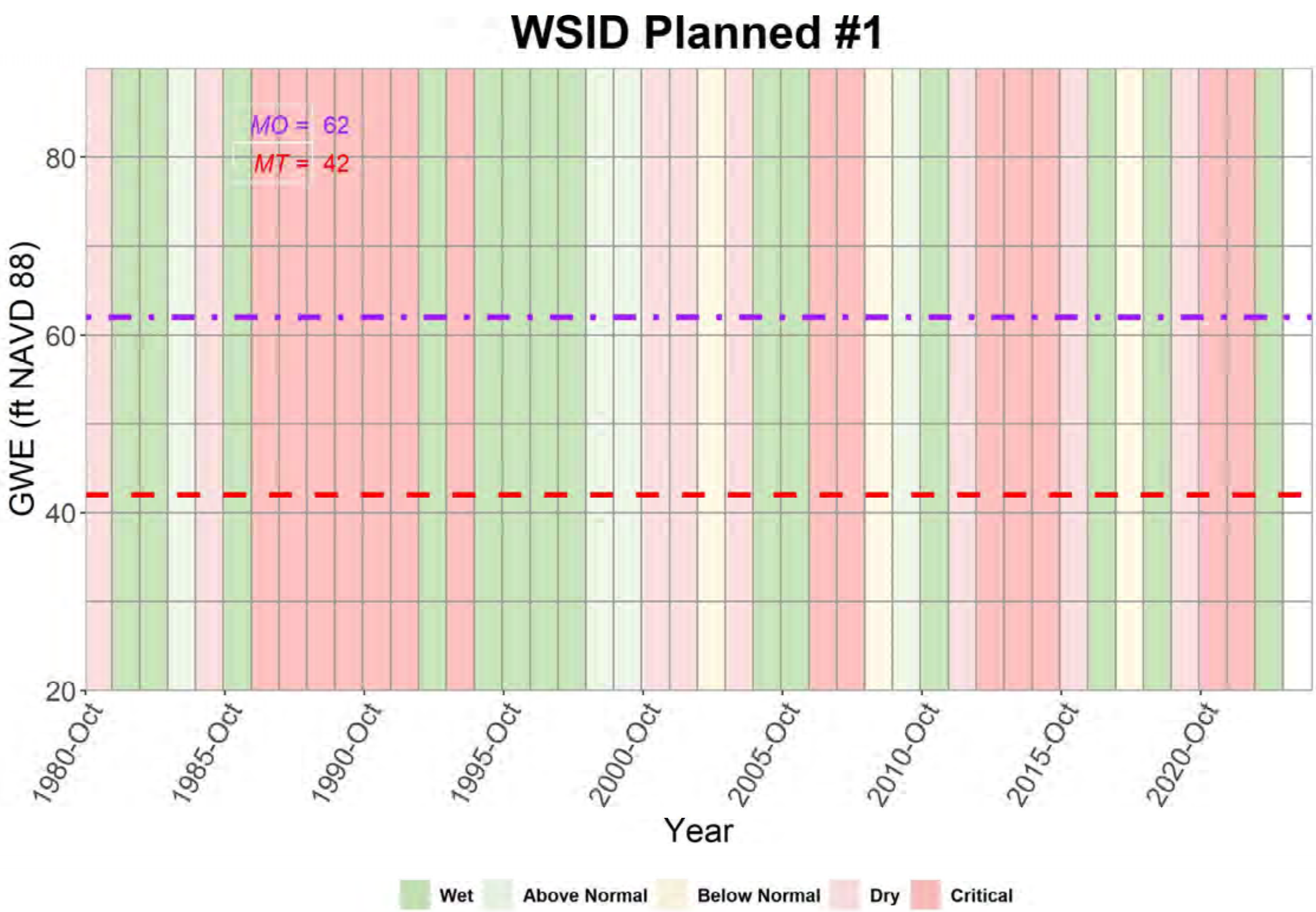

3PL-2
MO = 37
MT = 17
GWE (ft NAVD 88)
60
40
20
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

11-022

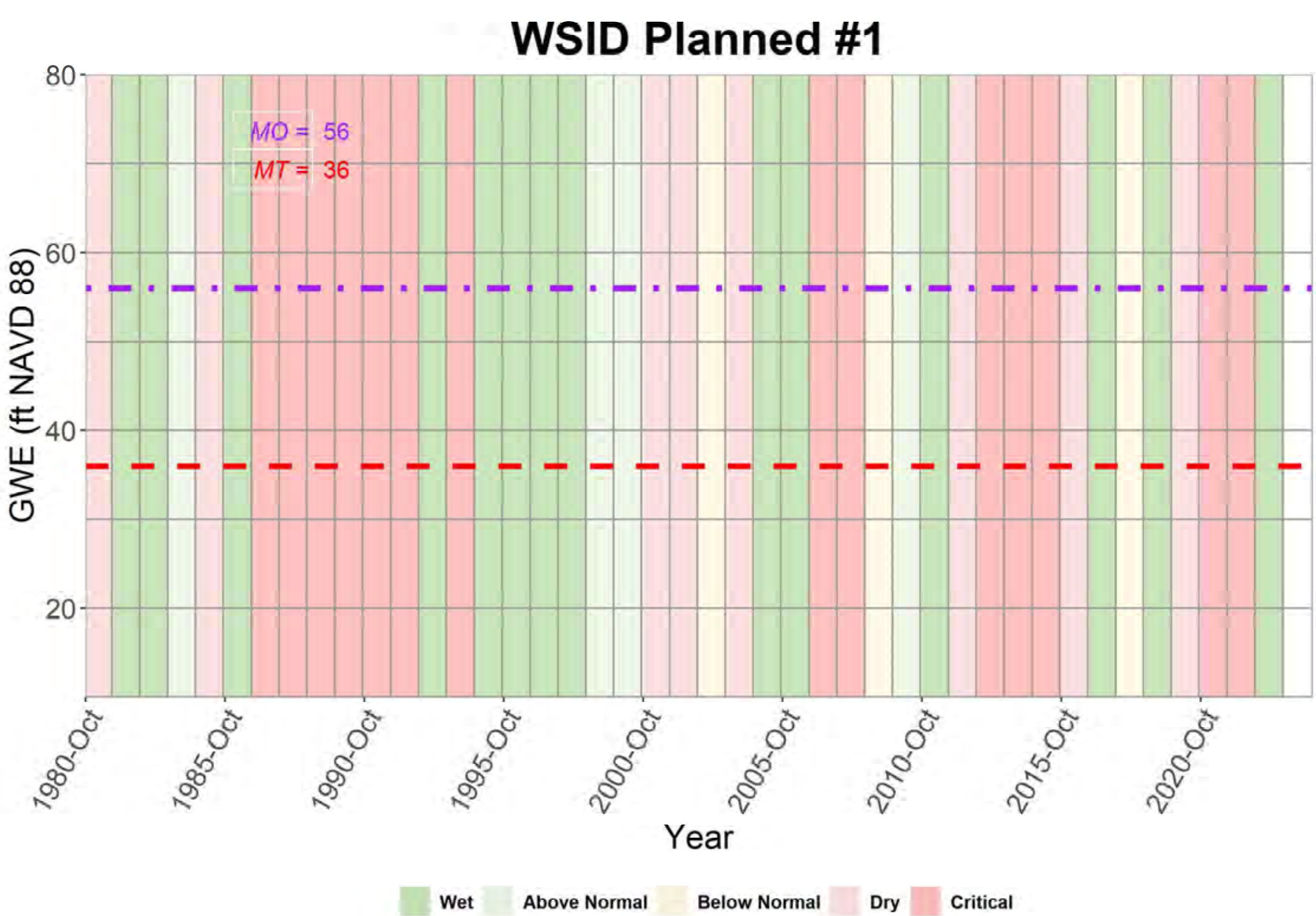


MW1UA Planned

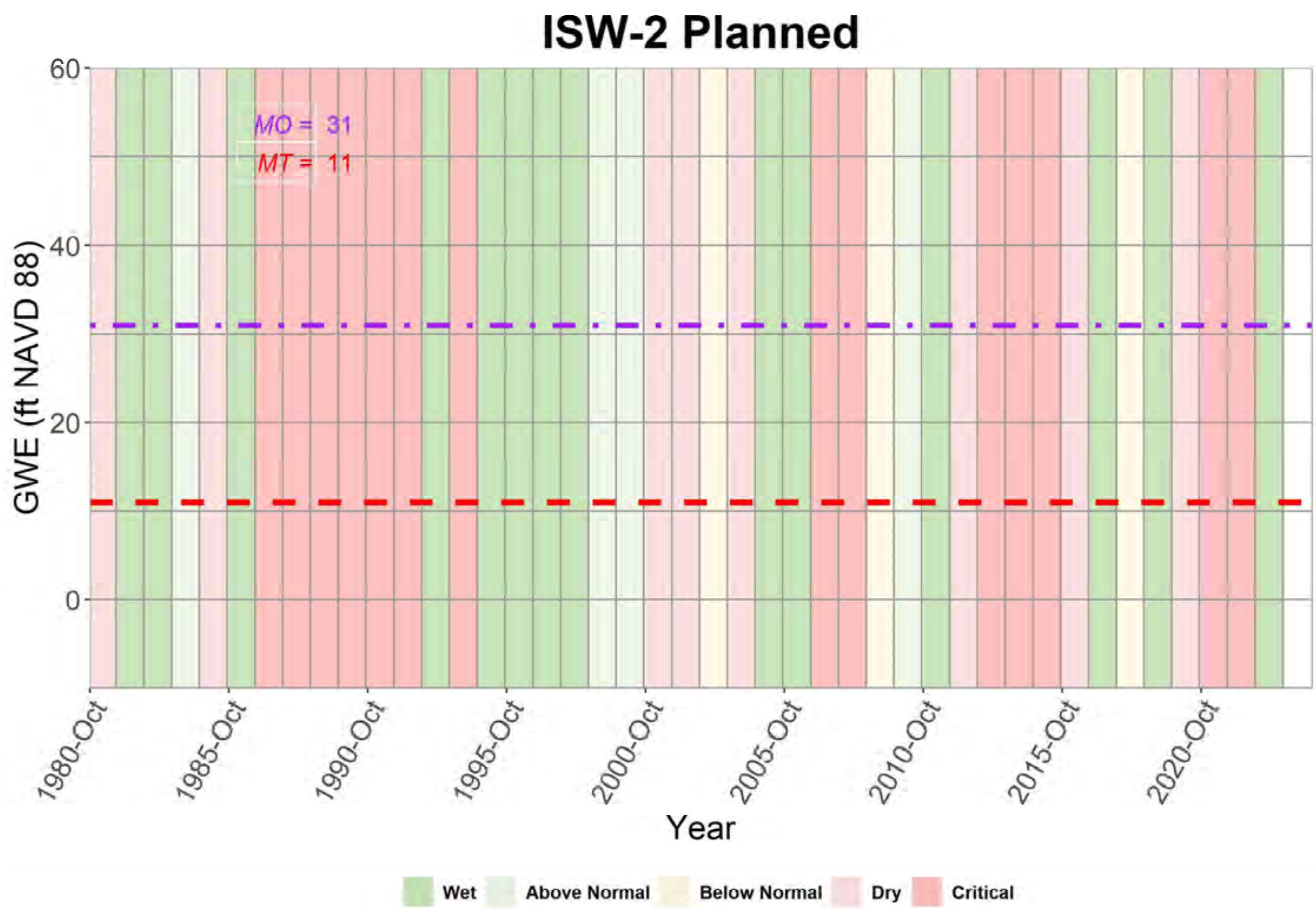


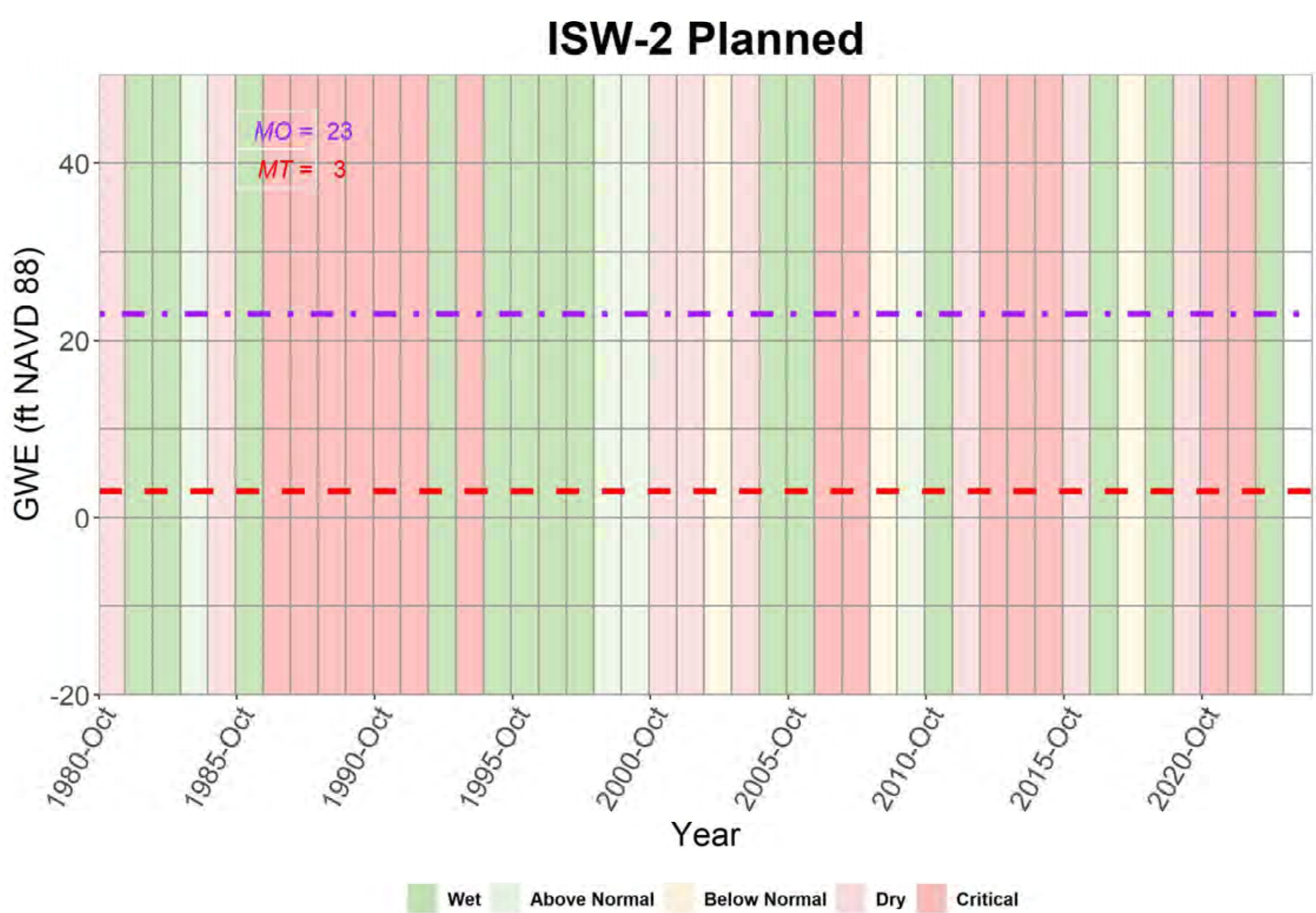


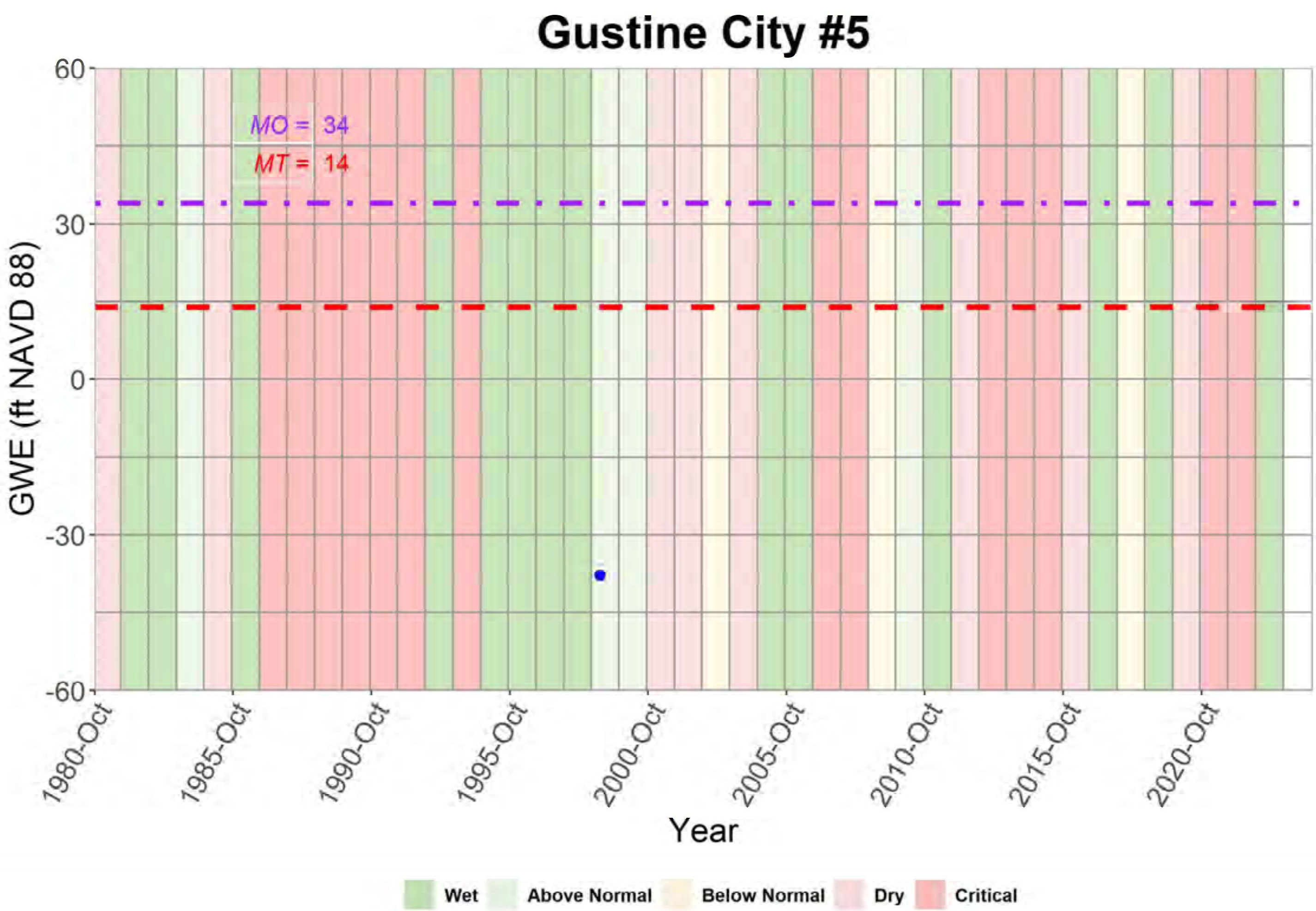
WSID Planned #1
MO = 62
MT = 42
GWE (ft NAVD 88)
80
60
40
20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

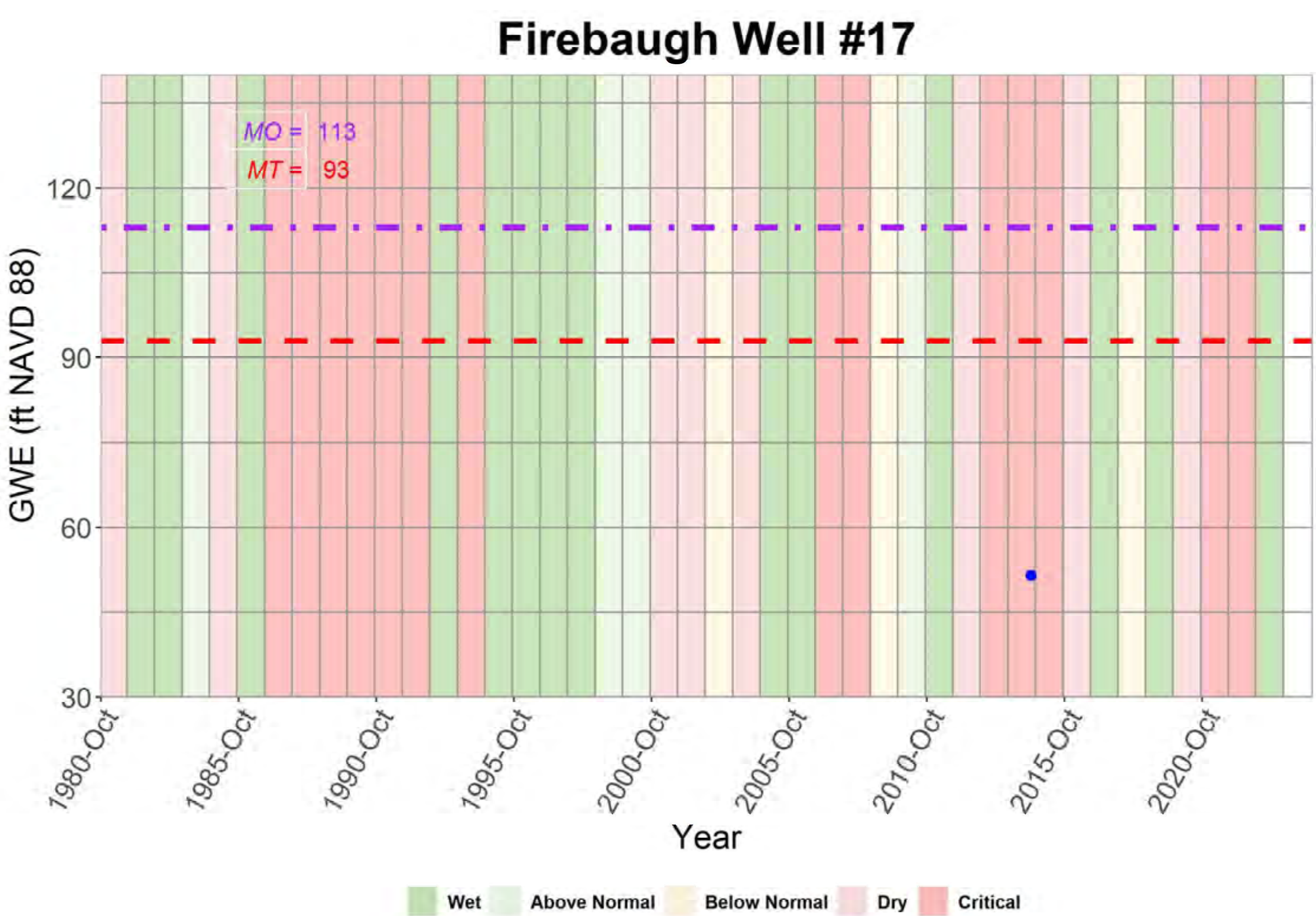


WSID Planned #1
MO = 56
MT = 36
GWE (ft NAVD 88)
80
60
40
20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

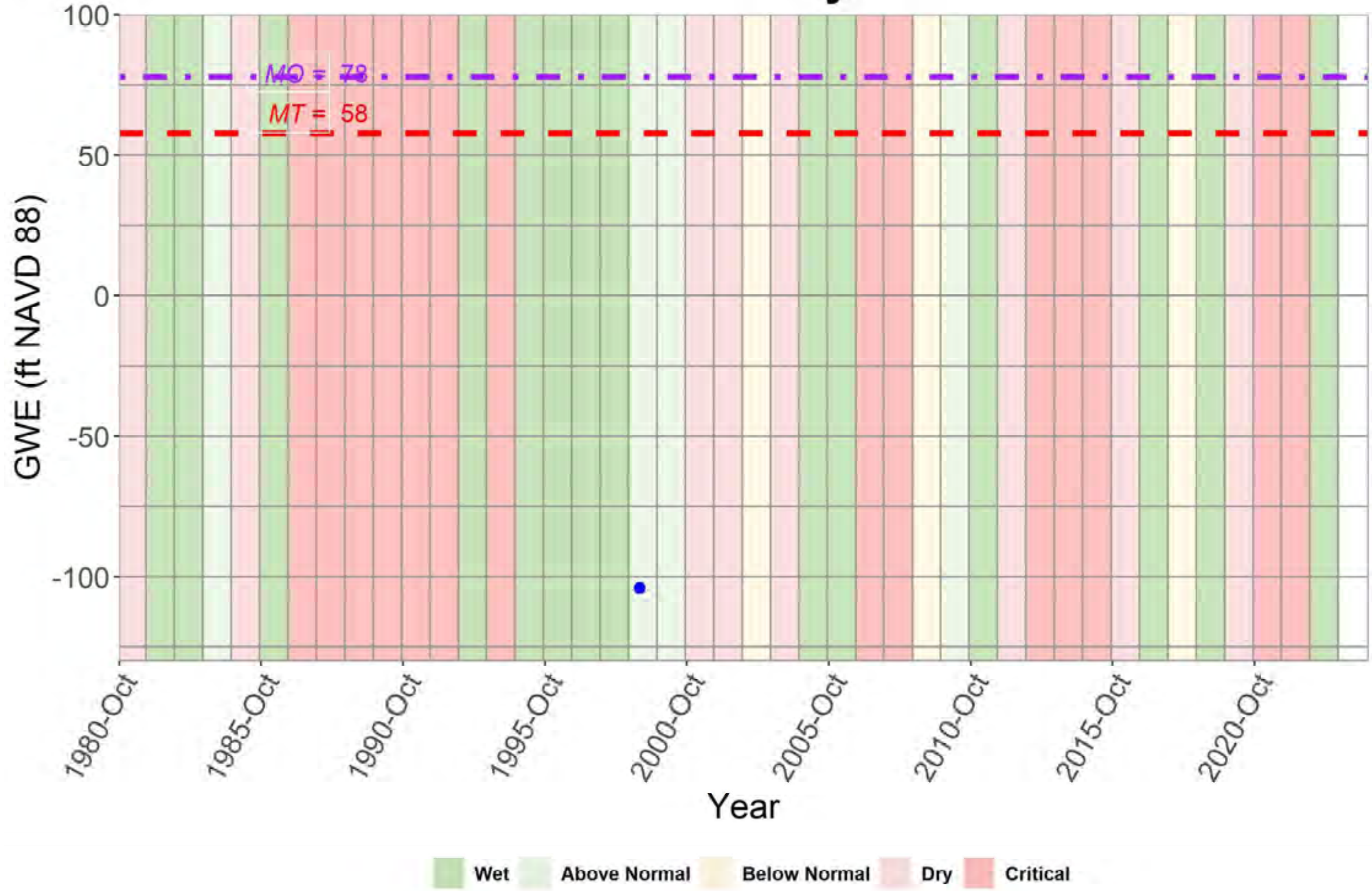

ISW-2 Planned
MO = 31
MT = 11
GWE (ft NAVD 88)
60
40
20
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


ISW-2 Planned
MO = 23
MT = 3
GWE (ft NAVD 88)
40
20
0
-20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

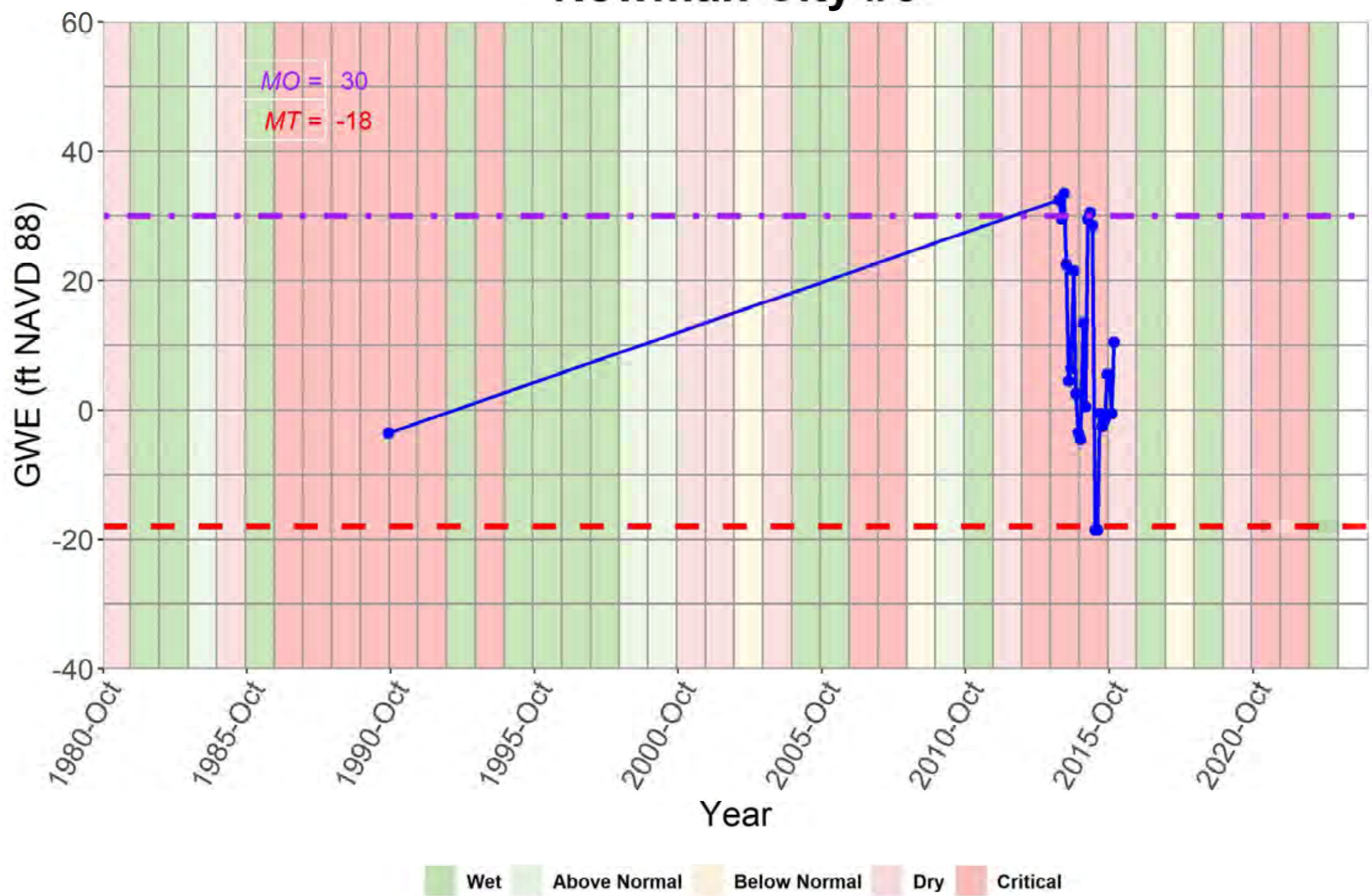

Gustine City #5
MO = 34
MT = 14
GWE (ft NAVD 88)
60
30
0
-30
-60
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

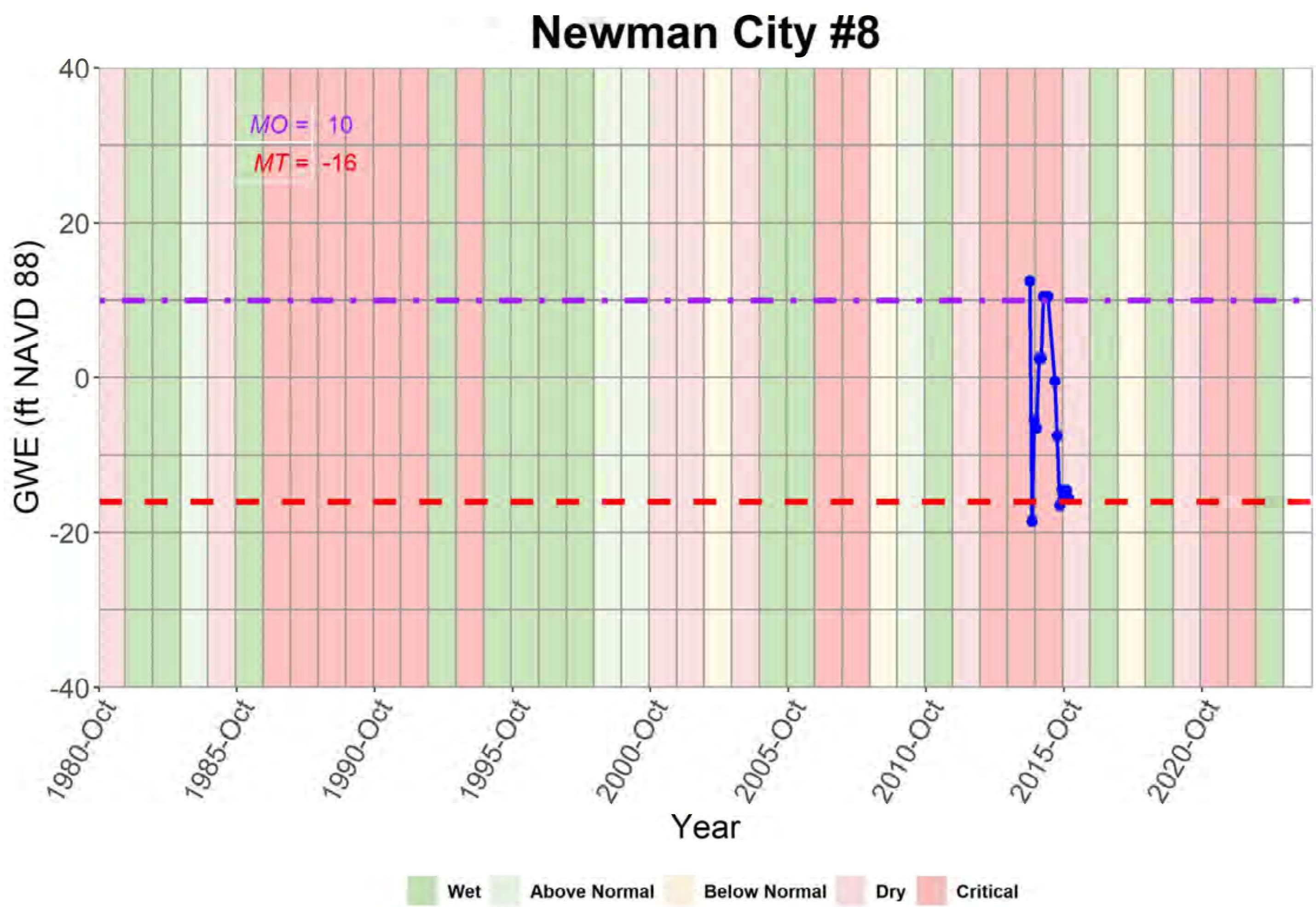

Firebaugh Well #17
MO = 113
MT = 93
GWE (ft NAVD 88)
120
90
60
30
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

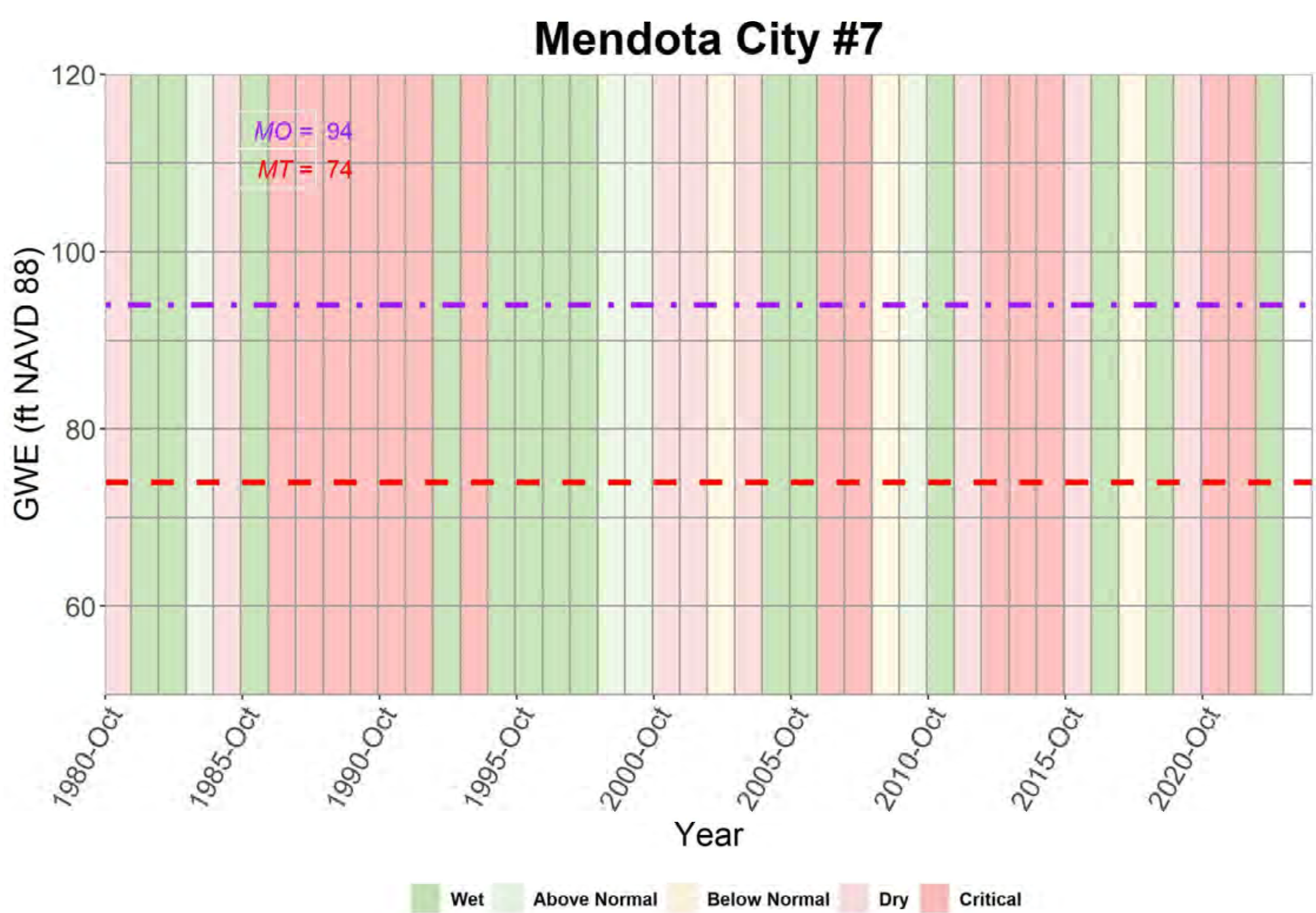
Gustine City #6

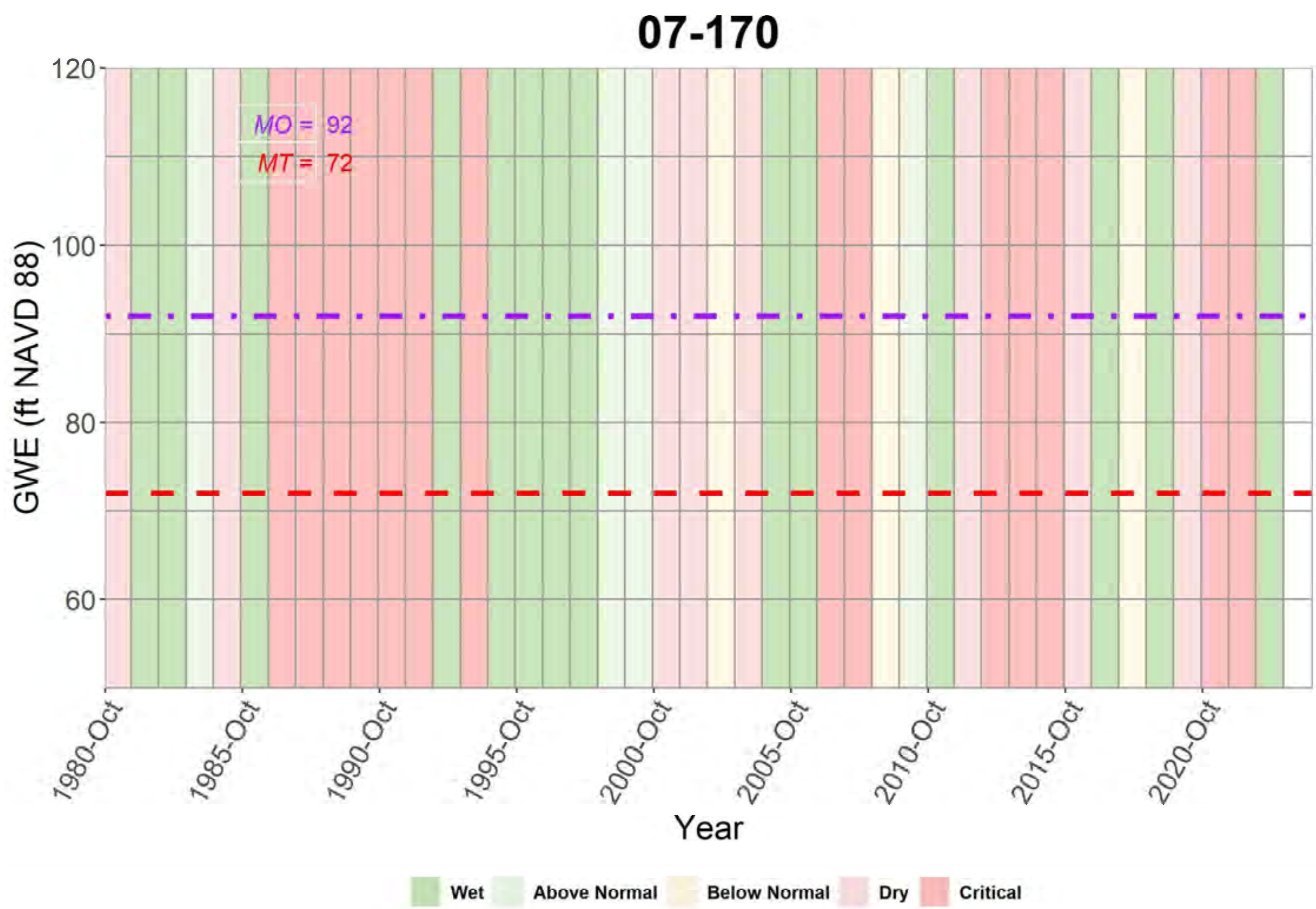


Newman City #6

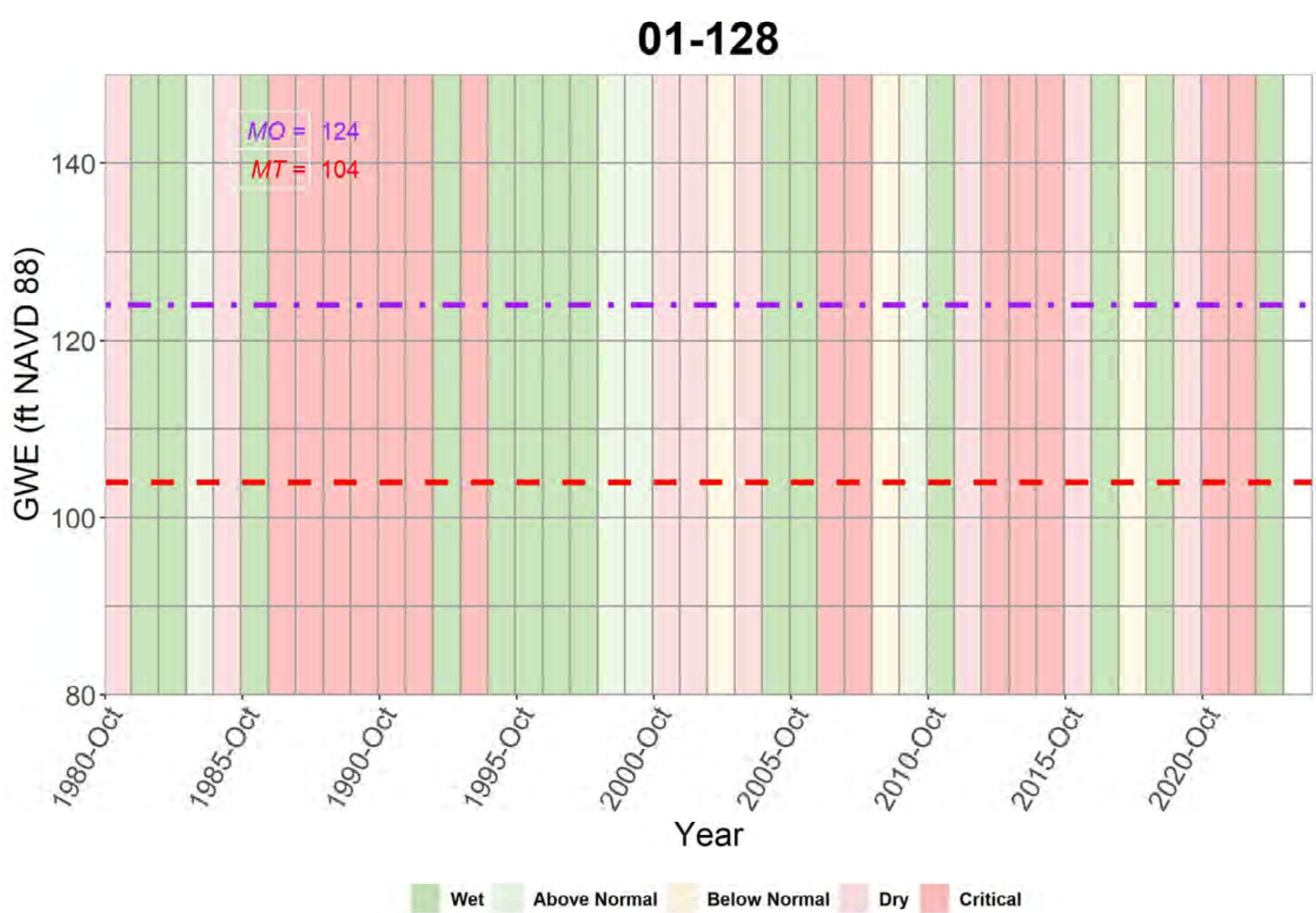



Newman City #8
MO = 10
MT = -16
GWE (ft NAVD 88)
40
20
0
-20
-40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

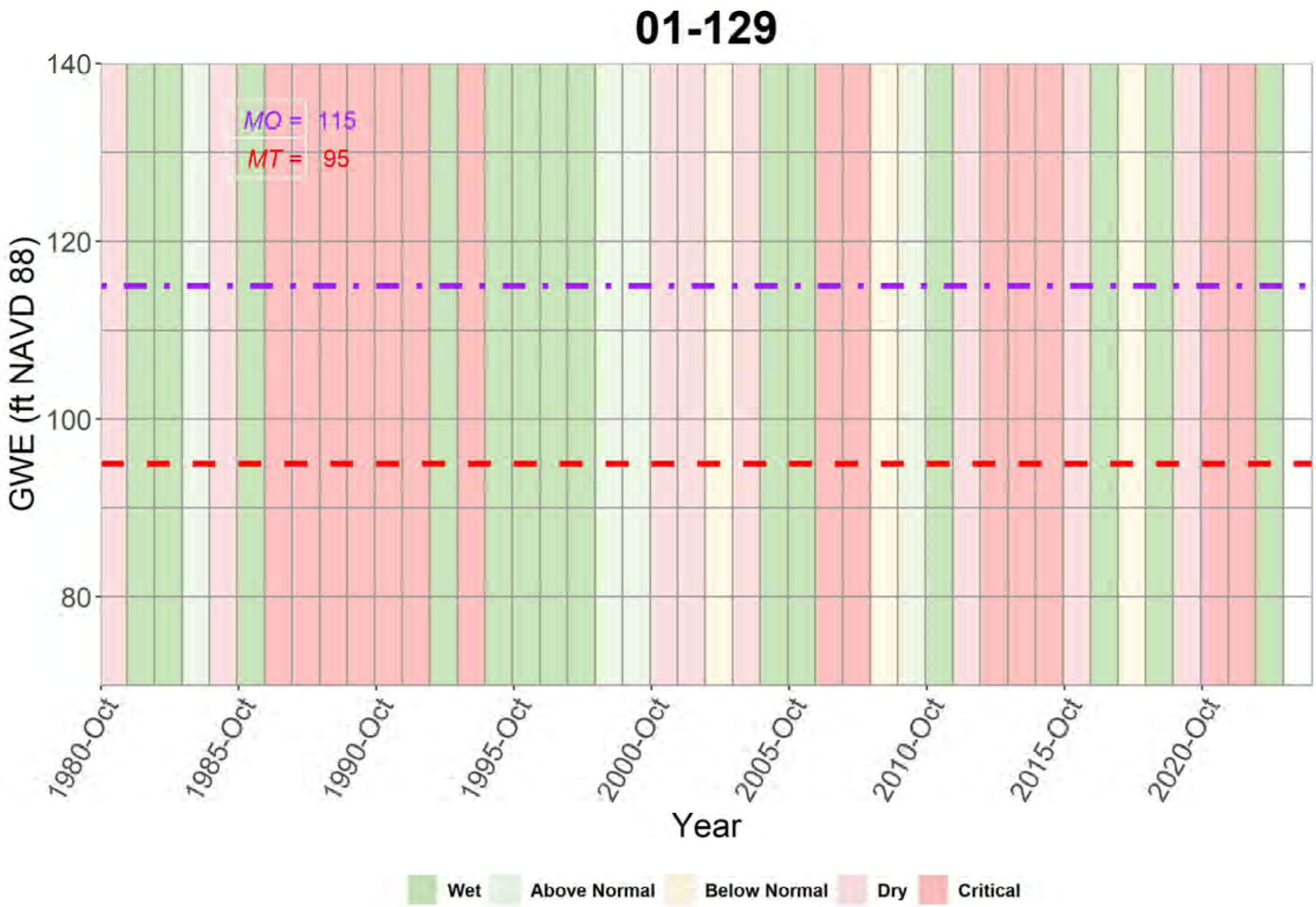

Mendota City #7
MO = 94
MT = 74
GWE (ft NAVD 88)
120
100
80
60
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

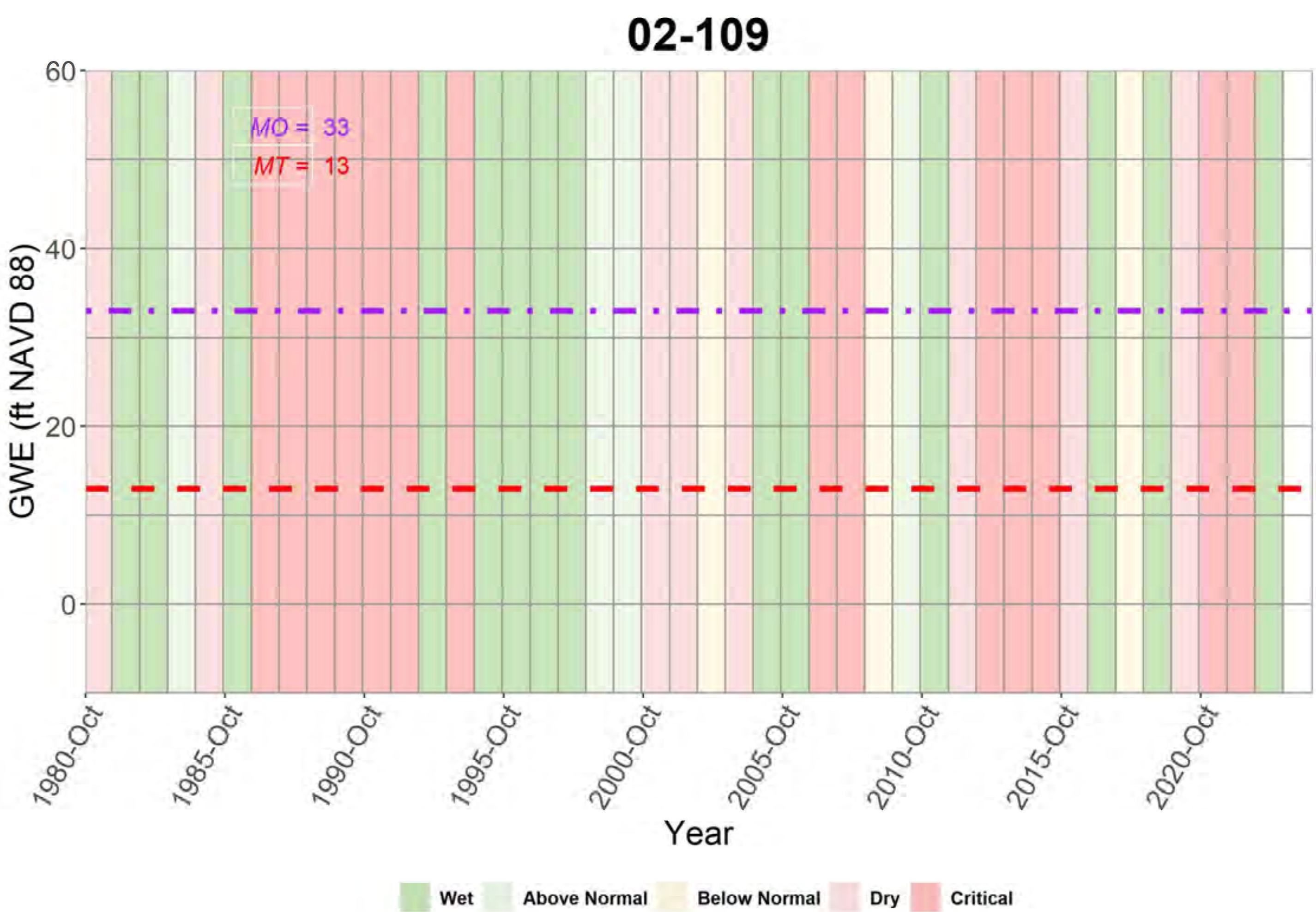


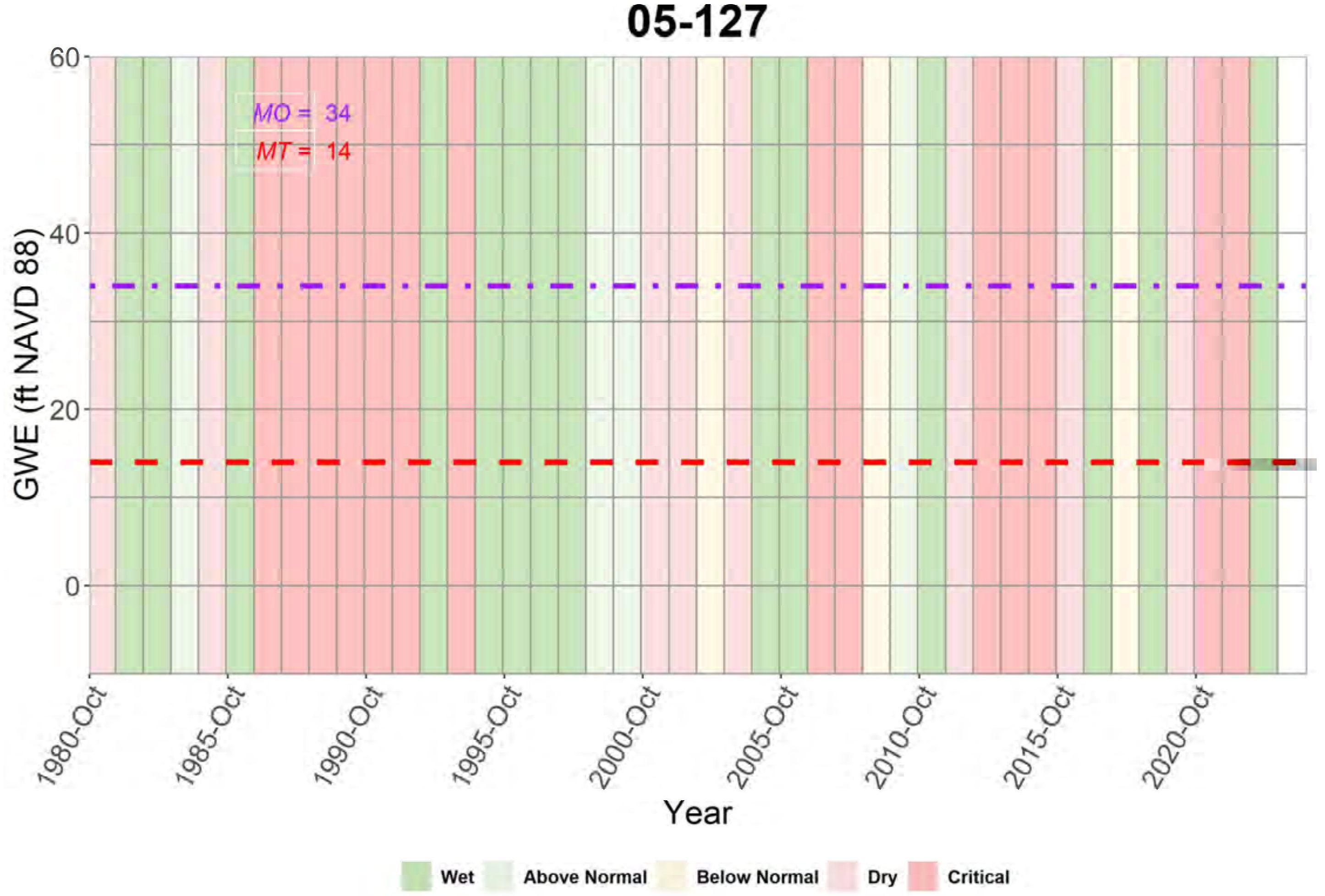
07-170
MO = 92
MT = 72
GWE (ft NAVD 88)
120
100
80
60
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

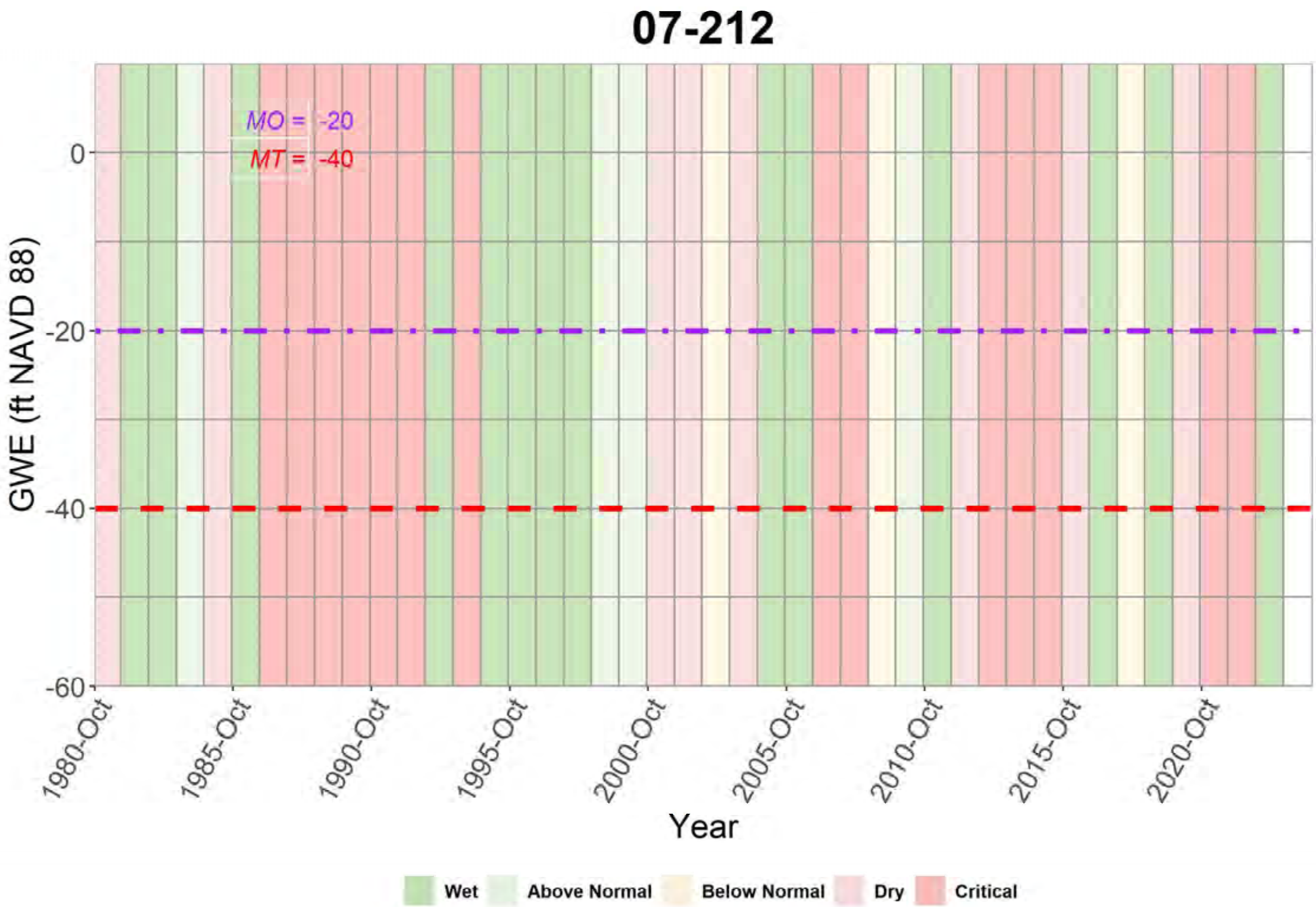


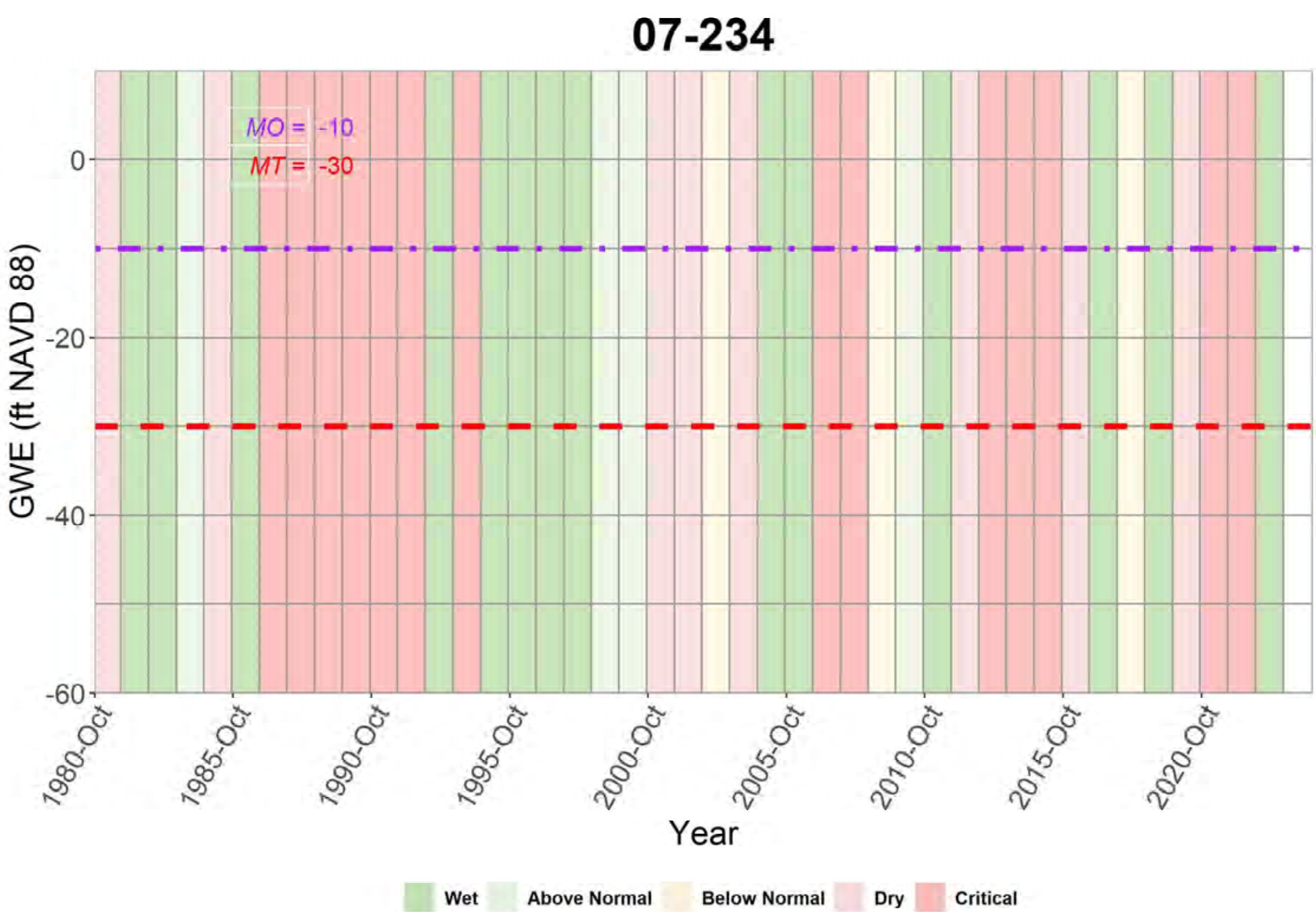
01-128
MO = 124
MT = 104
GWE (ft NAVD 88)
140
120
100
80
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

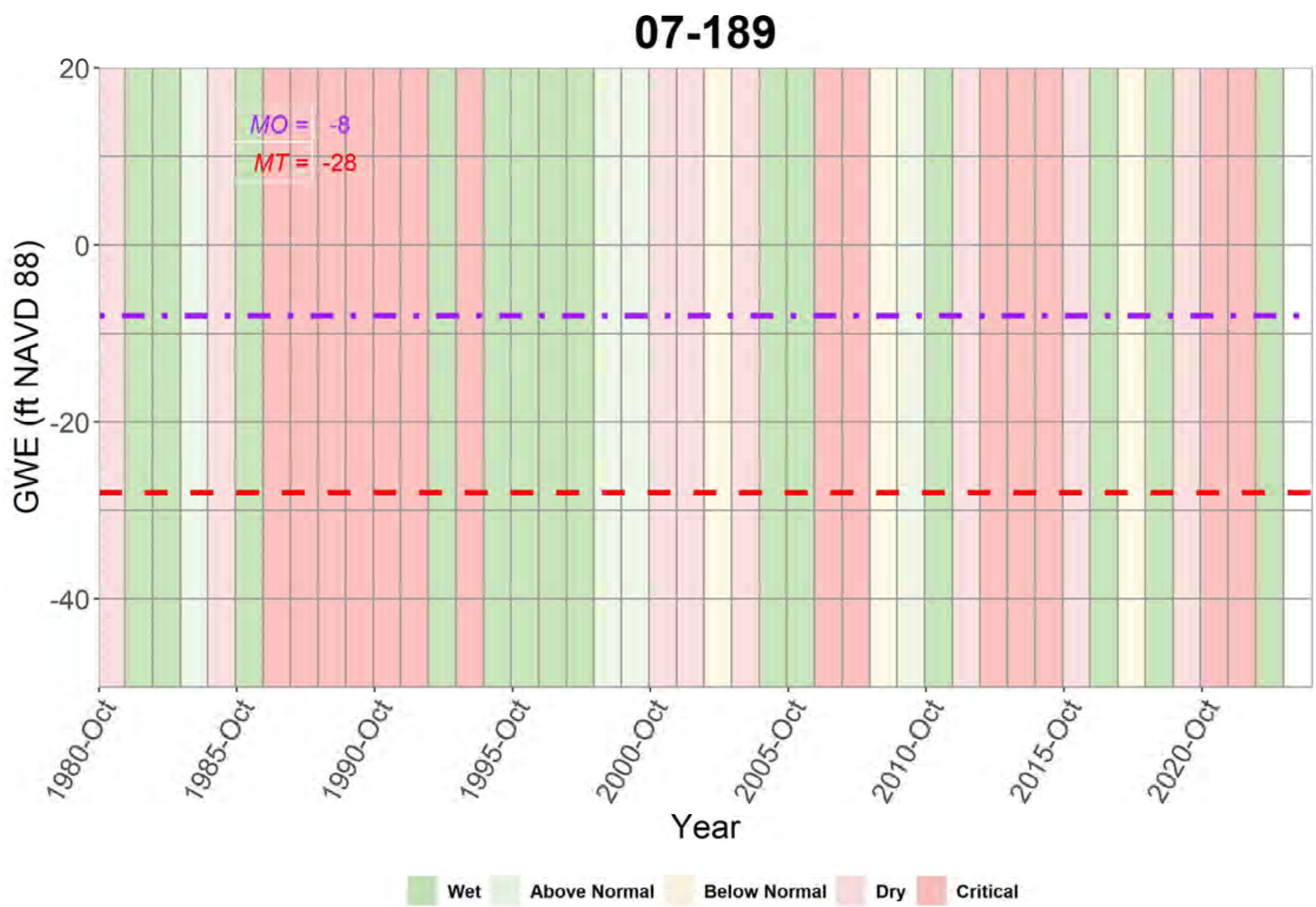

01-129
MO = 115
MT = 95
GWE (ft NAVD 88)
140
120
100
80
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


02-109
MO = 33
MT = 13
GWE (ft NAVD 88)
60
40
20
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

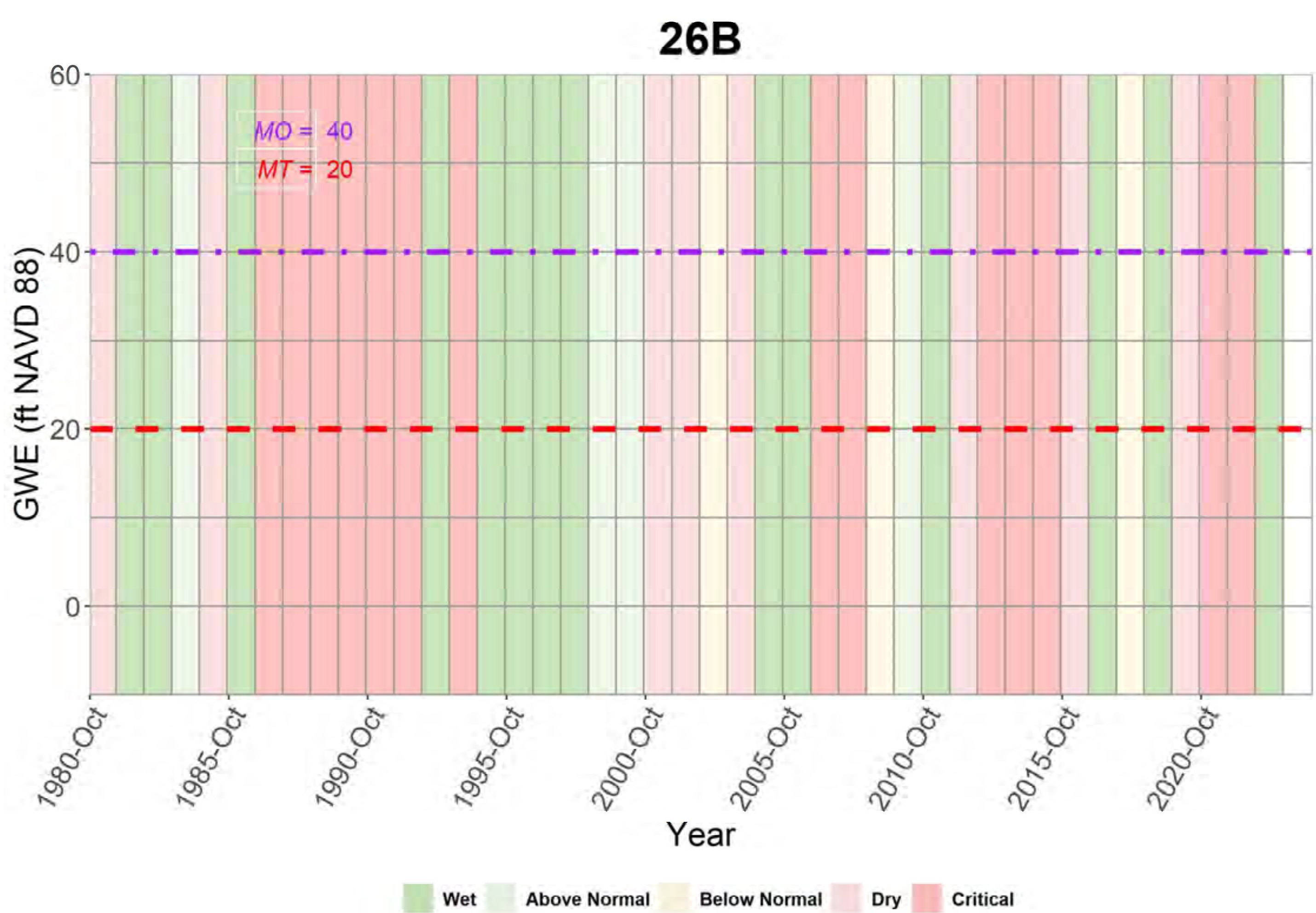

05-127
MO = 34
MT = 14
GWE (ft NAVD 88)
60
40
20
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-212
MO = -20
MT = -40
GWE (ft NAVD 88)
0
-20
-40
-60
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


07-234
MO = -10
MT = -30
GWE (ft NAVD 88)
0
-20
-40
-60
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

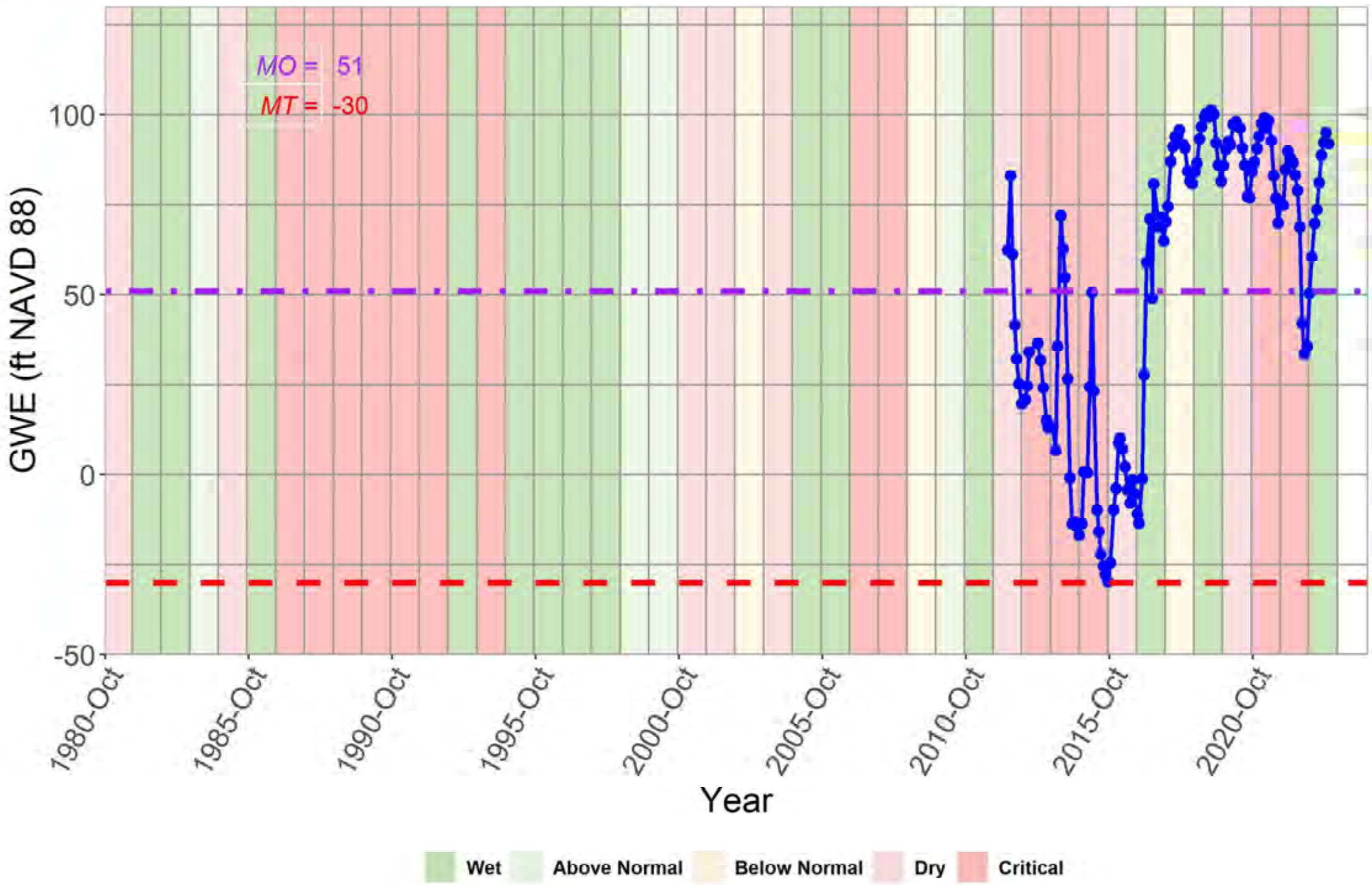


07-189
MO = -8
MT = -28
GWE (ft NAVD 88)
20
0
-20
-40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

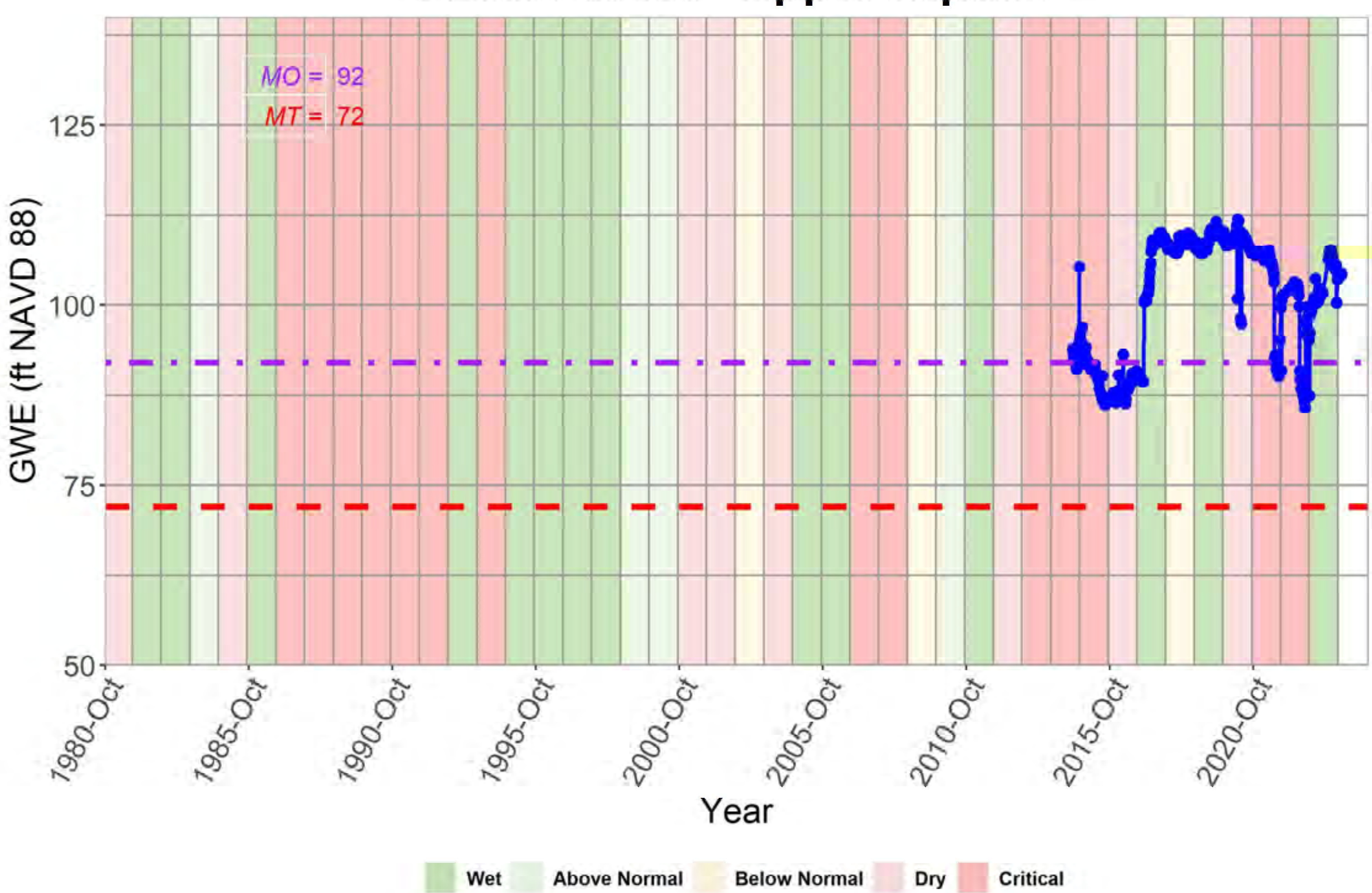


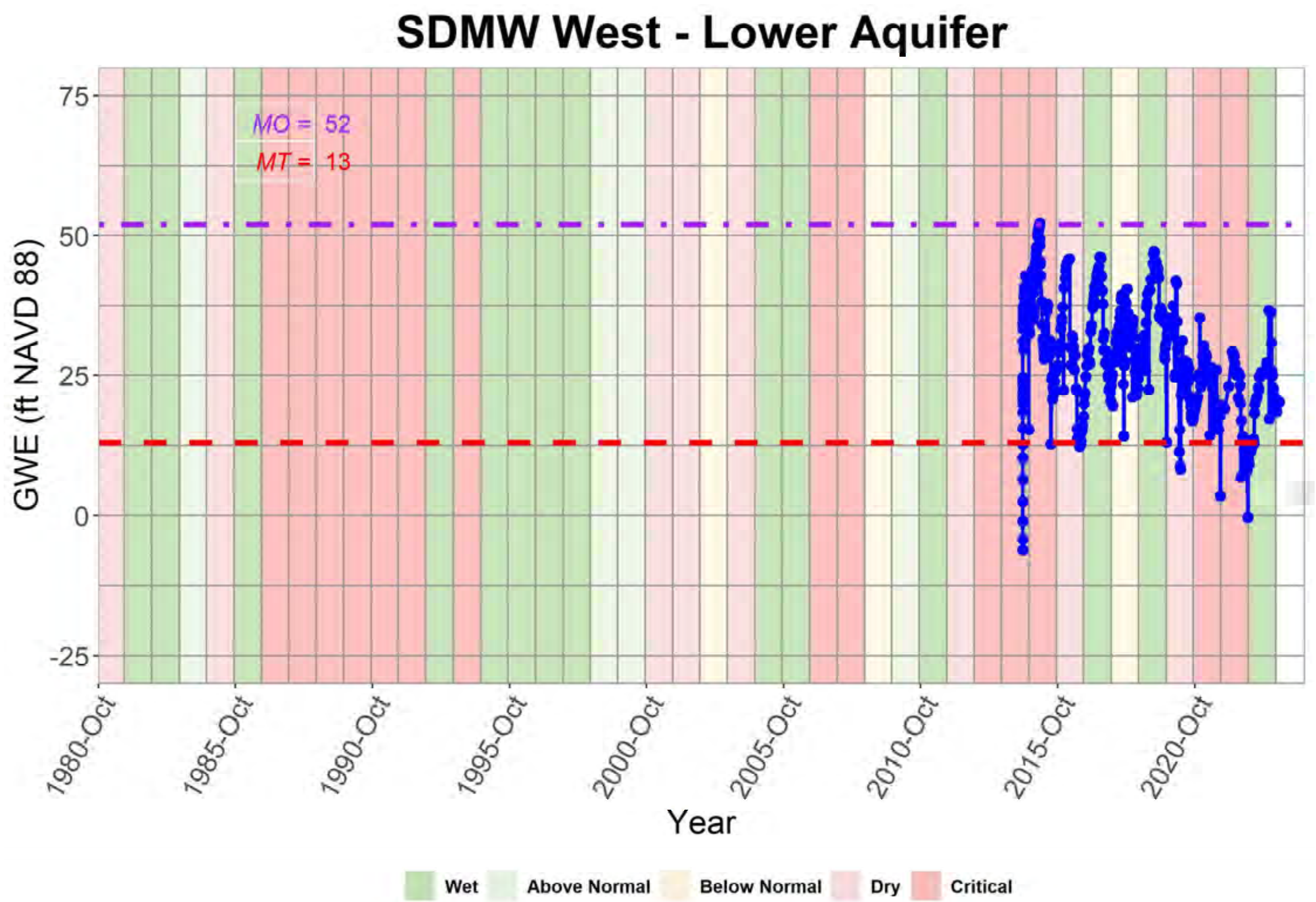
26B
MO = 40
MT = 20
GWE (ft NAVD 88)
60
40
20
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

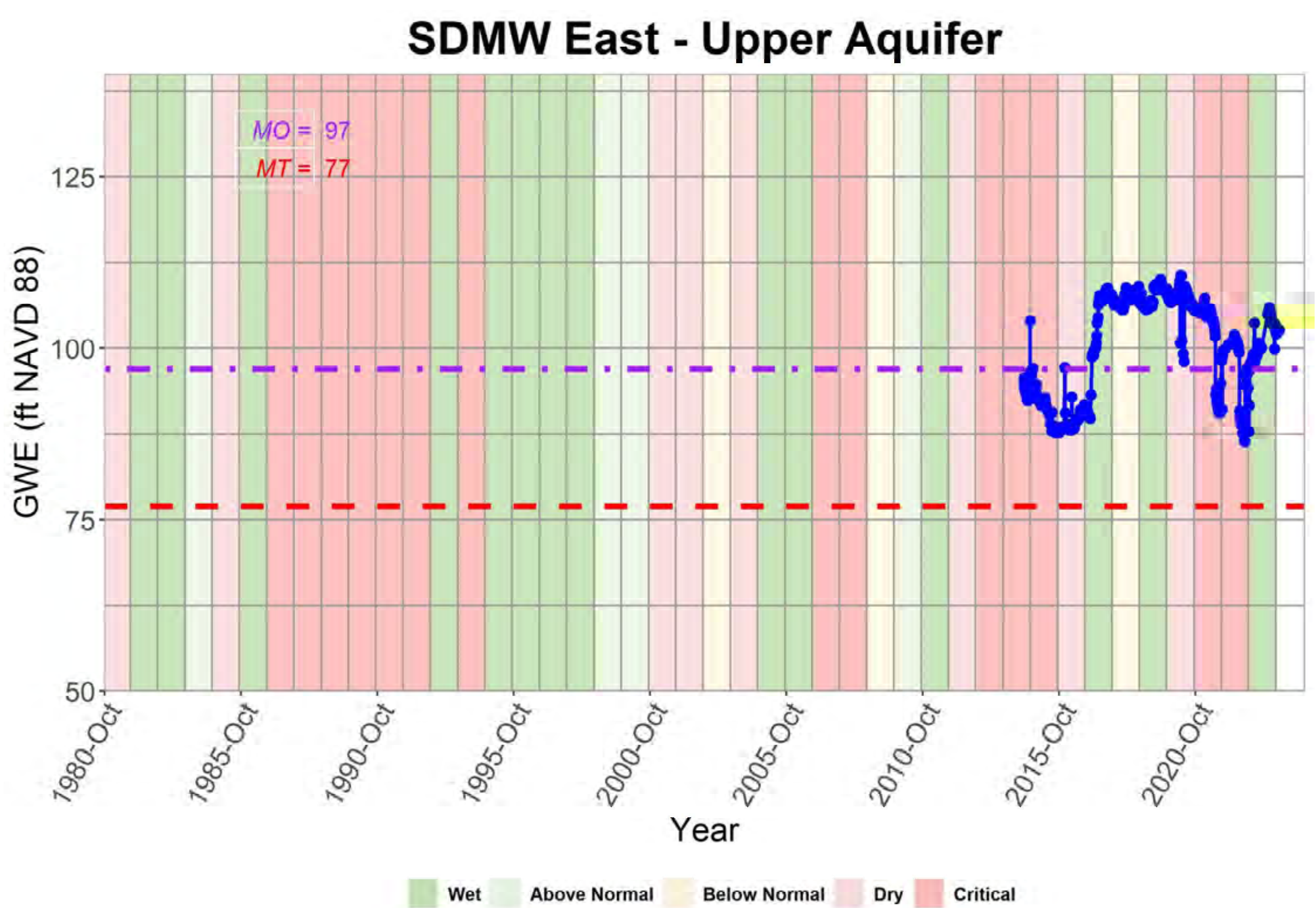
MC18-2



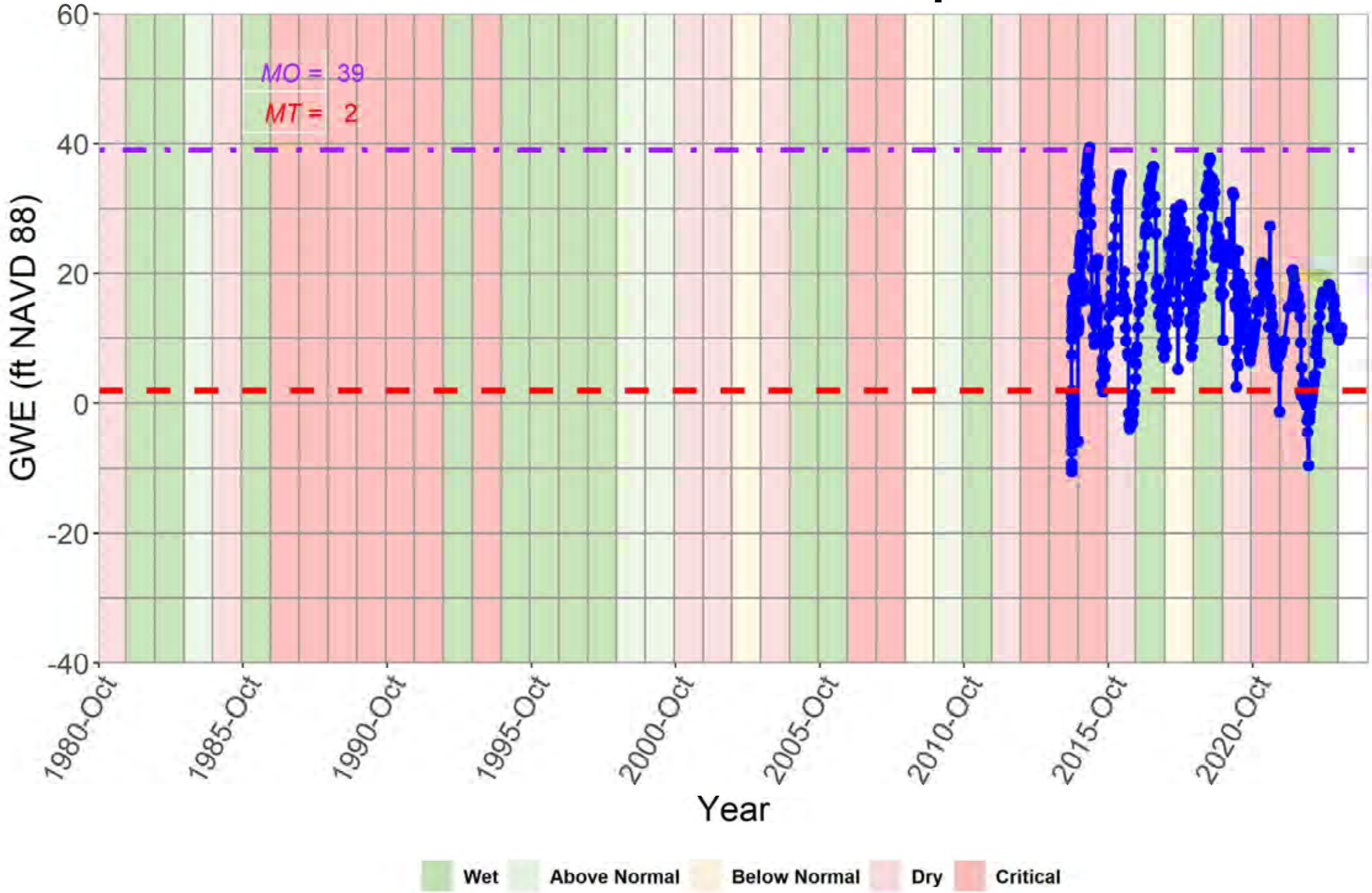
SDMW West - Upper Aquifer



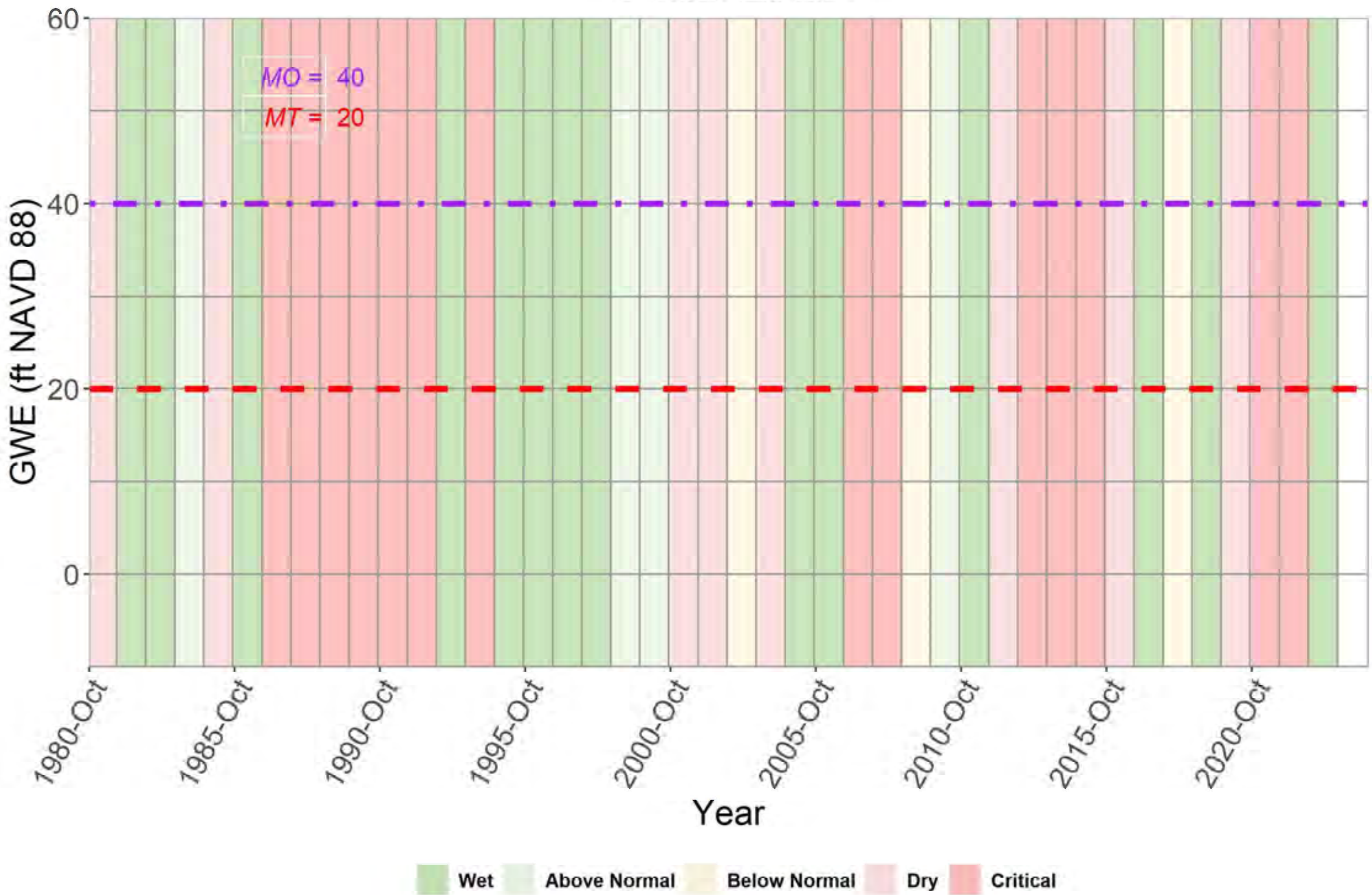

SDMW West - Lower Aquifer
MO = 52
MT = 13
GWE (ft NAVD 88)
75
50
25
0
-25
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

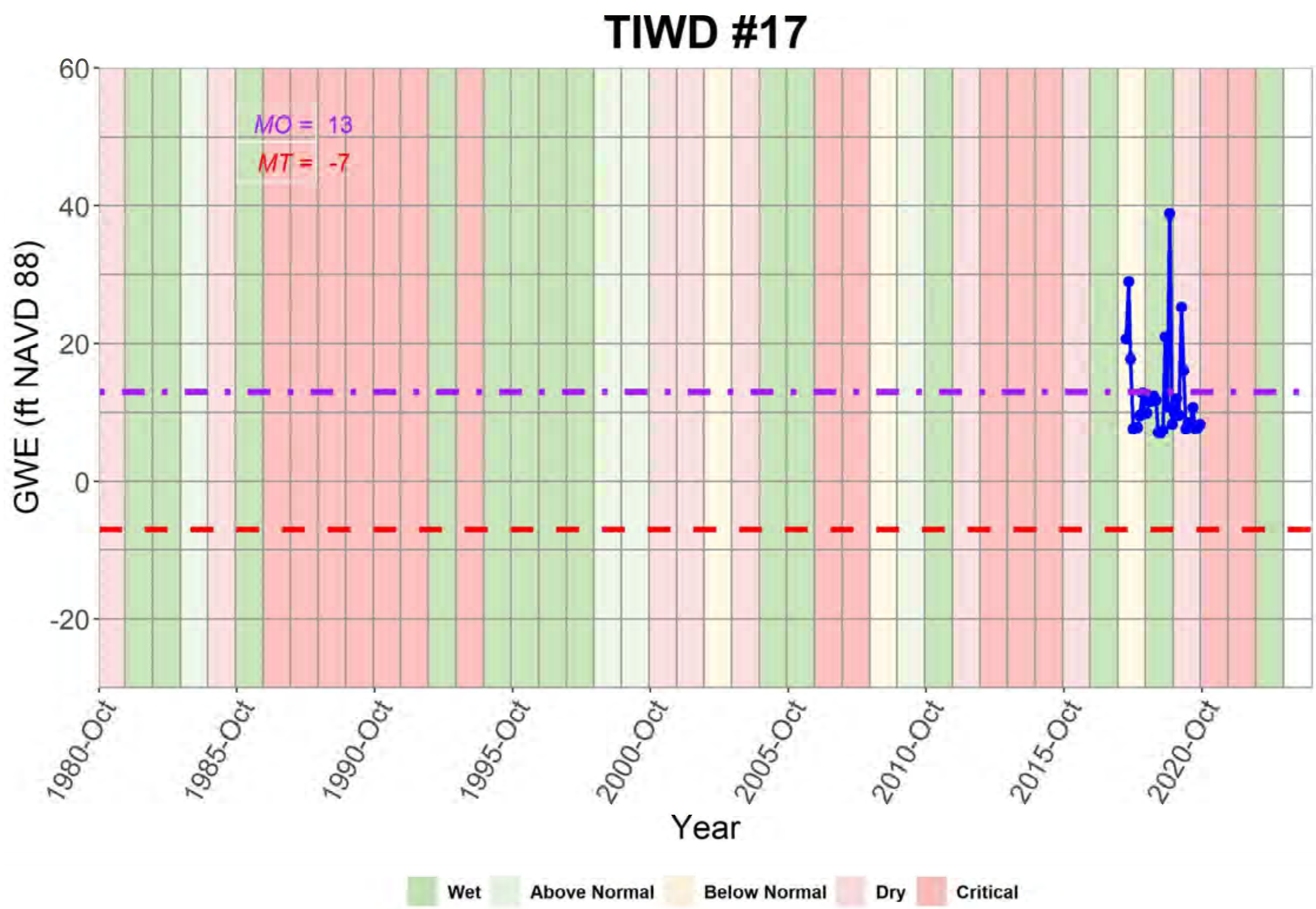

SDMW East - Upper Aquifer
MO = 97
MT = 77
GWE (ft NAVD 88)
125
100
75
50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

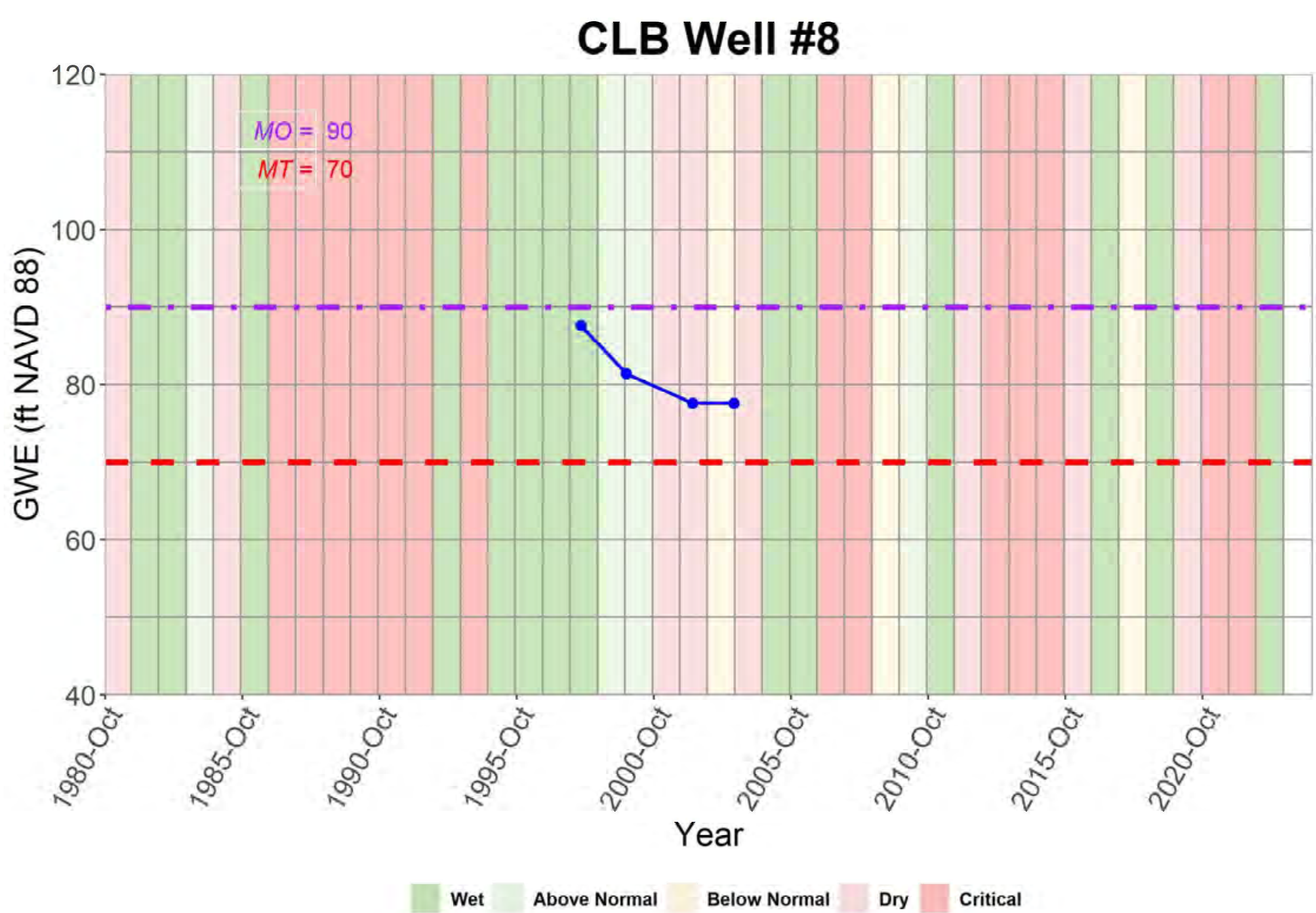
SDMW East - Lower Aquifer

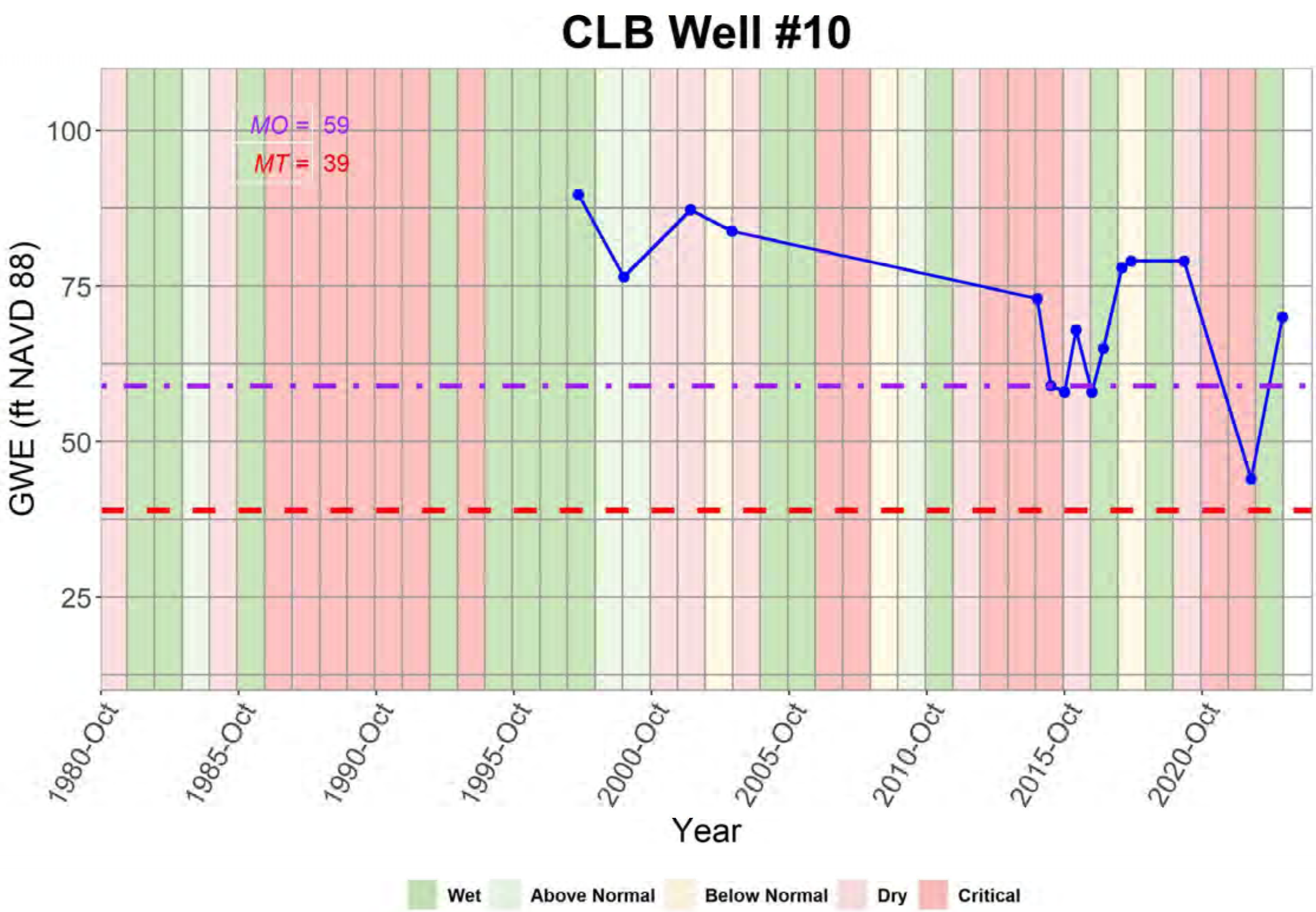


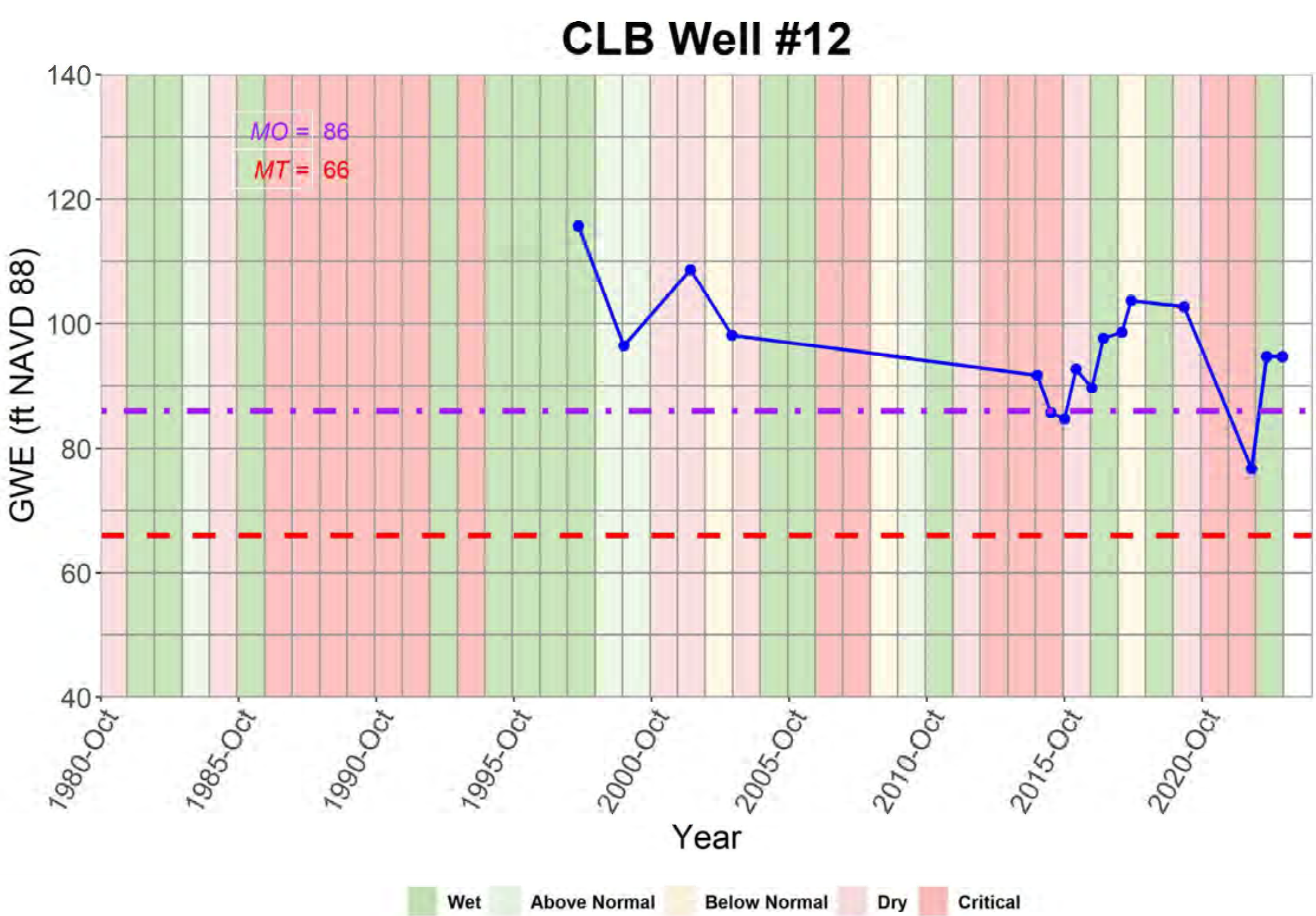
CCID 2723

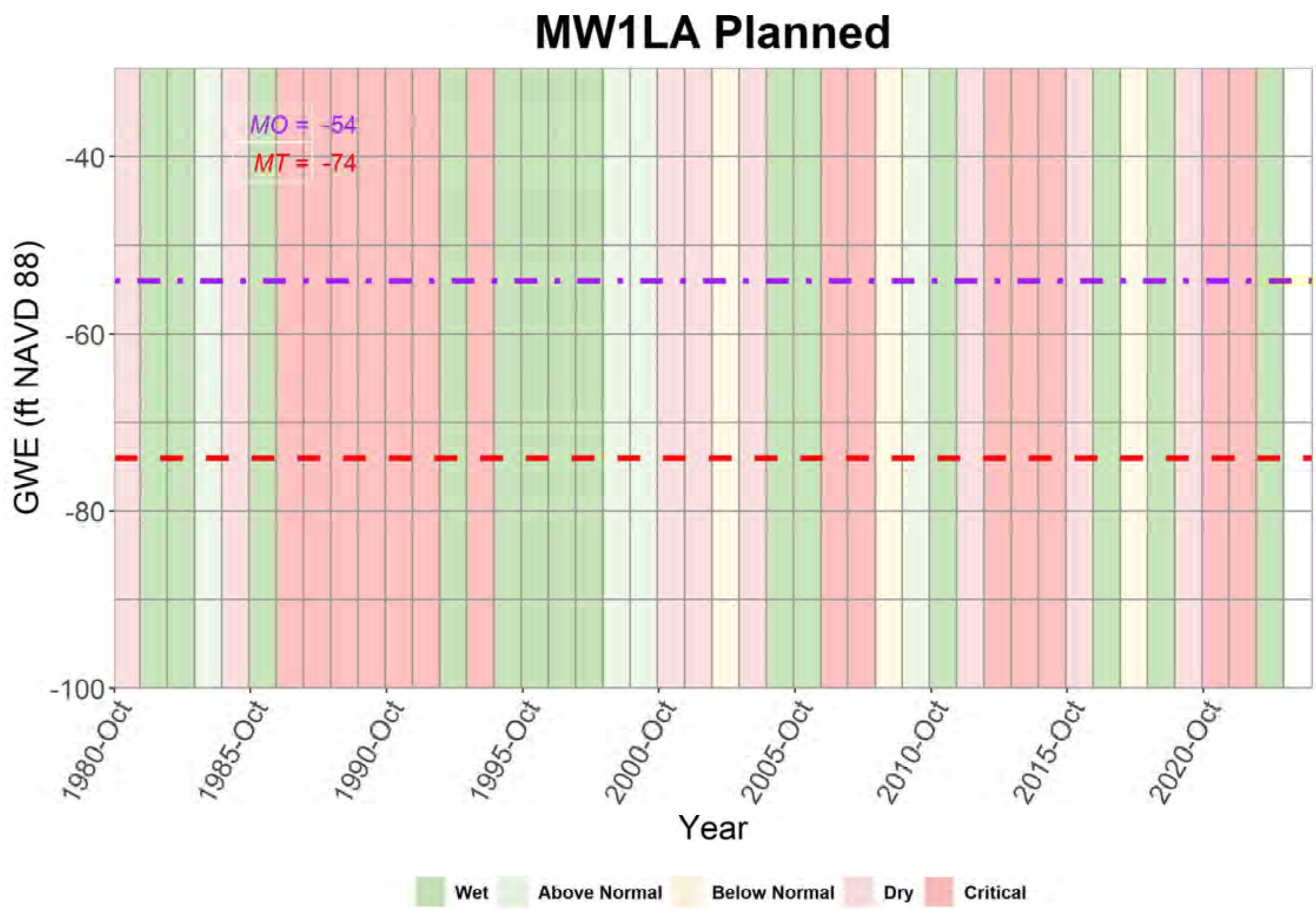


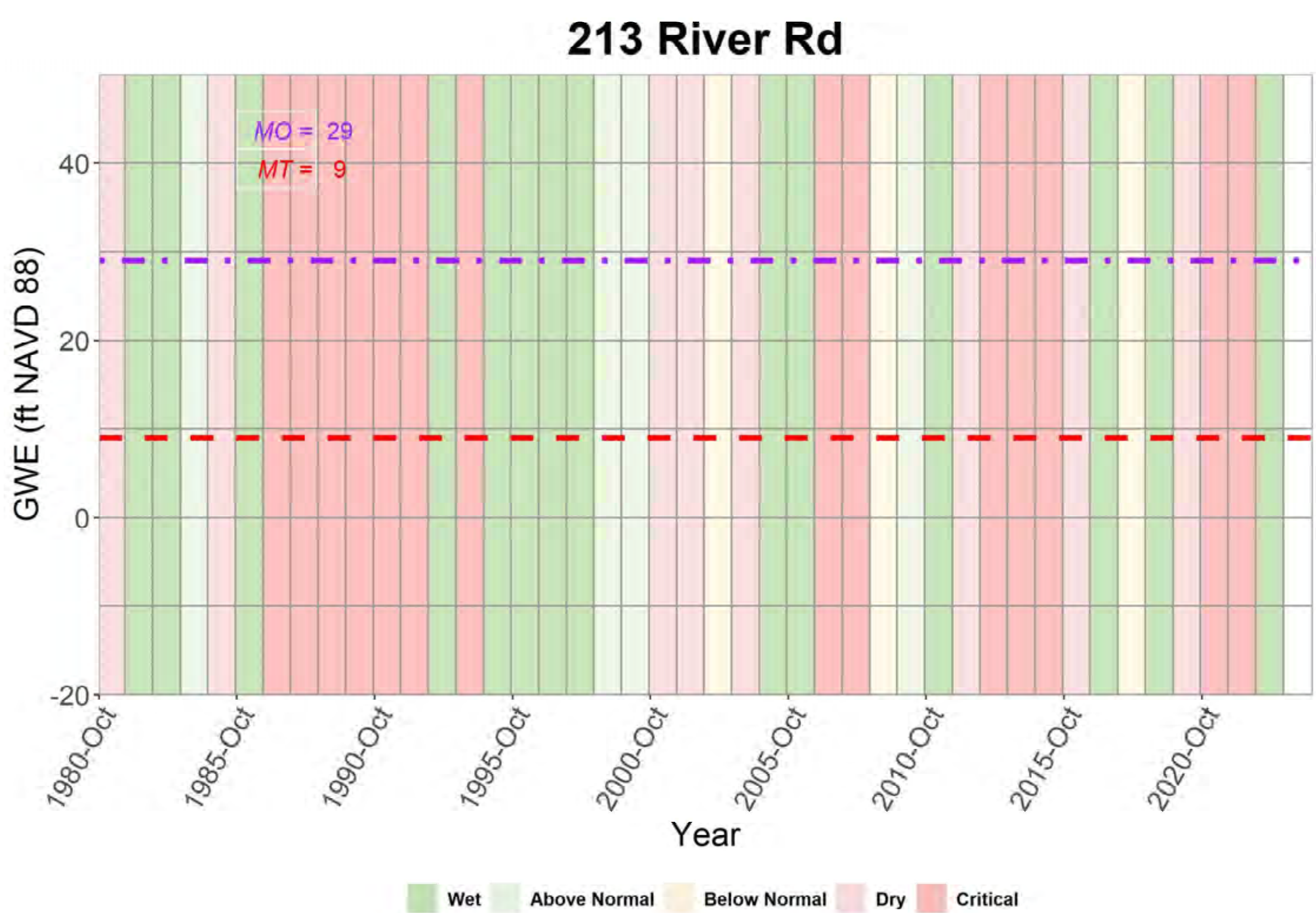

TIWD #17
MO = 13
MT = -7
GWE (ft NAVD 88)
60
40
20
0
-20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


CLB Well #8
MO = 90
MT = 70
GWE (ft NAVD 88)
120
100
80
60
40
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

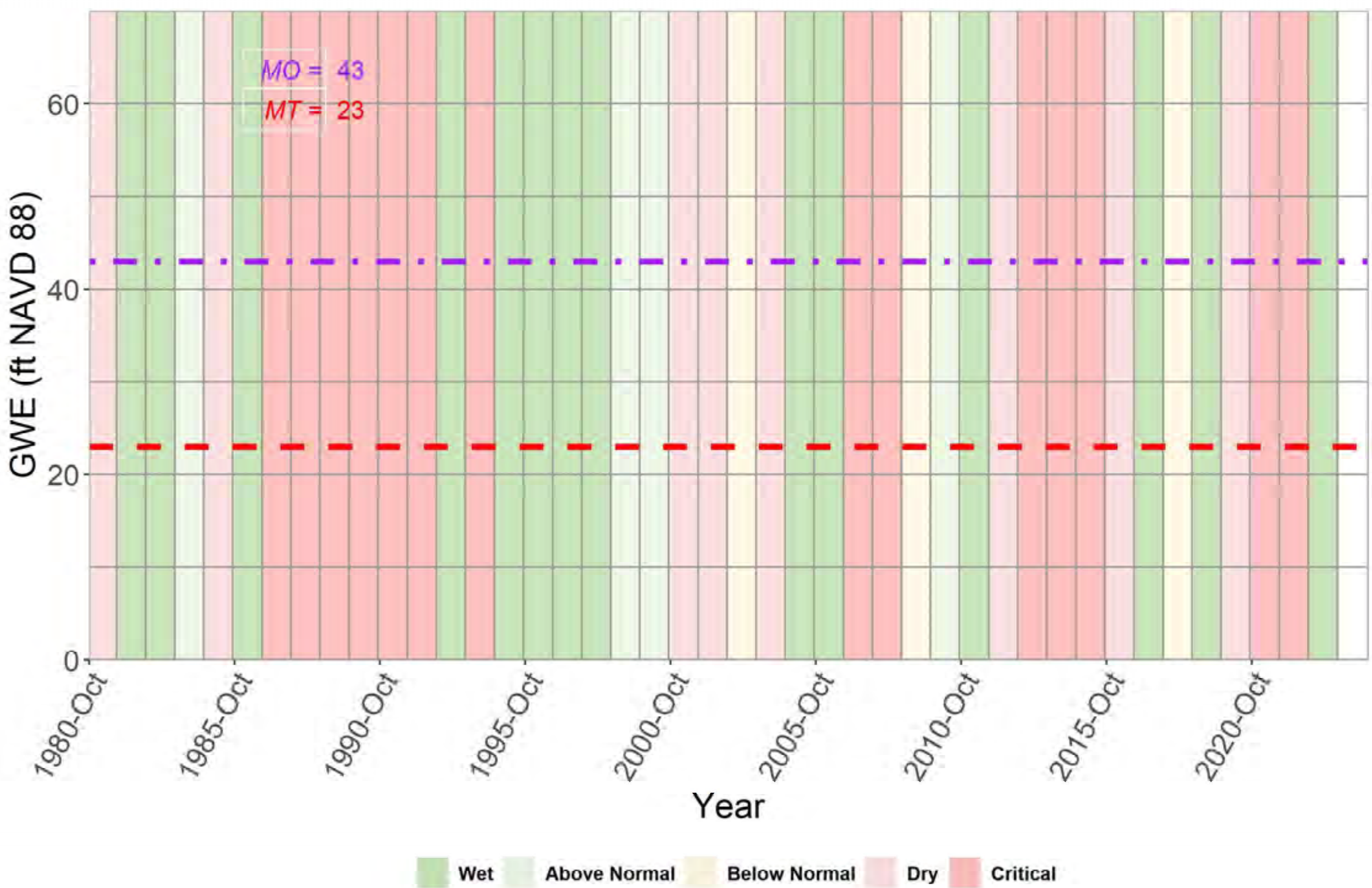

CLB Well #10
MO = 59
MT = 39
100
75
50
25
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


CLB Well #12
MO = 86
MT = 66
140
120
100
80
60
40
GWE (ft NAVD 88)
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


MW1LA Planned
MO = -54
MT = -74
GWE (ft NAVD 88)
-40
-60
-80
-100
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

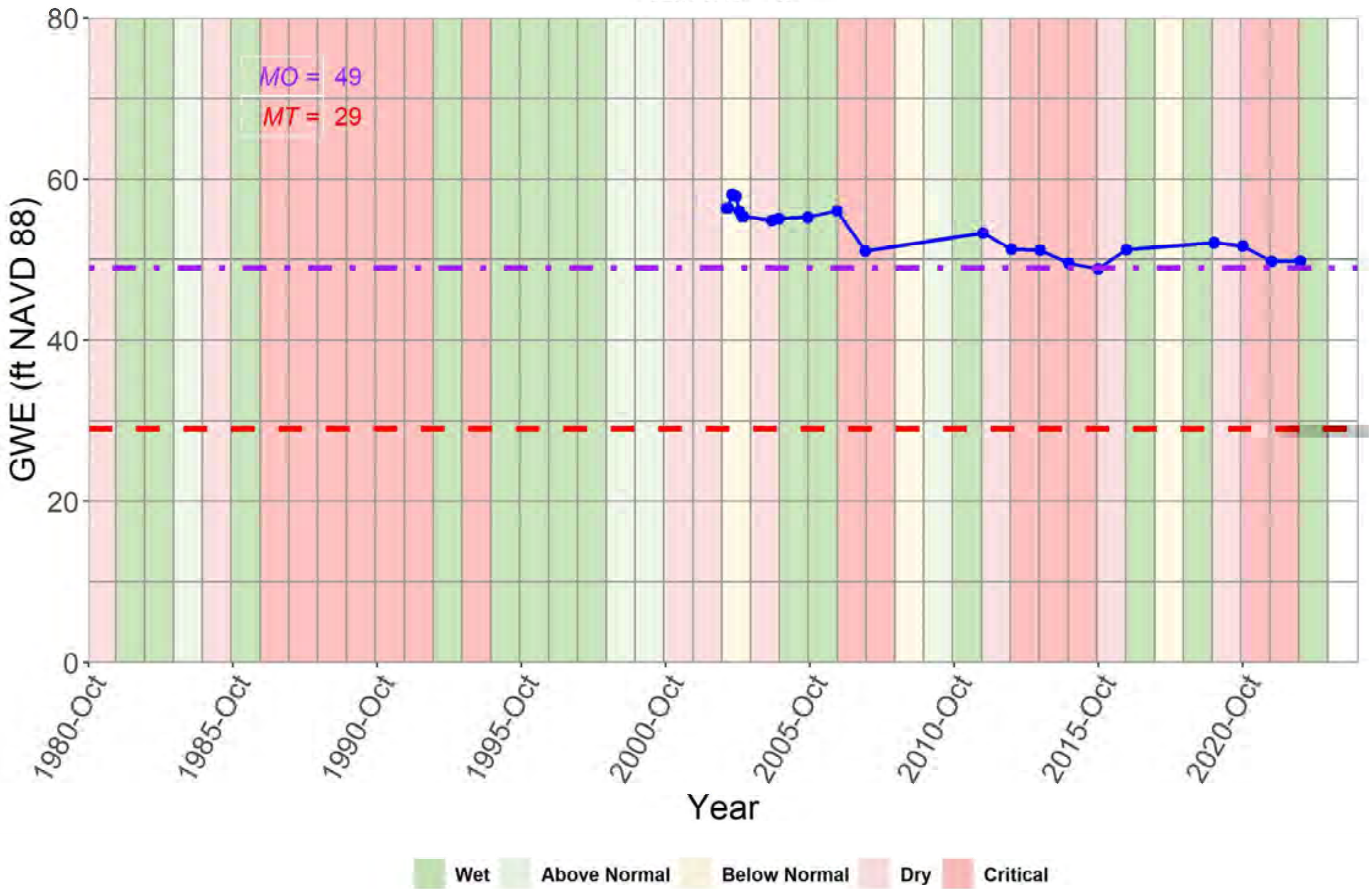

213 River Rd
MO = 29
MT = 9
GWE (ft NAVD 88)
40
20
0
-20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

05-124

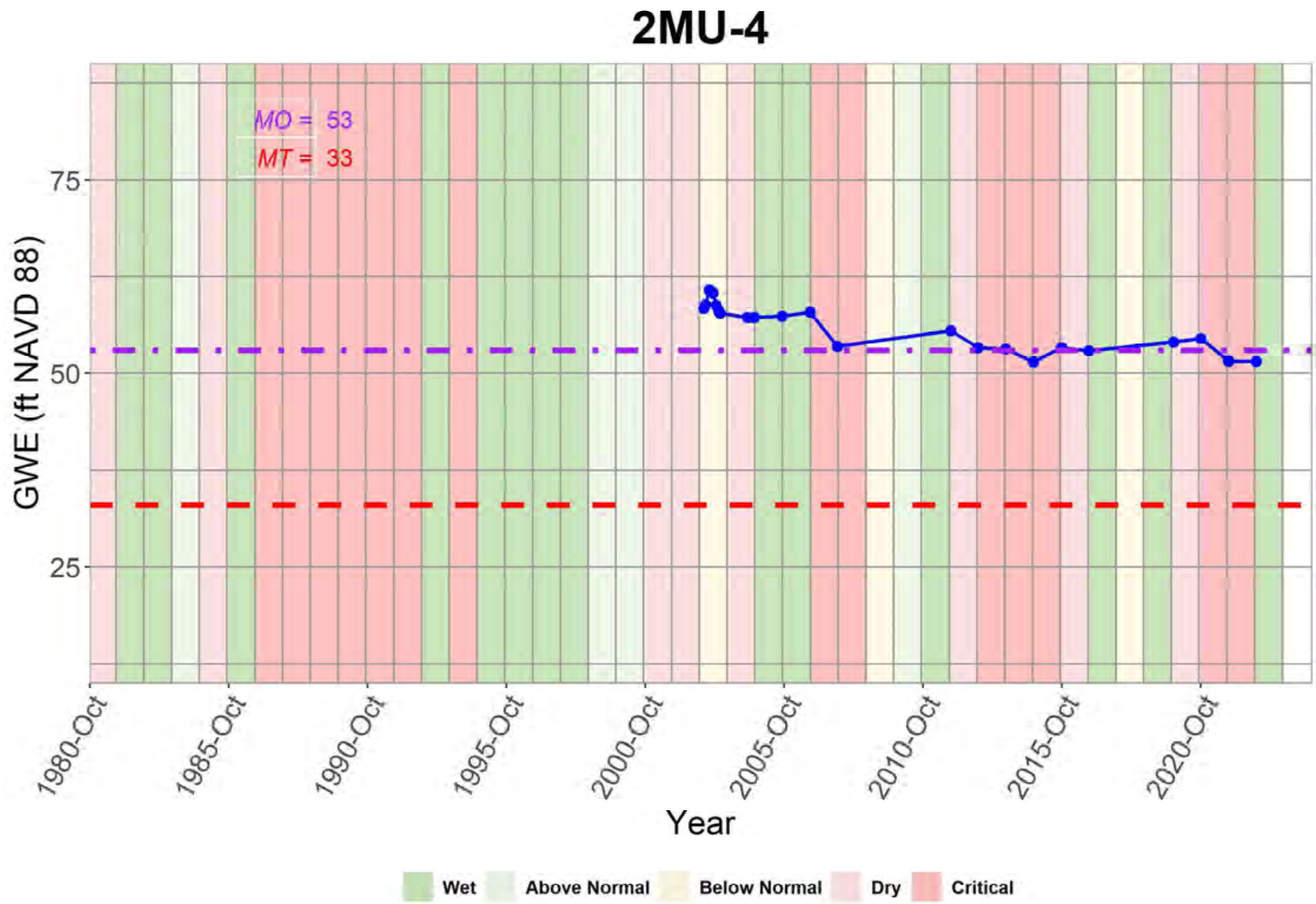


MO = 43
MT = 23
GWE (ft NAVD 88)
60
40
20
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

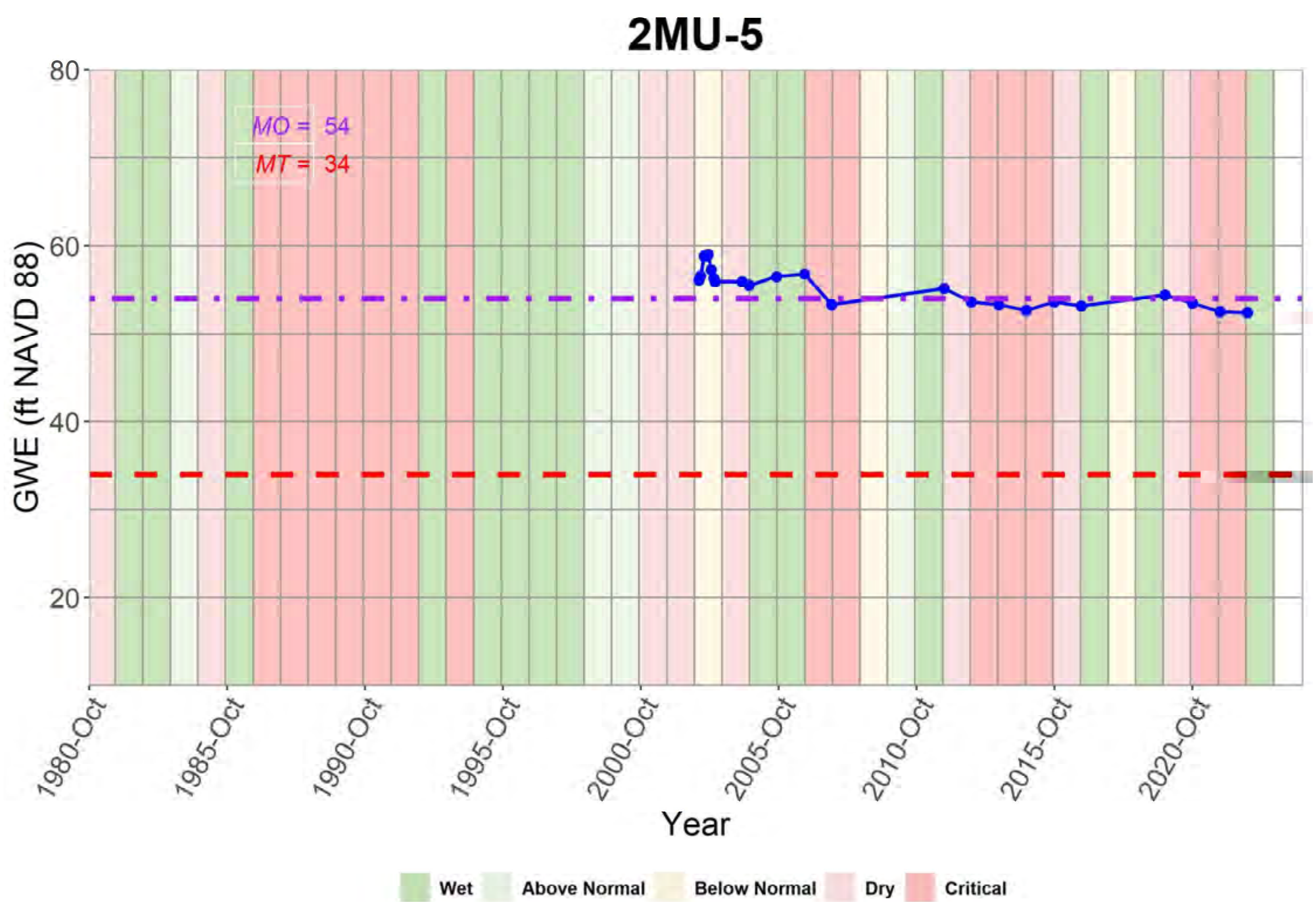
2MU-1



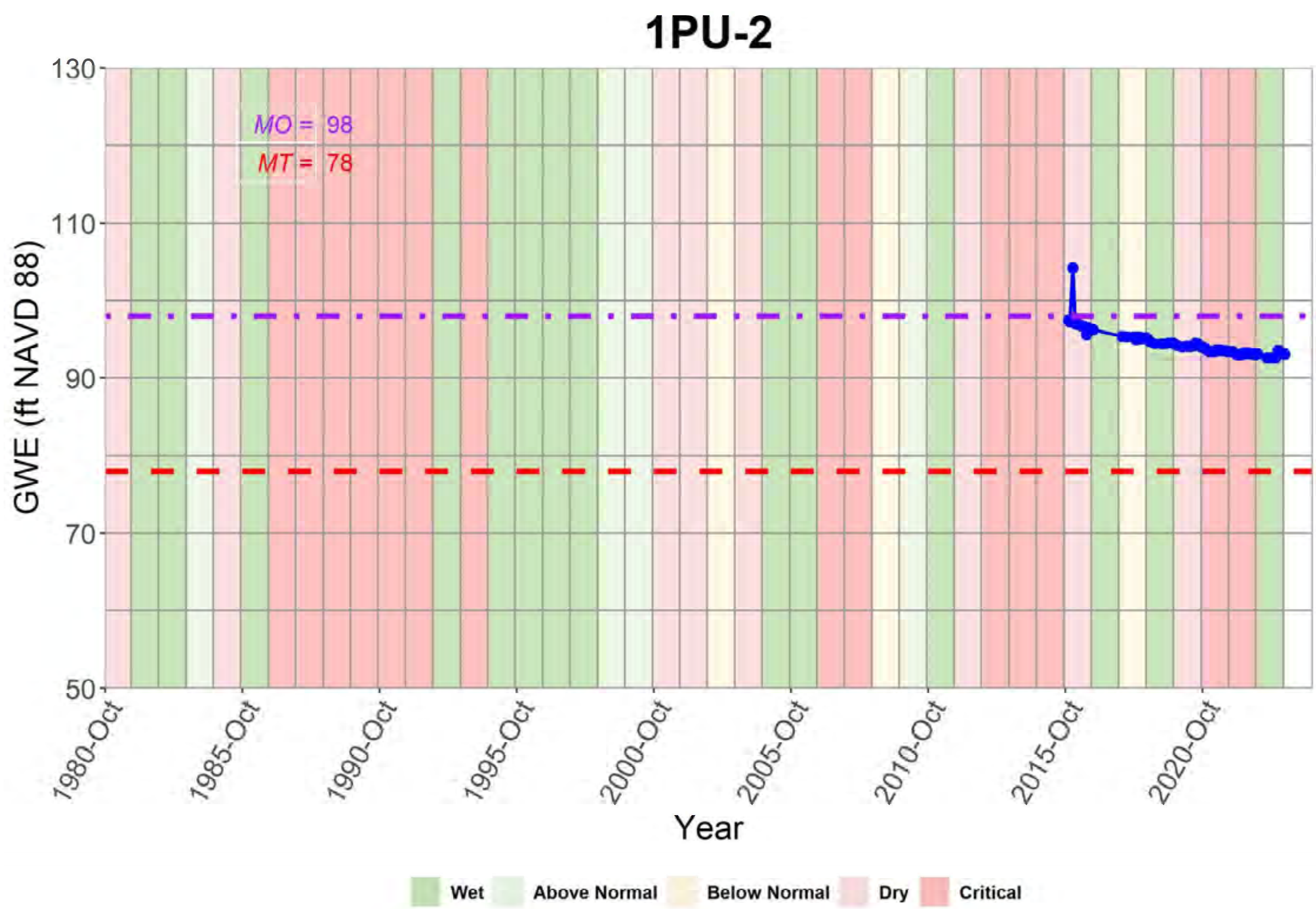
MO = 49
MT = 29
GWE (ft NAVD 88)
80
60
40
20
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

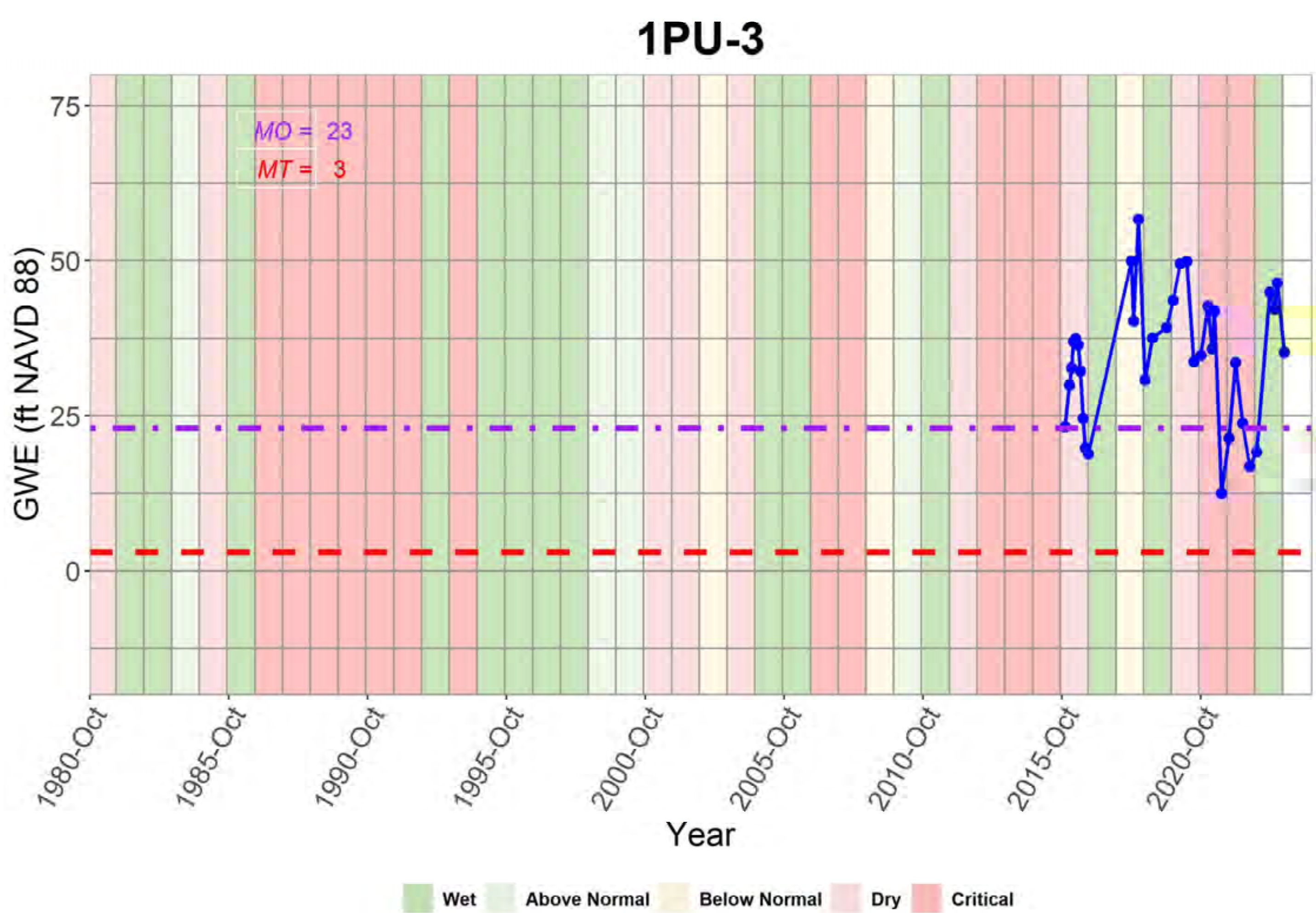


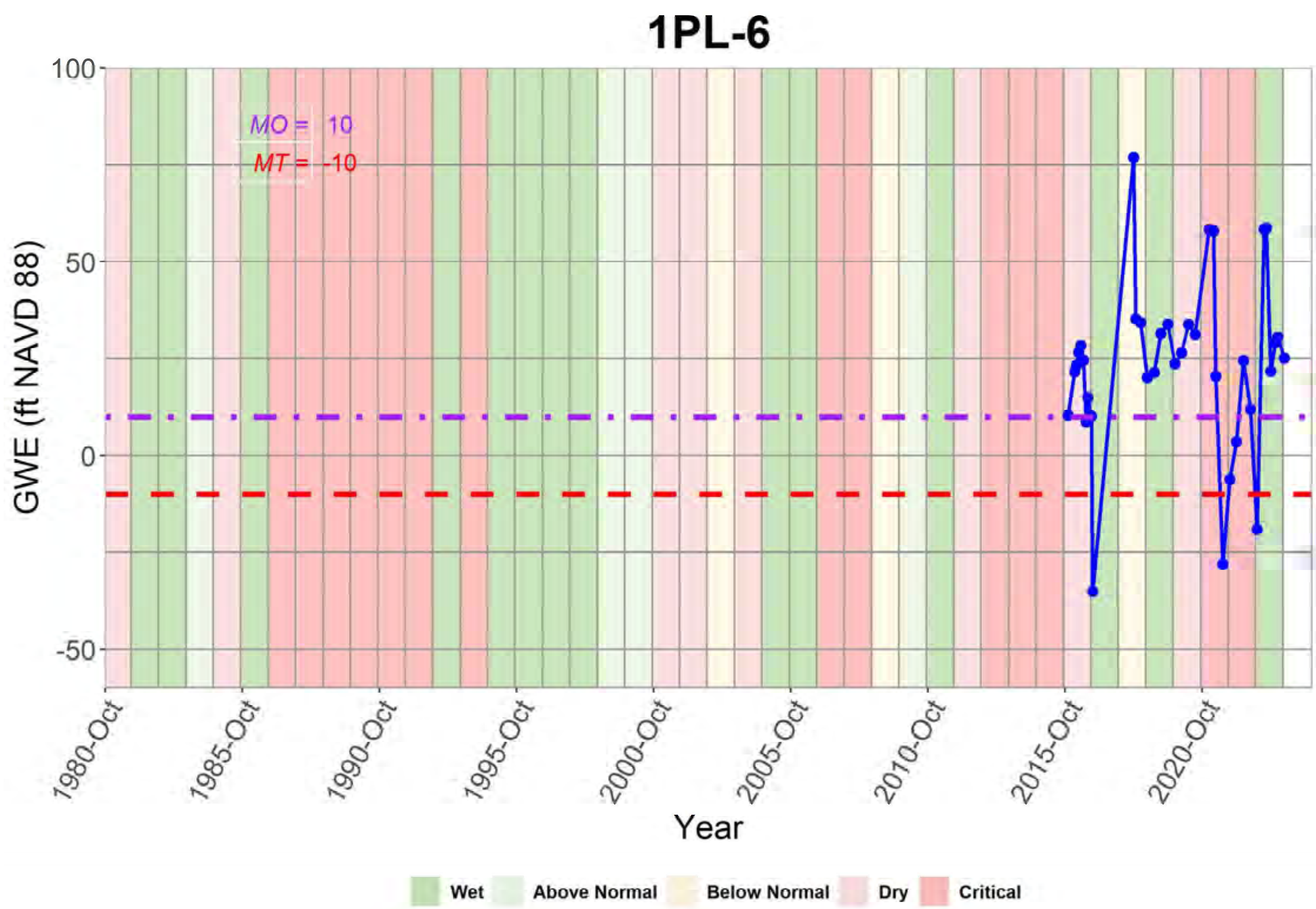
2MU-4
MO = 53
MT = 33
GWE (ft NAVD 88)
75
50
25
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

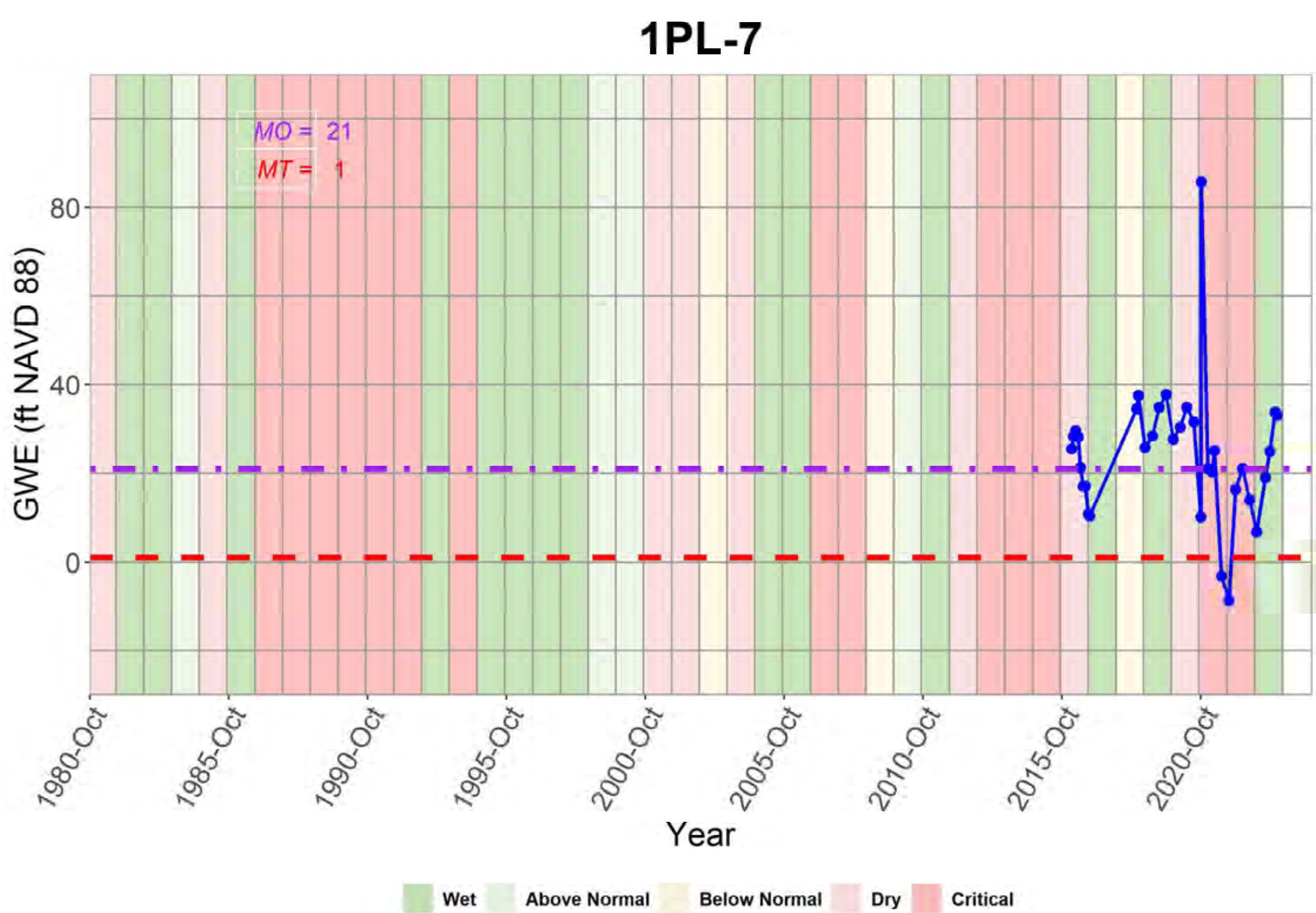


2MU-5
MO = 54
MT = 34
GWE (ft NAVD 88)
80
60
40
20
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


1PU-2
MO = 98
MT = 78
GWE (ft NAVD 88)
130
110
90
70
50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


1PU-3
MO = 23
MT = 3
GWE (ft NAVD 88)
75
50
25
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


1PL-6
MO = 10
MT = -10
GWE (ft NAVD 88)
100
50
0
-50
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical


1PL-7
MO = 21
MT = 1
GWE (ft NAVD 88)
80
40
0
1980-Oct
1985-Oct
1990-Oct
1995-Oct
2000-Oct
2005-Oct
2010-Oct
2015-Oct
2020-Oct
Year
Wet
Above Normal
Below Normal
Dry
Critical

Appendix K-2

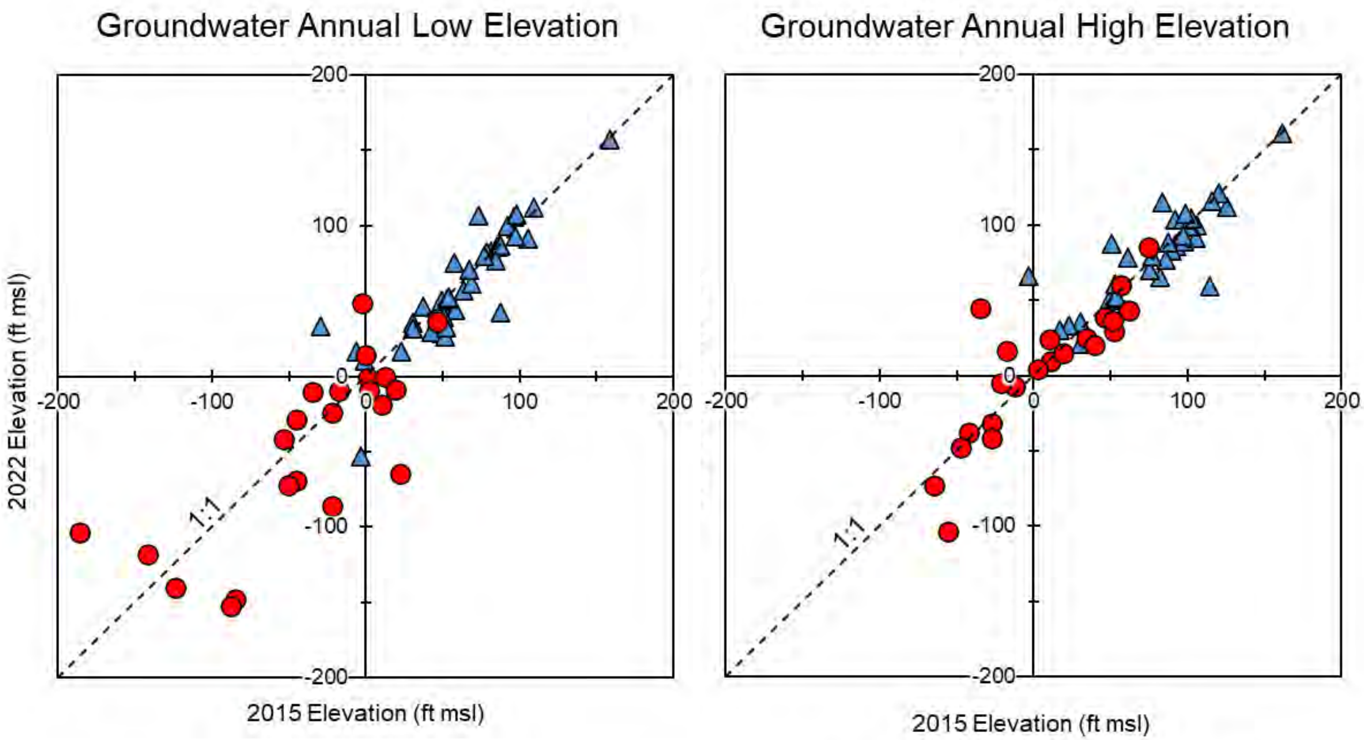
Other Water Level Analyses

Change in Groundwater Elevation from 2012 to 2016

Aquifer	RMW-WL	2012 Average Elevation (ft msl)	2016 Average Elevation (ft msl)	Difference (ft)	2012 Maximum Elevation (ft msl)	2016 Minimum Elevation (ft msl)	Difference (ft)
Lower	01-001	39.55	-36.78	-76.33	58.60	-36.78	-95.38
	01-002	14.75	-13.24	-27.99	23.42	-18.91	-42.33
	06-001	28.29	25.32	-2.97	49.75	-7.26	-57.01
	07-002	37.57	9.14	-28.43	39.84	5.65	-34.19
	07-005	-43.77	-40.05	3.72	-22.58	-49.33	-26.75
	01-003	63.80	56.82	-6.98	73.11	50.64	-22.47
	07-007	18.96	-27.68	-46.65	29.19	-41.67	-70.86
	07-028	-24.03	-59.00	-34.97	-10.23	-59.00	-48.77
	01-007	34.53	26.30	-8.23	52.10	26.30	-25.80
	11-021	47.50	58.25	10.75	47.50	49.60	2.10
	13-004	24.45	-42.99	-67.44	39.61	-59.02	-98.63
	Median	**28.3**	**-13.2**	**-28.0**	**39.8**	**-18.9**	**-42.3**
Upper	14-001	56.81	43.33	-13.48	64.70	40.76	-23.94
	14-002	126.93	113.89	-13.03	135.30	105.59	-29.71
	14-003	93.88	90.19	-3.69	95.20	84.03	-11.17
	14-004	104.36	92.24	-12.12	113.10	88.59	-24.51
	14-005	111.22	100.58	-10.64	113.20	94.01	-19.19
	14-006	99.52	86.00	-13.52	104.70	76.72	-27.98
	14-007	110.88	94.21	-16.67	115.80	90.50	-25.30
	14-008	87.45	97.49	10.04	87.45	88.45	1.00
	03-001	33.82	36.22	2.40	35.22	33.72	-1.50
	06-002	75.61	67.93	-7.68	78.86	61.46	-17.40
	07-003	85.75	83.10	-2.65	105.63	72.58	-33.05
	07-009	75.40	61.83	-13.57	87.23	50.53	-36.70
	07-010	95.13	86.08	-9.05	108.36	72.45	-35.91
	MC18-2	40.45	0.94	-39.51	83.01	-13.54	-96.55
	2MU-1	51.30	51.28	-0.02	51.30	51.28	-0.02
	2MU-4	53.33	52.90	-0.43	53.33	52.90	-0.43
	2MU-5	53.60	53.14	-0.46	53.60	53.14	-0.46
	01-004	165.04	159.70	-5.34	165.80	158.79	-7.01
	01-005	119.69	86.99	-32.70	119.69	86.99	-32.70
	08-002	80.15	68.65	-11.50	88.65	65.65	-23.00
	09-001	95.54	59.09	-36.45	95.54	58.34	-37.20
	09-002	60.76	-5.09	-65.85	60.76	-6.14	-66.90
	09-004	81.42	68.77	-12.65	81.42	61.42	-20.00
	12-001	112.62	100.48	-12.15	116.70	98.72	-17.98
	13-001	128.92	113.15	-15.78	134.56	109.38	-25.18
	13-003	86.56	84.90	-1.67	122.77	48.63	-74.14
	Median	**87.01**	**84.00**	**-11.81**	**95.37**	**69.05**	**-24.23**
Basin-wide	**Median**	**75.40**	**59.09**	**-12.12**	**81.42**	**52.90**	**-25.80**

Abbreviations
ft = Feet
msl = Mean Sea Level
RMW-WL = Representative Monitoring Well for Chronic Lowering of Groundwater Levels

Notes
Only RMW-WLs with water level data collected in calendar years 2012 and 2016 included in table.



Legend

- Upper Aquifer
- Lower Aquifer

Abbreviations

CASGEM = California Statewide Groundwater Elevation Monitoring

ft msl = Feet Above Mean Sea Level

Notes

1. If accommodation or alternative format is needed for this figure, please contact the Plan Manager for assistance.

Sources

1. Groundwater elevations provided by GSAs with data for additional wells with the Basin obtained from CASGEM.

Similar Groundwater Seasonal High and Low Elevations Measured in Basin Wells in 2022 and 2015

Delta-Mendota Subbasin
July 2024
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Appendix L

Well Impacts Analysis

Appendix L: Well Impact Analysis

Introduction

A well impact analysis was conducted to estimate the number of production wells within the Delta-Mendota Subbasin (Basin) that would be impacted under Minimum Thresholds (MTs) for the Chronic Lowering of Groundwater Levels. As the Subbasin's Well Mitigation Program is focused on the mitigation of impacts to drinking water wells, the results presented in Section 13.1.2.4 of the Groundwater Sustainability Plan (GSP) specifically reflect impacts to drinking water wells within the Basin. The results of the well impacts analysis for all production well types in the Basin are included herein.

As discussed in Section 5.1.5 of the GSP, the California Department of Water Resources' (DWR's) Online System of Well Completion Reports (OSWCR) database was used to estimate the total number of water supply wells in the Basin. However, the OSWCR dataset has certain limitations. In particular, records for many wells lack construction information (i.e., total depth and/or screen depth), and it is therefore not possible to assess whether those wells would be impacted at MTs for purposes of this well impact analysis. Further, many of these wells may have already been impacted prior to 2015, which would be considered a "pre-Sustainable Groundwater Management Act (SGMA)" Undesirable Result and thus outside of the purview of this GSP to remedy. Prior to conducting the analysis, wells were screened following the screening process described in Section 13.1.2.4 of the GSP. A summary of the wells by well type before and after screening is included in **Table L-1**.

Table L-1. Count of Wells by Well Use

Well Use	Domestic	Public Supply	Agricultural	Industrial	Unknown	Total
Count (OSWCR)	2,177	68	1,238	54	1,449	4,986
Count for Well Impacts Analysis	2,033	65	1,149	50	222	3,519

Construction records for these wells were compared to spatially interpolated MT values (as a depth below ground surface) across the Basin. A well was considered "impacted" if the interpolated MT depth to groundwater was below 80% of the total well depth. It is recognized that a wide range of well impacts may occur based on the various potential combinations of Representative Monitoring Wells for Chronic Lowering of Groundwater Levels (RMW-WLs) that could exceed MTs. As such, the well impact analysis considered the following four scenarios, three of which consider the criteria for Undesirable Results (i.e., 25% of RMW-WLs reaching MTs):

- Scenario #1 - Worst Case
- Scenario #2 - High-End Bracketed Results
- Scenario #3 - Low-End Bracketed Results
- Scenario #4 - Stochastic Prediction

The methodology and results from each of the five scenarios are detailed below.

Table L-2. Well Impact Analysis Results - Summary

Scenario	Impacted Drinking Water Well Count[1]	Total Impacted Well Count	Estimated Depletion of Supply (AFY)[2]	Percentage of Total WY 2022 Basin Groundwater Use[3]
#1: Worst Case	98	159	15,376	1.1%
#2: High-End Bracketed	87	138	12,906	0.9%
#3: Low-End Bracketed	0	0	0	0.0%
#4: Stochastic Prediction	25	40	3,790	0.2%

Notes:

1. "Drinking water wells" include domestic and public supply wells.
2. Average pumping for drinking water wells is conservatively estimated to be 10 AFY. This estimate is derived from WY 2022 pumping rates for domestic and public supply wells. Average pumping for all other production well types is 236 AFY.
3. The Basin's total reported water use in WY 2022 was 1,388,300 AF.

1.1 Scenario #1 – Worst Case

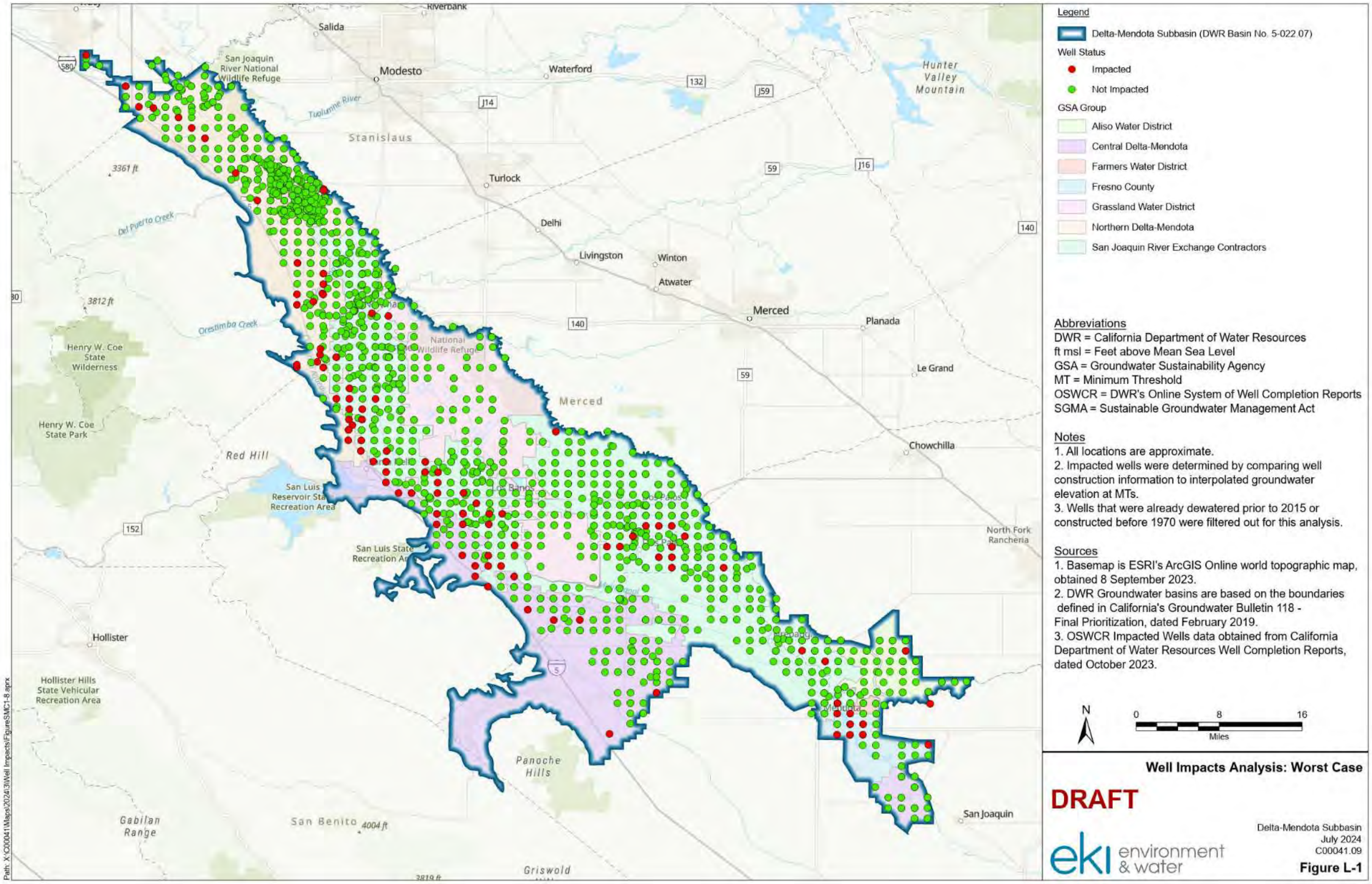
The worst-case well impacts scenario is defined as the number of wells that would be impacted if all 110 RMW-WLs reach their MTs. To evaluate this scenario, depths of wells within the Basin were compared to the spatially interpolated MT groundwater depth at each well location. It is important to note that while the results discussed in the GSP only include drinking water wells, the full analysis for Scenario #1 includes all of the well types listed in **Table L-1** above. The results are provided below for each well type in **Table L-3** and in **Figure L-1.**

Table L-3. Well Impact Analysis Results – Scenario #1

Well Type	Impacted Well Count	Estimated Depletion of Drinking Water Supply (AFY)[1]	Percentage of Total WY 2022 Basin Groundwater Use[2]
Domestic	98	980	<0.1%
Public Supply	0	0	0.0%
Agricultural	47	11,092	0.8%
Industrial	5	1,180	<0.1%
Unknown Use	9	2,124	0.2%
Total	**159**	**15,376**	**1.1%**

Notes:

1. Average pumping for drinking water wells is conservatively estimated to be 10 AFY. This estimate is derived from WY 2022 pumping rates for domestic and public supply wells. Average pumping for all other production well types is 236 AFY.
2. The Basin's total reported water use in WY 2022 was 1,388,300 AF.


Legend
Delta-Mendota Subbasin (DWR Basin No. 5-022.07)
Well Status
Impacted
Not Impacted
GSA Group
Aliso Water District
Central Delta-Mendota
Farmers Water District
Fresno County
Grassland Water District
Northern Delta-Mendota
San Joaquin River Exchange Contractors
Abbreviations
DWR = California Department of Water Resources
ft msl = Feet above Mean Sea Level
GSA = Groundwater Sustainability Agency
MT = Minimum Threshold
OSWCR = DWR's Online System of Well Completion Reports
SGMA = Sustainable Groundwater Management Act
Notes
1. All locations are approximate.
2. Impacted wells were determined by comparing well construction information to interpolated groundwater elevation at MTs.
3. Wells that were already dewatered prior to 2015 or constructed before 1970 were filtered out for this analysis.
Sources
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 8 September 2023.
2. DWR Groundwater basins are based on the boundaries defined in California's Groundwater Bulletin 118 - Final Prioritization, dated February 2019.
3. OSWCR Impacted Wells data obtained from California Department of Water Resources Well Completion Reports, dated October 2023.
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Well Impacts Analysis: Worst Case
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Delta-Mendota Subbasin
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Figure L-1
Modesto
Salida
Waterford
Stanislaus
Turlock
Delhi
Livingston
Winton
Atwater
Merced
Planada
Le Grand
Chowchilla
Hollister
San Benito
Panoche Hills
Red Hill
Henry W. Coe State Wilderness
Henry W. Coe State Park
San Luis Reservoir State Recreation Area
Hollister Hills State Vehicular Recreation Area
Gabilan Range
Hunter Valley Mountain
North Fork Rancheria
San Joaquin
San Joaquin River National Wildlife Refuge
Del Puerto Creek
Orestimba Creek
Tuolumne River
Griswold

1.2 Scenario #2 - High-End Bracketed Results

Scenario #2 evaluates the upper range of potential well impacts that would occur under the 25% threshold for Undesirable Results. For this analysis, each impacted well from Scenario #1 was assigned to the nearest RMW-WL. The 25% of RMW-WLs with the highest number of nearby impacted wells were identified, and the total impacted wells assigned to these RMW-WLs were counted. The Basin has a total of 110 RMW-WLs, 50 in the Lower Aquifer and 60 in the Upper Aquifer. Therefore, 13 RMW-WLs representing 25% of RMW-WLs in the Lower Aquifer and 15 RMW-WLs representing 25% of RMW-WLs in the Upper Aquifer with the highest densities of production wells around them were selected.

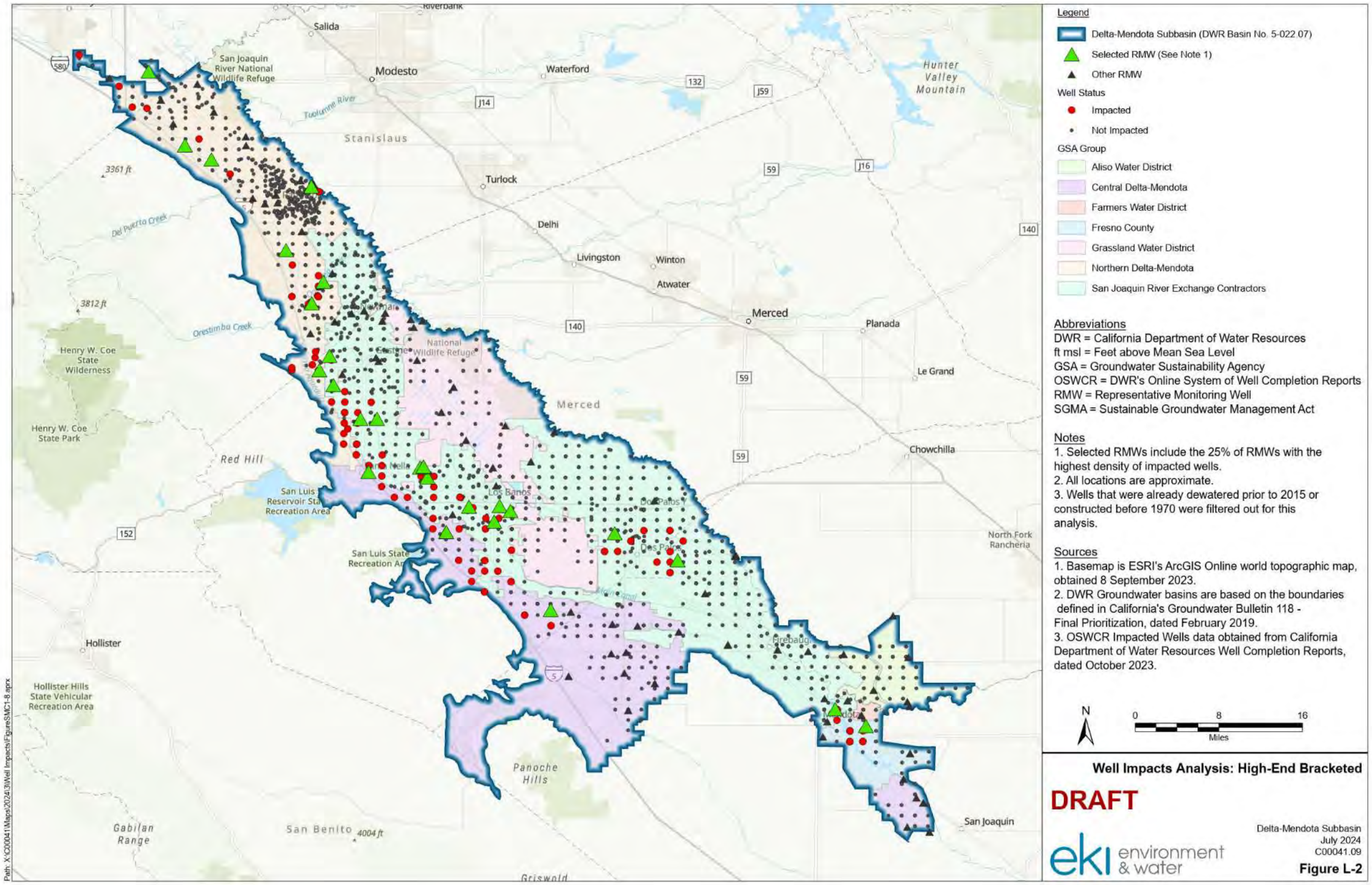
It is important to note that while the results discussed in the GSP only include drinking water wells, the full analysis for Scenario #2 includes all of the well types listed in **Table L-1** above. The results are provided below for each well type in **Table L-4** and in **Figure L-2.**

Table L-4. Well Impact Analysis Results – Scenario #2

Well Type	Impacted Well Count	Estimated Depletion of Drinking Water Supply (AFY)[1]	Percentage of Total WY 2022 Basin Groundwater Use[2]
Domestic	87	870	<0.1%
Public Supply	0	0	0.0%
Agricultural	39	9,204	0.7%
Industrial	4	944	<0.1%
Unknown Use	8	1,888	0.1%
Total	**138**	**12,906**	**0.9%**

Notes:

1. Average pumping for drinking water wells is conservatively estimated to be 10 AFY. This estimate is derived from WY 2022 pumping rates for domestic and public supply wells. Average pumping for all other production well types is 236 AFY.
2. The Basin's total reported water use in WY 2022 was 1,388,300 AF.


Legend
Delta-Mendota Subbasin (DWR Basin No. 5-022.07)
Selected RMW (See Note 1)
Other RMW
Well Status
Impacted
Not Impacted
GSA Group
Aliso Water District
Central Delta-Mendota
Farmers Water District
Fresno County
Grassland Water District
Northern Delta-Mendota
San Joaquin River Exchange Contractors
Abbreviations
DWR = California Department of Water Resources
ft msl = Feet above Mean Sea Level
GSA = Groundwater Sustainability Agency
OSWCR = DWR's Online System of Well Completion Reports
RMW = Representative Monitoring Well
SGMA = Sustainable Groundwater Management Act
Notes
1. Selected RMWs include the 25% of RMWs with the highest density of impacted wells.
2. All locations are approximate.
3. Wells that were already dewatered prior to 2015 or constructed before 1970 were filtered out for this analysis.
Sources
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 8 September 2023.
2. DWR Groundwater basins are based on the boundaries defined in California's Groundwater Bulletin 118 - Final Prioritization, dated February 2019.
3. OSWCR Impacted Wells data obtained from California Department of Water Resources Well Completion Reports, dated October 2023.
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Miles
Well Impacts Analysis: High-End Bracketed
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Delta-Mendota Subbasin
July 2024
C00041.09
Figure L-2
Modesto
Turlock
Merced
Los Banos
Chowchilla
Hollister

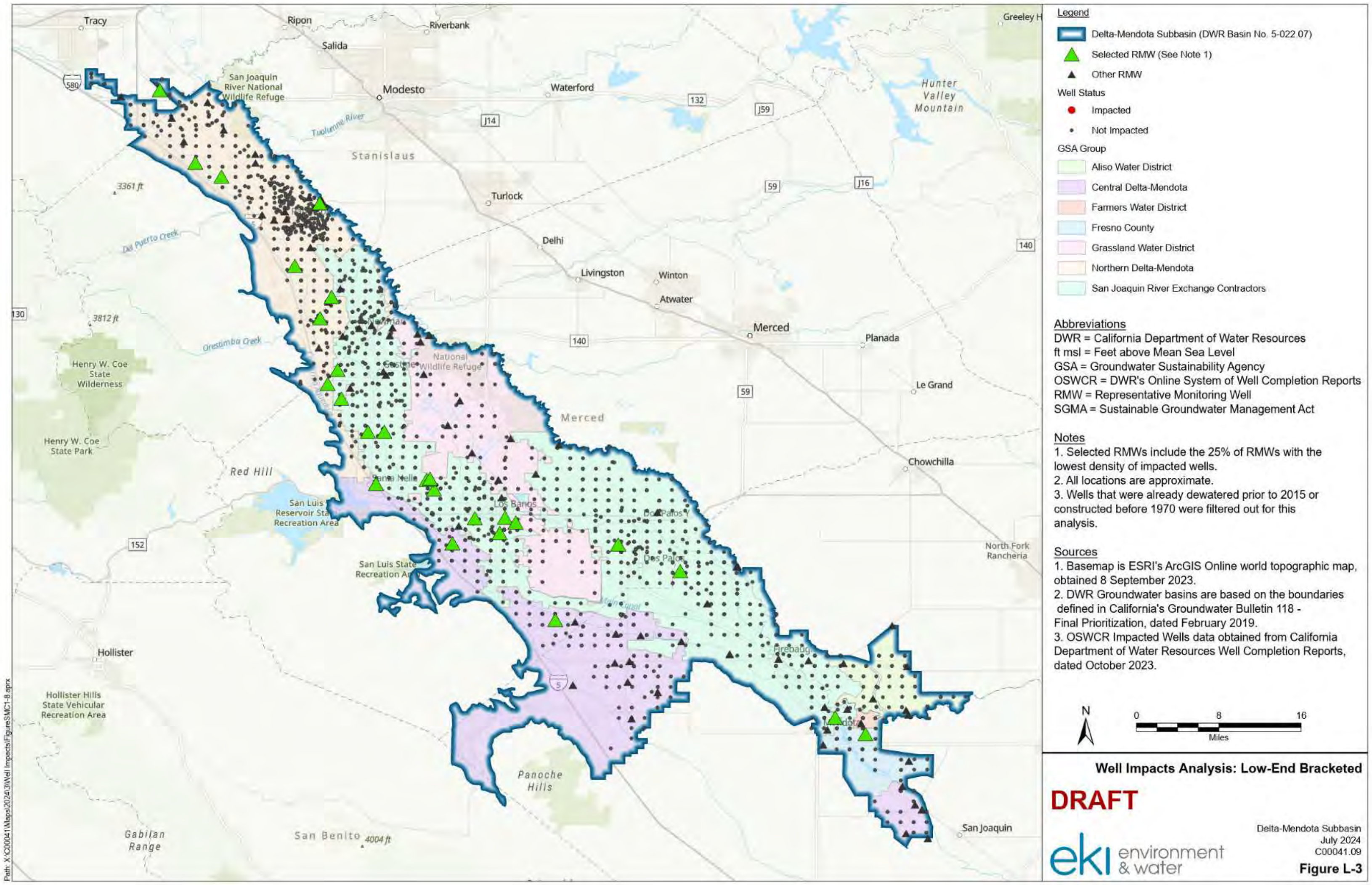
1.3 Scenario #3 - Low-End Bracketed Results

Scenario #3 evaluates the lower range of potential well impacts that would occur under the 25% threshold for Undesirable Results. For this analysis, each impacted well from Scenario #1 was assigned to the nearest RMW-WL. Similar to Scenario #2, 13 RMW-WLs representing 25% of RMW-WLs in the Lower Aquifer and 15 RMW-WLs representing 25% of RMW-WLs in the Upper Aquifer with the lowest densities of production wells around them were selected. In each case, the 25% of RMW-WLs with the lowest density were identified as those with associated well counts equal to 0; as such, no wells were considered impacted.

It is important to note that while the results discussed in the GSP only include drinking water wells, the full analysis for Scenario #3 includes all of the well types listed in **Table L-1** above. The results are provided below for each well type in **Table L-5** and in **Figure L-3.**

Table L-5. Well Impact Analysis Results – Scenario #3

Well Type	Impacted Well Count	Estimated Depletion of Drinking Water Supply (AFY)	Percentage of Total WY 2022 Basin Groundwater Use
Domestic	0	0	0.0%
Public Supply	0	0	0.0%
Agricultural	0	0	0.0%
Industrial	0	0	0.0%
Unknown Use	0	0	0.0%
Total	**0**	**0**	**0.0%**


Legend
Delta-Mendota Subbasin (DWR Basin No. 5-022.07)
Selected RMW (See Note 1)
Other RMW
Well Status
Impacted
Not Impacted
GSA Group
Aliso Water District
Central Delta-Mendota
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Fresno County
Grassland Water District
Northern Delta-Mendota
San Joaquin River Exchange Contractors
Abbreviations
DWR = California Department of Water Resources
ft msl = Feet above Mean Sea Level
GSA = Groundwater Sustainability Agency
OSWCR = DWR's Online System of Well Completion Reports
RMW = Representative Monitoring Well
SGMA = Sustainable Groundwater Management Act
Notes
1. Selected RMWs include the 25% of RMWs with the lowest density of impacted wells.
2. All locations are approximate.
3. Wells that were already dewatered prior to 2015 or constructed before 1970 were filtered out for this analysis.
Sources
1. Basemap is ESRI's ArcGIS Online world topographic map, obtained 8 September 2023.
2. DWR Groundwater basins are based on the boundaries defined in California's Groundwater Bulletin 118 - Final Prioritization, dated February 2019.
3. OSWCR Impacted Wells data obtained from California Department of Water Resources Well Completion Reports, dated October 2023.
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Well Impacts Analysis: Low-End Bracketed
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Delta-Mendota Subbasin
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Figure L-3
Tracy
Ripon
Riverbank
Salida
Modesto
Waterford
Stanislaus
Turlock
Delhi
Livingston
Winton
Atwater
Merced
Planada
Le Grand
Chowchilla
Hunter Valley Mountain
San Joaquin River National Wildlife Refuge
Henry W. Coe State Wilderness
Henry W. Coe State Park
Red Hill
San Luis Reservoir State Recreation Area
San Luis State Recreation Area
Hollister
Hollister Hills State Vehicular Recreation Area
Panoche Hills
Gabilan Range
San Benito
San Joaquin
North Fork Rancheria

1.4 Scenario #4 – Stochastic Prediction

Scenario #4 evaluates the average well impacts that would occur under the 25% threshold for Undesirable Results using stochastic predictive modeling. This analysis considered 5,000 random combinations of the 25% of RMW-WLs that exceed MTs to determine a distribution of well impacts.

It is important to note that while the results discussed in the GSP only include drinking water wells, the full analysis for Scenario #4 includes all five well types listed above. A histogram of the range of well impacts for each well type[1] is shown below in **Figures L-4 through L-7**, and a summary of all well types is shown in **Figure L-8**. The results are provided below for each well type in **Table L-6.**

Table L-6. Well Impact Analysis Results – Scenario #4

Well Type	Median Impacted Well Count	Estimated Depletion of Drinking Water Supply (AFY)[1]	Percentage of Total WY 2022 Basin Groundwater Use[2]
Domestic	25	250	<0.1%
Public Supply	0	0	0.0%
Agricultural	12	2,832	0.2%
Industrial	1	236	<0.1%
Unknown Use	2	472	<0.1%
Total	**40**	**3,790**	**0.3%**

Notes:

1. Average pumping for drinking water wells is conservatively estimated to be 10 AFY. This estimate is derived from WY 2022 pumping rates for domestic and public supply wells. Average pumping for all other production well types is 236 AFY.
2. The Basin's total reported water use in WY 2022 was 1,388,300 AF.

[1] The histogram for public supply wells is not shown because under Scenario #4, no public supply wells are anticipated to be impacted.

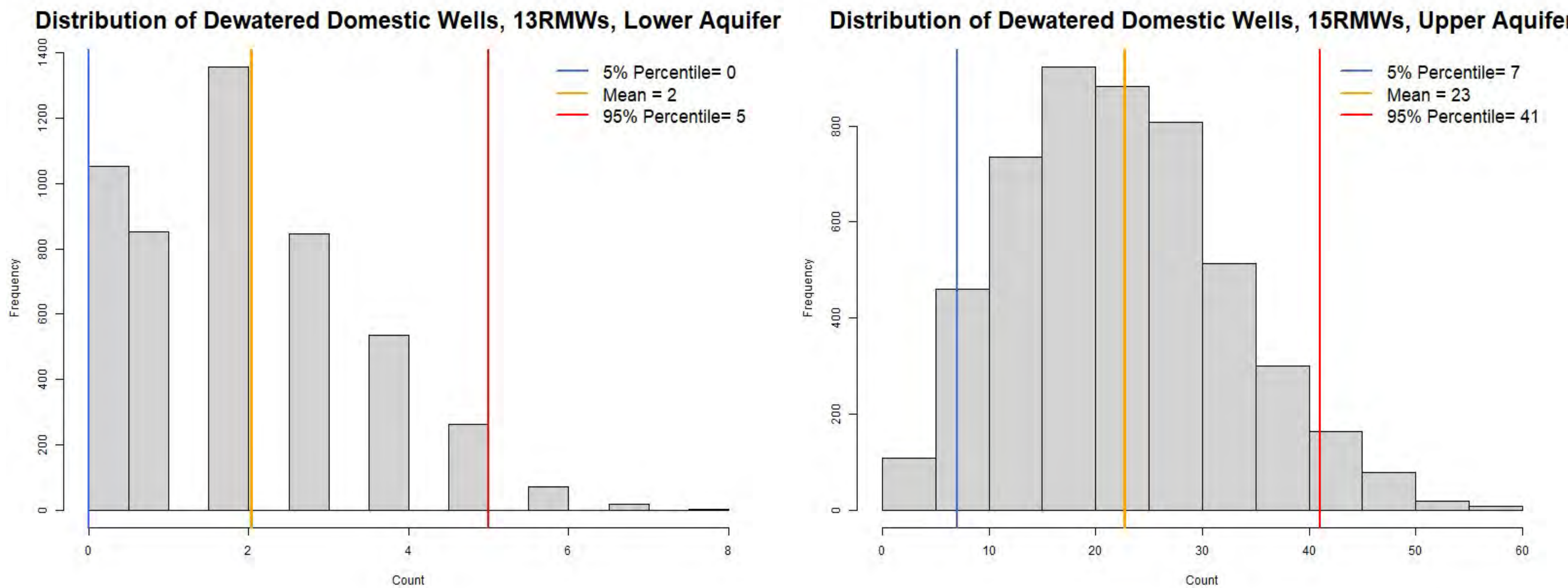


Figure L-4. Scenario #4 - Stochastic Prediction for Domestic Well

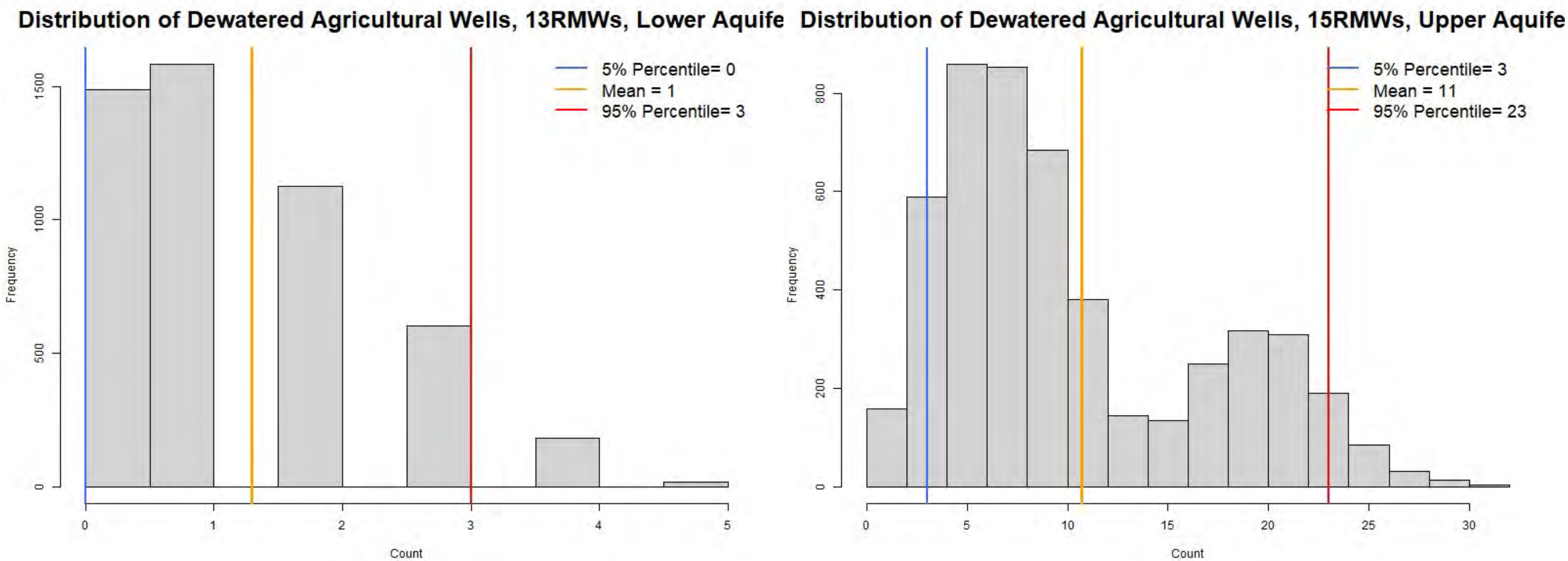


Figure L-5. Scenario #4 - Stochastic Prediction for Agricultural Wells

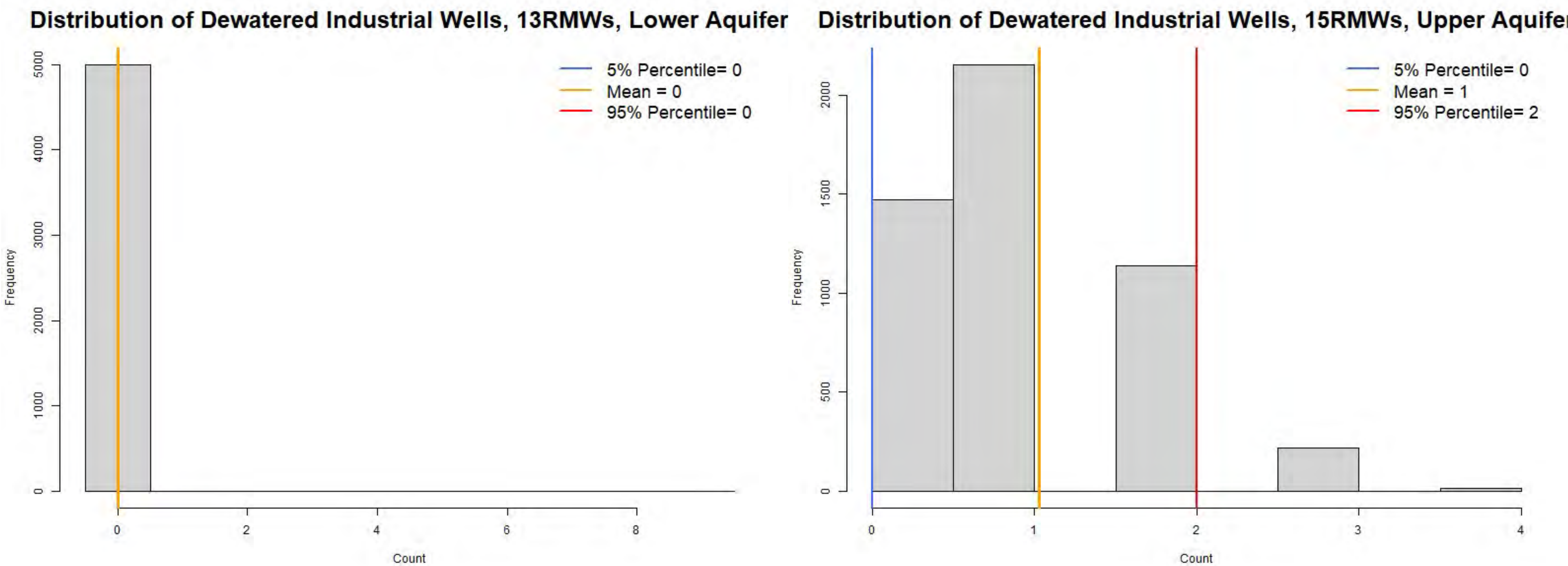
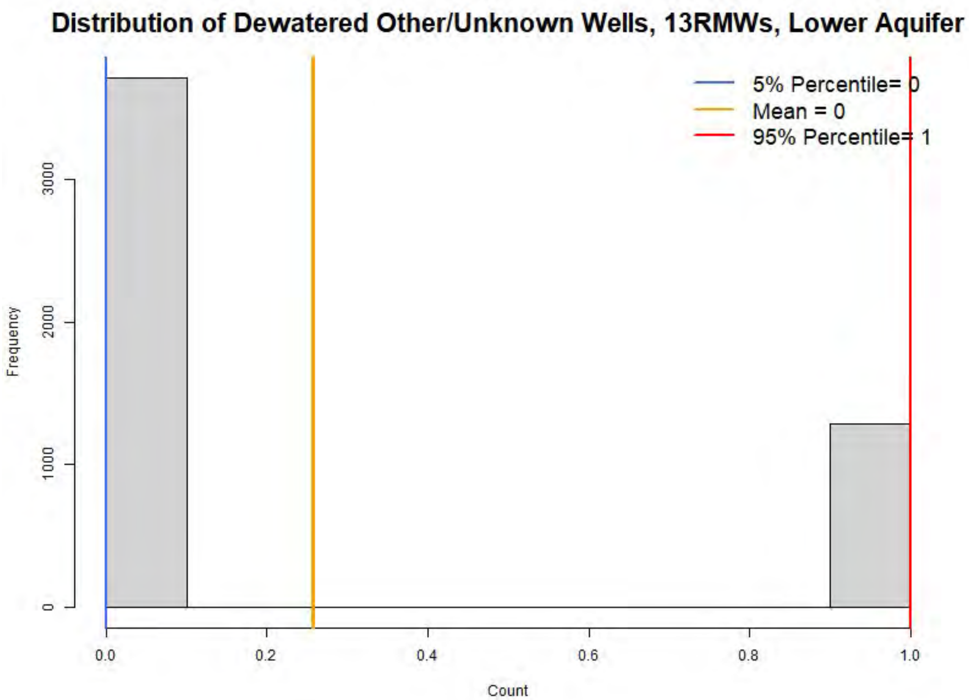


Figure L-6. Scenario #4 - Stochastic Prediction for Industrial Wells



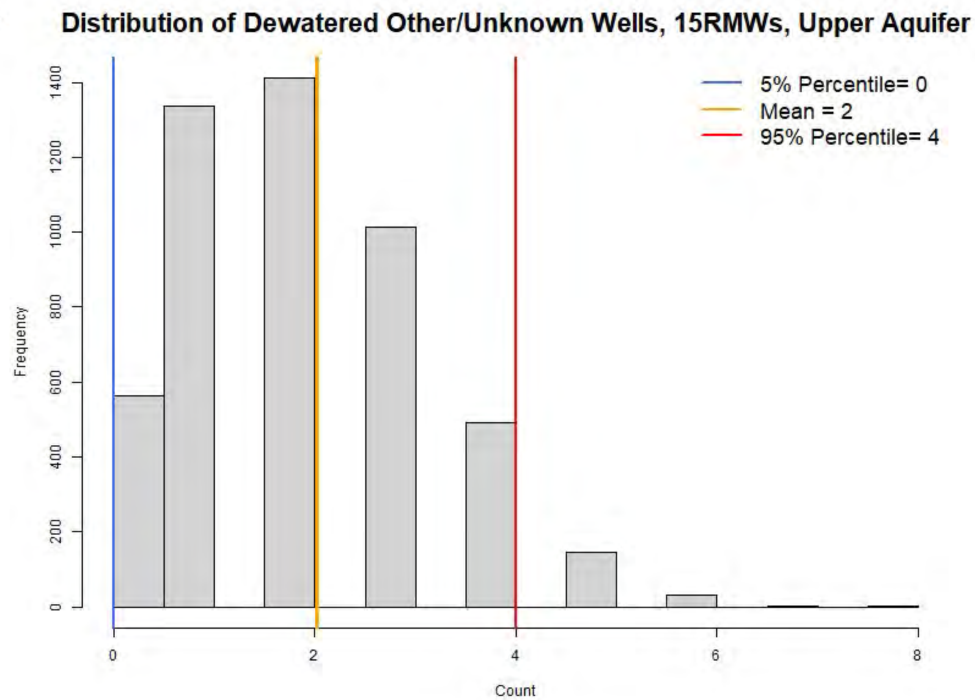


Figure L-7. Scenario #4 - Stochastic Prediction for Wells with Unknown Use

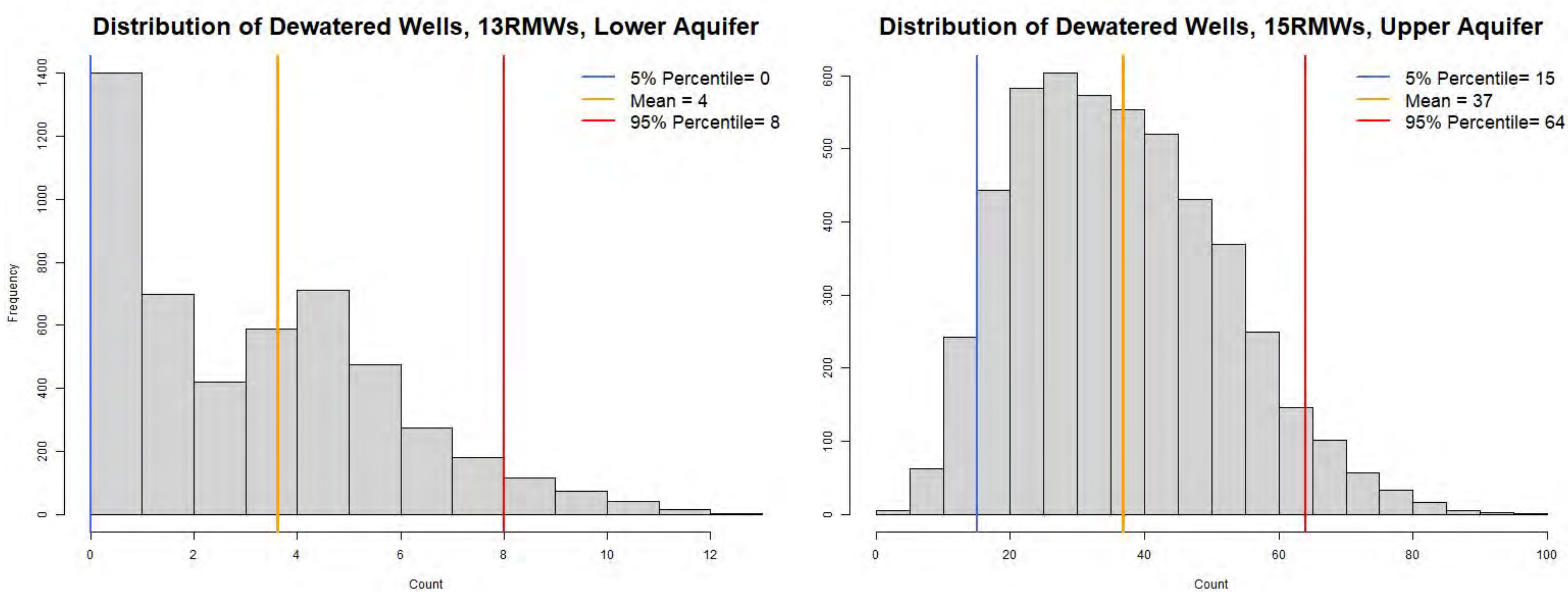


Figure L-8. Scenario #4 - Stochastic Prediction Summary for All Well Types

Appendix M

Well Mitigation Policy

APPENDIX TO BE INCLUDED IN THE FINAL GSP

Appendix M-1

Additional Resources for Domestic and Small Community Well Users

ADDITIONAL RESOURCES FOR DOMESTIC AND SMALL COMMUITY WELL USERS

The following programs may provide information and/or assistance to domestic and/or small community well users impacted by degraded water quality in the Delta-Mendota Subbasin.

1. Cleanup and Abatement Account (CAA) Urgent Drinking Water Needs Program
    - Eligible projects:
        - Provision of interim water supply;
        - Emergency improvements or repairs to existing water systems as necessary to provide adequate supply of domestic water;
        - Certain construction projects
    - Eligible entities: public agencies, tribal government, non-for-profit organization serving a disadvantaged community (DAC), community water system serving a DAC
2. Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) Management Zones
    - The Central Valley Water Board has initiated the Nitrate Control Program in six of the highest priority groundwater basins (Phase I). The Delta-Mendota Subbasin will be a part of the developing Phase II.
    - Program will provide access to safe drinking water for qualifying households that exceed the nitrate drinking water standard. Program offerings may include:
        - Well testing
        - Interim water supply delivery
        - Maintaining water filling stations
3. Self-Help Enterprises (SHE) Safe Drinking Water Program
    - SHE administers several programs in the San Joaquin Valley, including well testing, bottled water provision, implementation of Point-of-use/Point-of-entry (POU/POE) treatment systems for income-qualifying households or small community systems not meeting drinking water standards, and long-term solutions such as well repairs or replacements or connections to existing systems.
4. Safe and Affordable Funding for Equity and Resilience (SAFER) Program
    - The SAFER Program provides assistance with interim drinking water supplies, emergency repairs, technical assistance, administrators, planning, operations and maintenance and construction projects via various funding sources.
    - At risk state small water systems and domestic wells were identified as part of the 2023 Drinking Water Needs Assessment: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/saferdashboard.html