# APPENDIX E: CLIMATE CHANGE MEMO

# APPENDIX E - FINAL CLIMATE CHANGE TECHNICAL MEMORANDUM

**TO:** **SCV Water**

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**RE:** **2025 UWMP - Climate Change Impacts**

## 1. Introduction: Climate Change and Water Resource Planning Context

Climate change is a critical factor influencing long-term water resource planning for the Santa Clarita Valley Water Agency (SCV Water). Changes in temperature, precipitation patterns, and hydrologic variability affect not only water supply reliability for urban uses, but also the availability, timing, and quality of water needed to sustain aquatic ecosystems, groundwater-dependent habitats, river, and Delta environments that underpin California's water management system.

The purpose of this Climate Change Technical Memorandum is to evaluate how plausible future climate conditions may influence SCV Water's water demands, water supplies, and overall system reliability over the 2025 Urban Water Management Plan (UWMP) planning horizon. This evaluation is intended to inform long-term planning and risk management, rather than to predict a single future outcome. Climate change is inherently uncertain, and its impacts are best assessed through scenario-based analysis that examines system sensitivity under a range of conditions.

Consistent with guidance from the California Department of Water Resources (DWR), climate change is evaluated in this UWMP as a distinct planning consideration, separate from population growth, land use change, and planned conservation actions. This approach allows SCV Water to isolate physical climate-driven risks, such as increased temperatures, altered runoff timing, more frequent droughts, and constraints associated with ecosystem protection, without double-counting demand reductions already assumed through conservation programs and regulatory requirements.

Climate change affects water systems through multiple interconnected pathways. Warmer temperatures increase evapotranspiration and outdoor water demands, while shifts in precipitation timing and form reduce snowpack and alter the seasonal availability of surface water. These changes can intensify stress on groundwater basins during dry periods, reduce baseflows that support riparian and aquatic ecosystems, and increase the importance of environmental flow and water quality requirements in system operations. At the statewide scale, climate-driven hydrologic change, combined with ecosystem protection requirements in the Sacramento–San Joaquin Delta, influences the reliability of imported water supplies delivered through the State Water Project.

SCV Water's climate change evaluation recognizes that water supply reliability, ecosystem health, and infrastructure performance are closely linked. During extended dry periods, demands for water, environmental flow requirements, groundwater sustainability thresholds, and conveyance limitations converge, reducing operational flexibility. Understanding these interactions is essential for developing resilient water management strategies that balance human water needs with the protection of ecosystems and long-term resource sustainability.

This memorandum summarizes projected climate change conditions relevant to the Santa Clarita Valley, evaluates potential impacts on water demands and supplies, including imported water, groundwater, and recycled water, and discusses the broader implications for water supply reliability and ecosystem resilience. The findings provide a technical foundation to support SCV Water's 2025 UWMP and related planning efforts, ensuring that future decisions are informed by an integrated understanding of climate impacts, environmental stewardship, and water system reliability.

# 2. Climate Change Requirements in the 2025 UWMP

## 2.1 Purpose of Climate Change Requirements

The Urban Water Management Planning Act (UWMP Act) requires urban water suppliers to account for the potential impacts of climate change on water supplies and demands as part of long-term water resource planning. These requirements are intended to ensure that UWMPs evaluate future water system performance under changing hydrologic conditions, increasing climate variability, and evolving regulatory and ecosystem protection constraints, rather than relying solely on historical conditions.

For the 2025 UWMP, climate change considerations are incorporated to support risk-informed planning and to provide context for evaluating water supply reliability, drought resilience, and demand projections over the planning horizon. Climate change analysis in the UWMP is not intended to predict a single future outcome, but rather to assess system sensitivity to plausible future climate conditions consistent with guidance from DWR.

This Climate Change Technical Memorandum (TM) provides the foundational climate-related context and assumptions that inform, but do not replace, the detailed analyses presented in the Water Supply Reliability Technical Memorandum and the Drought Risk Assessment. **Table 1** lists the water code requirements that reference climate change's role in the 2025 UWMP.

## 2.2 Applicable Water Code Sections

**TABLE 1: UWMP REQUIREMENTS ON CLIMATE CHANGE**

| UWMP Requirement |
|---|
| Water Code Section 10631(a) A plan shall… Describe the service area of the supplier, including … climate… |
| Water Code Section 10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning… while accounting for impacts from climate change. |

| UWMP Requirement |
| --- |
| 4.2.6 Projected Water Use<br><br>Water Code Section 10635. (4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria |
| Water Code Section 10631.<br><br>A plan shall be adopted in accordance with this chapter that shall do all of the following [...] (b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a) providing supporting and related information, including all of the following:<br><br>(1) A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment. For each source of water supply, consider any information pertinent to the reliability analysis conducted pursuant to Section 10635, including changes in supply due to climate change. |

DWR's UWMP Guidebook for prior cycles emphasizes that climate change considerations should be integrated into demand projections, supply reliability assessments, and drought planning analyses using the best available science and information, including DWR-developed climate change scenarios and delivery capability analyses. The 2025 UWMP Guidebook continues this approach, with a focus on transparency, consistency with DWR methodologies, and clear documentation of assumptions.

## 2.3 Interpretation of Climate Change Requirements

In practice, the climate change requirements of the UWMP are not satisfied through a single standalone analysis. Instead, they are addressed through coordinated evaluation of how climate-driven changes may influence:

- Long-term water demand trends, including temperature-related effects on outdoor and overall water use.
- The availability, timing, and reliability of imported water supplies.
- Groundwater recharge, evapotranspiration, and basin sustainability conditions.
- The frequency, duration, and severity of drought conditions considered in reliability planning.
- Regulatory and operational constraints associated with ecosystem protection, water quality, and groundwater sustainability.

Climate change considerations are therefore embedded across multiple UWMP components, including demand projections, water supply characterization, water supply reliability analysis, drought risk

assessment, and water shortage contingency planning. This memorandum focuses specifically on establishing the climate-related context and assumptions that inform those analyses.

## 2.4 SCV Water Approach to Compliance

SCV Water's approach to meeting the climate change requirements of the 2025 UWMP is grounded in consistency with DWR guidance and alignment with other SCV Water planning efforts. This Climate Change Technical Memorandum serves as a supporting document for the 2025 UWMP by establishing the climate-related context used across multiple sections of the UWMP. Key elements of this approach include:

- **Use of DWR Risk-Informed Climate Scenarios**
  SCV Water relies on climate change scenarios developed by DWR for statewide water supply planning, including those used in the State Water Project (SWP) Delivery Capability Reports (DCRs). These scenarios are designed to reflect a range of plausible future climate conditions while maintaining transparency and consistency across planning documents.

- **Selection of a Central Tendency Planning Scenario**
  For purposes of this climate change assessment, SCV Water uses the 50 percent Level of Concern (LOC) scenario as the primary planning reference. This scenario represents a mid-range, risk-informed condition that reflects neither best-case nor worst-case outcomes and is consistent with DWR's recommended use of central tendency scenarios for planning-level evaluation.

- **Consistency with Other Technical Memoranda**
  This Climate Change TM does not independently quantify water supply reliability or drought impacts. Instead, it provides climate-related assumptions and qualitative context that feed directly into:

    - The Water Supply Reliability Technical Memorandum, which evaluates normal year, single dry year, and multiple dry year (five-year drought) conditions; and

    - The Drought Risk Assessment, which examines supply and demand balance under extended drought scenarios.

  - Numerical results, comparisons of supplies and demands, and determinations of shortages or reliability are addressed in those documents.
- Together, these documents provide a comprehensive, coordinated evaluation of how climate change may influence SCV Water's water demands, supplies, ecosystem considerations, and overall system reliability over the UWMP planning horizon.

- **Separation of Climate Impacts from Conservation Effects**
  Climate change impacts are evaluated independently from planned conservation, water use efficiency, and regulatory demand reductions to avoid double-counting effects. Conservation and efficiency measures are addressed separately through demand management analyses and related planning documents.

## 2.5 Integration of Ecosystem Considerations

Climate change requirements in the UWMP also reflect the increasing importance of maintaining water for ecosystem functions. Changes in temperature, precipitation patterns, and hydrologic variability affect both local water resources such as instream flows, groundwater dependent ecosystems, and local water quality. For local supplies, this includes environmental flow requirements for local streams, groundwater sustainability thresholds that limit pumping to protect dependent ecosystems, and water quality objectives that may restrict treatment or use.

SWP operations must support aquatic and riparian habitats in the Sacramento San Joaquin Delta. These ecosystem needs are incorporated into water supply planning through regulatory, operational constraints that influence water availability under climate change. These constraints include water quality and flow standards in the Delta, endangered species protections, and operational limitations that restrict SWP pumping and deliveries under changing hydrologic conditions. SCV Water's climate change evaluation recognizes that these local and statewide ecosystem driven constraints are integral to long term water supply reliability and are considered in the agencies reliability and drought planning analysis.

# 3. Climate Change in the Santa Clarita Valley

Climate change in the Santa Clarita Valley is expected to manifest primarily through rising temperatures, increased evaporative demand, changes in precipitation intensity, and greater hydrologic variability, rather than through uniform changes in average annual precipitation. These changes are consistent with broader Southern California and statewide climate assessments and are directly relevant to water demand, groundwater sustainability, imported water reliability, and ecosystem water needs.

This section summarizes observed trends and projected climate changes for the Santa Clarita Valley using established scientific assessments and California-specific planning tools. The intent is to quantify climate signals where possible and to describe how those signals translate into planning-relevant stressors for SCV Water, rather than to predict a single future outcome.

## 3.1 Temperature

**Observed Temperature Trends**

Observational records summarized in national and international assessments show that average temperatures across California have increased by approximately 1–2°F since the early to mid-20th century, with Southern California experiencing a similar warming signal (Intergovernmental Panel on Climate Change and U.S. Global Change Research Program). Warming has not been uniform across seasons, with greater increases in summer and nighttime temperatures, which are particularly relevant for outdoor water use and evaporative demand.

Observed historical data for the Santa Clarita Valley indicate that annual average maximum temperatures during the 1961–1990 baseline period averaged approximately 75–78°F, with year-to-year variability (**Figure 1**). These observed values are derived from gridded historical meteorological datasets and represent the average of the hottest daily temperatures in each year.

Modeled historical temperatures for the same baseline period closely reproduce observed conditions (**Figure 1**), with modeled annual average maximum temperatures within approximately 1°F of observed values. This agreement between observed and modeled historical conditions provides confidence that the downscaled climate models reasonably represent local temperature conditions and can be used to assess future changes. However, while closely aligned, the modeled trends may understate the true extent of warming in the region. The models' agreement with observed data provides confidence in their use, but there is a possibility that the models are somewhat conservative, that is, they may not fully capture the highest (max), lowest (min), or average temperature increases that have occurred or could occur. This conservative bias would mean that future projections, while robust, might slightly underestimate the actual warming trend, which is important to consider in planning for water demand, supply reliability, and ecosystem impacts.

As a result, decision-makers should be aware that even the projected increases in temperature might represent a lower bound, and actual conditions could be warmer than what the models predict. This highlights the need for adaptive strategies that account for the potential of greater-than-anticipated warming in the Santa Clarita Valley.

**Figure 2** further illustrates that while historical temperatures fluctuate from year to year, the long-term trajectory shifts upward beginning in the late 20th and early 21st centuries, consistent with statewide and regional observations reported in national and international climate assessments (Intergovernmental Panel on Climate Change and U.S. Global Change Research Program).

Key observed trend to highlight

- Historical variability is large, but recent decades are warmer than the mid-20th century baseline
- The close alignment between observed and modeled historical data supports use of the Localized Constructed Analogs (LOCA) downscaled models for future projections

**Future Temperature Trends**

Future warming is one of the most robust climate signals across all emissions scenarios. The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) and the Fifth National Climate Assessment (NCA5) indicate that:

- Mid-century (2030–2059): Southern California regions are projected to experience additional warming on the order of ~1.5–2.5°F relative to recent historical baselines.
- Late-century (2070–2099): Warming increases substantially under higher emissions pathways, with ~3–6°F or more possible, depending on global emissions trajectories.

These ranges are consistent with downscaled projections available through California climate planning tools and reflect ensemble averages rather than single model outputs.

For the Santa Clarita Valley, projected future conditions show a clear trend of increasing annual average maximum temperatures across all emissions scenarios evaluated (**Figures 2 and 3**). By mid-century (2035–2064), projections indicate that annual average maximum temperatures in the Santa Clarita Valley increase by approximately 4–5°F relative to the 1961–1990 baseline, depending on emissions assumptions (**Figure**

**4**). These figures contain the most up to date information from Cal-Adapt even though the observations shown end in 2005.

By late century (2070–2099), projected warming increases further, with:

- Medium emissions scenarios (RCP 4.5) showing increases on the order of ~5–6°F, and
- High emissions scenarios (RCP 8.5) showing increases approaching ~9°F in annual average maximum temperature (**Figure 4**).

**Figure 2** demonstrates that while individual models diverge in the magnitude of warming, all models show a general upward trend, indicating high confidence in the direction of change even where uncertainty remains in the exact magnitude.

Key projected trend to highlight:

- Warming is robust across all models and scenarios
- Differences between scenarios become more pronounced after mid-century
- The range of model outcomes widens over time, reflecting increasing uncertainty, but no scenario indicates stabilization or cooling

**FIGURE 1: OBSERVED AND MODELED HISTORICAL ANNUAL AVERAGE MAXIMUM TEMPERATURE (1961–1990) AND PROJECTED FUTURE CONDITIONS (2070–2099) FOR THE SANTA CLARITA VALLEY**
(Source: Cal-Adapt; LOCA Downscaled Climate Projections)

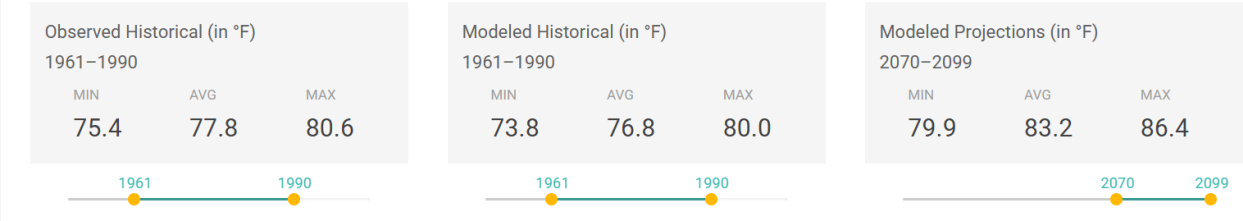
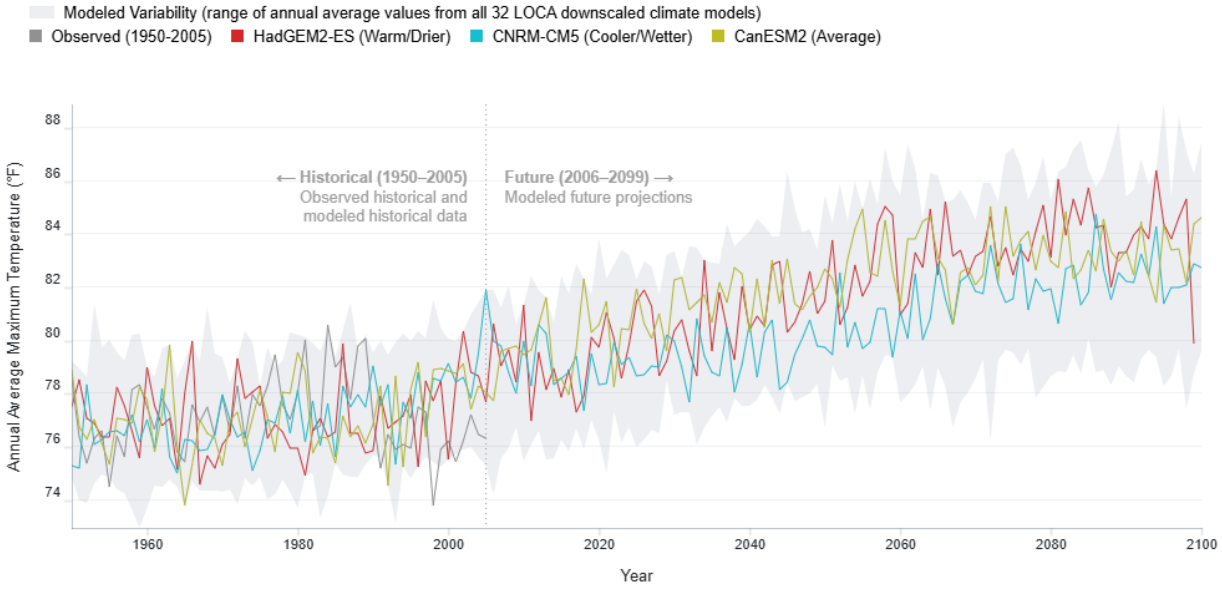


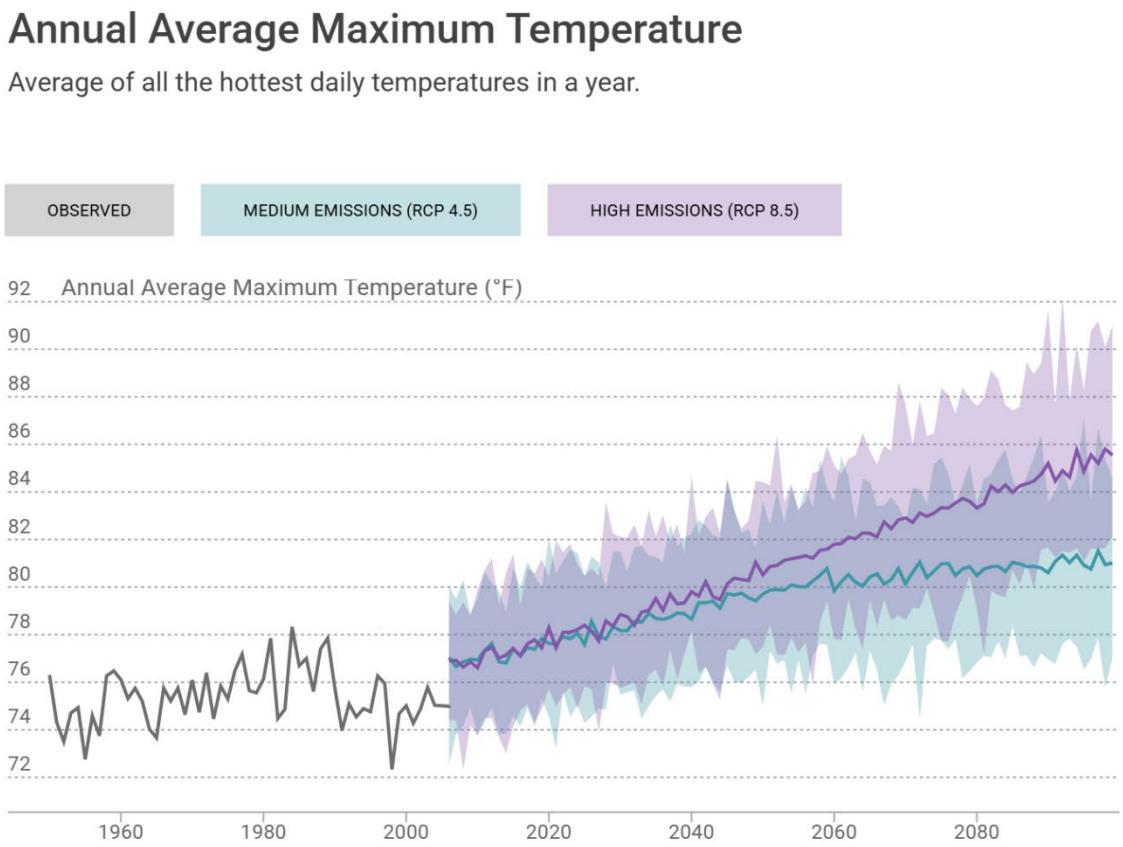
**FIGURE 2: HISTORICAL AND PROJECTED ANNUAL AVERAGE MAXIMUM TEMPERATURE TRENDS FOR THE SANTA CLARITA VALLEY BASED ON LOCA DOWNSCALED CLIMATE MODELS (1950–2099)**

*(Source: Cal-Adapt; LOCA Downscaled Climate Projections)*




- Source: Cal-Adapt. Data: LOCA Downscaled Climate Projections (Scripps Institution of Oceanography), Gridded Historical Observed Meteorological Data (University of Colorado, Boulder).
- Four models have been selected by California's Climate Action Team as priority models for research contributing to California's Fourth Climate Change Assessment (Pierce et al., 2018). Projected future climate from these four models can be described as producing:
  - A *warm/dry* simulation (HadGEM2-ES)
  - A *cooler/wetter* simulation (CNRM-CM5)
  - An *average* simulation (CanESM2)
  - The model simulation that is most unlike the first three for the best coverage of different possibilities (MIROC5)

**FIGURE 3: PROJECTED CHANGES IN ANNUAL AVERAGE MAXIMUM TEMPERATURE UNDER MEDIUM (RCP 4.5) AND HIGH (RCP 8.5) EMISSIONS SCENARIOS FOR THE SANTA CLARITA VALLEY**
*(Source: Cal-Adapt; California Fourth Climate Change Assessment)*




1Data derived from 32 LOCA downscaled climate projections generated to support California's Fourth Climate Change Assessment. Details are described in Pierce et al., 2018.

2Observed historical data derived from Gridded Observed Meteorological Data. Details are described in Livneh et al., 2015.

3Data presented are aggregated over all LOCA grid cells that intersect Santa Clarita boundary.

**FIGURE 4: THIRTY-YEAR AVERAGE ANNUAL MAXIMUM TEMPERATURE BASELINE (1961–1990) AND MID-CENTURY AND END-OF-CENTURY PROJECTIONS FOR THE SANTA CLARITA VALLEY**

*(Source: Cal-Adapt; LOCA Downscaled Climate Projections)*

## Annual Average Maximum Temperature

Average of all the hottest daily temperatures in a year.

**Observed (1961-1990)** 30yr Average: 75.8 °F

| | | 30yr Average | 30yr Range |
|---|---|---|---|
| **Baseline (1961-1990)** | | | |
| MODELED HISTORICAL | - | 75.2 °F | 74.8 - 75.5 °F |
| **Mid-Century (2035-2064)** | | | |
| MEDIUM EMISSIONS (RCP 4.5) | +4.5 °F | 79.7 °F | 77.2 - 82.3 °F |
| HIGH EMISSIONS (RCP 8.5) | +5.4 °F | 80.6 °F | 78.2 - 82.8 °F |
| **End-Century (2070-2099)** | | | |
| MEDIUM EMISSIONS (RCP 4.5) | +5.7 °F | 80.9 °F | 78.6 - 84.0 °F |
| HIGH EMISSIONS (RCP 8.5) | +9.0 °F | 84.2 °F | 81.2 - 88.0 °F |

1Data derived from 32 LOCA downscaled climate projections generated to support California's Fourth Climate Change Assessment. Details are described in Pierce et al., 2018.

2Observed historical data derived from Gridded Observed Meteorological Data. Details are described in Livneh et al., 2015.

3Data presented are aggregated over all LOCA grid cells that intersect Santa Clarita boundary.

The figures collectively demonstrate a shift in baseline temperature conditions for the Santa Clarita Valley. This has several planning-relevant implications:

- Higher baseline temperatures increase evapotranspiration and atmospheric evaporative demand, even in years with near-average precipitation.
- Higher baseline temperatures could compound heat conditions (potential frequency and intensity) may increase stress on riparian and groundwater-dependent ecosystems, particularly during dry periods.
- Baseline temperature increases influence statewide hydrologic processes, including snowpack loss and earlier runoff in source watersheds, which in turn affect imported water supply reliability.

The projected divergence between mid-century and late-century outcomes underscores the importance of adaptive planning, rather than reliance on a single deterministic forecast.

These figures support treating increasing temperature as a primary climate hazard in subsequent analyses of demand, supply reliability, and drought risk. While this Climate Change Technical Memorandum does not quantify supply shortages or reliability outcomes, the temperature trends shown in Figures 1 through 4 directly inform the assumptions and constraints applied in the Water Supply Reliability and Drought Risk Assessment technical memoranda.

*Temperature and Snow Melt*

Temperature increases have a direct and non-linear influence on snow accumulation and melt, which is critical for California's water system even in regions that do not rely directly on local snowpack.

AR6 and NCA5 find that:

- Baseline temperatures increase contributing to lifting of the snowline to higher elevations. As a result areas that once saw snow at lower elevations may likely see winter precipitation as rain.
- Snowpack acts as a natural reservoir, storing water and releasing it gradually during spring and early summer; warming reduces this storage function even if total precipitation remains unchanged.
- Small increases in temperature can produce large proportional losses in snow water equivalent (SWE).

The IPCC AR6 concludes with high confidence that warming reduces snowpack and advances the timing of snowmelt across mid-latitude mountain regions, including western North America. Similarly, DWR's hydroclimate assessments document that temperature-driven snowpack decline is a primary mechanism behind observed and projected shifts in runoff timing in California.

Relationships reported in the literature include:

- A shift of precipitation from snow to rain of several percentage points per degree of warming, depending on elevation band.

- Earlier peak runoff timing by weeks, with increased winter flows and reduced late-spring and summer flows.

Temperature-driven snowmelt changes alter not just the amount of water available, but when that water is available. DWR's hydroclimate adjustment work demonstrates that warmer conditions lead to:

- Increased winter runoff volumes
- Reduced spring and summer runoff
- Greater reliance on reservoir operations and conveyance capacity to capture water during high-flow periods

These timing shifts are particularly important for statewide systems such as the SWP, which depend on coordinated storage, conveyance, and environmental flow management. Earlier runoff reduces the ability to store water for dry-season use and increases the likelihood that high flows coincide with operational or regulatory constraints. DWR explicitly incorporates these temperature-driven timing shifts into the hydrologic inputs used for SWP delivery capability modeling.

*Temperature and Evapotranspiration*

Temperature increases also raise atmospheric evaporative demand, technically expressed as increases in reference evapotranspiration ($ET_0$). AR6 and NCA5 indicate that $ET_0$ increases on the order of ~2–5% per degree Fahrenheit of warming, with variation by season and local conditions.

This mechanism is well-established and has multiple implications:

- Increased irrigation demand even in years with near-average precipitation
- Faster soil moisture depletion
- Reduced effectiveness of precipitation for groundwater recharge
- Increased stress on vegetation and groundwater-dependent ecosystems

Importantly, temperature-driven increases in $ET_0$ operate independently of precipitation changes, meaning warming alone, holding precipitation constant, can intensify drought conditions.

*Temperature and Drought*

The scientific literature increasingly distinguishes between traditional precipitation-driven droughts and temperature-amplified droughts, often referred to as "hot droughts." IPCC AR6 identifies high confidence that warming intensifies drought impacts by increasing evaporation and reducing soil moisture, even when precipitation deficits are modest.

For California, this means:

- Droughts become more severe for the same precipitation shortfall

- Hydrologic and ecological drought conditions can persist longer
- Groundwater and ecosystem stress increases during multi-year dry periods

DWR's planning framework reflects this understanding by emphasizing multi-year drought scenarios and climate-adjusted hydrology in delivery capability and reliability analyses.

*Temperature and Ecosystems*

AR6 and NCA5 identify warming as the dominant climate variable affecting aquatic ecosystems, groundwater-dependent habitats, and riparian systems through its influence on evapotranspiration, soil moisture, snowpack dynamics, runoff timing, and water temperature.

The IPCC AR6 concludes with high confidence that increasing temperatures intensify ecological drought conditions by increasing atmospheric evaporative demand, reducing soil moisture, and altering hydrologic regimes, even where precipitation changes are uncertain. These mechanisms are particularly relevant for semi-arid regions such as Southern California, where ecosystems are already adapted to limited and highly seasonal water availability. Statewide ecosystems and downstream flow regimes that support aquatic habitat are strongly influenced by these temperature-driven changes. DWR's hydroclimate adjustment analyses demonstrate that warming alone, holding precipitation constant, produces measurable shifts toward earlier runoff and reduced late-season flows.

Ecosystem implications from warming include:

- Reduced availability of cold-water habitat during spring and summer
- Increased stress on aquatic species sensitive to flow timing and temperature
- Greater reliance on managed environmental releases to maintain instream flow objectives

For ecosystems, increased $ET_0$ results in:

- Faster depletion of soil moisture
- Increased water stress on riparian vegetation
- Reduced persistence of shallow groundwater that supports groundwater-dependent ecosystems
- Greater sensitivity of ecosystems to the timing, rather than just the amount, of precipitation

These effects occur even in years with near-average precipitation, meaning warming alone can increase ecological stress independent of changes in rainfall.

Increased air temperatures also raise stream and river water temperatures, particularly during low-flow periods. Warmer water temperatures can:

- Reduce dissolved oxygen levels
- Exceed thermal tolerance thresholds for sensitive aquatic species

- Increase susceptibility to disease and invasive species
- Alter species composition and habitat suitability

These impacts are compounded during drought conditions, when reduced flows limit the buffering capacity of aquatic systems. The IPCC AR6 identifies warming-driven increases in freshwater ecosystem stress. Temperature-driven increases in evapotranspiration and drought severity place additional pressure on groundwater systems. Reduced recharge efficiency and increased pumping during dry periods can lower groundwater levels, affecting:

- Riparian corridors sustained by shallow groundwater
- Springs and seeps
- Baseflow contributions to streams

DWR's groundwater and climate planning frameworks recognize that groundwater sustainability under SGMA is closely linked to ecosystem protection, particularly for groundwater-dependent ecosystems. Temperature-driven drying increases the risk that ecological thresholds are reached during extended dry periods, reinforcing the need for climate-informed groundwater management.

For SCV Water, temperature-driven ecosystem impacts are relevant even where impacts occur outside the immediate service area. Ecosystem stress affects:

- The timing and reliability of imported water supplies
- The operational flexibility of statewide systems
- Groundwater sustainability and baseflow conditions
- The severity and duration of drought impacts evaluated in reliability planning

Accordingly, temperature change is treated as a key climate hazard in the UWMP's climate change evaluation. Its ecosystem implications are reflected in the assumptions and constraints applied in subsequent water supply reliability and drought risk assessments, rather than evaluated as a separate, standalone impact.

## 3.2 Precipitation

Precipitation is a key driver of hydrologic conditions affecting groundwater recharge, surface runoff, ecosystem function, and drought severity in the Santa Clarita Valley. However, unlike temperature, precipitation exhibits greater spatial and temporal variability and higher uncertainty in future projections. As a result, climate change impacts on precipitation are best understood through changes in variability, intensity, and timing, rather than changes in long-term average totals alone.

AR6 and NCA5 emphasize that climate change alters the character of precipitation, increasing the likelihood of both intense storm events and extended dry periods. These changes have direct implications for water supply reliability, flood risk, groundwater sustainability, and ecosystem stress.

**Observed Precipitation Trends**

Historical observations summarized in national and international assessments show substantial interannual variability in precipitation across Southern California, with no strong long-term trend in average annual totals comparable to the temperature signal. This variability is characteristic of Mediterranean-climate[1] regions and complicates the use of historical averages as predictors of future conditions.

Observed historical data indicate that annual precipitation in the Santa Clarita Valley during the 1961–1990 baseline period averaged approximately 18–19 inches per year, with substantial year-to-year variability (**Figure 5**). Individual years ranged from very dry conditions (on the order of 3–5 inches) to very wet years exceeding 40 inches, reflecting the inherently variable, Mediterranean-climate precipitation regime of Southern California.

Modeled historical precipitation generally reproduces this observed range and average (**Figure 5**), with modeled 30-year average precipitation within approximately 1 inch of observed values. This agreement between observed and modeled historical conditions supports the use of LOCA downscaled climate projections to evaluate potential future changes, while also illustrating that natural variability dominates historical precipitation patterns.

Key observed signal to highlight:

- Large interannual variability is a defining feature of the historical record
- No strong long-term upward or downward trend in average annual precipitation is evident in the baseline period
- Models capture the magnitude and variability of historical precipitation reasonably well

**Future Precipitation Trends**

The IPCC AR6 concludes that projections of mean annual precipitation for Southern California show mixed results across climate models, with some models indicating modest increases and others indicating modest decreases. As a result, confidence in the *direction* of average annual precipitation change is lower than for temperature.

Projected future average annual precipitation for the Santa Clarita Valley shows relatively small changes in long-term averages compared to historical variability (**Figures 6 and 7**). Under both medium (RCP 4.5) and high (RCP 8.5) emissions scenarios:

Mid-century (2035–2064) projections indicate changes on the order of -1 inch relative to the historical baseline, with 30-year averages remaining close to 18 inches per year (**Figure 7**).

[1] As defined by Köppen Climate Classification System

End-century (2070–2099) projections similarly show modest changes in average annual precipitation, with modeled averages still clustering around historical values, though with a wide range across models (**Figure 7**).

**Figure 6** illustrates that while individual years may be substantially wetter or drier than average, the ensemble average does not indicate a consistent shift toward wetter or drier mean conditions. This lack of a strong directional signal in annual totals is consistent with broader Southern California climate assessments.

Key projected signal to highlight

- Mean annual precipitation alone is not a reliable indicator of climate change impacts for the Santa Clarita Valley
- Planning-relevant changes emerge more clearly in variability, extremes, and timing, rather than averages
- Water planning should not assume either wetter or drier average conditions but should account for greater variability and more extreme events.

**FIGURE 5: OBSERVED AND MODELED HISTORICAL ANNUAL PRECIPITATION (1961–1990) AND PROJECTED END-OF-CENTURY CONDITIONS (2070–2099) FOR THE SANTA CLARITA VALLEY**
(Source: Cal-Adapt; LOCA Downscaled Climate Projections)

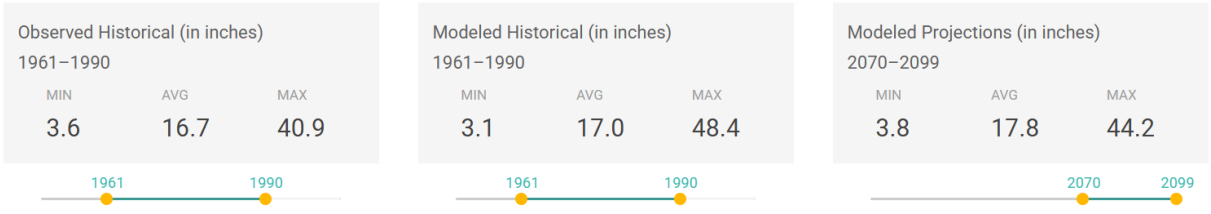
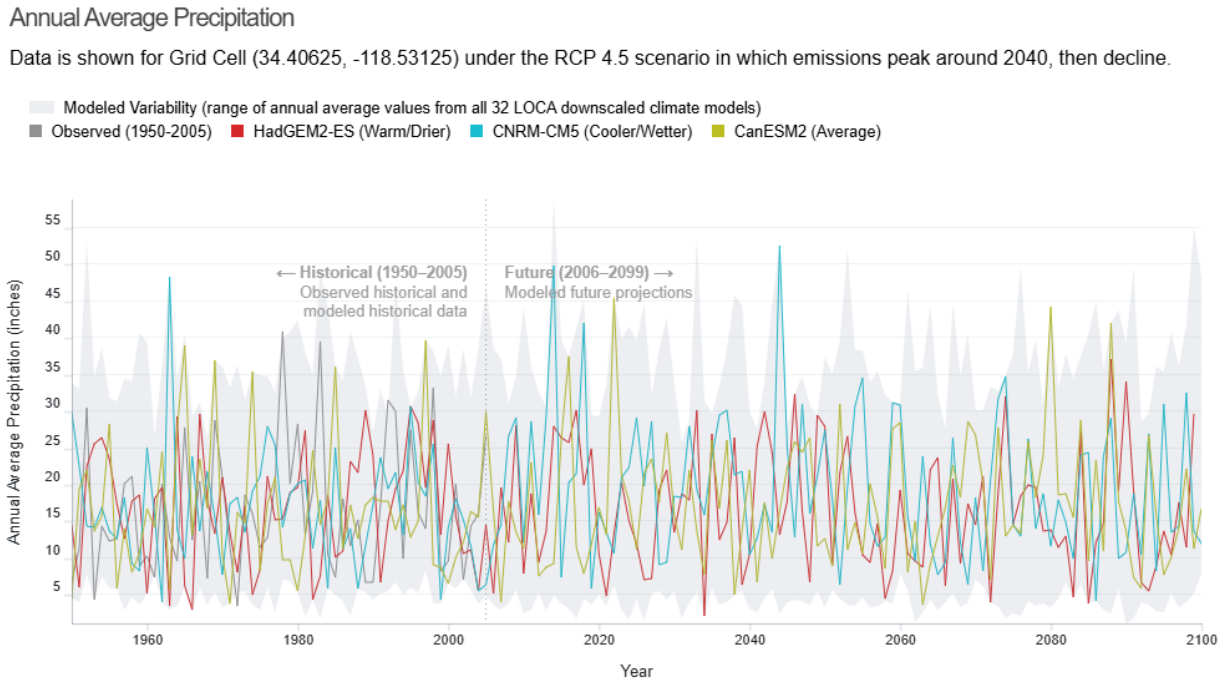


**FIGURE 6: HISTORICAL AND PROJECTED ANNUAL AVERAGE PRECIPITATION FOR THE SANTA CLARITA VALLEY UNDER A MEDIUM EMISSIONS SCENARIO (RCP 4.5)**
(Source: Cal-Adapt; LOCA Downscaled Climate Projections)




- Source: Cal-Adapt. Data: LOCA Downscaled Climate Projections (Scripps Institution of Oceanography), Gridded Historical Observed Meteorological Data (University of Colorado, Boulder).
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  - A *cooler/wetter* simulation (CNRM-CM5)
  - An *average* simulation (CanESM2)
  - The model simulation that is most unlike the first three for the best coverage of different possibilities (MIROC5)

**FIGURE 7: THIRTY-YEAR AVERAGE ANNUAL PRECIPITATION BASELINE (1961–1990) AND MID-CENTURY AND END-OF-CENTURY PROJECTIONS FOR THE SANTA CLARITA VALLEY**
(Source: Cal-Adapt; California Fourth Climate Change Assessment)

## Annual Precipitation

Total precipitation projected for a year

**Observed (1961-1990)** 30yr Average: 18.5 inches

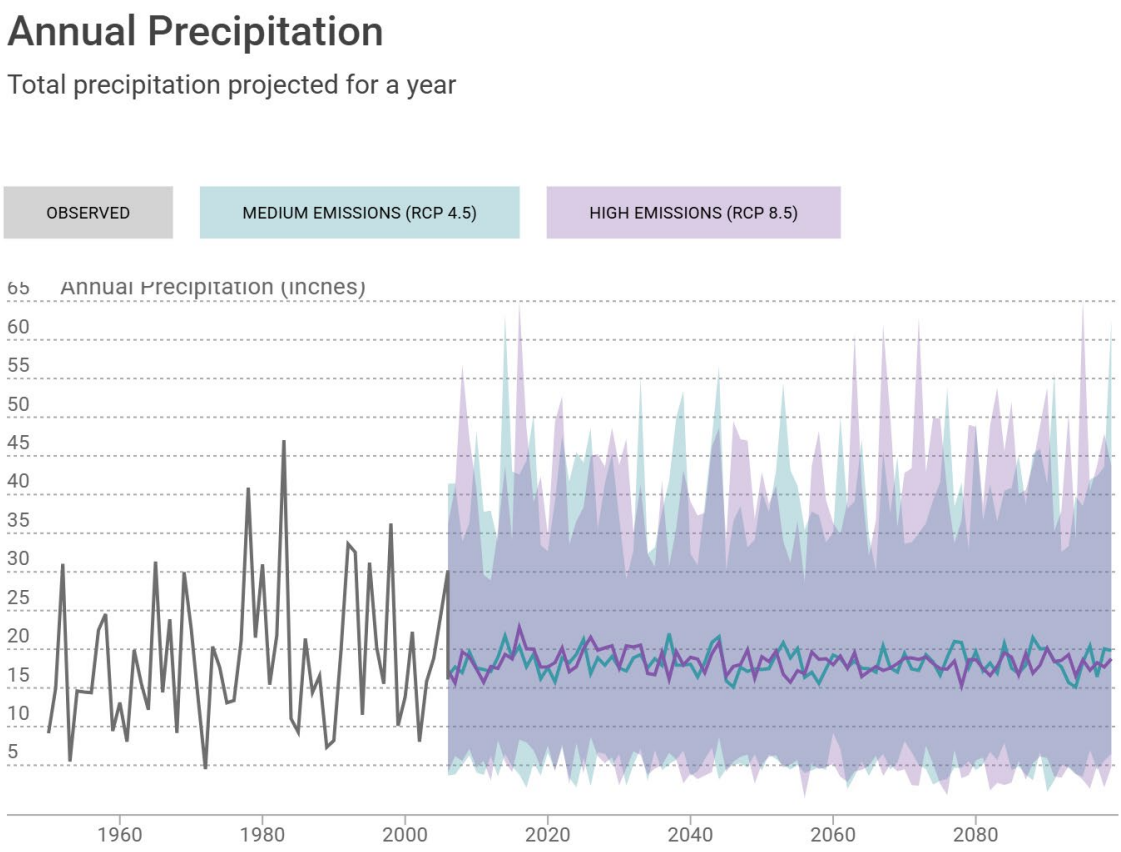
| | | 30yr Average | 30yr Range |
|---|---|---|---|
| **Baseline (1961-1990)** | | | |
| MODELED HISTORICAL | - | 18.8 inches | 16.4 - 20.6 inches |
| **Mid-Century (2035-2064)** | | | |
| MEDIUM EMISSIONS (RCP 4.5) | -0.6 inches | 18.2 inches | 14.4 - 23.8 inches |
| HIGH EMISSIONS (RCP 8.5) | -0.6 inches | 18.2 inches | 13.8 - 24.5 inches |
| **End-Century (2070-2099)** | | | |
| MEDIUM EMISSIONS (RCP 4.5) | -0.3 inches | 18.5 inches | 13.9 - 22.4 inches |
| HIGH EMISSIONS (RCP 8.5) | -0.7 inches | 18.1 inches | 11.7 - 27.0 inches |

1Data derived from 32 LOCA downscaled climate projections generated to support California's Fourth Climate Change Assessment. Details are described in Pierce et al., 2018.

2Observed historical data derived from Gridded Observed Meteorological Data. Details are described in Livneh et al., 2015.

3Data presented are aggregated over all LOCA grid cells that intersect Santa Clarita boundary.

**FIGURE 8: PROJECTED CHANGES IN ANNUAL PRECIPITATION VARIABILITY FOR THE SANTA CLARITA VALLEY UNDER MEDIUM (RCP 4.5) AND HIGH (RCP 8.5) EMISSIONS SCENARIOS**
(Source: Cal-Adapt; LOCA Downscaled Climate Projections)




1Data derived from 32 LOCA downscaled climate projections generated to support California's Fourth Climate Change Assessment. Details are described in Pierce et al., 2018.

2Observed historical data derived from Gridded Observed Meteorological Data. Details are described in Livneh et al., 2015.

3Data presented are aggregated over all LOCA grid cells that intersect Santa Clarita boundary.

*Precipitation and Extreme Events*

While projected changes in average annual precipitation are modest, the figures show increasing variability and a wider range of potential outcomes in future periods (**Figures 6 and 8**). The shaded bands representing the range of LOCA model outcomes widen over time, particularly toward the end of the century, indicating greater uncertainty and the potential for very wet and very dry years in the future.

**Figure 9** further demonstrates that extreme precipitation intensity is projected to generally increase, as reflected in the 99th-percentile 1-day precipitation metric at a global warming level of 1.5°C. This metric captures the most intense storm events rather than annual totals and is particularly relevant for flood risk, erosion, and water quality impacts.

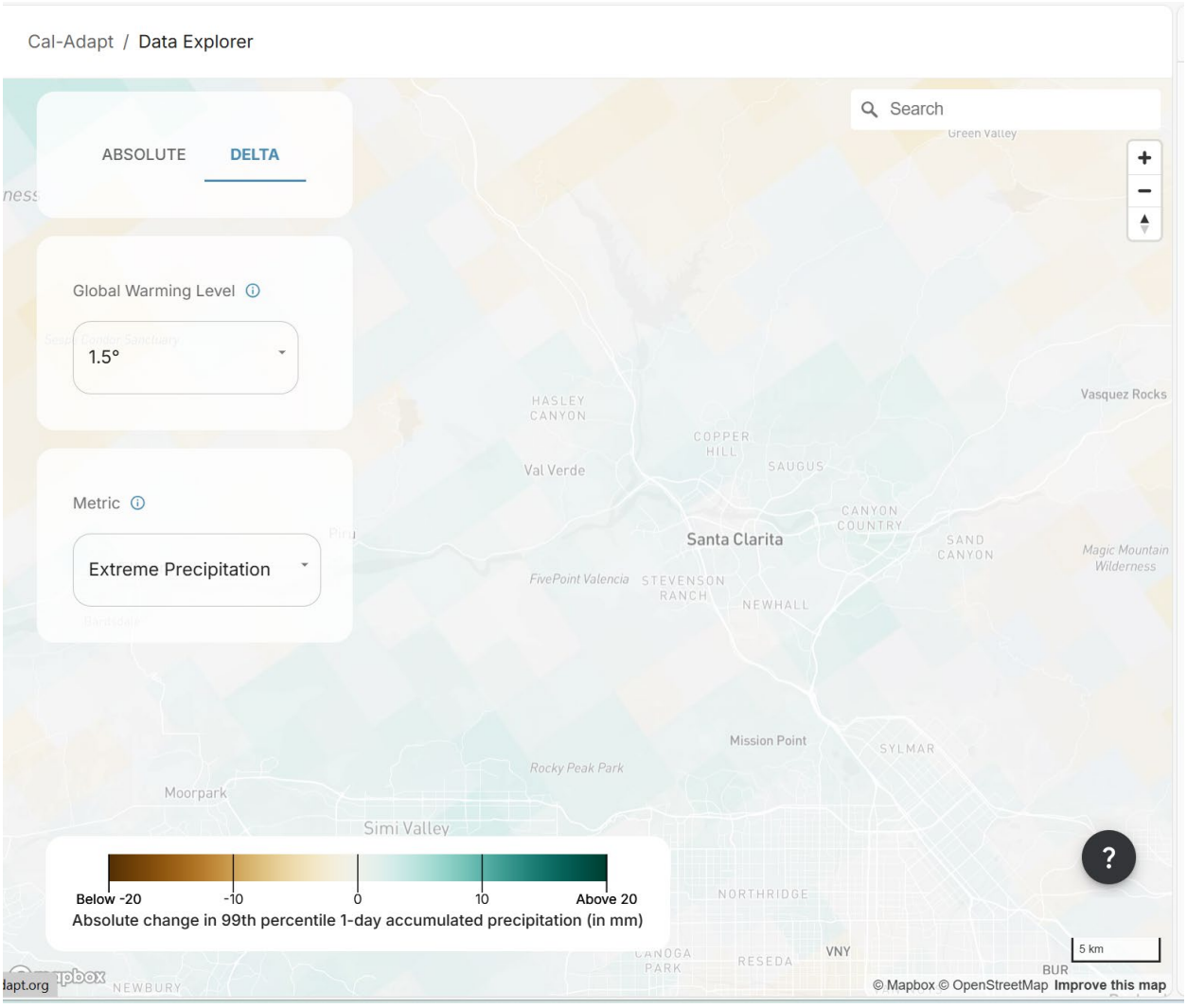
Key extreme-event signals to highlight:

- More intense single-day and multi-day storm events are projected, even where annual totals remain similar
- A greater share of annual precipitation may occur in fewer, larger storms

Hydrologic and ecosystem implications include:

- Increased surface runoff and erosion during storms
- Reduced infiltration efficiency for groundwater recharge during intense rainfall
- Disturbance of stream channels and riparian habitat
- Increased water quality impacts from sediment and pollutant transport

**FIGURE 9: PROJECTED CHANGE IN EXTREME PRECIPITATION INTENSITY (99TH-PERCENTILE 1-DAY ACCUMULATION) FOR THE SANTA CLARITA VALLEY AT A 1.5°C GLOBAL WARMING LEVEL**
(Source: Cal-Adapt; LOCA Downscaled Climate Projections)




*Precipitation and Groundwater Recharge*

Another feature of precipitation dynamics resultant from climate change can be longer dry spells between precipitation events, even in regions where total annual precipitation does not decline substantially. NCA5 and IPCC AR6 describe this pattern as increased precipitation intermittency, where rainfall occurs in fewer, larger events separated by longer dry periods.

For the Santa Clarita Valley, this pattern has several consequences:

- Extended periods without rainfall increase soil moisture depletion
- Vegetation and ecosystems experience greater water stress between storms
- Groundwater recharge becomes more episodic and less reliable
- Drought conditions can intensify more rapidly

Changes in precipitation intensity and timing influence how effectively precipitation contributes to usable water resources:

- Moderate, frequent storms tend to support infiltration and recharge.
- Intense storms increase runoff and flood risk but may contribute less to recharge, particularly where soils and channels are unable to absorb water rapidly.

DWR's hydroclimate adjustment work emphasizes that climate change can reduce the effectiveness of precipitation for water supply purposes even when total annual precipitation does not decrease. This has implications for both local recharge processes and statewide hydrology feeding imported supplies.

*Precipitation and Drought*

Precipitation changes interact with temperature increases to shape drought severity. IPCC AR6 distinguishes between:

- Meteorological drought (precipitation deficits)
- Hydrological drought (reduced streamflow and storage)
- Agricultural/ecological drought (soil moisture and vegetation stress)

In warmer conditions, the same precipitation deficit can produce more severe hydrologic and ecological drought due to higher evapotranspiration and reduced soil moisture retention. As a result, drought impacts become more severe even if the precipitation deficit alone does not worsen.

This understanding underpins DWR's emphasis on evaluating single dry year and multi-year drought conditions under climate-adjusted hydrology.

*Precipitation and Ecosystems*

Changes in precipitation regimes affect ecosystems through:

- Altered flow regimes in streams and rivers
- Increased disturbance from high-flow events
- Reduced baseflows during extended dry periods
- Increased reliance on managed environmental flows to sustain habitat

These impacts are particularly important in the context of groundwater-dependent ecosystems and riparian corridors, which rely on consistent subsurface moisture and baseflow contributions that can be disrupted by episodic recharge and prolonged dry intervals.

At the statewide level, precipitation variability influences Delta hydrology and water quality, affecting ecosystem protections that in turn shape operational constraints on imported water supplies.

## 4. Climate Change Impacts on Demand

Climate change affects water demand primarily through changes in temperature and precipitation that influence outdoor irrigation, evapotranspiration, and customer water use behavior. For the Santa Clarita Valley, temperature increases represent the dominant climate-driven demand signal, while changes in precipitation act as a secondary, partially offsetting factor. Consistent with DWR guidance, SCV Water evaluates climate impacts on demand independently from population growth, land use change, and planned conservation to isolate physical climate drivers and avoid double-counting demand reductions.

SCV prepared a Water Demand Forecasting (WDF) tool which contains population and number of households projections for SCV retail and sales to other customers (La County Water Work District 36 (LA36)) for SCV entire service area. These demand projections span from 2024-2050 to inform SCV Water long term planning. The WDF is a GIS based model that integrates land use projections and demographic data to forecast water demand. A&N Technical Services prepared a draft technical memorandum on August 26, 2025, analyzing the potential impacts of climate change on water demand. SCV Water is incorporating the three risk-informed future climate scenarios outlined in the Delivery Capacity Report (DCR) into its water resource planning efforts. To support this analysis, A&N utilized gridded climate data specific to the Santa Clarita Valley, along with climate change scenarios developed by DWR. By linking spatial land use projections with demographic data, the WDF allows SCV Water to evaluate how changes in growth patterns, development intensity, and climate conditions interact to influence future water demand across retail and sales to others customer classes.

*Climate Scenarios and Inputs*

A&N's analysis utilized:

- Gridded climate data specific to the Santa Clarita Valley
- Climate change scenarios developed by DWR
- The three risk-informed future climate scenarios defined in DWR's DCR, corresponding to the 50th (central tendency), 75th (worse outcome), and 95th (worst-case) percentiles

These scenarios reflect increasing levels of climate stress and are consistent with DWR's risk-informed planning approach.

Key findings from the 50th percentile (central tendency) scenario include:

- An expected 3.4 percent increase in temperature (approximately +2.7°F)
- An expected 1.9 percent increase in precipitation

Increased temperatures are projected to increase water demand, primarily through higher evapotranspiration and increased outdoor irrigation needs. Increased precipitation is projected to reduce water demand, reflecting reduced irrigation requirements. However, the analysis shows that water demand is more sensitive to temperature changes than similar precipitation changes, resulting in a net increase in demand.

The WDF tool is consistent with, and reinforced by, the regional climate change findings presented earlier in this Technical Memorandum. The climate analyses summarized in Section 3 demonstrate that the Santa Clarita Valley is expected to experience persistent warming, modest changes in average annual precipitation, and increased climate variability. These findings establish the direction and nature of climate signals affecting water demand.

The WDF tool translates those regional climate signals into planning-relevant demand impacts by explicitly incorporating temperature- and precipitation-driven demand adjustments, as quantified by A&N Technical Services. In this way, the WDF serves as the mechanism through which high-level climate science is operationalized within SCV Water's long-term demand projections.

Specifically:

- The temperature-driven increase in demand identified in the climate analysis is reflected in the WDF through sensitivity-based adjustments applied to baseline demand projections.
- The limited offsetting effect of increased precipitation, as shown in the climate findings, is likewise incorporated, resulting in a net positive demand effect under all three DCR risk-informed climate scenarios.
- The WDF's use of gridded, Santa Clarita–specific climate data aligns with the localized temperature and precipitation trends shown earlier, ensuring internal consistency between climate characterization and demand modeling.

As a result, the WDF does not contradict or reinterpret the climate findings; it implements them quantitatively within a demand forecasting framework.

*Climate Change Impact on Demand*

Under these assumptions, projected demand is anticipated to **increase by approximately 2.1%**. The results of their study are shown below in **Table 2**. These projections are preliminary and subject to revision upon completion of SCV Water's comprehensive demand analysis. Climate-driven demand impacts described in this section are intended to inform planning-level analyses and do not represent precise forecasts of future customer behavior.

**TABLE 2: CLIMATE SCENARIO EFFECTS ON SCV WATER DEMAND**

| Climate Scenario | Change in Demand Driver | Effect on Demand | Total Effect on Demand |
|---|---|---|---|
| Climate Scenario 1 – 50th percentile (Central Tendency) | $\Delta\text{Temp} = +2.7°\text{F}, \sim 3.4\%$<br>$\Delta\text{Rain} = +1.9\%$ | 3.4%·0.66 ≈ +2.3%<br>1.9%·0.14 ≈ -0.2% | +2.1% |
| Climate Scenario 2 – 75th percentile (Worse outcome) | $\Delta\text{Temp} = +3°\text{F}, \sim 3.7\%$<br>$\Delta\text{Rain} = +0.7\%$ | 3.7%·0.66 ≈ +2.5%<br>0.7%·0.14 ≈ -0.1% | +2.4% |
| Climate Scenario 3 – 95th percentile (Worst Case) | $\Delta\text{Temp} = +3.2°\text{F}, \sim 4.0\%$<br>$\Delta\text{Rain} = -1.1\%$ | 4.0%·0.66 ≈ +2.7%<br>-1.1%·0.14 ≈ +0.15% | +2.85% |

*Note: The temperature and precipitation drivers are gridded climate data specific and localized in SCV Water service area. Groundwater recharge assumptions used in the UWMP are consistent with the adopted Groundwater Sustainability Plan (GSP), which assumes limited recharge benefits from increased precipitation due to the intensity and timing of storm events.*

SCV WDF tool looked at many variables including water loss, recycled water, population growth, changes in development, land use projections as well as climate change impacts to project out demand. The projected change in demand for this UWMP is shown in **Table 3**. These 2025 values reflect current water or baseline conditions. The water demand forecast for 2050 includes projected water savings through passive conservation and impacts of climate change. SCV water is expected to see a 21% increase in growth in water demand from 61TAF to 74TAF in the next 25 years.

**TABLE 3: WATER DEMAND FORECAST**

| SCV Water | 2025 (Acre-feet) | 2050 (Acre-feet) | % Change |
|---|---|---|---|
| **SCV Retail** | 60,714 | 72,752 | 20% |
| **LA36 (Sales to Others)** | 231[1] | 1,023[2] | 343%[3] |
| **Total (SCV Water)** | 60,945 | 73,775 | 21% |

Notes:
[1]In 2025, LA36's water demand was about 1,209 AF. The volumes presented in Table 3 indicate the volume that SCV Water sold to LA36, included in the "sales to others" customer class, not the entire LA36 demand.
[2]For conservative planning purposes, the 2050 demand forecast for LA36 assumes that all of LA36's demand could be supplied by SCV Water.
[3]While LA36's actual percent change in demand is a 15% decrease (related to conservation), Table 3 shows the change in SCV Water's demand, based on the assumption that SCV Water will need to meet the entirety of LA36's future demand.

The climate change analysis demonstrates that even modest increases in temperature can measurably increase water demand, and that precipitation changes are unlikely to fully offset this effect. While climate

change is not the dominant driver of future demand growth in the Santa Clarita Valley, it reinforces upward demand trends driven by population and land use change and increases the sensitivity of demand during drought and heat events.

The WDF tool provides SCV Water with flexibility to:

- Adapt demand projections as updated climate data become available
- Evaluate demand under multiple climate change scenarios
- Maintain consistency between demand forecasting, water supply reliability analysis, and drought risk assessment

Incorporating climate change into demand forecasting supports risk-informed long-term planning, ensuring that SCV Water's supply portfolios, conservation strategies, and reliability assessments remain robust under a range of plausible future climate conditions.

*Conclusion*

Including the WDF tool in the UWMP helps ensure that demand projections are conservative, risk-aware, and suitable for long-term reliability planning, for several reasons.

1. **Climate impacts are treated as incremental**

The WDF incorporates climate change impacts as incremental adjustments to demand, rather than assuming step-change shifts in customer behavior or water use patterns. For example, under the 50th percentile climate scenario, climate change contributes approximately a 2.1 percent increase in demand, which is modest relative to overall growth-driven increases.

This approach avoids overstating climate impacts while still ensuring they are explicitly accounted for, consistent with DWR guidance to consider climate change without relying on extreme assumptions.

2. **Growth remains the dominant driver of demand**

The WDF clearly demonstrates that population growth, household formation, and land use change are the primary drivers of the projected 21 percent increase in total demand between 2025 and 2050. Climate change acts as a secondary amplifier, not the controlling variable.

This hierarchy of drivers is conservative because it avoids attributing excessive demand growth to climate change while still recognizing that warming increases baseline demand conditions over time.

3. **Use of risk-informed climate scenarios bounds uncertainty**

By incorporating the 50th, 75th, and 95th percentile climate scenarios from the DWR Delivery Capability Report, the WDF aligns demand forecasting with the same risk-informed framework used for water supply reliability analysis.

This ensures:

- The central tendency scenario supports baseline planning assumption.
- The higher-risk scenarios provide insight into how demand could increase under more adverse climate conditions.

Using these scenarios helps bound uncertainty without defaulting to worst-case assumptions for all planning purposes, which would be inconsistent with UWMP intent.

**4. Avoidance of double-counting conservation effects**

The WDF evaluates climate-driven demand impacts independently of planned conservation and efficiency measures. This separation is critical for conservative planning because it avoids double-counting demand reductions that may already be assumed elsewhere in the UWMP.

By holding conservation assumptions constant while testing climate sensitivity, the WDF produces demand estimates that are less likely to underestimate future demand, particularly during hot and dry periods when conservation savings may be more difficult to achieve.

**5. Consistency across UWMP analytical components**

Including the WDF ensures that demand projections are consistent with:

- Climate change characterization (this TM)
- Water supply reliability analysis
- Single-dry-year and multi-year drought assessments

This consistency is itself conservative, as it prevents optimistic assumptions in one component (e.g., demand) from offsetting more cautious assumptions in another (e.g., supply reliability).

Taken together, the climate change findings and the WDF tool indicate that future demand in the Santa Clarita Valley is expected to increase under all plausible climate scenarios, even where average precipitation remains near historical levels. The WDF provides a structured, transparent way to reflect this outcome in long-term planning while maintaining alignment with DWR guidance and avoiding overstatement of climate impacts.

This demand forecast in the UWMP ensuring that:

- Demand projections are grounded in localized climate data
- Climate uncertainty is addressed through scenario-based analysis
- Long-term planning assumptions err on the side of supply adequacy and reliability, rather than optimism.

# 5. Climate Change Impacts on Projected Supplies

Climate change has the potential to affect water supplies through multiple, interconnected pathways, including changes in hydrologic timing, increased climate variability, altered recharge conditions, and constraints on system operations and infrastructure. For SCV Water, these impacts are relevant across all major components of the water supply portfolio, including imported water from the State Water Project (SWP), local groundwater supplies, recycled water, and supplemental supplies such as transfers, exchanges, and groundwater banking. While the magnitude and mechanisms of climate change impacts vary by supply type, climate change introduces additional uncertainty that must be considered in long-term water supply planning and reliability assessments.

This section summarizes the projected impacts of climate change on SCV Water's water supplies, including imported water availability from the SWP, groundwater sustainability as evaluated in the Groundwater Sustainability Plan (GSP), recycled water availability, and other supplemental supply sources. The analysis integrates findings from DWR's Delivery Capability Reports and the GSP to provide a cohesive understanding of how climate change may influence future water supply availability and system reliability. Together, these evaluations provide a foundation for informed decision-making and support SCV Water's goal of maintaining a resilient and adaptable water supply portfolio under changing climate conditions.

## 5.1 Imported Water

*Overview*

SCV water imported water supplies are primarily from the SWP. The SWP is a multipurpose water storage project and delivery system thar covers two thirds the length of California. The SWP system of canals, pipelines, reservoirs, and hydroelectric facilities deliver throughout the state. SCV Water is a SWP contractor that allows them to receive a yearly allocation of water from the SWP. The allocation is dependent on DWR operations of the SWP and various hydrologic conditions that are present.

SCV Water holds a Table A allocation of 95,200 acre-feet as specified in the DCR. Table A represents the contractual maximum annual amount of water that can be delivered to each SWP contractor. Historically, total SWP deliveries have amounted to approximately 4,172,786 acre-feet, with a ten-year long-term average of 1,416,000 acre-feet. Table A serves as the basis for apportioning water supply and associated costs among SWP contractors. Once the total annual delivery amount is determined, all available water is allocated proportionally to each contractor's Table A entitlement. Table A water deliveries are prioritized over other SWP water types. Contractors have flexibility in managing their allocations, including direct use, storage, or transfer to other entities.

In addition to Table A water, SWP contractors may access supplemental water supplies under specific provisions:

- Article 21 Water: Defined in Article 21 of SWP contracts, this water is available on an intermittent and interruptible basis, in addition to Table A allocations, upon contractor request. Article 21 water is commonly used to meet demands when Table A allocations are less than 100 percent. Its availability and delivery cannot reduce any contractor's Table A allocation or interfere with normal SWP operations.

- Article 56 Carryover Water: This refers to SWP water allocated and approved for delivery within a given year but not utilized by year-end. Contractors may carry over this unused water into the following year, subject to storage and operational constraints.

- Turnback Pool Water: Contractors with surplus Table A water in a given year may offer a portion of their allocation to the SWP Turnback Pool. Other contractors can purchase this water to supplement their own supplies, providing a mechanism for resource optimization across the system.

*Climate Change Analysis*

SCV relies on SWP imported water, so the DWR 2023 and draft 2025 DCR is utilized to estimate the impacts of climate change on imported water. DCR categorizes the cumulative effects of climate change on hydrologic conditions relevant to SWP operations. These can be split into three primary areas:

- Changes to monthly flow patterns: Seasonal runoff timing is expected to shift, with earlier snowmelt and altered precipitation patterns affecting reservoir inflows and water availability throughout the year.

- More extreme events: Increased frequency and intensity of droughts and pluvial floods will challenge system reliability and require adaptive operational strategies to manage variability.

- Lower reservoir storage levels: Rising temperatures and reduced snowpack will likely decrease overall storage capacity, limiting flexibility in meeting demands during dry periods.

DWR has developed three climate change scenarios based on groupings of climate models and IPPC emissions and socioeconomic scenarios, expressed as Levels of Concern (LOC) ranging from the 50th percentile to the 95th percentile. These scenarios are designed to reflect increasing levels of climate-related risk while maintaining the usability of DCR results for local planning. DWR three climate change scenarios and parameters are shown in **Table 4**. For this Technical Memorandum, the 50th percentile LOC is used as the primary planning reference. The 50% LOC represents a central-tendency projection, meaning there is an approximately equal likelihood that future conditions could be wetter or drier than those represented by the scenario. Use of the 50% LOC aligns with past DCR practices and provides a balanced basis for estimating imported water availability under climate change.

**TABLE 4: HYDROLOGIC PARAMETER CHANGES FOR EACH 2043 CLIMATE CHANGE SCENARIO LEVEL OF CONCERN (DWR DCR 2023 TABLE 7-1)**

| Future System Performance Level of Concern (%) | Change in Temperature C° | Change in Average Precipitation (%) | Change in Precipitation Intensification (%) |
|---|---|---|---|
| 50% | 1.5 | +1.5% | +11% |
| 75% | 1.7 | +1.01 | +12% |
| 95% | 1.8 | -1.8% | +13% |

Sea level rise affects SWP operations primarily through its influence on conditions in the Sacramento San Joaquin Delta (Delta). As an estuary, the Delta is highly sensitive to rising sea levels, which pushes salty ocean water farther upstream into the interior channels. To prevent this salinity intrusion and maintain required Delta water quality, operators must release additional freshwater from upstream reservoirs. Maintaining these salinity levels is critical for protecting beneficial uses in Delta, including habitat for endangered and other native estuarine species.

Over the years, the U.S. Fish and Wildlife Service and National Marine Fisheries Service have issued multiple Biological Opinions that impose operational constraints on the SWP. These include limits on Delta exports during certain time periods and requirements for minimum Delta outflows to protect species. Meeting these outflow requirements often necessitates higher freshwater releases through the Delta, which in turn reduces the volume of water available for export to SWP contractors.

DWR incorporates sea level rise into its modeling by adjusting Delta salinity boundary conditions and increasing the freshwater outflow needed to meet salinity objectives. Although salinity impacts are not analyzed as a standalone factor, they are embedded within the adjusted hydrology and drive changes in modeled delivery capability across different levels of concern (LOCs). Under the 50 percent LOC scenario the model includes a projected sea level rise of 15 centimeters by 2043.

DWR provided a 2025 Draft DCR that shows SWP deliveries and allocations for existing and 50% LOC future conditions, as well as, specific allocations per contractor via alternative data tables. **Table 5** shows SCV Water's planning assumptions, as provided in the alternative data tables, for the estimates of SWP Table A Water Deliveries over the long term for normal and dry conditions. The table includes the addition of SCV allocation of Table A with estimated percent (%) of allocation for deliveries. Long term average deliveries from the 1922-2021 hydraulic record show 50% allocation for baseline conditions and 43% allocation for 50% central tendency projections.

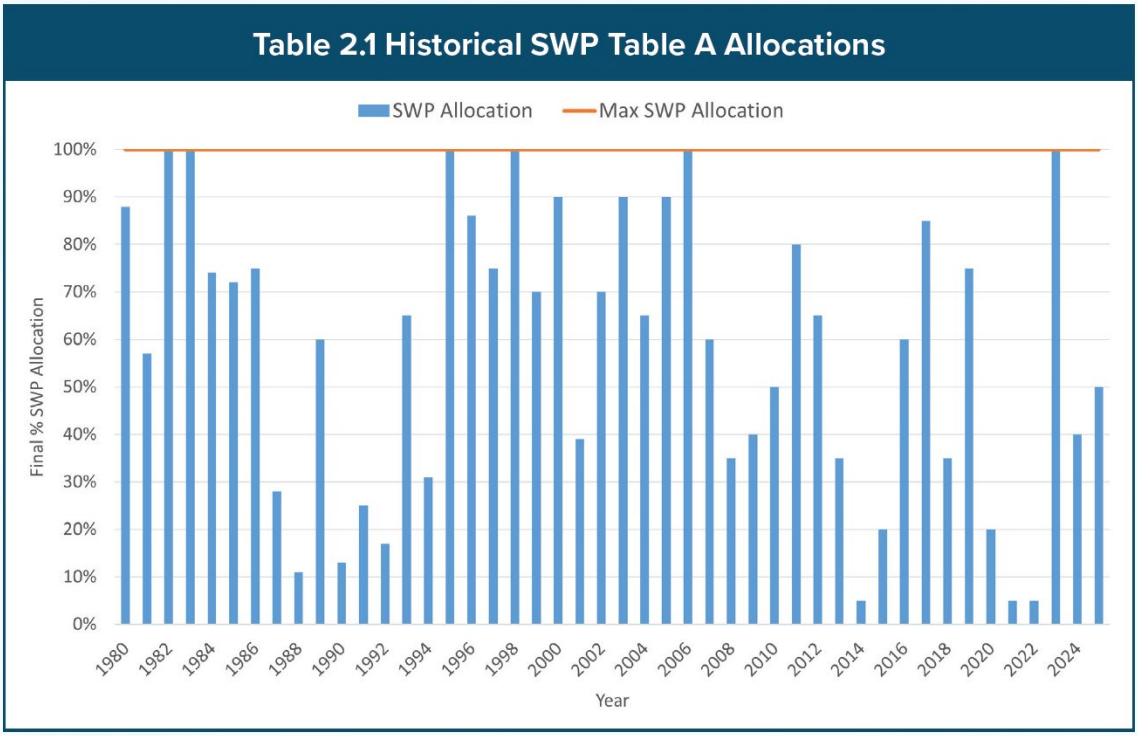
**TABLE 5: 2025 DCR TABLE A DELIVERIES BASELINE AND 50% LOC COMPARISON**

| 2025 DCR Table A Deliveries Under 2043 50% LOC | | | | | |
|---|---|---|---|---|---|
| **Period Type** | **Period Description** | **Draft DCR 2025 Existing Conditions (TAF)** | **Draft DCR 2025 2043 50% LOC (%)** | **DCR Existing Conditions SCV Table A Allocations (Acre-feet)** | **50% LOC Result SCV Table A Allocation (Acre-feet)** |
| **Long-Term Average** | 1922-2021 | 50% | 43% | ~47,600 | ~41,000 |
| **Dry Period** | Single Dry Year (1977) | 6% | 2%[1] | ~5,700 | ~1,900 |
| | 5-Year Drought (1929-1933) | 15% | 13% | ~14,300 | ~12,400 |

Note:
[1]For UMWP purposes, additional guidance from DWR for SWP contractors included assuming a 5% allocation—approximately 4,700 AFY—for a single dry year for 2025 – 2050 planning period.

Year to year variability of SWP Table A allocations are showing in **Figure 9** below. Each year water supply is decided by DWR based on the state's hydrologic conditions for that year. To meet demand SCV water utilizes a combination imported water supplies including Table A allocation, SWP carryover, SWP article 21, and water from groundwater banks.

**FIGURE 9: HISTORICAL SWP TABLE A ALLOCATIONS**




## 5.2 Groundwater

*Overview*

SCV Water overlies the Santa Clarita River Valley Groundwater Basin, Eastern Subbasin (DWR Basin No. 4-4.07), which is the sole source of groundwater supply for the Agency. The Santa Clarita Valley Groundwater Sustainability Agency (SCV-GSA) prepared a Groundwater Sustainability Plan (GSP) to comply with California's Sustainable Groundwater Management Act (SGMA) and to maintain long-term groundwater sustainability over the required 20-year planning horizon.

Climate change impacts on groundwater availability in the Santa Clarita Valley are evaluated using the methodology, assumptions, and modeling framework developed in the GSP, ensuring consistency between basin-scale groundwater management and UWMP water supply planning. The climate-adjusted groundwater scenarios evaluated in the GSP reflect the same projected temperature increases, evapotranspiration changes, and precipitation patterns described earlier in this Technical Memorandum, translated into basin-scale water budgets and groundwater availability.

The GSP characterizes the Santa Clarita Valley climate as semi-arid Mediterranean, with hot, dry summers and short, wet winters. The basin consists of two primary aquifer systems: the Alluvial Aquifer, a shallow unconfined aquifer with relatively high permeability and strong hydraulic connection to surface water, and the Saugus Formation, a deeper confined to semi-confined aquifer that provides greater storage capacity and functions as a long-term drought reserve. Recharge to the basin occurs through natural sources such as rainfall and streamflow infiltration, as well as anthropogenic sources including irrigation return flows and wastewater treatment plant discharges.

For the UWMP, the same pumping assumptions and Basin Operating Plan strategies modeled in the GSP are assumed, ensuring alignment across SCV Water planning documents and avoiding inconsistencies in groundwater availability or operational expectations.

*Climate Change and Groundwater*

The GSP integrates climate change into groundwater management through climate-adjusted water budget modeling, using DWR-provided local climate change factors for precipitation and reference evapotranspiration (ET). Historical hydrologic records spanning 1925–2019 are adjusted to simulate future climate conditions and applied to projected water budgets over the 2030–2070 planning period.

A full buildout scenario without climate change represents anticipated future land and water use by 2042 absent climate-related adjustments and provides a baseline for comparison.

Two climate-adjusted scenarios were then developed to assess near-term and longer-term conditions:

- A 2042 climate scenario, which applies near-term climate change factors consistent with average 2030 conditions, including an approximate 5 percent reduction in precipitation and a 3 percent increase in reference evapotranspiration (ET); and
- A 2072 climate scenario, which applies longer-term climate change factors consistent with average 2070 conditions, including an approximate 10 percent reduction in precipitation and a 6 percent increase in ET.

The 2042 scenario is emphasized for planning purposes because it aligns with SGMA's 20-year implementation horizon, while the 2072 scenario provides insight into longer-term conditions beyond the initial SGMA period.

Under full buildout conditions without climate change, total groundwater inflows and outflows are approximately 49,000 acre-feet per year (AFY), representing a balanced condition under SGMA assumptions. When climate change factors are applied, modeled water budgets indicate a net reduction of approximately 2,000–3,000 AFY in groundwater availability under the 2042 scenario and approximately 5,000–6,000 AFY under the 2072 scenario. These results reflect central-tendency climate change assumptions and do not include extreme wet or dry climate scenarios.

Despite these reductions, groundwater modeling results presented in the GSP indicate that the basin remains sustainable under SGMA criteria, with no indication of chronic long-term groundwater level declines or basin-wide overdraft when Basin Operating Plan strategies and climate adjustments are applied.

*Groundwater Production and Drought Operations*

Under normal hydrologic conditions, total groundwater production is projected at approximately 48,293 AFY, with about 37,193 AFY produced from the Alluvial Aquifer and 11,100 AFY from the Saugus Formation.

**Table 6** summarizes projected groundwater production under normal and extended drought conditions, consistent with the GSP Basin Operating Plan.

During extended drought conditions, groundwater operations shift to reduce stress on the shallow Alluvial Aquifer and increase reliance on the deeper Saugus Formation:

- Pumping from the Alluvial Aquifer is reduced to 32,500 AFY during drought years.
- Pumping from the Saugus Formation increases progressively, reaching 35,000 AFY by the third consecutive dry year.

This operational strategy reflects a deliberate shift toward use of the Saugus Formation as a strategic drought reserve, preserving shallow groundwater levels and reducing impacts to connected surface water systems during prolonged dry periods.

**TABLE 6: GROUNDWATER PRODUCTION BASED ON OPERATING PLAN FOR BASIN**

| Aquifer | Normal Years (AF) | Dry Year 1 (AF) | Dry Year 2 (AF) | Dry Year 3 (AF) |
|---|---|---|---|---|
| Alluvium | 30,000–40,000 | 30,000–35,000 | 30,000–35,000 | 30,000–35,000 |
| Saugus | 7,500–15,000 | 15,000–25,000 | 21,000–25,000 | 21,000–35,000 |
| Total | 37,500–55,000 | 45,000–60,000 | 51,000–60,000 | 51,000–70,000 |

*Historic Pumping and Comparison to Projected Operations*

Historical groundwater pumping from the Alluvial Aquifer has generally ranged between 25,000 and 45,000 AFY, with municipal pumping increasing through the 1990s and early 2000s before declining after 2015. As shown in **Figure 10**, projected pumping of approximately 37,000 AFY in normal years and 32,500 AFY during dry years is consistent with historical averages and well below peak historical production levels observed in the mid-1990s and early 2010s.

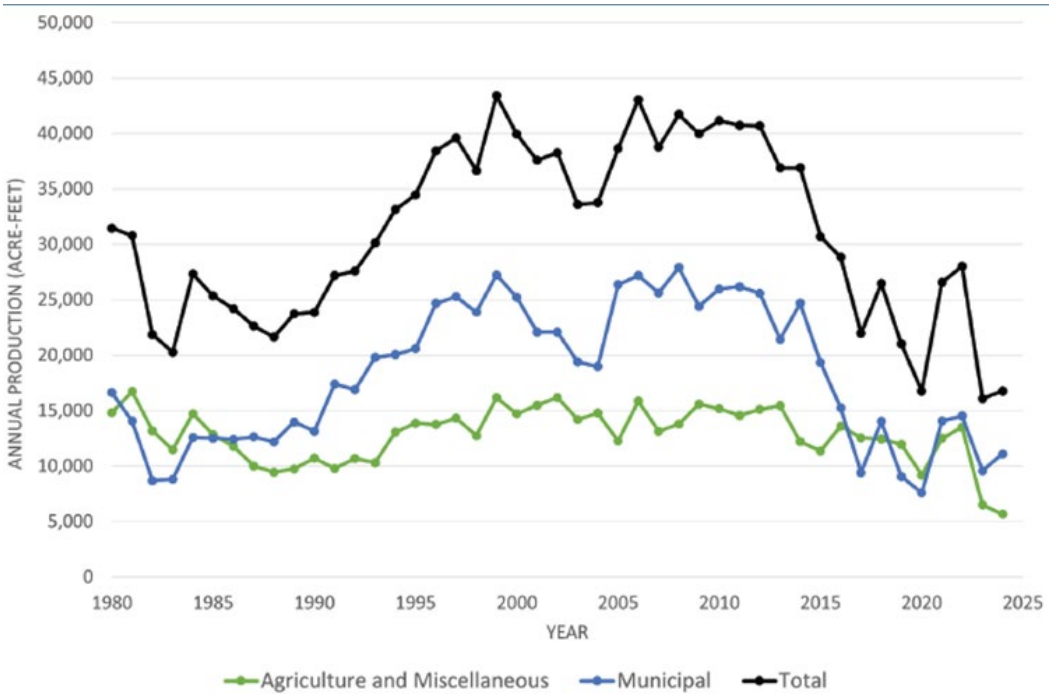
By contrast, the Saugus Formation has historically been used sparingly, with pumping typically below 10,000 AFY. The projected increase to 35,000 AFY during extended droughts represents a substantial but intentional operational change, reflecting its role as a long-term storage reserve rather than a routine supply source.

Projected groundwater production under the Basin Operating Plan was evaluated in the GSP relative to SGMA minimum thresholds and management trigger levels, including groundwater elevation thresholds at representative monitoring wells. Results indicate that modeled pumping levels under both normal and drought conditions remain above established minimum thresholds and within defined trigger levels, even when accounting for climate-adjusted reductions in recharge and increased evapotranspiration. This confirms that the projected operational strategy is consistent with SGMA sustainability criteria. Detailed

threshold definitions, monitoring locations, and trigger responses are documented in the GSP and are not repeated in the UWMP.

Climate change is expected to exacerbate variability in surface water supplies, increasing reliance on groundwater during dry periods. Under the 50% LOC scenario, reductions in SWP deliveries and increased evapotranspiration will likely heighten the importance of the Basin Operating Plan's drought strategy. The ability to shift pumping from the Alluvial Aquifer to the Saugus Formation during multi-year droughts will be critical for maintaining reliability and avoiding undesirable results under SGMA.

**FIGURE 10: GROUND WATER PRODUCTION- ALLUVIUM**




*Groundwater Dependent Ecosystems*

Groundwater-dependent ecosystems (GDEs) within the Santa Clara River Valley Eastern Subbasin are sustained by shallow groundwater conditions and groundwater–surface water interactions that support riparian vegetation, aquatic habitat, and seasonal surface water features. These ecosystems are inherently sensitive to changes in groundwater elevations, baseflow contributions, and the duration of wet conditions. As a result, climate change represents a potential stressor to GDEs through its influence on precipitation, evapotranspiration, and recharge processes that govern shallow groundwater availability.

The GSP explicitly incorporates consideration of GDEs into basin management and evaluates climate change impacts using climate-adjusted groundwater modeling. Under the climate-adjusted scenarios evaluated in the GSP, projected reductions in precipitation and increases in evapotranspiration result in lower effective recharge and increased seasonal groundwater demand, which may contribute to greater seasonal drawdown of shallow groundwater levels. These conditions can increase stress on riparian vegetation, reduce surface water connectivity, and shorten the persistence of pools and wet habitat during dry periods.

Climate-driven effects are expected to be most pronounced during extended dry and multi-year drought conditions, when reliance on groundwater increases and surface water availability is reduced.

Despite these projected stressors, groundwater modeling results presented in the GSP indicate that basin-wide conditions remain sustainable under SGMA criteria, including areas proximate to identified GDEs. Modeled groundwater elevations under both the 2042 and 2072 climate scenarios remain above established minimum thresholds at representative monitoring wells used to evaluate potential impacts to groundwater-dependent ecosystems. These results reflect the combined influence of basin hydrogeology, conservative pumping assumptions, and the operational strategies defined in the Basin Operating Plan.

The Basin Operating Plan plays a key role in mitigating potential climate change impacts to GDEs by limiting reliance on the shallow Alluvial Aquifer during drought periods and shifting incremental pumping to the deeper Saugus Formation, which has greater storage capacity and a more limited hydraulic connection to surface ecosystems. This operational approach reduces the likelihood of excessive drawdown in shallow groundwater zones that support riparian and aquatic habitats, particularly during prolonged dry periods.

In addition to modeling results, protection of GDEs is supported through the GSP's monitoring framework, which includes groundwater elevation thresholds and management triggers at wells located near groundwater–surface water interaction areas. If groundwater levels approach threshold conditions, the GSP identifies management actions that may be implemented to avoid undesirable results, including adjustments to pumping patterns and increased reliance on alternative supplies. This adaptive management framework provides an additional layer of protection for groundwater-dependent ecosystems under changing climate conditions.

Overall, the GSP's climate-adjusted analysis indicates that, while climate change may increase seasonal and interannual stress on groundwater-dependent ecosystems, sufficient groundwater is expected to remain available to support GDEs within the Santa Clara River Valley Eastern Subbasin under the evaluated scenarios. The basin is anticipated to remain sustainable and continued monitoring and adaptive management will be essential to ensure that ecosystem conditions are protected as climate conditions evolve over time.

*Conclusion*

Climate change is expected to influence groundwater conditions in the Santa Clarita River Valley Eastern Subbasin primarily through reduced effective recharge and increased evapotranspiration, consistent with the temperature and precipitation trends described earlier in this Technical Memorandum. When these climate signals are incorporated into groundwater water budgets using DWR-provided climate change factors, modeled results show modest reductions in groundwater availability under both near-term and longer-term scenarios.

Despite these reductions, groundwater modeling performed for the GSP demonstrates that the basin remains sustainable under SGMA criteria, with projected pumping levels remaining within established management thresholds and no indication of chronic long-term groundwater level declines. The Basin Operating Plan's strategy of reducing reliance on the shallow Alluvial Aquifer and increasing use of the deeper Saugus Formation during droughts is a critical component of maintaining both supply reliability and ecosystem protection under climate change.

Overall, the GSP's climate-adjusted analysis indicates that groundwater can continue to play a resilient and reliable role in SCV Water's supply portfolio under central-tendency climate conditions, provided that ongoing monitoring, adaptive management, and coordination with imported water and demand management strategies are maintained.

## 5.3 Recycled Water

Recycled water is an important component of SCV Water's supply portfolio, but climate change affects recycled water differently than other sources because recycled water supply and recycled water use respond to different drivers. Recycled water availability is primarily determined by wastewater influent volumes, which are closely linked to indoor water use and overall service area growth. Because indoor water use is relatively stable across climate conditions compared to outdoor irrigation, climate change is not expected to materially reduce the volume of recycled water produced.

In contrast, recycled water is used primarily for non-potable outdoor irrigation and other non-potable demands that are directly influenced by climate conditions. As described in the demand and regional climate sections of this Technical Memorandum, increasing temperatures and higher evapotranspiration increase outdoor water needs, while precipitation can offset irrigation demand in some years. Because outdoor use is more sensitive to temperature than precipitation, the net effect of climate change is expected to increase irrigation demand over time. As a result, while recycled water supply is not expected to decline due to climate change, recycled water demand (use) may increase, potentially increasing the importance of recycled water as a substitute for potable supplies during warm and dry periods Over the past 20 years, recycled water use from existing accounts has remained relatively constant at approximately 400 AFY, and in 2025 recycled water was 492 AFY.

Although recycled water is generally considered a climate-resilient supply because its production is tied to indoor flows, a planning consideration under climate change is the potential for divergence between supply and demand. If outdoor irrigation requirements increase faster than recycled water production or system expansion, SCV Water may experience increased pressure to allocate limited recycled water supplies among competing non-potable uses, which could affect the degree to which recycled water can offset potable demand during high-stress periods.

Overall, recycled water supply is expected to remain stable and scalable with growth, but climate change is expected to increase recycled water use demands, particularly for outdoor irrigation. Long-term planning should therefore treat recycled water as a resilient supply with potentially increasing value for potable offset, while also recognizing that future allocation priorities, including ecological needs, may influence how recycled water contributes to overall system reliability.

## 5.4 Other Supply Sources

*Transfers and Exchanges*

SCV Water utilizes water transfers and exchanges as a supplemental supply when surplus water is available beyond local storage and exchange opportunities. These mechanisms provide operational flexibility and can help balance short-term supply and demand conditions, particularly during periods of hydrologic variability.

For purposes of climate change evaluation in the UWMP, water transfers and exchanges that are currently under contract are assumed to remain unchanged under future climate conditions, unless specific provisions in the contract explicitly link the availability or volume of transferred water to external factors such as SWP allocations or other hydrologic conditions. Where contract language ties delivery amounts to imported water availability or regional hydrology, the reliability of these transfers may be indirectly affected by climate-driven changes in water supply, consistent with the impacts described in Section 5.1 (Imported Water).

This assumption provides a conservative and transparent baseline for planning while recognizing that contractual or regulatory stipulations could result in adjustments under certain conditions. Any such adjustments would be reflected in supply projections and reliability analyses rather than assumed implicitly in this climate change assessment.

Looking forward, future transfers and exchanges involving imported water supplies are assumed to be affected by climate change in the same manner as primary imported water supplies. Reductions in imported water availability due to climate-driven changes in runoff timing, increased variability, or drought conditions would similarly influence the volume of water available for transfer or exchange. As a result, transfers and exchanges should not be viewed as independent from broader imported water reliability but rather as mechanisms that operate within the same climate and hydrologic constraints.

Overall, transfers and exchanges remain a valuable component of SCV Water's supply portfolio, providing flexibility under variable conditions. However, their long-term reliability under climate change is inherently linked to the performance of the underlying water sources, particularly imported water supplies, and is therefore addressed in coordination with imported water planning and reliability analyses.

*Groundwater Banking*

Groundwater banking is an important component of SCV Water's long-term supply portfolio, providing the ability to store water during wetter periods for use during dry and multi-year drought conditions. Groundwater banking programs rely on two key elements: available underground storage capacity and the availability of surplus water for recharge, and typically imported water delivered during wet years.

While subsidence and overdraft are more directly "human driven," these are cascading effects of the climate trends outlined, and such issues (subsidence, overdraft, compaction) could potentially impact storage capacity; however, sustainable groundwater basin management and legislation require groundwater sustainability in the face of climate change to be considered and mitigated. Therefore, for the purposes of this evaluation, physical storage capacity remains unchanged for groundwater banking and climate change is not expected to alter the subsurface storage capacity of the basins used for banking. This assumption allows groundwater banking to continue to function as a flexible supply management tool that enhances overall system reliability. However, while storage capacity itself is assumed to be stable, climate change may affect the timing and quantity of water available for recharge, as well as operational considerations such as delivery timing and conveyance constraints.

SCV Water maintains dry-year reserves within two long-term groundwater banking programs, as well as additional short-term exchange and banking arrangements located outside the service area. These programs are used to store surplus SWP water in wet years and to recover stored supplies during dry years to supplement local water availability.

The availability of imported water during wet years is therefore a critical driver of groundwater banking effectiveness. Based on projections under the 2043 50 percent LOC scenario from the DWR DCR, and the May 2025 DCR addendum addressing subsidence impacts, climate change and conveyance constraints are expected to influence the volume of SWP water available for storage in wet periods.

The May 2025 subsidence addendum indicates that land subsidence affecting the California Aqueduct and related conveyance infrastructure can reduce the system's ability to deliver SWP water, particularly during high-flow periods. As shown in **Table 7,** estimated wet-year deliveries under the 50% LOC scenario decline when subsidence impacts are applied, with reductions exceeding 20,000 acre-feet in certain single wet-year scenarios, such as 1998 and 2017. These reductions reflect diminished conveyance capacity rather than a lack of water in the system.

**TABLE 7: ESTIMATED WET-YEAR IMPORTED WATER DELIVERIES TO SCVWA UTILIZING 50% LOC**

| Wet-Year Scenario | Delivery % Without Subsidence | AF Without Subsidence | Delivery % With Subsidence | AF With Subsidence | Reduction Due to Subsidence (AF) |
|---|---|---|---|---|---|
| Single Year (1983) | 92% | 87,584 | 81% | 77,112 | 10,472 |
| Single Year (1998) | 93% | 88,536 | 70% | 66,640 | 21,896 |
| 2-Year (1982-1983) | 87% | 82,824 | 70% | 66,640 | 16,184 |
| 4-Year (1980-1983) | 69% | 65,688 | 64% | 60,928 | 4,760 |
| 6-Year (1978-1983) | 67% | 63,784 | 62% | 59,024 | 4,760 |
| 10-Year (1978-1987) | 59% | 56,168 | 57% | 54,264 | 1,904 |
| Single Year (2017) | 85% | 80,920 | 61% | 58,072 | 22,848 |

**Acre-feet (AF) volumes are calculated by applying delivery percentages to SCV Water's Table A allocation of 95,200 AF.*

***The reduction column quantifies the loss in imported water availability attributed to subsidence impacts.*

Reduced conveyance capacity limits operational flexibility and the ability to adjust delivery timing during wet years. In some cases, these constraints result in greater volumes of water remaining in upstream reservoirs, increasing system storage but reducing immediate deliveries available for groundwater banking. As a result, climate change combined with subsidence may modestly reduce the volume of imported water available for recharge during wet years, even when hydrologic conditions would otherwise support higher deliveries.

Despite these constraints, groundwater banking remains a key element of SCV Water's supply reliability strategy. While future wet-year deliveries available for storage may be reduced if subsidence impacts are not mitigated, banking programs continue to provide valuable drought resilience by allowing SCV Water to shift water availability across years. Planning for groundwater banking therefore assumes continued use of these programs, while recognizing that climate-driven changes to imported water reliability and conveyance capacity may reduce recharge opportunities under certain conditions.

Overall, groundwater banking is expected to remain an effective and flexible supply management tool under future climate conditions. However, long-term planning and reliability assessments should account for potential reductions in wet-year recharge opportunities associated with climate change and subsidence, reinforcing the importance of coordinated management of imported water supplies, groundwater operations, and infrastructure investments.

# 6. Conclusion: Climate Change Implications for Long-Term Water Supply Planning

This Climate Change Technical Memorandum evaluates how projected climate conditions may influence water demand and the reliability of SCV Water's diverse supply portfolio, including imported water, groundwater, recycled water, transfers and exchanges, and groundwater banking.

The analyses summarized in this memorandum demonstrate that climate change is expected to affect SCV Water's system primarily through increased variability and compounding stressors, rather than through abrupt loss of any single supply source. **Figure 11** visually summarizes the impacts and vulnerabilities associated with climate change on SCV Water's supply system. This figure illustrates the interconnected nature of climate-driven stressors, including demand fluctuations, groundwater sustainability, and ecological considerations. It serves as a comprehensive overview, reinforcing the need for coordinated and adaptive management strategies in response to evolving climate challenges. **Figure 12** shows climate change impacts on the SWP. These impacts and dependencies show how SWP water delivery is interconnected and how climate change impacts many facets of water deliveries.

Importantly, no individual supply source is projected to fail under the evaluated climate scenarios. Instead, climate change acts as a system amplifier, increasing the frequency with which multiple stressors, higher demand, reduced imported water availability, groundwater drawdown, and ecological constraints, occur simultaneously. This reinforces the importance of integrated portfolio management rather than reliance on any single supply or assumption.

Viewed collectively, the impacts of climate change on SCV Water's supplies are interconnected. Climate-driven reductions in State Water Project reliability increase the importance of groundwater and groundwater banking during dry periods. At the same time, climate-adjusted groundwater modeling shows modest reductions in available recharge but continued basin sustainability when Basin Operating Plan strategies are applied. Recycled water supply remains resilient because it is driven by indoor use, but climate-driven increases in outdoor demand heighten its value as a potable offset and raise potential allocation considerations, including ecological uses. Transfers, exchanges, and banking remain viable tools, but their effectiveness is influenced by the same climate and conveyance constraints affecting imported water.

Taken together, the analyses presented in this memorandum provide a cumulative view of how climate-driven changes to demand, imported water reliability, groundwater conditions, and operational flexibility may overlap rather than occur in isolation. This integrated perspective reinforces that climate change planning is less about predicting a single outcome and more about understanding how multiple moderate impacts can combine to influence overall system reliability.

Several considerations emerge from this analysis that are relevant for long-term planning:

- Climate change increases uncertainty and variability, making flexibility and operational adaptability more important than maximizing any single supply.
- Groundwater and banking strategies are increasingly critical, particularly during multi-year droughts when imported supplies are constrained.
- Demand growth and climate impacts interact, with temperature-driven demand increases reinforcing supply-side stresses during dry periods.
- Ecological and regulatory considerations are integral, not external, to water supply reliability under future climate conditions.
- Infrastructure performance matters, as conveyance limitations such as subsidence can affect supply availability even in wet years.

These considerations do not indicate a loss of reliability, but they do underscore the importance of coordinated planning across demand management, imported water operations, groundwater sustainability, and infrastructure investment.

This Climate Change Technical Memorandum documents how climate change was evaluated across demand and supply components using best available information from DWR, SCV Water's WDF tools, and the GSP. More importantly, it represents an intentional step by SCV Water to move toward a more integrated understanding of climate impacts. By explicitly linking climate science to demand forecasting, imported water reliability, groundwater sustainability, recycled water use, and operational flexibility, this memorandum provides a foundation for informed decision-making as SCV Water considers future investments, policies, and adaptive strategies. As climate conditions continue to evolve, the insights developed here can be refined and expanded through future planning efforts, ensuring that SCV Water remains resilient, adaptable, and prepared to meet the challenges of a changing climate.

**FIGURE 11: LOCAL SCV WATER CLIMATE CHANGE IMPACTS AND VULNERABILITIES**

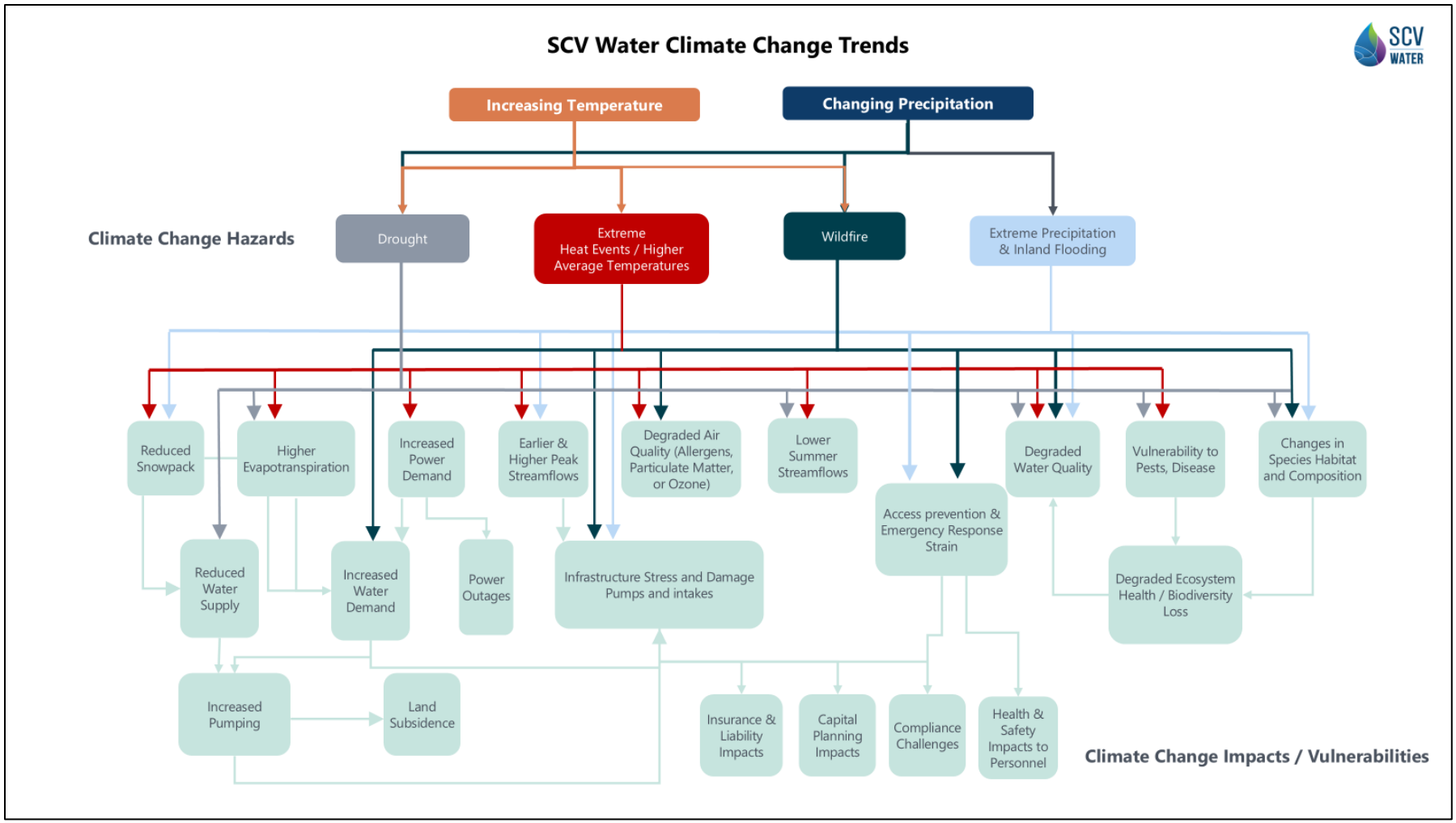
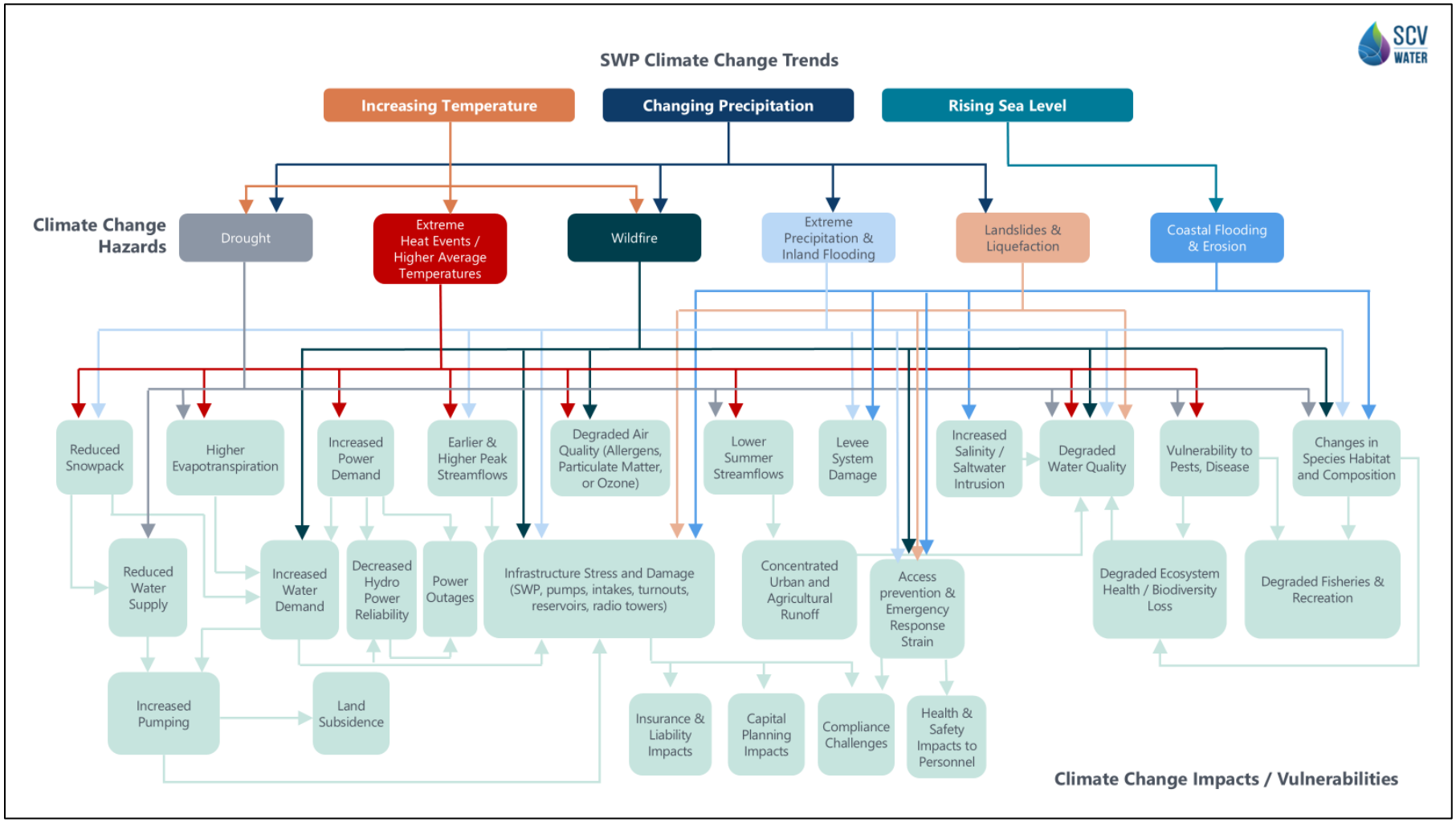


**FIGURE 12: CLIMATE CHANGE IMPACTS ON SWP**



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