DRAFT - Drought Contingency Plan

Pechanga Indian Reservation

MARCH 2024

Prepared for:

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Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AF	acre-feet
AFY	acre-feet per year
CIMIS	California Irrigation Management Information System
CRA	Colorado River Aqueduct
DEW	drier with extreme warming
DCP	drought contingency plan
DMP	drought monitoring program
DSCI	drought severity and coverage index
DWR	Department of Water Resources
EMWD	Eastern Municipal Water District
ET	evapotranspiration
ET_o	reference evapotranspiration
GHG	greenhouse gas
GOR	Great Oak Rock well
MWDSC	Metropolitan Water District of Southern California
NOAA	National Ocean and Atmospheric Administration
PWS	Pechanga Water Systems
RCP	Representative Concentration Pathway
RCWD	Rancho California Water District
SPI	Standardized Precipitation Index
SWP	California State Water Project
USDM	U.S. Drought Monitor
USGS	U.S. Geological Survey
WMW	wetter with moderate warming

Executive Summary

The Pechanga Indian Reservation Drought Contingency Plan (DCP) was developed for the Pechanga Band of Indians (Tribe) to evaluate their vulnerabilities related to drought, identify actions that can improve their drought resiliency, and establish a drought monitoring and response program. The primary focus of the DCP is on drought impacts to the Tribe's water supply; the implications of these impacts to human, environmental, cultural,and economic health; and on how modifications to supply and demand could mitigate the impacts.

The Pechanga Indian Reservation's residents (~600) and the staff and tourists of the casino and golf course (upwards of 20,000 people per day) are currently supported by groundwater pumped from four wells and recycled water provided by Eastern Municipal Water District . When needed, the Tribe's supply may be augmented by potable water from the Metropolitan Water District of Southern California. The Tribe's claim to 4,994 acre-feet per year of water was ensured in the 2016 Pechanga Band of Luiseño Mission Indians Water Rights Settlement Act (Bill HR 5984), which included a provision to bank up to 6,000 acre-feet of groundwater.

While the 4,994 acre-feet per year claim meets current and projected water demands for the Tribe, recent severe droughts and issues with groundwater quality have encouraged the Tribe to assess their vulnerabilities and develop measures to improve their resiliency and independence. Based on analysis of projected local and regional short- and long-term drought conditions, the Tribe is projected to experience increased air temperatures, prolonged dry seasons, increasing wildfire risks, and multiyear droughts. Without modifications to existing water supply and/or demand, this could result in decreased groundwater storage, decreased access to recycled water, and decreased access to imported potable water.

This DCP was developed in coordination with input from the Pechanga Indian Reservation community and from the Pechanga Drought Task Force to identify and prioritize feasible and meaningful modifications to the Tribe's current supply and demand structure. It provides a framework for the Tribe to prepare for, monitor, and respond to the anticipated droughts of the twenty-first century. The primary components of the DCP framework are:

- **Drought Monitoring Program (Section 2):** The drought monitoring program will be overseen by Pechanga Water Systems. This program consists of monthly evaluations of local and regional hydrological and meteorological data to establish current drought conditions (i.e., drought stages).
- **Vulnerability Assessment (Section 3):** The vulnerability assessment estimates shifts in temperature, evapotranspiration demands, precipitation, streamflow, and groundwater recharge using climate projection tools developed through the State of California's Fourth Climate Change Assessment. These shifts are evaluated relative to the Tribe's human, environmental, cultural, and economic health.
- **Mitigation Actions (Section 4):** The mitigation actions are designed as preemptive actions the Tribe can take to improve water supply (e.g., increase production/storage, improve redundancy), reduce water demand, and improve public, environmental, and cultural health.
- **Response Actions (Section 5):** The response actions are designed to immediately augment supply and/or reduce demand during drought conditions. Designation and implementation of any of these actions during any drought stage will be conducted by the Pechanga Water Systems Director and will require input from the Pechanga Water Board and Tribal Council Liaisons.
- **Administrative and Operational Framework (Section 6):** Roles and responsibilities for overseeing tasks outlined within the DCP are defined in this section. Because the DCP is a living document, responsibilities have also been assigned for reviewing the efficacy of its components and updating them accordingly.

The DCP was developed in two phases. The first phase consisted of establishing a Drought Task Force, a workplan for the DCP, and developing communication protocol for engaging the Drought Task Force and community. Members of the Pechanga Drought Task Force include:

- Director of Pechanga Water Systems (DCP Manager)
- Director of the Pechanga Environmental Department (DCP Deputy Manager)
- Director of Pechanga Public Works
- Member from Pechanga Development Corporation
- Superintendent from Pechanga Golf Course
- Director of Facilities for the Pechanga Resort Casino
- Tribal Utility Consultant from Indian Health Services
- Regional Manager from the Rural Community Assistance Corporation
- Director of Water Resources for Western Municipal Water District
- Water Production Manager for Rancho California Water District

The second phase of the DCP consisted of the development of the drought monitoring program, the vulnerability assessment, development of the mitigation and response actions, and creation of the administrative and operational framework. The Drought Task Force helped review and guide development of each of these components prior to submittal to the Pechanga Indian Reservation community for their review and feedback (excluding community review of the administrative and operational framework). Workshops prepared for the Drought Task Force and community are provided in the appendices of this DCP.

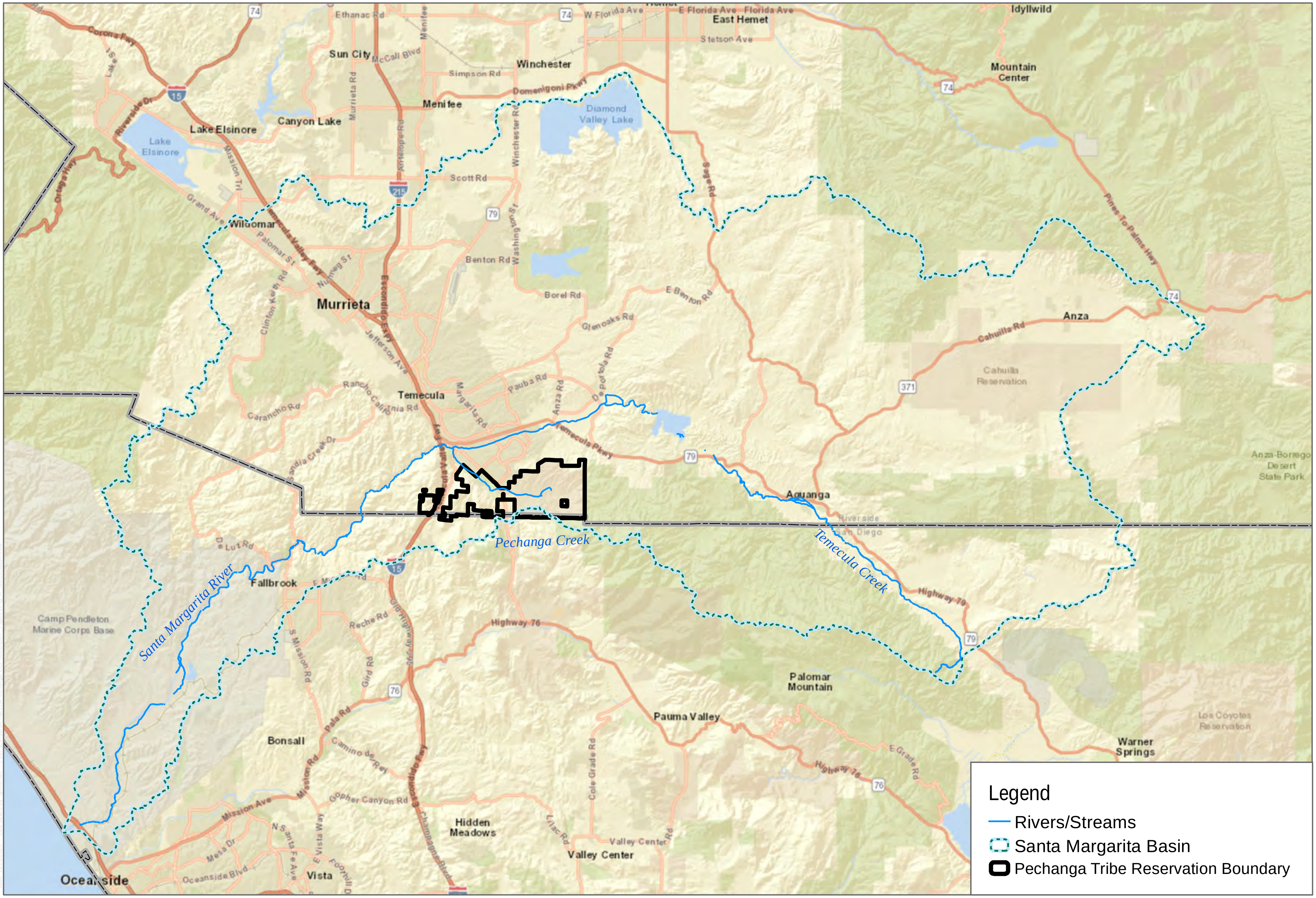
1 Introduction

The Pechanga Indian Reservation (Reservation) is located in a region of Southern California that has experienced periods of severe and prolonged droughts, which have impacted the primary source of water for the Pechanga Band of Indians (Tribe)—groundwater. Climate models project increasing temperatures and prolonged dry periods, which will increase drought stress on the Tribe. In response to worsening drought conditions, the evaluation of existing and projected water demands and infrastructure, as well as the development of robust drought monitoring and response programs, has become a priority for the Tribe. In 2020, the Tribe was awarded a U.S. Bureau of Reclamation WaterSMART grant for developing a drought contingency plan (DCP). The purpose of this DCP is to mitigate and prepare for the future impacts that droughts will have on the Reservation's community, ecosystems, and commerce, and to ensure the sustainability of water resources and community resiliency during severe droughts.

Historically, California has experienced several multiyear droughts. Notable droughts since the mid-twentieth century occurred in 1976–1977, 1987–1992, 2007–2009, 2012–2016, and most recently 2020–2023. These multiyear droughts have resulted in the loss of production wells for smaller communities throughout California (DWR 2024) and drastic cuts to imported water from the State Water Project (SWP) and Colorado River Aqueduct (CRA), which many communities in Central and Southern California have grown dependent on. As global temperatures are projected to rise due to increasing greenhouse gas (GHG) emissions, several climate models have been developed to project various local and global climate trends, which include anticipated shifts in temperature and precipitation. California's Fourth Climate Change Assessment downscaled 10 global climate models for Localized Constructed Analogues to simulate medium and high GHG and aerosol emissions for the state of California (Bedsworth et al. 2018; Pierce et al. 2018). In general, the models projected an increase in below-average water years (i.e., droughts) and an increase in high-intensity precipitation events when precipitation does arrive (e.g., similar to the atmospheric rivers from the 2023 water year). Based on these models, a primary concern for water providers in the arid southwest is the duration and frequency with which drought conditions may persist due to extreme annual variability in precipitation. With some projections including decadal and even multi-decadal droughts (Udall and Overpeck 2017), planning for various levels of drought severity is critical for ensuring the Reservation's water supplies are resilient through various drought stages and that they are able to support basic human health and community safety needs.

1.1 Geographic Overview

The Reservation is located in Riverside County, south of the City of Temecula (Figure 1). The Reservation is situated within the Pechanga Creek watershed at the northwest base of the Palomar Mountains, just upstream from Pechanga Creek's confluence with Temecula Creek in the Temecula Valley. The border of the Reservation extends from approximately 1,075 feet above mean sea level just upstream from the confluence of Pechanga Creek with Temecula Creek to approximately 2,750 feet above mean sea level in the Palomar Mountains.



SOURCE: National Hydrology Dataset, ESRI, NOAA weather stations, CIMIS, CDEC

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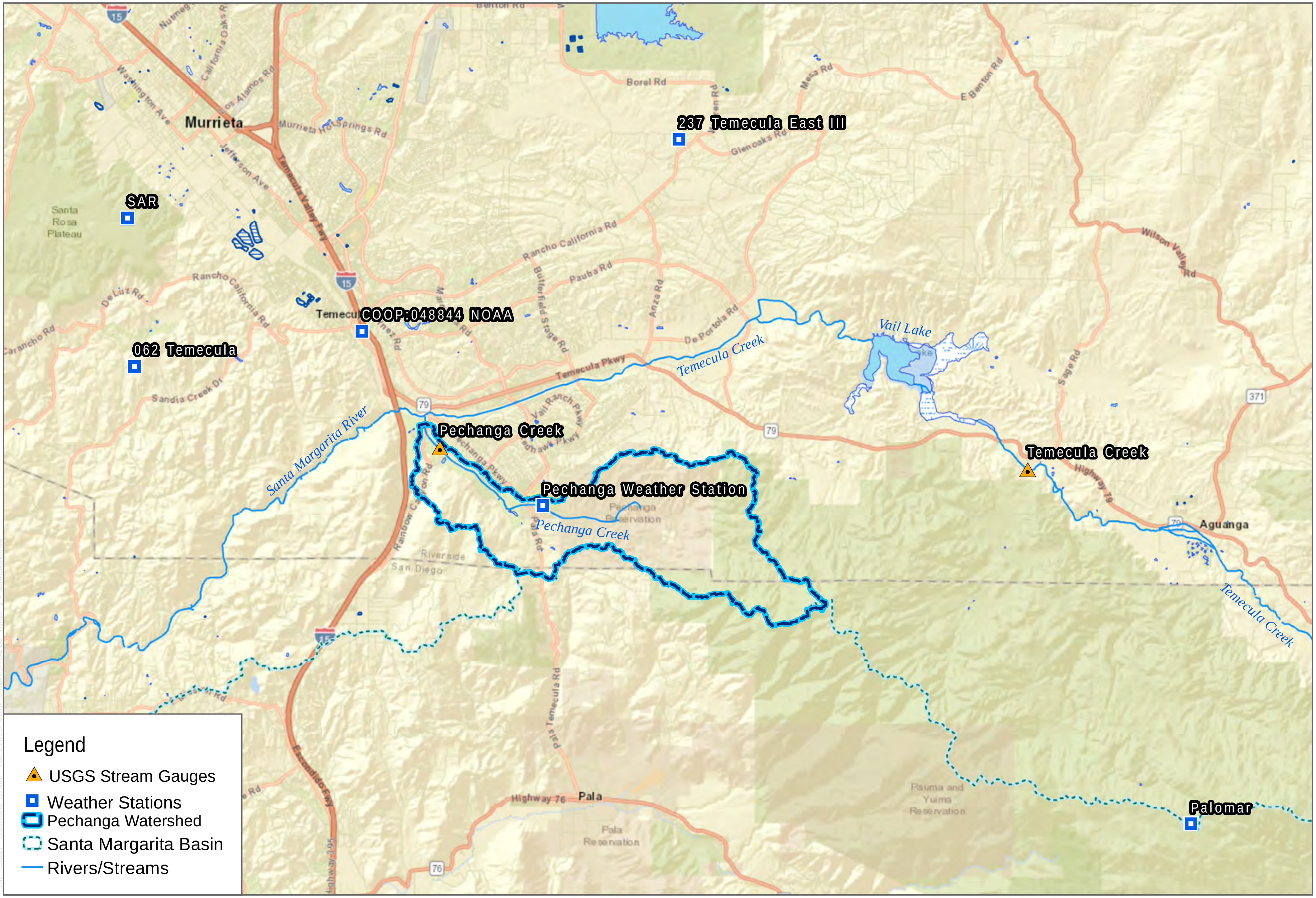
Figure 1: Pechanga Reservation Location

Pechanga Indian Reservation Drought Contingency Plan



SOURCE: National Hydrology Dataset, ESRI, NOAA weather stations, CIMIS, CDEC

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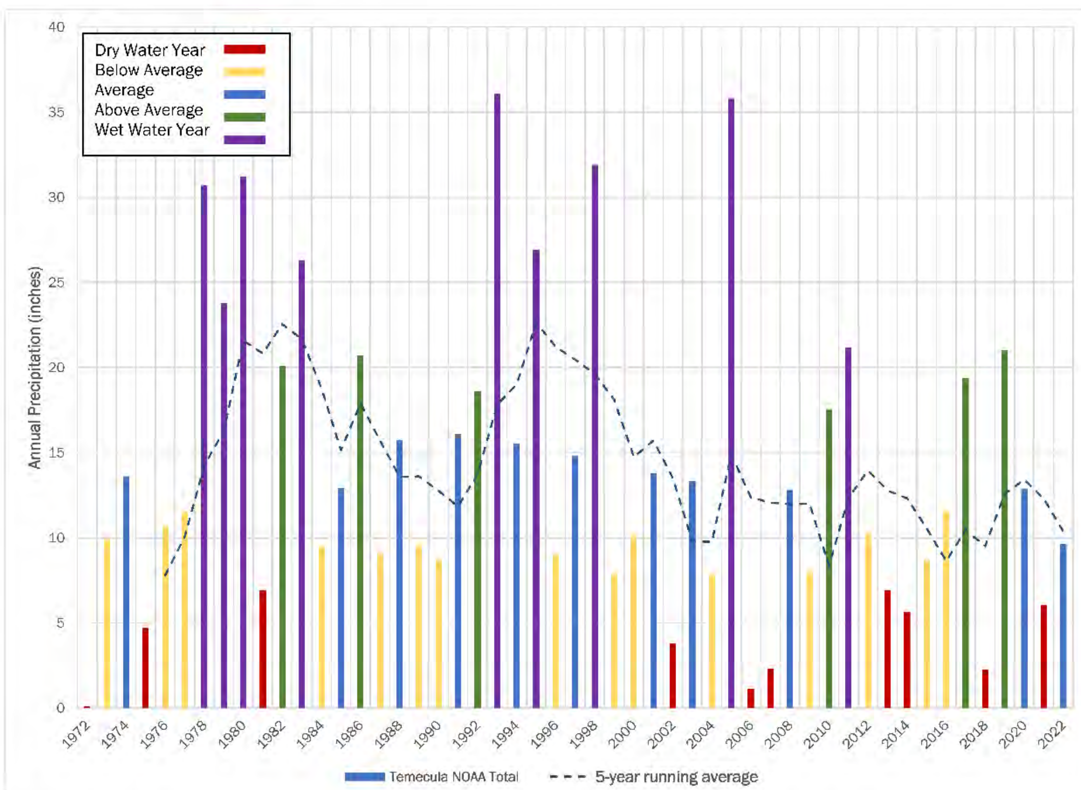
Figure 2: Pechanga Watershed
Weather Stations and Streamflow Monitoring Stations

Climate/Hydrology

The climate of the Reservation is characterized as Mediterranean, with cool, wet winters and dry, hot summers. On average, the Temecula Valley Groundwater Basin receives 7–15 inches of rainfall annually (DWR 2004), with the majority of the rainfall occurring during the winter rainy season (November through March). Rainfall recorded near the Reservation in Temecula Valley (National Oceanic and Atmospheric Administration [NOAA] station COOP:048844; Figure 2) provides a much broader range of annual rainfall totals, from less than 2 inches for a "dry" water year, to more than 35 inches for a "wet" water year (Figure 3). Based on review of historical precipitation records from surrounding weather stations (see Section 2.2.1), there is a natural bimodal distribution of water year types, where the majority of the water years receive less than 85% or more than 115% of the average rainfall. Sections of the Reservation at higher elevations receive more rainfall; a Bureau of Land Management weather station on Palomar Mountain at approximately 5,500 feet above mean sea level received between 11 and 70 inches of rain annually between the 2005 and 2023 water years.

Figure 3. Annual Precipitation Total - Temecula NOAA Station



Streamflow in Pechanga Creek is influenced by both rainfall and groundwater discharge. Rainfall duration, frequency, and intensity, along with antecedent soil moisture conditions and properties (e.g., infiltration rates, storage capacity) and groundwater levels, influence how much of the total precipitation is going to be captured in the watershed (soil storage, plant uptake), recharged to bedrock or alluvial aquifers, and generated as streamflow. During extremely dry years with depressed groundwater levels, Pechanga Creek functions more like an ephemeral stream that only experiences streamflow for brief periods following rainfall events in which rainfall intensity exceeds watershed storage and soil infiltration capacities; in extremely dry years, runoff may not occur in Pechanga Creek. Under more favorable water-year conditions and with higher groundwater elevations, Pechanga Creek is a seasonal stream that can sustain longer periods of flow.

Pechanga Creek joins the perennial Temecula Creek just downstream from the Reservation boundary. Temecula Creek flows into the larger Santa Margarita River approximately 0.6 miles downstream from the confluence with Pechanga Creek. The Santa Margarita River then flows through the Santa Rosa Mountains and Camp Pendleton prior to discharging into the Pacific Ocean. Pechanga Creek, Temecula Creek, and the Santa Margarita River all have stream gages managed by the U.S. Geological Survey (USGS), which are monitored by an appointed Watermaster.

In the fall and winter months, Southern California experiences the dry Santa Ana Winds that arise from the southwestern deserts and carry dry air to the California coast. The dry air significantly increases the risk of wildfires by causing vegetation to dry out under low-humidity conditions. The increased availability of dry vegetation as tinder poses a risk to the Tribe. The frequency for wildfire may escalate with worsening multi-decadal drought conditions.

Local Geology and Wolf Valley Subbasin

The Reservation overlies the Wolf Valley Subbasin of the southwestern portion of Temecula Valley Groundwater Basin (DWR 2004). The water-bearing formations found in the basin include the Pauba Formation and the Temecula Arkose Formation, and beneath this basin is a water-bearing fractured-igneous bedrock (Figure 4a). To the east of the Reservation lies the Vail Lake Reservoir on Temecula Creek. The reservoir, managed and owned by Rancho California Water District (RCWD), is used to recharge the groundwater basin.

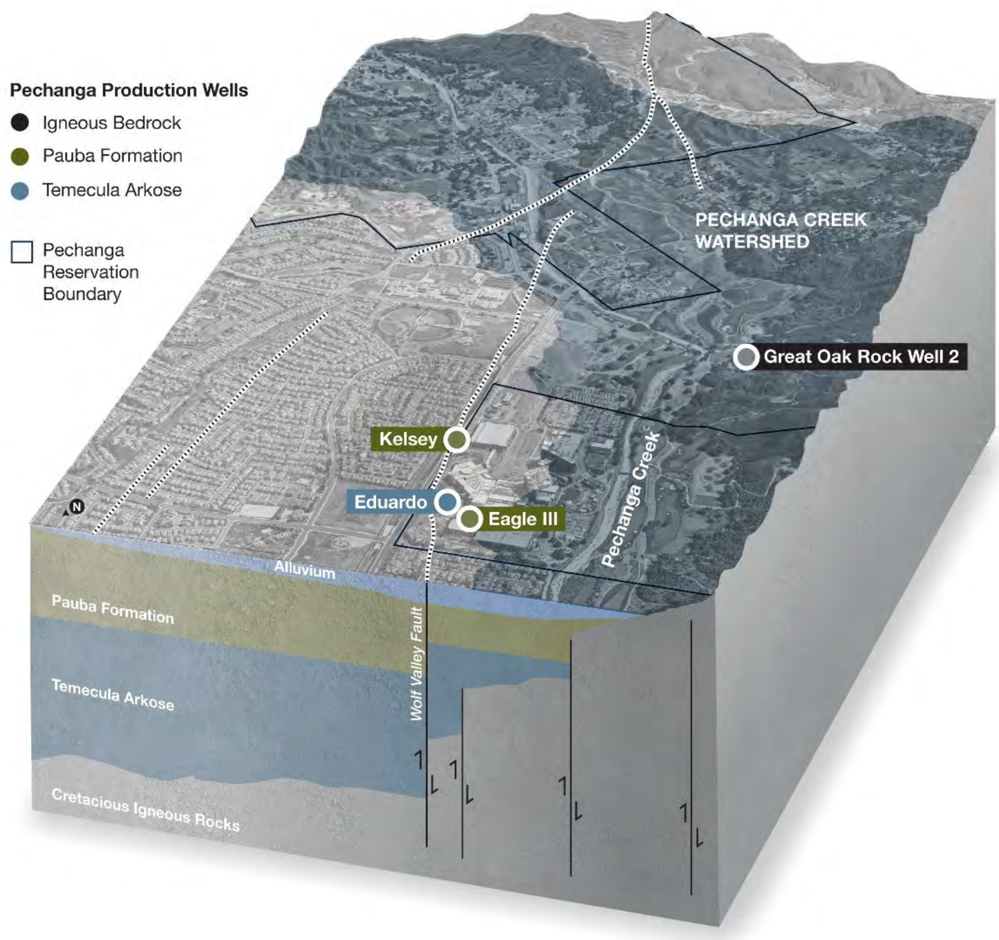
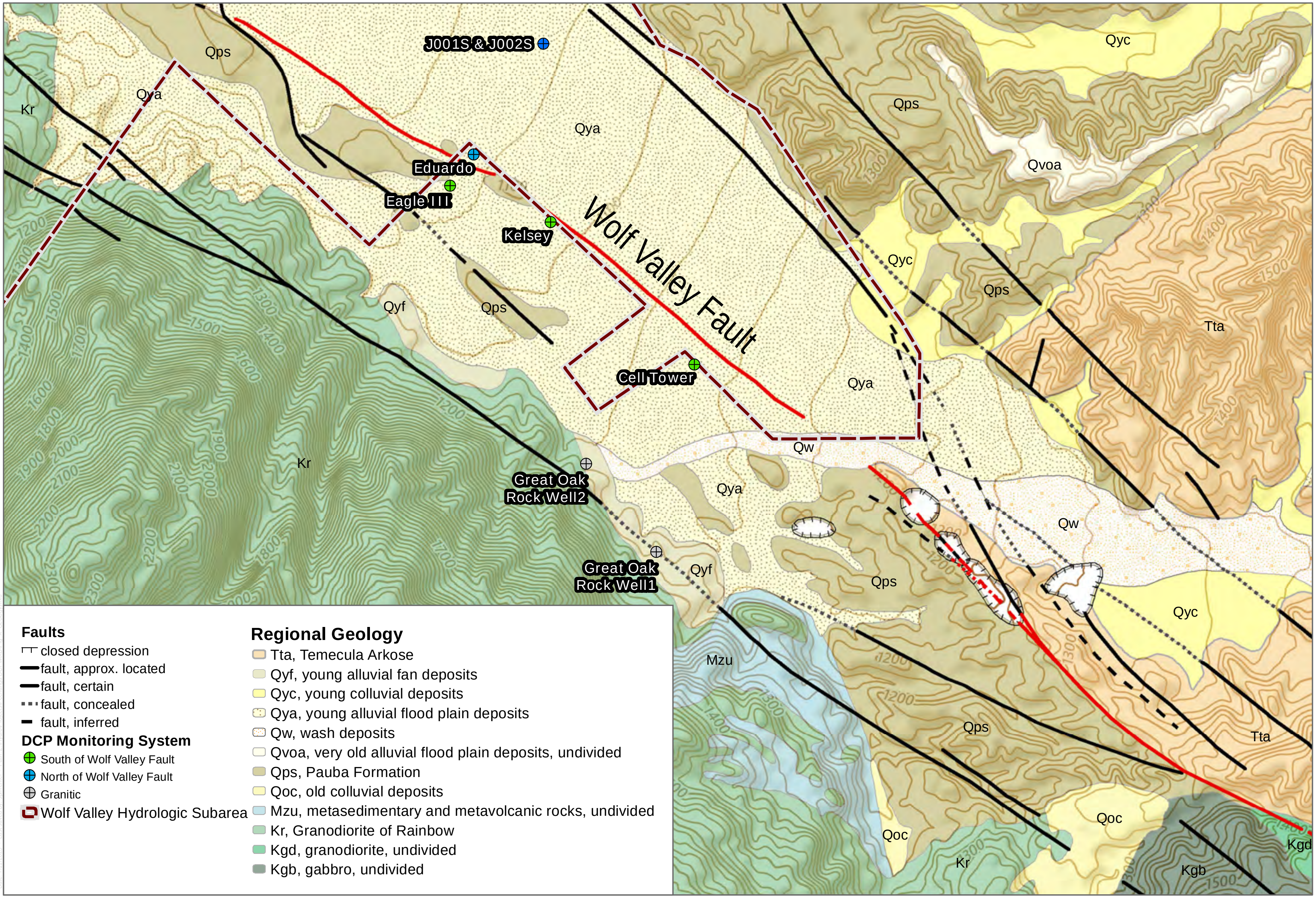


Figure 4a. Block Diagram of Wolf Valley Subbasin Geology on the Reservation



Source: Esri, Maxar, Earthstar Geographics, GSSI, DWR and California Geological Survey

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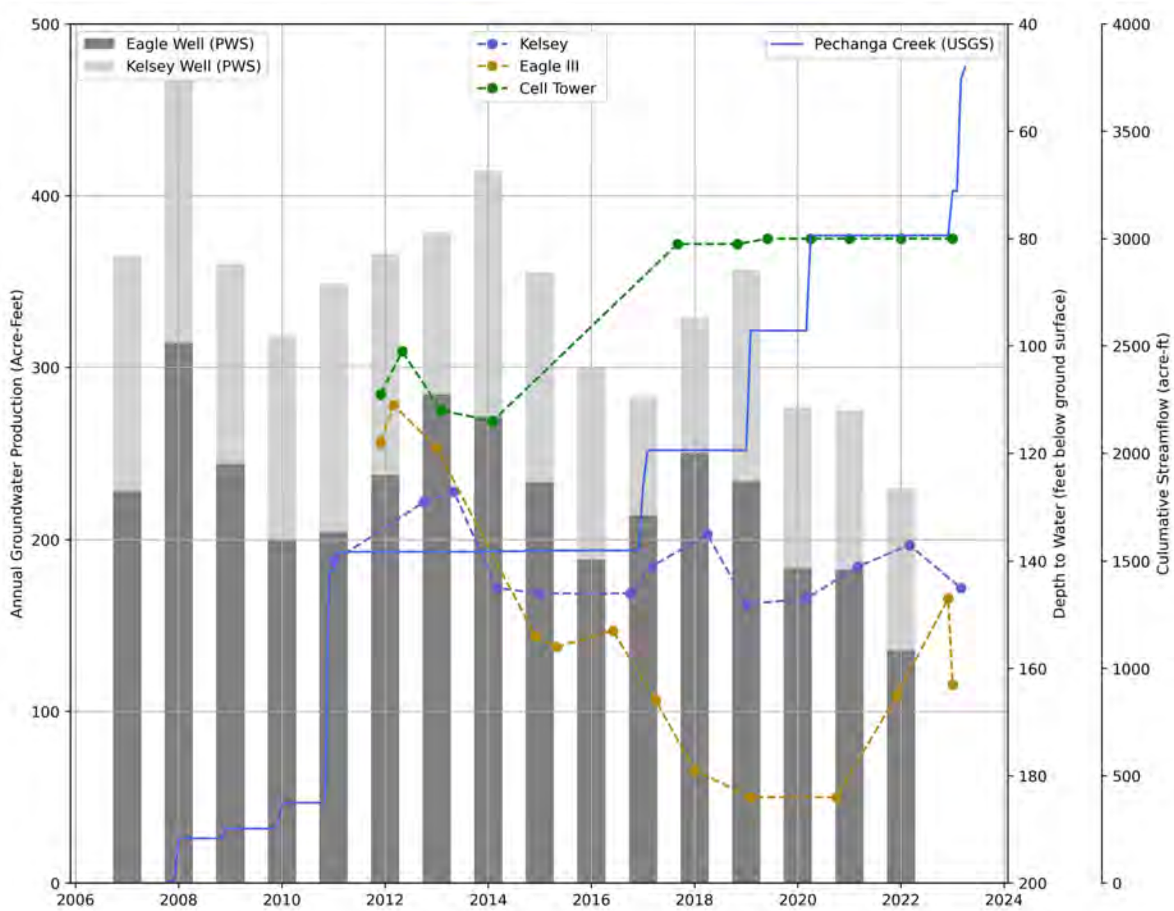
Figure 4b: Geology of Wolf Valley Subbasin in the Pechanga Reservation

With groundwater serving as the primary source of potable water for the Tribe, characterization of the different aquifers the four production wells are screened in is critical for understanding the varying responses in water levels and water quality resulting from drought stresses (i.e., increased demand and reduced recharge). Description of the local groundwater conditions is primarily drawn from a 2003 study conducted by Natural Resources Consulting Engineers Inc. (NRCE 2003), which was conducted to better understand groundwater dynamics within the Wolf Valley Subbasin aquifers. The four wells are located in what is referred to as the Wolf Valley Subbasin, a groundwater basin composed of various alluvial, sedimentary, and igneous bedrock aquifers bisected by numerous faults (Figures 4a and 4b).

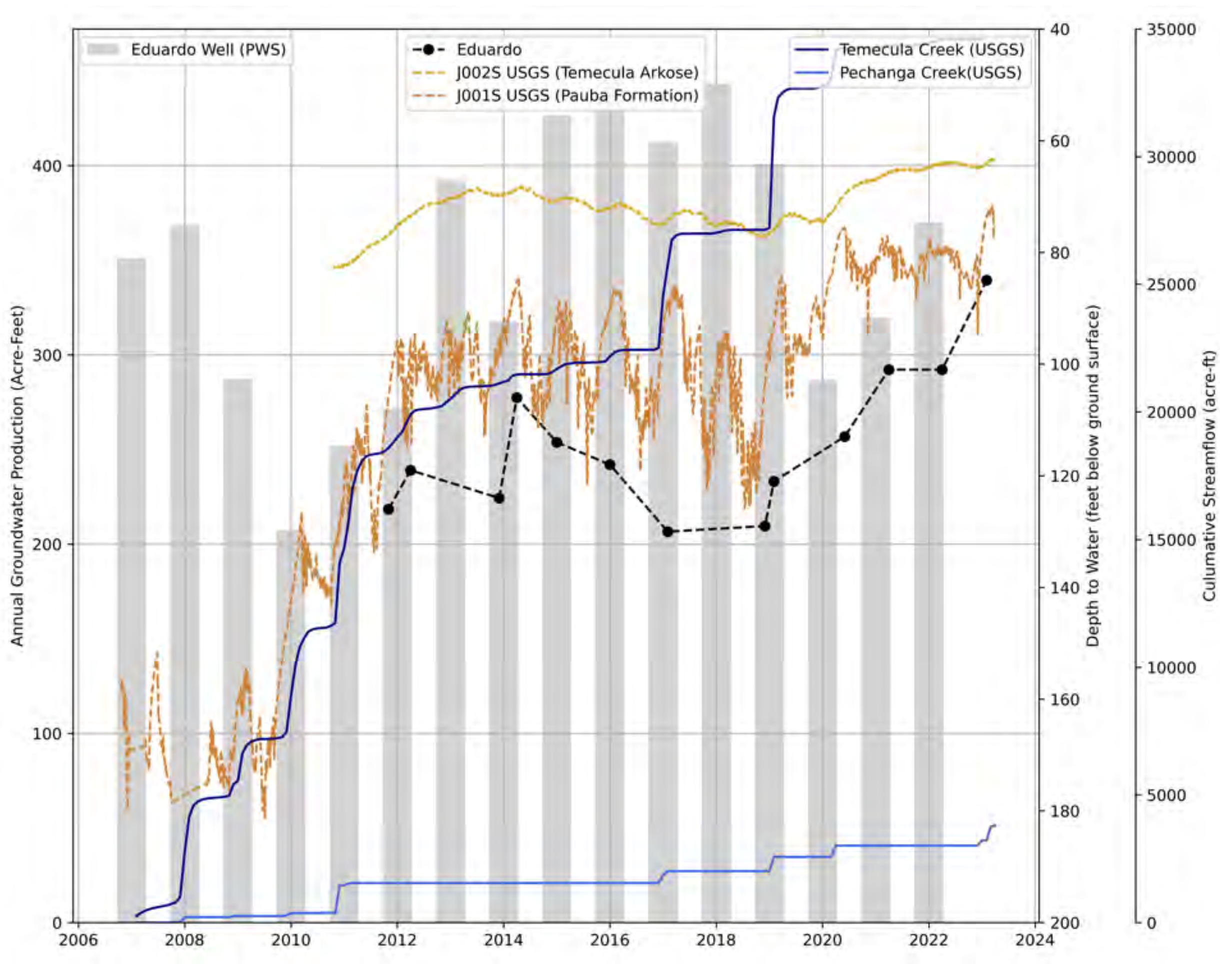
Unconfined Pauba Aquifer: The Pauba Formation consists primarily of sandstones and siltstones with thin layers of clays or conglomerates, and ranges in thickness from 0–570 feet. The Eagle III and Kelsey wells are both screened in the unconfined Pauba Formation. Per the 2003 Natural Resources Consulting Engineers Inc. groundwater study, this aquifer responded immediately to significant runoff events within Pechanga Creek (higher runoff resulting in greater recharge; Figure 5a). The Reservation's two active wells in this aquifer are located southwest of the Wolf Valley fault, which was also identified in the 2003 study as a potential hydraulic barrier to production from the Eduardo well set in the Temecula Arkose aquifer located northeast of the fault (Figures 4a and 4b). It should be noted that the USGS alignment of the Wolf Valley Fault on Figures 4a and 4b is approximate and incorrectly shows the position of the fault southwest of the Eduardo well.

Figure 5a. Cumulative Streamflow (Pechanga Creek) and Annual Production of Eagle and Kelsey Wells since 2007 Plotted against maximum annual groundwater elevation in Pauba Formation wells (Kelsey, Eagle III, and Cell Tower)



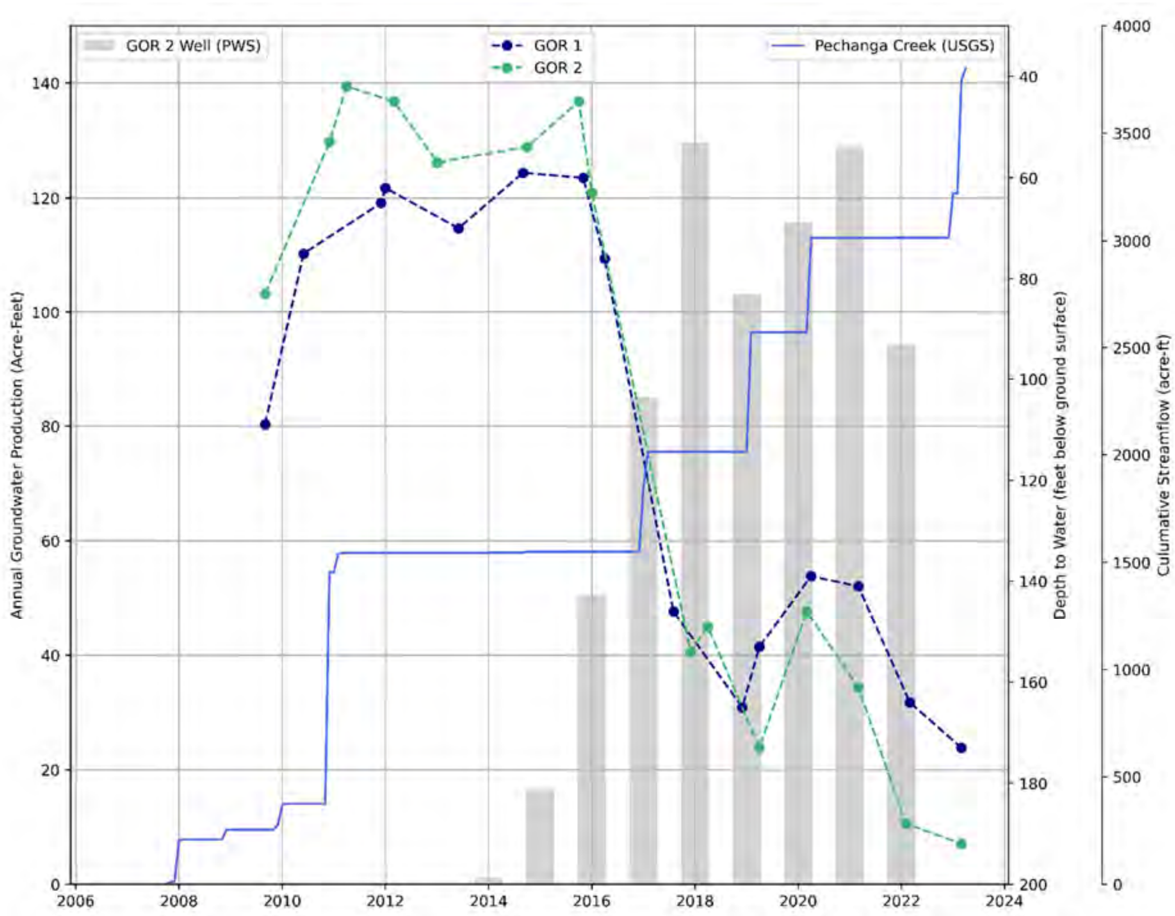
Confined Temecula Arkose Aquifer: The highest-producing well (Eduardo) is screened within the unconfined Temecula Arkose aquifer northeast of the Wolf Valley Fault. This 2,400-foot formation consists of interbedded sandstones, siltstones, claystones, and conglomerates. Groundwater levels in this aquifer are more stable than those in the Pauba and igneous bedrock aquifers (i.e., hydrographs from monitoring wells in this aquifer reflect buffered responses to increased production or recharge compared to the Pauba or igneous bedrock aquifers; Figure 5b). Based on a 117-day pump test conducted at this well in 1993 (at an average daily rate of 457 gallons per minute), the existence of a hydraulic barrier to the southwest of the well was hypothesized (later identified as the Wolf Valley Fault). During the pump test, there was minimal response from wells set in the Pauba Formation on the same side (northeast) of the Wolf Valley Fault, and there was no response from the wells southwest of the Wolf Valley Fault (including one well set in the Temecula Arkose aquifer). Numerous RCWD groundwater wells are also producing from this aquifer northeast of the Wolf Valley Fault. As stated above, the USGS alignment of the Wolf Valley Fault on Figures 4a and 4b incorrectly shows the position of the fault southwest of the Eduardo well.

Figure 5b. Cumulative Streamflow (Pechanga Creek and Temecula Creek) and Annual Production of Eduardo Well since 2007 – Plotted against maximum annual groundwater elevation north of Wolf Valley Fault (Eduardo and USGS)



Igneous Bedrock Aquifer: Great Oak Rock Well 2 (GOR 2) is screened in the cretaceous igneous bedrock of the Peninsular Range batholith. Storage and transmissivity for this aquifer are unknown. Based on initial review of annual hydrographs from the two bedrock wells (GOR 1 and GOR 2), water levels in the bedrock aquifer dropped 100 feet between 2015 and 2019, which may be attributed to increased production during this period (Figure 5c). Rebounding water levels between 2019 and 2020 may be attributed to decreased production and the above-average 2019 water year (as evident in the Pechanga Creek streamflow record), while the decreasing water levels since 2020 are likely a result of the 2021 and 2022 water-year droughts.

Figure 5c. Cumulative Streamflow (Pechanga Creek) and Annual Production of GOR 2 since 2007 – Plotted against maximum annual groundwater elevation in bedrock wells (GOR 1 and GOR 2)



1.2 The Pechanga Band of Indians

Historical Overview

A brief historical overview of the Tribe is provided on their website and summarized below (PBI 2024a).

The Tribe has resided in the Temecula valley for over 10,000 years. Historically, the band described themselves as part of the Payómkawichum (the People of the West), consisting of seven bands: La Jolla, Pauma, Pala, Pechanga, Rincon, San Luis Rey, and Soboba. From the late 1700s to the mid-1800s, the Tribe encountered Spanish missionaries, Mexican soldiers, and American settlers, groups that introduced the Tribe to new diseases, malnutrition, and war.

After California became a state in 1850, the Payómkawichum communities were not recognized as American citizens and lost land ownership in the newly founded state. In September of 1875, the Tribe was evicted from their homes and displaced. It was not until 1882 that the Pechanga band of Indians Reservation was established by Congress. In 1907, the Reservation expanded with the addition of the Kelsey Tract, bringing the present-day acreage of the Reservation to 7,080.

Much of the history of the Payómkawichum people has been lost. However, recent efforts have been made to preserve several sites of cultural significance. One example is the acquisition of the Great Oak Ranch area, in order to preserve Wi’áaşal, known as the Great Oak. This Great Oak has stood for over 1,000 years and holds a place of cultural importance to the Tribe. The Pechanga Hot Spring, another culturally significant site, is situated in a tributary in the upper Pechanga Creek watershed. This spring is named Pecháa’anga, which translates to “place where water drips”; it is a heritage site and serves as the origin for the name Pechanga.

Current Population Dynamics

There are 270 residential water connections and 51 commercial connections that can serve water to a potential residential population of 600 residents and a transient population of approximately 20,000 (primarily casino and golf course staff and tourists). According to the 2021 census data, the estimated population size for the Reservation was 347 (U.S. Census Bureau 2021). The residential community is not projected to grow in the near or distant future.

Current Economy

In 1994, the Tribe established the Pechanga Development Corporation for the purposes of economic development and improvement. The first economic venture was the Pechanga Entertainment Center, opened in 1995, presently known as the Pechanga Resort Casino.

The Pechanga Resort Casino now employs over 4,000 people. The net revenue from the casino is used by the Reservation government to maintain and improve existing infrastructure such as emergency services (e.g., fire department and patrol rangers), domestic water lines, roads, housing, a recreation center, and community parks. The funds also support various community programs for health and social services, public education from preschool to 5th grade, a senior supplemental program, and educational scholarship for advance degrees or job skills training.

Historical and Recent Water Rights

The history of the Santa Margarita River watershed's surface and subsurface water rights has been a long legal dispute that started in 1951, in the United States v. Fallbrook Public Utility District et al. (Civil No. 51-cv-1247-GPC-RBB). The dispute began when the federal government sued the Fallbrook Public Utility District for its water use of the Santa Margarita River. The federal government claimed they had riparian rights to the river, asserting that all the water flowing through the Santa Margarita River belonged to the Marine base at Camp Pendleton. Initially, the courts agreed. However, after much public backlash, the decision was modified on appeal. In 1966, the Santa Margarita River watershed became an adjudicated basin and in March 1989, the court assigned a Watermaster to oversee and enforce the water rights agreements among the local water authorities and districts. These included the Eastern Municipal Water District (EMWD), Fallbrook Public Utility District, Metropolitan Water District of Southern California (MWDSC), the Tribe, Western Municipal Water District, Marine Corps Base Camp Pendleton, and RCWD.

In 2016 Congress passed the Pechanga Band of Luiseño Mission Indians Water Rights Settlement Act (Settlement Act), ensuring the Tribe's claim to 4,994 acre-feet of water per year (AFY) from the Santa Margarita River watershed (Bill HR 5984). The current water agreement grants the Tribe access to up to 1,575 AFY of groundwater from the Wolf Valley Subbasin (based on 75% of the historical "safe yield" of the basin, which is 2,100 AF), 525 to 700 AFY of recycled water from EMWD (as wheeled through RCWD), and 2,100 to 2,275 AFY of imported potable water from MWDSC (excluding use for agricultural purposes or for selling excess groundwater). The updated groundwater and recycled water conditions were established by the Amended Groundwater Management Agreement between RCWD and the Tribe, and the Amended Recycled Water agreement between EMDW and the Tribe, respectively. The Settlement Act includes a carryover fund that allows the Tribe to bank up to 6,000 acre-feet (AF) of groundwater during years when they do not utilize the full 1,575 AFY from the Wolf Valley Subbasin. As part of the Settlement Act, RCWD is required to bank the Tribe's unused groundwater to promote sustainability in the basin.

The volumes determined in the Settlement Act are contingent on the water being available under "normal conditions." If safe yield for the Wolf Valley Subbasin is calculated as less than 2,100 AFY during RCWD's 5-year review of conditions in the Temecula Valley Groundwater Basin, this could result in a reduction of the volume of groundwater that the Tribe can draw from their the Reservation's main production wells (Eduardo, Eagle III, and Kelsey); per RCWD's 2020 Urban Water Management Plan, 75% of the Wolf Valley Subbasin's safe yield is reserved for the Tribe's use as determined by modeling performed by RCWD (RCWD 2020). Lastly, groundwater production from the bedrock aquifer (i.e., GOR No. 2) is not restricted under the Settlement Act.

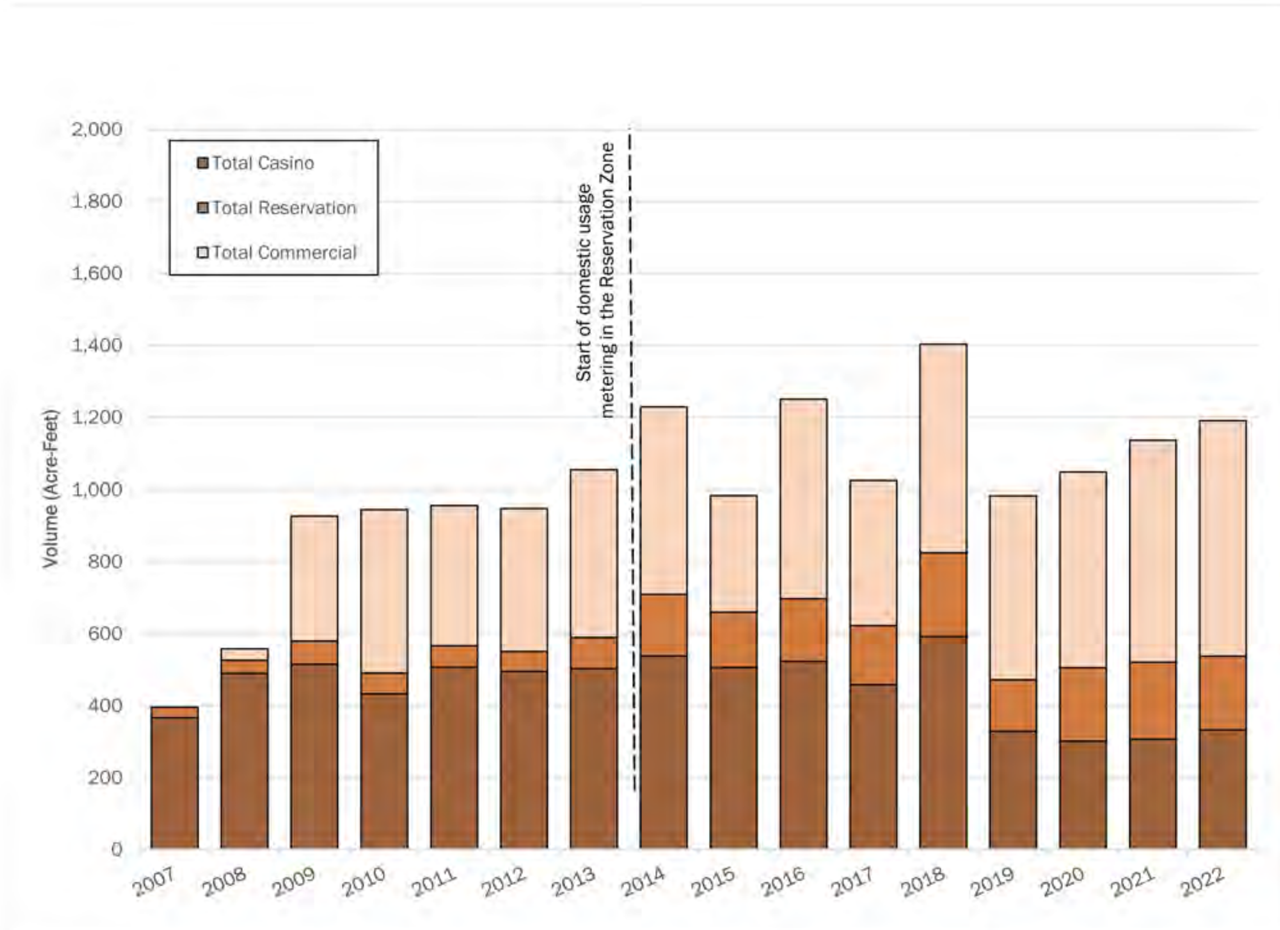
1.3 Current Water Demand and Supply

1.3.1 Demand

Pechanga Water Systems (PWS) manages the water supply and demand for the Tribe. There are three primary zones that PWS services: the Casino Zone (which includes the Pechanga Resort Casino), the Commercial Zone (which includes the irrigation of the Journey at Pechanga golf course), and the Reservation Zone (which accounts for approximately 600 residents, the government buildings, and minor commercial usage). The only agriculture within the Reservation is limited to residential gardens. Since 2009, total demand for the three zones has fluctuated between 900 AFY and 1,400 AFY (Figure 6, Historical Water Demands). Outside of the current 80-Acre Project, which consists of a new school, sports park, and government building, there are no projected increases in demand across the three zones (i.e., no projected population increases or new commercial or casino operations). Since

2014, the average overall water demand, broken down by sector is 37% for the Casino Zone, 16% for the Reservation Zone, and 46% for the Commercial Zone.

Figure 6. Historical Water Demands

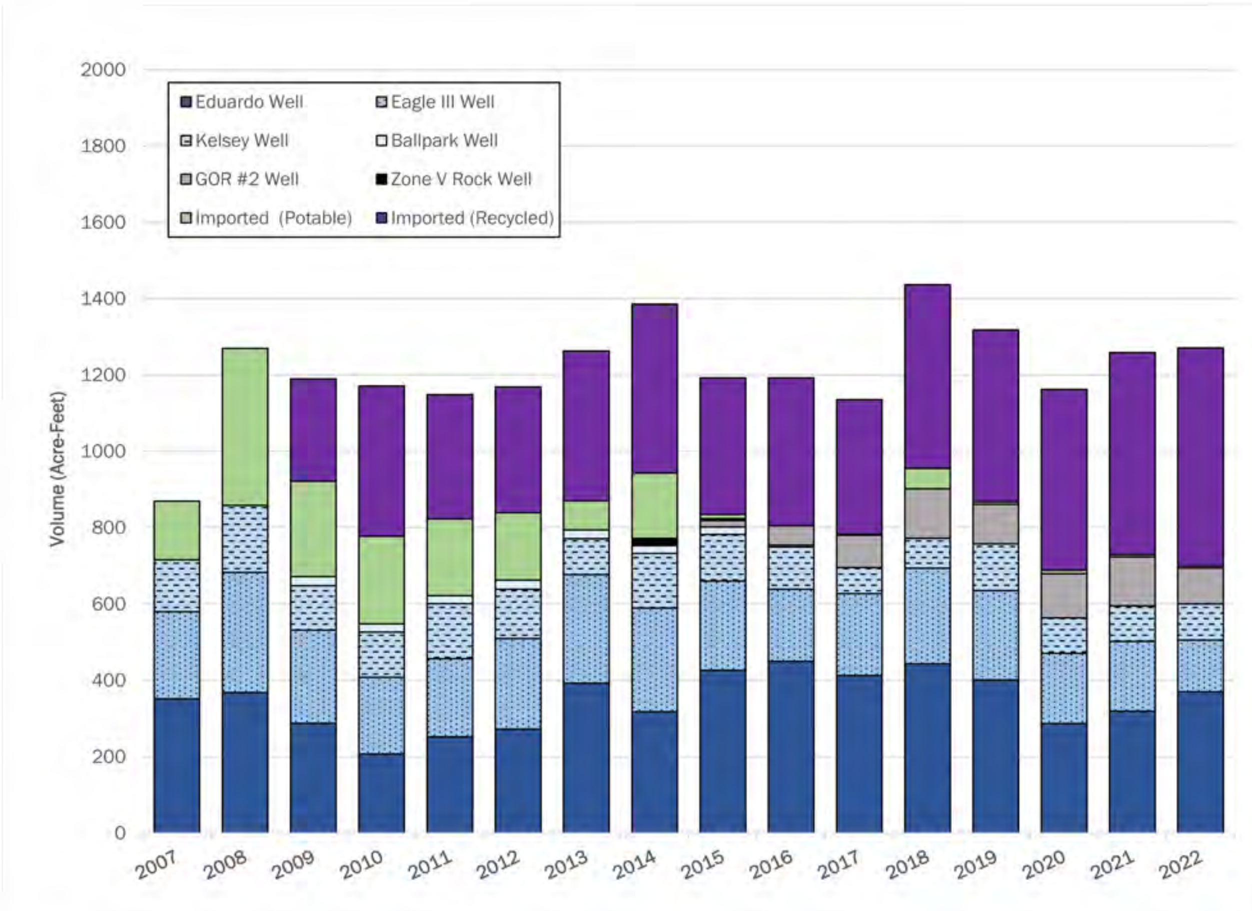


1.3.2 Supply

Local Supply

Historically, PWS total water supply has primarily been sourced from the four active wells (Eduardo, Eagle III, Kelsey, and GOR 2 wells), two now inactive wells (the Ballpark and Zone V wells) and imported potable and recycled water transferred through RCWD. PWS currently relies on the three active groundwater wells located in Wolf Valley Subbasin (Kelsey, Eagle III, and Eduardo) and in the igneous bedrock aquifer (GOR 2) (Figure 4b). Average annual production from each of the four wells is provided in Table 1. The total water supply for the reservation has fluctuated between 1,130 AFY and 1,437 AFY since 2008 (Figure 7).

Figure 7. Historical Water Supplies



Presently, the Eduardo, Eagle III, and Kelsey wells undergo chlorination to disinfect the water. The Great Oak Rock Well 2 undergoes iron and manganese treatment as it pumps from igneous bedrock, which is typically rich in these chemical components. The Ball Park well became inactive after 2015 due to elevated iron concentrations. These data underscore the importance of ongoing monitoring and management to ensure the safety and quality of the water supply.

Table 1. Production Rates for the Four Pechanga Indian Reservation Water-Supply Wells

Eduardo Well[1]	Eagle III Well[1]	Kelsey Well[1]	Great Oak Rock Well 2[2]
350 gpm	250 gpm	140 gpm	220 gpm

Notes: gpm = gallons per minute.
1 Well set in the Wolf Valley Groundwater Basin and is subject to conditions of Settlement Act.
2 Well set in bedrock aquifer and not subject to conditions of recent water rights settlement.

Imported Supply

In addition to the four production wells, PWS operates a tie-in with EMWD (wheeled through RCWD) for importing recycled water, which is used for commercial and casino operations (golf course irrigation and cooling towers). Use of this recycled water began in 2009, initially for irrigating the Journey at Pechanga golf course, but additional measures have been taken to expand use of the recycled water (recently the casino has converted one cooling tower to use recycled water). The Tribe operates an additional tie-in from MWDSC that serves as an auxiliary source of potable water (also wheeled through RCWD). Due to the high cost and salinity of the MWDSC water, this connection is only used to augment supply during times of excess demand or because of loss of production from local production wells.

Storage Tank Supply

There are six storage tanks on the Reservation, which have the capacity to store a total of 19.68 AF (6,597,000 gallons) of potable water. Additionally, there is a reclaimed water tank that is not part of the potable water system but has the capacity to hold 3.07 AF (1,000,000 gallons). Capacity and service zone for each of the storage tanks is provided in Table 2.

Table 2. Storage Tank Volume – Potable Water

Zone	Storage Tank	Storage Volume (AF)
Casino	North Casino Tank	3.9
	South Casino Tank	2.7
Commercial	Commercial Tank	2.8
	Tribal Tank	2.8
Reservation	N. Magee Tank	1.4
	S. Magee Tank	6.1

Note: AF = acre-feet.

2 Drought Monitoring Program

As outlined in the Drought Response Program (DMP) Framework, the DMP establishes the process for monitoring near-term and long-term water availability, characterizing existing drought conditions, and predicting future drought conditions. Local hydrological and meteorological data, drought indices, and regional water shortage classifications have been evaluated for development of Pechanga's DMP. This section summarizes how these potential drought indicators were evaluated, which were selected for inclusion in the Pechanga DMP, and how drought severity stages and their respective triggers were developed using the indicators.

2.1 Drought Impacts

The Intergovernmental Panel on Climate Change defines drought as a drier than normal period in which there is a local/regional deficit in precipitation (Douville et al. 2021). The duration and severity of drought will impact local water storage (groundwater or stream flow), agriculture, and ecology to varying degrees, depending on water accessibility and storage. Characterization of the spectrum of drought conditions and their associated impacts was incorporated into development of the drought severity stages in the Pechanga DMP.

Short-Term Drought Impacts

Short-term droughts are defined as precipitation deficits that last no more than 6 months, which would limit the extent of a short-term drought to one full rainy season for the Pechanga Creek watershed. For Southern California, a short-term drought could encompass a full rainy season but would be bookended by normal or above-average water years. While the temporal extent of a short-term drought is limited, the severity of the conditions during the drought will result in variable impacts to water resources, human health, ecological health, and local businesses. Negligible precipitation, extreme temperatures, Santa Ana winds, local/regional wildfires, and dynamic water supply and demand scenarios, which are often exacerbated by drought (e.g., increased irrigation demand or supply for firefighting), can result in immediate and disastrous impacts to the following:

- **Groundwater:** Increased local groundwater demands to offset reduced soil moisture, increased evapotranspiration (ET) demands, and increased temperatures could be experienced across the Reservation's three zones (Casino, Commercial, and Reservation). This would result in increased aquifer drawdown within all three of the Reservation's aquifers but would be most acutely experienced in the Pauba Formation aquifer (Eagle III and Kelsey wells) and the bedrock aquifer (GOR 2 well). As groundwater pumping increases, there are potential concerns about maintaining sustainable groundwater yields. In addition, over-pumping of groundwater could lead to loss in production (loss of pressure head required for operating submersible pumps) and decrease in water quality (where water from lower aquifer zones may have different chemistry).
- **Imported Water:** The water districts supplying PWS with recycled water (EMWD) and potable water (MWD) have implemented their own water shortage contingency plans (WSCPs), which establish water restrictions associated with various water shortage tiers. While it is less likely a short-term drought will result in significant cuts to imported water, even minor restrictions could impact availability of imported water to the Reservation.
- **Ecology:** Increasingly dry, hot, and windy conditions are contributing to increased catastrophic wildfires throughout the Southwest. The Pechanga Creek watershed is primarily undeveloped and highly susceptible

to rapid wildfire development under Santa Ana conditions. These conditions can develop within weeks and are anticipated to increase in frequency under various climate change scenarios (Bedsworth et al. 2018; Pierce et al. 2018).

- **Cultural Resources:** Declines in groundwater levels and available soil moisture could impact the culturally significant Pechaa'anga Spring and Great Oak (PBI 2024b).

Long-Term Drought Impacts

Overall, long-term droughts compound the effects of short-term droughts, intensifying the severity of their impacts. As drought conditions worsen from water-year to water-year, there is a greater demand on local groundwater resources and a reduction in natural or managed aquifer recharge, leading to accelerated aquifer drawdown. Over-pumping of groundwater leads to land subsidence, reducing the amount of groundwater storage through compaction of the aquifer, and the land surface gradually sinks, adversely impacting infrastructure and permanently reducing aquifer storage capacity. For example, in 1988, pumping from RCWD wells was temporary suspended for 5 years after a large crack was discovered northwest of the Kelsey Tract (NRCE 2003). Significant groundwater drawdown could also lead to complete loss of production wells and increased dependence on imported water. Because long-term droughts are often regional, supply from the SWP and CRA may also be reduced, limiting availability of imported water to augment the Reservation's annual water demand.

Lastly, long-term droughts will result in increased occurrence and severity of wildfires with increased plant stress and/or mortality and could permanently affect the Great Oak.

Climate predictions for California and the Colorado River Basin forecast greater annual variability in precipitation, potentially resulting in more frequent extreme wet events followed by prolonged decadal to multi-decadal droughts (Udall and Overpeck 2017; Bedsworth et al. 2018; Pierce et al. 2018). The purpose of the Pechanga DCP is to provide tools for identifying current drought conditions, projecting future drought scenarios, establishing mitigation and response actions to improve drought resiliency, and establishing the operational and administrative framework to ensure effective implementation and adaptive management of the DCP. The DMP is a critical component of the DCP, in that it establishes the framework for linking suitable drought mitigation and response actions with current and projected drought conditions, both short- and long-term.

2.2 Local and Regional Drought Indicators

Development of the Pechanga DMP utilized data from local weather stations, stream gages, and groundwater production/monitoring wells to evaluate suitability for inclusion as drought indicators and to assess suitability of various drought indices for defining current local drought conditions. To capture regional drought conditions that might impact imported water supplies, multiple water shortage contingency plans (WSCPs), urban water management plans, and DCPs from municipalities dependent on MWDSC supply were evaluated.

2.2.1 Local Hydrology and Meteorology Indicators

Hydrology

Conditions of local water resources (groundwater, streamflow, and spring discharge) are paramount in defining local drought conditions. Groundwater elevation trends are plotted against annual well production rates (in AFY) and cumulative streamflow (in AF) in Figures 5a through 5c. Recent drought conditions (2012–2016 and 2021–

2022 water years) coincide with reduced streamflow, increased water demand, and decreasing groundwater elevations. Well production rates and groundwater elevation trends from the three main aquifers (see Section 1.3) are included in this DMP to characterize both existing and potential future drought conditions. Presence or absence of surface water in the Pechanga and Temecula Creeks is included to augment characterization of current (short-term) drought conditions and for managing future (long-term) water resources, as streamflow is an indication of watershed conditions and has been linked to increased aquifer recharge.

Well Production Rates and Groundwater Elevations

Two types of data currently being collected directly from the four production wells (and/or adjacent monitoring wells screened in the same aquifers) are included in the DMP. The first is the well's production rate (flow rate in gallons per minute), and the second is groundwater elevation.

1. Well production rates may diminish as a result of decreasing water levels due to reduced pump efficiency or could cease completely if water levels were to drop below the pump intakes. In addition, PWS may dial back pumping from wells where water from lower sections of each well's respective aquifer may have different water quality signatures requiring additional treatment infrastructure. The proposed drought stages in the DMP are linked to incremental levels of reduction in groundwater production from the active wells, which can be directly linked to decreased groundwater elevation. Calculation of production rate efficiency for the wells in service is defined as:

$$\left.{Current\ Production\ Rate}\middle/{Expected\ Production\ Rate}\right.$$

   Current production rate is the sum from all active wells, and the expected production rate is the sum of the expected production rates for the active wells (current expected rates are presented in Table 3).

2. Groundwater elevation trends will be measured from each production well (using static water levels), and four additional monitoring wells. Static water levels measured from the production wells must be collected when the pumps are not running. If static water levels are measured after a pump is turned off, sufficient time must be allowed for the water level to reach equilibrium with the aquifer prior to measurement. The full list of groundwater monitoring stations is provided in Table 3 (locations provided in Figure 3).

Table 3. Groundwater Monitoring Stations

Well Name	USGS Station ID	Production/ Monitoring	Expected Production Rate (gpm)
Temecula Arkose Aquifer – Northeast of Wolf Valley Fault			
Eduardo	332733117062301	Production	350
J002S	332747117061102	Monitoring	N/A
Pauba Formation Aquifer – Northeast of Wolf Valley Fault			
J001S	332747117061101	Monitoring	N/A
Pauba Formation Aquifer – Southwest of Wolf Valley Fault			
Eagle III	332729117063101	Production	250
Kelsey	332724117061501	Production	140
Cell Tower	332704117055301	Monitoring	N/A

Table 3. Groundwater Monitoring Stations

Well Name	USGS Station ID	Production/ Monitoring	Expected Production Rate (gpm)
Igneous Bedrock Aquifer – Southwest of Wolf Valley Fault			
GOR 1	—	Monitoring	N/A
GOR 2	—	Production	220

Notes: USGS = U.S. Geological Survey; gpm = gallons per minute; GOR = Great Oak Rock well.

Streamflow

Large runoff events measured in Pechanga Creek were linked to increased aquifer recharge in the 2003 groundwater study (NRCE 2003). Cumulative streamflow is plotted against groundwater elevation in the proposed DMP groundwater monitoring stations, as well as annual production from the Reservation's wells, in Figures 5a–5c. While statistical relationships between groundwater production, streamflow, and groundwater elevations have not been established, continued collection of these data will be useful for better characterizing production and recharge dynamics in each aquifer. Two stream gages managed by the USGS (Pechanga Creek and Temecula Creek) are included in this DMP (Figure 2; Table 4).

Table 4. Streamflow Monitoring Stations

Stream Gage Station:	USGS Site ID	Record Start and End Date: (MM/DD/YYYY)
Pechanga Creek	11042631	10/1/1987 to Present
Temecula Creek near Aguanga, CA	11042400	8/1/1957 to Present

Note: USGS = U.S. Geological Survey.

Climate/Weather

Historical precipitation data from five weather stations within and surrounding the Pechanga Creek watershed were used to evaluate suitability of various drought indices for inclusion in the DMP (Figure 2; Table 5). The Pechanga tribal government has a local weather station located on the roof of the government building and has been recording weather data since November 2016. A weather station atop Palomar Mountain managed by the Bureau of Land Management (through the Remote Automatic Weather Stations interagency initiative) was included to evaluate weather conditions near the headwaters of the Pechanga Creek watershed; the daily precipitation from this station is available back to September 2004. Longer precipitation records were available from the California Irrigation Management Information System (CIMIS) Stations No. 62 and No. 237 and a NOAA station, all three located in Temecula. Hourly temperature, solar radiation, vapor pressure, humidity, and reference evapotranspiration (ET_o) are available from November 1986 and November 2012 from CIMIS Stations No. 62 and No. 237, respectively. Hourly precipitation data from the NOAA station are only available from August 1971 through August 2008. Lastly, a weather station on the Santa Rosa Plateau operated by the California Department of Forestry and Fire Protection was used as a quality check against anomalous data in the CIMIS record.

Linear regression analyses were conducted between the precipitation records to calculate the strength of the correlation between the datasets. For datasets with higher correlations (R^2 values >0.75), the linear relationship between the stations was used to extend the precipitation record (gap fill). Strong correlations were found between the Pechanga and Palomar Remote Automatic Weather Stations and between the Temecula stations (CIMIS No. 62 and NOAA), but there were poor correlations (R^2 values <0.55) between the Temecula stations and the Pechanga/Palomar stations. Due to the poor correlation between the Temecula stations and the Pechanga/Palomar stations, the daily precipitation record for the Pechanga weather station was only extended back to August 2004 using the Palomar Remote Automatic Weather Station dataset. This limited the analysis of drought indices with local Pechanga precipitation records to the recent 19-year record (see Section 2.2.2). A longer Temecula dataset was developed using the NOAA Temecula station and the California Department of Forestry and Fire Protection station on the Santa Rosa Plateau to evaluate historical drought conditions in the area and assist with climate projections (see Section 3).

Table 5. Weather Stations Included in Development of the Pechanga DCP

Weather Station	Agency Source	Elevation (ft amsl)	Record Start and End Date
No. 62 Temecula	CIMIS	1,420	11/25/1986 to Present
No. 237 Temecula East III	CIMIS	1,530	11/1/2012 to Present
Temecula, CA US COOP:048844	NOAA	1,020	8/31/1974 to 8/31/2008
Pechanga Band	Pechanga Tribal Government	1,200	11/14/2016 to Present
Palomar	RAWS	5,530	9/14/2004 to Present
Santa Rosa Plateau (SAR)	CA Dept of Forestry and Fire Protection	1,980	07/01/1994 to Present

Notes: ft amsl = feet above mean sea level; CIMIS = California Irrigation Management Information System; RAWS = Remote Automatic Weather Stations.

2.2.2 Drought Indices

Drought indices evaluated for the Pechanga DMP included the Standardized Precipitation Index (SPI) (McKee et al. 1993), the U.S. Drought Monitor (USDM) tool, and various drought monitoring platforms with predictive functions currently in development.[1] Drought classifications using the SPI and USDM tools were related to known water-year conditions within the Pechanga Creek watershed (based on the precipitation record from the Pechanga/Palomar weather stations).

Standard Precipitation Index

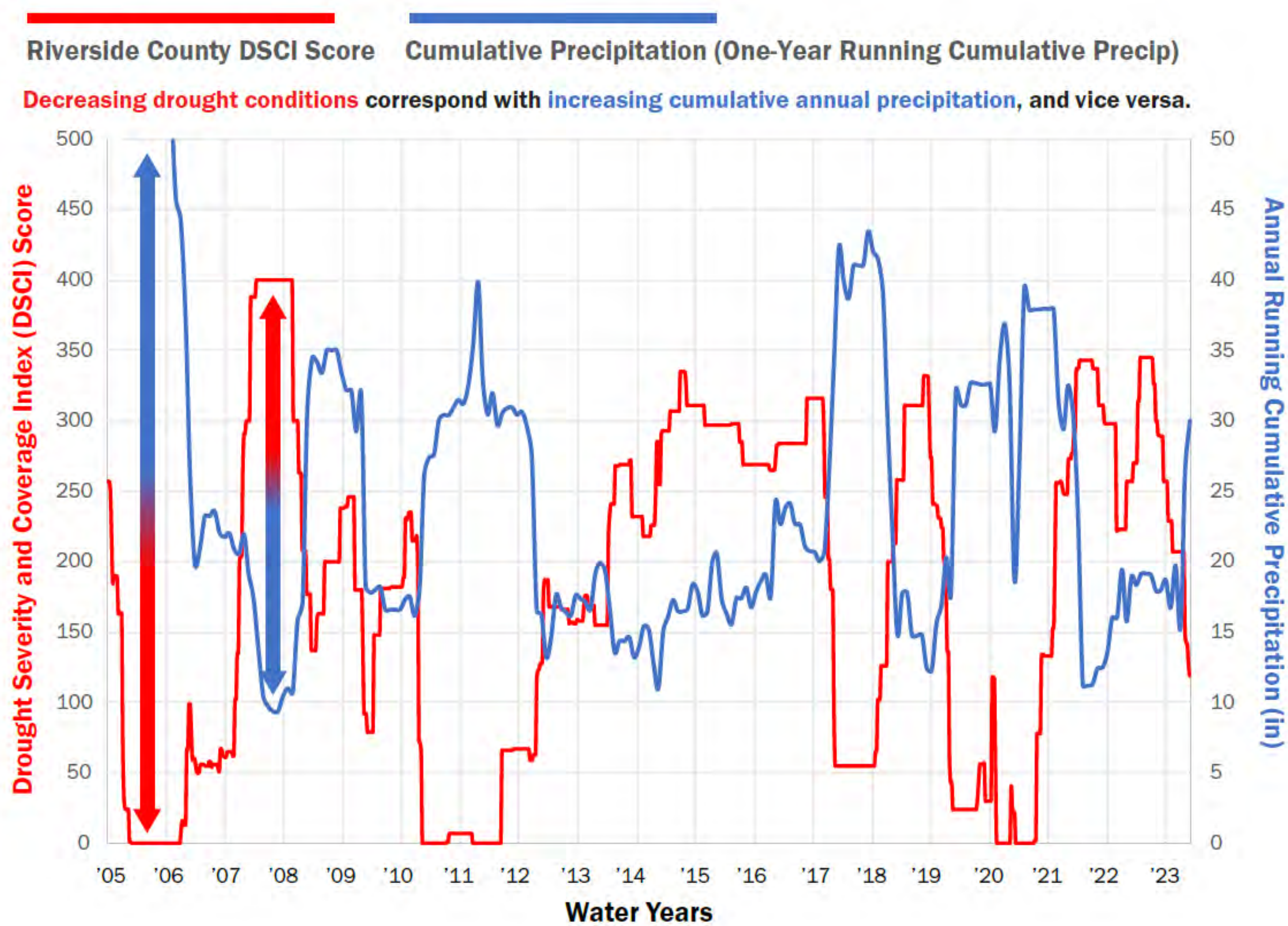
The SPI is used to characterize water-year conditions (normal versus varying degrees of below or above average) based on current precipitation measurements relative to the historical precipitation record. This is a simple index in that it only requires one data input (precipitation), but it is dependent on long, gap-free precipitation records to establish meaningful thresholds. Use of the SPI for the Pechanga DMP was explored using the relatively limited precipitation records defined in Section 2.2.1. Using the gamma distribution, 3- and 9-month SPI values were generated from these data. The SPI values generated from the Pechanga/Palomar stations did not adequately capture the 2012–2016 and 2020–2022 droughts in the Pechanga Creek watershed, and this is attributed to the small datasets from these stations (skewed to drier conditions). The poor correlation between the Pechanga/Palomar stations and the Temecula stations precluded the use of the SPI values generated from the Temecula stations.

1 See HydroGEN (https://www.hydro-generation.org/) and the Southwest U.S. Burn Period Tracker as examples (https://cals.arizona.edu/climate/SWBurnPeriod/).

U.S. Drought Monitor Tool

The USDM tool provides weekly countywide Drought Severity and Coverage Index (DSCI) scores, which are produced by several federal agencies (U.S. Department of Agriculture, NOAA, and the National Drought Mitigation Center). These agencies alternate updating the DSCI scores every two weeks and utilize numerous drought indicators and indices to make sure that the latest data capture necessary trends relative to the region and current climatic conditions. These indicators include, but are not limited to, precipitation and temperature (local/regional weather stations, SPI scores, and Palmer Drought Severity Index); streamflow and reservoir levels (USGS, California Data Exchange Center, SWA, and CRA); evaporation; soil moisture; and vegetation health indices. The data is presented as categorical drought conditions ranging from none (i.e., no drought conditions present) to abnormally dry (D0), moderate drought (D1), severe drought (D2), extreme drought (D3), and exceptional drought (D4). These categorical conditions are assigned to each county weekly based on percent cover of the area and can then be used to sum the total drought categories of the USDM weekly data and provide a DSCI for the week.

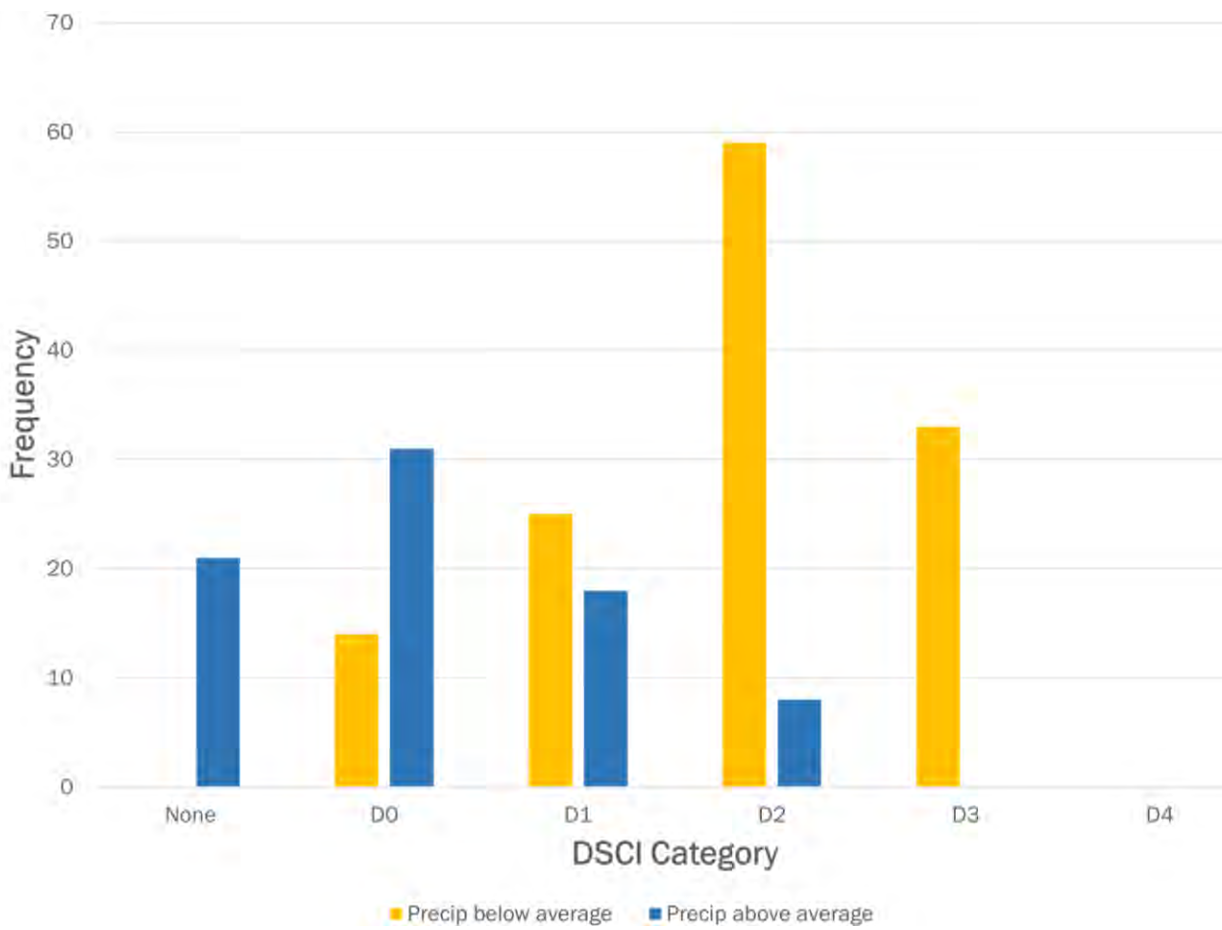
Figure 8. Comparison of USDM Weekly Drought Classification for Riverside County with One-Year Running Cumulative Precipitation from the Pechanga Weather Station



Precipitation data from the Pechanga weather station were used to evaluate the suitability of the Riverside DSCI scores (Figures 8 and 9). Precipitation was plotted as a running annual sum to capture both the current and previous water-year's impacts on watershed/aquifer conditions. These data were then plotted against the weekly DSCI scores (Figure 8), where there is an apparent relationship between increasing cumulative precipitation and decreasing drought conditions (blue arrows) and between decreasing cumulative precipitation and increasing drought conditions (red arrows). DSCI scores were then split between periods when the running cumulative annual precipitation fell above or below the average annual precipitation for this record (~25 inches[2]) to evaluate the distribution of DSCI scores during below-average and above-average precipitation conditions. Due to the apparent strong relationship between the local precipitation record and the USDM scores for Riverside County, as well as its use of various drought indicators for defining current conditions, this tool is proposed as the main drought index for inclusion in the Pechanga DMP.

During below-average precipitation conditions, 100% of the extreme drought (D3), 88% of the severe drought (D2), and 58% of the moderate drought (D1) conditions were mapped in Riverside County. Conversely, during above-average precipitation conditions, 100% of the "no drought," 69% of the abnormal drought (D0), and 42% of the moderate drought (D1) conditions were mapped in Riverside County (Figure 9).

Figure 9. The DSCI Score Frequency Based On the Difference Between One- Year Running Cumulative Precipitation and the Average Precipitation for Pechanga Weather Station



2 The average annual precipitation of 25 inches recorded at the Pechanga weather station between 2016 and 2023 includes four anomalously above-average water years (2017, 2019, 2020, and 2023), which pulls the average higher than the average annual rainfall of 14 inches in the Temecula basin.

2.2.3 Regional Drought Monitoring

The Reservation's future uses of imported potable and recycled water are largely dependent on the resiliency of the SWP and CRA supplies servicing the larger municipalities in the Temecula Valley Groundwater Basin (EMWD, Western Municipal Water District, EVMWD, and RCWD). MWDSC's WSCP incorporates regional water supply projections and curtailments established by the California Department of Water Resources (DWR) and USBR as part of their process for defining various water shortage stages. The water shortage stages in RCWD's WSCP incorporate MWDSC's water shortage stages as critical triggers for defining water shortages, ultimately capturing regional drought impacts on water supply delivered through the SWP and CRA. The Pechanga DMP incorporates RCWD's water shortage stages as the regional drought indicator for this program.

2.3 Drought Monitoring Stages and Triggers

The final proposed Pechanga DMP is provided in Table 6. There are four separate resources used for characterizing the local and regional drought conditions for this DMP:

1. **Local Drought Index Score:** The monthly drought classification for Riverside County as defined by the U.S. Drought Monitoring Network (see Section 2.2.2).
2. **Groundwater Production:** Current versus expected production rates from the Reservation's active wells (monthly metric, and only applied to the wells that were active during the period they were in operation) (see Section 2.2.1).
3. **Hydrological Conditions:** Streamflow and groundwater elevations (static) will be continually logged to identify trends in decreasing groundwater elevations and streamflow, which can be used to evaluate water supply resiliency relative to forecasted drought conditions (see Section 2.2.1).
4. **Regional Drought Conditions:** The RCWD water shortage stages have been incorporated into the DMP to capture current and anticipated reductions in imported waters (SWP and CRA).

Table 6. Pechanga DMP Drought Stages and Corresponding Indicators/Criteria

Pechanga DMP Drought Stages	DROUGHT STAGE CRITERIA			
	Local Drought Conditions			Regional Drought Conditions
	USDM (Riverside County)[1]	Pechanga Indian Reservation Production Wells[2]	Groundwater Monitoring Wells and Streamflow (USGS)	RCWD WSCP Stages
None	None	>95% average production	Increasing or stable water levels; above-average or average annual streamflow within Pechanga and Temecula Creeks	Stage 1 – Water Supply Watch
Stage 1	D0	90%–95% average production	Gradual decline in water levels; average to below-average streamflow in Pechanga Creek (but flow was present during the water year)	Stage 2 – Water Supply Alert
Stage 2	D1	80%–90% average production		
Stage 3	D2	70%–80% average production		Stage 3 – Water Supply Warning
Stage 4	D3	50%–70% average production	Increased decline in water levels; below-average streamflow in Pechanga and Temecula Creeks (but flow was present during the water year)	Stage 4 – Extreme Water Supply Warning
Stage 5	D4	<50% average production	Increased decline in water levels; no streamflow in Pechanga Creek and below-average streamflow in Temecula Creek over the course of the current water year	Stage 5 – Water Supply Emergency Criteria

Notes: DMP = Drought Monitoring Program; USDM = U.S. Drought Monitor; USGS = U.S. Geological Survey; RCWD = Rancho California Water District; WSCP = water shortage contingency plan.

1 None = no drought conditions present; D0 = abnormally dry; D1 = moderate drought; D2 = severe drought; D3 = extreme drought; D4 = exceptional drought.

2 Based on reduction in production directly associated with declining water levels and relative to the cumulative average pumping rates for the wells in service during the period they were active. For instance, if demand is low and only two of the main wells are active (say Eagle III and Kelsey), then evaluation of drought stage will be based on the average production rate from these two wells (390 gallons per minute); a combined production rate of 290 gallons per minute from these wells is an approximate 25% reduction in their combined average production rate and warrants designation of a Stage 3 drought classification. Note that loss of production associated with non-drought-related issues, such as mechanical failures or anomalous water quality issues, would not be included in evaluating drought conditions.

2.4 Protocol for Continued Assessment of Drought Status

The director of PWS and the director of the Pechanga Environmental Department serve as the manager and deputy manager of the Pechanga DCP, respectively. They shall ensure that PWS staff are available and trained to conduct the monthly drought monitoring and evaluation defined in this DCP. This will include collecting and recording the four drought stage criteria established in Table 6, which will include coordination with RCWD's Drought Task Force. With various inputs defining local and regional drought conditions in the Pechanga DMP, the criteria for each indicator may not align as presented in Table 6 and will need to be weighed by the PWS director prior to defining the Reservation's active drought stage. For instance, if the USDM designation for Riverside County is D3, yet the Reservation's production wells are operating at >90% expected capacity, the PWS director will need to determine how to weight the varying indicators through review of the circumstances leading up to the current drought, what trends can be pulled from the hydrological monitoring stations, what water shortage stage RCWD is implementing, as well as additional information from new resources that may assist with forecasting regional and local drought conditions.

Monthly reports will be generated and submitted to the Pechanga Drought Task Force. These reports will, at a minimum, summarize the condition of each drought indicator, present the updated Reservation drought stage, and provide additional rationale for addressing conflicting indicators and/or incorporating additional information.

3 Vulnerability Assessment

The Pechanga DCP vulnerability assessment was conducted to identify historical and projected drought conditions within the Reservation, estimate future drought scenarios utilizing local climate projection tools developed through the State of California's Fourth Climate Change Assessment (Bedsworth et al. 2018; Pierce et al. 2018), and document the vulnerabilities to the Tribe associated with observed and projected droughts. While the emphasis of the vulnerability assessment is on the provision of potable and recycled water for the Tribe, it also takes into consideration potential drought impacts to human and ecosystem health and the Tribe's main industry (i.e., the Journey at Pechanga golf course and the Pechanga Resort Casino).

The effects of drought on the Tribe's water resources were evaluated using both local and regional drought projections. Local drought scenarios were used to assess the impact of shifts in local climate conditions on water supplies and demands, while the regional drought projections were used to assess vulnerabilities associated with long-term reliability and accessibility of imported potable water supplies for the Tribe. The scenarios incorporated into this assessment characterize the vulnerabilities that may be associated with the varying magnitudes and frequencies of the anticipated droughts. Understanding and preparing for a range of climate change projections and incorporating previously identified vulnerabilities will help the Tribe's policyholders and interested parties implement meaningful mitigation actions and develop appropriate response measures to address different levels of drought. Details of the local and regional drought scenarios are described in Sections 3.1 and 3.2. Section 3.3 characterizes vulnerabilities and risks to the Tribe's water supplies associated with each drought scenario.

3.1 Local Drought Projections

The meteorological and hydrological parameters used for evaluating drought vulnerabilities within the Reservation are air temperature, evapotranspiration (ET) demands, precipitation, and streamflow. Air temperature data serve as a direct measurement of global warming impacts within the area, and ET demands are a measure of outdoor irrigation demands associated with warming temperatures and decreasing precipitation. Historical and projected precipitation and streamflow data are used as to evaluate water available for supporting groundwater recharge to the Tribe's main water-producing aquifers (see Section 1.1).

Two primary resources were used for projecting shifts in local air temperature, precipitation, ET, and streamflow through the twenty-first century: the California Energy Commission's Cal-Adapt suite of climate change tools (Cal-Adapt 2024) and the climate change factors published by DWR supporting management of groundwater resources (DWR 2018). Both resources utilize the same global climate models identified by the California Change Technical Advisory Group as the most appropriate for projecting future climate scenarios in the state of California, and they incorporate two GHG emission scenarios (a medium and a high GHG emission scenario). The main difference between the two resources is that the Cal-Adapt tool runs Transient Climate Simulations, while the DWR tool utilizes Climate Period Simulations. Cal-Adapt's Transient Climate Simulations predict absolute values of temperature, precipitation, and streamflow, incorporating interannual variability in addition to variability associated with the climate change signal. DWR's Climate Period Simulations produce climate change "factors" that linearly scale historical records from local monitoring stations. This approach removes modeled interannual variability and provides a tool for water resources managers to evaluate the magnitude of climate change effects using the historically documented distribution of water-year types (i.e., critically dry, below average, average, above average, and wet water years). In addition, DWR's correction factors are centered around two different future climate periods that average mean model output from 20 global climate models to develop a Central Tendency simulation for 15 years on either side of 2030 (2016–2045) and 2070 (2056–2085); they also provide bookend projections from two of the extreme global climate models: HadGEM2-E5 = drier with extreme warming (DEW); and CNRM-C5 = wetter with moderate warming (WMW).

Precipitation and extreme weather projections from Cal-Adapt's tool were used to evaluate trends in precipitation/drought (i.e., anticipated magnitude and frequency), and the DWR correction factors for precipitation and streamflow from local meteorological and streamflow stations were used to quantify the anticipated impacts of rainfall and runoff on the Reservation.

Historical and projected air temperatures, ET demands, precipitation, and streamflow are described in detail below.

3.1.1 Temperature and Evapotranspiration

3.1.1.1 Temperatures

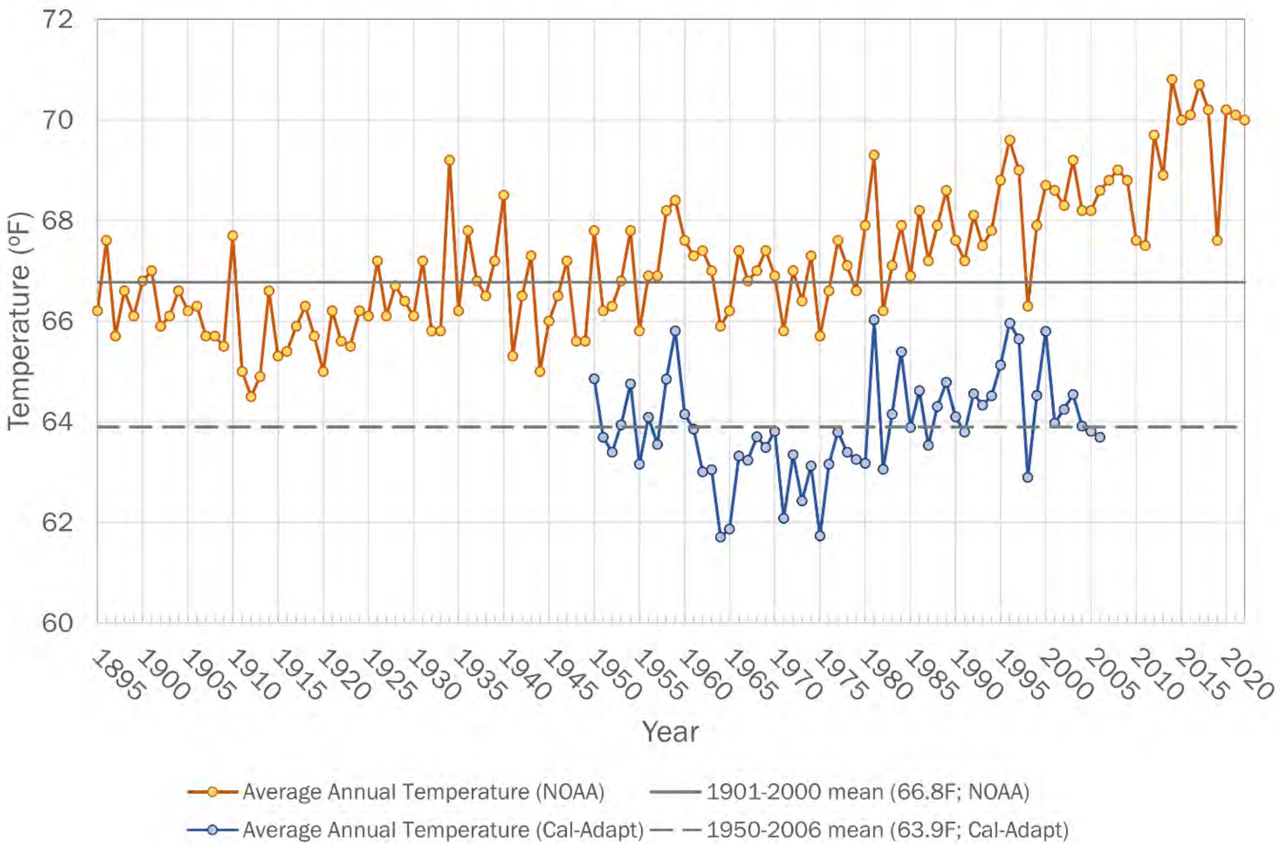
Historical Conditions

Historical temperature data for Riverside County and the Reservation are provided by two separate agencies: the NOAA and (2) Cal-Adapt (Table 7).

The historical data publicly available through NOAA are estimates of minimum, maximum, and average daily temperatures for all of Riverside County. These data were estimated by NOAA as part of their Climate at a Glance program (NOAA 2023), which calculates near-real-time temperature information using their Global Historical Climatology Network (NOAA 2023). For Riverside County, NOAA's Global Historical Climatology Network data indicates that average annual temperatures have historically averaged approximately 66.7°F. Average annual temperatures have generally increased since the 1970s, with the 7 warmest years on record occurring in the last 10 years (NOAA 2023; Figure 10). The warmest year on record since 1895 occurred in 2014, when NOAA estimated that the average annual temperature in Riverside County was approximately 70.8°F.

Cal-Adapt's estimates of historical temperature are derived from gridded observed meteorological data prepared for the entire country of Mexico, coterminous United States, and regions of southern Canada (Livneh et al 2015). These data are based on daily observations of precipitation and maximum and minimum temperature gridded to a 1/16° resolution. Cal-Adapt's estimates of average annual temperature are lower than NOAA's. For the period from 1950 through 2006, Cal-Adapt estimates that average annual temperature on the Reservation was approximately 63.9°F. This is approximately 3.5°F lower than NOAA's estimate for the same period (Figure 10). Despite the difference in absolute temperature values, both the Cal-Adapt and NOAA datasets indicate that temperatures in Riverside County and on the Reservation have been increasing since the 1970s.

Figure 10. Riverside County, California Average Annual Temperature



Cal-Adapt Projections

Table 7 summarizes Cal-Adapt's mid-century and end-of-century temperature projections. Shifts in annual maximum and minimum temperatures for the two scenarios are provided in Figure 11. Under the Representative Concentration Pathway (RCP) 4.5 scenario (moderate GHG emissions), average annual minimum and maximum temperatures are projected to increase by approximately 4°F in Riverside County and on the Reservation. Over the second half of the century, Cal-Adapt predicts that warming will slow, with an increase in temperature of approximately 1°F in the last 30 years of the century compared the mid-century projection (Table 7).

Under the RCP 8.5 scenario (high GHG emissions), Cal-Adapt estimates that average annual minimum and maximum temperatures in Riverside County and on the Reservation will increase by approximately 5°F. Unlike the RCP 4.5 scenario, warming is not projected to slow, and by the end of the century, Cal-Adapt predicts that temperatures in Riverside County and the Reservation will have increased by approximately 8°–9°F.

Figure 11. Minimum and Maximum Cal-Adapt Projected Temperatures for 4.5 and 8.5 RCP

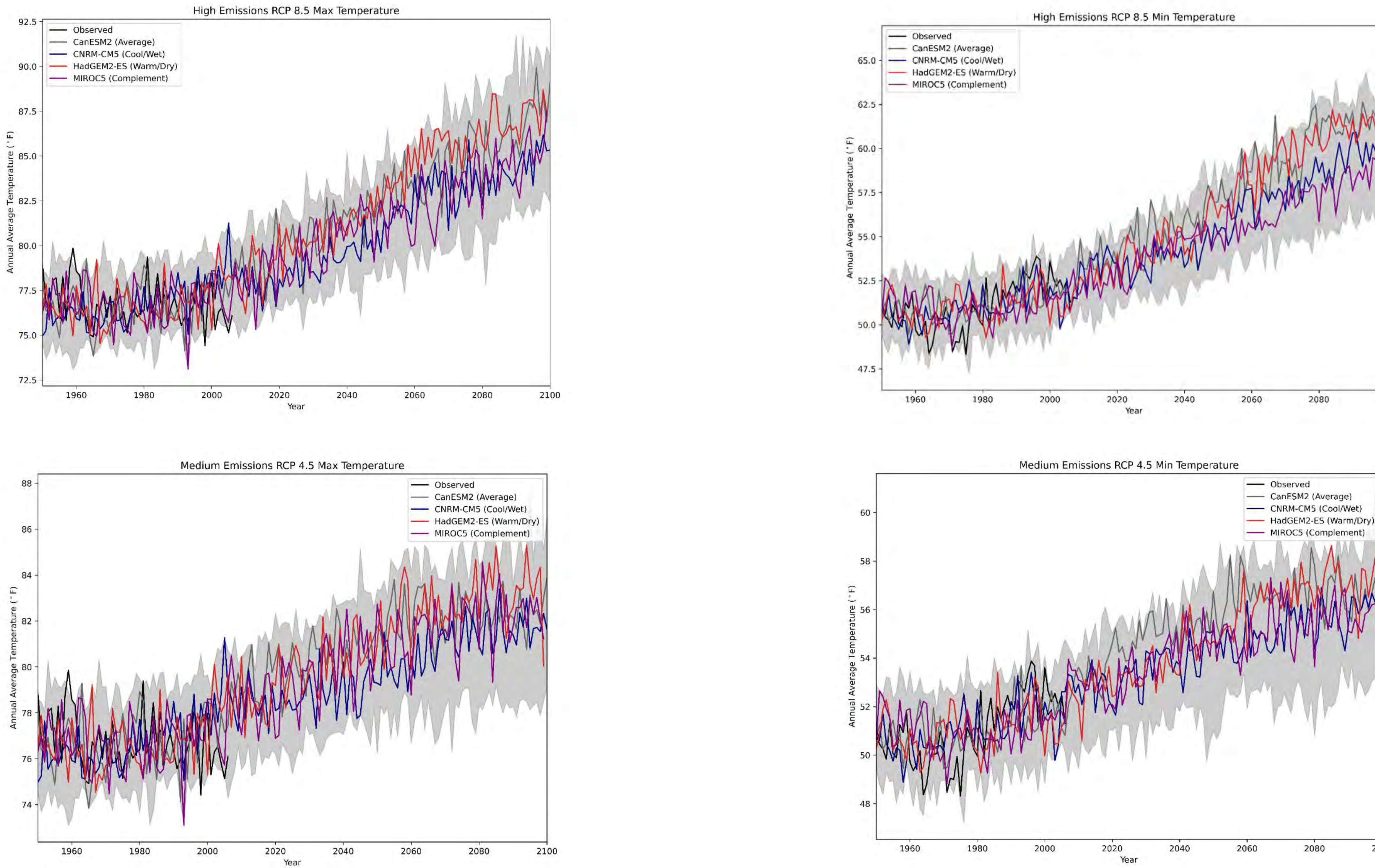


Table 7. Average Temperature Changes for Riverside County and the Pechanga Indian Reservation*

			Riverside County		Pechanga Indian Reservation	
Scenarios	Agency	Time Period	Average Temperature (°F)	Changes from Observed Historical Average (°F)	Average Temperature (°F)	Changes from Observed Historical Average (°F)
Historical Estimates	NOAA	GHCN Historical	Min: 54.3	N/A	N/A	N/A
		(1950–2000)	Max: 80.4			
	Cal-Adapt	Gridded Observed Historical	Min: 52.1	N/A	Min: 51.0	N/A
		(1950–2000)	Max: 81.2		Max: 76.3	
Medium Emissions (RCP 4.5)	Cal-Adapt	Mid-Century Projection	Min: 56.4	+4.4	Min: 54.9	+3.9
		(2035–2064)	Max: 85.5	+4.3	Max: 80.5	+4.2
		End-of-Century Projections	Min: 57.7	+5.7	Min: 56.2	+5.2
		(2070–2099)	Max: 87.0	+5.8	Max: 81.9	+5.6
High Emissions (RCP 8.5)	Cal-Adapt	Mid-Century Projection	Min: 57.4	+5.4	Min: 55.9	+4.9
		(2035–2064)	Max: 86.6	+5.4	Max: 81.6	+5.3
		End-of-Century Projections	Min: 61.4	+9.4	Min: 59.6	+8.6
		(2070–2099)	Max: 89.9	+8.7	Max: 84.8	+8.5

Notes: NOAA = National Oceanic and Atmospheric Administration; GHCN = Global Historical Climatology Network; RCP = representative concentration pathway.

* The state's summary of the model output (Pierce et al. 2018) includes additional projections for temperature in the region:

- *Temperature extremes are anticipated to amplify over the next century*: The hottest day of the year is projected to increase by 4°–7°F for the RCP 4.5 scenario and by 7°–11°F for the RCP 8.5 scenario.
- *Extreme warm days are anticipated to increase in frequency over the next century in Riverside County:* Under the RCP 8.5 scenario, the number of days with temperatures exceeding 90°F is anticipated to double over the next century. The number of days with temperatures exceeding 100°F is anticipated to range from approximately 75 to 100 days per year.

DWR Projections

DWR does not provide temperature projections in their climate change datasets.

3.1.1.2 Evapotranspiration

Historical Conditions

The state maintains two CIMIS weather stations near the Reservation: Station 62 (Temecula), which is located approximately 8.5 miles northwest of the Reservation, and Station 237 (Temecula East), which is located approximately 7.5 miles northeast of the Reservation. These two weather stations measure multiple parameters, including temperature, solar radiation, vapor pressure, and humidity, which are then used to calculate estimates of reference ET (ET_o, which is the expected ET demand for grass. The ET_o values calculated from the CIMIS data reflect the amount of water transpired by grass. The state has operated Station 62 since November 1986 and station 237 since November 2012.

Table 8 summarizes the monthly normal ET_o values for CIMIS Stations 62 and 237. The CIMIS data indicates that ET demands are highest during the summer months of July and August; during these months, ET_o values are on average approximately 2–3 times higher than the winter months. On average, ET demands in the region have ranged from approximately 54 inches (or 4.5 feet) per year at Station 62 to approximately 63 inches (or 5.3 feet) per year at Station 237.

Table 8. Reference Evapotranspiration (ET_o)

Month	Measured Average Monthly Normal ET_o		DWR Projections (Applied to CIMIS Station 62)			
	CIMIS Station 62 (1987–2022)	CIMIS Station 237 (2012–2022)	2030	2070 Central Tendency	2070 DEW	2070 WMW
January	2.80	2.76	3.00	3.20	3.50	3.19
February	2.83	3.30	2.96	3.15	3.47	2.90
March	3.96	4.66	4.12	4.36	4.64	3.95
April	4.89	5.96	5.08	5.35	5.87	4.82
May	5.44	6.56	5.71	6.08	6.55	5.63
June	6.10	7.68	6.31	6.62	7.20	6.38
July	6.64	8.10	6.86	7.06	7.01	6.75
August	6.42	7.78	6.65	6.86	7.00	6.69
September	5.16	6.18	5.34	5.54	5.58	5.32
October	4.07	4.81	4.26	4.47	4.53	4.20
November	3.22	3.41	3.40	3.66	4.09	3.38
December	2.58	2.39	2.76	3.01	3.32	2.89
Total	**54.10**	**63.60**	**56.45**	**59.37**	**62.75**	**56.10**

Notes: DWR = California Department of Water Resources; CIMIS = California Irrigation Management Information System; DEW = drier with extreme warming; WMW = wetter with moderate warming.

DWR Climate Projections

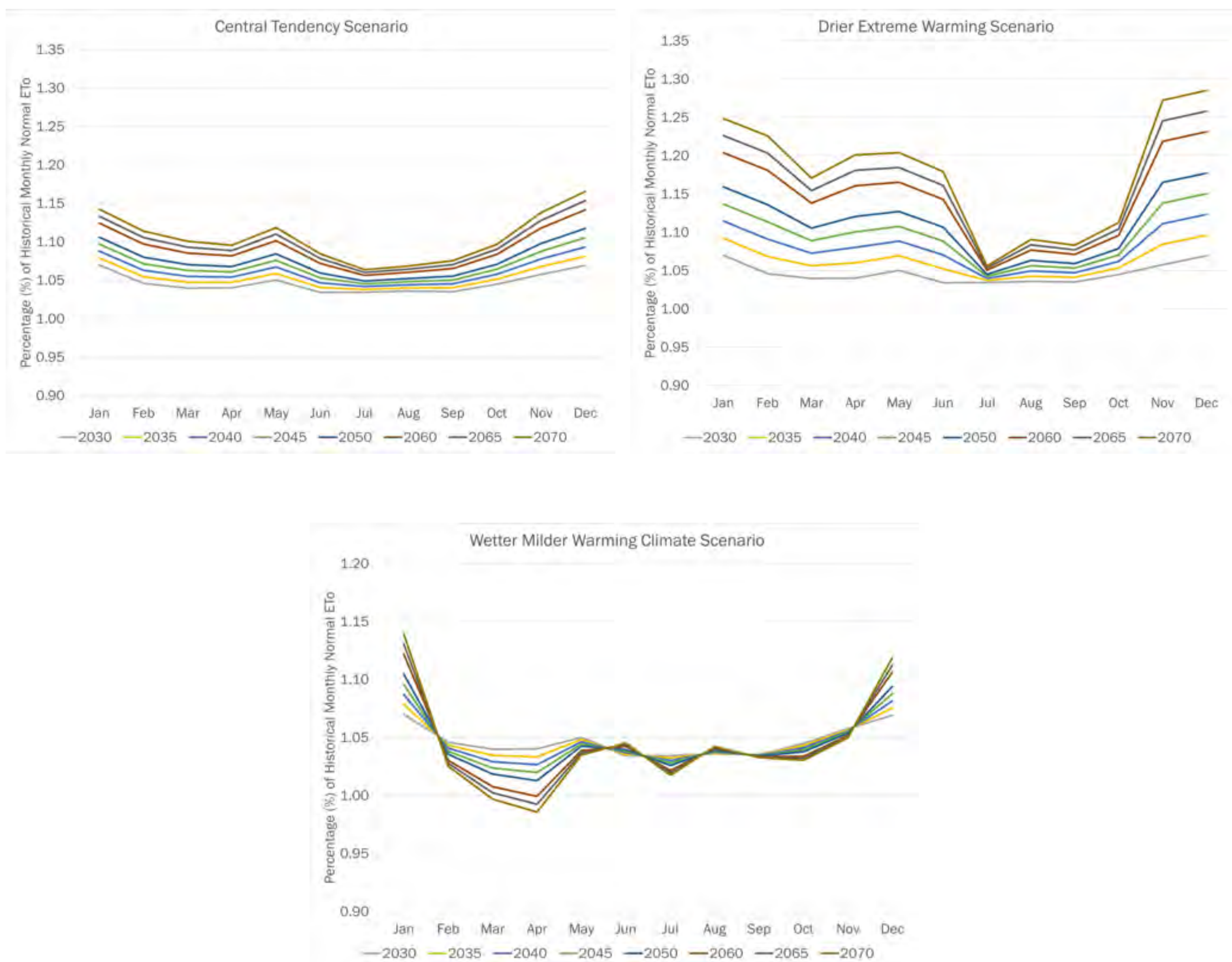
The statewide gridded datasets provided by DWR include climate change factors for evapotranspiration (Figure 12). DWR's 2030 projections suggest that ET_o will increase on the Reservation, with the largest increases occurring in the months of December and January. In December and January, DWR projects that ET_o demands will increase by approximately 7%–8%. By 2030, DWR predicts that total annual ET demands will increase by approximately 4%. Applying this to the ET_o data measured at CIMIS Station 62 leads to an increase in ET demand of approximately 2.5 inches per year (Table 8).

Under the central tendency projections, DWR predicts that the trends in increasing ET_o will remain relatively consistent through 2070. By 2070, DWR's central tendency projection suggests that January ET_o values will increase by approximately 14%, and December ET_o values will increase by approximately 17%. DWR predicts that ET demands will increase by approximately 5%–8% during summer months. Under the central tendency projections, DWR predicts that average annual ET will increase by approximately 10%. Applying this to the ET_o data measured at CIMIS Station 62 leads to an increase in ET demand of approximately 5 inches per year (Table 8).

DWR projects that under Drier Extreme Warming conditions, ET_o increases will be amplified during winter months compared to the central tendency projections (Figure 12). In the months of December and January, DWR's DEW projection suggests that ET demands will increase by approximately 30% and 25%, respectively. While the ET increases in the summer months are comparable to the central tendency projections, the increased winter demands are anticipated to lead to an additional 6% increase in annual ET demands compared to the central tendency predictions.

Under the WMW projections, DWR predicts that ET demands will either decrease or remain stable during spring and summer months between 2030 and 2070 (Figure 12). Like the central tendency and DEW projections, winter ET demands are anticipated to increase between 2030 and 2070 (Table 8).

Figure 12. DWR Climate Scenarios for ETo from 2030 to 2070



3.1.2 Precipitation

Historical Conditions

Cal-Adapt's estimate of average annual precipitation for Riverside County is approximately 7.9 inches, and the average annual precipitation for the Reservation is 17.2 inches. The higher precipitation average for the Reservation relative to Riverside County is due to its position within the Peninsular Range, where increased precipitation is associated with the orographic effect caused by the 4,500-foot climb up the Pechanga Creek watershed.

The annual precipitation recorded at the nearby Temecula NOAA weather station (Figure 2) is provided in Figure 5 (see discussion of data gap filling in Section 2.2.1). The average annual precipitation for this record is 14.0 inches, with a standard deviation of 8.8 inches (63% of the average), and a minimum and maximum measurement of 0.07 inches (1972) and 36.1 inches (1993), respectively. The high standard deviation is a reflection of the high interannual variability in this region, where water years more often alternate between below-average or above-average precipitation and less frequently experience "average" water years (i.e., a bimodal distribution rather than a normal distribution).

Cal-Adapt Projections

Cal-Adapt's historical and projected precipitation metrics for both Riverside County and the Reservation are provided in Table 9. Under the RCP 4.5 scenario (moderated GHG emissions), shifts in mean annual precipitation appear minimal countywide and within the Reservation. Shifts in minimum and maximum annual precipitation are more apparent, with a projected decrease in both minimum and maximum precipitation for the Mid-Century Projection (by 0.9 inches and 1.8 inches, respectively), and an increase in the maximum precipitation for the End-of-Century Projection (by 4.0 inches). Under the RCP 8.5 scenario (high GHG emission scenario), both Mid-Century and End-of-Century Projections show a decrease in minimum precipitation (1.2 inches and 0.9 inches, respectively), and an increase in maximum precipitation (both by 6 inches).

Table 9. Annual Average Precipitation Changes for Riverside County and the Pechanga Indian Reservation*

		Riverside County		Pechanga Indian Reservation	
Scenarios	Projections	Annual Average Precipitation (inches)	Precipitation Range (inches)	Annual Average Precipitation (inches)	Precipitation Range (inches)
Medium Emissions (RCP 4.5)	Observed Historical (1950– 2000)	7.9	2.2–19.4	16.9	4.6–44.6
	Mid-Century Projection (2035–2064)	8.0	1.7–19.9	16.9	3.7–42.8
	End-of-Century Projections (2070 –2099)	7.9	2.4–24.2	17.0	4.4–48.6
High Emissions (RCP 8.5)	Observed Historical (1950– 2000)	7.9	2.2–19.4	16.9	4.6–44.6
	Mid-Century Projection (2035–2064)	7.8	1.6–22.3	16.9	3.4–50.6
	End-of-Century Projections (2070 –2099)	8.9	1.8–24.2	18.4	3.7–50.6

Note: RCP = representative concentration pathway.

* The state's summary of the model output (Pierce et al. 2018) includes the additional projections for precipitation in the region:

- *Moderate increases in precipitation are anticipated during the wet winter months* (typically between October and January): These range between a 5%–15% increase in precipitation for the RCP 4.5 scenario and a 15%–20% increase for the RCP 8.5 scenario.
- *However, these wetter winters seasons are projected to then be followed by a decline in spring precipitation and a prolonged dry season* (typically between May and October).
- *Overall, Southern California is projected to experience slightly drier conditions for both scenarios in the mid and late century.*
- *Extreme rainfall events are anticipated to become more frequent*: The similarities between historical and projected mean precipitation in Table 9 (as well as projected increases in precipitation during the wet winter months) do not capture the impacts of receiving a significant amount of the total annual rainfall in fewer high-intensity events. These extreme events often exceed watershed infiltration and storage capacities, resulting in high-volume/short-duration flows through the watershed (i.e., flooding) where a significant portion of the precipitation is conveyed to the Pacific Ocean through the Santa Margarita River. Cal-Adapt's projections for change in rainfall intensity during extreme events (classified as 2-day rainfall totals exceeding 0.96 inches for this region) show under both RCP 4.5 and 8.5 scenarios that there will be an overall increase in rainfall intensity for the higher-frequency return events (e.g., 2-year, 5-year, 10-year, and 20-year return period rainfall events). Projections for the 50-year and 100-year return events show that the average anticipated rainfall intensity will remain relatively similar, but the 95% confidence interval expands under certain projections to the point where the current upper-end 100-year rainfall total of 15.1 inches could be as high as 36.7 inches (2069–2099 projection from the HadGEM2-ES [Warm/Dry] model run).

DWR Climate Projections

Development of local precipitation projections using DWR's four climate scenarios involved application of their climate change factors to the entire NOAA Temecula station record (1972–2022); this station was selected because it has the longest continuous record with minimal gaps and anomalous entries.[3] DWR's climate change factors are spatially dependent variables where model output was downscaled into 1/16th degree polygons across the state; these statewide polygons comprise DWR's Variable Infiltration Capacity grid. The NOAA Temecula weather station is located within Variable Infiltration Capacity grid polygon No. 11,045, one grid west of the grid encompassing Wolf Valley (No. 11,044). Monthly specific climate change factors for this polygon were applied to the NOAA precipitation record (1972–2022 water years) for the four different climate scenarios (no climate correction factor was applied for the "baseline" scenario, which assumes no climate change impact).[4]

Anticipated shifts in precipitation were then evaluated by computing the cumulative departure from mean (CDM) for the NOAA weather station (14.2 inches) using the 2030 and 2070 central tendency models, and the 2070 DEW model (Figure 13). The cumulative departure from mean shows the variability in precipitation as short- and long-term wet and dry periods, where an increase resembles a wetter-than-average year or period, and a decrease reflects a below-average year or period. Individual or multiyear decreases in the CDM in Figure 13 reflect the projected magnitude and frequency of single or multiyear droughts that can be anticipated in this region based on the interannual variability established in the 1972–2022 NOAA record. Historical and projected (2070 central tendency and 2070 DEW) water years were then categorized based on percent total precipitation relative to the 1972–2022 mean. These were defined as critically dry (< 50% of the mean), dry (> 50% and <75%), below average (>75% and < 90%), average (>90% and <110%), above average (>100% and <150%), and wet (>150% of normal) (Figure 14).

The implications from this analysis are:

- Historical and projected annual precipitation for the area has a bimodal distribution, where below-average and critically dry periods comprise ≥50% of the record, and above-average and wet periods comprise 25%–30% of the record. Average water years (where average annual precipitation totals fall between 85% and 115% of the mean) comprise only 20% of the historical record, and this is projected to decrease, with an increase in wet water years (annual precipitation exceeding 150% of the mean) and below-average water years (annual precipitation between 50% and 85% of the mean).
- Between the late 1970s and 2005, the region experienced numerous concurrent above-average and wet water years, with infrequent below-average (or dry) years.
- Since 2005, the region has been experienced numerous multiyear droughts, which are captured in the ~85-inch decrease in the CDM on Figure 13.
- The two central tendency models (both 2030 and 2070) mimic the magnitude and frequency of baseline conditions in the region through 2045.

3 The precipitation record from the local Pechanga weather station was not used due to its brief record (installed in 2016) and poor correlation with the nearby National Ocean and Atmospheric Administration (NOAA) and California Irrigation Management Information System (CIMIS) stations (not suitable for developing a relationship to fill record). In addition, the average annual precipitation recorded from the Pechanga weather station is approximately 25 inches, which is substantially higher than the average presented in the Cal-Adapt toolbox or recorded at the nearby CIMIS and NOAA weather stations. This high annual average is resultant from the wet and above-average 2017, 2019, 2020 and 2023 water years skewing the 8-year record. The NOAA Temecula station stopped recording data in September 2008. These data were populated to round out the dataset through the 2022 water year using the linear correlation with the nearby Santa Rosa Plateau weather station (R^2 = 0.86).

4 The California Department of Water Resources' climate change factors end in 2011, meaning there are no specific correction factors that can be applied to the precipitation records post 2011. In order to use these data, we identified a water year early in the record that is comparable to the 2012 water year and applied the climate correction factors beginning in that comparable water year to the remaining precipitation record (2012–2022). For this analysis, the 1976 water year was most comparable to the 2012 precipitation record, so the correction factors beginning in January 1976 were applied to the January 2012 precipitation record.

- The 2070 central tendency model begins deviating significantly from baseline conditions after 2050, with an increased magnitude in dry conditions.

Compared to the 1972–2022 historical record, the 2030 central tendency simulation presents a decrease in average annual precipitation of approximately 0.75 inches, whereas the 2070 central tendency simulation presents a decrease of approximately 1.2 inches. The 2070 DEW model presents an overall reduction in the mean annual precipitation for the region by more than 2 inches, whereas the 2070 WMW model presents an overall increase by more than 2 inches.

Figure 13. Cumulative Departure from Mean Annual Precipitation – Historical and Projected (Temecula NOAA Station - COOP:048844)

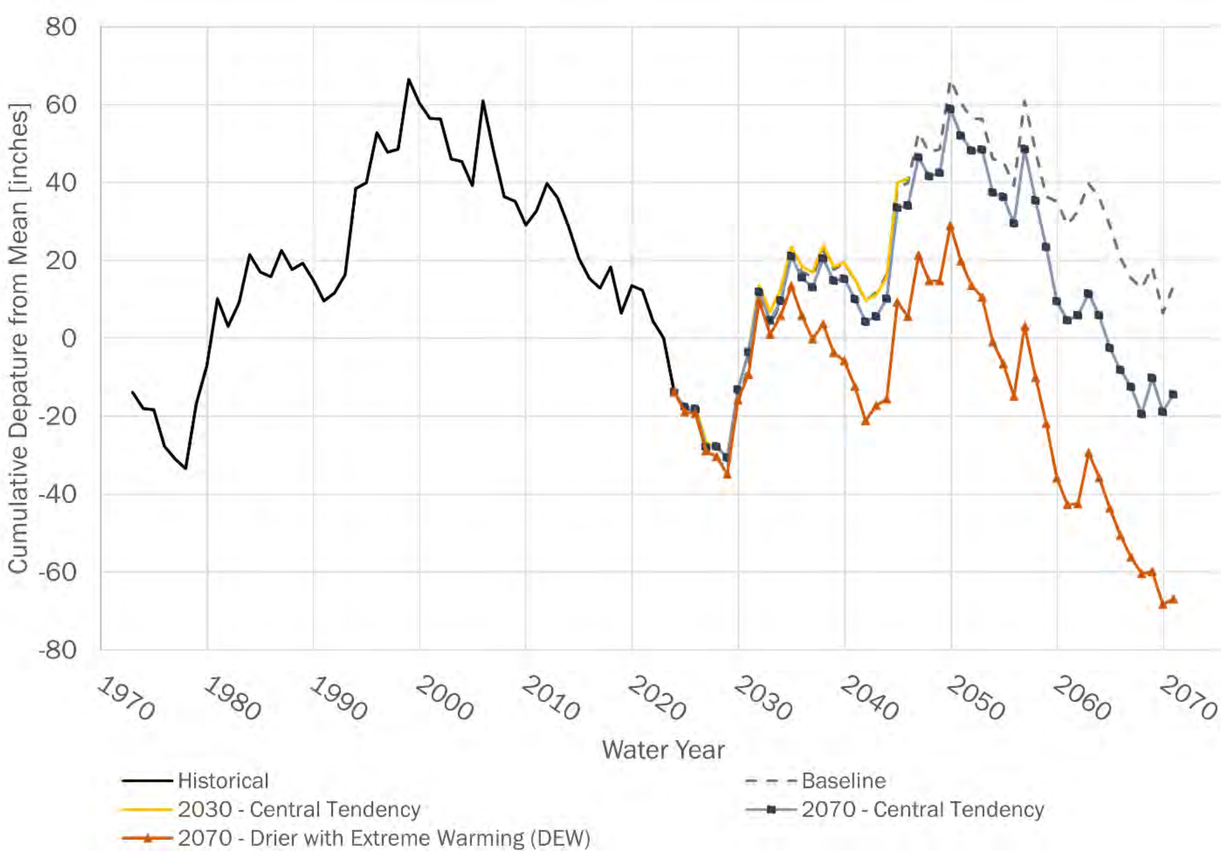
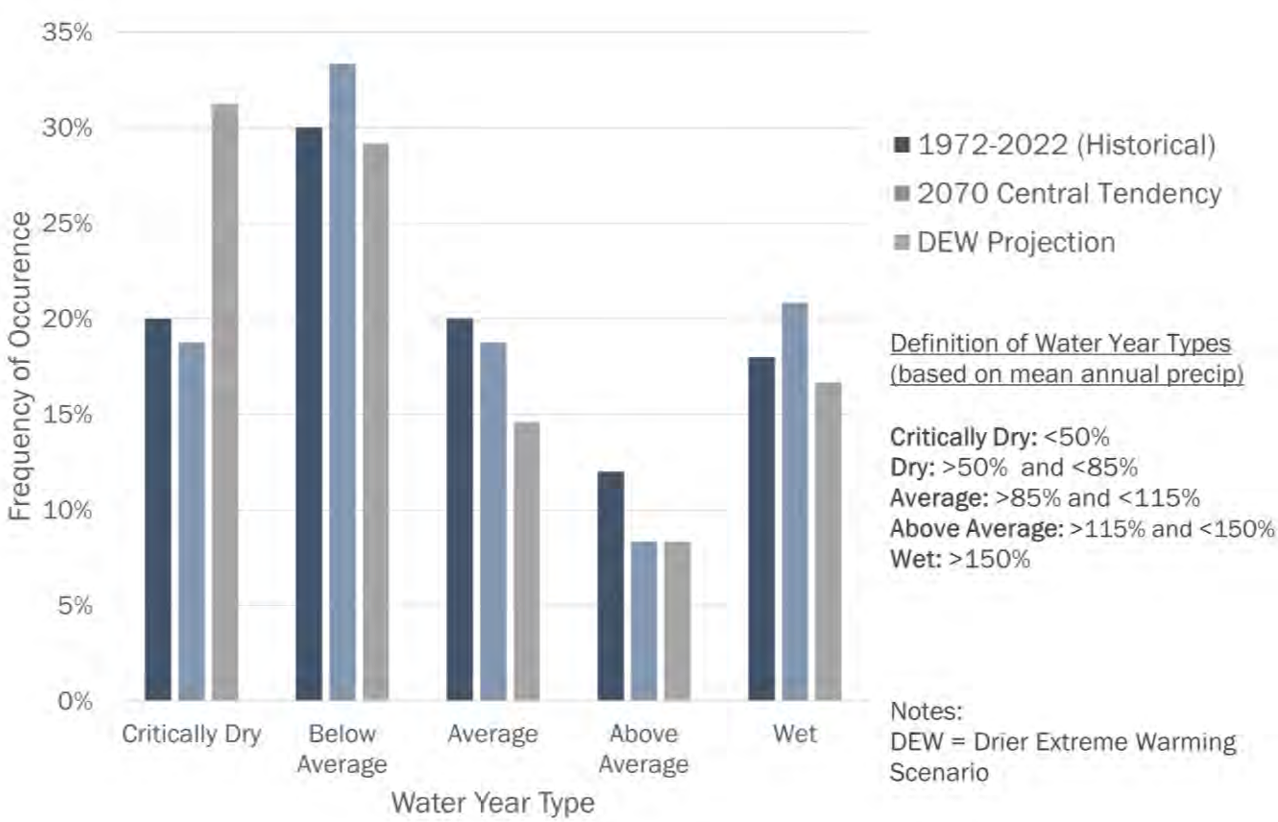


Figure 14. Comparison of Historical and Projected Precipitation Trends (Temecula NOAA Station - COOP:048844)



3.1.3 Streamflow and Groundwater

Historical Conditions

While Pechanga Creek is not identified as a source of water for the Tribe and could be classified as an ephemeral stream for most water years, the 2003 groundwater study conducted for the Wolf Valley Subbasin (NRCE 2003) identified increased groundwater recharge in the shallow unconfined aquifer (the Pauba Formation – see Section 1.1) during "large runoff" events in Pechanga Creek. Historical streamflow data were plotted alongside groundwater elevation data in the unconfined aquifer (Figure 4a) as an initial evaluation of this relationship. Based on this high-level review, there appears to have been a decline in Pauba Formation groundwater elevation (see water levels in the three wells) during the 2011–2016 drought, where there was no recorded discharge in Pechanga Creek. Conversely, groundwater elevation appears to stabilize and then rebound after the wetter 2017, 2019, and 2020 water years, when Pechanga Creek recorded nearly 1,500 AF of discharge across the three water years.[5] These data reflect the impact the existing bimodal distribution of extremely wet and dry water years has on both streamflow and groundwater recharge.

5 Additional analyses of parameters affecting groundwater elevation (e.g., groundwater production and aquifer storage/transmissivity) would be required to establish rates of recharge from precipitation and streamflow to the three aquifers within the Wolf Valley Subbasin.

DWR Climate Projections

DWR developed large-watershed-scale (Hydrologic Unit Code 8) streamflow change factors for Groundwater Sustainability Agencies to evaluate potential shifts in streamflow conditions (DWR 2018). The change factor developed for the Santa Margarita River watershed (Hydrologic Unit Code 8: 18070302) was applied to the Pechanga Creek to evaluate potential shifts in average annual discharge to see if there are any major anticipated shifts in streamflow in this region by 2045 and by 2070 (Figures 15a and 15b). It should be stressed that this is a coarse tool intended to evaluate regional conditions over a larger watershed area (i.e., may not be suitable for the ephemeral Pechanga Creek) and that the average monthly values provided in Figures 15a and 15b do not convey the extreme nature of flow through this system, where multiple years of no flow through the channel are offset by wet years with significant flow.

Additionally, the projected increases in rainfall intensity and extended dry periods could result in less recharge overall to the local aquifers. Increased rainfall intensity will result in flashier runoff events, reducing the amount of contact time runoff has with the Pechanga channel (where recharge primarily occurs through channel transmission), whereas the projected extended dry periods could result in desiccated watershed conditions and increase watershed storage in soils, vegetation, and depressions for retaining rainfall that would otherwise have become runoff.

Figure 15a. DWR Projected Climate Scenarios in Monthly Flow (Pechanga Creek) by 2045

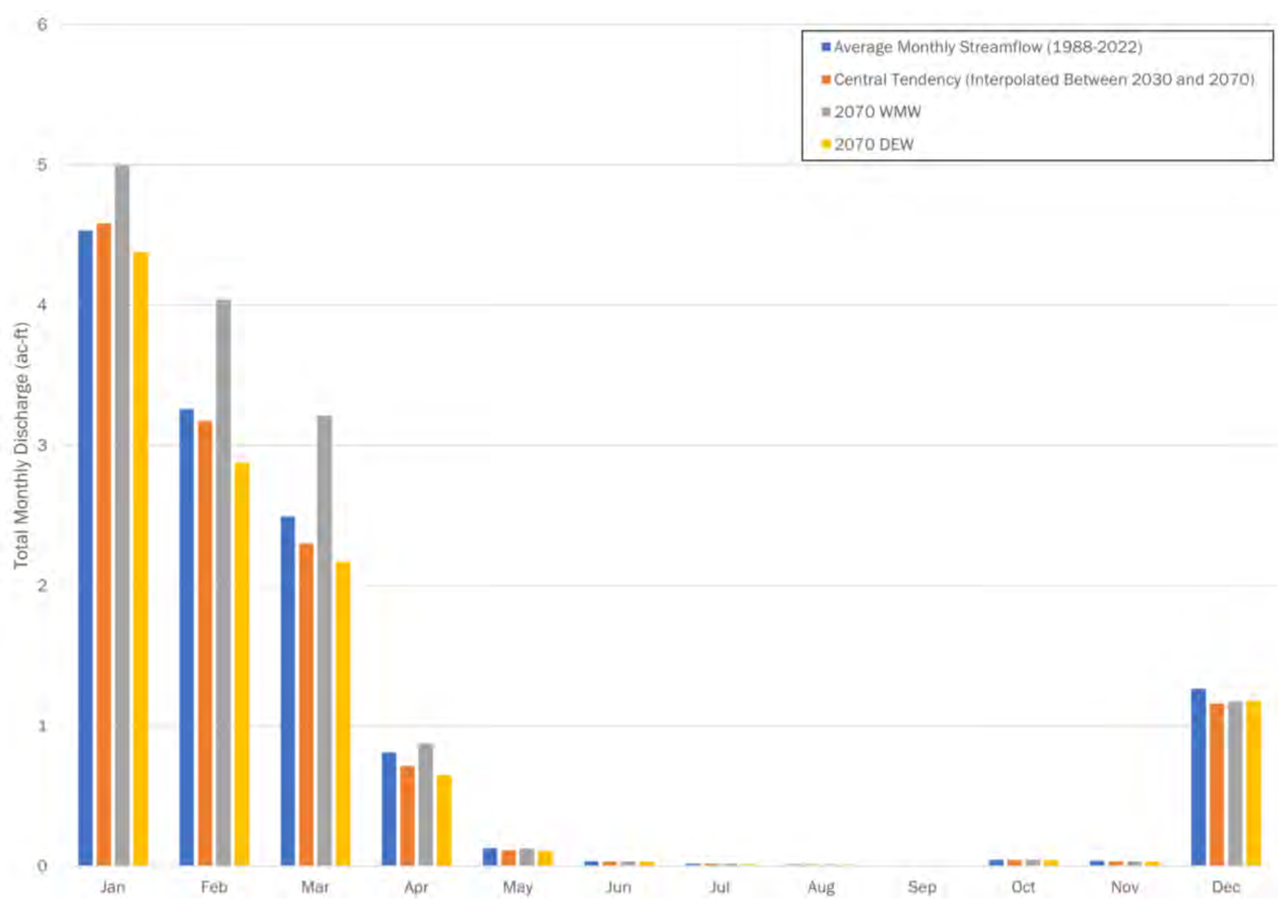
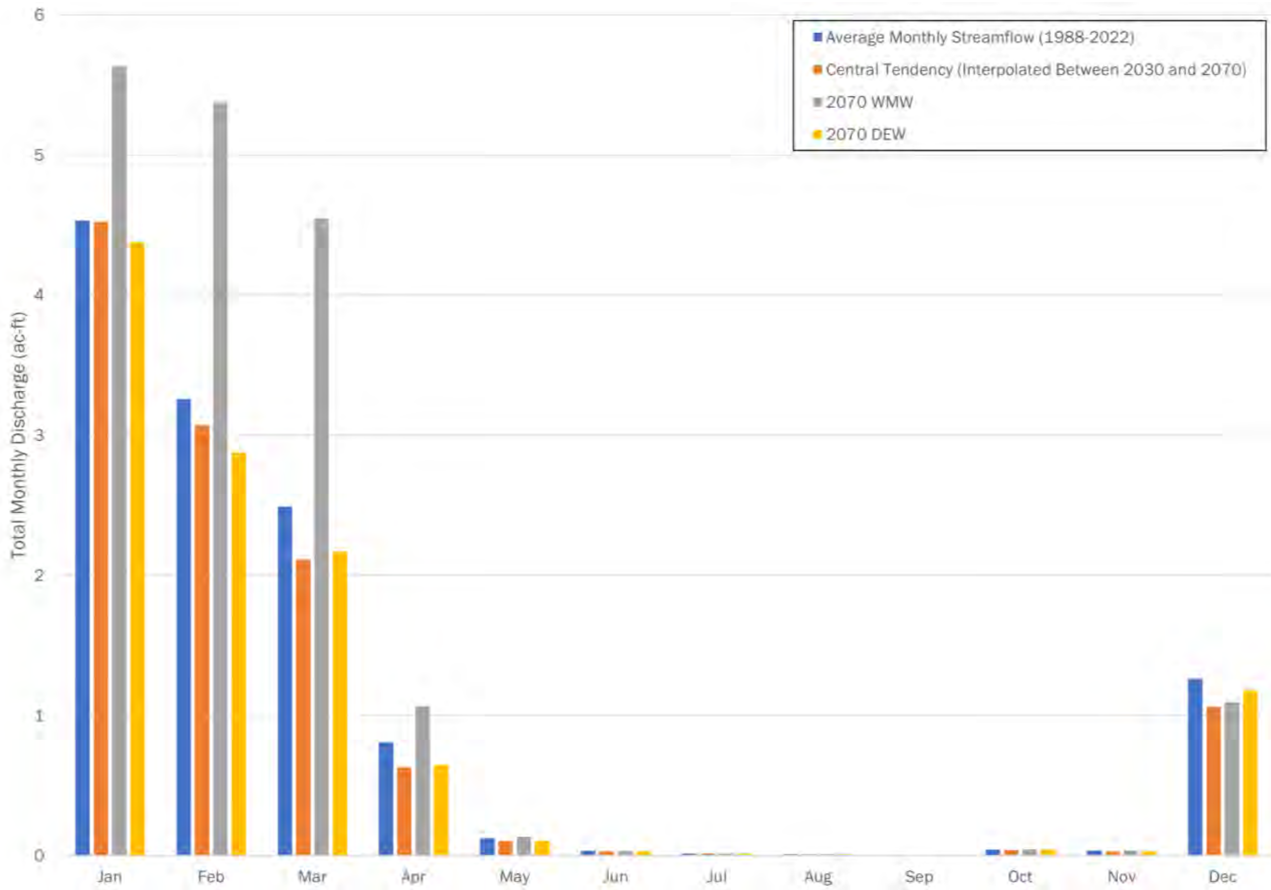


Figure 15b. DWR Projected Climate Scenarios in Monthly Flow (Pechanga Creek) by 2070



3.2 Regional Drought Projections

While the Tribe's annual imported water demand is primarily limited to recycled water, access to imported potable water serves as a key tool for implementing conjunctive use strategies that mitigate against the impacts of drought as well as system failures, local water quality concerns, and other emergency situations. Potable water is imported through an intertie with RCWD (PWS 33-10038), where RCWD delivers a combination of treated groundwater (from the larger Temecula Valley Groundwater Basin, including the Wolf Valley Subbasin) and imported SWP/CRA water provided by the regional wholesaler MWDSC. Therefore, regional droughts affecting provision of water to Southern California through the SWP and CRA have been included in this DCP.

The assessment of regional drought scenarios and associated impacts to the Tribe's imported water supply is based on MWD's 2020 Integrated Water Resources Plan (IRP). MWD's IRP incorporates four climate change and water supply scenarios to evaluate a broad range of anticipated water supply and demand dynamics for their service areas through 2045, including Western and Municipal Water District and EMWD, respectively), which are the wholesale water agencies to RCWD (the Reservation's connection to imported potable and recycled water). While the Tribe's dependence on imported water is primarily limited to reclaimed water (since 2015, see Figure 7), understanding potential future restrictions on imported potable water to the region is critical for identifying risks associated with imported potable water reliance during extended regional drought scenarios.

Climate models cited in California's Fourth Climate Change Assessment project an increase in interannual variability dictated by extreme droughts or atmospheric rivers, extended hot/dry summer seasons, and an increase in below-average water years (Bedsworth 2018). In addition to the anticipated increases in drought intensities and durations, the projected increases in temperature throughout the region are also expected to drastically reduce the snowpack in the Sierras and the Colorado River Basin (Bedsworth 2018), shifting hydrology for many of the watersheds supporting water supply reservoirs from strong spring and summer baseflows generated by snowmelt to high-flow pulse flows generated by strong atmospheric rivers or monsoons (under both RCP 4.5 and 8.5 scenarios). Shifting delivery of precipitation to these water supply reservoirs from gradual snowmelt to extreme daily precipitation events could result in a significant portion of the annual precipitation exceeding reservoir storage and being sent downstream. While water providers throughout the state are exploring new methods and technologies for capturing these extreme events (e.g., managing aquifer recharge and additional reservoirs), there is still a concern that even during above-average water years, the region's existing infrastructure lacks the ability to store runoff generated by the anticipated high-intensity and short-duration precipitation events.

Recent large-scale and multiyear droughts in the Southwest have already exposed these vulnerabilities. There have been numerous cuts in delivery of SWP water to Southern California during recent droughts (where supply has been reduced to 0%), and California is now facing unprecedented reductions in the delivery of CRA water to MWDSC until 2026 (California, Nevada, and Arizona recently agreed to a 13% reduction through 2026: Bland 2023). Looking forward, MWDSC's 2020 Integrated Water Resources Plan (IRP) projects future supply and demand across four different scenarios through 2045 that incorporate climate impacts, regulatory settings, and economic growth (i.e., demand) (MWDSC 2021). Where demand increases and/or supply decreases, MWDSC projects varying degrees of water shortages that will impact the provision of imported potable water. Under the most severe scenario (Scenario D – Increased Demand and Reduced Supply), MWDSC anticipates that by 2025, 2% of their service area will be confronted with water shortages, and by 2045 this could increase to 66% (a potential shortage of up to 1.2 million AF).

While these projections highlight immediate impacts to provision of potable water, there are potential impacts to delivery of recycled water resultant from statewide efforts to reduce demand (e.g., low-flow toilets and drought tolerant landscaping) and implement wastewater treatment technologies targeting effluent as a potential source of potable water. Such efforts could reduce the availability of recycled water from EMWD to the Reservation.

3.3 Potential Drought Risks for the Tribe

In general, the various climate models used in conducting this vulnerability assessment predict increasing air temperatures, more frequent extreme weather events, prolonged dry seasons, and reduced snowpack. While there are varying projections for shifts in average annual precipitation totals, the models currently show a strengthening of the bimodal distribution of wet and dry water years this region has been subject to for the past two decades. This translates to the potential for increased frequency of multiyear droughts separated by above-average/wet water years. How these projected shifts in local and regional climate could impact the Reservation's critical resources are presented in the following.

3.3.1 Water Demand and Supply Vulnerabilities

Projected Demand

Estimates of future water demands for the Tribe are based on historical measurements of water usage, climate change projections, and estimates of population growth and commercial property expansion. The baseline (2023) water demand for the Tribe was established as the average annual demand recorded between 2014 and 2022.[6] Population and tourism are not anticipated to increase on the Reservation, and there are no proposed expansions to the Journey at Pechanga golf course or other commercial operations. Because of this, the Reservation's projected increases in current demand are limited to those associated with the 80-Acre Project, consisting of a new school, athletic fields, and government support buildings, and the increase in outdoor irrigation demands associated with increasing ET demands. As of the development of this DCP, there are no definitive water demand projections for the 80-Acre Project; the assumptions used to estimate future demands associated with this project are described in the following.

Projected Commercial and Residential Water Demands

Potable water supplies are used to support operations of the casino, Commercial Zone, and government facilities, and to meet residential demands on the Reservation (Section 1.3). Potable water supplies consist of water imported through RCWD and groundwater and may in the future include imported water from MWDSC (Section 1.3). Between 2014 and 2022, commercial and residential water demands averaged 690 AFY. Of this, an average of 140 AFY was used to support outdoor irrigation. Because the Tribe does not anticipate population increase, an expansion of tourism, or an expansion of commercial and golf course operations, the only anticipated increase in historical potable water demands is associated with increasing irrigation demands that result from climate change.

To estimate the future increase in potable outdoor irrigation, the central tendency, DEW, and WMW projections for ET demand provided in Section 3.1.1 were applied to the 2014–2022 average potable outdoor irrigation demands for the golf course and Commercial Zone and to the domestic water demands on the reservation. Based on these projected scenarios, it is estimated that by 2070, potable outdoor irrigation demands may increase by a minimum of approximately 15 AFY under WMW conditions to a maximum of approximately 50 AFY under DEW conditions (Table 10; Figures 16a and 16b).

Based on current understanding, construction of the 80-Acre Project is not anticipated to increase demand on potable water use because proposed facilities are intended to replace existing/older facilities and will be outfitted with water-conserving fixtures.

6 Domestic usage was not metered/reported prior to 2014.

Table 10. Historical and Projected Demands

Scenario	Potable Water Supplies (AFY)						Recycled Water Supplies (AFY)	
	Casino Zone		Reservation Zone		Commercial Zone		Commercial Zone	
	Non-Irrigation	Irrigation	Commercial	Domestic	Buildings	Golf course	Golf Course	80-Acre Project
Historical Avg. (2014–2022)	358	71	55	134	4	71	457	—
Central Tendency (2030)	358	74	55	140	4	74	478	180
Central Tendency (2070)	358	78	55	148	4	78	503	200
Drier Extreme Warming (2070)	358	83	55	157	4	83	534	212
Wetter Milder Warming (2070)	358	74	55	139	4	73	473	189

Notes: AFY = acre-feet per year. The assumptions used during estimation of the 80-Acre Project demands are described in Section 3.3.1

Figure 16a. Historical and Projected Total Water Supplies and Demands on the Reservation

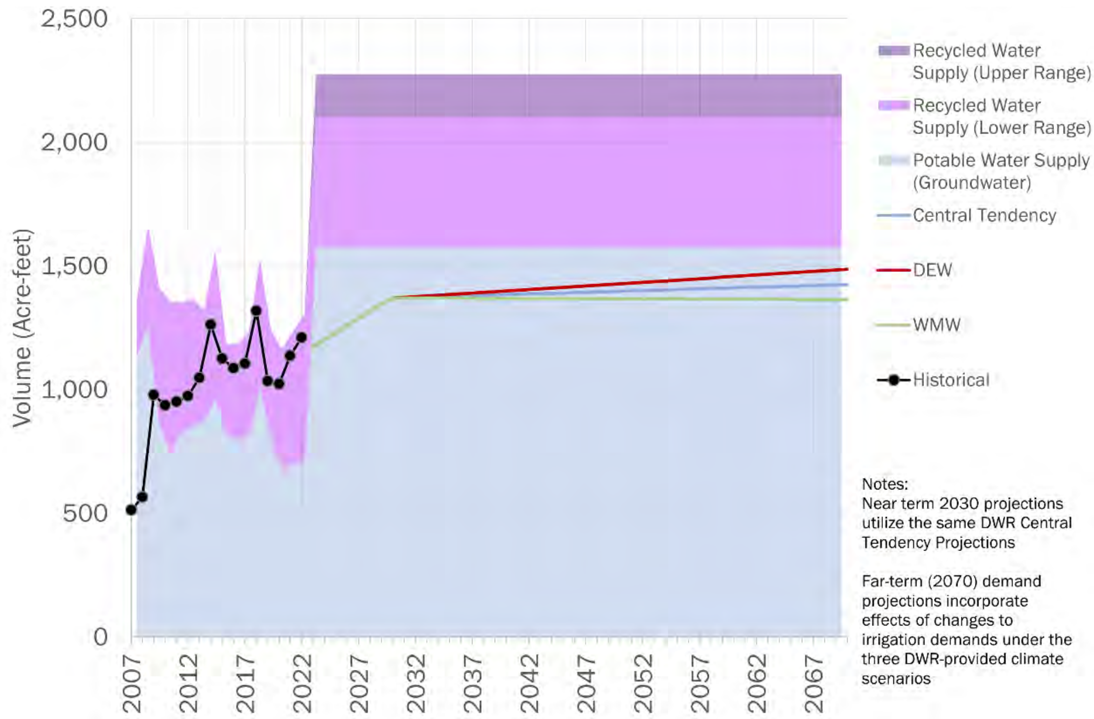


Figure 16b. Historical and Projected Potable Water Supplies and Demands on the Reservation

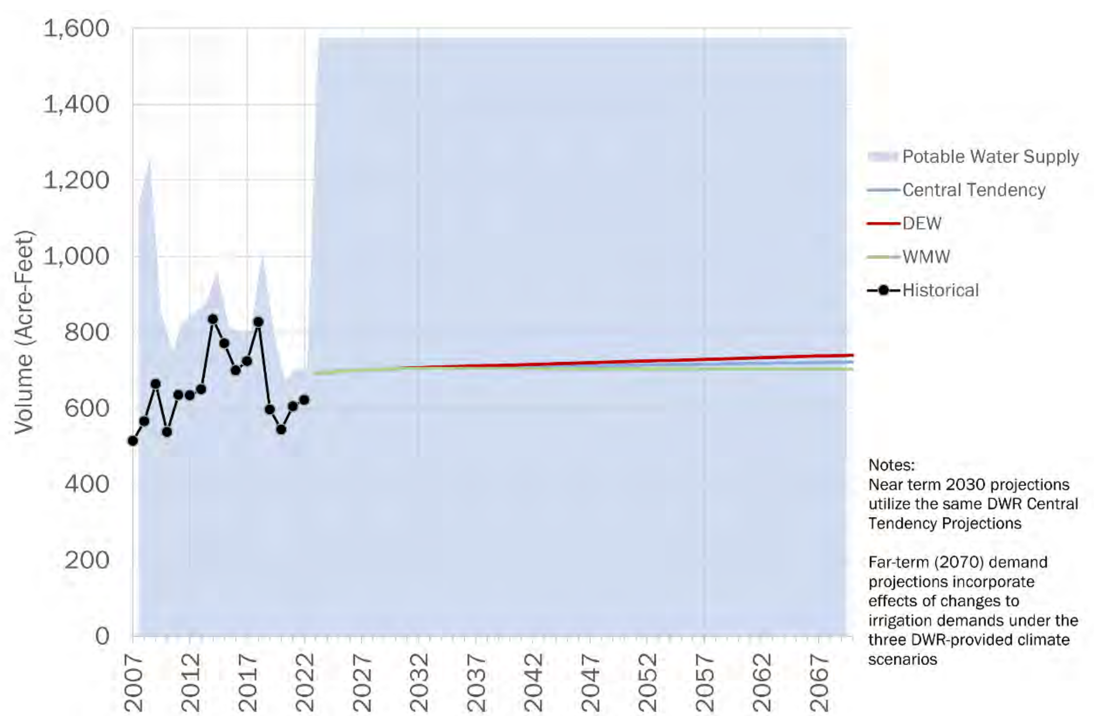
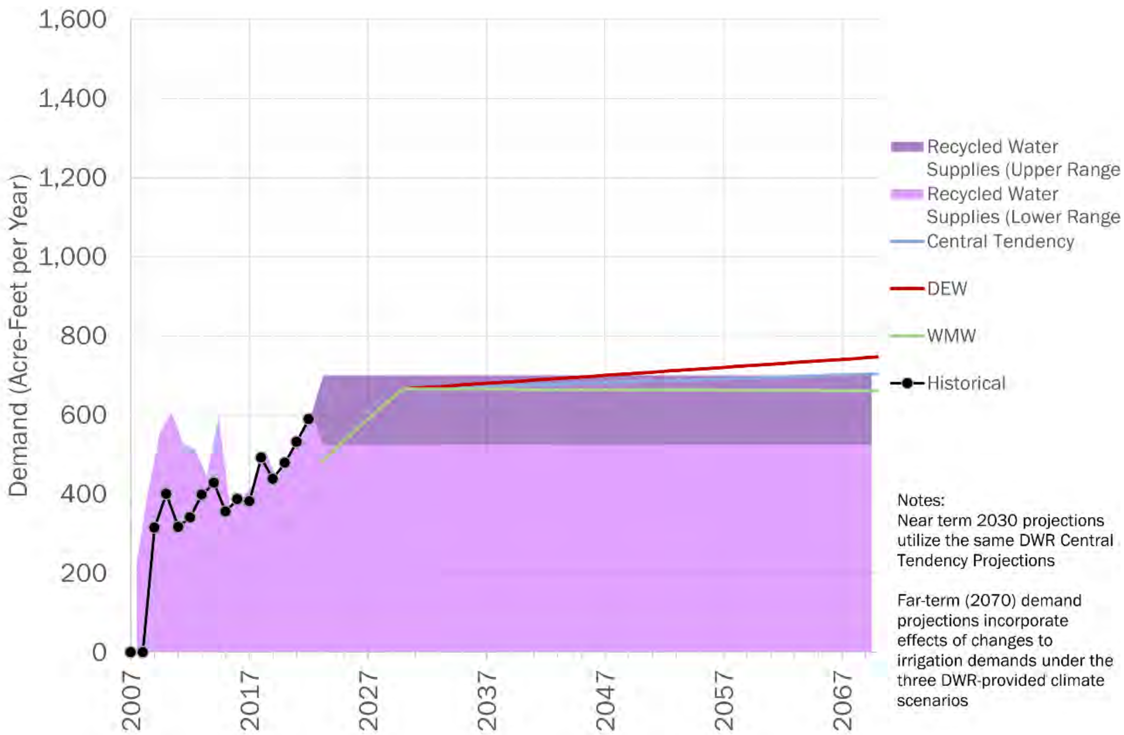


Figure 16c. Historical and Projected Recycled Water Supplies and Demands on the Reservation



Projected Recycled Water Demands

The Tribe has been utilizing recycled water since 2009 to support irrigation of their golf course (Section 1.3.1). Between 2014 and 2022, recycled-water golf course irrigation demands averaged approximately 460 AFY (Table 10). DWR's projections of ET demands suggest that golf course irrigation demands will increase due to climate change (DWR 2018). To estimate the future increase in recycled water demand associated with climate change, the central tendency, DEW, and WMW projections for ET demand provided in Section 3.1.1 were applied to the 2014–2022 average recycled-water golf course demand. Based on these projected scenarios, it is estimated that by 2070, recycled water irrigation demands for the golf course may increase by a minimum of approximately 15 AFY under WMW conditions to a maximum of approximately 80 AFY under DEW conditions (Table 10).

As previously noted, final specifications for the 80-Acre Project have not been developed. To provide a conservative estimate of future water demands for the project, it was assumed that the 80-Acre Project would include 40 acres of irrigated turf. Using the monthly ET recorded at the CIMIS Temecula Station (62), it is estimated that 40 acres of irrigated turf would require a total water demand of approximately 190 AFY. The Tribe anticipates that this demand would be met by with recycled water. Additionally, assuming that the 80-Acre Project would be completed by 2030, near-term water demands were estimated using a linear increase in demand between 2022 and 2030 to the projected irrigation demand of 190 AFY. To estimate far-term demands, DWR's ET demand change factors (Section 3.1.1) were applied to the estimated baseline demand of 190 AFY. Based on these scenarios, it is estimated that by 2070, irrigation of 40 acres of turf would increase recycled water demands for the 80-Acre Project by a minimum of approximately 10 AFY (WMW scenario) to a maximum of approximately 30 AFY (DEW scenario; Table 10).

Combining the projected recycled water demands for both the golf course and 80-Acre Project leads to an estimated increase in recycled water demands for the Reservation of approximately 210–290 AFY by 2070 (Table 10; Figures 16a and 16c).

Projected Supply

Projections of future supply scenarios are set to match the two main water allocations defined in the 2016 Settlement Act (Bill HR 5984), which include 1,575 AFY of groundwater extracted from the Wolf Valley Subbasin and 525–700 AFY of imported recycled water. Although the Settlement Act includes access to an additional 2,275 AFY of imported potable water (from MWDSC), it was not included in the future projections of supply because it is currently treated as an emergency resource only. Without further understanding of aquifer properties (i.e., aquifer storage, transmissivity, recharge rates, and safe yield), projections of groundwater storage or water quality under various climate scenarios could not be included in this assessment. It should be stressed that potential loss of groundwater resources is a significant concern with regard to the future stability of the Reservation's water supply (primarily through reduced sustainable yield and poor water quality); measures have been included in the DMP that include using groundwater elevations as thresholds for defining drought stages (and implementing drought response actions), and the Tribe is pursuing additional studies that will help characterize the Reservation's aquifer properties, which may be used to support long-term groundwater management.

Water Supply Vulnerability

Under all scenarios, the Reservation is projected to have sufficient water to cover all demands (Figure 16a). The projected increase in demand on potable water is minimal: <30 AFY by 2070 under the central tendency scenario and <50 AF by 2070 under the 2070 DEW scenario. The projected increase in recycled water demand is the greatest, at ~220 AF by 2070 under the central tendency scenario (an increase of 55%) and ~290 AFY by 2070 under the 2070 DEW scenario (an increase of 63%). These increases in recycled water demand would exceed the maximum recycled water allotment (700 AFY) under the Settlement Act by 2048 under the 2070 DEW scenario. It should be noted that the modeled increase in recycled water demand is primarily associated with the additional 40 acres of irrigated land assumed for the 80-Acre Project and may be revised with additional project details.

Considering all water sources, the 1,575 AFY of groundwater allotted to the Tribe through the 2016 Settlement Act is sufficient to cover all projected demands under all scenarios through 2070 (Figure 16a). This assumes that there will be no limitations on groundwater production in the Wolf Valley Subbasin and that sustainable yield for the Wolf Valley Subbasin (as modeled by RCWD every 5 years) will exceed 2,100 AFY, and/or that groundwater banking conducted under the Settlement Act will augment supply when sustainable yield is below 2,100 AFY. Further characterization of each aquifer is recommended to better understand the implications of long-term drought effects on the Pauba Formation south of the Wolf Valley Fault (the Kelsey and Eagle III wells), as well as the bedrock aquifer (GOR No. 2 well).

3.3.2 Environmental, Cultural, and Human Health Vulnerabilities

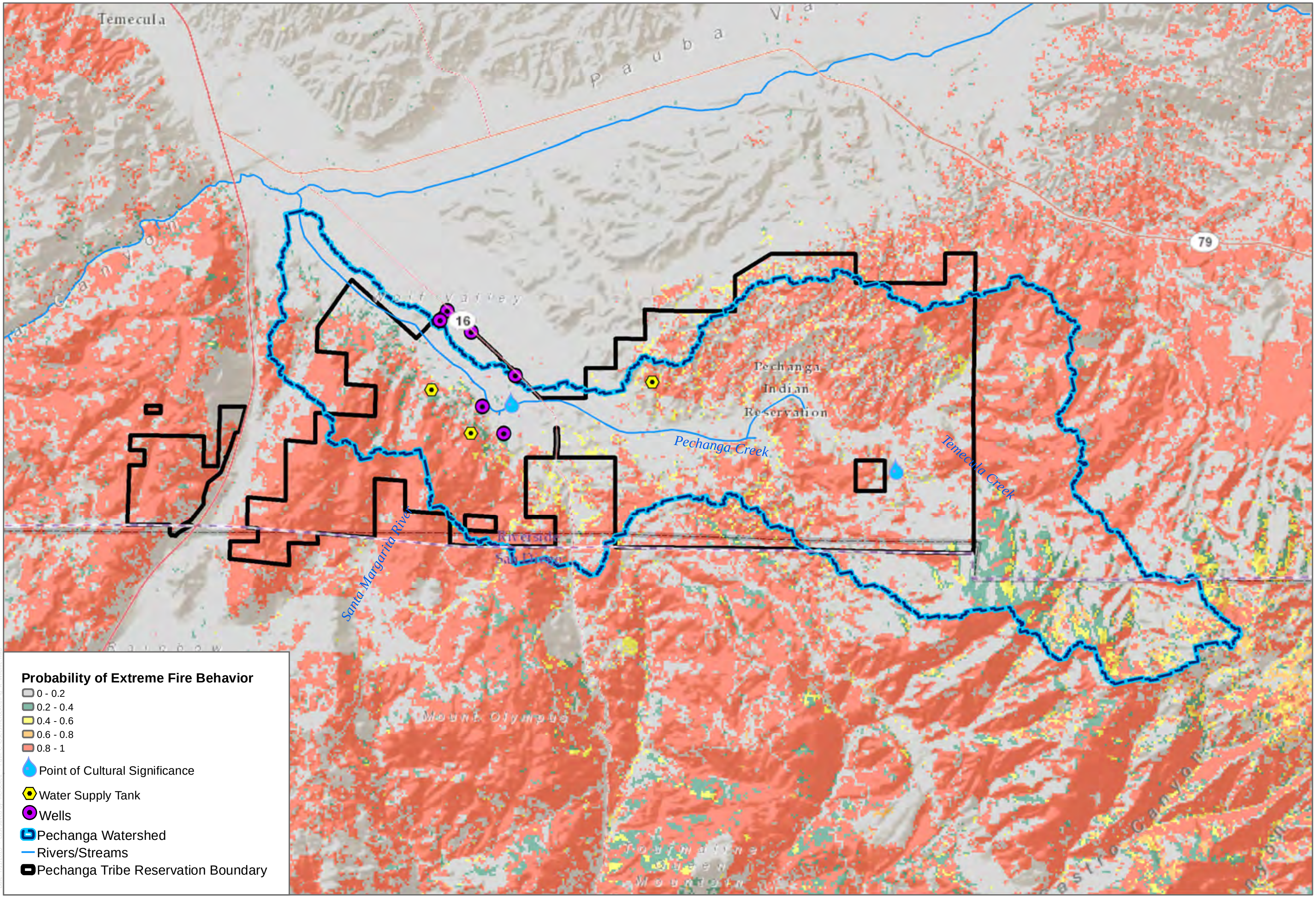
The impacts of drought on the Reservation's environmental and cultural resources, as well as on the human health of the members of the Tribe, are directly and indirectly linked to projected shifts in air temperature, precipitation, and streamflow. Environmental and cultural resource vulnerabilities can be discussed relative to the overall health of the Pechanga Creek watershed, as loss of watershed biomes resultant from excessive heat, extreme soil moisture deficits, reduced spring discharge, and increased wildfire frequency may irreversibly affect the various ecosystems across the 3,000-foot vertical gain through the watershed (from chaparral to pine forests) and the culturally significant Pechaa'anga Spring and Great Oak (see Figure 17).

Watershed Health

Increasing air temperatures and extended drought periods will contribute to increased plant stress by both increasing leaf temperature and reducing available water through soil moisture. With some climate models projecting 75–100 days over 100°F for the region in conjunction with periods of extremely dry soils, the potential exists for a number of plant species within the Pechanga Creek watershed to exceed hydraulic thresholds that could trigger mortality (Marchin et al. 2021). The projected multiyear droughts and possible multi-decadal droughts (Udal and Overpeck 2017) would lead to large-scale mortality among the watershed's chaparral, drastically limit groundwater recharge in the upper bedrock aquifer that sustains the Pechaa'anga Spring, and would reduce development of winter or spring baseflows from developing in Pechanga Creek.

Reduced winter and spring baseflows in Pechanga Creek and/or the shift to high-intensity runoff events resultant from extreme short-burst rainfall events may have long-term consequences for the Great Oak as well. With streamflow in Pechanga Creek serving as a primary source of water for the Great Oak, a reduction in the number of days Pechanga Creek is wetted adjacent the Great Oak will result in a long-term reduction of the soil moisture the Great Oak has adapted to.

Lastly, increasing air temperatures and decreased soil moisture will contribute to increased fire risk within the Pechanga Creek watershed. Current fire risk zones defined by the state are shown on Figure 17, while a separate integrated wildfire hazard model was run with specific weather conditions and fuel inputs. The Reservation's significant water supply features (storage tanks and production wells) and the two primary cultural features (the Great Oak and the Pechaa'anga Spring) are included in the maps. Projected increases in wildfire frequency and/or intensity within the Reservation will have immediate and long-term negative effects on ecosystem health, water quality, human health, residential/commercial infrastructure, and the local economy.



SOURCE: CA Wildfire and Forest Resilience Task Force, ESRI

DUDEK

0 0.5 1 Miles

Figure 17:Probability of Extreme Wildfire Behavior

Human Health

Wildfires introduce immediate risk to life and livelihood and can have long-term effects on respiratory and mental health (Pappas 2023). Increased air temperatures and sustained periods above 100°F are also anticipated to have negative effects on human health. With increasing temperatures globally, more attention is being paid to human physiological responses to extreme temperatures. A 2021 study in the Lancet (Asseng et al. 2021) identified that short exposure to temperatures exceeding 104°F in areas with low humidity could be lethal. The Tribe may need to coordinate cooling centers during extreme heat waves for members of the Tribe lacking resources for avoiding the heat.

3.3.3 Economic Vulnerabilities

In addition to the potential loss of commercial infrastructure through increased wildfire risks, persistent smoke from a regional fire could reduce tourism at the Journey at Pechanga golf course. Increased operational costs for the Reservation's commercial operations are also associated with decreased groundwater production (requiring purchase of imported potable water from MWDSC) and increased irrigation/cooling demands.

3.4 Summary

The climate projections analyzed in development of the Pechanga DCP indicate that the Tribe will be experiencing increased air temperatures, increasing occurrences of extreme weather events, prolonged dry seasons, and increased wildfire risks. These projected shifts have the potential to negatively affect the Tribe's provision of water; their environmental, cultural, and human health; and the economy (see summary of vulnerabilities in Table 11). Despite limited projected increases in future water demands for the Tribe, reductions in local groundwater and/or imported potable and recycled water resources are likely to occur and will require being offset by drought mitigation and response actions.

Table 11. Summary of Pechanga Indian Reservation Drought Vulnerabilities

Pechanga Resource	Drought-Related Impact	Primary Cause(s)	Vulnerability
Water Supply	Declining water levels in bedrock, unconfined (Pauba Formation) and confined (Temecula Arkose) aquifers	Increased demand (irrigation) and subsequent production from the Reservation's four wells coupled with decreased recharge (reduced local precipitation and streamflow)	Reduced "sustainable yield" modeled by RCWD for the Wolf Valley Subbasin, reducing the Reservation's annual groundwater budget (below the 1,575 AFY established in the Settlement Act)
			Drop in water levels below one or all submersible pumps in the Reservation's production wells, reducing their capacity to produce groundwater
			Possibility that declining water levels could tap into lower-quality groundwater deeper in the aquifers that exceeds water quality standards and treatment capabilities
	Reduced availability of imported potable water	Multiyear/multi-decade regional drought coupled with reduced snowpack limiting SWP and CRA deliveries to Southern California	Could limit MWDSC's capacity to provide potable water to PWS, even under emergency situations
	Reduced availability of imported recycled water	Water use restrictions in the Temecula Basin possibly limit EMWD ability to meet recycled water agreement under Settlement Act	Could experience turf die-off at the Journey at Pechanga and 80-Acre Project with reduced irrigation source
	Loss of water storage and/or delivery capabilities	Increased wildfire frequency and intensity	The Reservation's water tanks, pumps, and distributions lines located adjacent/within the dense chaparral forest most susceptible to wildfire destruction
Environmental and Cultural	Reduced streamflow and soil moisture alongside increasing ET demands	Local multiyear/multi-decade droughts with extreme air temperatures, followed by "wet" years where precipitation is distributed in more extreme (high-intensity) events, thus reducing percolation into local soils	Reduction in water available for plant use, resulting in increased plant stress, potential increase in tree mortality (including Great Oak)
	Increased wildfire frequency and intensity	Increased plant stress coupled with increased air temperatures	Loss of significant portions of the Pechanga Creek watershed, Reservation infrastructure, biological life; increased erosion and reduced water quality (streamflow)
Human Health	Sustained periods of extreme air temperatures and poor air quality	Projected increased air temperatures associated with climate change, as well as increased frequency of local/regional wildfires	Possible that outdoor conditions may become unhealthy for residents and tourists for sustained periods (e.g., >100 days)
Economic	Unhealthy air quality and/or temperatures	Increased wildfire frequency and intensity and/or sustained periods of high air temperatures	Reduction in tourism to the Reservation
	Increased irrigation and cooling demands	Increasing ET demands and air temperatures	Increased costs for maintaining irrigated turf/landscaping and providing water to cooling towers

Notes: RCWD = Rancho California Water District; AFY = acre-feet per year; SWP= State Water Project ; CRA = Colorado River Aqueduct; PWS = Pechanga Water Systems; EMWD = Eastern Municipal Water District; ET = evapotranspiration.

4 Mitigation Actions

One of the main elements of the Pechanga DCP is the identification of mitigation actions that can help reduce the magnitude and/or duration of the Tribe's drought vulnerabilities and improve their overall resiliency. These actions range from built infrastructure to resource management strategies that could be implemented at any point when funding and social/political support are aligned. An initial list of proposed mitigation actions was developed based on the vulnerabilities identified in Table 11 and through input from the Tribe collected in March and April of 2023 (Appendix A, Community Drought Survey). While the majority of the mitigation actions are focused on water supply resiliency or water conservation programs/strategies, there are additional actions targeting human, cultural, environmental, and economic health.

This list was presented to the Drought Task Force during the September 7, 2023, workshop (Appendix B, Task Force Workshop 1 [Elements M.2 through M.5]), and components of the list were vetted by the community on October 12, 2023, during the Pechanga Fire Department (PFD) Fire Prevention Night (Appendix C, Community Outreach Analysis). Input from the Drought Task Force and Pechanga community was used to finalize the list of proposed mitigation actions presented in this section. Each mitigation action is scored based on potential benefits each provides relative to:

- Water supply resiliency
- Water conservation
- Cultural preservation
- Human health
- Environmental health
- Economic health

The maximum sum of the potential benefits is 6. This score is further adjusted by applying multipliers for community favorability and feasibility. Input from the Drought Task Force and community workshops was used for defining the favorability multiplier. Development of the mitigation action feasibility multiplier includes a broad range of components that may impact the efficacy of a proposed project/strategy, including funding, collaboration, operations and maintenance costs, and degree of certainty of benefits. The favorability and feasibility multipliers are split into three values reflecting low favorability and feasibility (0.2), mixed favorability (or no input) and moderate feasibility (0.5), and high favorability and feasibility (1.0). The mitigation actions and their respective scores presented in this DCP serve as recommendations only; the Tribe will ultimately determine which mitigation actions to prioritize and pursue.

The full suite of mitigation actions is provided in Table 12. They have been subdivided into categories based on their emphasis on water supply resiliency, water conservation, increased storage and delivery, and improved human, cultural, and environmental health. Each mitigation action is defined in greater detail in sections 4.1 through 4.4 of this DCP.

Table 12. Mitigation Action Evaluation

MA No.	Mitigation Action	Focus	Benefits						*Favorability (0-1)*	*Feasibility (0-1)*	***Total Score (out of 6)***
			Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental Health	Economic Health			
1	Conduct **pump test at Kelsey and/or Eagle III** wells to define Pauba Formation aquifer properties and transmissivity across Wolf Valley Fault	Water Supply Resiliency	X	X				X	*1*	*1*	***3.0***
2	**GOR No. 2 boring evaluation**		X	X				X	*0.5*	*0.2*	***0.3***
3	**Ballpark well improvements** (rehabilitation, evaluate) – Serve as backup well		X					X	*1*	*0.2*	***0.4***
4	Rehab/Install **monitoring wells**		X	X	X		X		*1*	*0.5*	***2.0***
5	**Import MWDSC water** during "wet" years to allow aquifer recovery/recharge		X		X		X	X	*0.5*	*0.5*	***1.0***
6	**Managed aquifer recharge** – Feasibility study evaluating use of injection well(s) in Pauba **Formation (Kelsey/Eagle III) or Eduardo (Temecula Arkose)**		X	X			X	X	*0.2*	*0.2*	***0.2***
7	**Managed aquifer recharge** – Conduct pilot study for a recharge basin along Pechanga **Creek in Wolf Valley**		X	X	X		X	X	*1*	*0.2*	***1.0***
8	**Managed aquifer recharge** – Feasibility study evaluating upper-Pechanga **Creek floodplain connectivity to** channel		X	X	X		X	X	*0.5*	*0.2*	***0.5***
9	**Increase stormwater recharge** – Incorporate stormwater infiltration tanks/recharge systems with future development and retrofit existing facilities with large impervious surfaces		X	X			X		*1*	*0.5*	***1.5***
10	Develop **groundwater model** using aquifer properties from pump tests to estimate recharge from rainfall/runoff events.		X		X			X	*0.5*	*0.2*	***0.3***
11	Install **smart meters** tracking usage, temperature, pH, and with remote disconnect	Water Conservation		X		X		X	*1*	*0.5*	***1.5***
12	Promote **xeriscaping**			X		X		X	*0.5*	*1*	***1.5***
13	**Landscape audits** (non-mandatory)			X			X	X	*0.2*	*0.2*	***0.1***
14	**Reduce**/eliminate use of **potable water for irrigation**			X				X	*0.2*	*0.5*	***0.2***
15	**Sensor** based irrigation system for government/commercial landscaping			X				X	*0.5*	*0.5*	***0.5***
16	Local/residential stormwater capture for landscape irrigation (**rainwater harvesting** program)			X	X			X	*0.5*	*0.5*	***0.8***
17	Expand use of recycled **water** (for ballpark and 80-acre)		X	X		X			*1*	*1*	***3.0***
18	Implement **drought alert system/portal** (inform community and provide water conservation tips)			X				X	*1*	*1*	***2.0***
19	Promote/incentivize local & residential plumbing **updates**			X		X		X	*0.5*	*0.5*	***0.8***
20	Reduce water demands for **golf course/casino**			X		X		X	*0.2*	*0.5*	***0.3***
21	New **pump station for 80-Acre Project** and line bringing potable water to residential (gravity fed recycled water)	Increased Storage and Delivery	X			X			*1*	*1*	***2.0***
22	**Increase above**ground storage (i.e., additional storage tank(s))		X	X		X			*1*	*1*	***3.0***
23	Establish "**cooling center**" for residents	Improved Public, Cultural, and Environmental Health				X		X	*0.5*	*1*	***1.0***
24	**Firefighting** system upgrades (upgrade to industry standards)			X	X	X	X	X	*0.5*	*0.5*	***1.3***
25	Develop **Great Oak Adaptive Management Plan**				X		X		*0.5*	*0.5*	***0.5***
26	Review/revise (as needed) current **Fuel Reduction Program and Wildfire Response Program**				X	X	X		*0.5*	*0.5*	***0.8***

Note: MA = Mitigation Action.

4.1 Mitigation Action Focus – Water Supply Resiliency

Mitigation actions that emphasize improved water supply resiliency include actions that augment water supply, improve understanding of each aquifer's storage and transmissivity properties, and improve monitoring of groundwater conditions southwest of the Wolf Valley Fault.

MA No. 1 – Pauba Formation Pump Test – Currently the Reservation relies on groundwater trends defined at the USGS monitoring well northeast of the fault (J001S) and groundwater modeling results performed by RCWD every 5 years characterizing safe yield for the combined Pauba Formation and Temecula Arkose zone in the Wolf Valley Subbasin. As the Reservation wells are set in a section of the subbasin separated by an impermeable boundary created by the Wolf Valley Fault, use of the USGS monitoring wells and RCWD groundwater model may not adequately capture conditions in the Pauba Formation and Temecula Arkose aquifers southwest of the fault. This mitigation action proposes conducting a pump test in either or both the Kelsey and Eagle III production wells to provide storage and transmissivity data for the Pauba Formation aquifer southwest of the fault.

MA No. 2 – Bedrock Well Evaluation – Additional bedrock aquifer information may be gained from hydrogeologic investigations in the GOR No. 2 boring that may improve management of this resource over time. These could include identification of primary fractures feeding the boring, estimates of fracture(s) transmissivity, and establishment of groundwater elevation thresholds informing production rates and timing. The feasibility for this action scored low due to the complexity of bedrock aquifers and difficulty in drawing clear conclusions from borings fed by complex networks of fractures.

MA No. 3 – Ball Park Well Improvements – PWS is interested in pursuing a "back-up" well in the event that any of the main production wells are out of commission. Prior to drilling a new production well, the Ball Park well could be thoroughly evaluated to see if prior issues associated with elevated iron concentrations could be ameliorated. The feasibility for these actions scored low due to uncertainties associated with the source of iron and the necessity for long-term treatment/management outside of well rehabilitation.

MA No. 4 – Increased Monitoring Well Network – The current program for monitoring groundwater conditions in the aquifers southwest of the Wolf Valley Fault consists of capturing periodic water-level measurements from the four active production wells. A potential issue with the use of production wells for measuring local groundwater elevations is that measurements may have been recorded prior to static water levels being reached after the pumps were turned off. Use of existing or new monitoring wells offset from the production wells could provide continuous static water levels in the Pauba Formation, Temecula Arkose, and bedrock aquifers. These data will help establish a long-term record that will be critical for establishing trends and comparing aquifer properties on either side of the Wolf Valley Fault.

MA No. 5 – Import MWSDC Water – Use of MWSDC water when it is available will serve to (1) reduce demand on the Reservation aquifers; and (2) establish the Tribe's use of this resource, which may be taken into consideration during future drought scenarios when MWSDC has to prioritize delivery with established customers.

MA No. 6, No. 7, and No. 8 – Managed Aquifer Recharge – Augmenting groundwater recharge during extremely wet periods and/or with treated wastewater is becoming a common tool in the state of California for tackling dwindling water resources. Managed aquifer recharge is typically conducted in alluvial aquifers (e.g., Pauba Formation and Temecula Arkose aquifers) where conditions support installation of injection wells or recharge basins. Mitigation actions MA No. 6 and MA No. 7 propose feasibility studies evaluating the suitability of recharging the alluvial aquifers through either an injection well (MA No. 6) or through a recharge basin offset from Pechanga Creek adjacent to or upstream from the golf course (MA No. 7). These options would explore the use of diverted streamflow from Pechanga Creek and water imported from MWDSC during above-average water years. Mitigation action MA No. 8 targets the upper Pechanga Creek watershed and would evaluate suitable locations for diverting runoff to floodplains that could support local riparian habitat and increase mountain-front recharge (bedrock aquifer), both of which may increase groundwater supporting the Pechaa'anga Spring.

The low feasibility score for all of these actions is because it is uncertain whether there suitable soils or sections of Pechanga Creek to implement them in, coupled with the high-maintenance requirements (cost and frequency) for ensuring proper infiltration rates during their lifetime. The feasibility analyses would focus on identifying the most appropriate suitable locations for these recharge features and what level of long-term maintenance might be required.

MA No. 9 – Stormwater Recharge – This action focuses on projects that incorporate stormwater capture and recharge facilities for all new development projects and potential redevelopment projects. These may be simple infiltration swales or basins offset from impervious urban surfaces (e.g., buildings and parking lots) or use of subgrade infiltration chambers. Similar to the proposed aquifer recharge mitigation actions, the suitability of the soils where the infiltration facilities would be located is unknown, and the long-term maintenance requirements for maintaining the desired infiltration rates are high. That said, there are engineering controls that can increase localized recharge rates and reduce transport of fine organics and inorganics into the system, improving this action's feasibility score.

MA No. 10 – Groundwater Modeling – In addition to the proposed aquifer tests and static groundwater monitoring (MAs No. 1, No. 2, and No. 4), development of an integrated groundwater model focusing on the Reservation's section of the Wolf Valley Subbasin southwest of the Wolf Valley Fault could be used to quantify inflows and outflows to the Reservation's two alluvial aquifers (the Pauba Formation and Temecula Arkose aquifers). These data could be used to characterize the interaction between rainfall and runoff in Pechanga Creek with recharge to the two alluvial aquifers, allowing for better characterization of sustainable yield across varying drought scenarios. Ultimately, the model could help establish quantifiable objectives for reduced production rates during different drought stages (e.g., during a Stage 3 Drought, production from the Reservation's wells should be reduced by a specific percentage).

4.2 Mitigation Action Focus – Water Conservation

Mitigation actions that emphasize increased water conservation include actions that reduce demand for potable water, improve systems for monitoring and managing water use, and improve the communication of drought conditions to the community.

MA No. 11 – Smart Metering – The installation of smart meters aims to track water usage and monitor water supply conditions, including temperature and pH. Additionally, these smart meters would enable remote disconnection of the public water supply when water use exceeds the limits set on water usage based on drought stage. This system may serve as an early-detection system for capturing breaks in waterlines. As a proactive step toward improving water conservation, PWS has already begun installing smart meters at limited locations within the Reservation.

MA No. 12 – Xeriscaping – Promoting xeriscaping is a mitigative action that implements less-water-intensive lawn practices and can effectively conserve water. The main benefit from this action would be in replacing grass lawns with drought-tolerant landscaping.

MA No. 13 – Landscape Audits – To enhance local landscape practices, PWS can offer water conservation landscape audits. These audits would only be conducted at the homeowner's request and would be designed to raise awareness of water-saving practices for landscaping and provide recommendations for reducing water usage. The focus of the audit would include assessing water usage, irrigation systems, stormwater management (i.e., harvesting rainwater), and water quality.

MA No. 14 – Reduce Potable Water Irrigation – Between 2014 and 2022, an average of 140 AF of potable water was used to irrigate outdoor spaces, including the golf course and commercial zones (Section 3.3.1, Water Demand and Supply Vulnerabilities). By limiting reliance on potable water, groundwater pumping is reduced. This approach also ensures a more efficient allocation of imported potable water from the RCWD. Furthermore, taking this action will prepare the community by promoting sustainable practices for drought resilience during periods of water scarcity.

MA No. 15 – Sensor-Based Irrigation – Sensor-based irrigation technology, such as soil moisture sensors, can help optimize the water usage in outdoor spaces. These sensors accurately measure moisture levels in soil, providing real-time data. Based on this information, the sensor can adjust the water schedule as needed. Delivering an appropriate amount of water to the landscape can reduce water waste and produce less runoff and evaporation.

MA No. 16 – Rainwater Harvesting – By collecting and storing rainwater during heavy rainfall, Residents can improve community water conservation efforts. This reduces residential reliance on the public water supply, which includes both groundwater and imported water from RCWD. The harvested rainwater can enhance community resilience during droughts, as it can augment water supply used for landscape irrigation and small residential gardens.

MA No. 17 – Expand use of Recycled Water – Expanding access to recycled water across Pala Road to the Reservation Zone will greatly reduce dependence on potable water for irrigating public landscaping (including the upcoming 80-acre Project, which will have a sports park). The Tribe may also pursue expanded use of recycled water in the Reservation Zone for cooling towers, toilets, construction activities, and supplying artificial water structures.

MA No. 18 – Implement Drought Alert System/Portal – The DMP provided in this DCP includes monitoring criteria and thresholds for triggering different drought stages. Components of this monitoring program can be shared with the public as an online drought alert system managed by PWS. With this information available to the public, the Tribe introduces another tool for communicating the importance and timing of water conservation actions before and during droughts.

MA No. 19 – Residential Plumbing Upgrades – Promoting or incentivizing high-efficiency plumbing fixtures will reduce water usage.

MA No. 20 – Reduce Golf Course and Resort Casino Water Use – By implementing water conservation measures such as installing sensor-based irrigation, xeriscaping when feasible, using smart metering, and expanding the use of recycled water, the Pechanga Resort Casino can economically reduce their utilities costs and enhance water use efficiency within the casino and golf course.

4.3 Mitigation Action Focus – Increased Storage and Delivery

MA No. 21 – Booster Station for 80-Acre Project – One of the desired components of the 80-Acre Project is the inclusion of a booster station. The Tribe currently depends on one booster station to provide potable water to the Residential Zone. The additional booster station will provide much-needed redundancy (backup) for the Residential Zone.

MA No. 22 – Increased Above-Ground Storage – Funding and constructing of additional aboveground water storage facilities can enhance water availability in the PWS during periods of increased drought conditions or loss of production due to infrastructure or water quality issues. Additional storage may also be used to support firefighting resources.

4.4 Mitigation Action Focus – Improved Public, Cultural, and Environmental Health

MA No. 23 – Establish "Cooling Centers" – Cooling centers are areas where the community can visit public establishments to utilize the air conditioning and reduce the chance of heat-related illnesses during times of extreme heat conditions. This action can be implemented using existing infrastructure such as libraries, recreation centers, community centers, or town halls, etc. This can result in cost savings for members of the Tribe who might otherwise experience high electricity costs or lack access to such amenities.

MA No. 24 – Upgrade Firefighting Systems – PFD actively protects the community and infrastructure while promoting fire safety within the Pechanga Tribe and Reservation. The Tribe faces the threat of wildfires each year the Santa Ana winds blow through. By investing in firefighting equipment, advanced monitoring and detection systems, and improving communication both internally (by updating radio equipment for the PFD) and to the public (through radio networks, mobile apps, or emergency alert systems), the PFD can be better prepared to protect human and environmental health.

MA No. 25 – Great Oak Adaptive Management Plan – The Great Oak serves as a physical embodiment of the Tribe's strength, wisdom, longevity, and determination. The reduced plant-available moisture and increased temperatures anticipated with the droughts of the twenty-first century may exceed the physiological thresholds of the Great Oak, leading to tree dieback and potentially tree death. Development of a Great Oak adaptive management plan could help identify what biological, meteorological, and hydrological parameters should be monitored to evaluate the Great Oak's health and determine what adaptive management actions could be taken to improve the health of the Great Oak during periods of stress.

MA No. 26 – Fuel Reduction Program and Wildfire Response Program – An effective fuel reduction program helps minimize wildfire risk by strategically treating vegetation in fire-prone areas to reduce the potential for damage to highly valued resources, which may include buildings, infrastructure, and other environmental or cultural resources. An effective wildfire response program enhances wildfire suppression capabilities through activities that may include pre-incident planning, staff training, funding, and equipment acquisition and maintenance.

5 Response Actions

Response actions are a set of immediate actions that the Tribe can take to reduce water demand, increase water conservation, and improve drought resiliency. An initial list of proposed response actions was developed based on the vulnerabilities identified in Table 11, as well as through input from the Tribe collected in March and April of 2023 (Appendix A). Proposed response actions were evaluated by the Drought Task Force during the September 07, 2023, workshop (Appendix B), and components of the list were vetted by the community during the PFD's's Fire Prevention Night on October 12, 2023 (Appendix C). Input from the Drought Task Force and Pechanga community was used to finalize the list of proposed response actions and to assign them to the drought stages in which they would be implemented.

The full suite of response actions is provided in Table 13. Each response action is identified as either augmenting the Tribe's water supply, reducing its water demand, or both. How each action is implemented, either through operational changes or mandated restrictions or penalties, is also identified. Lasty, action favorability (low, medium, high, or unknown) is defined based on feedback from the Drought Task Force and community feedback. A scoring system was not developed for the response actions because selection of each action will be contingent on immediate drought conditions, community needs, and feasibility for implementation. That said, input from the community during the 2023 drought survey (Appendix A) should be taken into consideration when weighing response actions under different drought stages. Based on feedback from this survey, the Tribe's priorities under extreme drought conditions are as follows (1 being highest):

1. Household Uses: Water used for drinking, cooking, laundry, and other household tasks needs remains the top priority for the Pechanga community. These uses should be the last to be subject to demand reductions, and support may be needed for augmenting supply to the Reservation Zone (see MA No. 21 in Section 4.3).
2. Public Services and Fire Safety: Facilities and services supporting the community follow behind household uses. These may include the Pechanga tribal government building, the community center, pool, and irrigated fields (including the proposed 80-Acre Project). If demand needs to be reduced within the Reservation Zone, reduction should begin with the nonessential public services before extending to essential public services (e.g., fire safety or community cooling centers) and then to household uses.
3. Commercial Uses: The Reservation's Casino Zone and Commercial Zone fall within the lowest priority for the community during extreme drought conditions. Demand reductions in these zones should be implemented before they are implemented within the Reservation Zone.

Each proposed response action is defined in greater detail in sections 5.1 through 5.5 of this DCP. Designation of the appropriate response actions during each defined drought stage will be coordinated between PWS, the Pechanga Water Board, and the Pechanga Tribal Council Liaisons (see Section 6).

Table 13. Response Action Project Evaluation

RA No.	Response Action	Proposed Drought Stage for Initial Implementation	Benefits		Implementation Mechanism		*Favorability*
			Supply Augmentation	Demand Reduction	Operational Change	Mandatory Restrictions or Penalties	
1	**Public information campaign** with action items for each household (i.e., monthly newsletters, fact sheets, text messages)	Drought Stage 1		X	X		High
2	Limit or eliminate water usage for **decorative water features**, or implement requirements for recirculating systems			X	X		High
3	Utilize full recycled water allocation from **2016 Water Rights Settlement Act**		X		X		High
4	Introduce **a rate structure** during drought conditions			X	X	X	Low
5	Limit **landscaping irrigation** to set times or days of the week	Drought Stage 2		X		X	Medium
6	Decrease **line flushing** and other water-intensive maintenance activities			X	X		Unknown
7	Lodging businesses limit water use by providing **linen services** only to guests that request it	Drought Stage 3		X		X	High
8	Utilize full potable water allocations from **2016 Water Rights Settlement Act**		X		X		Unknown
9	Limit or eliminate water use for **construction** (unless using recycled water)	Drought Stage 4		X		X	High
10	Implement **financial penalties** for overuse			X		X	Low
11	Limit **restaurants'** water use by only serving water to customers who request it	Drought Stage 5		X		X	High
12	Purchases outside of 2016 Water Rights Settlement Act		X		X		Unknown

Note: RA = response action.

5.1 Response Actions for Drought Stage 1

RA No. 1 – Public Information Campaign – PWS and/or the Pechanga Environmental Department staff will develop and conduct a drought public information campaign beginning at the lowest drought stage level (Drought Stage 1). Information provided to the Pechanga community will include concerns related to the Reservation's water supply relative to the immediate drought scenario and a potential long-term drought and provide a suite of measures community members can take to reduce their water demand. The public information campaign will also serve to communicate all additional response actions the Tribe is planning on taking, especially those that will impact individual uses (such as limiting landscaping irrigation dates or introducing usage rates).

RA No. 2 – Limit or Eliminate Decorative Water Features – Decorative water features, such as water fountains, should limit or terminate operations to reduce water demand.

RA No. 3 – Utilize Full Recycled Water Allocation from 2016 Settlement Act –Where feasible, use recycled water in place of potable water (e.g., outdoor landscape irrigation and cooling towers).

RA No. 4 – Introduce Rate Structure – Currently, Reservation residents do not pay for water. A rate structure could be developed that establishes tiered usage rates. These rates could be adjusted based on the different drought stages. To help promote this concept, PWS could work with the community to establish a reasonable monthly household volume that would remain free before rates take effect.

5.2 Response Actions for Drought Stage 2

RA No. 5 – Set Limit on Landscape Irrigation Practices – Implementing restrictions on when to water and how much water should be used could help conserve water when the drought severity has reached Stage 2.

RA No. 6 – Line Flushing – Decreasing the frequency of line flushing for PWS operations can reduce unnecessary water use and improve water conservation.

5.3 Response Actions for Drought Stage 3

RA No. 7– Hotel Linen Service – Reduce water used at the Pechanga Resort Casino by minimizing the frequency with which housekeepers change bed linens, towels, and other material requiring washing. The reduction in laundry service can improve efficiency in water usage and lowers utility costs.

RA No. 8 – Utilize Full Potable Water Allocations from 2016 Settlement Act – Reduce drawdown and limit stress on the local aquifers by importing MWDSC water.

5.4 Response Actions for Drought Stage 4

RA 9– Eliminate Construction Water Use – Halt construction activity that will increase water demands (e.g., additional grading that will require dust control).

RA No. 10 – Financial Penalties for Water Overuse – Establish financial penalties for water use that exceeds a predefined threshold.

5.5 Response Actions for Drought Stage 5

RA No. 11 – Reduce Water Use in Restaurants – Only serve water to customers who request it.

RA No. 12 – Purchase Water Outside of the 2016 Settlement Act –Where water from the 2016 Settlement Act is not available or insufficient, the Tribe may consider purchasing additional water.

6 Administrative and Operational Framework

The final component of this DCP is the establishment of its operational and administrative framework. This framework defines the roles and responsibilities for overseeing the three main elements of the DCP and ensuring the DCP is updated accordingly. The three main elements of the DCP include:

1. Oversight and Implementation of the drought monitoring program (Section 2)
2. Evaluation and Implementation of Mitigation Actions (Section 4)
3. Designation and Communication of Response Actions (Section 5)

As a living document, all components of the DCP will need to be evaluated periodically to ensure that significant changes that could impact its efficacy are incorporated. Such changes could include:

- Updated climate projections
- Shifts in current or anticipated supply or demand
- Incorporation of new monitoring tools and drought stage thresholds
- Changes to applicable mitigation and response actions
- Changes in administrative and operational framework

Staff assigned to oversee the implementation of the elements within this DCP and ensure it remains current are defined in the following sections. The proposed structure of the DCP's operational and administrative framework was presented to the Drought Task Force during the January 9, 2024, workshop (Appendix D, Task Force Workshop 2 [Elements M.6 and M.7]),

6.1 Drought Contingency Program Implementation Staffing and Responsibilities

The PWS Director of Water Operations is the DCP manager and is responsible for ensuring that each element of the DCP is actively managed by the staff identified in the following sections. Where the PWS Director of Water Operations is unavailable, the Director of the Pechanga Environmental Department serves as the deputy manager of the DCP. Most of the tasks under each element will be spearheaded by PWS staff with support from Pechanga's Environmental Department and the Pechanga Water Board. Additional support will come from RCWD in coordinating assessment of local and regional water supply conditions and from the Pechanga Tribal Council Liaisons in communicating mitigation and response actions with the community.

Staff overseeing the main responsibilities under the three elements of the DCP were reviewed and selected by the Pechanga Drought Task Force during a January 9, 2024, workshop. Key responsibilities and associated staff for each element are provided in Table 14.

Table 14. Summary of Pechanga Indian Reservation Drought Vulnerabilities

DCP Element	Responsibilities	Staff
Drought Monitoring Program	Evaluate drought stage criteria metrics (monthly): ▪ USDM ▪ Reservation production wells ▪ USGS streamflow/monitoring wells ▪ RCWD WSCP Stages	PWS Director and Administrative Assistant RCWD Task Force Member
	Evaluate projected water supply forecasts for local (Wolf Valley Subbasin) and regional (SWP and CRA) sources	
	Evaluate suitability of upcoming tools for use in drought forecasting (beyond 3 weeks)	PWS Director and Administrative Assistant
	Determination of drought stage	PWS Director and Administrative Assistant Pechanga Environmental Department Director
	Community outreach	
Mitigation Actions	Evaluate/Prioritize of mitigation actions	PWS Director, Operations Manager, and Administrative Assistant Pechanga Environmental Department Director, Environmental Specialist, and Environmental Technician
	Review ongoing funding opportunities	
	Mitigation action planning and implementation (schedule, staff, funding, etc.)	
	Community outreach	
Response Actions	Establish response actions commensurate with current drought stage	PWS Director, Operations Manager, and Administrative Assistant Pechanga Water Board Pechanga Tribal Council Liaisons
	Response action planning (schedule, staff, funding, etc.)	
	Approval and implementation	
	Community outreach and communication	PWS Director Pechanga Environmental Department Director

Notes: USMD = U.S. Drought Monitor; USGS = U.S. Geological Survey; RCWD = Rancho California Water District; WSCP = water shortage contingency plan; PWS = Pechanga Water Systems.

6.1.1 Drought Monitoring Program

The protocol for evaluating current drought stages is provided in Sections 2.3 and 2.4. This protocol consists of a monthly compilation and evaluation of local and regional drought and water supply conditions. PWS staff are responsible for collecting these data, which will include communication with RCWD whenever there are shifts in RCWD's WSCP Stages, shifts in the 5-year estimate of safe yield in the Wolf Valley Subbasin, or if there are other impacts that might limit production from the Wolf Valley Subbasin wells (e.g., water quality impairments) or RCWD's capacity to provide potable or recycled water to the Reservation.

As of the development of this DCP, no suitable drought forecasting tool was identified for inclusion in the DMP. There are federal and academic efforts actively developing drought forecasting tools that may become useful for inclusion in the DMP. One of the responsibilities of the PWS staff overseeing the monthly data collection is to periodically evaluate the potential incorporation of a drought forecasting tool.

Responsibility for the determination of drought stage and communication with the Pechanga community resides with the manager and deputy manager of this DCP (the directors of PWS and the Pechanga Environmental Department). This will require weighing the score for each drought stage criteria (Table 5) relative to regional and local conditions, community demands, and forecasted scenarios (see Section 2.4).

6.1.2 Mitigation Actions

Evaluation and prioritization of mitigation actions that improve drought resiliency for the Tribe is an ongoing process that will be jointly spearheaded by PWS and Pechanga Environmental Department staff. This element will likely be significantly affected by available funding, which will largely come from the Tribe, the 2016 Settlement Act, and state or federal grants. Additional mitigation actions not identified in this DCP may be pursued as Tribal needs and available funding warrant them. Staffing for the planning and implementation of the mitigation actions will depend on each project but will be coordinated through DCP manager and/or deputy manager.

6.1.3 Response Actions

Determination of response actions to be implemented at each drought stage is to be overseen by the DCP director and will require input from the Pechanga Water Board and Pechanga Tribal Council Liaisons. Because this element consists of immediate water use restrictions, financial penalties, and purchase of outside water, PWS and the Pechanga Environmental Department may solicit feedback from the community prior to finalizing suitable response actions.

6.2 Drought Contingency Program Update

The efficacy and practicality of the elements in this DCP will be evaluated as they are applied and as new opportunities (e.g., funding) and constraints arise. Identification of modifications that could improve its efficiency should be vetted by the Drought Task Force and Pechanga community prior to formalizing in an updated DCP.

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Appendix A

Community Drought Survey

Pechanga Band of Indians

DROUGHT SURVEY RESULTS ANALYSIS	2023

Pechanga Environmental Department
Bureau of Reclamation
Drought Contingency Plan Grant
FY 2020-2021

Abstract

An analysis of the results of the Drought Survey administered for outreach and education purposes under the BOR Drought Contingency Plan Grant beginning in February 2023 and ending in April 2023.

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Executive Summary:

The Environmental Department received funding from the Bureau of Reclamation (BOR) Drought Planning Grants program for the creation of a Drought Contingency Plan (Plan) for the Pechanga Reservation. One of the key tasks of the grant is Community Outreach and Engagement. Pechanga Environmental Department (PED) staff developed the Planning for Drought Survey (survey) to gather community input. It is important to have input from stakeholders and understand the priorities of the community.

The PED surveyed 54 tribal community members about their drought concerns and preferred response actions for the Reservation and its water supply. A total of 44 surveys were completed via a Google Forms, a survey administration software. Community input and participation in the survey was encouraged through a public outreach campaign that involved many forms of static, printed, virtual, and dynamic media, including social media (email, video/website, Instagram, flyers, and roadside signage on the Reservation).

The questions included in the survey can be divided into three categories: Water Use Prioritization, Pechanga Environmental Department Services, and Demographics.

Background:

The Plan will be written by Dudek, an environmental firm with expertise in hydrology and drought planning, with the assistance and input of Pechanga Environmental Department (PED) staff and a Drought Task Force composed of members of the Pechanga Tribal Government, local (off-Reservation) government, neighboring water agencies, and associated NGOs.

The PED staff implemented various outreach strategies to gather community input. The survey was initially launched in 2021, but received little engagement due to COVID social distancing restrictions. The survey was relaunched in 2023 with a comprehensive campaign to bring awareness to the community about the survey and its importance to the Plan.

Community input gathered through survey responses will be instrumental to writing an effective plan that can be successfully implemented when necessary.

Methods

An effort was made to solicit survey responses from a cross-section of the community. Media and outreach efforts were designed to capture various demographics within the tribal community including youth, young adults, adults, and Silver Feathers (seniors). Some respondents completed the survey during the March 12, 2023 General Membership meeting using a provided iPad (Appendix B). The remaining participants accessed the survey posted on the Membership Website via a QR code included on all advertising media. Ten surveys were completed via paper copies collected during the week preceding Pechanga Earth Day and on the day of the event (Appendix A). The PED incentivized survey participation by advertising a raffle for a $50 gift card that could be entered upon survey completion.

Results

A total of 44 surveys were completed via Google Forms. Additional data from completed paper copies were incorporated into the dataset and the data were analyzed. Analysis results are discussed in the proceeding sections. A full breakdown by question and age group, when appropriate, is provided.

Survey limitations include a relatively small number of participants in the under 18 age group (n=4) and 65+ age group (n=2). Caution should be taken when interpreting the results for these two demographic groups. However, inclusion of these age groups in the overall survey results provides a holistic picture of attitudes, norms, and priorities of the tribal community.

Survey Demographics

Demographics questions were added to the survey after 6 participants had already responded, resulting in 48 surveys completed with demographics data (age group). A demographics summary (of the 48) is included in the table below.

Age Group	Number of Respondents	Percentage of Overall Respondents
under 18	4	(8%)
18-25	7	(15%)
26-35	14	(29%)
36-50	16	(33%)
51-65	5	(10%)
65+	2	(4%)

The Reservation has roughly 500 residents, with minor population fluctuations from year to year. Therefore, this sample size, n=54 (including those from whom demographic data were not collected), should be considered representative of the tribal community. Only age demographic data was collected; sex/gender, education status, vocation, and other potentially relevant demographic information was not collected.

Water Use Prioritization

Question 2: In case of extreme drought, which water uses should be prioritized on the Reservation? Rank from most (1) to least (5) important.

Respondents were asked to rank the following in order from most to least important:

- Agricultural Use (growing produce, livestock, etc.)
- Commercial Use (casino, gas station, golf course)
- Fire Safety, Household Water Use (shower, sink, etc.)
- Public Services (government, school, Public Works, etc.).

One respondent did not rank their answers, so these results reflect data collected from 53 individuals.

The overwhelming majority of respondents (25 out of 53, or 47%) identified Household Water Use as first priority for water use on the Reservation in case of extreme drought. Results were fairly evenly distributed for priorities 2 through 4 (Figure 1). As a second priority, Public Services was the most important for survey respondents, but only slightly more than Agricultural and Commercial use, which were tied. For most respondents, Fire Safety was a relatively low priority, as was Commercial Use. These results suggest the tribal community prioritizes household water use that includes drinking, cooking, laundry, and other domestic activities (Figure 2).

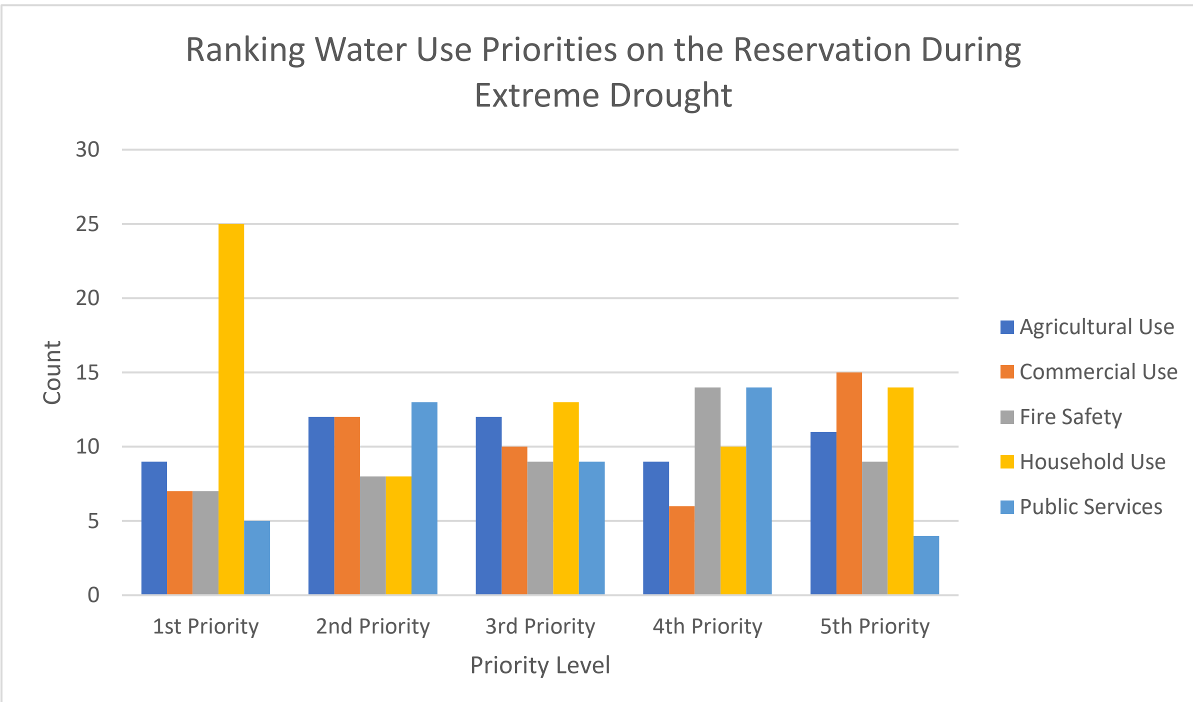


Figure 1: Combined Count of Water Use Priorities on the Reservation During Extreme Drought (priority level versus count per water use category).

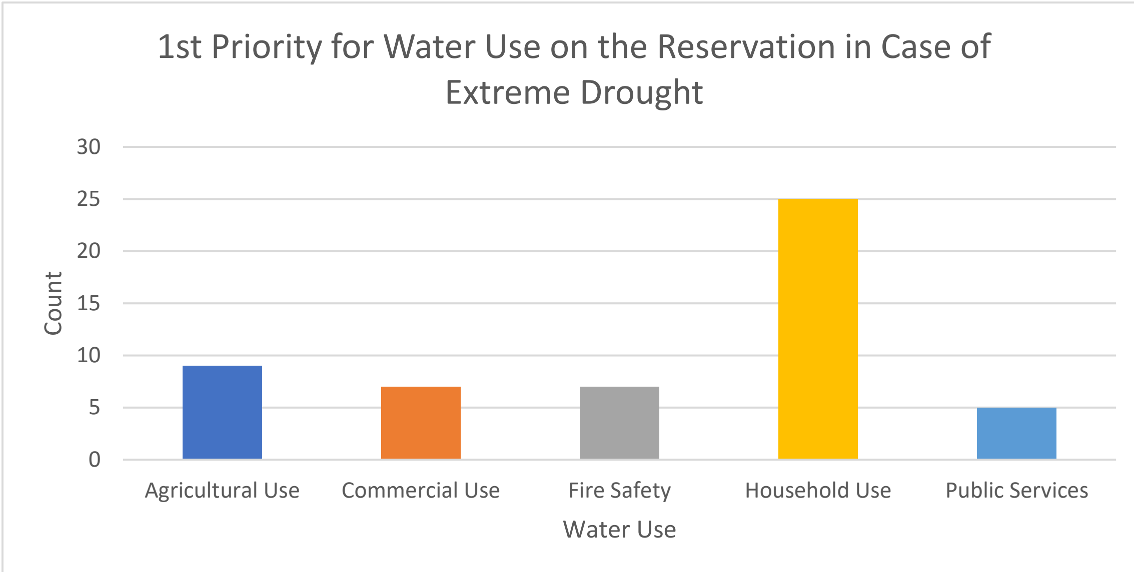


Figure 2: 1st Priority for Water Use on the Reservation During Extreme Drought (water use versus count). Household water use is identified as highest priority.

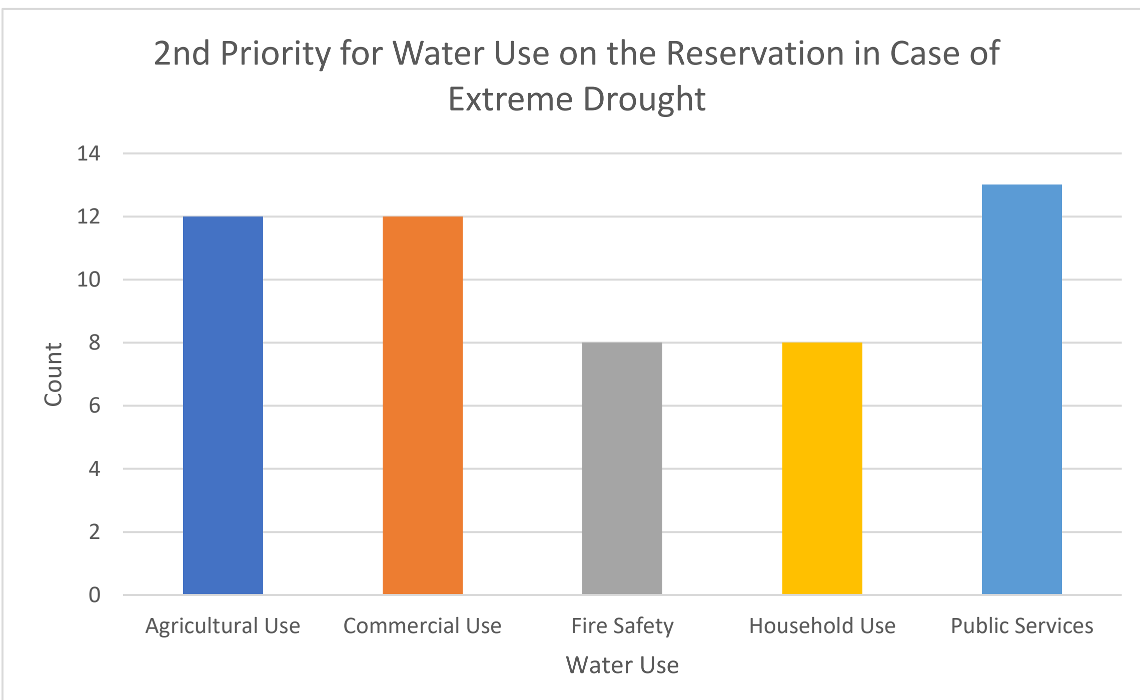


Figure 3: 2nd Priority for Water Use on the Reservation During Extreme Drought (water use versus count). Public Services was identified as second priority by a slim margin, followed by agricultural use and commercial use.

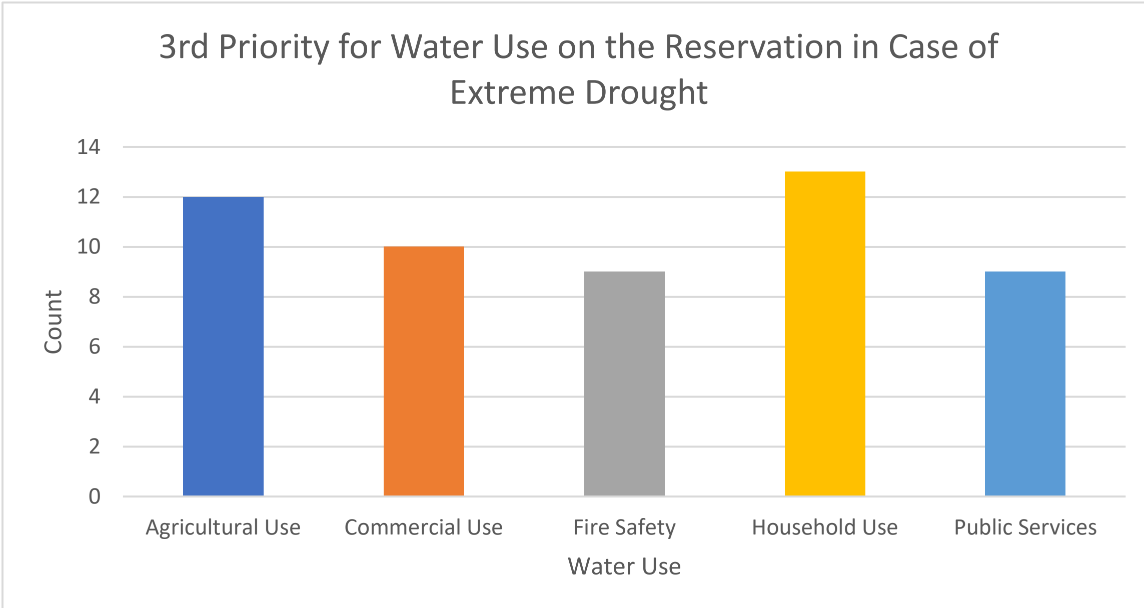


Figure 4: 3rd Priority for Water Use on the Reservation During Extreme Drought (water use versus count). Household use was ranked third by a slim margin, followed closely by agricultural use.

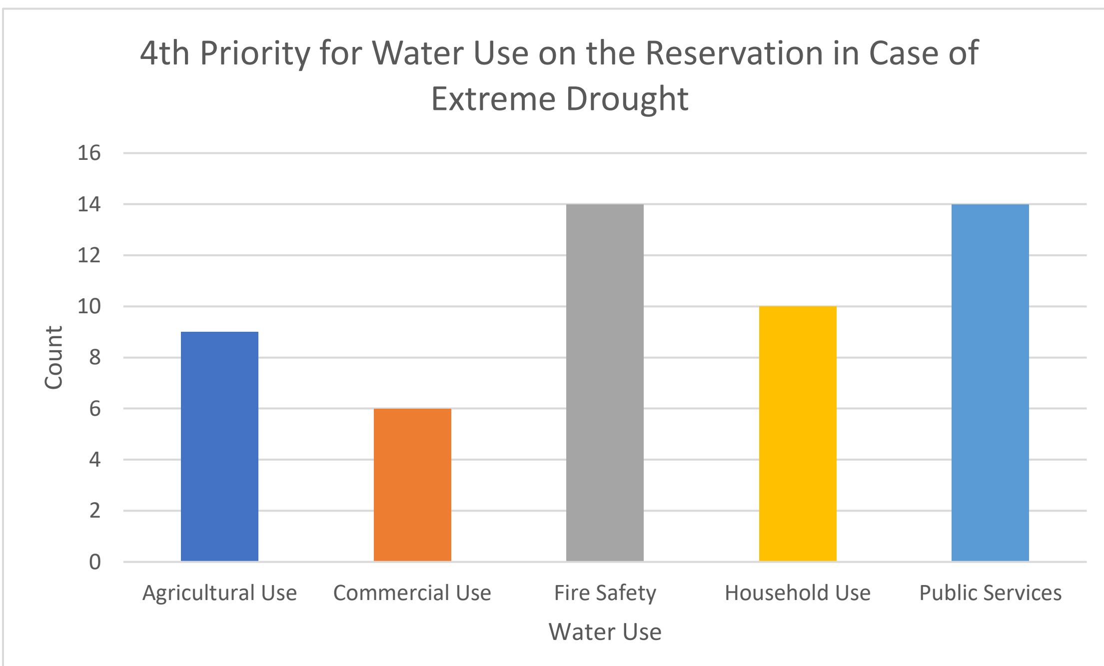


Figure 5: 4th Priority for Water Use on the Reservation During Extreme Drought (water use versus count). Fire Safety and Public Services were tied for fourth priority.

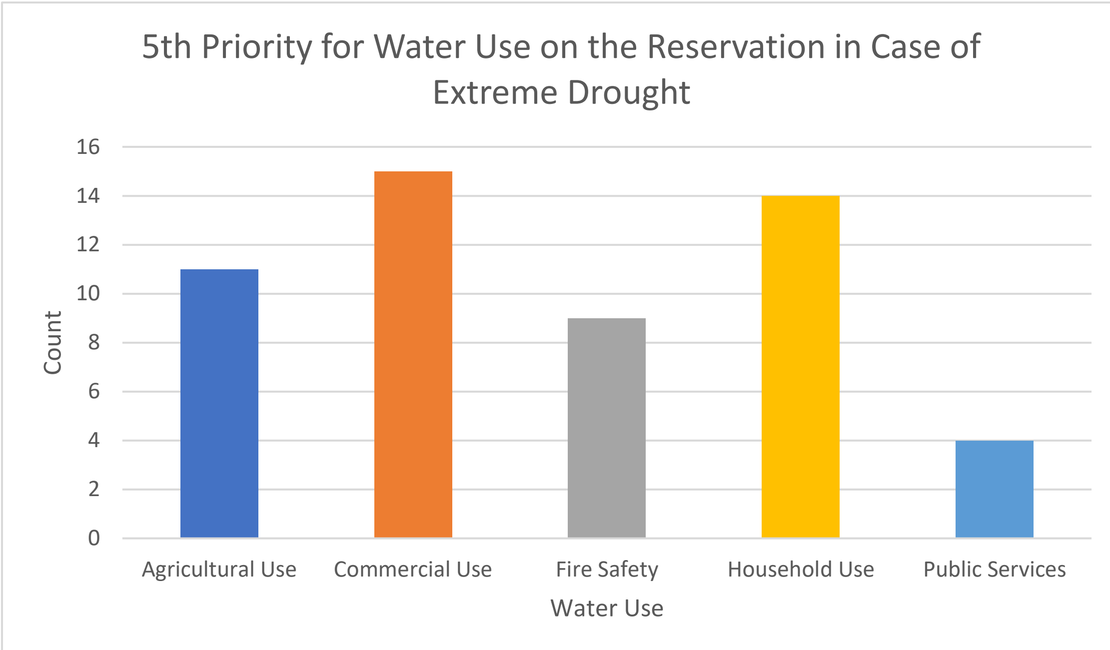


Figure 6: 5th Priority for Water Use on the Reservation During Extreme Drought (water use versus count). Commercial use was ranked as fifth priority by a slim margin, followed by household use.

Data was analyzed to determine if there was a correlation between top prioritization of water uses and age groups. Respondents under 18 (n=4) favored household water use (50%), respondents 18-25 (n=7) favored household water use by the greatest margin compared to all other age groups, with 70% ranking it as top priority. Respondents in the 26-35 (n=14) and 36-50 (n=16) age groups garnered mixed results, with 50% and 38%, respectively, ranking household water use as top priority. Approximately 60% of respondents 51-65 (n=5) ranked household water use as priority one, while respondents 65+ (n=2) did not prioritize household water use. Instead, respondents 65+ favored agricultural use and fire safety as top priorities.

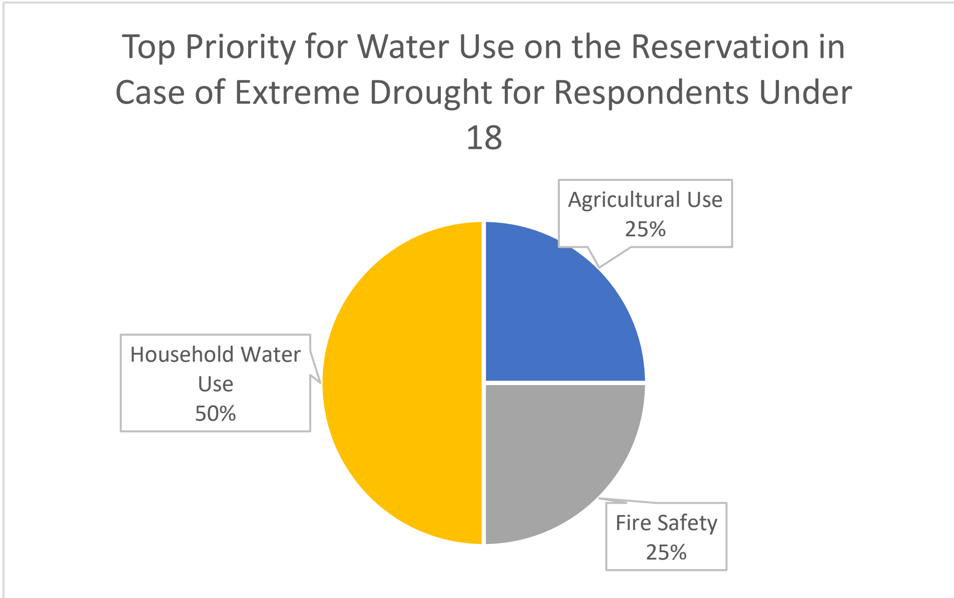


Figure 7: Priority for Water Use on the Reservation During Extreme Drought for Respondents Under 18. Household water use was the highest priority for this age group with agricultural use and fire safety tying for second and commercial use and public services receiving no votes.

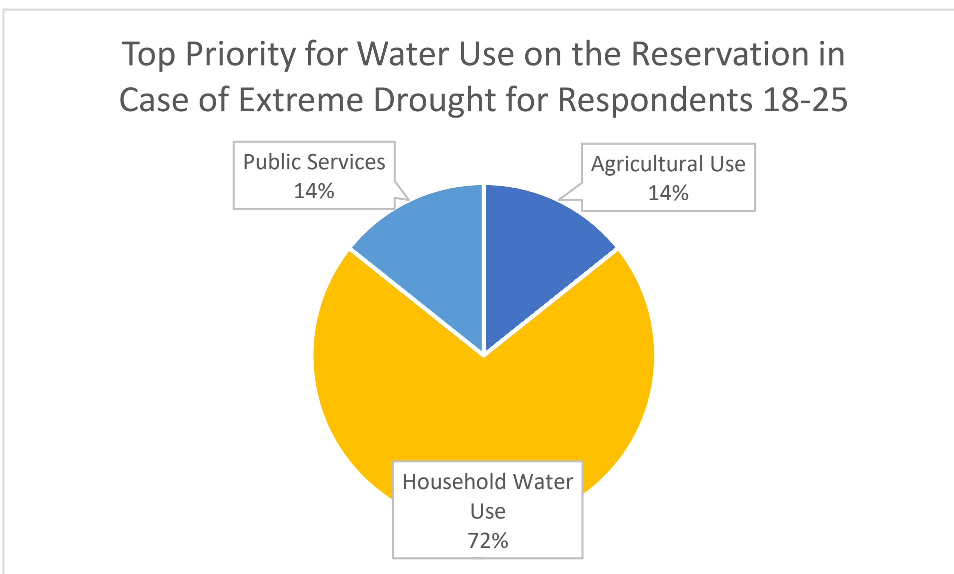


Figure 8: Priority for Water Use on the Reservation During Extreme Drought for Respondents 18-25. Household water use was deemed as the top priority by 72% in this age group, with agricultural use and public services tying for second and commercial use and fire safety receiving no votes.

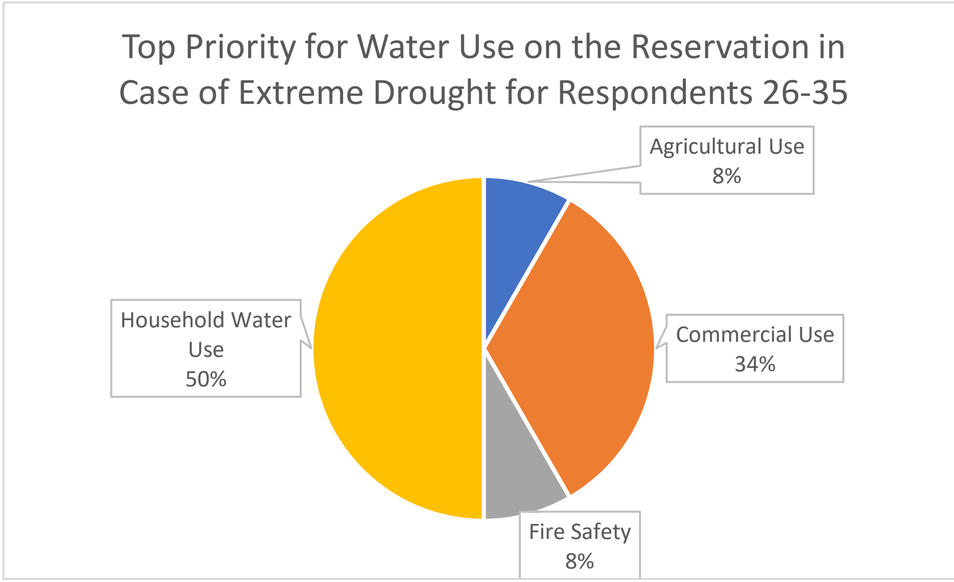


Figure 9: Priority for Water Use on the Reservation During Extreme Drought for Respondents 26-35. Household water use was ranked as top priority, followed by commercial use, with agricultural use and fire safety tying for third.

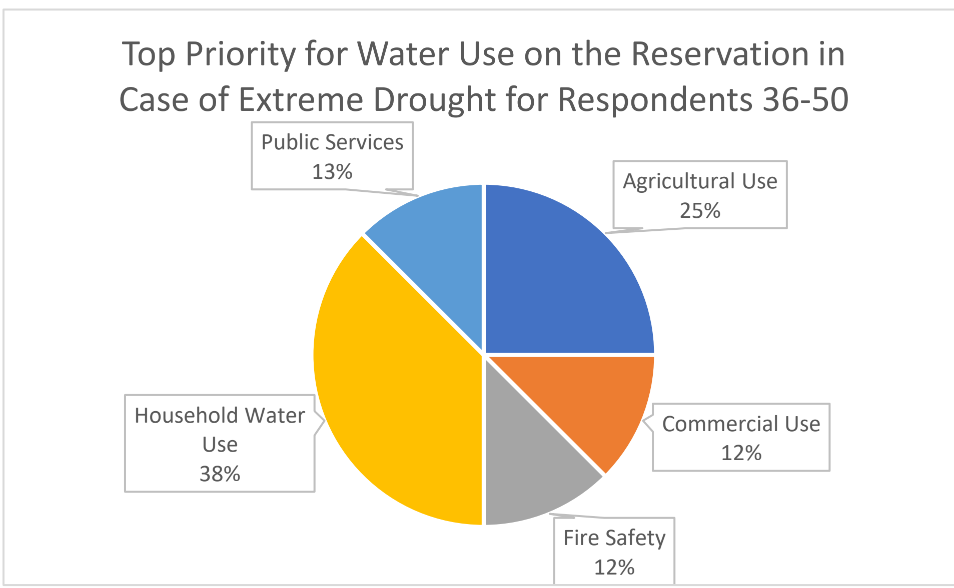


Figure 10: Priority for Water Use on the Reservation During Extreme Drought for Respondents 36-50. Household water use ranked as top priority, followed by agricultural use, public services, and commercial use and fire safety tying for last priority.

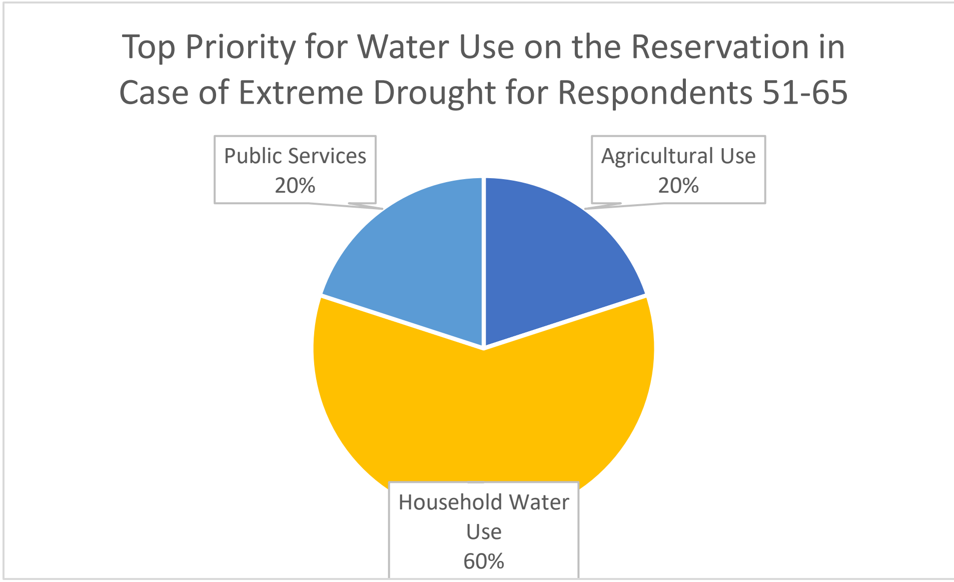


Figure 11: Priority for Water Use on the Reservation During Extreme Drought for Respondents 51-65. Household water use ranked as top priority, followed by agricultural use and public services tying for second, and commercial use and fire safety receiving no votes.

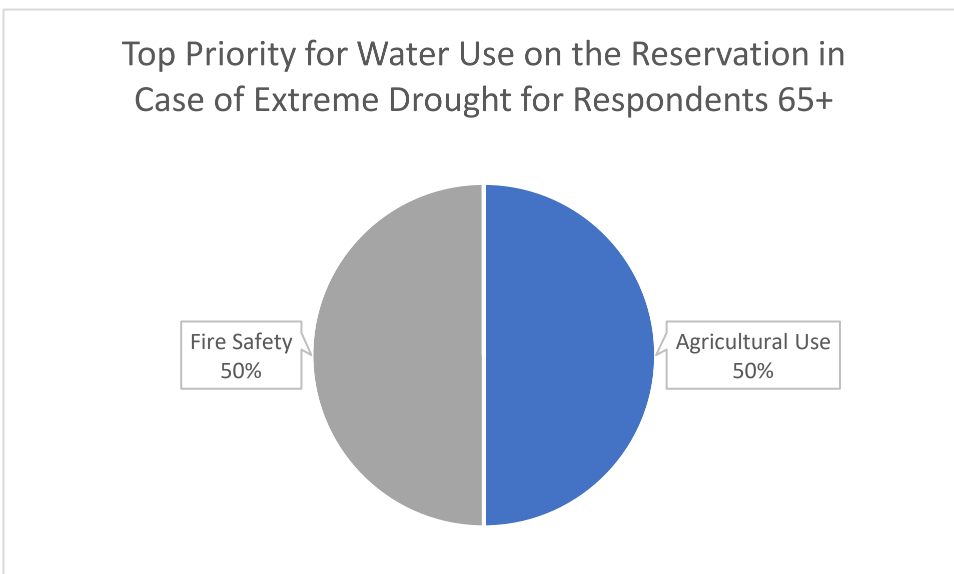


Figure 12: Priority for Water Use on the Reservation During Extreme Drought for Respondents 65+. Agricultural use and fire safety both tied for top priority.

Question 3: What would you be willing to do to reduce your water use during a water shortage? Check all that apply.

Respondents were asked to select any of the supplied strategies for water use reduction that they would be willing to carry out. 80% were willing to reduce landscape watering. 65% were willing to landscape with drought tolerant plants. 72% were willing to sweep their driveways rather than hose them off. 76% were willing to fix household leaks. 78% were willing to take shorter showers. 70% were willing to switch to more efficient appliances.

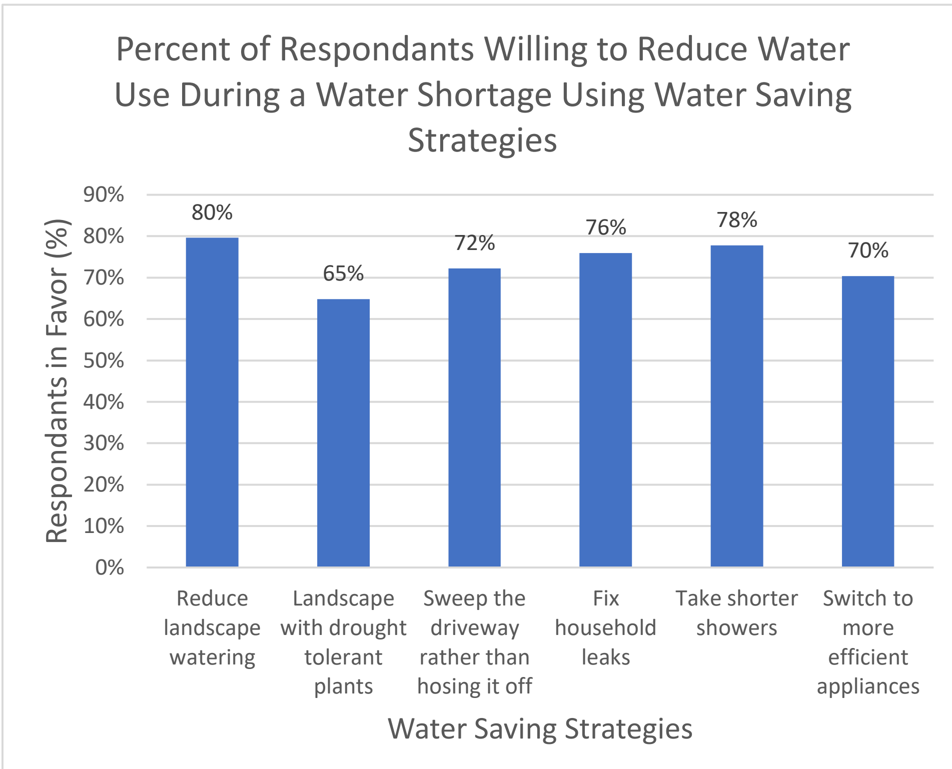


Figure 13: Water Saving Strategies Used During Severe Drought

Data was sorted to determine if there were any correlations between responses and age groups. Landscaping with drought tolerant plants was unpopular amongst respondents 18-25 (n=7) (only 29% in favor), while 71% or more of respondents 26-35 (n=14) were willing to take any of the suggested actions. Approximately 69% or more of the respondents 36-50 (n=16) were willing to take any of the suggested actions. Finally, 0% of 65+ age group (n=2) was willing to landscape with drought tolerant plants.

Question 4: How likely are you to share water-saving tips with your community? Select one: 1) Very likely 2) Probably 3) Neutral 4) Unlikely or 5) Absolutely not

Of those surveyed, over 50% consider themselves to be very likely to share water-saving tips with their community. The other two most-selected categories include likely to share (31%) and neutral (13%). The biggest deviation in responses per age group is for under 18 age group (n=4), with 75% of their responses as "neutral" and 25% as "very likely." The rest of the age groups are more evenly distributed among the "very likely," "likely," and "neutral" answers. The age group of the person who answered "unlikely" is unknown, as they were one of the first 6 people to complete the survey before demographics data were collected. No surveys answered "absolutely not."

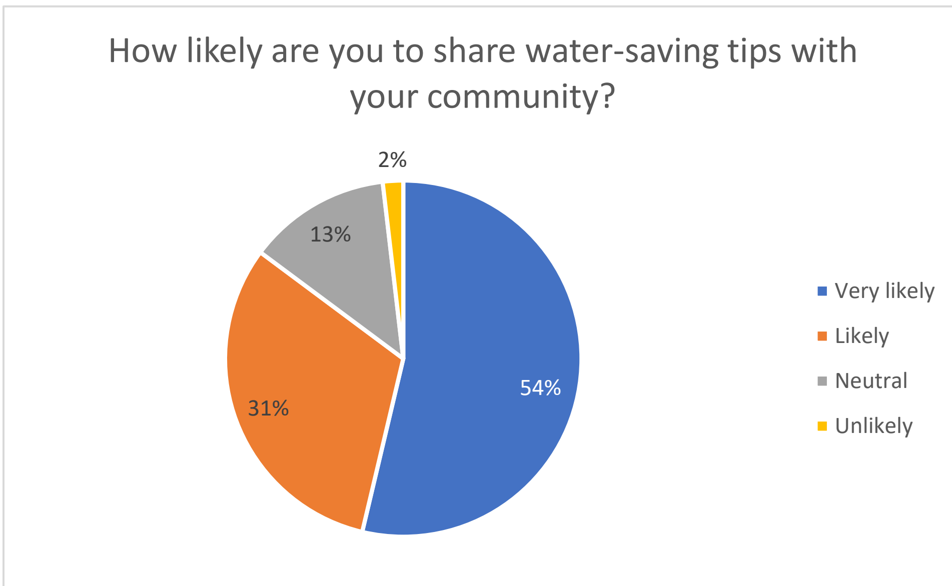


Figure 14: Likelihood of those surveyed to share water-saving tips with their community

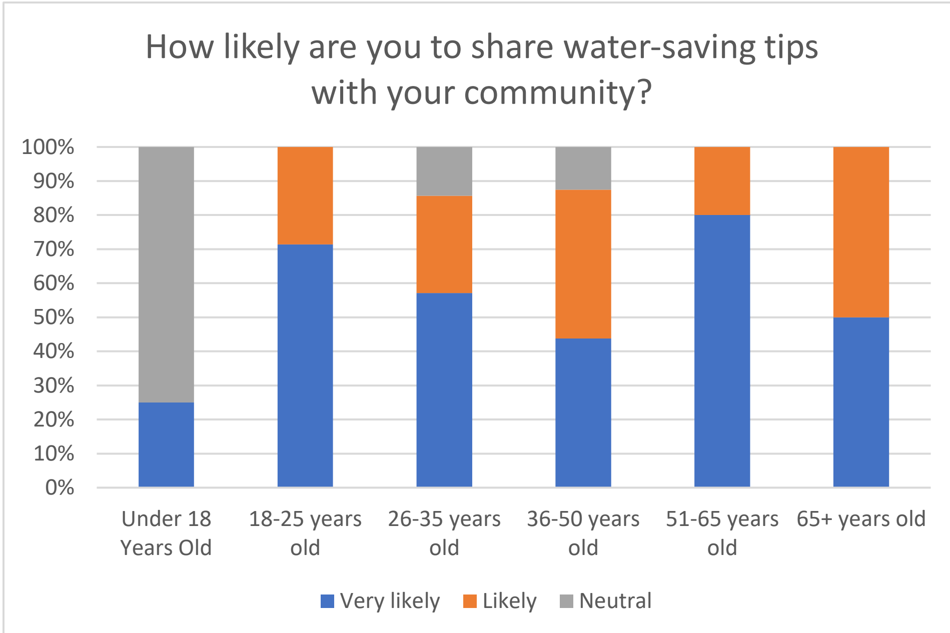


Figure 15: Likelihood of those surveyed to share water-saving tips with their community by age group

Question 5: Would you support water use restrictions during a water shortage emergency? Yes or No.

Only one person surveyed responded that no, they would not support water use restrictions during a water shortage emergency. Respondents were given the option to provide additional comments or context in an associated text box, but this participant (18-25 age group) did not provide additional information.

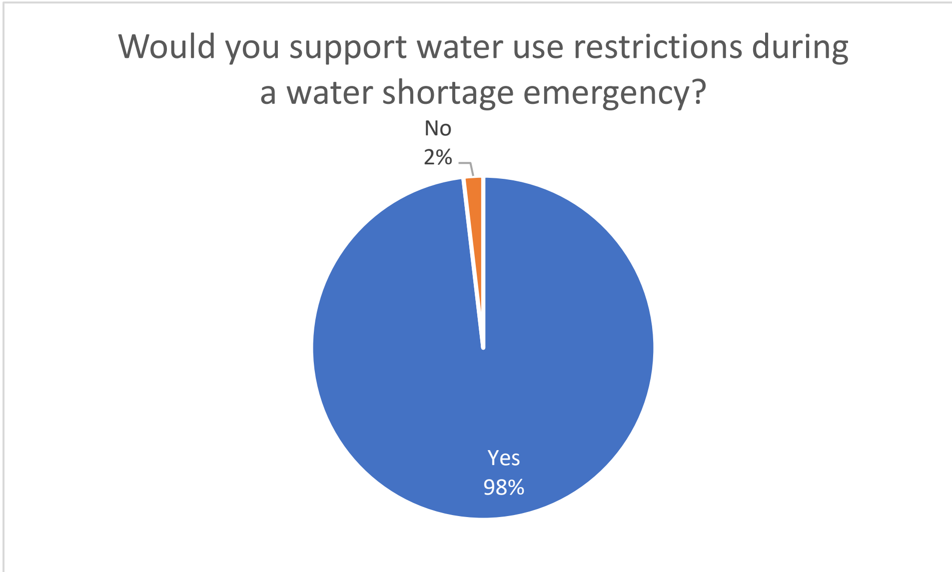


Figure 16: Support of water use restrictions during a water shortage emergency, with "yes" as a declaration of support for restrictions

Question 6. How would you like to be notified in the event of water restrictions? Options include: email, phone call, social media post, text message, other.

Almost half of responders selected text message as their preferred notification method, if water use restrictions were set in place (47%). Email was the second most popular option (27%). Social media post (14%) and phone call (12%) were third and fourth place, respectively. Most responders (75%) indicated they were open to multiple notification methods.

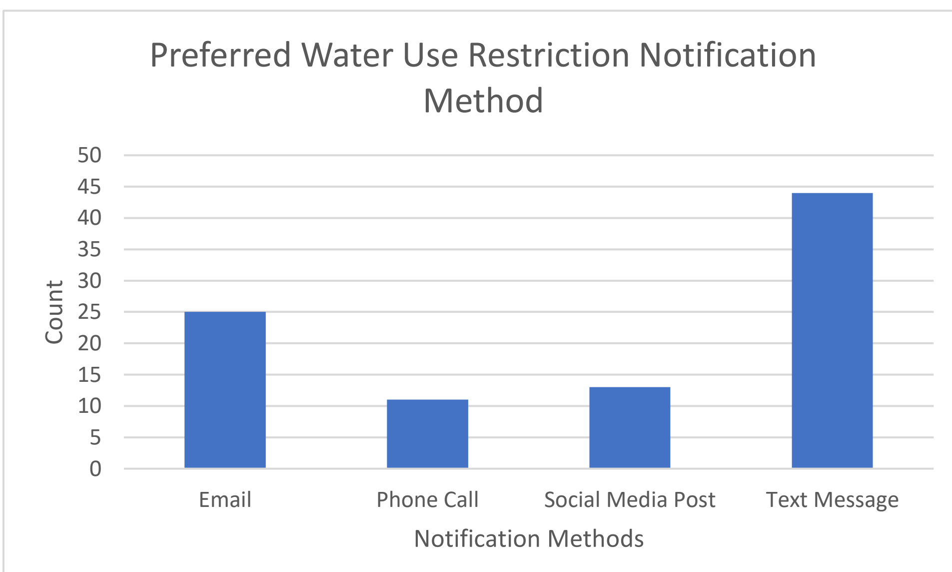


Figure 17: Preferred Water Use Restriction Notification Method

The age groups that diverged the most in response were the under 18 and 65+ groups. Those under 18 (n=4) were split between a text message notification and social media notification. Those 65+ (n=2) were split between a text message notification and an email notification. The rest of the age groups had much more similar responses across the board. Text message was generally the most popular option, followed by email. A phone call was more popular than a social media post for respondents 18-25 (n=7) and 26-35 (n=14), while a social media post was more popular than a phone call for respondents 36-50 (n=16) and 51-65 (n=5).

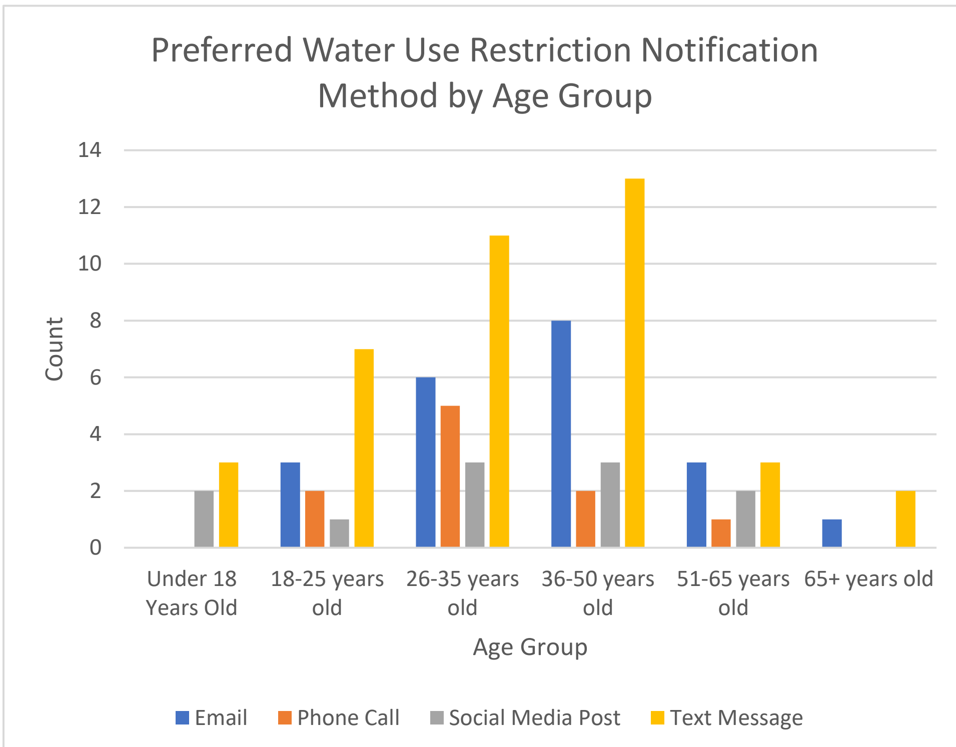


Figure 18: Preferred Water Use Restriction Notification Method by Age Group

Pechanga Environmental Department Services

Question 1: Have you seen/follow Pechanga Environmental Department’s Instagram @pechanga_environmental? Check what applies: yes or no.

Some of the participants explicitly stated they don’t use social media, and therefore have not seen (and will not see) Pechanga Environmental’s Instagram page. Of those surveyed, 69% have some exposure to the Instagram page while 31% had none. All age groups were split between Yes and No except for the Under 18 year old’s (n=4), who had all had some exposure to the Instagram page.

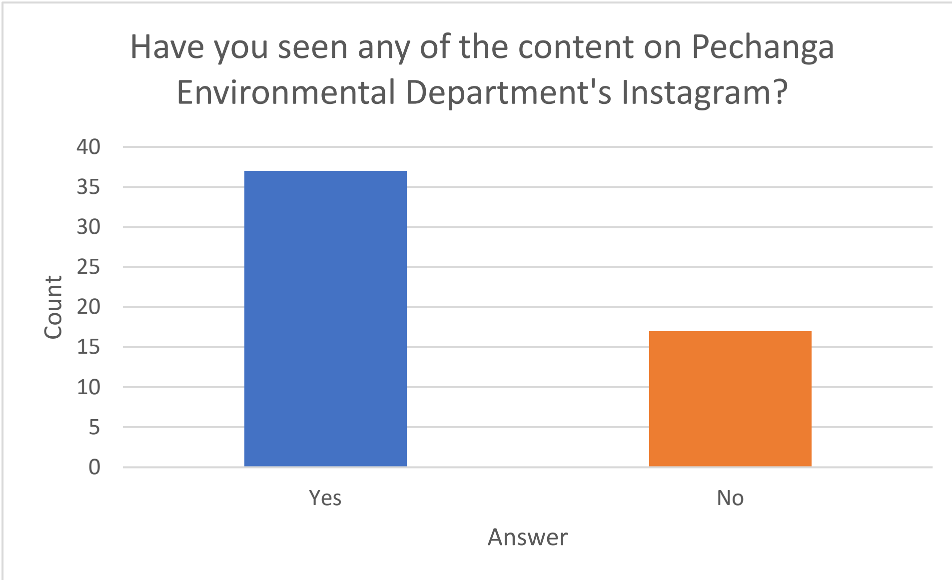


Figure 19: Exposure to Pechanga Environmental's Instagram Page

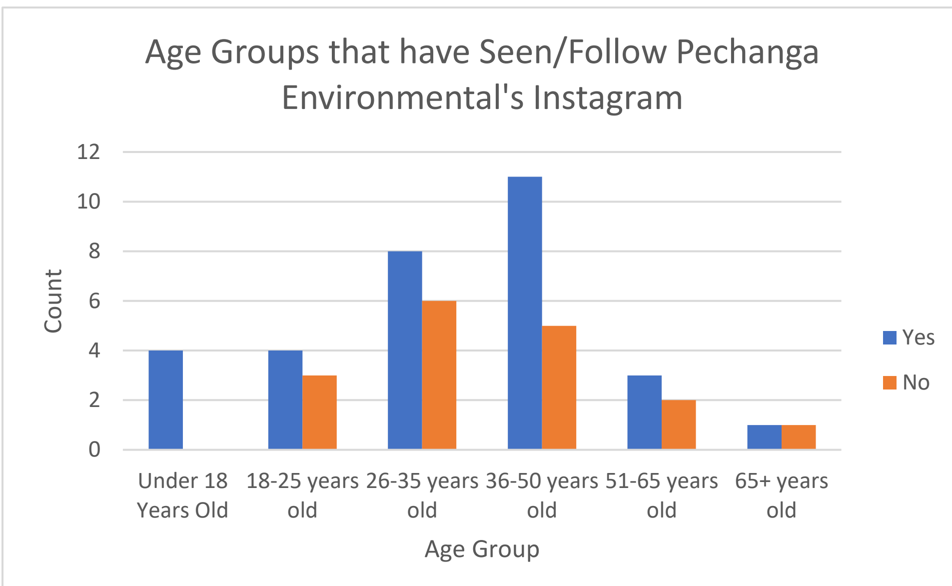


Figure 20: Exposure to Pechanga Environmental's Instagram Page by Age Group

Question 7: Have you seen/read Pechanga Environmental Department's electronic newsletter *The Manzanita Minute*?

Of those surveyed, 56% had not had any exposure to the Manzanita Minute, while 44% had some exposure. There is a positive correlation between age and percent exposure to the department newsletter.

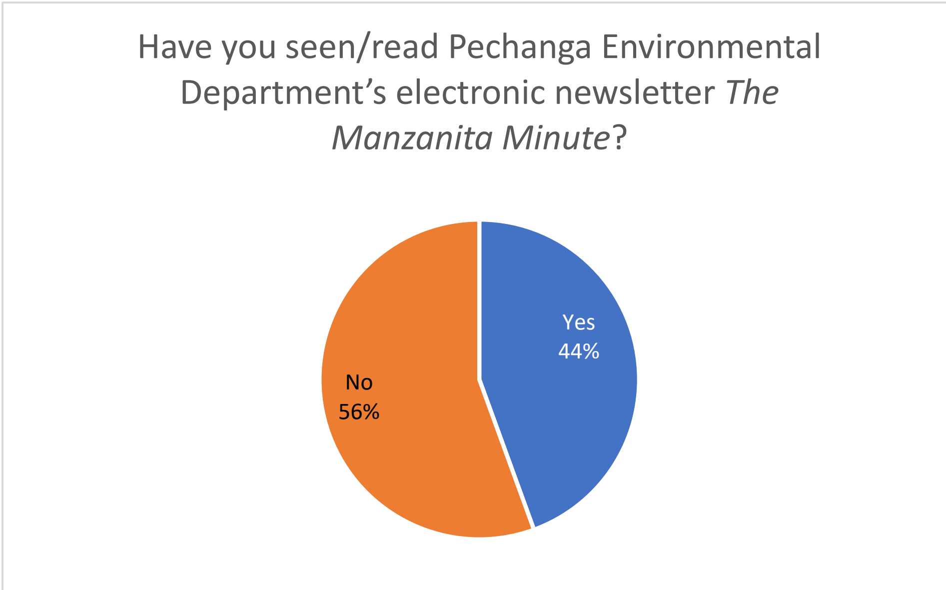


Figure 21: Exposure to Pechanga Environmental's Newsletter *The Manzanita Minute*

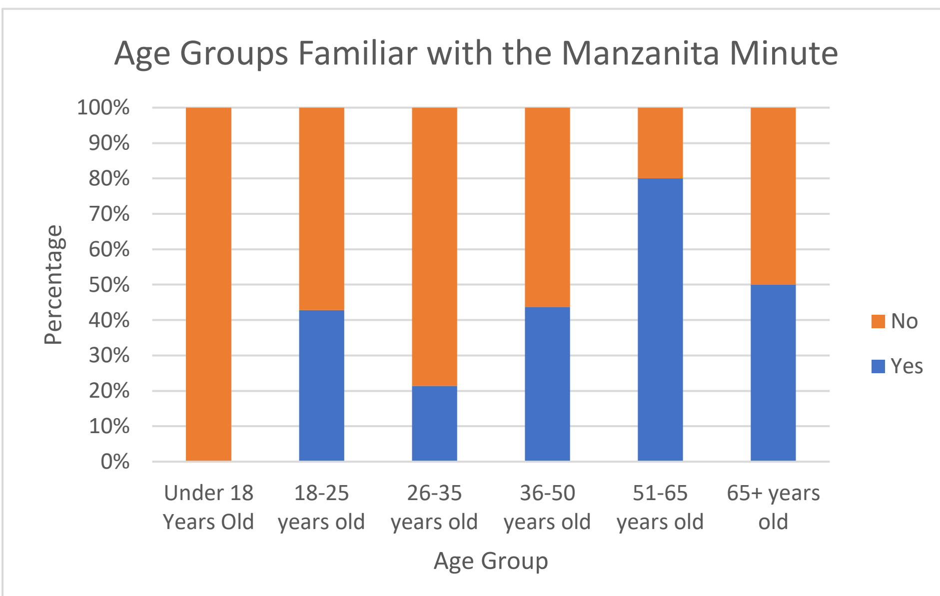


Figure 22: Percent exposure to Pechanga Environmental's newsletter *The Manzanita Minute* by age group.

Demographics

Question 8: What age group do you belong to? Under 18 years old/ 18-25 years old/ 26-35 years old/ 36-50 years old/ 51-65 years old/ 65+ years old.

Demographics questions were added to the survey after 6 people had responded to the survey, resulting in 48 surveys completed with demographics data (age group).

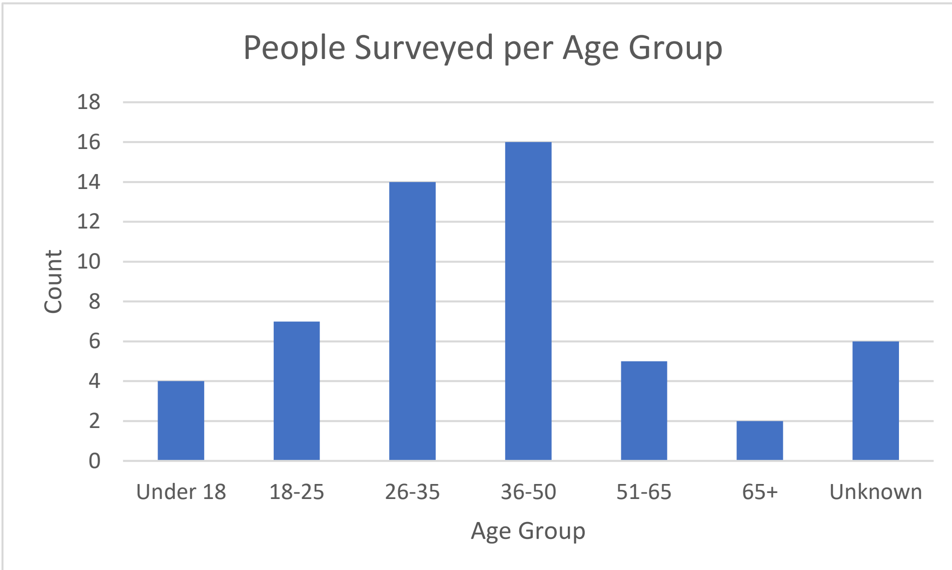


Figure 23: Count of people surveyed per age group.

Discussion

Data gathered from the survey have revealed trends and insight into strategies for communications and Drought Plan development. Household water use is a top priority for survey respondents, showing that domestic activities are most important to those who live on the Reservation. Agricultural use, commercial use, and public services are all secondary priorities. Therefore, household water use should be the focal use priority in the Drought Plan.

Over 60% of respondents are willing to enact all of the water-saving strategies suggested in the Drought Survey. Reservation residents show a general willingness to conserve and modify behavior as needed. Drought tolerant plant landscaping was an unpopular water conservation strategy for a couple of the surveyed age groups. Reframing “drought tolerant landscaping” as landscaping with adaptive native plants or native plants could potentially have made a difference in garnering support for this strategy. Specific language should be used in the Drought Plan to describe water conservation strategies, and strategies other than drought tolerant landscaping should be emphasized.

Over 50% of total respondents were likely to share water-saving tips with others in their community. There is a general willingness to engage in conversations about water conservation, and saving water is important to Reservation residents. 98% of respondents are willing to support water restrictions in a water shortage emergency. This showcases, once again, that Reservation residents are willing to alter behavior when necessary. It should be noted that there is less desire to opt-in to restrictions or water-saving behaviors preemptively. Social marketing will be necessary to encourage Reservation residents to take action before critical conditions arise. Social marketing techniques or recommendations could be incorporated into the Plan or as a supplementary document. In case of extreme drought, respondents largely preferred text message as a means to be notified of water use restrictions. Emergency notifications are already sent to Tribal Members and Government staff by the Pechanga Fire Department and Pechanga Tribal Rangers. There is an opportunity for Pechanga Water Systems to piggyback on this established communication method since Tribal members are already familiar and comfortable with it.

We now know the community is generally knowledgeable of the Environmental Department's Instagram and newsletter *The Manzanita Minute*. 69% of total respondents have interacted with the Instagram content in some manner, while only 44% have been exposed to the newsletter. Age is correlated to which media a respondent is most likely to interact with; youth are more familiar with the Instagram (with an even split amongst the rest of the older age groups) while those who are older have more familiarity with the newsletter (exposure increases with age). The Environmental Department can use multiple types of media to solicit input on the Draft Drought Plan to get comprehensive feedback from all age groups. Additional means for outreach besides Instagram and the *Manzanita Minute* could include tabling at events, sending out an email blast, doing a presentation at the elementary school, and so forth. Word of mouth will be a vital outreach strategy in the Pechanga community, and key community members should be identified and supported in spreading the message.

Appendix A Paper Survey

The Pechanga Environmental and Water Departments are interested in understanding the water use needs of the Pechanga community. Understanding community priorities will help the tribal government plan for the future. We greatly appreciate you taking the time to share your thoughts.

Complete the survey to be entered into a drawing for a $50 gift card. Winner selected at Pechanga Earth Day: April 15, 2023.

1. Have you seen/follow Pechanga Environmental Department's Instagram @pechanga_environmental? Check what applies.
   ___ Yes
   ___ No

2. In case of extreme drought, which water uses should be prioritized on the Reservation? Rank from most (1) to least (5) important.
   ___ Agricultural Use (growing produce, livestock, etc)
   ___ Commercial Use (casino, gas station, golf course)
   ___ Fire Safety
   ___ Household Water Use (shower, sink, etc.)
   ___ Public Services (government, school, Public Works, etc.)
   ___ Other (please specify)

3. What would you be willing to do to reduce your water use during a water shortage? Check all that apply.
   ___ Reduce landscape watering
   ___ Landscape with drought tolerant plants
   ___ Sweep the driveway rather than hosing it off
   ___ Fix household leaks (e.g. leaky faucet)
   ___ Take shorter showers
   ___ Switch to more efficient appliances (showerheads, toilets, sprinklers, etc.)
   ___ Other (please specify)

4. How likely are you to share water-saving tips with your community? Circle one.
   1- Very likely
   2- Probably
   3- Neutral
   4- Unlikely
   5- Absolutely not

5. Would you support water use restrictions during a water shortage emergency?
   ___ Yes
   ___ No. Please explain why: ____
   ____

6. How would you like to be notified in the event of water restrictions?
   ___ Email
   ___ Phone Call
   ___ Social Media Post
   ___ Text message
   ___ Other (please specify)

7. Have you seen/read Pechanga Environmental Department's electronic newsletter *The Manzanita Minute*?
   ___ Yes
   ___ No

8. What age group do you belong to?
   ___ Under 18 years old
   ___ 18-25 years old
   ___ 26-35 years old
   ___ 36-50 years old
   ___ 51-65 years old
   ___ 65+ years old

9. Would you like to be entered to win a $50 gift card? Add your name and phone number below.
   ____
   ____

Appendix B Online Survey

Planning for Drought

The Pechanga Environmental and Water Departments are interested in understanding the water use needs of
the Pechanga community. Understanding community priorities will help the tribal government plan for the future. We greatly appreciate you taking the time to share your thoughts.

Complete the survey to be entered into a drawing for a $50 gift card. Winner selected at Pechanga Earth Day: April 15, 2023.

mpoffinbarger@pechanga-nsn.gov (not shared)
Switch account

* Required

Have you seen/follow Pechanga Environmental Department's Instagram @pechanga_environmental? *

- ◯ Yes
- ◯ No

In the case of extreme drought, which water uses should be prioritized on the Reservation? Rank from most (1) to least (5) important. *

	Household Water Use (shower, sink, etc.)	Public Services (government, school, Public Works, etc.)	Fire Safety	Commercial Use (casino, gas station, golf course)	Agricultural Use (growing produce, livestock, etc.)
1	○	○	○	○	○
2	○	○	○	○	○
3	○	○	○	○	○
4	○	○	○	○	○
5	○	○	○	○	○

What would you be willing to do to reduce your water use during a water shortage? Check all that apply. *

- [ ] Reduce landscape watering.
- [ ] Landscape with drought tolerant plants.
- [ ] Sweep the driveway rather than hosing it off.
- [ ] Fix household leaks (e.g. leaky faucet).
- [ ] Take shorter showers.
- [ ] Switch to more efficient appliances (showerheads, toilets, sprinklers, etc.).
- [ ] Other: ______________________

How likely are you to share water-saving tips with your community?

- ○ Very likely
- ○ Likely
- ○ Not likely or unlikely
- ○ Unlikely
- ○ Very unlikely

Would you support water use restrictions during a water shortage emergency? *

- ○ Yes
- ○ No

If you answered "No" above, please explain why you would not support water use restrictions during a water shortage emergency. Otherwise, type "N/A."

Your answer

How would you like to be notified in the event of water restrictions? Select all that apply. *

- [ ] Email
- [ ] Social Media Post
- [ ] Phone Call
- [ ] Text message
- [ ] Other:

Have you seen/read Pechanga Environmental Department's electronic newsletter *The Manzanita Minute*? *

- ○ Yes
- ○ No

What age group do you belong to? *

- Under 18 years old
- 18-25 years old
- 25-35 years old
- 35-50 years old
- 50-65 years old
- 65+ years old

Would you like to be entered to win a $50 gift card? Enter your name and phone number below.

Your answer

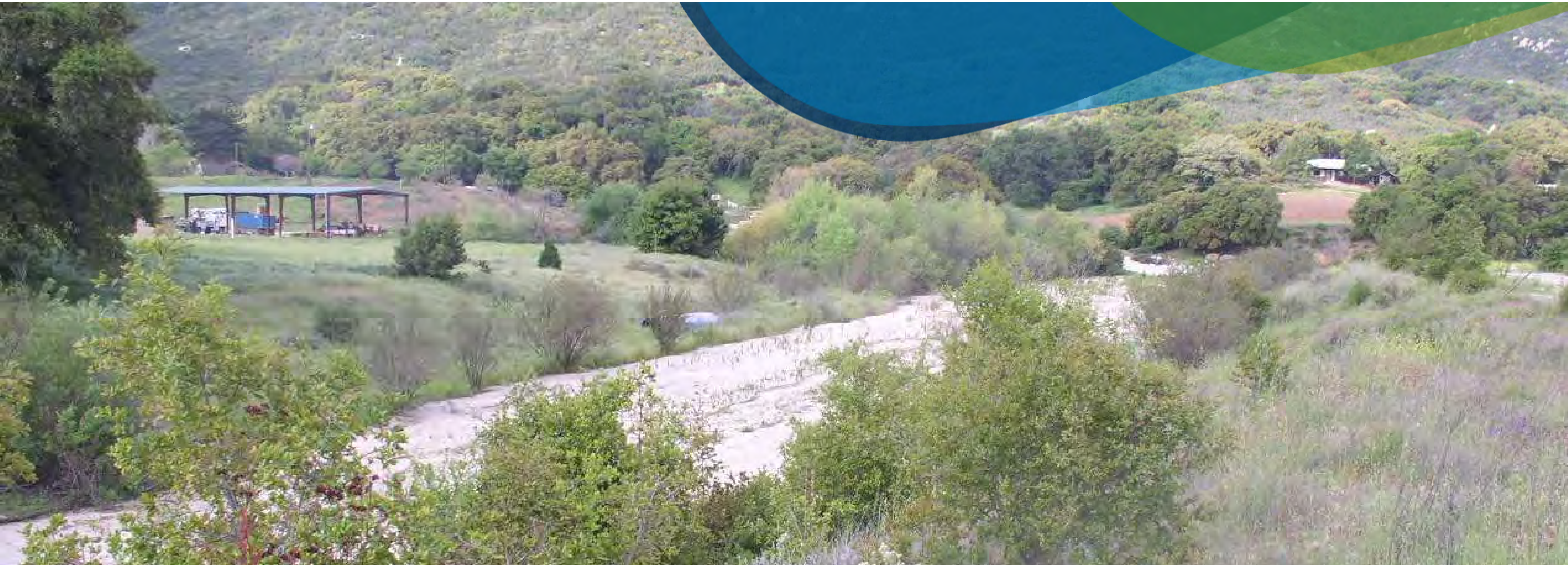
Submit

Page 1 of 1

Clear form

Appendix B

Task Force Workshop 1 (Elements M.2 through M.5)



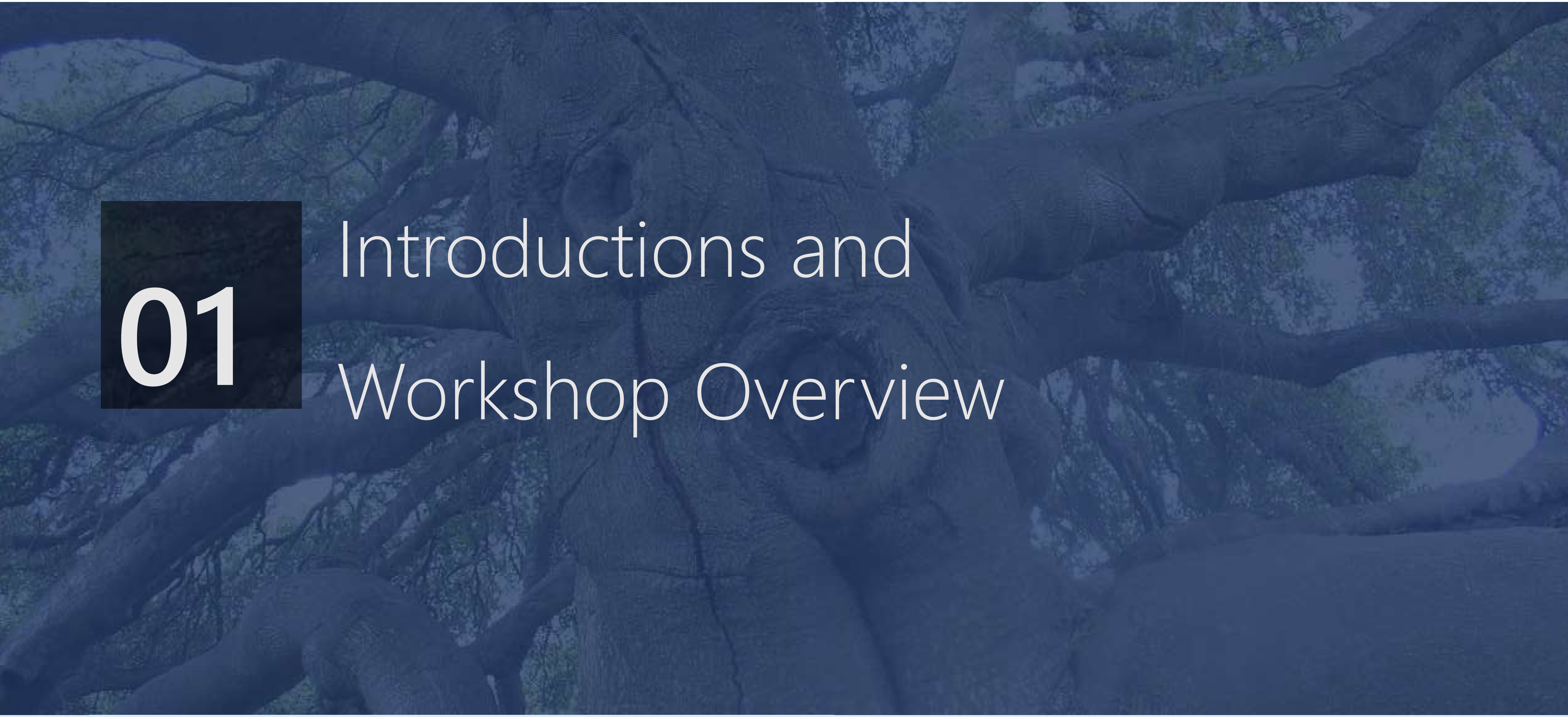
Pechanga Band of Luiseño Indians

2023 Drought Contingency Plan – Task Force Workshop

Review of DCP Elements M.2 – M.5

September 07, 2023

Pechanga DCP – Task Force Workshop 09/2023



01 Introductions and Workshop Overview

Pechanga DCP Team

Agency	Name	Role	Title
U.S. Bureau of Reclamation	Leslie Cleveland	WaterSMART Grant Manager	Water Resource Manager
Pechanga Tribal Government	Eagle Jones	Project Lead and Manager	Director of Water Operations
	Eddie Hernandez	Project Co-Lead	Interim Director of Environmental Department
	Lynette Stewart	Project Support	Administrative Assistant
	Tiffany Wolfe	Project Support	Environmental Specialist
	Megan Poffinbarger	Project Support	Environmental Technician
Dudek	Jonathan Martin	Consultant Team Manager	Senior Hydrologist
	Trevor Jones	Lead Hydrogeologist	Senior Hydrogeologist
	Sharllyn Pimentel	Project Hydrologist	Hydrologist
	Greg Ripperger	Lead Engineer	Project Manager

Pechanga DCP Task Force

Agency	Name	Title
Indian Health Services	Josh Sims	Tribal Utility Consultant
Rural Community Assistance Corporation	Angela Hengel	Regional Manger
Rancho California Water District	Jordan Farrell	Water Production Manager
Western Municipal Water District	Ryan Shaw	Director of Water Resources
Pechanga Development Corporation	Andrew Masiel Sr.	Committee Member
Pechanga Golf Course	Mario Ramirez	Golf Course Superintendent
Pechanga Casino	Gary Senz	Director of Facilities
Pechanga Public Works	John Magee	Director of Public Works

Updated Schedule for DCP Phase 2 Elements

Milestone/Task/ Activity	Original Start Date	Original Completion Date	Revised Start Date	Revised Completion Date	Status
M.2 – Drought Monitoring Plan	June 2022	July 2022	March 2023	September 2023	Task Force Workshop (09/07/2023)
M.3 – Vulnerability Assessment	June 2022	September 2022	March 2023	October 2023	
M.4 – Mitigation Actions	January 2022	February 2022	May 2023	November 2023	Community Workshop (Scheduled October 2023)
M.5 – Response Actions	March 2022	April 2022	May 2023	November 2023	
M.6-M.7 – Operation and Administrative Framework	April 2022	N/A	January 2024	March 2024	Not started
Prepare Drought Contingency Plan	May 2022	June 2022	January 2024	March 2024	Draft in development
Prepare Final Drought Contingency Plan	September 2022	N/A	March 2024	May 2024	Not started

Workshop Focus

Review DCP Elements M.2 – M.5 and provide feedback.

- M.2: Drought Monitoring Plan (DMP)
- M.3: Vulnerability Assessment
- M.4: Mitigation Actions
- M.5: Response Actions

A PDF of the presentation will be sent to each Task Force Member, as well as a link to a survey where you can submit feedback for each element.

Survey Link: https://www.surveymonkey.com/r/PechangaDCP

Survey Password: DCP2023

02 DCP Element M.2 Drought Monitoring Plan

Pechanga Band of Luiseño Indians Drought Contingency Plan (DCP) Overview

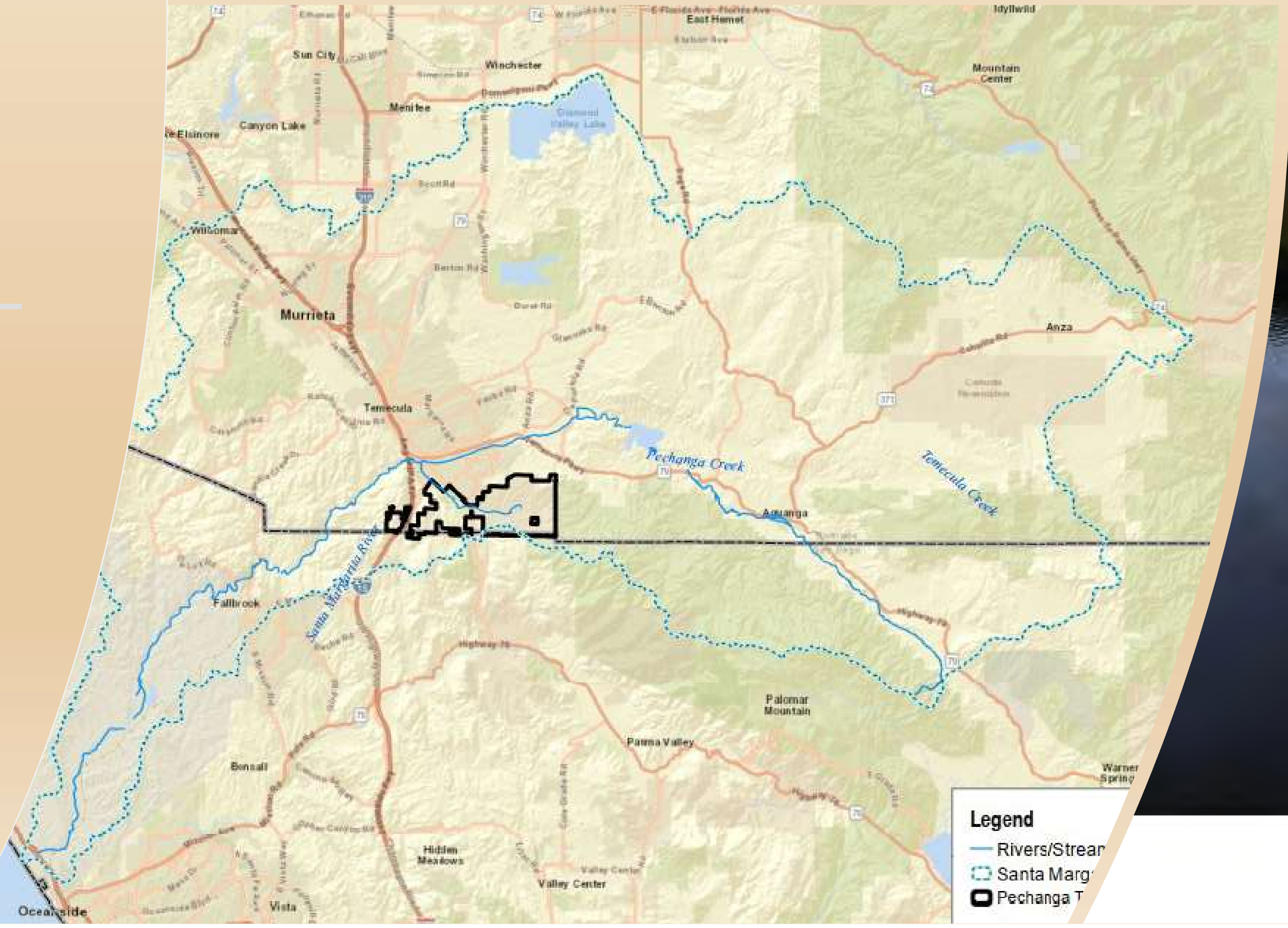


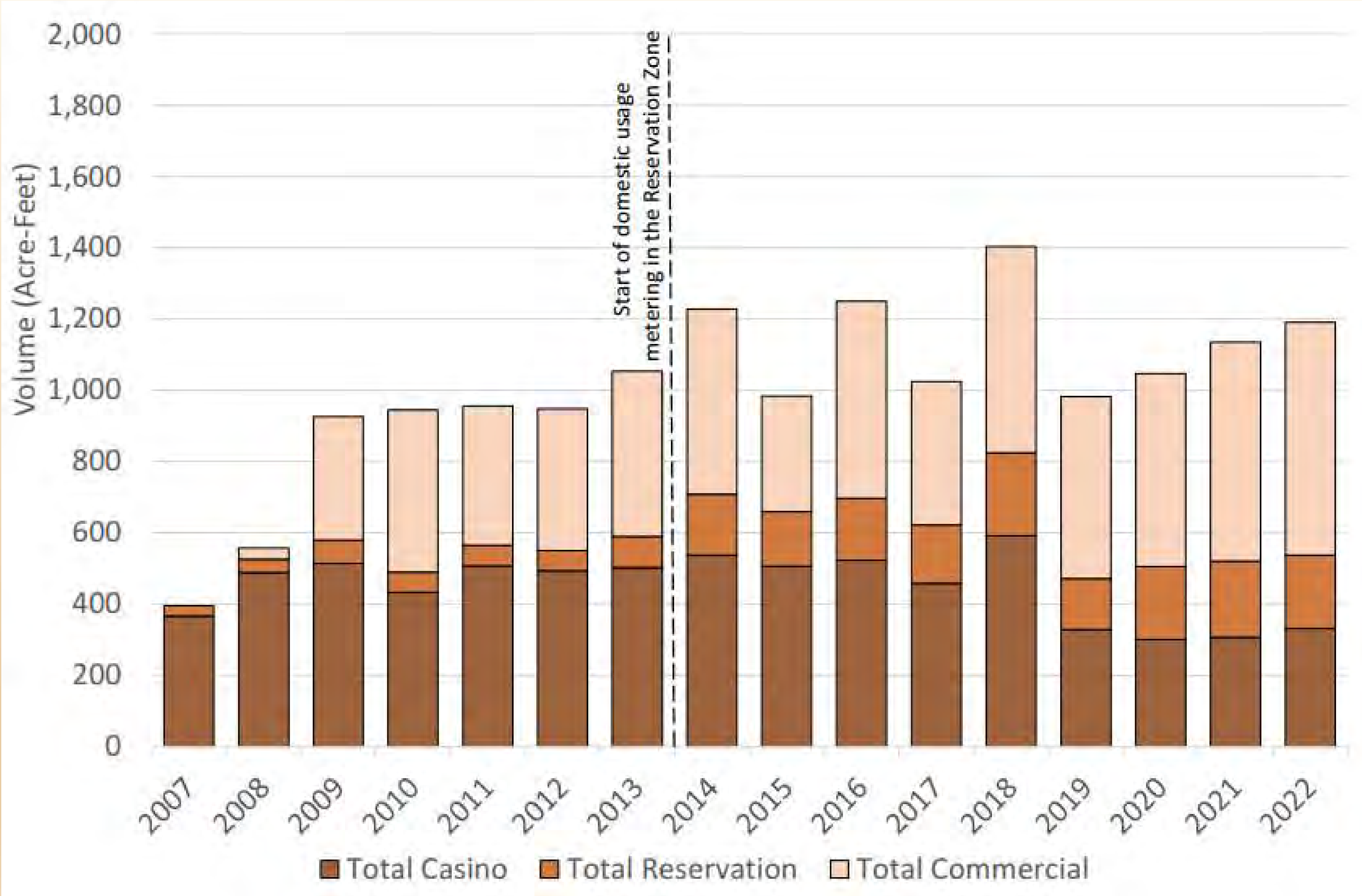
Image credit: Doug McCulloh

Historical Annual Water Demand

Pechanga's annual water demand is split between three sectors:

- Reservation
- Commercial
- Casino

Since the incorporation of domestic use metering in 2014, total annual demand has ranged between **900** and **1,400 ac-ft/year (AFY)**.



Current Groundwater Supply

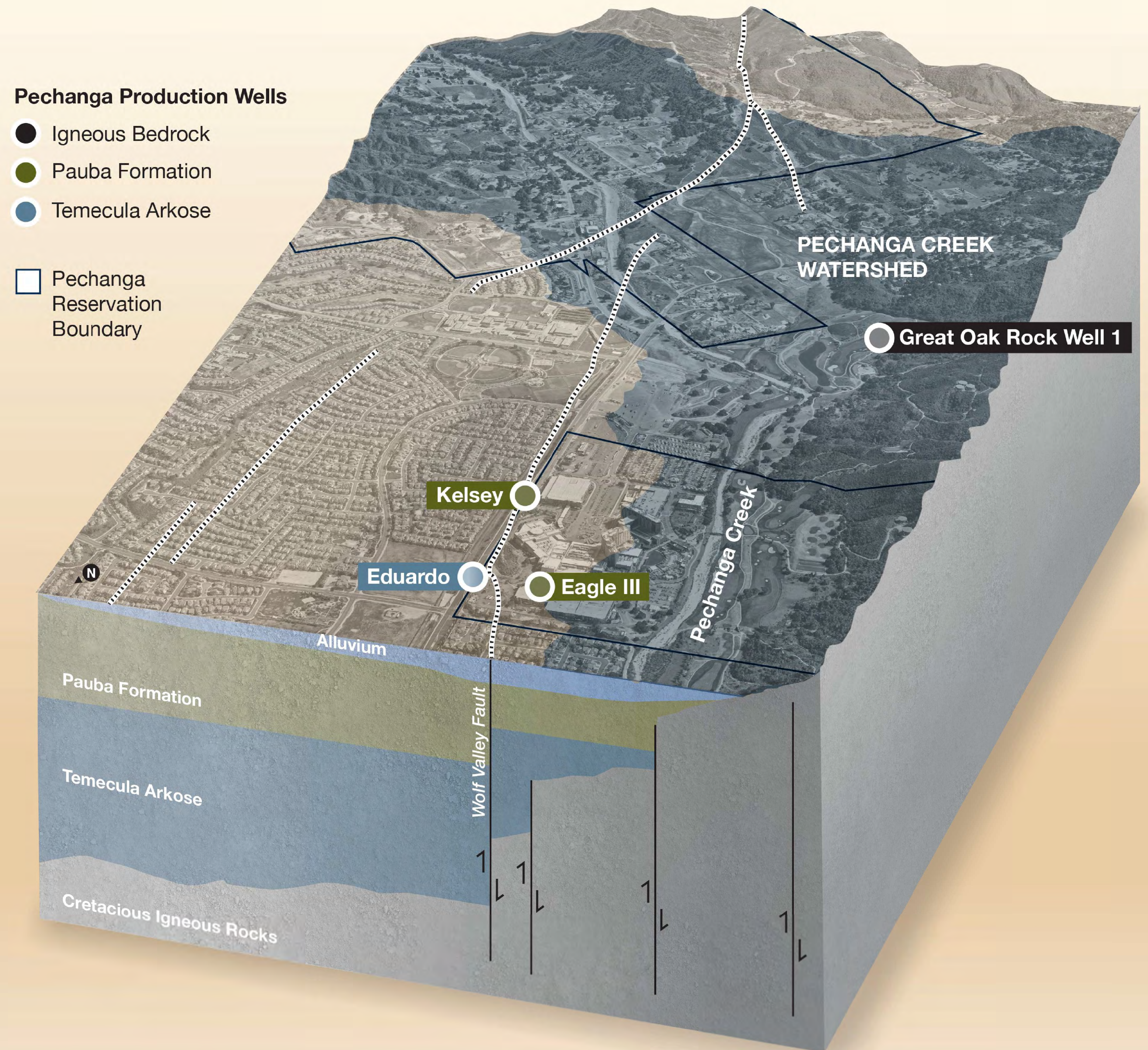
Tribe operates **4** production wells
3 set in the ***Wolf Valley Subbasin***.

Eduardo (~350 gpm): set in the confined Temecula Arkose aquifer, northeast of the *Wolf Valley Fault*

Eagle III (~250 gpm) and **Kelsey** (~140 gpm): set in the unconfined Pauba Formation aquifer, southwest of the *Wolf Valley Fault*

GOR #2 (~220 gpm): set in the igneous bedrock aquifer

Wolf Valley Fault: An aquifer test conducted in the 1990s indicated that this fault may serve as a hydraulic barrier to groundwater flow within the Wolf Valley Subbasin.

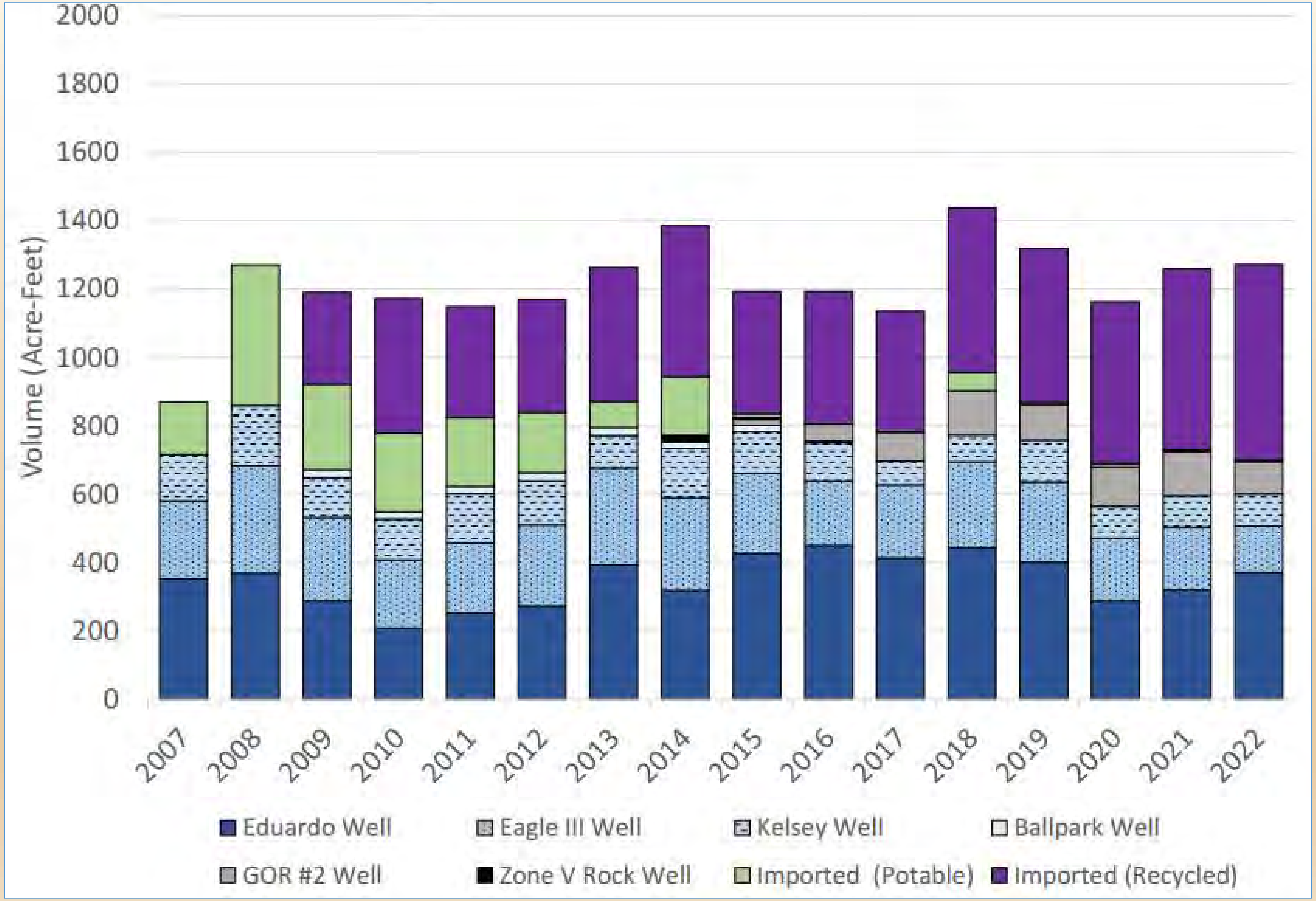


Historical Annual Water Supply

Graph includes imported **potable** water and **recycled** water.

The general trend since 2014 has shown an ***increase in use of recycled water*** (purple), and a ***reduced use of imported potable water*** (green).

Groundwater production has ranged between ***600*** and ***800 AFY*** from the three wells set in the Wolf Valley Subbasin, where production from the bedrock aquifer has ranged from <100 to 200 AFY.



Characterization of Potential Short- and Long-Term Drought Impacts

DROUGHT DURATION	DROUGHT IMPACTED RESOURCE			
	GROUNDWATER	**IMPORTED WATER**	**HUMAN/ENV HEALTH**	**CULTURAL**
SHORT-TERM (<6 months)	• Increase ET demand • Increased GW production/ decreasing water levels • Loss of GW production (reduced head, decreased WQ)	• Potential reduction of imported potable water through water restrictions administered by MWDSC • Potential reduced availability to recycled water (EMWD)	• Hotter/drier conditions could contribute to plant die-offs and increasing probability for wildfires • Exacerbate conditions contributing to heat stress	• Declining soil moisture supporting the Great Oak and groundwater supporting the Pechaa’anga Spring
LONG-TERM	• Accelerated aquifer drawdown & potential land subsidence & associated reduced aquifer storage	• Potential drastic cuts to potable water and recycled water delivers	• Increased desiccation of Pechanga biome and increased wildfire risk	• Permanently affect Great Oak

Evaluation of Local Drought Indicators

I. Hydrological (surface and groundwater)
II. Meteorological

Meteorological Monitoring Stations

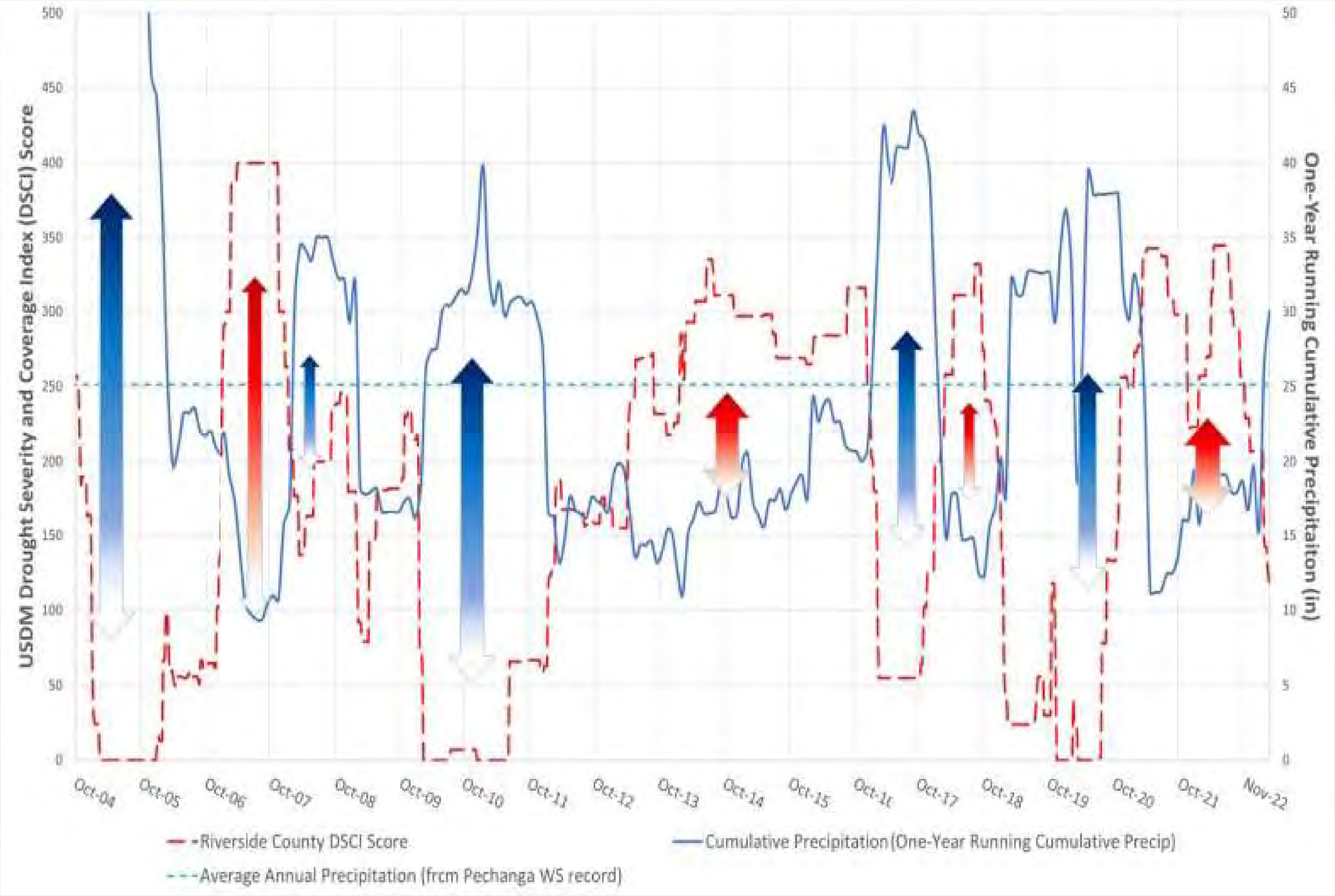
Weather Station:	Agency	Data & Purpose	Record Start and End Date:
# 62 Temecula	CIMIS	• Evaluate historical and projected local ET demands • Monitor current ET demands	11/25/1986 to Present
# 237 Temecula East III			11/1/2012 to Present
Temecula, CA US COOP:048844	NOAA	• Evaluate historical and projected local precipitation trends	8/31/1974 to 8/31/2008
Pechanga Tribe	Pechanga Tribal Government	• Evaluate historical and projected local precipitation trends • Monitor current precipitation	11/14/2016 to Present
Palomar	RAWS	• Gap-fill Pechanga weather station data back to 2004 • Evaluate upper-Pechanga watershed rainfall	9/14/2004 to Present
Santa Rosa Plateau (SAR)	CA Dept of Forestry and Fire Protection	• Gap-fill Temecula NOAA station (COOP: 04844)	07/01/1994 to Present

Multiple stations were included during initial data analysis to identify longest nearby record for suitability of gap-filling local Pechanga weather station's record, to support evaluation of these data against existing Drought Indices and for incorporation into the Vulnerability Assessment (Element M.3).

Riverside County Drought Conditions

US Drought Monitor tool, managed by the National Drought Mitigation Center, NOAA, and the USDA, best captured local drought conditions from 2004-2023.

This tool is updated bi-weekly using historical/current observations from multiple physical hydro/meteorological observations, and includes multiple existing drought indices (SPI, Palmer Index, NDVI, etc).



Hydrological Monitoring Stations

Streamflow Monitoring Stations

Stream Gage Station:	USGS Site ID	Record Start and End Date:
Pechanga Creek	11042631	10/1/1987 to Present
Temecula Creek near Aguanga, CA	11042400	8/1/1957 to Present

Groundwater Monitoring Stations

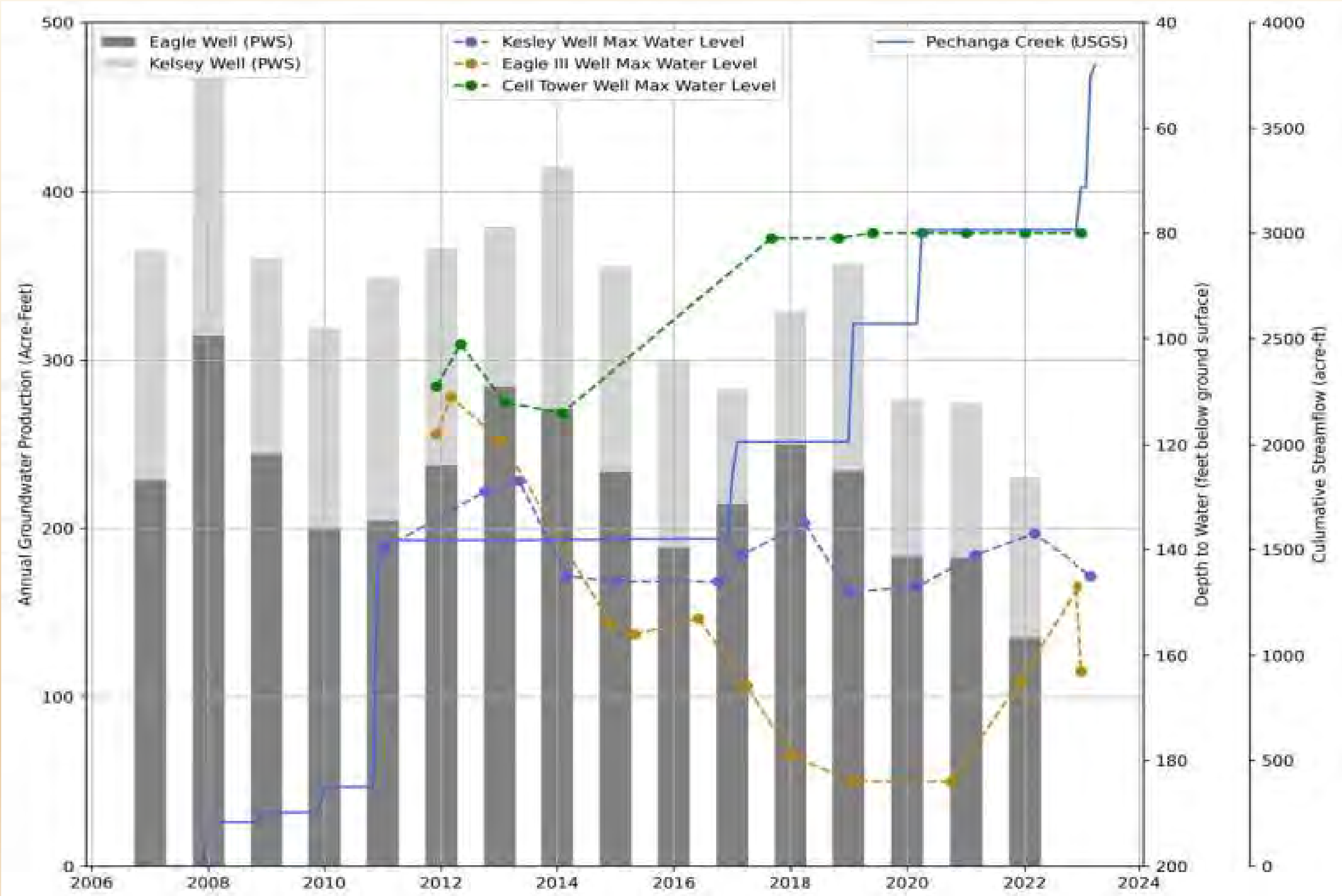
Well Name	USGS Station ID	Production / Monitoring	Expected Production Rate (gpm)
Temecula Arkose Aquifer – Northeast of Wolf Valley Fault			
Eduardo	332733117062301	Production	350
J002S	332747117061102	-Monitoring	-
Pauba Formation Aquifer – Northeast of Wolf Valley Fault			
J001S	332747117061101	Monitoring	-
Pauba Formation Aquifer – Southwest of Wolf Valley Fault			
Eagle III	332729117063101	Production	250
Kelsey	332724117061501	Production	140
Cell Tower	332704117055301	Monitoring	-
Igneous Bedrock Aquifer – Southwest of Wolf Valley Fault			
GOR #1	-	Monitoring	-
GOR #2	-	Production	220

Hydrological Monitoring Data

- Require additional information regarding aquifer properties to adequately characterize drawdown and recharge associated with pumping, rainfall, and streamflow

- Water-level data still critical for evaluating real-time conditions of aquifer and drawdown rates

- Streamflow measurements at USGS stations useful for evaluating previous/current water year conditions



Regional Drought Indicator – RCWD WSCP

Rancho California Water District's Water Shortage Contingency Plan (WSCP) includes evaluation of broader Temecula Groundwater Basin conditions and incorporates MWDSC's Water Shortage stage classifications and Water Supply Allocation Plan.

Table 1-1 Correlation Between District's Stages and 2020 UWMP Shortage Levels

District Shortage Stage	CWC Standard Shortage Stage	Shortage Percentage
1 – Water Supply Watch	N/A	N/A
2 – Water Supply Alert	N/A	N/A
3 – Water Supply Warning		
3a	N/A	N/A
3b	1	Up to 10 percent
3c	2	Up to 20 percent
4 – Extreme Water Supply Emergency		
4a	3	Up to 30 percent
4b, 4c	4	Up to 40 percent
5 – Catastrophic Water Supply Emergency		
5a, 5b	5	Up to 50 percent
5c	6	Greater than 50 percent

Proposed Drought Stages	DROUGHT STAGE CRITERIA			
	Local Drought Conditions			Regional Drought Conditions
	USDM (Riverside County)	Pechanga Production Wells	Groundwater Monitoring Wells & Streamflow (USGS)	RCWD WSCP Stages
None	None	>95% Average Production	Increasing or Stable Water Levels; Above Average or Average Annual Streamflow within Pechanga and Temecula creeks	Stage 1 - Water Supply Watch
Stage 1	D0	90%-95% Average Production	Gradual Decline in Water Levels; Average to Below Average streamflow in Pechanga Creek (but flow was present during the water year)	Stage 2 - Water Supply Alert
Stage 2	D1	80%-90% Average Production		
Stage 3	D2	70%-80% Average Production		Stage 3 - Water Supply Warning
Stage 4	D3	50%-70% Average Production	Increased Decline in Water Levels; Below Average streamflow in Pechanga and Temecula creeks (but flow was present during the water year)	Stage 4 - Extreme Water Supply Warning
Stage 5	D4	<50% Average Production	Increased Decline in Water Levels; No streamflow in Pechanga Creek and below average streamflow in Temecula Creek over the course of the current water year.	Stage 5 - Water Supply Emergency Criteria

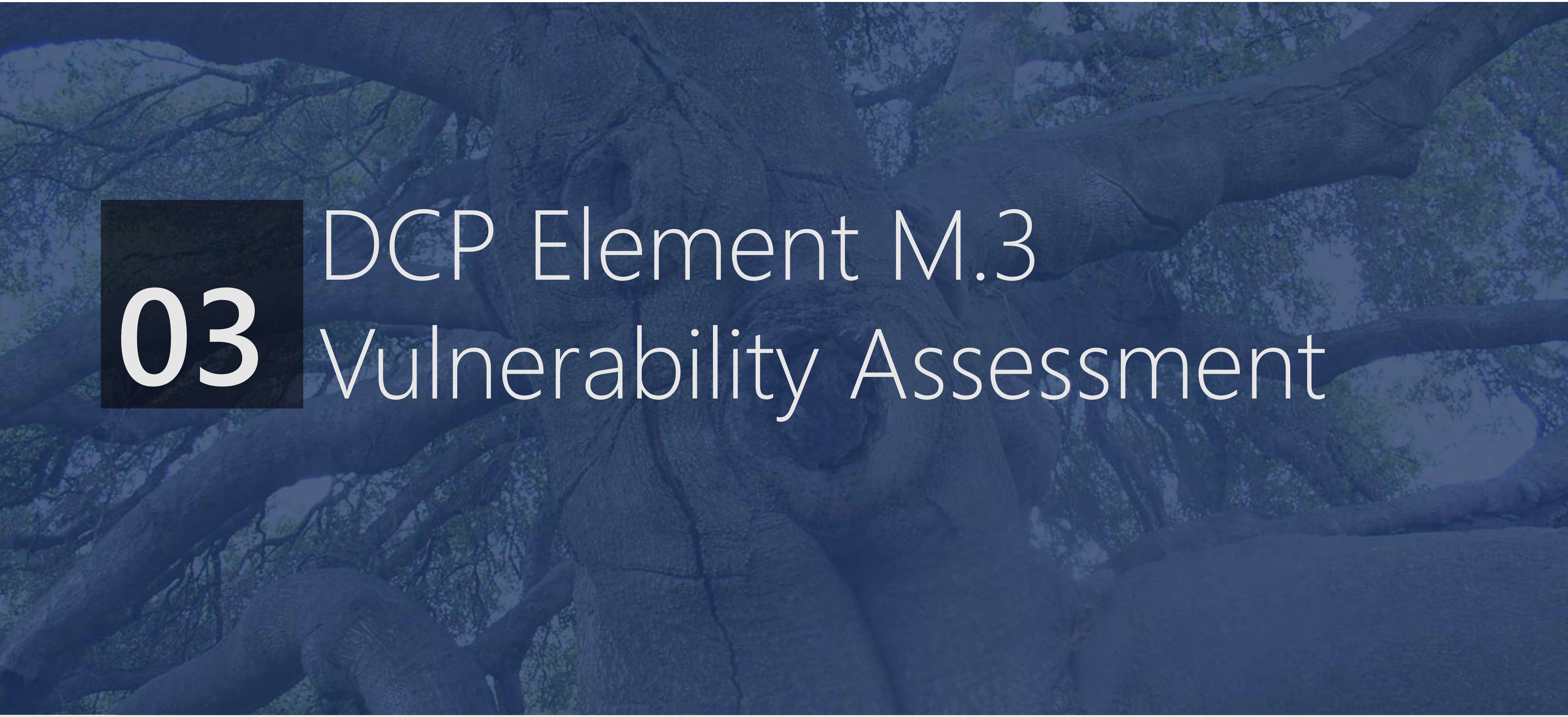
Drought Forecasting

Two forecasting tools were evaluated for evaluating future drought conditions as part of the DMP. These included:

- **The NWS Climate Prediction Center's** experimental drought forecast tool (limited to two-week forecast): https://www.drought.gov/forecasts or https://www.cpc.ncep.noaa.gov/index.php or https://www.drought.gov/states/California, &

- **HydroGEN** – A federal/university led collaboration currently in beta-test developing seasonal forecasts for soil moisture and groundwater change: https://www.hydro-generation.org/. We have spoken with the developers, and they are interested in including Pechanga's watershed for their upcoming beta-test.

Both tools are in experimental stage and were not immediately included in the Pechanga DMP.



03 DCP Element M.3 Vulnerability Assessment

Vulnerability Assessment

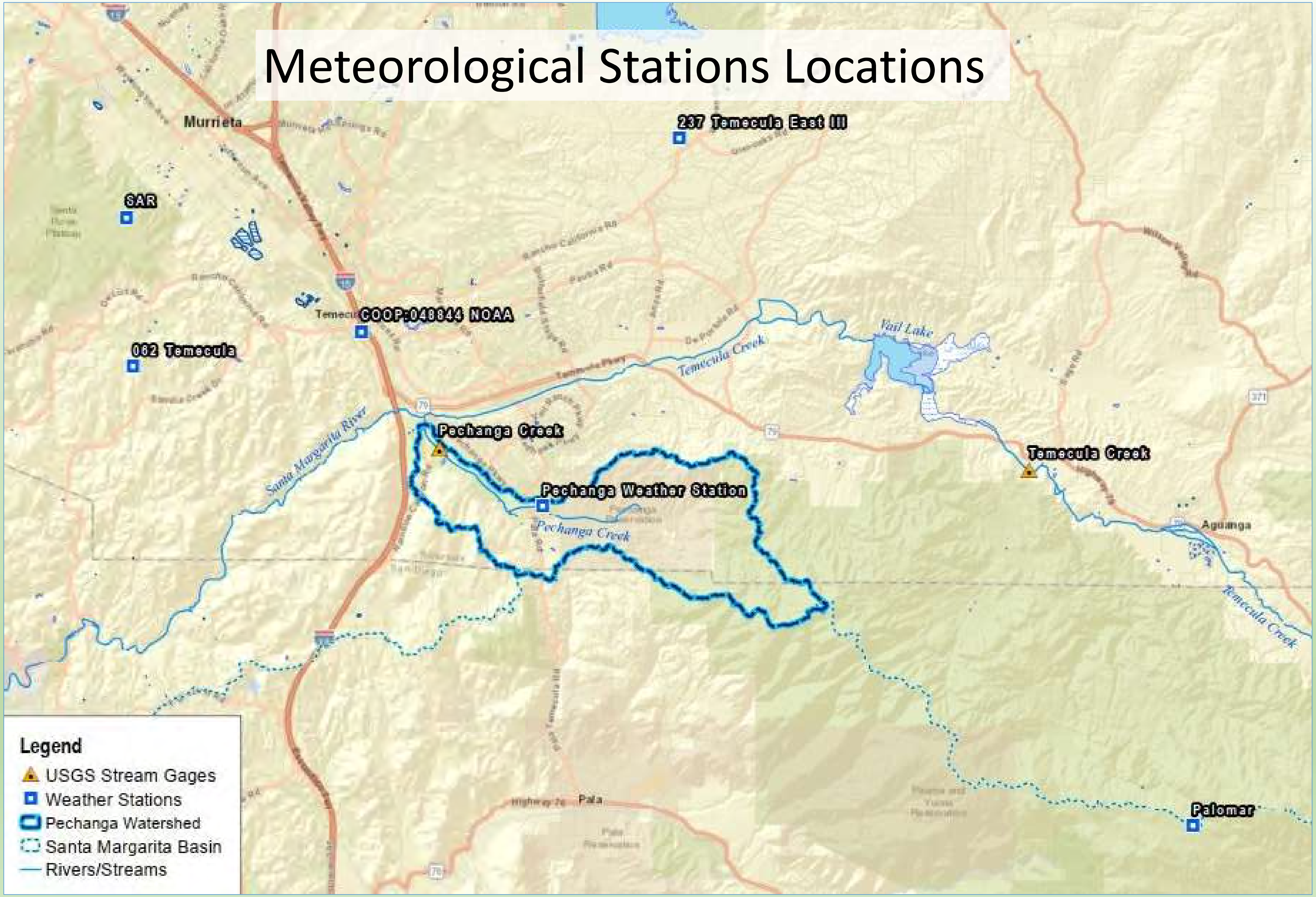
1. Characterize previous drought conditions

2. Project future drought scenarios
- Cal-Adapt climate change tools (https://cal-adapt.org/)
- DWR's climate change factors (https://data.cnra.ca.gov/dataset/sgma-climate-change-resources)

3. Document Pechanga's vulnerabilities associated with projected drought scenarios

https://www.climateassessment.ca.gov/

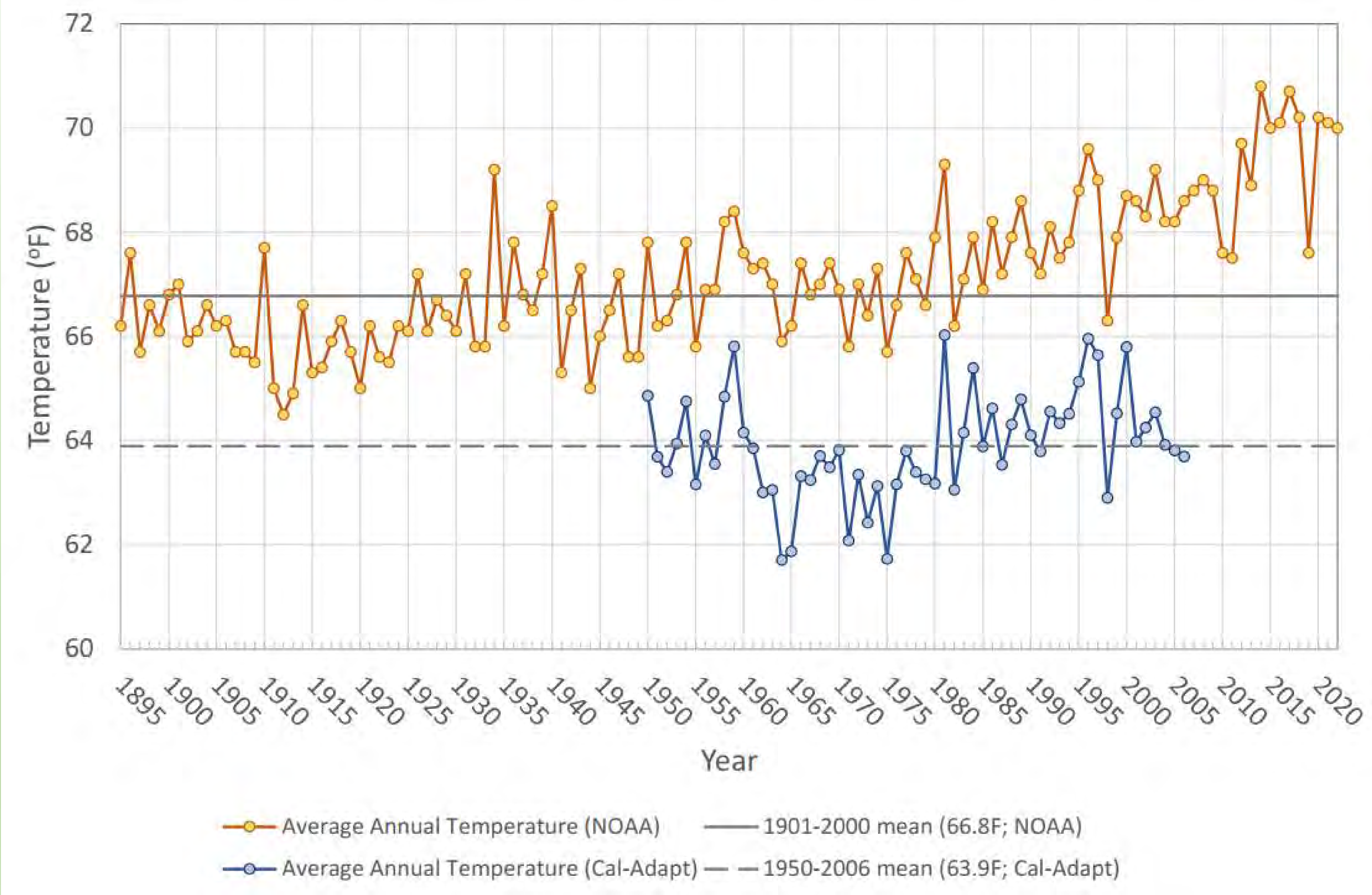
Meteorological Stations Locations



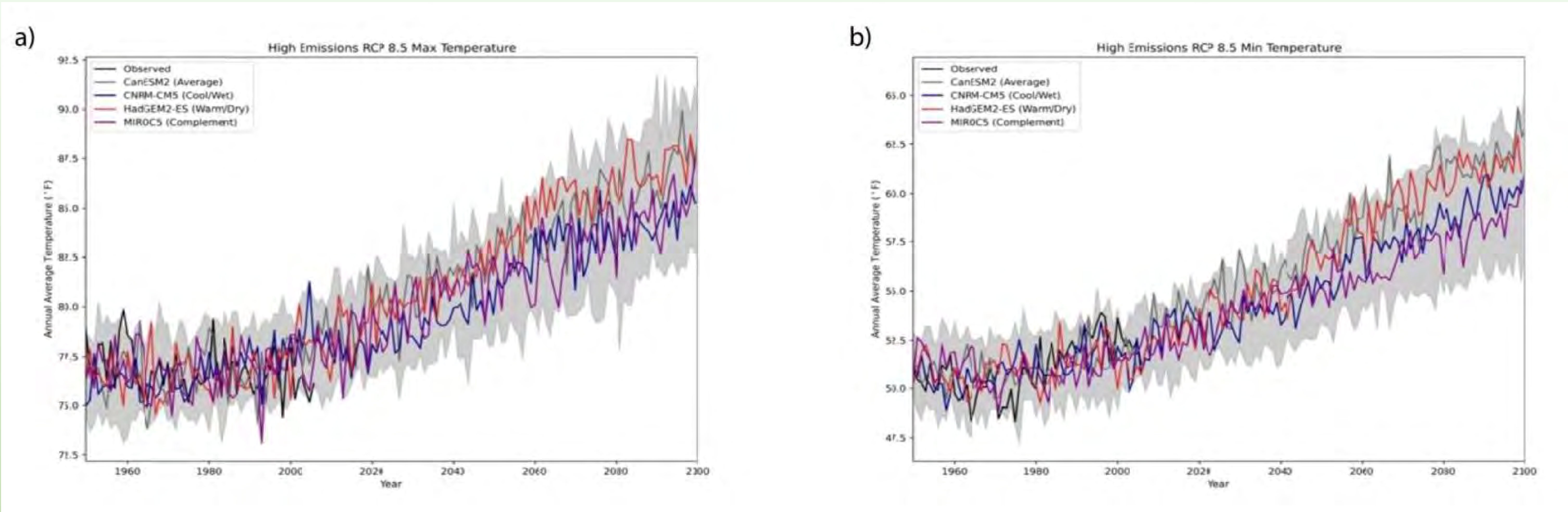
Historical Annual Average Air-Temperature

1. Per NOAA data (orange line):
   - Since 1895 the average annual temperature in Riverside County is 66.7º F
   - Average temperatures have been increasing since the 1970s
   - 7/10 warmest years have occurred in the past 10 years

2. Per Cal-Adapt data (blue line):
   - Between 1950 and 2006, the average annual temperature for the Reservation was 63.9º F
   - Annual temperature trends post-1970 mirror NOAA trends



Projected Shifts in Min/Max Air Temperatures



Cal-Adapt's mid-century and end-of-century temperature min and max air-temperature projections under high green-house-gas emission scenario (RCP 8.5).

For Riverside County, average min/max temperatures are anticipated to increase by 5° F by mid-century, and by up to 9° F by end-of-century.

The medium green-house-gas scenario (RCP 4.5) projected a 4° F increase by mid-century, and only minor increases thereafter.

Projected Shifts in Min/Max Air Temperatures

Scenarios	Agency	Time Period	Riverside County		Pechanga Reservation	
			Average Temperature (ºF)	Changes from Observed Historical Average	Average Temperature (ºF)	Changes from Observed Historical Average
Historical Estimates	NOAA	GCHN Historical (1950 – 2000)	Min: 54.3 Max: 80.4	-	-	-
	Cal-Adapt	Gridded Observed Historical (1950 – 2000)	Min: 52.1 Max: 81.2	-	Min: 51.0 Max: 76.3	-
Medium Emissions (RCP 4.5)	Cal-Adapt	Mid-Century Projection (2035-2064)	Min: 56.4	+4.4	Min: 54.9	+3.9
			Max: 85.5	+4.3	Max: 80.5	+4.2
		End-of-Century Projections (2070 – 2099)	Min: 57.7	+5.7	Min: 56.2	+5.2
			Max: 87.0	+5.8	Max: 81.9	+5.6
High Emissions (RCP 8.5)	Cal-Adapt	Mid-Century Projection (2035-2064)	Min: 57.4	+5.4	Min: 55.9	+4.9
			Max: 86.6	+5.4	Max: 81.6	+5.3
		End-of-Century Projections (2070 – 2099)	Min: 61.4	+9.4	Min: 59.6	+8.6
			Max: 89.9	+8.7	Max: 84.8	+8.5

Projected % Shift in Monthly ETo Demands

Month	Measured Average Monthly Normal ETo		DWR Projections (Applied to CIMIS Station 062)			
	CIMIS Station 062 (1987-2022)	CIMIS Station 237 (2012-2022)	2030	2070 Central Tendency	2070 DEW	2070 WMW
January	2.80	2.76	3.00	3.20	3.50	3.19
February	2.83	3.30	2.96	3.15	3.47	2.90
March	3.96	4.66	4.12	4.36	4.64	3.95
April	4.89	5.96	5.08	5.35	5.87	4.82
May	5.44	6.56	5.71	6.08	6.55	5.63
June	6.10	7.68	6.31	6.62	7.20	6.38
July	6.64	8.10	6.86	7.06	7.01	6.75
August	6.42	7.78	6.65	6.86	7.00	6.69
September	5.16	6.18	5.34	5.54	5.58	5.32
October	4.07	4.81	4.26	4.47	4.53	4.20
November	3.22	3.41	3.40	3.66	4.09	3.38
December	2.58	2.39	2.76	3.01	3.32	2.89
Total	**54.10**	**63.60**	**56.45**	**59.37**	**62.75**	**56.10**

Four DWR correction factors applied to historical ETo data from CIMIS Station 062.

- 2030 – Projected 4% increase in annual ETo demand
- 2070 Central Tendency – Projected 10% increase in annual ETo demand
- 2070 Drier Extreme Warming – Projected 15% increase in annual ETo demand
- 2070 Moderate Warming/Wetter Conditions – Projected 3-4% increase in annual ETo demand

Projected Shifts in Precipitation
Cal-Adapt Projections

Scenarios	Projections	Riverside County		Pechanga Reservation	
		Annual Average Precipitation (inches)	Precipitation Range (inches)	Annual Average Precipitation (inches)	Precipitation Range (inches)
Medium Emissions (RCP 4.5)	Observed Historical (1950 – 2000)	7.9	2.2 - 19.4	16.9	4.6 – 44.6
	Mid-Century Projection (2035-2064)	8.0	1.7 - 19.9	16.9	3.7 - 42.8
	End-of-Century Projections (2070 – 2099)	7.9	2.4 - 24.2	17.0	4.4 - 48.6
High Emissions (RCP 8.5)	Observed Historical (1950 – 2000)	7.9	2.2 - 19.4	16.9	4.6 – 44.6
	Mid-Century Projection (2035-2064)	7.8	1.6 - 22.3	16.9	3.4 – 50.6
	End-of-Century Projections (2070 - 2099	8.9	1.8 - 24.2	18.4	3.7 – 50.6

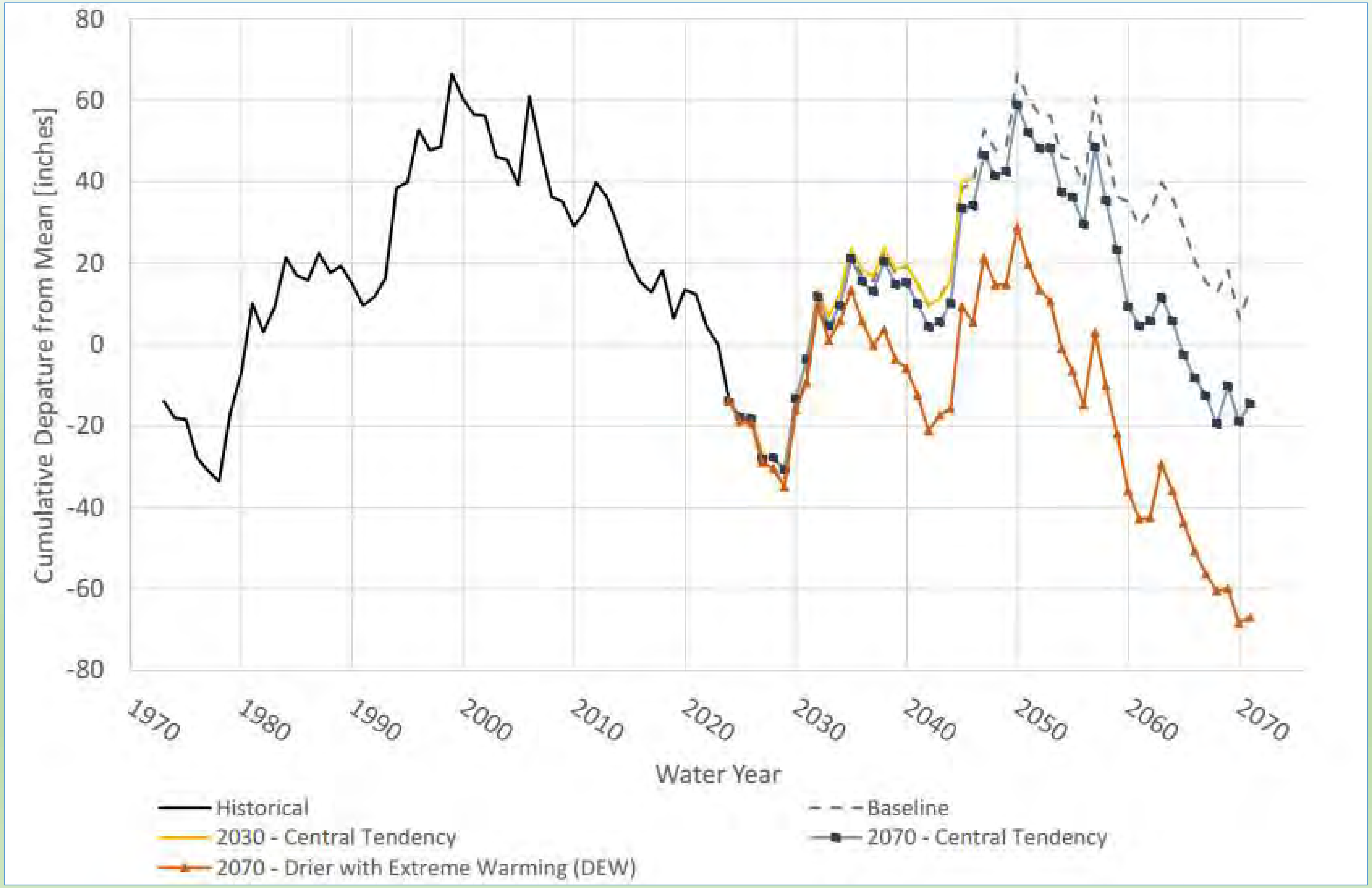
In general, the Cal-Adapt projected scenarios for Riverside County and Pechanga show small shifts in average annual precipitation, but larger shifts in the annual minimum/maximum precipitation range.

Projected Shifts in Precipitation DWR Climate Change Factors

1. Applies anticipated climate change correction factors to historical water-year trends

2. The 2030 central tendency average is ~0.8 inches less than the 1972-2022 average

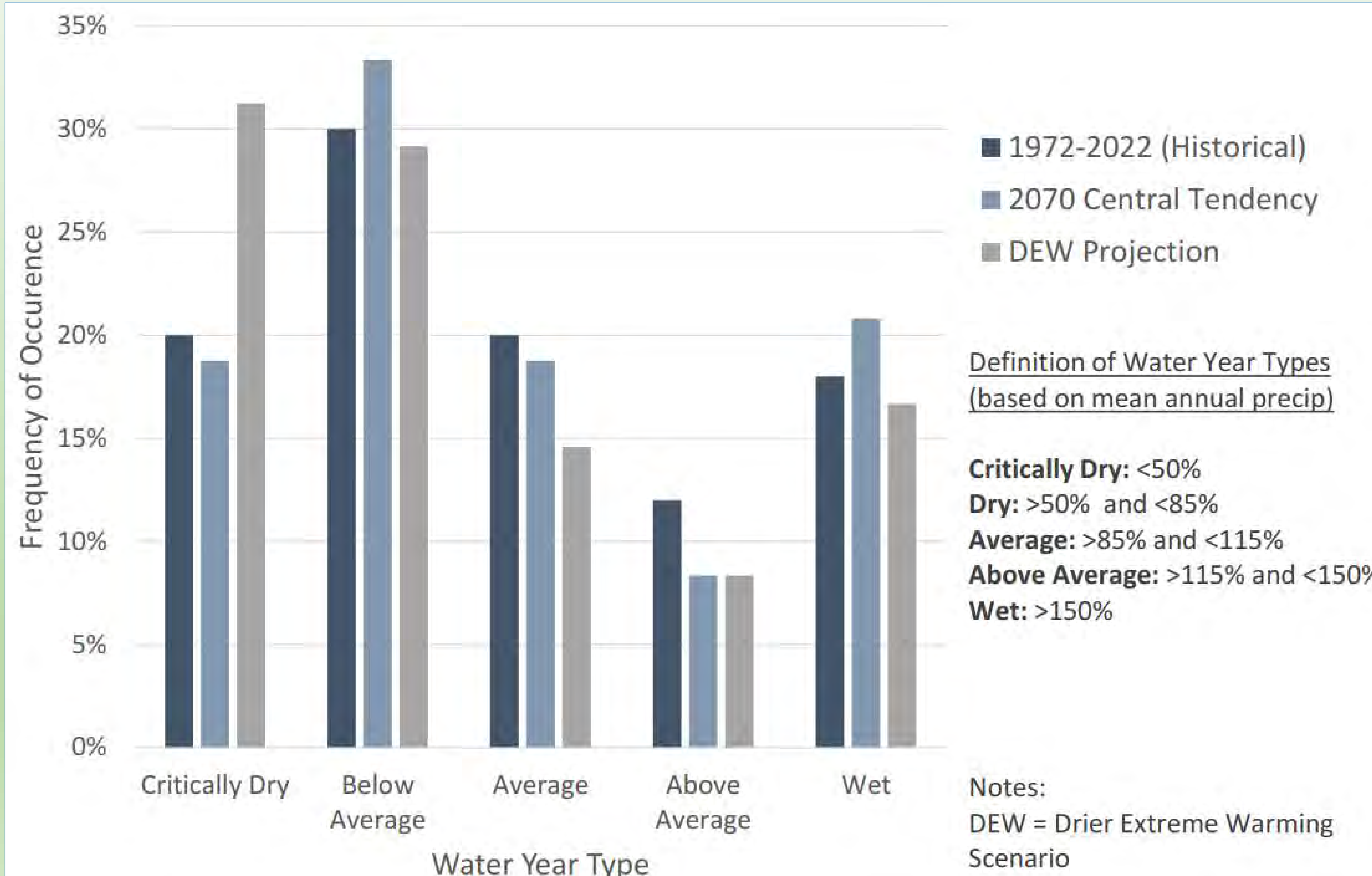
3. The 2070 Drier Extreme Warming average is ~2.0 inches less than the 1972-2022 average



Projected Shifts in Precipitation
DWR Climate Change Factors

4. Current distribution of water years is bimodal, with the majority falling below average or above average

5. Future simulations support the concern that we're going to experience more whiplash between water years dominated by drought vs. extreme rainfall events

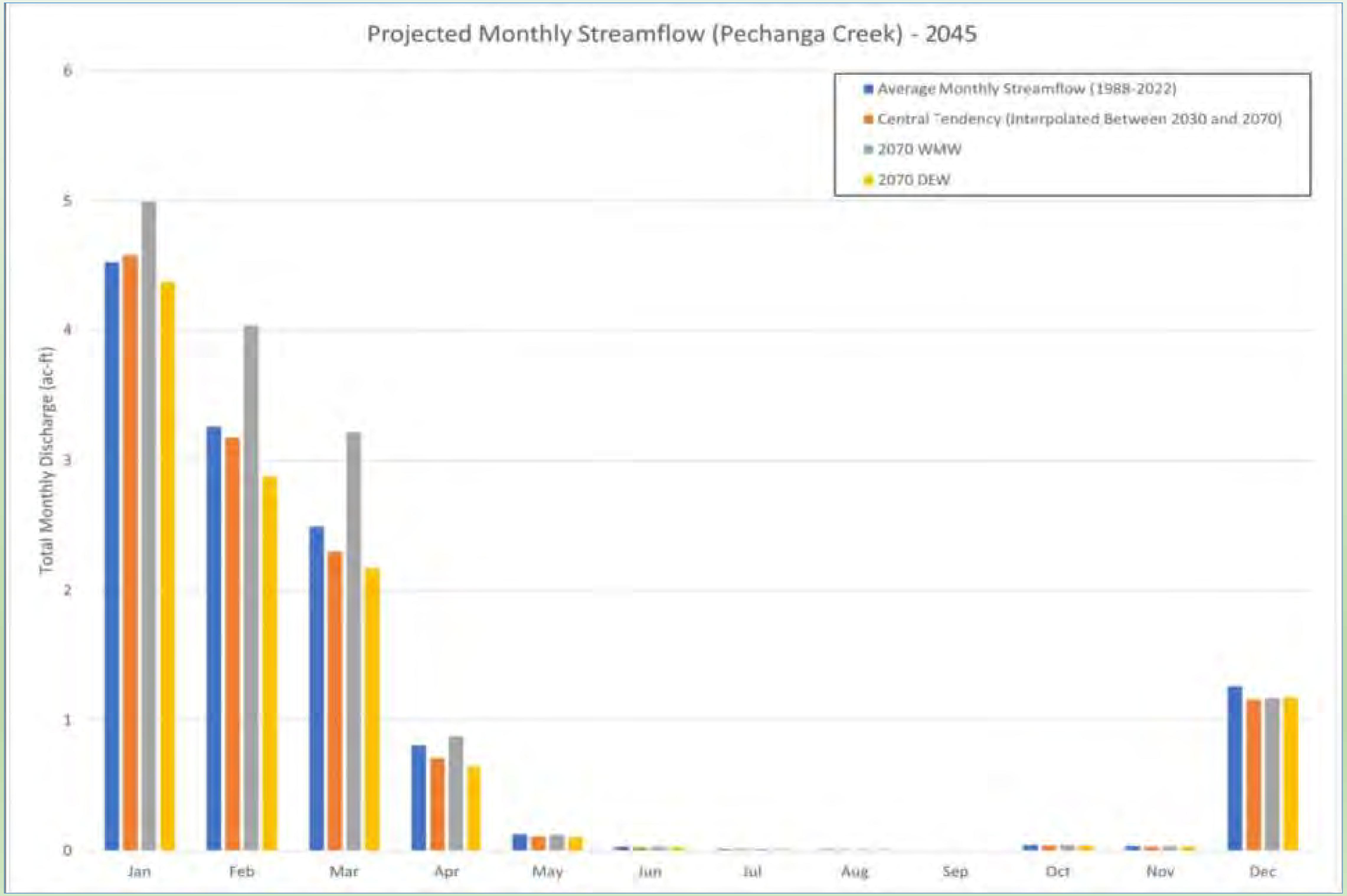


Projected Impacts on Streamflow and Recharge

1. DWR streamflow change factors for the Santa Margarita River Watershed were applied to Pechanga Creek

2. Based on 2003 groundwater study, periods of significant runoff in Pechanga Creek are associated with increased recharge

3. This is a high-level evaluation of “average” monthly streamflow in a system that dependent on rainfall (and experiences years with minimal/no flow)



Regional Drought Projections

Based on California's Fourth Climate Change Assessment, the following large-scale shifts across the state are anticipated:

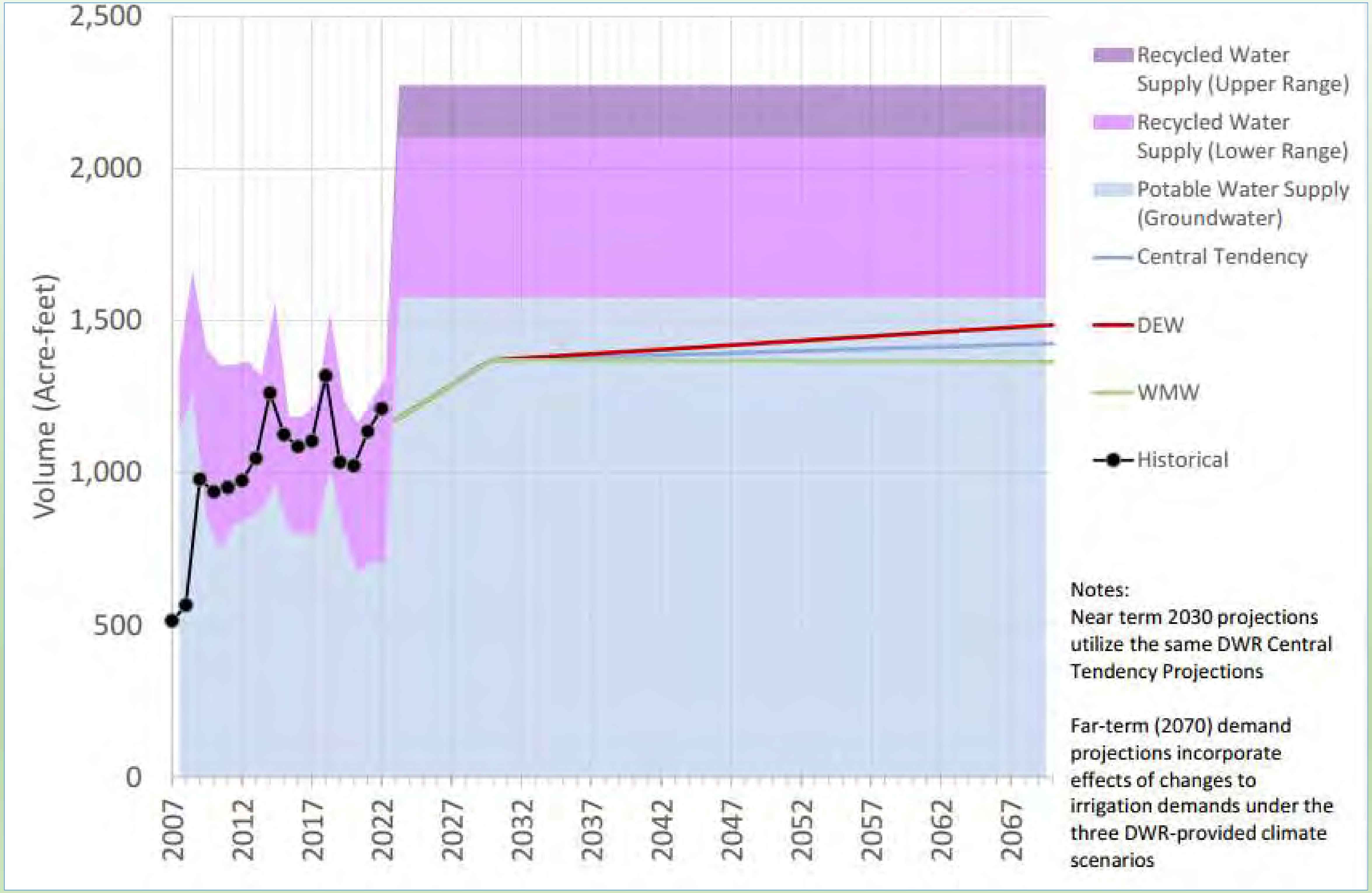
1. Increase in inter-annual precipitation variability: Future conditions are anticipated to have water-years bouncing between extreme (multi-year) droughts, extended hot/dry summer seasons, and below-average water years, with above average water years where a significant portion of the rainfall is distributed in fewer events (intense bursts such as the atmosphere rivers of 2023).

2. Reduced snowpack in the Sierras and Colorado River Basin: The anticipated shift from snowmelt dominated streams to those dependent on rainfall will stress the existing water storage and flood management systems throughout the southwest. These systems were designed to manage perennial flow generated through gradual snowmelt. How the Southwestern U.S. adjusts water use and storage in the upcoming decades will define the reliability of the State Aqueduct and CO River Aqueduct as backup sources of potable water for Pechanga.

Vulnerability Assessment on Supply and Demand

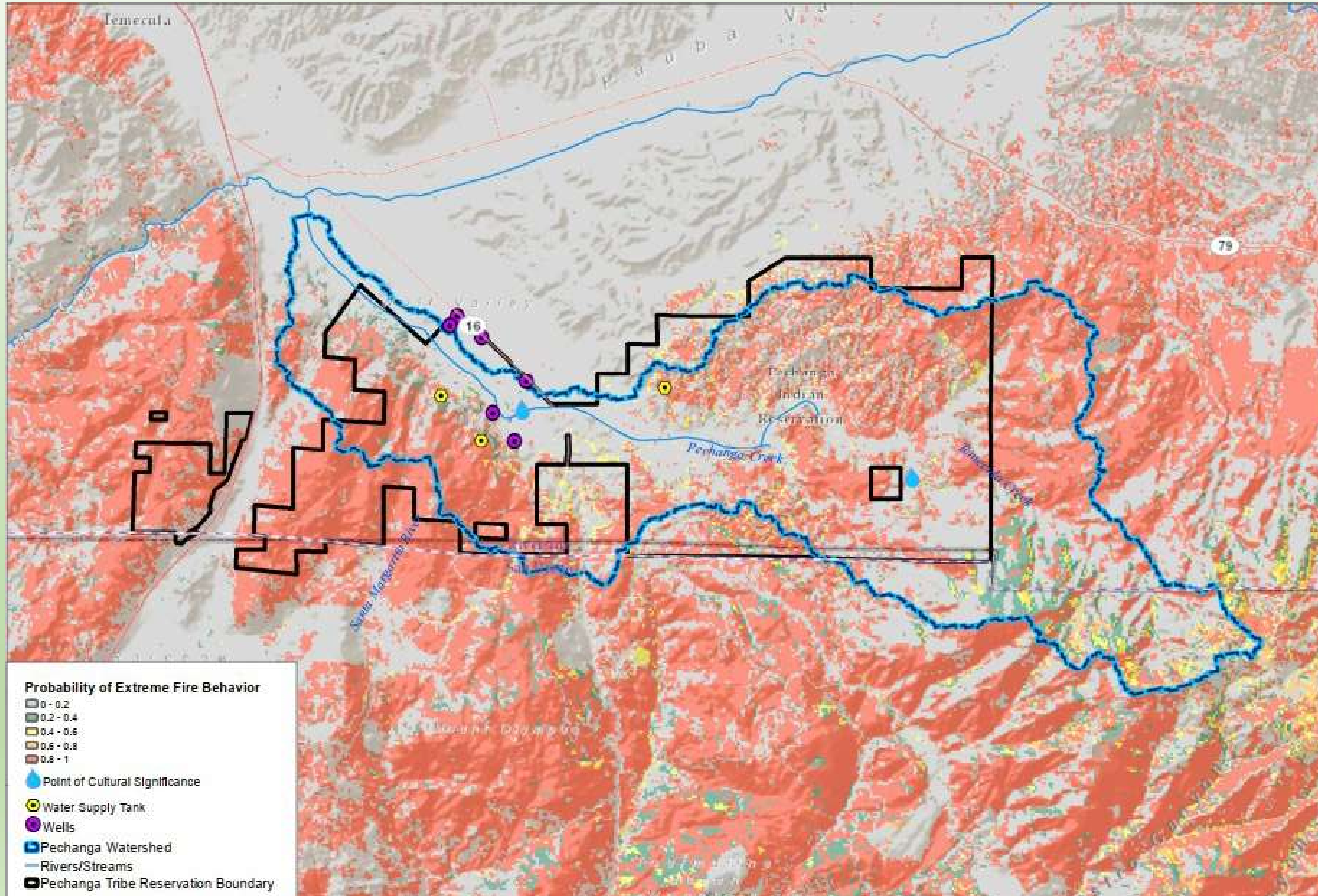
1. Future supply conditions set to match those defined in 2016 Water Settlement:
   - 1,575 AFY from Wolf Valley Subbasin
   - 525 AFY recycled water (lower range)
   - 700 AFY recycled water (upper range)

2. Only projected increase in demand associated with irrigation for 80-acre project.
   - Possible increase in recycled water demand of up to 290 AFY
   - No projected residential or commercial growth

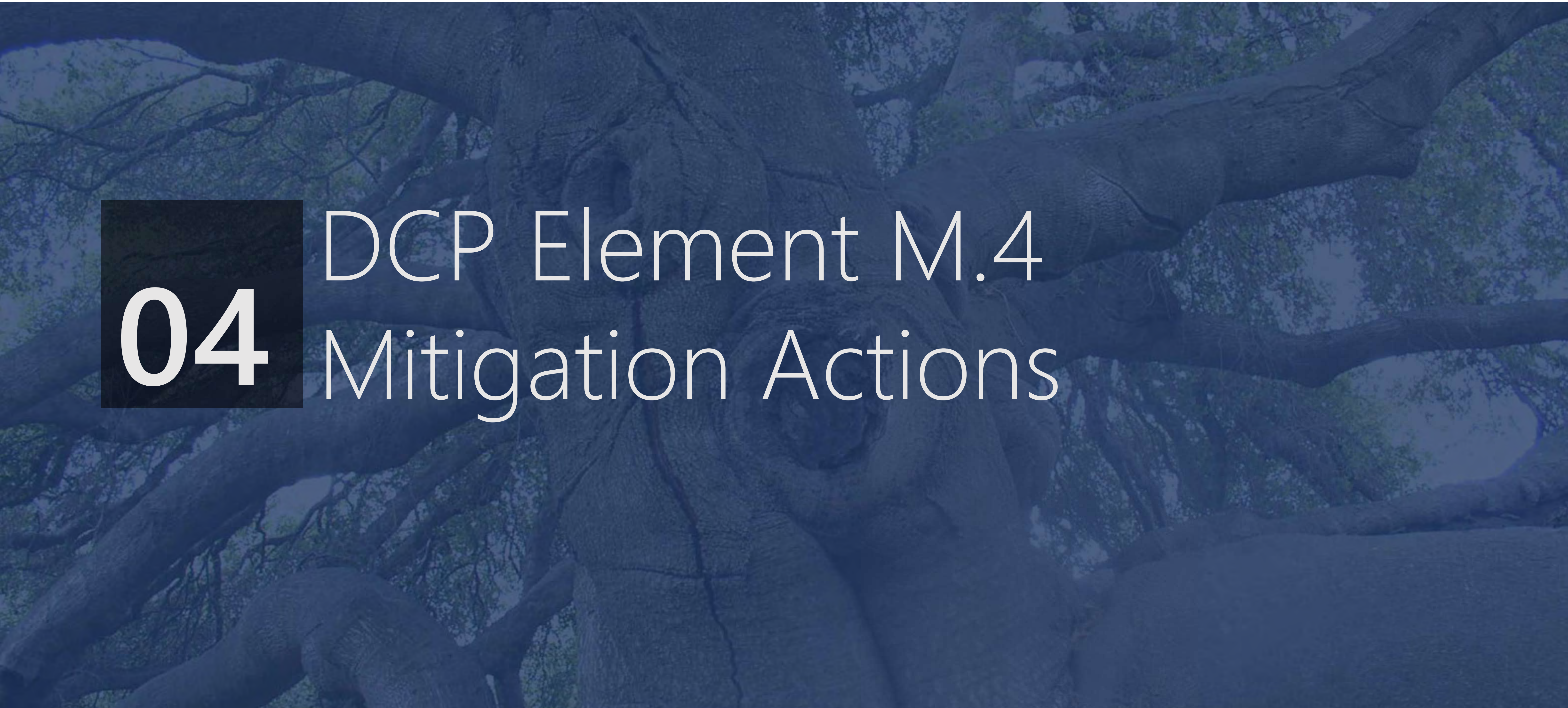


Projected Impacts on the Environment

1. Increase air-temperature and extended drought periods may contribute to large-scale plant mortality
2. Reduced recharge and runoff supporting Pechaa'anga Spring and Great Oak
3. Increase in extreme fire behavior risk through Pechanga watershed



Pechanga Resource	Drought Related Impact	Primary Cause(s)	Vulnerability
Water Supply	Declining water levels in bedrock, unconfined (Pauba Formation), and confined (Temecula Arkose) aquifer	Increased demand (irrigation) and subsequent production from Pechanga's four wells coupled with decreased recharge (reduced local precipitation and streamflow)	Water levels drop below one or all submersible pumps in Pechanga's production wells, reducing their capacity to produce groundwater.
			Declining water levels could tap into lower-quality groundwater deeper in the aquifers which exceeds water quality standards and treatment capabilities.
	Reduced availability of imported portable water	Multi-year/multi-decade regional drought coupled with reduced snowpack limiting SRP and CRA deliveries to Southern California	Could limit MWDSC's capacity to provide potable water to PWS, even under emergency situations.
	Reduced availability of imported recycled water	Water use restrictions in the Temecula Basin could limit RCWA ability to meet recycled water agreement under 2016 settlement	Could experience turf die off at the Journey at Pechanga and 80-Acre Project with reduced irrigation source.
	Loss of water storage and or delivery capabilities	Increased wildfire frequency and intensity	Pechanga's water tanks, pumps, and distributions lines located adjacent/within the dense chaparral forest are most susceptible to wildfire destruction.
Environmental & Cultural	Reduced streamflow and soil moisture alongside increasing ET demands	Local multi-year/multi-decade droughts with extreme air temperatures, followed by "wet" years where precipitation is distributed in more extreme (high-intensity) events thus reducing percolation into local soils	Reduction in water available for plant use resulting in increased plant stress, potential increase in tree mortality (including Great Oak).
	Increased wildfire frequency and intensity	Increased plant stress coupled with increased air temperatures	Loss of significant portions of the Pechanga Watershed, Reservation infrastructure, biological life, increased erosion and reduced water quality (streamflow).
Human Health	Sustained periods of extreme air temperatures and poor air quality	Projected increased air temperatures associated with climate change, as well as increased frequency of local/regional wildfires	Outside conditions may become unhealthy for residents and tourists for sustained periods (e.g., >100 days).
Economic	Unhealthy air quality and/or temperatures	Increased wildfire frequency and intensity and/or sustained periods of high air temperatures	Reduction in tourism to Pechanga.
	Increased irrigation and cooling demands	Increasing ET demands and air temperatures	Increased costs for maintaining irrigated turf/landscaping and providing water to cooling towers.



04 DCP Element M.4 Mitigation Actions

Proposed Mitigation Actions

- **Water Supply Resiliency**
- **Water Conservation**
- **Increase Storage and Delivery**
- **Public Health**
- **Cultural Resources**
- **Watershed Health**
- **Economy**

Water Supply Resiliency

MA #	Mitigation Action	Potential Benefits					
		Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
1	Conduct **pump test at Kelsey and/or Eagle III** wells to define Pauba Formation aquifer properties and transmissivity across Wolf Valley Fault	X	X				X
2	Conduct **pump test at GOR #2** well to define bedrock aquifer properties	X	X				X
3	**Ballpark Well Improvements** (rehabilitation, evaluate) - Serve as backup well	X					X
4	**Import MWDSC Water** during "wet" years to allow aquifer recovery/recharge	X	X	X		X	X
5	**Managed Aquifer Recharge** - Feasibility study evaluating use of injection well(s) in **Pauba Formation (Kelsey/Eagle III) or Eduardo (Temecula Arkose)**	X	X			X	X
6	**Managed Aquifer Recharge** - Conduct pilot study for a recharge basin along **Pechanga Creek in Wolf Valley**	X	X	X		X	X
7	**Managed Aquifer Recharge** - Feasibility study evaluating **upper-Pechanga Creek floodplain** connectivity to channel	X	X	X		X	X
8	**Increase Stormwater Recharge** - Incorporate stormwater infiltration tanks/recharge systems with future development and retrofit existing facilities with large impervious surfaces	X	X			X	
9	Develop **Groundwater Model** using aquifer properties from pump tests to estimate recharge from rainfall/runoff events.	X		X			X

Water Conservation

MA #	Mitigation Action	Potential Benefits: Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
10	Install **smart meters** tracking usage, temperature, pH, and with remote disconnect	X	X		X		X
11	Promote **xeriscaping**	X	X				
12	**Landscape Audits** for all customers		X				
13	**Reduce**/eliminate use of **potable water for irrigation**	X	X				X
14	**Sensor based irrigation** system for government/commercial landscaping	X	X				X
15	Local/residential stormwater capture for landscape irrigation (**Rainwater Harvesting** program)	X	X				
16	Expand use of r**ecycled water** (for ballpark, and 80-acre)	X	X				X
17	Implement **Drought Alert System/Portal** (inform community and provide water conservation tips)		X		X		
18	Promote/incentivize local & residential **plumbing updates**	X	X		X		X

Increase Storage and Delivery

MA #	Mitigation Action	Potential Benefits					
		Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
19	New **pump station for 80-acre** development and line bringing potable water to residential (gravity fed recycled water)	X			X		
20	**Increase above ground storage** (i.e., additional storage tank(s))	X	X		X		

Public Health

MA #	Mitigation Action	Potential Benefits					
		Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
21	Establish "**Cooling Center**" for residents				X		X
22	**Fire fighting system upgrade**s (upgrade to industry standards)		X	X	X	X	X

Cultural Resources

MA #	Mitigation Action	Potential Benefits: Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
23	Develop **Great Oak Adaptive Management Plan**			X		X	

Watershed Health

MA #	Mitigation Action	Potential Benefits: Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
24	Review/revise (as needed) current **Fuel Reduction Program & Wildfire Response Program**			X	X	X	

Economy

MA #	Mitigation Action	Potential Benefits: Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
25	**Reduce water demands** for Golf Course/Casino	X	X		X		X

Mitigation Actions – Pechanga Settlement Fund

1. **Pechanga Recycled Water Infrastructure Account** – Increased storage for recycled water

2. **Pechanga ESAA Delivery Capacity Account** – Supports interim and permanent transition to the Extension of Service Area Agreement (ESAA) Delivery Capacity established in the Pechanga Settlement Agreement (i.e., potable water provided by MWDSC and EMWD through RCWD)

3. **Pechanga Water Fund Account** – Supports delivery or use of water pursuant the Pechanga Settlement Agreement

4. **Pechanga Water Quality Account** – For groundwater desalination activities in Wolf Valley Subbasin

05 DCP Element M.5 Response Actions

Proposed Response Actions

Demand Reduction

Supply Augmentation

Operational Changes

Mandatory Restrictions

Demand Reduction

RA #	Response Action	Potential Benefits					
		Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
1	**Public Information Campaign** with action items for each household (i.e., monthly newsletters, fact-sheets, text messages)		X	X	X	X	
2	Limit **landscaping irrigation** to set times or days of the week		X				
3	Limit or eliminate water usage for **decorative water features**, or implement requirements for recirculating systems		X				
4	Require **swimming pool covers**		X				
5	Limit or eliminate water use for **construction** (unless using recycled water)		X				
6	Lodging businesses limit water use by providing **linen services** to only guests that request it		X				
7	Limit **restaurants** water use by only serving water to customers who request it		X				

Supply Augmentation

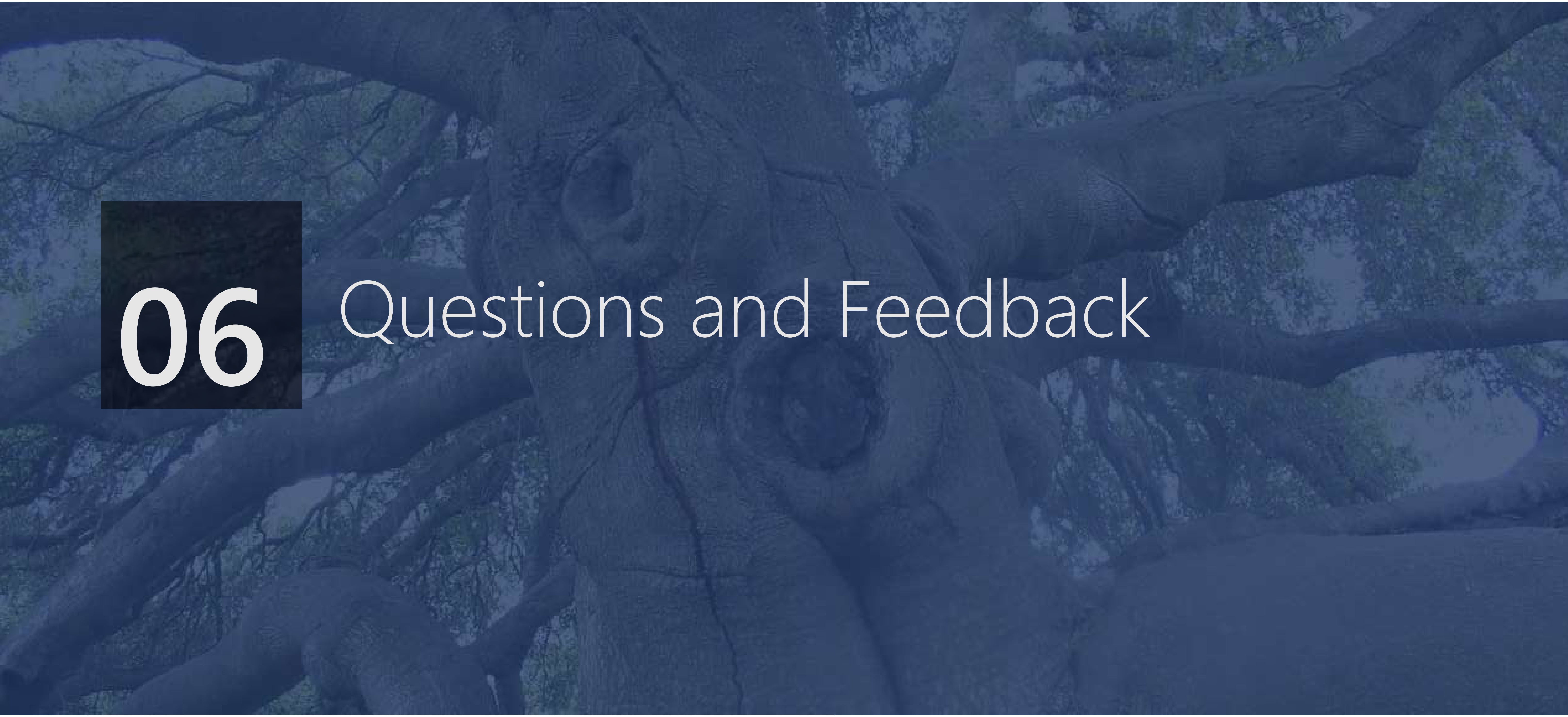
RA #	Response Action	Potential Benefits					
		Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
8	Utilize full potable water allocation from **2016 Water Settlement**	X	X				X
9	Utilize full recycled allocation from **2016 Water Settlement**	X	X				X
10	Utilize banked water in carryover account per **2016 Water Settlement**	X	X				X
11	**Purchases** outside of 2016 Water Settlement	X					

Operational Changes

RA #	Response Action	Potential Benefits					
		Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
12	Expand use of **recycled water** where feasible	X	X	X		X	
13	Decrease **line flushing** and other water-intensive maintenance activities		X				
14	Introduce **a rate structure** during drought conditions		X				X

Mandatory Restrictions

RA #	Response Action	Potential Benefits					
		Water Supply Resiliency	Water Conservation	Cultural Preservation	Human Health	Environmental	Economic
15	Install **shut-off nozzles** and **recirculation systems** for outdoor water features		X				
16	**Water Use Patrols**		X				X
17	Implement **financial penalties** for overuse		X				X


06
Questions and Feedback

Appendix C

Community Outreach Analysis

Pechanga Band of Indians

Community Outreach Analysis

2023

Pechanga Environmental Department
Bureau of Reclamation
Drought Contingency Plan Grant
FY 2020-2021

Executive Summary

This document is an analysis of the results of the Community Outreach administered during Fire Prevention Night for the BOR Drought Contingency Plan development process.

On October 12, 2023, the Pechanga Environmental Department hosted a booth during the Pechanga Fire Department's Fire Prevention Night. Tribal Members were asked to provide feedback on the proposed Mitigation and Response Actions, a major component of Pechanga's Drought Contingency Plan (DCP). Tribal Members were encouraged to give their opinion on the actions proposed in the DCP by adding a colored sticker to each input box. Red stickers were defined as "red-hot" issues that should definitely be pursued as part of the DCP. Yellow stickers were defined as mid-tier issues that could either be included or left out. Blue stickers were defined as "cool" issues that should not be included in the DCP. Each action was explained to Tribal Members, and any follow-up questions were answered on the spot. Giveaways purchased through Tribal funding were offered as incentives for participation.

Mitigation Actions

Mitigation actions proposed to the Membership at Fire Prevention Night included:

- Install smart meters
- Use only recycled water for landscaping
- Build a recharge basin
- Drought Alert System or Portal
- Import water during wet years
- Build injection wells

The majority of the Mitigation Actions received either positive or neutral response. The only Mitigation Action that was not favored by Members was “Build injection wells” with only 40% of votes with positive or neutral feedback.

Mitigation Actions (count)						
Option	Install smart meters	Use only recycled water for landscaping	Build a recharge basin	Drought Alert System or Portal	Import water during wet years	Build injection wells
Red	15	19	16	12	10	5
Yellow	7	9	7	4	8	4
Blue	0	0	0	0	0	14

Table One: Input (count) from community members on Mitigation Actions. Red is positive feedback. Yellow is neutral feedback. Blue is negative feedback.

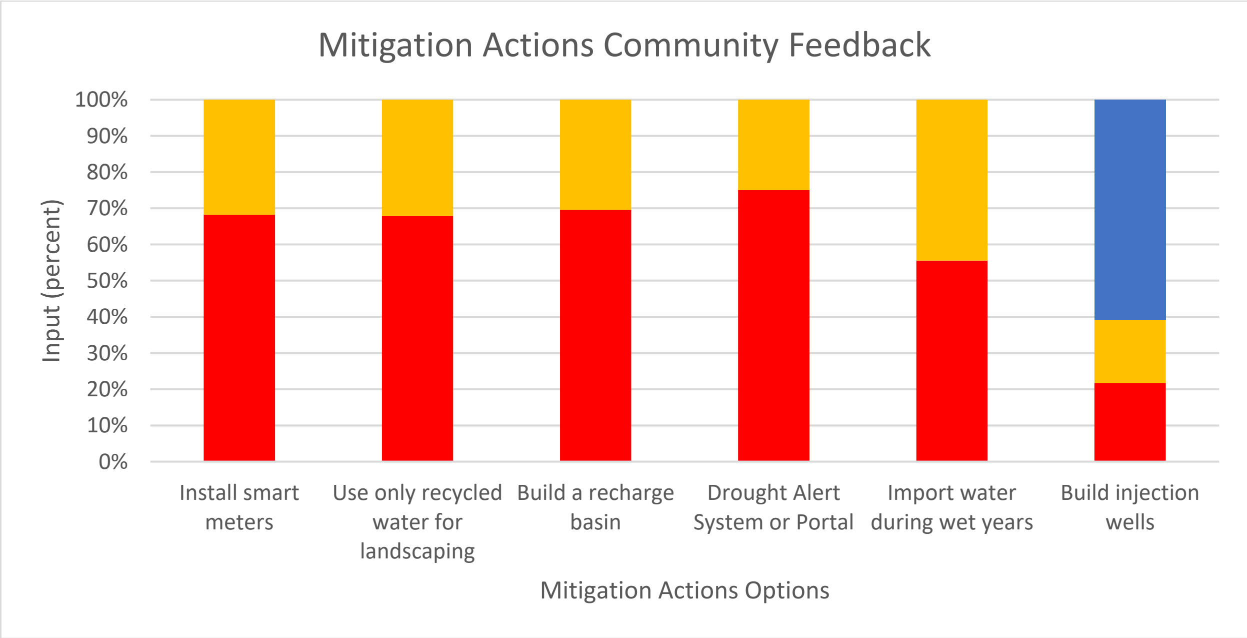


Figure One: Input (in percent) from community members on Mitigation Actions. Red is positive feedback. Yellow is neutral feedback. Blue is negative feedback.

Mitigation Actions

Mitigate: to reduce, to ease, to lessen

How do we reduce the effects of drought on the Pechanga Reservation?

Which of these ideas do you like? Add a sticker!

R-15 Y-7 B-0	**Install smart meters**
Drought Alert System or Portal	R-12 Y-4 B-0
R-19 Y-9 B-0	**Use only recycled water for landscaping**
Import water during wet years	R-10 Y-8 B 0
R-16 Y-7 B-0	**Build a recharge basin**
Build injection wells	R-5 Y-4 B-14

Response Actions

Response actions proposed to the Membership at Fire Prevention Night included:

- Limit landscaping irrigation to set times each week
- Water conservation at Pechanga Resort & Casino
- Limit or eliminate water usage for decorative water features (e.g. fountains)
- Expand use of recycled water where feasible

Response actions received more of a mix of feedback from Members. Limiting or eliminating water usage for decorative water features was most favored. Expanding the use of recycled water where feasible on the Reservation was also a popular selection. Limiting landscaping irrigation to set times each week was favored by just under 60% of respondents. Water conservation at PRC was only favored by 40% of respondents, likely because that phrase is ambiguous. Follow-up clarification with Members about what that consists of was helpful in changing the opinion of respondents (i.e. low-flow toilets, low-flow showerheads).

Response Actions (count)				
Option	Limit landscaping irrigation to set times each week	Water conservation at PRC	Limit or eliminate water usage for decorative water features	Expand use of recycled water where feasible
Red	15	9	15	17
Yellow	8	9	1	1
Blue	3	4	3	5

Table Two: Input (count) from community members on Response Actions. Red is positive feedback. Yellow is neutral feedback. Blue is negative feedback.

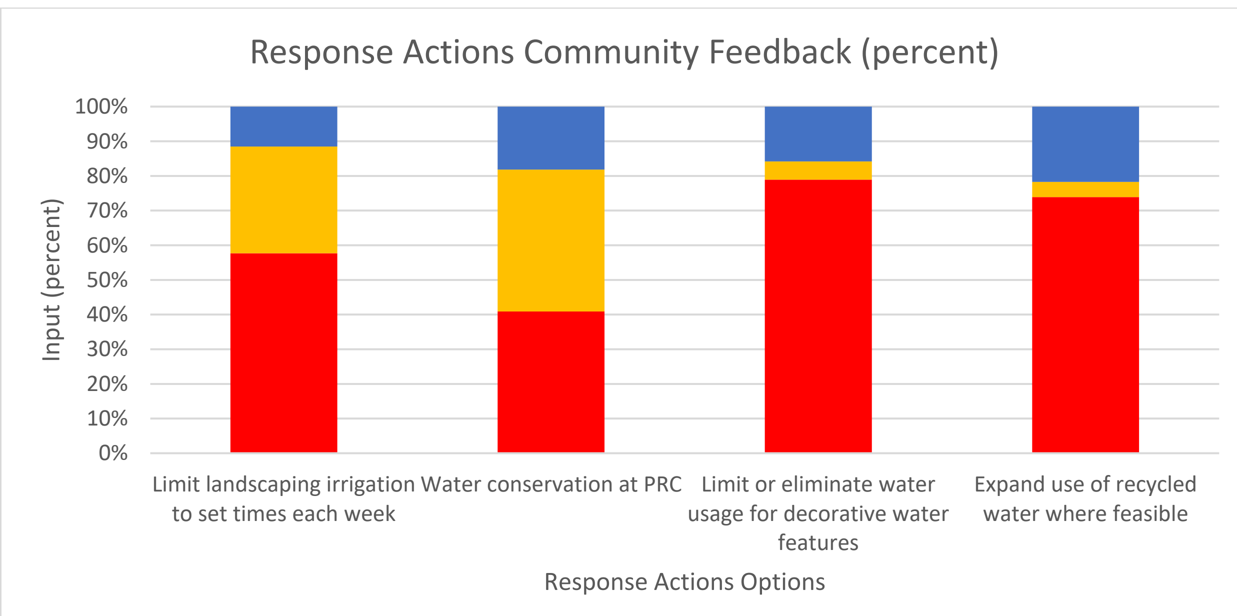


Figure Two: Input (in percent) from community members on Response Actions. Red is positive feedback. Yellow is neutral feedback. Blue is negative feedback.

Response Actions

Respond: reply to, counter

How do we fight back against drought? Which of these ideas do you like? Add a sticker!

Limit landscaping irrigation to set times each week	Water conservation at Pechanga Resort & Casino	Limit or eliminate water usage for decorative water features (e.g. fountains)	Expand use of recycled water where feasible
R-15 Y-8 B 3	R-9 Y-9 B-4	R-15 Y-1 B-3	R-17 Y-1 B-5

Verbal Feedback

Verbal feedback was also collected from Members during the outreach event. Various statements can be summarized as follows:

- I don’t want to recycle water.
- Most of these projects are super expensive and would be hard to implement. They would have to be very well engineered.
- I love all of these!
- I don’t want oversight on what I do at my own house. I don’t want the Water Department to have the power to limit what I do or regulate how I do it.
- I think below-ground storage is a good idea.
- Don’t water fountains already used recycled water? Do they use drinking water?
- “No!” in response to limiting or eliminating water used in decorative water features

Appendix D
Task Force Workshop 2 (Elements M.6 and M.7)

Pechanga Band of Luiseño Indians

2024 Drought Contingency Plan – Task Force Workshop

Review of DCP Elements M.6 & M.7

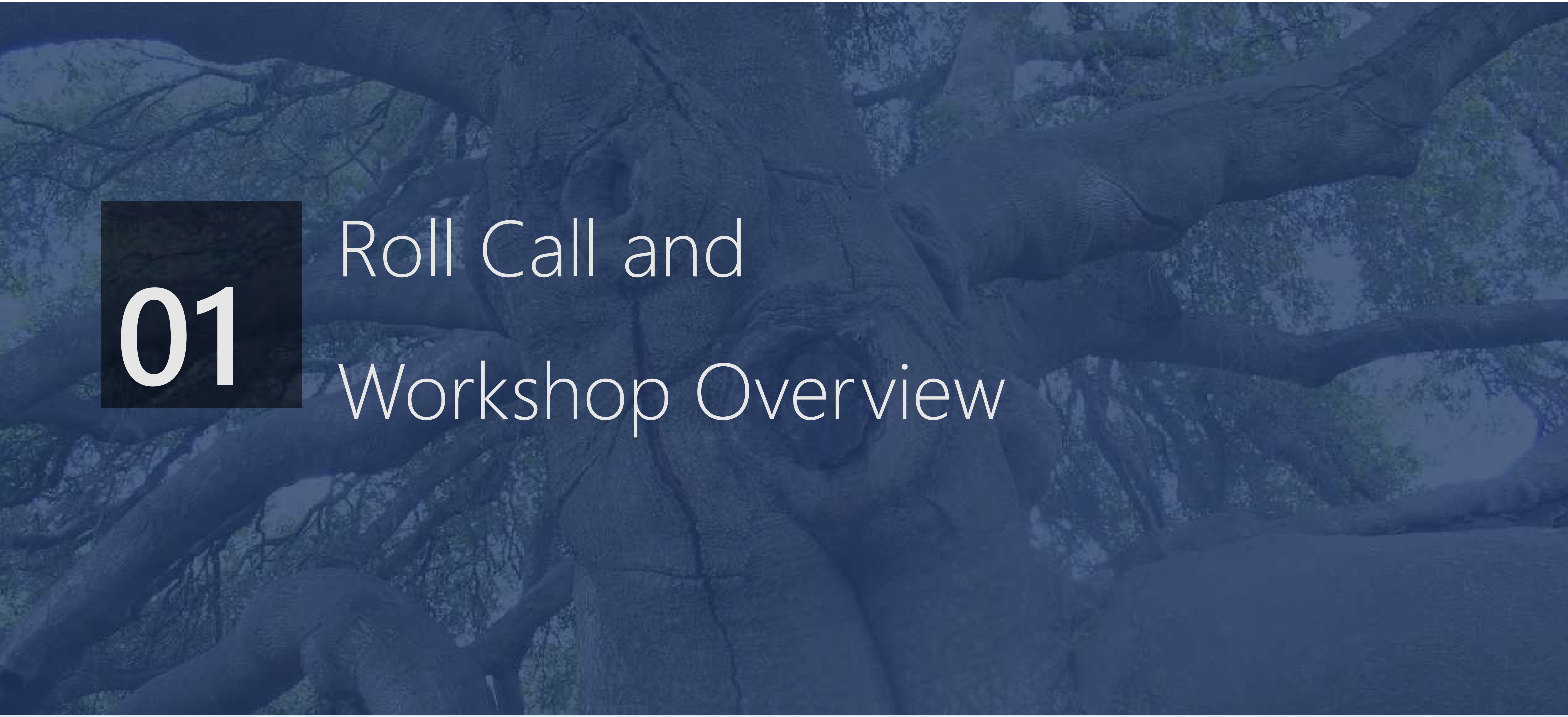
January 09, 2024

Pechanga DCP – Task Force Workshop 01/2024

01 Roll Call and Workshop Overview

02 DCP Elements M.6 & M.7 (Operational and Administrative Framework)

03 Task Force Questions and Feedback



01 Roll Call and Workshop Overview

Pechanga DCP Team

Agency	Name	Role	Title
U.S. Bureau of Reclamation	Leslie Cleveland	WaterSMART Grant Manager	Water Resource Manager
Pechanga Tribal Government	Eagle Jones	Project Lead and Manager	Director of Water Operations
	Eddie Hernandez	Project Co-Lead	Interim Director of Environmental Department
	Lynette Stewart	Project Support	Administrative Assistant
	Tiffany Wolfe	Project Support	Environmental Specialist
	Megan Poffinbarger	Project Support	Environmental Technician
Dudek	Jonathan Martin	Consultant Team Manager	Senior Hydrologist
	Trevor Jones	Lead Hydrogeologist	Senior Hydrogeologist
	Sharllyn Pimentel	Project Hydrologist	Hydrologist
	Greg Ripperger	Lead Engineer	Project Manager

Pechanga DCP Task Force

Agency	Name	Title
Indian Health Services	Josh Sims (Michael Cadena)	Tribal Utility Consultant
Rural Community Assistance Corporation	Angela Hengel	Regional Manger
Rancho California Water District	Jordan Farrell	Water Production Manager
Western Municipal Water District	Ryan Shaw	Director of Water Resources
Pechanga Development Corporation	Andrew Masiel Sr.	Committee Member
Pechanga Golf Course	Mario Ramirez	Golf Course Superintendent
Pechanga Casino	Gary Senz	Director of Facilities
Pechanga Public Works	John Magee	Director of Public Works

Updated Schedule for DCP Phase 2 Elements

Milestone/Task/ Activity	Original Start Date	Original Completion Date	Revised Start Date	Revised Completion Date	Status
M.2 – Drought Monitoring Plan	June 2022	July 2022	March 2023	September 2023	Incorporating Task Force and Community Feedback from September and October 2023 workshops.
M.3 – Vulnerability Assessment	June 2022	September 2022	March 2023	October 2023	
M.4 – Mitigation Actions	January 2022	February 2022	May 2023	January 2024	
M.5 – Response Actions	March 2022	April 2022	May 2023	January 2024	
M.6-M.7 – Operation and Administrative Framework	April 2022	N/A	January 2024	March 2024	Task Force Workshop January 2024
Prepare Drought Contingency Plan	May 2022	June 2022	January 2024	March 2024	Draft in development
Prepare Final Drought Contingency Plan	September 2022	N/A	March 2024	May 2024	Not started

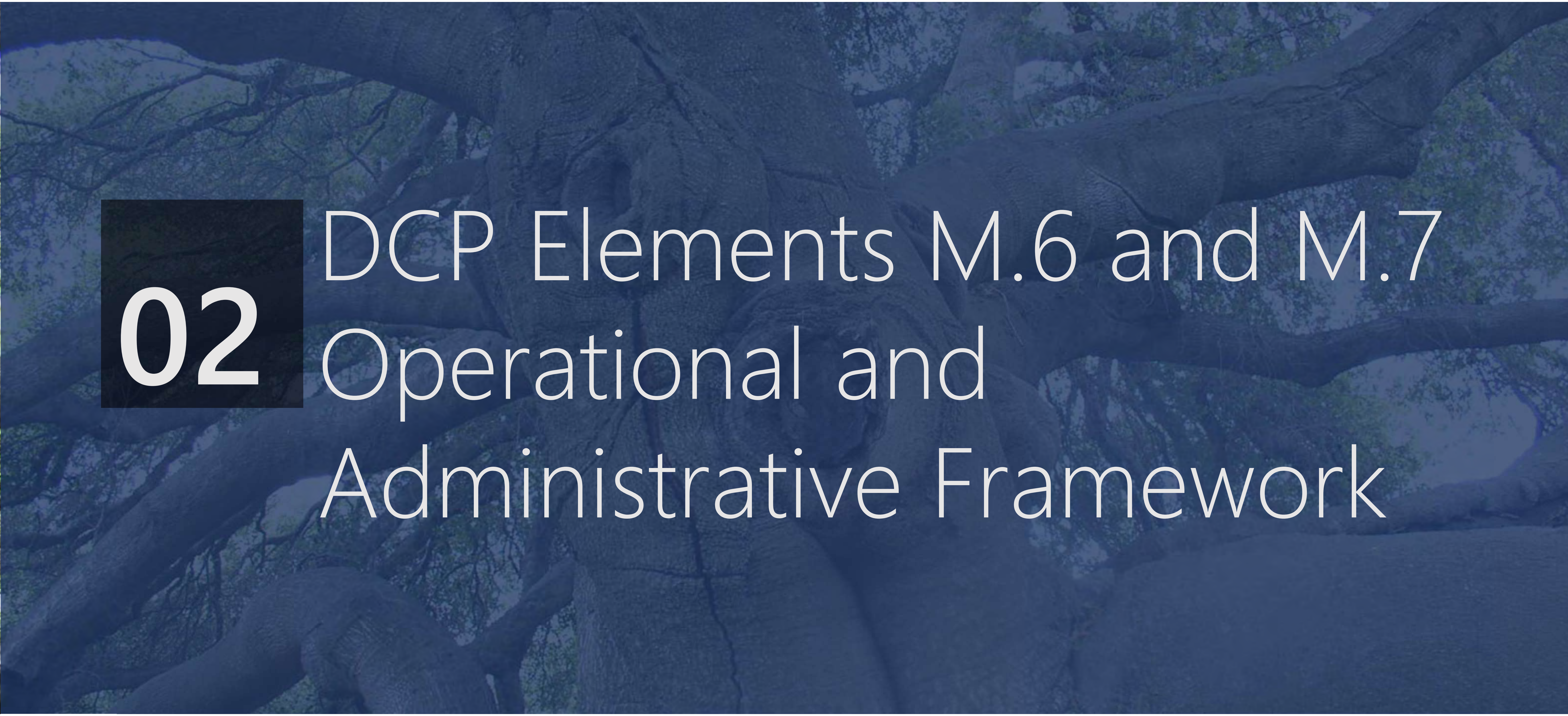
Workshop Focus

Element M.6 – Operational and Administrative Framework (1)

- Review proposed Responsibilities for the Operational and Administrative Framework
- Assign staff that will oversee the proposed DCP Responsibilities

Element M.7 – Operational and Administrative Framework (2)

- Discuss proposed process and schedule for monitoring, evaluating, and updating the DCP.



02 DCP Elements M.6 and M.7 Operational and Administrative Framework

Operational and Administrative Framework

DCP Task	Responsibilities
Drought Monitoring	Evaluate Drought Stage Criteria Metrics
	Evaluate projected water supply forecasts and climate scenarios
	Regional Planning – Coordinate response with RCWD
	Determination of Drought Stage
	Community outreach & communication
Mitigation Actions	Evaluate/Prioritize of mitigation actions
	Review ongoing funding opportunities
	Mitigation Action Planning
	Implementation
	Community outreach
Response Actions	Establish Response Actions commensurate with current Drought Stage
	Response Action Planning
	Approval/Implementation
	Community outreach and communication
Plan Update	DCP Evaluation
	DCP update

DCP Task	Responsibilities	Staff
Drought Monitoring (M.6)	Evaluate Drought Stage Criteria Metrics (monthly): • USDM • Pechanga Production Wells • USGS Streamflow/Monitoring Wells • RCWD WSCP Stages	PWS Director and Administrative Assistant RCWD Contact
	Evaluate projected water supply forecasts for local (Wolf Valley Subbasin) and regional (SWP & CRA) sources.	PWS Director and Administrative Assistant RCWD Contact
	Evaluate suitability of upcoming tools for use in drought forecasting (beyond 3-weeks)	PWS Director and Administrative Assistant
	Determination of Drought Stage	PWS Director and Pechanga Env Dept Director
	Community outreach	

POTENTIAL STAFF

- PWS – Director of Water Operations
- PWS – Administrative Assistant
- PWS – Operations Manager
- Pechanga Env Dept – Director
- Pechanga Env Dept – Environmental Specialist
- Pechanga Env Dept – Environmental Technician
- Pechanga Drought Task Force
- Other (e.g., Pechanga Water Board, stakeholders, consultant)

Task 1. Drought Monitoring

DCP Task	Responsibilities	Staff
Mitigation Actions (M.6)	Evaluate/Prioritize of mitigation actions	PWS and Environmental Dept
	Review ongoing funding opportunities	
	Mitigation action planning (schedule, staff, funding, etc)	
	Implementation	
	Community Outreach	

POTENTIAL STAFF

- PWS – Director of Water Operations
- PWS – Administrative Assistant
- PWS – Operations Manager
- Pechanga Env Dept – Director
- Pechanga Env Dept – Environmental Specialist
- Pechanga Env Dept – Environmental Technician
- Pechanga Drought Task Force
- Other (e.g., Pechanga Water Board, stakeholders, consultant)

Task 2. Mitigation Actions

DCP Task	Responsibilities	Staff
Response Actions (M.6)	Establish Response Actions commensurate with current Drought Stage	PWS and Environmental Dept & Pechanga Water Board and Tribal Council Liaisons
	Response Action Planning (schedule, staff, funding, etc)	
	Approval/Implementation (who will have the final say as to when these actions will be enforced)	
	Community outreach and communication	PWS Director and Pechanga Env Dept Director

POTENTIAL STAFF

- PWS – Director of Water Operations
- PWS – Administrative Assistant
- PWS – Operations Manager
- Pechanga Env Dept – Director
- Pechanga Env Dept – Environmental Specialist
- Pechanga Env Dept – Environmental Technician
- Pechanga Drought Task Force
- Other (e.g., Pechanga Water Board, stakeholders, consultant)

Task 3. Response Actions

DCP Task	Responsibilities	Staff
Plan Update (M.7)	DCP Evaluation	PWS, Env, RCWD, Water Board
	Plan Update (as needed)	PWS/Env

POTENTIAL STAFF

- PWS – Director of Water Operations
- PWS – Administrative Assistant
- PWS – Operations Manager
- Pechanga Env Dept – Director
- Pechanga Env Dept – Environmental Specialist
- Pechanga Env Dept – Environmental Technician
- Pechanga Drought Task Force
- Other (e.g., Pechanga Water Board, stakeholders, consultant)

DCP EVALUATION SCHEDULE

Option 1. Schedule (e.g., once every XX-years)
Option 2. Event-based
Option 3. Combined schedule/event-based
See if there are concurrent programs/plans that get routine updates to fold this into

Task 4. Plan Updates

Pechanga DCP Ops/Admin Organization

PECHANGA DCP MANAGEMENT STRUCTURE

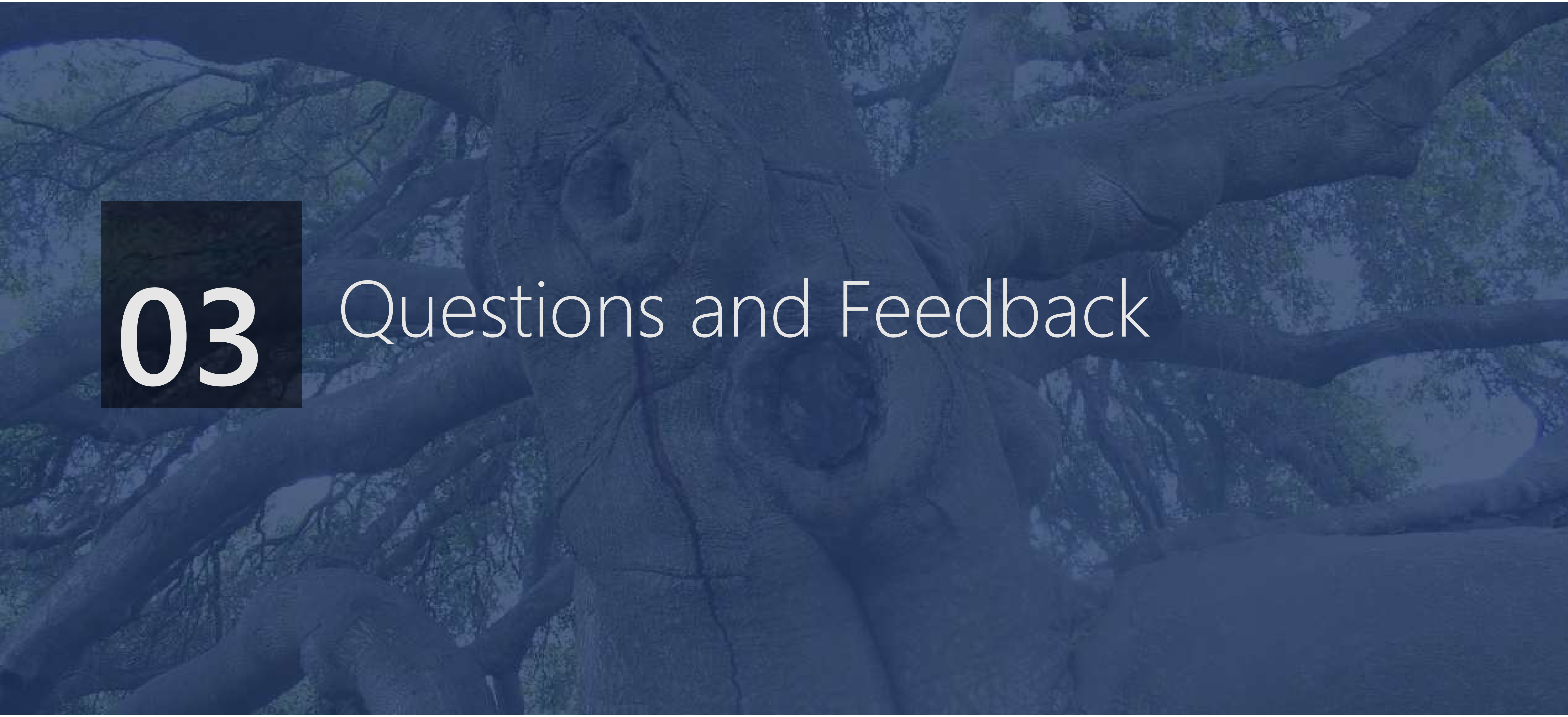
DCP Manager
PWS Director of Water Operations

Deputy DCP Manager
Pechanga Environmental Department Director

DCP Director
Pechanga Drought Task Force

DCP IMPLEMENTATION TASK MANAGEMENT STRUCTURE

TASK 1 Drought Monitoring	TASK 2 Mitigation Actions	TASK 3 Response Actions	TASK 4 Plan Update
Task Manager ***Drought Stage Determination*** Staff	**Task Manager** ***Mitigation Action Designation/Planning*** Staff	**Task Manager** ***Response Action Designation/Planning*** Staff	**Task Manager** ***DCP Evaluation*** Staff
Data Management and Evaluation Staff	**Mitigation Action Implementation** Staff	**Response Action Implementation** Staff	**DCP Update Team** Staff
Communications Staff	**Communications** Staff	**Communications** Staff	**Communications** Staff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Questions and Feedback