DECEMBER 2021

EXECUTIVE SUMMARY

# UKIAH VALLEY BASIN GROUNDWATER SUSTAINABILITY AGENCY

# Ukiah Valley Groundwater Sustainability Plan

FINAL REPORT

# UKIAH VALLEY BASIN GROUNDWATER SUSTAINABILITY AGENCY
# UKIAH VALLEY BASIN GROUNDWATER SUSTAINABILITY PLAN

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**Ukiah Valley Groundwater Basin**
**Groundwater Sustainability Plan**
Ukiah Valley Basin Groundwater Sustainability Agency

December 10, 2021

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# Executive Summary

# Abstract

The Sustainable Groundwater Management Act (SGMA), passed by the California legislature in 2014, requires local entities to jointly assess groundwater conditions in their local areas and to develop a Groundwater Sustainability Plan (GSP) by a specified deadline to ensure that sustainable conditions are achieved within 20 years of GSP adoption. An effective and efficient groundwater management plan is critical for the local economy and the health and welfare of the people, the environment, and all other beneficial uses and users of groundwater in a local area.

The Ukiah Valley Basin (Basin) is a medium-priority groundwater basin located in Mendocino County. The sole Groundwater Sustainability Agency for the Basin is the Ukiah Valley Groundwater Sustainability Agency (UVBGSA or GSA). UVBGSA consists of the following local agencies: the County of Mendocino, the City of Ukiah, the Upper Russian River Water Agency, and the Russian River Flood Control and Water Conservation and Improvement District. The GSA applied for and was awarded Proposition 1 and Proposition 68 grant funds to develop the GSP and meet the SGMA-mandated schedule for submitting a GSA-approved GSP to the California Department of Water Resources (DWR) by January 31, 2022. UVBGSA will be funded through member agency contributions during the first 5-year implementation period until a fee structure is implemented to support and fund GSA activities. Additional funding opportunities will continue to be explored, including grants. In late-2022, DWR will open round 2 solicitations under the SGMA Grant Program, which will provide approximately $204 million to high and medium priority subbasins to implement the GSP and its projects and management actions.

A variety of local interests are represented by the GSA and served on the technical advisory committee (TAC), including municipal-residential water users, agricultural water users, public water systems, local land use planning agencies, environmental users, surface water users, tribal governments, disadvantaged communities, groundwater monitoring and reporting entities, holders of overlying groundwater rights, adjacent Basins, industrial users, commercial users, remediation pumpers, natural ecosystems, and the general public. Many of these local entities have a long history with groundwater and surface water management in the Basin and are well equipped to perform SGMA-required planning functions.

The GSA, TAC members, and the public have undertaken a thorough and timely review of past, current, and projected future water resources needs and groundwater conditions to meet SGMA requirements for GSP development. Throughout the development of the GSP, regular communication and engagement activities were conducted to inform and receive input from local stakeholders and the public. The GSP includes a comprehensive groundwater basin description, which was used to develop a regional integrated hydrological model that quantifies current water budgets and projects future conditions of the Basin. The GSP also includes an assessment of the impacts of predicted future groundwater levels on beneficial users, including groundwater-dependent ecosystems, shallow wells, and interconnected surface water using the best available data and science available. Importantly, these assessments are used to develop measurable sustainable management criteria that avoid significant and unreasonable impacts to these beneficial users, and that can be monitored and adjusted throughout plan implementation.

The key finding of the GSP, based on a thorough analysis of the best available information, is that the Basin will be sustainable over the next twenty years if planned projects and management actions (PMAs) are implemented as needed with respect to climate change and changes in the water system.

These PMAs will help maintain groundwater levels and storage volumes and protect ecosystems, interconnected surface water, and shallow wells. Potential climate change impacts are not fully understood at this stage due to data gaps and the need for additional modeling and data collection. The GSP will implement a more comprehensive data collection that improves modeling capabilities and can provide a better assessment of climate change impacts in the future. The proposed PMAs will promote adaptive management practices and long-term resiliency to varying climatic conditions, such as more frequent, longer-lasting, and more intense droughts and less frequent and wetter winters. As described in Chapter 2, the sustainable yield for the entire Basin is estimated to be at least 6,500 acre-feet, based on historical, average groundwater pumping. The sustainable yield of the Basin is defined based on avoidance of undesirable results. Because the Basin is not overdrafted and the historical pumping average may not represent the actual sustainability yield of the Basin.

A groundwater monitoring network comprised of selected wells will be used to track groundwater levels and groundwater quality. Sustainable management criteria set at representative monitoring wells in the network will be implemented to gage these conditions over time and ensure that groundwater levels and quality remain within a range that avoids significant and unreasonable impacts to beneficial uses and users of groundwater. Streamflow measurements are added to the monitoring network to measure surface water depletion due to groundwater pumping in combination with groundwater level measurements and integrated hydrological modeling simulations. Monitoring and data collection efforts will continue through the first five years of GSP implementation to further identify and prioritize project and management actions.

Once approved by the GSA, the activities identified throughout the GSP development process will be implemented, including:

- Ongoing monitoring and annual reporting on conditions in the Basin;
- Ongoing public engagement and outreach;
- Coordination within the watershed and with neighboring basins and water management entities;
- Development and implementation of a shallow well protection and monitoring program;
- Coordination with land use agencies and water supply agencies to promote consistency with the GSP;
- Coordination with regional agencies in the development of updated climate change projections;
- Implementing PMAs as deemed needed by the GSA to maintain and promote sustainability of the Basin; and,
- Preparation of five-year updates to the GSP starting in 2027.

# ES-1. Introduction (Chapter 1)

## ES-1.1. Background (Section 1.1)

*Chapter 1 describes the Sustainable Groundwater Management Act and the purpose of the Groundwater Sustainability Plan. Chapter 1 also introduces the management structure of the agencies developing and implementing the Groundwater Sustainability Plan (GSP).*

The 2014 Sustainable Groundwater Management Act (SGMA) was established to provide local and regional agencies the authority to sustainably manage groundwater resources through the development and implementation of Groundwater Sustainability Plans for high and medium priority subbasins (e.g., Ukiah Valley). In accordance with SGMA, this Groundwater Sustainability Plan (GSP or Plan) was developed and will be implemented by the Ukiah Valley Groundwater Sustainability Agency (UVBGSA or GSA) located within Mendocino County. The GSA manages the Ukiah Valley Groundwater Basin (Basin) and consists of the County of Mendocino (County), the City of Ukiah (City), the Upper Russian River Water Agency (URRWA), and the Mendocino County Russian River Flood Control and Water Conservation Improvement District (RRFC).

The California Department of Water Resources (DWR) and the State Water Resources Control Board (State Board) provide primary oversight for implementation of SGMA. DWR adopted regulations that specify the components and evaluation criteria for alternatives to GSPs, and coordination agreements to implement such plans. To satisfy the requirements of SGMA, local agencies must do the following:

Locally controlled and governed Groundwater Sustainability Agencies (GSAs) must be formed for all high- and medium-priority groundwater basins in California.

- GSAs must develop and implement GSPs or Alternatives to GSPs that define a roadmap for how groundwater basins will reach long-term sustainability.
- The GSPs must consider six sustainability indicators defined as: groundwater level decline, groundwater storage reduction, seawater intrusion, water quality degradation, land subsidence, and surface-water depletion.
- GSAs must submit annual reports to DWR each April 1 following adoption of a GSP.
- Groundwater basins should reach sustainability within 20 years of implementing their GSPs.

This GSP was prepared to meet the regulatory requirements established by DWR, as shown in the completed GSP Elements Guide, provided in **Appendix X**, which is organized according to the California Code of Regulation Sections of the GSP Emergency Regulations.

## ES-1.2. Purpose of the Groundwater Sustainability Plan

The GSP outlines a 20-year plan to direct sustainable groundwater management activities that consider the needs of all users in the Basin and ensure a viable groundwater resource for beneficial use by agricultural, residential, industrial, municipal, and ecological users. Furthermore, current drought conditions suggest that the GSP can provide solutions and support the development of drought resiliency measures for future emergency conditions. The initial GSP is a starting point towards the achievement of the sustainability goal for the Basin. Although available information and monitoring data have been evaluated throughout the GSP development to set sustainable management criteria and define projects and management actions, there are gaps in knowledge and additional monitoring requirements. The information gained in the first five years of plan implementation and through the planned monitoring network expansions will be used to further refine the strategy outlined in this draft of the GSP. The GSA will work towards implementing the GSP to meet all provisions of SGMA and will utilize available local resources and resources from State and Federal agencies to achieve this. It is anticipated that coordination with other agencies that conduct monitoring and/or management activities will occur throughout GSP implementation to fund and conduct this important work. Additional funding required may be achieved through fees, or other means, to support progress towards compliance with SGMA.

# ES-2. Plan Area and Basin Setting (Chapter 2)

*Chapter 2 provides an overview of the Basin. This includes descriptions of plan area, relevant agencies and programs, groundwater conditions, water quality, interconnected surface waters, and groundwater-dependent ecosystems. These details inform the hydrogeologic conceptual model and water budget developed for the Basin which will be used to frame the discussion for sustainable management criteria (Chapter 3) and projects and management actions (Chapter 4).*

## ES-2.1. Description of Plan Area (Section 2.1)

### ES-2.1.1. Summary of Jurisdictional Areas and Other Features (Section 2.1.1)

The Basin is a medium priority Basin located in Northern California that encompasses a surface area of 37,500 acres (59 square miles (mi)). The groundwater Basin is located in Mendocino County and underlies the Ukiah Valley and the Redwood Valley. The Russian River flows through the entire length of the Basin and is joined by several smaller tributaries. Lake Mendocino borders the eastern side of the Basin and provides managed releases to the East Fork of the Russian River through the operation of the Coyote Valley Dam. The east and west forks of the Russian River merge north of the City of Ukiah and flow southward towards the Basin drainage and Hopland. The Basin is bounded by the Mendocino Range of the Coastal Ranges and is bordered by the Sanel Valley Groundwater Basin (1-053) to the south.

Most land within the Basin is privately owned except for small California Tribal Reservations and Rancheria areas, land owned by the State of California, and land in the proximity of Lake Mendocino that is owned by the federal government. Four small portions of the Basin are designated federal tribal lands and are exempt from SGMA requirements. These tribal lands are owned by the Guidiville Rancheria Tribe, Pinoleville Pomo Nation, Coyote Valley Tribe, and Redwood Valley Little River Band of Pomo Indians. Communities within the Basin are designated as either Disadvantaged Communities (DACs) or Severely Disadvantaged Communities (SDACs) based on annual median income. The population of the Basin (including the Ukiah Census County Division (CCD), the Calpella Census Designated Place (CDP), and the Redwood Valley CDP) was approximately 29,671 in the 2010 census.

Current land use within the Basin is divided into three major categories: agricultural, urban, and native vegetation, which includes forests and riparian vegetation. According to the 2010 Land Use Survey (DWR, 2019), the three largest land use percentages are listed as Native and Riparian Vegetation (51.3%), Vineyards (20.7%), and Urban (19.14%). Smaller agricultural and farm uses include fruit and nut crops, grain and hay crops, as well as pasture.

Public information regarding well uses and location in the Basin is limited to data from the DWR Online System for Well Completion Reports (OSWCR) (DWR 2019c). The public data gives an estimate of the quantity of each major well use category as follows: domestic (n = 1058), agricultural (n = 117), and public/municipal (n = 70). Because OSWCR represents an index of Well Completion Report (WCR) records dating back many decades, this dataset may include abandoned wells, destroyed wells, or wells with quality control issues such as inaccurate, missing, or duplicate records, but is nevertheless a valuable resource for planning efforts. For the spatial distribution of wells within the Basin, the greatest density of wells resides in the valley floor, specifically near Ukiah City, Calpella, and Redwood Valley.

#### ES-2.1.2. Water Resources Monitoring and Management Programs (Section 2.1.2)

**Section 2.1.2** documents monitoring and management of surface water and groundwater resources in the Basin and their relation to GSP implementation. These include federal, state, and local agencies and their associated activities in the Basin.

#### ES-2.1.3. Land Use Elements or Topic Categories of Applicable General Plans (Section 2.1.3)

Applicable land use and community plans in the Basin are outlined in **Section 2.1.3** including the Ukiah Valley Area Plan and the County of Mendocino General Plan.

#### ES-2.1.4. Additional GSP Elements (Section 2.1.4)

Well policies, groundwater use regulations and the role of land use planning agencies and federal regulatory agencies in GSP implementation are outlined in **Section 2.1.4**.

#### ES-2.1.5. Notice and Communication (Section 2.1.5)

Development of a Communication Plan (CommPlan) to promote the efficient and effective coordination of both internal and external communications, as well as stakeholder engagement in the UVBGSA GSP creation efforts is outlined in **Section 2.1.5**.

### ES-2.2. Basin Setting (Section 2.2)

*Section 2.2 includes descriptions of geologic formations and structures, aquifers, and properties of geology related to groundwater, among other related characteristics of the Basin.*

#### ES-2.2.1. Hydrogeologic Conceptual Model (Section 2.2.1)

The purpose of the HCM is to meet the regulatory requirements mandated by SGMA and to establish a framework hydrogeologic model with which to guide development of the GSP and management of the Basin. This includes future modeling efforts and monitoring programs.

*Basin Setting (2.2.1.1)*

The Basin underlies the Redwood Valley and Ukiah Valley, along with their tributary valleys, in Mendocino County, California. It is approximately 22 miles long and 5 miles wide at its widest point with a total area of 37,500 acres. The ground surface elevation of the Basin ranges from approximately 500 feet mean sea level (msl) in the south to 1,000 feet msl in the north (DWR, 2004). The Basin is bounded on all sides by the Coastal Ranges, primarily the Mendocino Range (Farrar, 1986). Highway 101 runs the entire length of the Basin and connects with Highway 20, which enters the Basin from the east, at Calpella (DWR, 2004). City of Ukiah is the only incorporated city within the Basin. The Russian River, and its tributaries, along with Lake Mendocino are the major surface water features within the Basin. The Russian River runs through the entire length of the Basin with many smaller tributaries contained within the Basin. The east fork of the river flows into Lake Mendocino and enters the Basin just south of the lake. The west fork originates to the north towards Redwood Valley and each fork merges into the main stem below Coyote Valley Dam. Annual precipitation in the Basin ranges from 45 inches in the north to 35 inches in the south (DWR, 2004).

*Soils 2.2.1.2*

Soils within the Ukiah Valley Basin were analyzed based on two categories: hydrologic soil groups and taxonomic soil orders. The Natural Resources Conservation Service (NRCS) Hydrologic Soils Group classifications (Soil Survey Staff, 2014) provide an indication of soil infiltration potential and ability to transmit water under saturated conditions. Hydrologic soil groups are developed based on saturated hydraulic conductivities of shallow, surficial soils. Each group has an associated range with higher conductivities (greater infiltration) in Group A and lower conductivities (lower infiltration) in Group D. High infiltration soils, Group A, are located primarily in small bands along the rivers. Moderate infiltration soils, Group B, occupy the majority of the Basin and are primarily in the central portion of the Basin. Slow infiltration soils, Group C and Group D, occupy the northern and southern portions as well as the eastern edge of the Basin.

Taxonomic orders were identified using the Soil Survey Geographic Database from the NRCS. A total of 5 taxonomic orders are present within the Basin. These soil orders include Alfisol, Entisol, Inceptisol, Mollisol, and Vertisol. The most prominent soils groups within the Basin are Mollisols and Inceptisols. Mollisol is an order formed primarily through the accumulation of calcium-rich organic matter typically containing swelling type clays and a granular/crumb structure. Mollisols are found throughout the Basin and primarily along the low-lying middle of the Basin where vegetation and clays are present. Inceptisols are weakly developed mineral soils that contain a soil horizon but have very little soil development. Inceptisols are found primarily in the foothills or highlands. Younger Entisols, which are weakly developed mineral soils without a soil horizon, are found along the river channels and likely associated with young alluvial deposits. Alfisols, which are strongly weathered mineral soils, and Vertisols, which are identified by shrink swell clays, are found in small patches scattered throughout the Basin.

*Regional Geology 2.2.1.3*

There are four significant geologic formations identified within the Basin: Quaternary (Recent) Alluvium, Pleistocene Terrace Deposits, Pliocene/Pleistocene Continental Basin Deposits, and Franciscan Formation. The Franciscan Formation is not considered to be part of the Basin from the perspective of SGMA. The Franciscan Formation consists of rocks from the Jurassic to Cretaceous age and is considered the basement and bedrock for the Basin along with comprising the majority of the surrounding Mendocino Range.

Continental Basin Deposits are Pliocene and Pleistocene in age and underlie the Quaternary Alluvium and Terrace Deposits. They are comprised of poorly consolidated and poorly sorted clayey and sandy gravel, clayey sand, and sandy clay (Farrar, 1986). The vertical distribution of the Continental Basin Deposit materials includes thick clay layers that lie over and below confined aquifers consisting of sands and gravels. The high clay content in the formation results in low permeability and low producing wells (MCWA, 2010).

Terrace Deposits are Pleistocene in age and composed of partially to loosely cemented beds of gravel, sand, silt, and clay. They are similar in composition to Continental Basin Deposits but with less silt and clay. Terrace Deposits are discontinuous and long, narrow, elevated, gently inclined surfaces that are laterally interfingered with neighboring beds. Aggradation of eroded material, most likely from the surrounding Franciscan formation, formed the Terrace Deposits (Farrar, 1986).

Lastly, Quaternary Alluvium is the primary water producing geologic unit in the Basin. It consists of unconsolidated gravel, sand, silt, and minor amounts of clay that were deposited in thin bands along river channels and wider flood plains of the Russian River and its tributaries, along with alluvial fans and as colluvium (Cardwell, 1965).

*Principal Aquifers and Aquitards 2.2.1.4*

There are two principal aquifers which make up the Basin. Principal Aquifer I – Quaternary Alluvium is the primary production aquifer for the Basin. It is constrained to small, narrow bands along the Russian River and its tributaries. Its extent and depth increases moving south in the Basin. Estimated storage capacity of Aquifer I varies between 60,000 to 120,000-acre feet (74 to 148 million cubic meters) using specific yields between 6 to 20 percent (DWR, 2016; Farrar, 1986). Due to its proximity to the river systems and high permeability, the Quaternary Alluvium is considered hydraulically connected with adjacent rivers (Cardwell, 1965).

Principal Aquifer II – Terrace Deposits and Continental Basin Deposits is the second main aquifer. The Principal Aquifer II comprises the largest portion of the Basin and is a low-yield aquifer that contains both the thin and discontinuous Terrace deposits and the gravelly/sandy clays and thick clays of the Continental Basin deposits. Both geologic formations have low hydraulic conductivities, and the large clay content can act to locally confine the aquifer, restricting flow between aquifers. At depth, Principal Aquifer II may act like a confined aquifer. Recharge to Principal Aquifer II comes from precipitation where surface outcroppings are present, the Basin margins, and fractured Franciscan Formation bedrock (Fisher, Brown, & Warne, 1965). Storage capacity for Principal Aquifer II is estimated at 324,000 acre-feet (275.6 million cubic meters) but is difficult to develop due to low permeability (Farrar, 1986).

*Groundwater Recharge and Flow 2.2.1.5*

The general flow direction in the Basin is of north to south with larger flow gradients found in the north and along the edges of the Basin. A maximum water surface elevation of 789 ft-amsl (240.5 m-amsl) was observed in the northernmost portion of the Basin and a minimum elevation of 541 ft-amsl (165 m-amsl) was observed in the southernmost portion of the Basin.

Historical studies indicate that much of the Basin is recharged through precipitation, with shallow alluvial aquifers receiving recharge from surface water. While historical studies identify recharge to Principal Aquifer I as being through stream losses, there is little data confirming this assertion. Planned projects identified in this GSP should help to clarify recharge to Principal Aquifer I. The deeper aquifers receive recharge through deep percolation on the edges of the Basin and through fractures in the Franciscan bedrock. Recharge along the edges of the Basin contributes to the Continental Basin Deposits and is likely slow percolation of precipitation or stormwater (Cardwell, 1965).

The main elements of recharge to both aquifers can be categorized into:

- Deep percolation of precipitation in outcrop areas;
- Infiltration of surface water from streambeds of the Russian River and its tributaries; and,
- Recharge from applied irrigation, unlined storage ponds, and percolation ponds of the small water agencies and City of Ukiah Wastewater Treatment Plan (UWWTP).

Through continuous monitoring and implementation of the GSP, along with future studies in the Basin, there should be further clarity on recharge to principal aquifers. By analyzing where regions of Hydrologic Soil Group A are found within the Basin, it can be determined where the greatest potential for recharge in the Basin is located. These may not be areas of ongoing recharge but show soils with the greatest recharge capacity.

Discharge areas within the Basin include discharge to surface water bodies, root uptake and evapotranspiration by vegetation and crops, groundwater withdrawal through municipal, domestic, and agricultural pumping, and discharges from the boundaries of the Basin. Recharge and discharge from the aquifers are discussed in more detail in the water budget section and will be improved upon a better understanding of Basin conditions using additional data and studies.

*Surface Water 2.2.1.6*

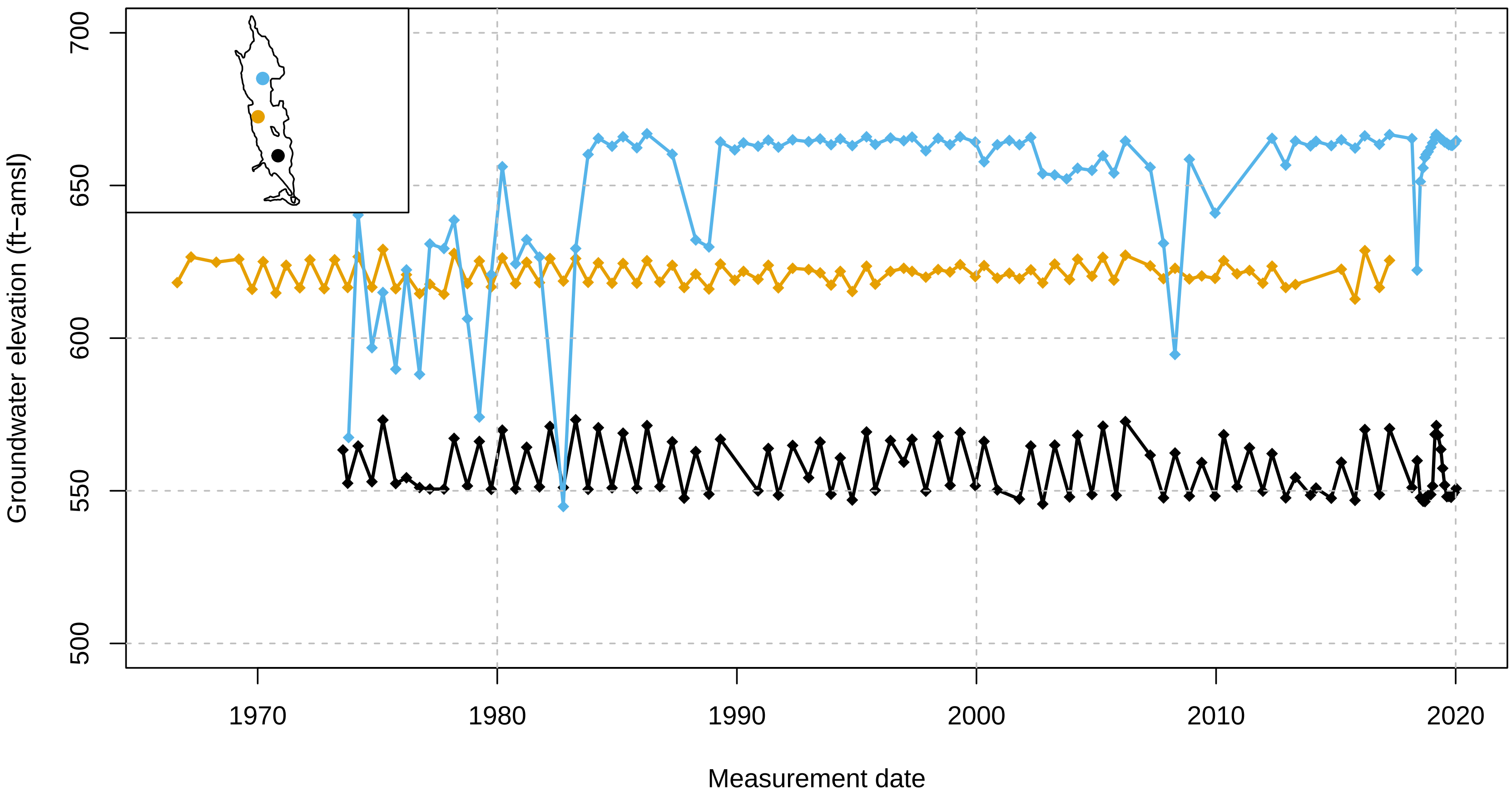
The two major surface water features controlling surface water hydrology within the Basin include Lake Mendocino along with the Russian River and its tributaries. Lake Mendocino is located on the eastern edge of the Basin, just southeast of Calpella. While technically outside of the Basin, releases from Lake Mendocino are significant because the lake is a federal water supply and flood control reservoir managed by Sonoma Water and the United States Army Corps of Engineers (USACE). Sonoma Water is a wholesale water supply and manages water supply storage and releases to maintain minimum instream flows in the Russian River and to meet water supply demands for both Sonoma Water and Russian River water users (SCWA, 2016). It was constructed in 1958 for flood control, water supply, recreation, and streamflow regulation.

The Russian River runs north to south through the center of the Basin. It extends for the entire length of the Basin for approximately 33 miles with several tributaries connecting to it (LACO Associates 2017). Most of the contributing tributaries are seasonal or intermittent but have been shown to be flowing upstream and within the Basin area while disconnected from the Russian River. The West Fork of the Russian River runs through the center of the Basin while the East Fork runs into Lake Mendocino. The East Fork and West Fork meet south of Lake Mendocino and comprise the Russian River. The Russian River exits at the southernmost end of the Basin, just north of Hopland. Significant controls on surface water flows in the Russian River are releases from Lake Mendocino. Headwaters of the Russian River is located 15 miles north of Ukiah. It is habitat to endangered salmonid species and subject to minimum flow requirements established under the Federal Endangered species Act (SCWA, 2016).

### ES-2.2.2. Current and Historical Groundwater Conditions (Section 2.2.2)

*Groundwater Elevation (2.2.2.1)*

Groundwater levels in the Basin have remained relatively stable over the last 30 years while showing small seasonal fluctuations (DWR, 2019). Seasonal cycling of groundwater levels is noted throughout the Basin, with decreasing levels in the summer months followed by increasing levels in the winter months. Limited availability and spatial coverage of historical data may affect the reliability of these results. Groundwater elevation data is very scarce prior to 2014 and is limited to three DWR wells **(Figure 1)** and periodic measurements of wells with data in the GeoTracker database. For recent and current groundwater elevation evaluation, CASGEM wells have been monitored since 2014-2015 and were exclusively used due to their spatial and depth coverage and their overall data quality. Fall groundwater levels are generally stable, while spring measurements are affected by drought conditions. Levels are generally lower in springs that follow a dry winter. Overall, the Basin is shown to maintain its stable levels despite these fluctuations and rebounds to approximately the same levels as pre-drought conditions once drought conditions subside.




Well IDs, south to north: Site Code: 391096N1231677W001 | Well Depth; 112ft | Assigned as Aquifer II
Site Code: 391730N1232108W001 | Well Depth; 62ft | Assigned as Aquifer II
Site Code: 392358N1232020W001 | Well Depth; 274ft | Assigned as Aquifer II

**Figure 1:** Historical Groundwater elevations for the three DWR monitoring wells.

*Change in Groundwater Storage (2.2.2.2)*

Available storage in principal Aquifers was estimated in the existing literature to be 60,000 to 120,000 acre-feet per year (74 to 148 million cubic meters) for Aquifer I and 324,000 acre-feet (275.6 million cubic meters) for Aquifer II (DWR, 2016; Farrar, 1986).

The Ukiah Valley Integrated Hydrological Model (UVIHM) was used to estimate the historical change in storage of the Basin for water years 1992-2018.8 During this period, as shown in **Figure 2**, storage in the Basin has changed following water year types and precipitation patterns, losing water in storage during dry periods and gaining in storage during above normal to wet periods. These changes to storage are not significant, the estimated cumulative storage change in the Basin does not reach or exceed 1,500 acre-feet during this period (**Figure 3**).

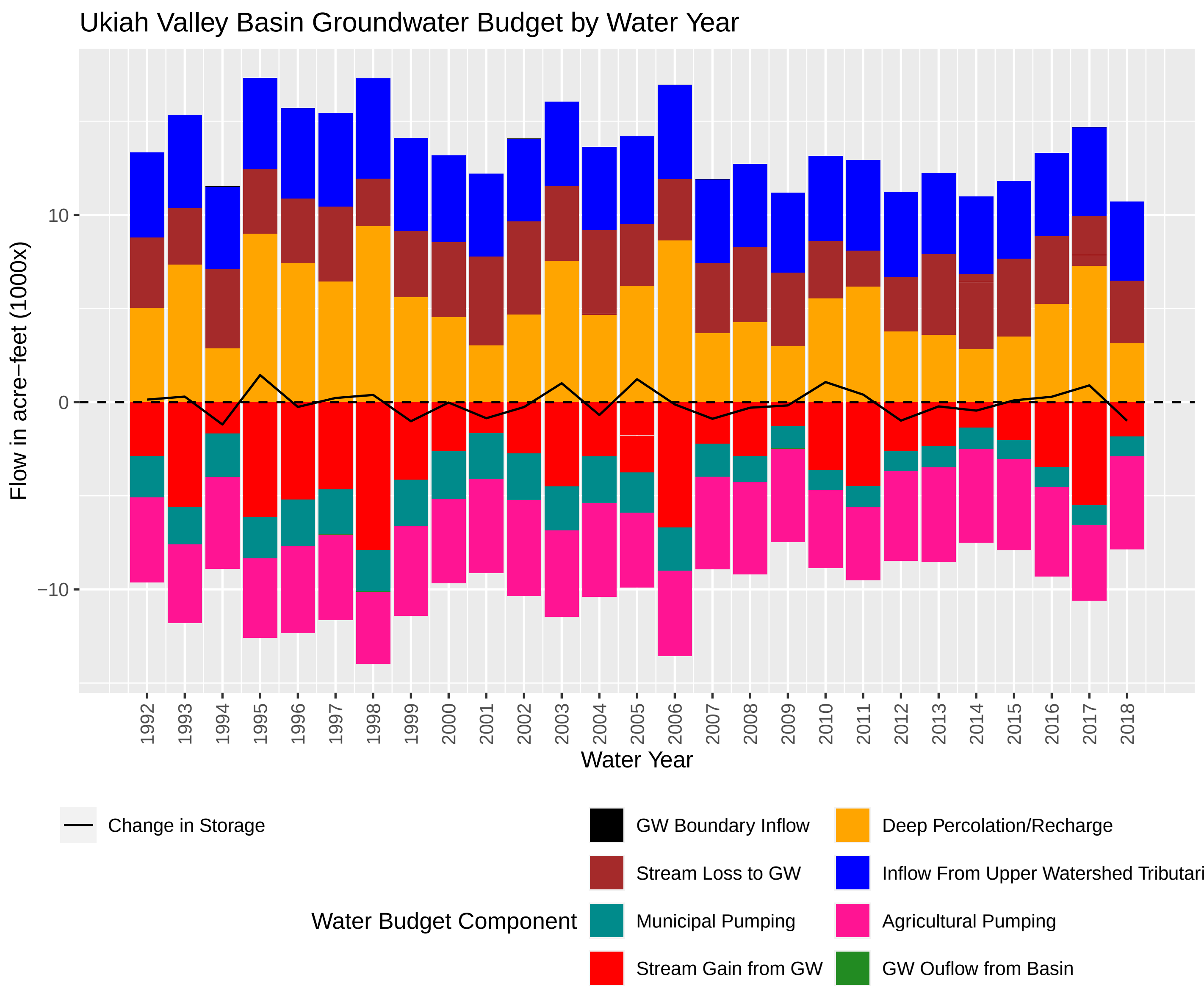



**Figure 2:** Estimated historical annual groundwater budget for the Basin averaged over 1992-2018.

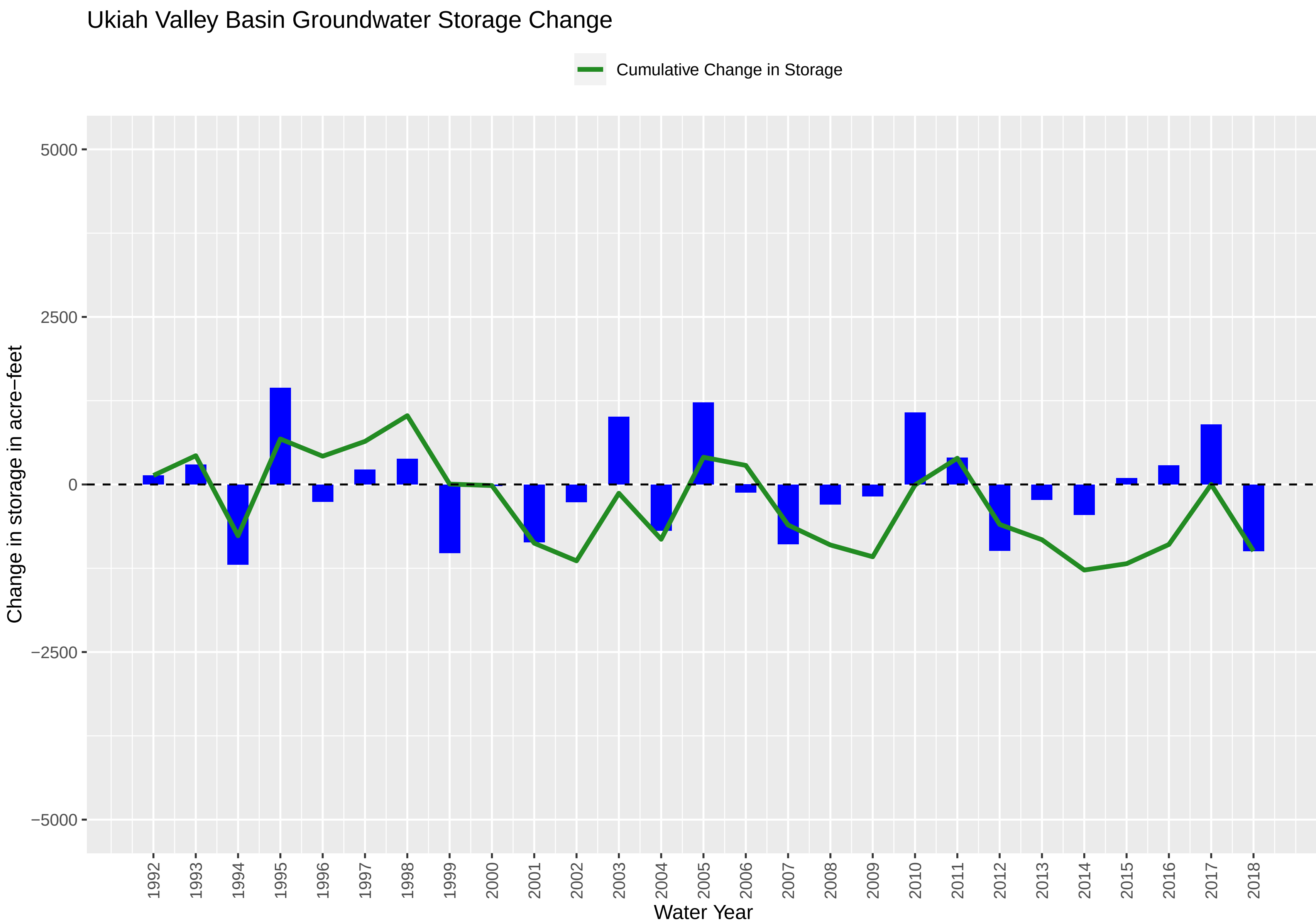



**Figure 3:** Change in groundwater storage in Ukiah Valley Groundwater Basin in water years 1992-2019.

*Seawater Intrusion (Section 2.2.2.3)*

Due to the distance between the Ukiah Valley Groundwater Basin and the Pacific Ocean, saltwater intrusion is not evident nor of concern and therefore, is not applicable to the Basin.

*Groundwater Quality (Section 2.2.2.4)*

Groundwater in the Basin is generally of good quality and has relatively consistent water quality characteristics which meet local needs for municipal, domestic, and agricultural uses. Ongoing monitoring programs show that some naturally occurring constituents, including boron, iron, and manganese exceed water quality standards in parts of the Basin. Exceedances may be caused by geology and natural localized conditions and may not be reflective of regional water quality. The assessment of groundwater quality for the Basin was prepared using available information obtained from the California Groundwater Ambient Monitoring and Assessment (GAMA) Program database, which includes water quality information collected by the California Department of Water Resources (DWR); State Water Resources Control Board (SWRCB), Department of Drinking Water (DDW); and the United States Geological Survey (USGS). Important constituents to sustainable groundwater management in the Basin include boron, iron, manganese, nitrate, and specific conductivity. While the latter two do not historically show exceedances from their regulatory thresholds, they are important for tracking sustainability in the future. The regulatory threshold for Nitrate as N is 10 mg/L while the threshold for specific conductivity is 900 micromhos, under Title 22 of the California Code of Regulations (CCR). Naturally occurring constituents will be monitored during the GSP implementation to demonstrate that the GSP Projects and Management Actions are not contributing to the spread of this constituents in areas where they were not present before.

*Land Subsidence Conditions (Section 2.2.2.5)*

Land subsidence is the lowering of the ground surface elevation. Land subsidence has not been observed in the Basin historically and generally ranges from 0.01 to -0.02 ft from 2015 to 2019, which is within the limits of measurement errors.

*Identification of Interconnected Surface Water Systems (Section 2.2.2.6)*

Interconnected surface water (ISW) is defined as surface water that is connected to groundwater through a continuous saturated zone. SGMA mandates an assessment of the location, timing, and magnitude of ISW depletions, and to demonstrate that projected ISW depletions will not lead to significant and undesirable results for beneficial uses and users of groundwater.

The Russian River and its tributaries were analyzed to determine surface water interconnectivity in the Basin between 2014 and 2020. ISWs in the Basin were classified into “likely ISW” and “unlikely ISW” based on the analysis and professional judgment to reflect the inherent uncertainty of the datasets used to complete the analysis, as shown in **Figure 4**. An estimated 45% of assumed stream and river bed segments were classified as likely ISW leaving 55% of surface water segments as unlikely ISW.

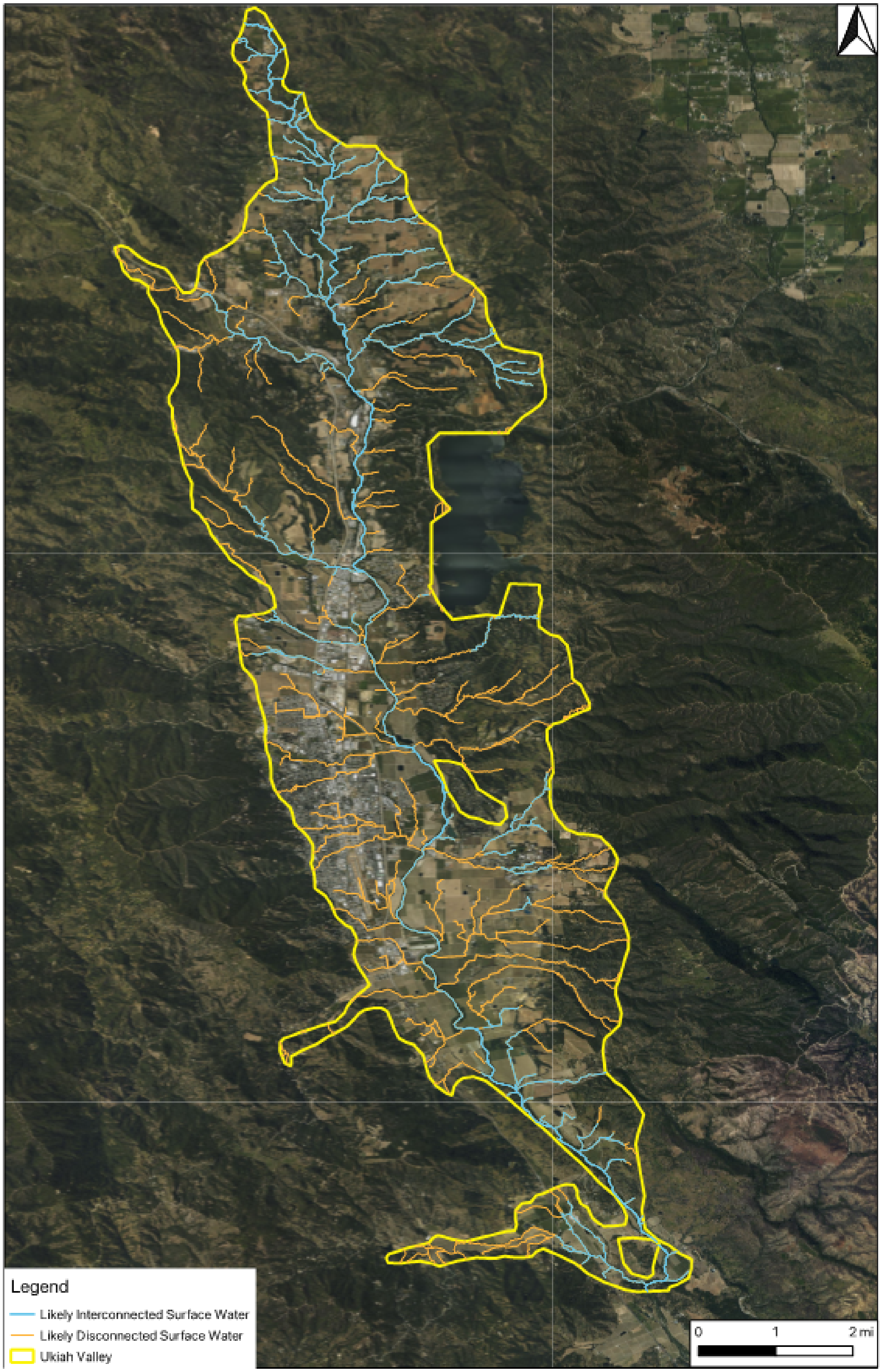



**Figure 4:** Likely Interconnected Surface Water segments along the Russian River and its tributaries.

*Identification of Groundwater Depended Ecosystems (Section 2.2.2.7)*

SGMA refers to GDEs as "ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface." This definition includes both areas of vegetation and flowing surface waters supporting aquatic ecosystems.

Environmental beneficial water users of surface water were identified to establish sustainable management criteria for the depletions of surface water sustainability indicator. The CDFW Biogeographic Information and Observation System (BIOS) Viewer was used to identify threatened and endangered species that may be present within the Ukiah Basin. A total of two species are listed as endangered by the State of California. No species that may be present within the Basin are listed as endangered at the federal level though four species are listed as Birds of Conservation Concern and the petition to list the Foothill Yellow-legged Frog is currently under review. It is worth noting that the California Fish and Game Commission determined in their Notice of Findings (March 10, 2020) that listing the Northwest/North Coast clade of foothill yellow-legged frog as threatened is not warranted, which applies to the Basin area. The species is still designated by CDFW as a "Species of Special Concern" but is not listed/protected under the California Endangered Species Act in this region. An additional ten species are listed as Species of Special Concern at the state level with the Baker's Meadowfoam also assigned rare status. Moreover, National Oceanic and Atmospheric Administration (NOAA) Protected Resources App[1] indicates that the Russian River mainstem, Forsythe Creek, Mariposa Creek, and Salt Hollow Creek are critical habitats for threatened-listed Steelhead (Oncorhynchus mykiss). Russian River mainstem is also listed as critical habitat for Chinook Salmon (Oncorhynchus tshawytscha), listed as threatened.

A spatial data analysis procedure which combined data on the mapped location of vegetation, vegetation rooting depths, and depth to groundwater was implemented to identify and categorize potential vegetation GDEs for the Ukiah Basin. Areas with assumed vegetation that appear to have access to groundwater for greater than 50% of the period of record are assumed to be "likely connected" to groundwater. During the period of record, and generally common for the Basin, Spring groundwater levels are higher than Fall levels. Therefore, this criteria translates into the ability of assumed vegetation GDEs to access groundwater during all Springs and their growing period. Areas with assumed vegetation and rooting zone depths that appear to have access to groundwater for less than 50% of the period of record are considered to be "potential GDEs" to account for the uncertainty and data gaps discussed here and in **Appendix 2-E**. Potential GDEs will be re-evaluated upon collection of additional data and information. GDEs that do not have access to groundwater in any season during the period of record are assumed to be "likely disconnected" from groundwater. The distribution of classified GDEs for the Ukiah Basin is presented in **Figures 5**.

[1] https://www.fisheries.noaa.gov/resource/map/protected-resources-app

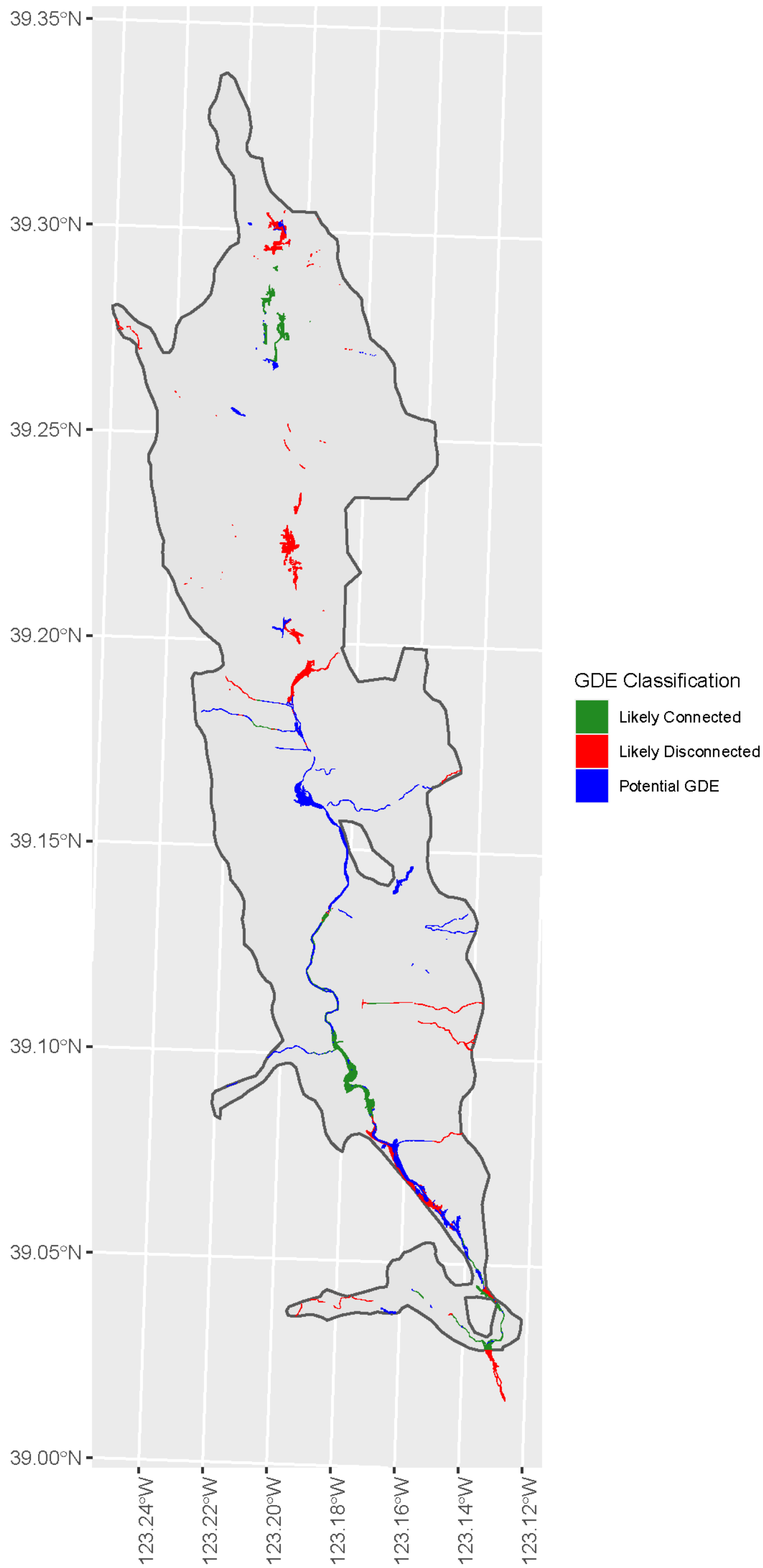



**Figure 5:** Classification of mapped potential GDEs into likely connected and likely disconnected for the Ukiah Basin.

### ES-2.2.3. Water Budget (Section 2.2.3)

*Historical Water Budget*

The historical water budget for the Basin was estimated for the period October 1996 through September 2018, using the UVIHM. This integrated model is comprised of a PRMS model to simulate surface hydrology, a MODFLOW model to simulate groundwater flow, and an Integrated Water Flow Model Demand Calculator (IDC) program to estimate agricultural demands and soil zone budget.

Groundwater budgets show inflows and outflows to the aquifer from the bottom of the root zone, down through all aquifer layers. The Basin is underlain by two principal aquifers: Aquifer I and Auifer II. Groundwater inflows to the Basin are dominated by deep percolation and recharge from the overlying land surface, streambed recharge from the Russian River and its tributaries including inflow from the outer watershed area that flows through the Basin and is eventually recharged into the aquifer. Groundwater outflows are mainly comprised of pumping for irrigation and municipal uses, discharge to the Russian River and its tributaries including water that flows out of the Basin as part of the Russian River. The difference between groundwater inflows and outflows represents the net change in groundwater storage.

Main inflows to the Basin are deep percolation or recharge from precipitation and agricultural irrigation, stream recharge, and inflow from upper watershed tributaries. All three of these inflows are directly dependent on precipitation. These three sources of inflow provide the entire water input to the groundwater budget and can vary between 15 TAF (1000 Acre Feet) to 20 TAF depending on the water year type and precipitation, as shown in **Table 1**.

Main outflows from the Basin and groundwater budget are groundwater use and production, groundwater loss to stream network, and water that flows out of the Basin through the Russian River stream channel. Agricultural pumping was estimated using the Integrated Water Flow Model Demand Calculator (IDC) program. Agricultural demand estimated by IDC is around 5 TAF and slightly changes due to water year types. Based on observational input from stakeholders in the Basin, more than 60% of the agricultural demand is satisfied using surface water diversions. Therefore, agricultural groundwater pumping is representative of less than 40% of the total demand.

Stream gain from the aquifers normally happens during wet periods (mid-November to mid-June) as shown in **Figure 6**.Stream gain from the aquifers can significantly vary based on the water year type and precipitation pattern, from less than 2 TAF during critical and dry years to more than 6 TAF in wet years. On the other hand, stream loss to groundwater (stream recharge) normally happens during the summer months and in early fall, during irrigation periods. stream recharge is also dependent on the water year types and can vary between 3 TAF to 4.5 TAF.

**Table 1:** Ukiah Valley Groundwater Basin estimated historical water budget for each water year type based on the average of 1992-2018. Values are in acre-foot.

| Water Budget Component | Critical | Dry | Below Normal | Above Normal | Wet |
|---|---|---|---|---|---|
| Groundwater Boundary Inflow | 5.4 | 5.3 | 5.3 | 5.3 | 5.3 |
| Deep Percolation/Recharge | 3352.3 | 3777.0 | 3898.7 | 5799.3 | 7879.3 |
| Stream Loss to Groundwater | 3992.6 | 4255.4 | 3967.4 | 3414.5 | 3156.7 |
| Inflow From Upper Watershed | 4277.8 | 4349.6 | 4497.8 | 4632.1 | 4954.9 |
| Municipal Pumping | 1233.7 | 1711.5 | 2038.6 | 1752.2 | 2130.0 |
| Agricultural Pumping | 5000.3 | 4882.3 | 4872.2 | 4477.8 | 4363.0 |
| Stream Gain from Groundwater | 1828.7 | 2205.7 | 2358.4 | 3851.7 | 5913.3 |
| Groundwater Ouflow from Basin | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

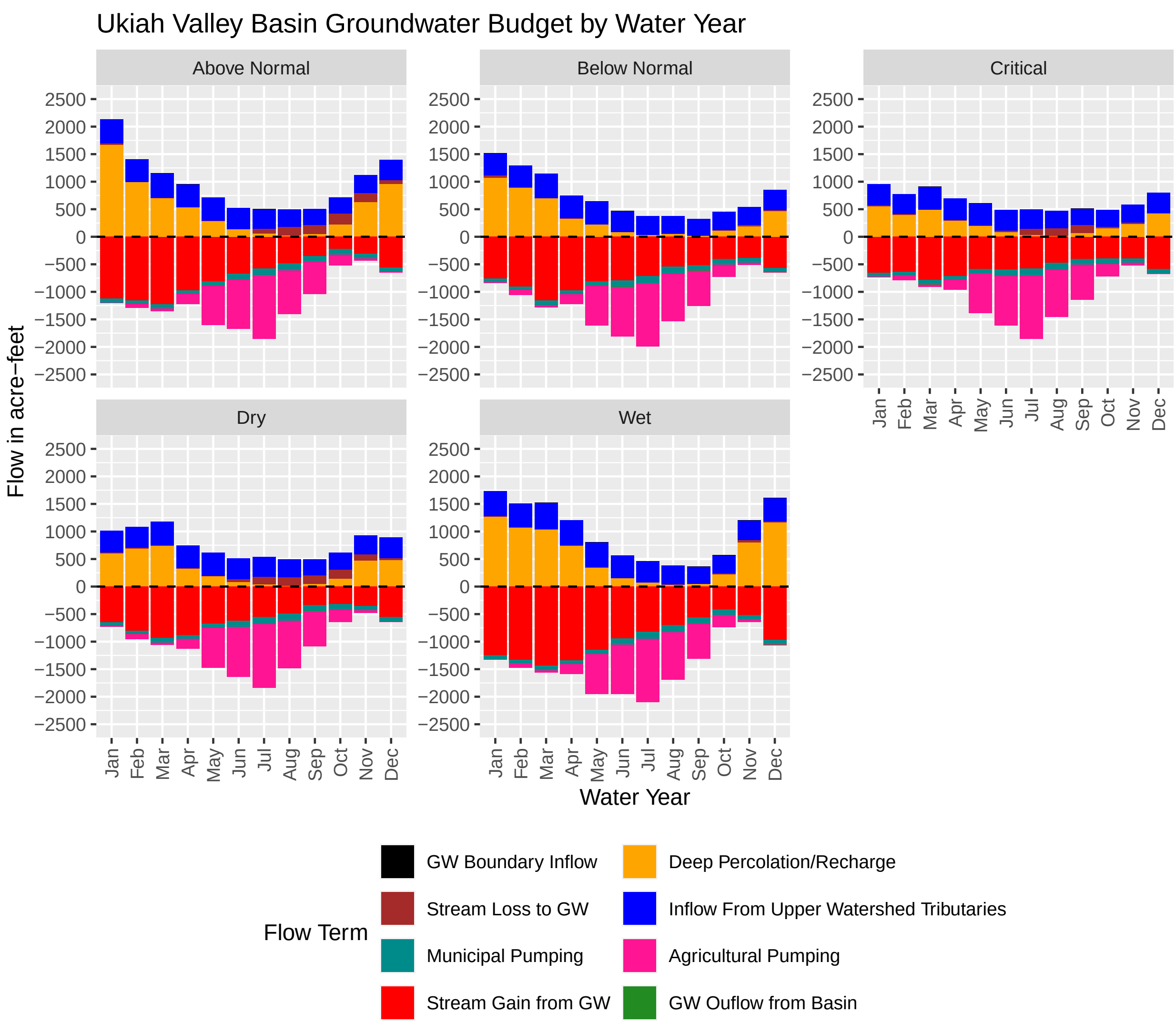



**Figure 6:** Estimated historical average monthly water budget for the groundwater Basin for each water year type. Water budget components are averaged over the same water year types in the 1992-2018 period.

*Current Water Budget*

Current period for the Basin is defined as the 2015-2018 water years. For current conditions, municipal demands, including groundwater pumping and surface water diversions, were implemented based on the data available. If data did not exist after 2015, similar demands to the 2015 water year were used for the rest of the period.

Current conditions follow a similar pattern as the historical period. Wetter years lead to more recharge and inflow from the upper Russian River watershed tributaries and higher stream gains from the aquifers (**Table 2**). On a monthly scale, most of the recharge happens from October to June, with the majority of recharge occurring during the December to April period. Groundwater and stream exchange is divided into stream losses from June to November, and stream gain during the rest of the year. This mirrors the primary irrigation season and agricultural use in the Basin.

**Table 2:** Estimated Ukiah Valley Groundwater Basin monthly water budget averaged over 2015-2018 for current conditions. Values are in acre-foot.

| Water Budget Component | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater Boundary Inflow | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.5 | 0.4 | 0.5 |
| Deep Percolation/Recharge | 1602.4 | 1016.4 | 1031.1 | 507.5 | 271.1 | 103.5 | 40.3 | 18.8 | 13.0 | 193.4 | 372.2 | 1084.6 |
| Stream Loss to Groundwater | 11.3 | 0.0 | 7.1 | 0.0 | 1.2 | 88.1 | 528.2 | 655.0 | 535.0 | 695.2 | 435.1 | 181.1 |
| Inflow From Upper Watershed | 434.2 | 413.8 | 455.1 | 431.5 | 433.5 | 400.1 | 377.1 | 341.9 | 302.4 | 308.4 | 319.2 | 370.8 |
| Municipal Pumping | 69.7 | 55.8 | 81.7 | 61.2 | 76.0 | 114.0 | 125.2 | 126.0 | 103.1 | 100.1 | 79.7 | 77.0 |
| Agricultural Pumping | 4.7 | 40.7 | 39.9 | 249.1 | 659.3 | 816.7 | 1143.0 | 704.3 | 526.0 | 206.9 | 24.6 | 13.7 |
| Stream Gain from Groundwater | 808.9 | 1050.9 | 1112.5 | 836.6 | 297.4 | 16.3 | 0.0 | 0.0 | 0.0 | 0.0 | 15.9 | 325.3 |
| Groundwater Ouflow from Basin | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

*Projected Water Budget*

To inform long-term hydrologic planning, the future projected water budget was developed using Climatic and hydrologic data and input from water years 1965-2018. Water demands including agricultural and municipal pumping and surface water diversions are considered constant and equal to that of the water year 2018. To assess the impacts of climate change, two scenarios were implemented using DWR estimated change factors: 2030 central tendency (near-future) and 2070 central tendency (far future).

Similar to the historical period, the projected water budget is largely dependent on precipitation and water year type, specifically for groundwater recharge, streams and groundwater exchange, and inflow from upper watershed tributaries. **Table 3** shows annual groundwater budgets for all timelines and scenarios averaged over their entire respective periods. Comparison of historical, current, and future baseline periods indicates that less recharge and stream loss to groundwater on average is expected in the future, shrinking the amount of inflow to the Basin. Groundwater discharge to the stream system will also be increased compared to historical and current conditions adding to the increasing difference between inflows and outflows.

Similarly, Near and Far climate change scenarios show a decline in aquifer recharge and stream loss to aquifers. Although this seems to constrain the Basin in the future in average conditions, no significant trend in cumulative storage change could be established from the future baseline conditions, or climate change scenarios. In addition, the uncertainty and unpredictability of climate conditions need to be considered to interpret future baseline and climate change results cautiously since a repeat of the historical period may not be likely.

**Table 3:** Ukiah Valley Groundwater Basin estimated historical, current, and future water budgets. Future budgets include future baseline, 2030, and 2070 Climate Change Scenarios. Values are in acre-foot.

| Water Budget Component | Historical: 1992-2018 | Current: 2015-2018 | Future Baseline: 2017-2070 | Climate Change 2030 Scenario | Climate Change 2070 Scenario |
|---|---|---|---|---|---|
| Groundwater Boundary Inflow | 5.3 | 5.3 | 5.3 | 5.3 | 5.3 |
| Deep Percolation/Recharge | 5422.8 | 6254.2 | 5123.1 | 1949.4 | 4100.1 |
| Stream Loss to Groundwater | 3660.7 | 3137.3 | 818.8 | 1363.7 | 1031.8 |
| Inflow From Upper Watershed | 4611.7 | 4588.0 | 4512.2 | 4404.4 | 4183.0 |
| Municipal Pumping | 1854.7 | 1069.5 | 1069.0 | 1069.0 | 1069.0 |
| Agricultural Pumping | 4630.0 | 4429.0 | 4914.0 | 4914.0 | 4914.0 |
| Stream Gain from Groundwater | 3632.2 | 4463.7 | 4889.5 | 2152.0 | 3758.9 |
| Groundwater Ouflow from Basin | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

### ES-2.2.5. Projected Sustainable Yield

The sustainable yield “means the maximum quantity of water, calculated over a base period representative of long-term conditions in the Basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result.” (California Water Code Section 10721). The Sustainable Groundwater Management Act explicitly makes the sustainable yield a function of long-term conditions and of the conditions causing undesirable results. The sustainable yield in the Basin is not equal to the historic 1992 – 2018 average groundwater pumping, since those conditions have not resulted in overdraft. Water levels and groundwater storage have been in a dynamic equilibrium with inflows to and outflows from the aquifer system, with no significant, discernable negative trend in water levels or groundwater storage. Also, the sustainable yield cannot be defined for the Basin as a single number that is constant over time, as future conditions may decrease or increase the amount of groundwater that can be withdrawn without causing undesirable results.

In addition, in the Ukiah Valley Basin, protecting against depletion of interconnected surface waters and impacts on GDEs warrants the addition of a spatial and possibly hydrogeological component to the sustainable yield. In other words, a single sustainable yield number may lead to different impacts if the pumping patterns differ significantly.

According to the SGMA definition, the sustainable yield for the Basin is estimated to be at least 6,500 acre-feet, based on the average groundwater pumping of the historical period. The sustainable yield of the Basin may be greater than 6,500 with the current conditions persisting, but cannot be estimated based on the available historical record. Therefore, it is recommended that the sustainability of the Basin is not determined based on the sustainable yield, but rather based on the tracking of sustainable management criteria.

## ES-3. Sustainable Management Criteria (Chapter 3)

*Chapter 3 builds on the information presented in the previous Chapters and details the key sustainability criteria developed for the GSP and associated monitoring networks.*

### ES-3.1. Sustainability Goal and Sustainability Indicators (Section 3.1)

**The Sustainability Goal of the Basin is to maintain groundwater resources in ways that best support the continued and long-term health of the people, the environment, and the economy in Ukiah Valley, for generations to come.**

This includes managing groundwater conditions for each of the applicable sustainability indicators in the Basin so that:

- Groundwater elevations and groundwater storage do not significantly decline below their historically measured range, protect the existing well infrastructure from outages, protect groundwater dependent ecosystems, and avoid significant additional streamflow depletion due to groundwater pumping.
- Groundwater quality is suitable for the beneficial uses in the Basin and is not significantly or unreasonably degraded.

- Significant and unreasonable land subsidence is prevented in the Basin. Infrastructure and agricultural production in Ukiah Valley remain safe from permanent subsidence of land surface elevations.
- Significant and undesirable streamflow depletions due to groundwater pumping are avoided through projects and management actions consistent with existing regulatory requirements.
- The GSA's groundwater management is efficiently and effectively integrated with other watershed and land use planning activities through collaborations and partnerships with local, state, and federal agencies, private landowners, and other organizations, to achieve the broader "watershed goal" of sufficient surface water flows that sustain healthy ecosystem functions.

**Table 3** defines undesirable results for each sustainability indicator. Quantifiable minimum thresholds (MT), measurable objectives (MO), and interim milestones (IM) were developed as checkpoints that evaluate progress made towards the sustainability goal and are quantified in Chapter 3 of the GSP. Monitoring wells throughout the Basin will be used to assess conditions relevant to each sustainability indicator. New continuous groundwater data will be collected to expand the current network, to provide a better temporal evaluation of the changes in the system, and will be included in the Ukiah Valley Basin Integrated Hydrologic Model (UVIHM, based on the GSFLOW platform to be consistent with other ongoing modelling effort in the Russian River watershed) for calibration. Monitoring wells were selected based on well location, monitoring history, well information, and well access. The UVIHM and its future updates will be used to monitor and assess the depletions of interconnected surface water. Based on preliminary assessments, the UVIHM model will need to be updated based on the expanded monitoring network and through new research activities, including water level measurements, stream gaging, aquifer assessments, studies of streambed and river profile, isotopes analysis and monitoring of projects and management actions. It represents the scientifically and technologically most accurate and defensible approach to measuring stream depletion due to groundwater use, and the reversal of stream depletion expected in the summer months as a result of projects and management actions suggested in this GSP.

**Table 4:** Ukiah Valley GSP Sustainability Indicator undesirable results defined.

| Sustainability Indicator | Undesirable Result Defined |
|---|---|
| Chronic Lowering of Groundwater Levels | Groundwater level observations in the Fall season (i.e., the minimum elevation in any given water year) in more than third of the RMPs in the Basin fall below their respective minimum thresholds for two consecutive years |
| Reduction of Groundwater Storage | Similar to chronic lowering of groundwater levels, if the Fall low groundwater level observations in more than a third of the RMPs in the Basin fall below their respective minimum thresholds for two consecutive years. |
| Degraded Water Quality | Maximum thresholds are exceeded at 50% or more of the groundwater quality monitoring wells sampled in the respective sampling period for any Constituent of Interests (COIs) with a defined maximum threshold. |
| Depletions of Interconnected Surface Water | Groundwater levels at more than a third of the Representative Monitoring Points (RMPs) falling below their defined minimum thresholds in two consecutive years. The criteria are applicable for the first five years of the GSP implementation and will be revised upon further data collection and availability of sufficient information. Revised undesirable results will be defined based on the volume and/or rate of depletion at monitoring transect and streamgage locations calculated by the UVIHM. |
| Seawater Intrusion | Not applicable for the Basin. |
| Land Subsidence | Groundwater pumping induced subsidence is greater than the minimum threshold of 0.1 ft (0.03 m) in any single year. |

## ES-4. Projects and Management Actions (Chapter 4)

*Chapter 4 describes past, current, and future projects and management actions used to achieve the Ukiah Valley Basin sustainability goal.*

To achieve the sustainability goals for Ukiah Valley by 2042, and to avoid undesirable results over the remainder of a 50-year planning horizon, as required by SGMA regulations, multiple projects and management actions (PMAs) have been identified and considered in this GSP.

PMAs are categorized into two tiers of implementation, as follows:

**Tier I: Existing PMAs that are currently being implemented and are anticipated to continue to be implemented.**

Projects and management actions in Tier I include general plans for Mendocino County and Ukiah Valley area, conceptual modeling of watershed hydrology, plans related to Lake Mendocino's management and water supply, Ukiah City storm water and water management plans, Sonoma County water resources plans, and more.

**Tier II: PMAs planned for near-term initiation and implementation (2022–2027) by individual member agencies, as well as additional PMAs that may be implemented in the future, as necessary (initiation and/or implementation 2027–2042).**

Tier II PMAs fall into the following subcategories: supply augmentation projects, demand management water conservation, and other management actions.

Tier II supply augmentation projects include conjunctive use projects, managed aquifer recharge and injection wells, and projects to reduce evaporative losses from existing surface water storage. Demand management and water conservation projects include installing new pump(s) for potable water intertie, possible implementation of conservation easements, conservation programs and green infrastructure, irrigation efficiency improvements, voluntary land repurposing, farming alternative lower ET crops, and municipal supply and use efficiency improvements. Lastly the projects which fall into the other management actions category include monitoring activities needed for better implementation of the GSP and achieving its sustainability goal including establishing a well inventory program, implementing drought mitigation measures, forbearance, projecting the future of the Basin for enhanced management, design and implementation of a voluntary well metering program, and conducting outreach and education to beneficial users and impacted parties.

Projects and management actions are further outlined for GSP implementation in the full body of Chapter 4.

## ES-5. Plan Implementation (Chapter 5)

*Chapter 5 details key GSP implementation steps and timelines. Cost estimates and elements of a plan for funding GSP implementation are also presented in this chapter.*

Implementation of the GSP will focus on the following several key elements:

1. GSA management, administration, legal and day-to-day operations.
2. Reporting, including preparation of annual reports and 5-year evaluations and updates.
3. Implementation of the GSP monitoring program activities.

4. Technical support, including UVIHM model updates, SMC tracking, and other technical analysis.
5. Implementation of PMAs
6. Ongoing outreach activities to stakeholders

Implementation of the GSP over the 20-year planning horizon is projected to cost $140,000-$405,000 per year (present dollar value) based on the best available information at the time of Plan preparation and submittal. Actual cost of GSP implementation for each year will depend on the specific tasks that need to be conducted during that year. This estimated amount excludes major capital projects.

The GSAs will pursue various funding opportunities from state and federal sources for GSP implementation. As the GSP implementation proceeds, the GSAs will further evaluate funding mechanisms through its rate fee study PMA and may perform a cost-benefit analysis of fee collection to support consideration of potential refinements. At the start of the GSP implementation, the GSA will be funded through member agency contributions. Member agency contribution will continue during the first 5-year implementation period until a fee structure is implemented to support and fund GSA activities. Upon such action, member agency contributions will be reduced to cover the needed costs that are not funded through the implemented fee structure.

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