DECEMBER 2021

EXECUTIVE SUMMARY

SISKIYOU COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

Shasta Valley Groundwater Sustainability Plan

FINAL DRAFT REPORT

Siskiyou County Flood Control and Water Conservation District Groundwater Sustainability Agency Shasta Valley Groundwater Sustainability Plan

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Executive Summary

ES-1: INTRODUCTION (CHAPTER 1)

Background (Section 1.1)

Section 1 describes the Sustainable Groundwater Management Act and the purpose of the Groundwater Sustainability Plan. Section 1 also introduces the management structure of the agencies developing and implementing the 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 GSPs for high and medium priority subbasins (e.g., Shasta Valley). In accordance with SGMA, this GSP was developed and will be implemented by the Siskiyou County Flood Control and Water Conservation District, the GSA representing the Basin.

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 groundwater sustainability plans, alternatives to Groundwater Sustainability Plans (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 1-D, which is organized according to the California Code of Regulation Sections of the GSP Emergency Regulations.

Purpose of the Groundwater Sustainability Plan

The Shasta Valley GSP outlines a 20-year plan to direct sustainable groundwater management activities that considers the needs of all users in the Basin and ensures a viable groundwater resource for beneficial use by, agricultural, residential, industrial, municipal and ecological users. The initial GSP is a starting point towards achievement of the sustainability goal for the Basin. Although available information and monitoring data have been evaluated throughout the GSP to set sustainable management criteria and define projects and management actions, there are gaps in knowledge and additional monitoring requirements. 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 implementation of 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 Shasta Valley Basin area. 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).

Description of Plan Area (Section 2.1)

Summary of Jurisdictional Areas and Other Features (Section 2.1.1)

The Shasta Valley Basin (the Basin) is a medium priority basin located in Northern California. The Basin is bounded by Mount Shasta to the South, the Klamath Mountains to the west and the Cascade Range to the east and the Klamath River to the north. The Basin is drained by Shasta River, a tributary to the Klamath River. The primary communities in Shasta Valley are the Cities of Yreka, Weed, and Montague and the census-designated places of Grenada, Carrick, Gazelle, and Edgewood. As reflected in the 2012-2016 disadvantaged community (DAC) Mapping Tool, Gazelle, Granada, Weed, and Yreka all qualify as severely disadvantaged communities (SDACs) and Montague qualifies as a DAC based on annual median household income. Land ownership in the Basin is predominantly private, with two large conservation properties, California Department of Fish and Wildlife's Shasta Valley and Big Springs Ranch Wildlife Areas. Agriculture is a significant land use in the Basin with pasture, alfalfa, grain and hay as the primary crops.

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 Shasta Valley.

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 2.1.4 including the County of Siskiyou General Plan, City of Weed General Plan and Yreka General Plan.

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.

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.

Hydrogeologic Conceptual Model (Section 2.2.1)

The hydrogeologic conceptual model encompasses the Basin setting including its geographical location, climate, geology, soils, land use and water management history, and hydrology (Sections 2.2.1.1 through 2.2.1.5).

Current and Historical Groundwater Conditions (Section 2.2.2)

Groundwater Elevation (2.2.2.1)

Groundwater data for the Basin is entirely within the DWR CASGEM Records. The majority of groundwater level data available for the Basin dates back to at least the early 1990s, with some data available earlier and a few with only post-2010 data. Generally, groundwater level data indicated levels are stable over the full period of the record as shown in a subset of five wells in Figure 1.1. Groundwater levels are generally shallow in the central to west-central areas of the basin (<20-40 ft below ground surface) and typically do not show seasonal or longer variations. In contrast, the deeper groundwater table northwest of Gazelle shows some variation with drought conditions. In the volcanic aquifers, groundwater levels have generally remained stable but with increases in pumping and drought conditions (post 2019), increased lowering is noted, particularly in the Pluto’s Cave basalt aquifer area.

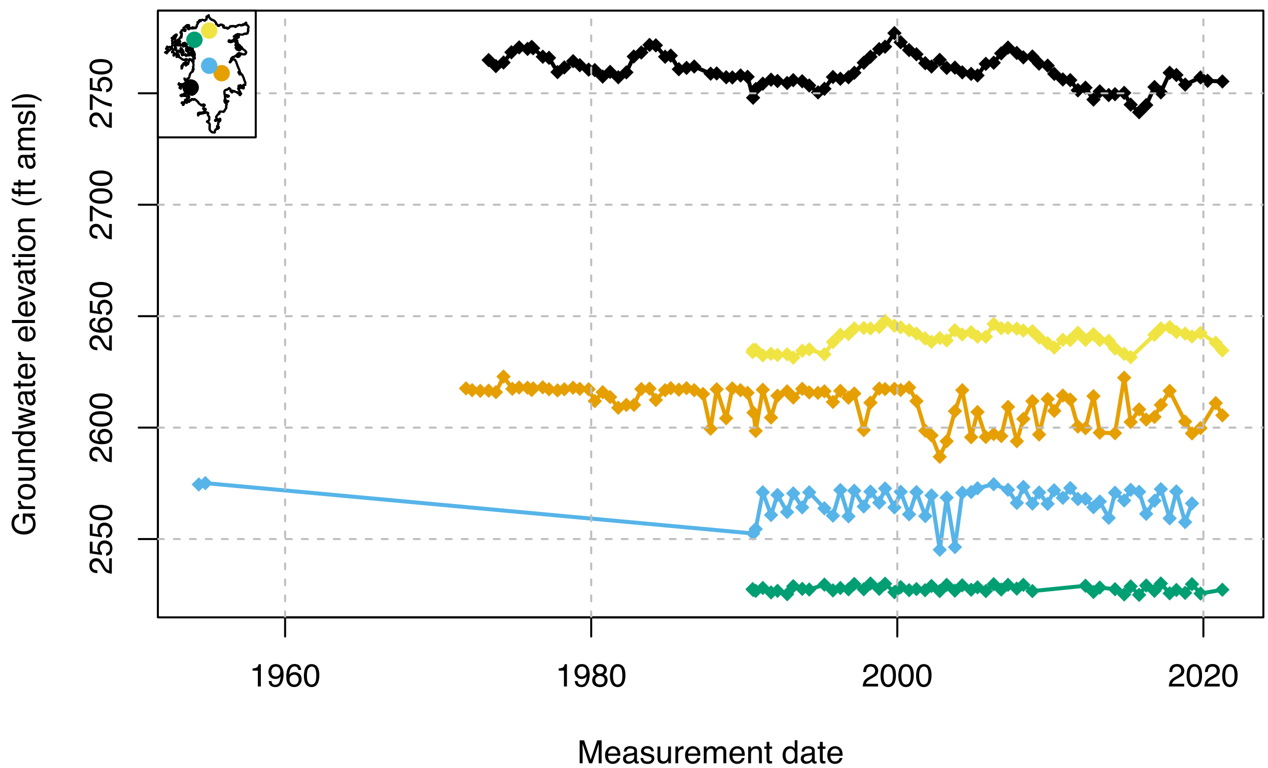

Figure 1.1: Groundwater level measurements over time in five wells, one located in each hydrogeologic zone.

Estimate of Groundwater Storage (2.2.2.2)

Groundwater storage is estimated based on the model, the Shasta Watershed Groundwater Model (SWGM).

Groundwater Quality (Section 2.2.2.3)

Based on an evaluation of Basin groundwater quality using available monitoring data (see Appendix 2-C), a list of constituents of interest was generated for the Basin. This list includes arsenic, benzene, boron, iron, manganese, nitrate, pH and specific conductivity. Multiple known contaminated sites exist in the Basin including a leaking underground storage tank (LUST) site, the Davenport Property, and three open cleanup program sites in Yreka as well as six California Department of Toxic Substances Control sites.

Seawater Intrusion (Section 2.2.2.4))

The Basin is more than 60 miles east of the Pacific Ocean and water levels are more than 2,000 feet above mean seal level. Seawater intrusion is not an issue in this Basin.

Land Subsidence Conditions (Section 2.2.2.5)

Land subsidence is lowering of the ground surface elevation and is not known to be currently or historically significant in the Basin. Subsidence in Shasta Valley, based on the TRE Altamira InSAR dataset provided by DWR is within the range of -0.1 to 0.1 ft, largely within the margin of error indicating the absence of significant subsidence. The type of geological formations present in the basin is also suggesting that future subsidence is unlikely.

Identification of Interconnected Surface Water Systems (Section 2.2.2.6)

Interconnected surface water (ISW) is defined as surface water which 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 surface water.

The Shasta River and its major tributaries are all considered part of the interconnected surface water system in the Basin (Figure 1.2). Their large seasonal flow variations exhibit all five elements of the recently proposed functional flows framework for managing California rivers: fall flush flow, winter storm flow, winter baseflow, spring recess, and summer baseflow. The system is also subject to significant interannual variations in flow and largely affected by the complex springs system that is present throughout the valley as a result of the volcanic origin.

The magnitude and direction of flow exchanged between surface water and groundwater varies both in time and spatially (i.e., the geographic distribution of gaining and losing stream reaches is not constant). When this flux is net positive into the aquifer over the Basin, it is commonly referred to as stream leakage; when it is net positive into the stream it is referred to as groundwater discharge.

In most years, the net direction in the entire watershed of stream-aquifer flux is as aquifer recharge into the river, with the largest net groundwater replenishment from streams occurs in wet years. Seasonally, the magnitude of leakage from the streamflow system to the aquifer is greatest during late winter and early spring, while the net magnitude of groundwater discharge to the stream is greatest in late fall at the end of the dry season (least seasonal recharge). Spatially, the mainstem

Shasta River is alternately gaining and losing depending on the season, on the location, and on the year type. In other words, river water weaves in and out of the aquifer on its journey along the valley floor. The upper sections of tributaries tend to be losing stream reaches but conditions depend on precipitation levels during any given water year and some of the tributaries tends to be dry in the summer months before connecting to the main stem of the Shasta river.

With respect to the functional flows of the Shasta River, depletion of surface water due to groundwater pumping affects the timing of the late spring recess, the amount of summer baseflow, and the onset of fall flush flow.

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."

The habitat ranges of freshwater species in the Basin with special designations (i.e., endangered, threatened, species of special concern or on a watch list), were mapped. Chinook salmon, coho salmon, steelhead trout, pacific lamprey and riparian vegetation are all prioritized for management in the Basin as managing for these species addresses the needs of other special-status species in the Basin. These prioritized species are considered throughout the GSP, particularly in setting the sustainability indicators defined in Chapter 3 and identifying projects and management actions identified in Chapter 4. Vegetative GDE identification and classification was conducted through:

- the mapping of potential GDEs;
- assigning rooting depths based on predominant assumed vegetation type;
- establishing representations of depth to groundwater;
- identifying potential areas where depth to groundwater, rooting depth, and presence of potential GDES confirm likely groundwater-dependence.

Potential mapped GDEs were grouped into three categories: riparian GDE, assumed GDE and assumed not a GDE (where the grid-based analysis showed that the area is disconnected from groundwater). Based on this analysis, around 22% of the mapped potential GDE area is likely connected to groundwater and 14% of the mapped potential GDE area is composed of riparian GDEs (shown in Figure 3, below).

Water Budget (Section 2.2.3)

The historical water budget for the Basin was estimated for the period October 1991 through 2018, using the Shasta Watershed Groundwater Model (SWGM). This 28-year model period includes water years ranging from very dry (e.g., 2001 and 2014) to very wet (e.g., 2006 and 2017). On an interannual scale, it includes a multi-year wet period in the late 1990s and a multi-year dry period in the late 2000s and mid-2010s.

The water budget is presented as flows into and out of three subsystems of the integrated watershed: the surface water subsystem, the soil zone (land/soil model subsystem) and the groundwater subsystem.

Stream and lake seepage, at 124 TAF per year, accounts for 96% of the contributions from surface water to the groundwater subsystem in the Basin. Fluxes from the groundwater subsystem to

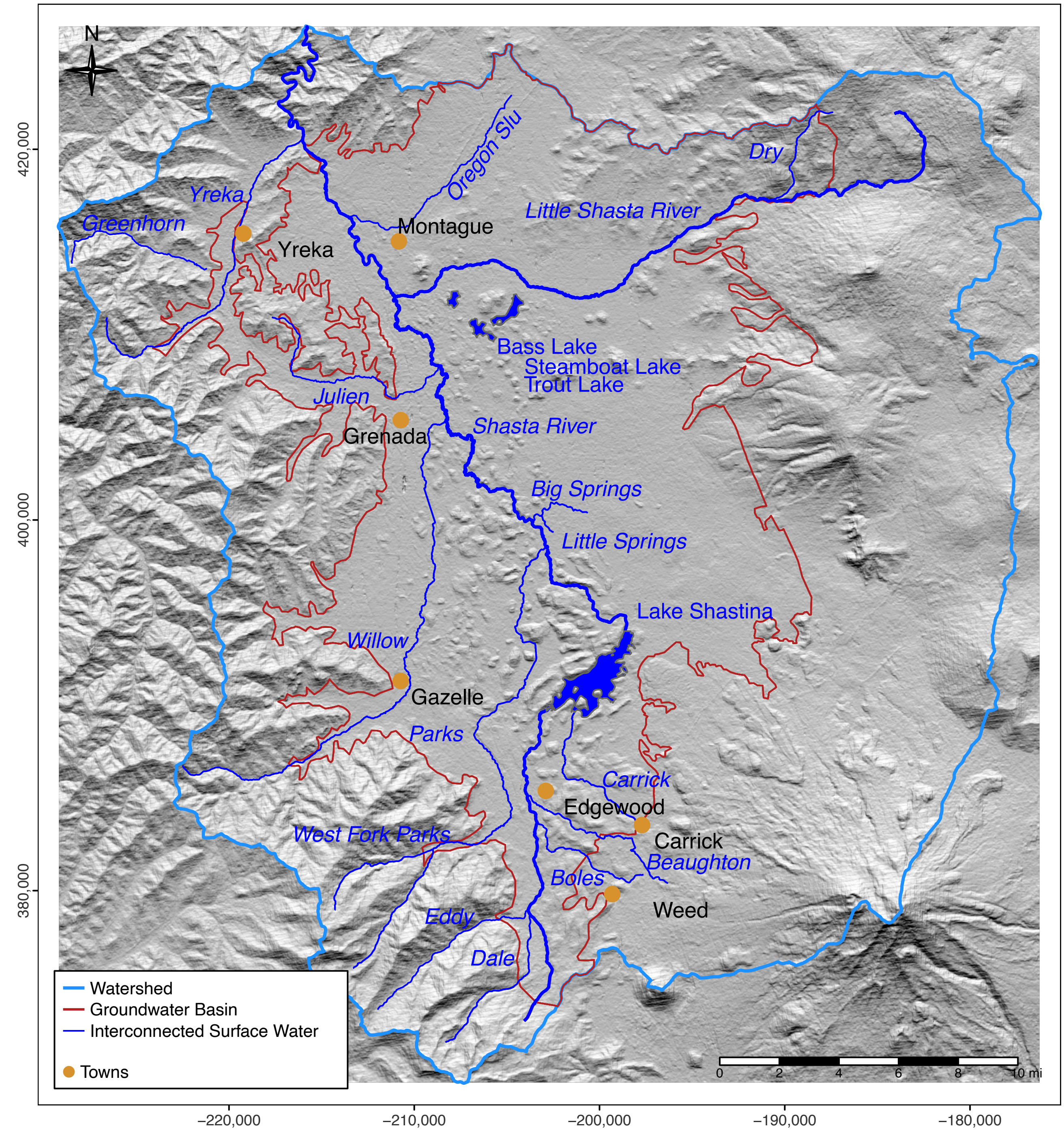

Figure 1.2: Major interconnected surface waters in Shasta Valley.

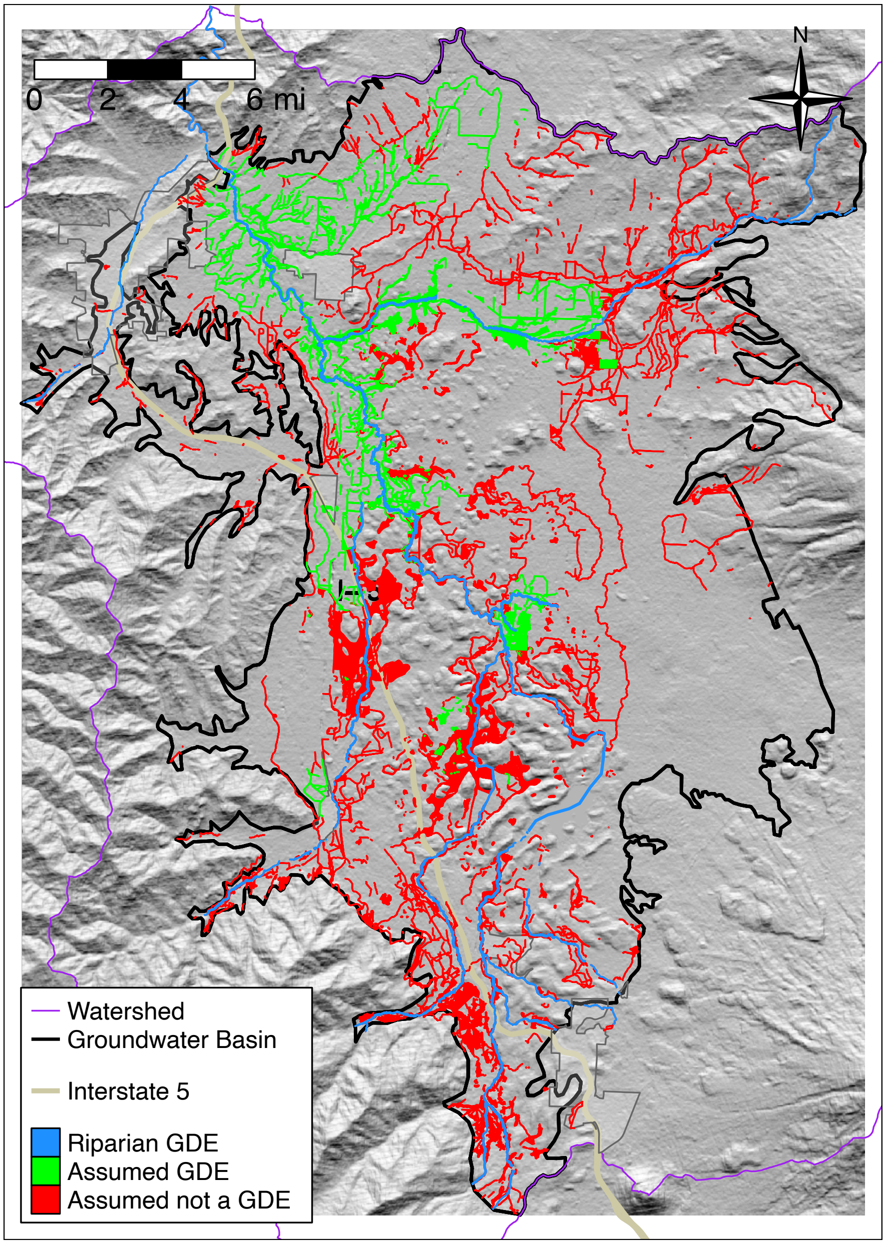

Figure 1.3: Categorized GDEs within the Shasta Basin.

surface water is primarily through groundwater leakage into streams with an average value of 219 TAF. Agricultural pumping in the Basin accounts for an average of 43 TAF per year, around one-third of the total land/soil subsystem recharge in the Basin. The difference between total outflows from the groundwater subsystem to land and surface water (312 TAF/ year, on average), and land and surface water inflows to the groundwater subsystem (255 TAF/ year, on average is due to net groundwater inflow from outside the Basin.

Within the integrated model, fluxes from each subsystem to the other two subsystems are simulated as distinct components (e.g. stream leakage, recharge through the soil zone, and applied irrigation water). This section contains a description of each water budget component. Fifty-year future projected water budgets were developed using historical hydroclimate data (for water years 1991-2011) and four climate change scenarios were applied to explore potential effects of global warming on the Shasta Valley watershed.

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.

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 Shasta Valley for generations to come.

The GSP details six sustainability indicators with a goal of preventing undesirable results to any one of the following sustainability indicators:

1. Chronic Lowering of Groundwater Levels
2. Reduction of Groundwater Storage
3. Degraded Water Quality
4. Depletions of Interconnected Surface Water
5. Seawater Intrusion
6. Land Subsidence

Table 1.1 defines undesirable results for each sustainability indicator. Quantifiable minimum thresholds (MT), measurable objectives (MO), and interim milestones (IM) were also 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. Monitoring wells were selected based on well location, monitoring history, well information, and well access.

Table 1.1: Shasta Valley GSP Sustainability Indicator undesirable results defined

Sustainability Indicator	Undesirable Result Defined
Chronic Lowering of Groundwater Levels	The fall low water level observation in any of the representative monitoring sites in the Basin falls below the respective minimum threshold for 2 consecutive years.
Reduction of Groundwater Storage	Same as ”Chronic Lowering of Groundwater Levels.”
Degraded Water Quality	More than 25% of groundwater quality wells exceed the respective maximum threshold for concentration and/or concentrations in over 25% of groundwater quality wells increase by more than 15% per year, on average over ten years.
Depletions of Interconnected Surface Water	Greater than the depletion under which a minimum threshold of 100 CFS +/- 20% average monthly groundwater contributions occurs, for two consecutive years.
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 TO ACHIEVE SUSTAINABILITY (CHAPTER 4)

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

To achieve the sustainability goals for Shasta 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 Groundwater Sustainability Plan (GSP).

Projects and management actions (PMAs) are categorized into three different tiers, as follows:

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

Projects or management actions in the Tier I category include:

- Nature Conservancy Leasing Program
- Safe Harbor Group Flow Management
- Bank Stabilization, Streambed Alteration, Floodplain Enhancement, and Riparian Vegetation
- Riparian Fencing and Planting
- Novy Ice Zenkus Fish Passage Improvement Project
- Montague- Grenada Weir Modification Project
- Piezometer Transect Study Project

- City of Yreka Water Demand
- Enforcement of Survival Permits Authorizing Shasta River Template Safe Harbor Agreement
- Site Plans/ Recovery of Sothern Oregon/ Northern California Coast (SONCC) Coho Salmon
- Shasta River Tailwater Reduction Plan
- Upland Management

Tier II: PMAs planned for near-term initiation and implementation (2022–2027) by individual member agencies.

Tier II PMAs include:

- High Priority PMAs - Data Gaps and Data Collection
  - Shasta Watershed Groundwater Model (SWGM) Update (High Priority)
  - Drought Year Analysis (High Priority)
  - Expand Monitoring Networks (High Priority)
  - General Data Gaps (High Priority)
  - Groundwater Dependent Ecosystem Data Gaps (High Priority)
  - Interconnected Surface Water Data Gaps (High Priority)
- Aquifer Characterization Analysis
- Avoiding Significant Increase of Total Net Groundwater Use from the basin
- Upslope Water Yield Projects
- Habitat Improvement in Shasta Watershed
- Instream Flow Leases
- Irrigation Efficiency Improvements
- Juniper Removal
- Reporting of Pump Volumes
- Voluntary Managed Land Repurposing
- Shasta Recharge Pilot Project

Tier III: Additional PMAs that may be implemented in the future, as necessary (initiation and/or implementation 2027–2042).

Tier III PMAs, identified as potential future options, include:

- Alternative, lower ET Crops
- MAR and ILR
- Strategic Groundwater Pumping Curtailment
- Reservoirs

Additionally, other management actions are outlined that may be explored during GSP implementation are outlined.

ES-5: PLAN IMPLEMENTATION, BUDGET AND SCHEDULE (CHAPTER 5)

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

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

1. GSA management, administration, legal and day-to-day operations.
2. Implementation of the GSP monitoring program activities.
3. Technical support, including SWGM model updates, SMC tracking, and other technical analysis.

4. Reporting, including preparation of annual reports and 5-year evaluations and updates.
5. Implementation of PMAs
6. Ongoing outreach activities to stakeholders

Annual implementation of the GSP over the 20-year planning horizon is projected to cost between $168,750 and $287,500. The GSA may pursue funding from state and federal sources for GSP implementation. As the GSP implementation proceeds, the GSA will further evaluate funding mechanisms and fee criteria and may perform a cost-benefit analysis of fee collection to support consideration of potential refinements.