GROUNDWATER LEVELS

BACKGROUND

Groundwater levels fluctuate with the amount recharge (supply) and groundwater use (demand) that occurs. Groundwater elevations increase as recharge increases and/or as groundwater use decreases. Similarly, groundwater levels decline as recharge decreases and/or groundwater use increases.

Changes in groundwater levels vary over time and location. For example, in California, groundwater levels are generally are higher in the spring and lower in the fall. Also, groundwater levels may be relatively stable in one area while another area sees larger fluctuations in groundwater level. Groundwater levels vary by location because aquifers do not act like bathtubs – where, when water is taken out, the entire water surface drops at the same time. Instead, aquifers consist of complex layers of rocks and soils, and it may take years for changes in groundwater levels to travel from one part of the system to another.

GROUNDWATER DYNAMICS IN AN AQUIFER

Geology plays a large role in groundwater dynamics: different characteristics of the aquifer can either impede or facilitate the flow of groundwater. Geologic faults can serve as conduits to help move water, or act as barriers to groundwater flow. In more porous soils, such as gravels, groundwater flow is quicker; in more compact soils, such as clays, groundwater flow is slower.

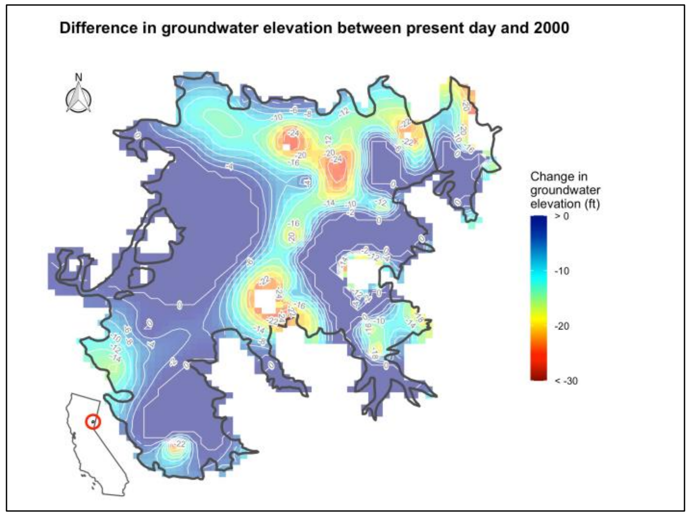
Additionally, groundwater pumping involves wells that are not evenly spaced, do not extract water from the same geologic units, and do not pump at equal rates. This also contributes to different changes in groundwater levels in different locations.

GROUNDWATER LEVELS, GROUNDWATER STORAGE AND SUBSIDENCE

Groundwater levels are also closely tied to – and can serve as an indicator for – groundwater storage (or the volume of groundwater stored in the main aquifer). As groundwater levels decline or increase, the volume of groundwater stored in the aquifer also decreases or increases. Also, total groundwater storage can be reduced by land subsidence. Although subsidence refers to a depression in the land surface, it is the result of conditions below the surface. Subsidence due to groundwater pumping is caused by relatively fine-grained sediments, like clay, becoming more compact as water is removed. While subsidence can be either elastic (temporary) or inelastic subsidence (permanent), the compaction of sediments reduces the overall amount of groundwater that can be stored in the aquifer.

WHAT WE KNOW: AVAILABLE DATA

Data on groundwater levels are obtained from monitoring wells and can be tracked over time, in a chart called a hydrograph. In the Sierra Valley subbasin, the majority of monitoring wells show groundwater decline over the past 20 years. The amount of average annual decline varies, from minimal to 1.5 feet in the most heavily impacted areas of the basin. Declines are more pronounced in the central and northeastern portion of the valley. A collection of 133 hydrographs are available at https://www.sierravalleygmd.org/gsp-documents. Over the past 20 years, groundwater levels have declined by 5 feet up to 25 feet in some areas of Sierra Valley. (Note: In the graph, areas lacking data are shown in white.)



UNDESIRABLE RESULTS RELATING TO CHRONIC GROUNDWATER LEVEL DECLINE

Reduced groundwater levels can impact groundwater uses and users. "Undesirable results" represent impacts that are significant and unreasonable, as defined by local Groundwater Sustainability Agencies. Examples of undesirable results can include: impacts to domestic wells (e.g., dewatering, or going dry), agricultural producers needing to pump from greater depths, loss of wildlife habitat and interconnected surface water that depend on groundwater, and severe curtailments in available municipal supplies.

PROPOSAL FOR GROUNDWATER LEVEL SECTION IN GSP

1. Identify a representative monitoring network of wells that are distributed across the valley, and at different depths, to record and track groundwater levels.
2. Establish **Measurable Objectives** (MOs, or goals) for stable groundwater levels at points in the monitoring network to be achieved and maintained by 2042. The proposal is that the Measurable Objectives be set to the average post-2015 groundwater level at each monitoring well. This objective is based on 2015 marking the end of a multi-year drought, and improved groundwater conditions in 2016 and 2017 due to increased precipitation and reduced pumping. Subsequently, average post-2015 groundwater levels are generally higher than those observed in to 2015.
3. Establish ***Minimum Thresholds*** (MTs) where groundwater levels would likely cause undesirable results. It is proposed that these be set as the projected post-2000 average 10-year decline in groundwater levels, or the post-2015 low groundwater level at each well, whichever is lower, plus an additional 10% of the post-2000 range. The additional 10% reduction is determined on a well-by-well basis and creates a cushion below the 2015 groundwater levels to provide flexibility for water management while implementing projects to reduce demand or increase supply. Impacts to beneficial users at these MTs are currently being analyzed.