

5 GROUNDWATER CONDITIONS

5.5 Interconnected Surface Water

SGMA regulations define interconnected surface water as “surface water that is hydraulically connected at any point by a continuous saturated zone to the underlying aquifer and the overlying surface water is not completely depleted” (§351 (o)). SGMA requires that GSPs evaluate “impacts on groundwater dependent ecosystems.” (Water Code §10727.4(1)).

Groundwater dependent ecosystems (GDEs) are defined in the GSP regulations as “ecological communities or species that depend on groundwater emerging from aquifers or on groundwater occurring near the ground surface” (CCR § 351 (mm)). GDEs can be divided into two groups: plants and animals that depend on surface flow in streams (for example, fish, invertebrates, amphibians) and plants and animals that depend on a shallow water table accessible by plant roots (phreatophytic riparian vegetation and bird or other animal species that inhabit riparian vegetation). In this GSP, GDEs are discussed in the general category of interconnected surface water even though organisms in the second group strictly speaking rely only on a shallow water table, not surface flow in a stream.

Interconnection with stream flow occurs when the water table is near the stream bed elevation, and interconnection with riparian vegetation occurs when the water table is within the root zone, which generally extends to about 25 feet below the ground surface. These two elevation thresholds have different frequencies and durations of occurrence. Along some stream reaches, the water table might reach the stream bed elevation only when there is surface inflow and associated percolation. This connection might be present only during storm runoff events or seasonally in winter. In contrast, the water table may remain within the root zone for months even while water levels are seasonally declining. If the reach is in an area of regional groundwater discharge, the water table can be in the root zone most or all of the time. Thus, the duration of interconnection of groundwater with the riparian root zone is much greater than the duration of interconnection with surface flow in the stream.

In the Paso Robles Subbasin, major streams all overlie alluvial deposits, and interconnection is with alluvial groundwater. The alluvial deposits are relatively thin, and in some parts of the Basin there are extensive clay layers between the alluvium and the deeper aquifers of the Paso Robles Formation, where most pumping occurs. Accordingly, potential effects of pumping on interconnected surface water are evaluated in two steps: the effects of Paso Robles Formation pumping on alluvial groundwater levels, and the effects of alluvial groundwater levels on vegetation and stream flow. Pumping from the Alluvial Aquifer in the Basin is rare and generally occurs to meet domestic and limited livestock water demands. Large scale irrigation pumping from the Alluvial Aquifer does not typically occur in the Basin.

A generalized conceptual model of interconnection between surface water and groundwater in the Paso Robles Subbasin was articulated in SWRCB Decision 1585, issued in 1982 (SWRCB, 1982). The decision regarded a group of applications for surface diversions from tributaries to the Salinas River between Salinas Dam and the Nacimiento River. By that date, the SWRCB had already determined that groundwater in alluvial deposits along the Salinas River was classified as underflow subject to the rules of surface water appropriation. The Decision described hydrogeologic conditions and recharge processes in the Paso Robles Groundwater Basin, stating that there are “silty clays of low permeability existing within the upper portion of the Paso Robles Formation beneath and adjacent to the Salinas River alluvium... [that] appear to be sufficiently thick and extensive to act as a barrier separating underflow in the river alluvium from groundwater that occurs in the underlying older water-bearing formations.” The clays were noted to extend eastward to about the community of Estrella along the Estrella River and the community of Creston along Huer Huero Creek. Upstream of the clays, some percolation from the Estrella River and Huer Huero Creek may directly recharge the Paso Robles Formation.

This hydrogeological conceptual model suggests that groundwater pumping—the preponderance of which is from the Paso Robles Formation—could potentially lower alluvial groundwater levels and deplete stream flows upstream of the clay layers but have only a negligible effect on alluvial water levels and stream flows overlying the clay layers. An additional geographic variation in regional hydrology is that the western part of the watershed surrounding the Subbasin is much wetter than the eastern part. Average annual precipitation over the Coast Ranges along the western side of the watershed is about four times greater than precipitation along the eastern edge of the watershed. As a result, surface runoff into the Salinas River is substantially greater than surface runoff into the Estrella River. The combined effect of greater surface inflow and confining layers beneath the alluvium is to enable the Salinas River to maintain relatively steady groundwater levels in the Alluvial Aquifer that support the establishment and growth of riparian vegetation. Except during major droughts, river recharge has been able to outpace leakage across the confining layers, even after water levels in deep wells have declined. In contrast, some stream reaches in the eastern half of the Subbasin do not appear to be buffered from the effects of pumping. Over several decades, pumping has lowered groundwater levels in localized areas within the Paso Robles Formation Aquifer, which may have potentially depleted stream flow in the past and may have decreased the extent and health of riparian vegetation. Throughout the majority of the Basin, these conditions occurred prior to 2015, and subsequent pumping has not resulted in the depletion of stream flow. SGMA does not require that GDEs be restored to any condition that occurred prior to 2015.

The identification of interconnected stream reaches was based on a joint evaluation of multiple data sets related to interconnected surface water and GDEs, including precipitation, stream flow, groundwater levels, stream bed elevation, vegetation maps, aerial photographs of vegetation, satellite mapping of vegetation health, and results of groundwater modeling. A preponderance of evidence approach was used in delineating potentially interconnected stream reaches, including

subjective assessment of whether the frequency and duration of shallow water table conditions were sufficient to classify a reach as mostly or sometimes interconnected.

Many of the data used in the analysis pre-date 2015, which was the start of the SGMA management period. SGMA does not require that GDEs be restored to any condition that occurred prior to 2015. However, long-term data sets provide greater opportunity for differentiating the separate effects of variables that are often correlated. For example, precipitation, stream flow and groundwater levels are all potential sources of water for riparian vegetation, and all three are low during droughts. The extensive use of pre-2015 data in the analysis does not mean that this GSP intends to restore any conditions to a pre-2015 level.

Evaluation of the multiple data sets is summarized in subsections 5.5.1 through 5.5.4 below¹. Subsection 5.5.5 presents the delineated interconnected stream reaches while Subsection 5.5.6 addresses groundwater dependent animals.

5.5.1 Groundwater Levels

Historical measurements of groundwater levels in wells can be used to identify where and to what extent Alluvial Aquifer water levels are different from Paso Robles Formation Aquifer water levels. The approach used to identify Alluvial Aquifer wells for this interconnected surface water analysis is not the same as the well-log based approach used for the groundwater elevation analysis in Section 5.1.1. The water-level database compiled for the GSP was screened to select wells with long periods of record located near streams. Thirty-one wells met these criteria. For the interconnected surface water analysis, the wells were classified as Alluvial Aquifer or Paso Robles Formation Aquifer based on the historical water level patterns. In Alluvial Aquifer wells, water levels remain relatively steady year after year at an elevation close to that of the nearby stream, and seasonal fluctuations are small. In wells completed in the Paso Robles Formation Aquifer, water levels exhibit seasonal fluctuations, have multiple-year trends in some areas of the Basin and are commonly substantially lower (rarely higher) than the nearby stream. **Figure 5-14** shows sample hydrographs illustrating the two characteristic patterns.

Three of the five wells with an alluvial water table pattern are along the Salinas River, which is consistent with the conceptual model for interconnected surface water with the associated Alluvial Aquifer. One is near the Estrella River near the town of Estrella (Jardine Road), which the conceptual model suggests is still within the region of extensive clay layers beneath the alluvium. The final well is next to San Juan Creek about 7 miles upstream of Shandon. Its hydrograph is not as strongly alluvial, but the water levels are close to the creek bed elevation

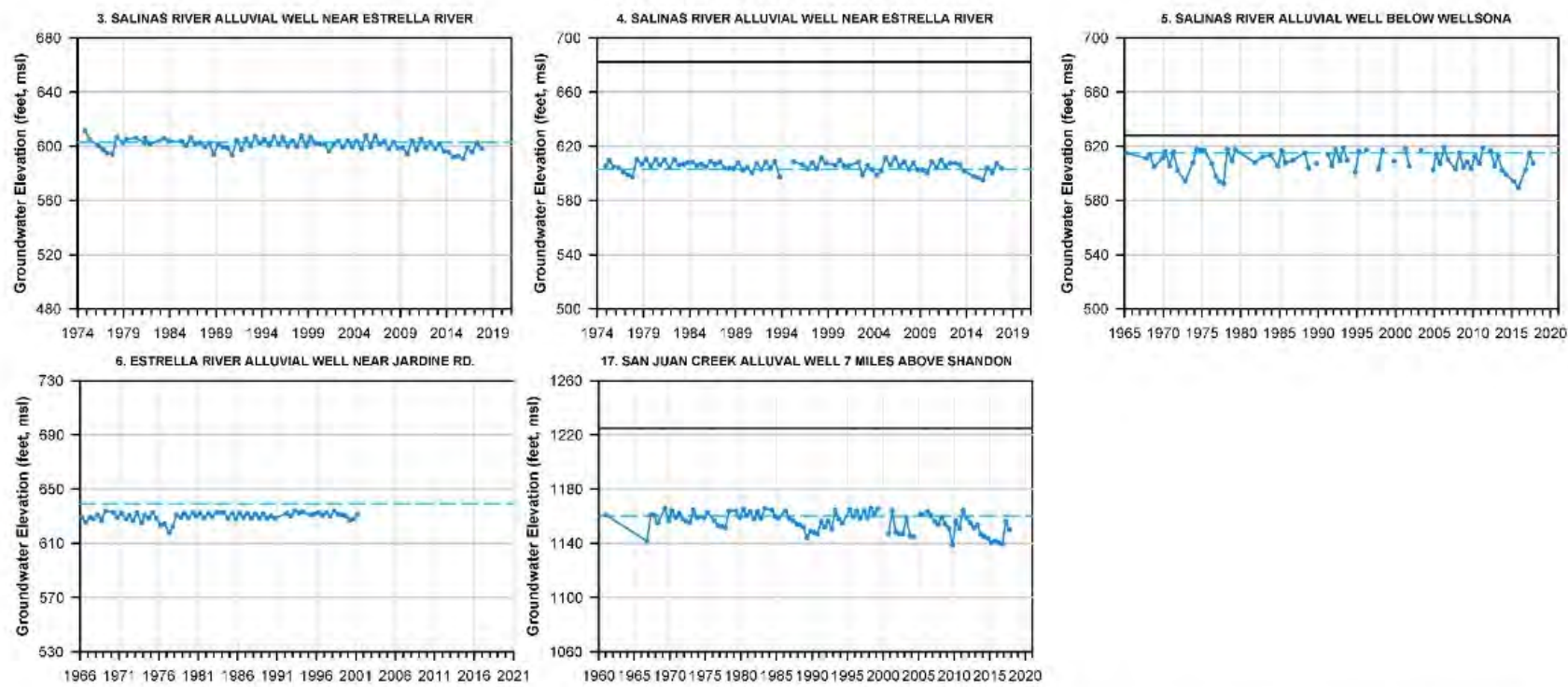
¹ Methodology for Identifying Groundwater Dependent Ecosystems (Reference Document)

and fairly steady. In either case, there is no evidence of surface water depletion as a consequence of pumping from the Paso Robles Formation Aquifer.

Two new pairs of monitoring wells installed in 2021 provided additional confirmation of the conceptual model (Cleath-Harris Geologists, 2021). One shallow-deep pair is next to the Salinas River at the 13th Street bridge. Water levels in both wells were within 3 feet of the riverbed elevation, indicating interconnection with surface water with the Alluvial Aquifer and a local absence of drawdown in the Paso Robles Formation Aquifer. The other pair was next to the Estrella River at Airport Road. These wells were constructed in 2021 as part of a Supplemental Environmental Project (SEP) which was implemented by the City of Paso Robles. This site is within the region where extensive shallow clay layers are thought to be present, and the water levels appear to confirm this. The shallower well was screened down to 40 feet below the ground surface and had a depth to water of 29.5 feet. The top of the screen in the second well was 160 feet deeper and its water level was 158 feet lower. This represents a vertical water-level gradient close to unity, which means the shallow aquifer is perched above the clay layers and there is an unsaturated zone between the shallow and deep aquifers.

It is recommended that pairs of shallow and deep monitoring wells be installed along the Estrella River upstream of Estrella and along San Juan Creek to provide a better understanding of the relationship between the Alluvial Aquifer and the underlying Paso Robles Formation Aquifer in these areas. Installation of additional monitoring wells is described in the monitoring discussion in Section 7.6.

ALLUVIAL WELL HYDROGRAPHS



PASO ROBLES WELL HYDROGRAPHS

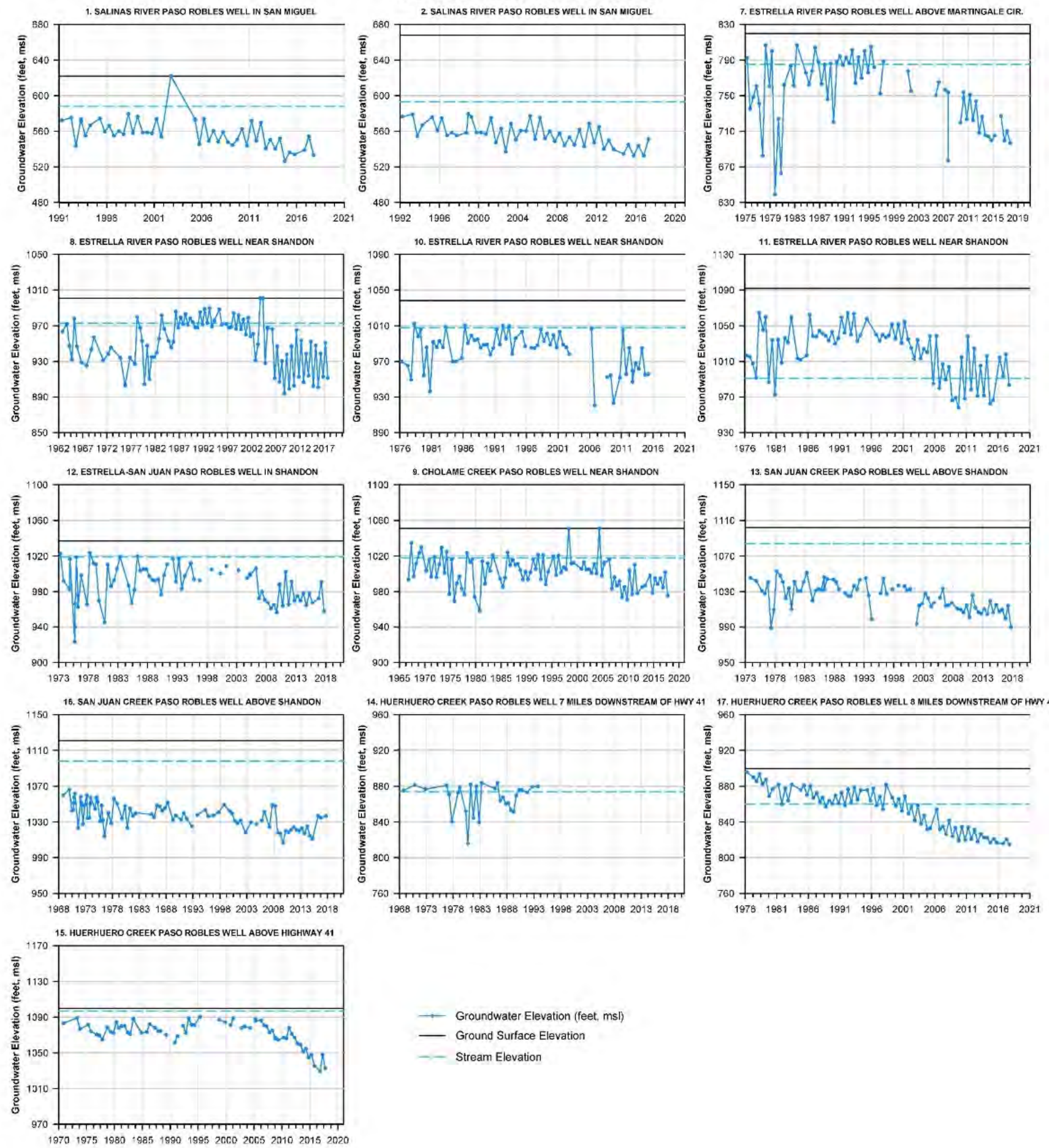
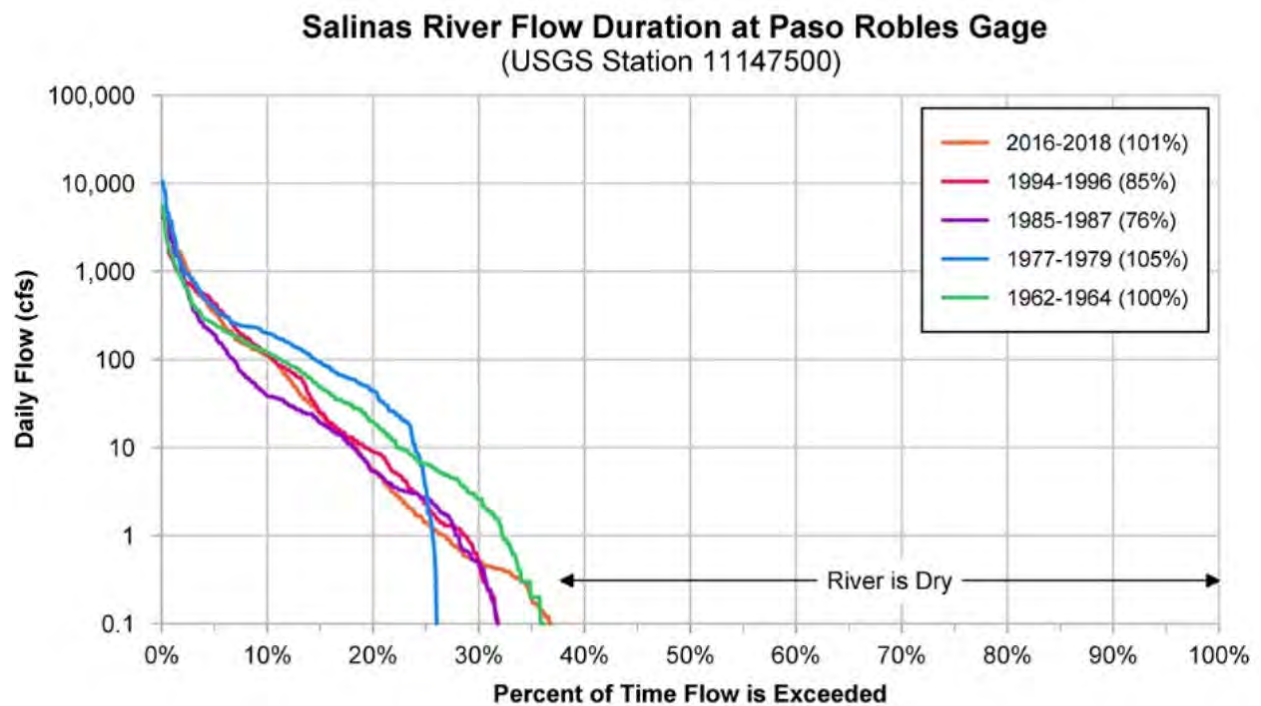
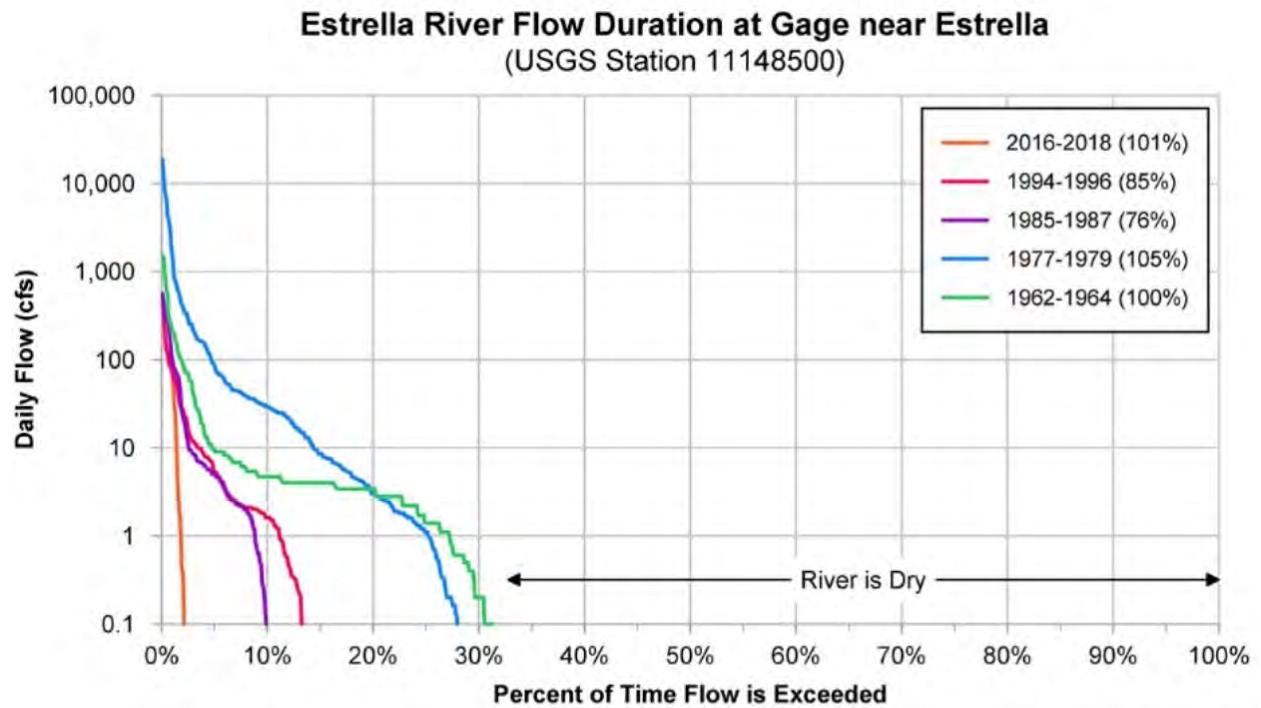


Figure 5-14. Alluvial and Paso Robles Well Hydrographs

5.5.2 Stream Flow

Differences between the low-flow regimes in the Salinas and Estrella Rivers are generally consistent with the hydrologic conceptual model and provide some evidence of flow depletion historically due to pumping along the Estrella River, although the flow record indicates that flow in the Estrella River are infrequent and typically only occur in response to seasonal wet weather conditions. Based on a review of the available stream flow records, any depletion of surface flow within the Estrella River occurred prior to 2015, and subsequent pumping has not resulted in the depletion of stream flow. SGMA does not require that GDEs be restored to any condition that occurred prior to 2015. The Salinas River gage is at Paso Robles, at the upstream edge of the Subbasin. Flows at that location do not reflect percolation or pumping effects within the Subbasin. The Estrella River gage is at Airport Road, and downstream of the reaches that may be potentially subject to impact by pumping. The gage was out of service from 1997-2015, but low-flow data for 2016-2018 was compared with data for 1955-1996.

Figure 5-15 shows flow-duration curves for both rivers for four three-year time intervals, roughly a decade apart from the 1960s to 2010s. Each curve displays all daily flows during a three-year period sorted from largest to smallest. The horizontal X axis shows the percentage of time each flow magnitude is exceeded. For perennial streams, the curves would extend across the entire width of the graph because flow exceeds zero 100 percent of the time. For seasonally intermittent streams, the curve bends down and crosses the X axis indicating the percentage of time flow is greater than zero. By plotting the vertical Y axis on a logarithmic scale, changes in low flows are visually expanded. If stream flow depletion is occurring, the effect is to curtail the duration of low flows (bend the curve downward) and shift the X axis intercept to the left.



Note: Percentages in legend indicate precipitation at Paso Robles as percent of 1910-2021 average

Figure 5-1. Flow-Duration Curves for Estrella and Salinas Rivers

As documented in **Figure 5-15**, low flows in the Estrella River have become progressively shorter in duration over the past five decades, indicated by the curves shifting progressively to the left. In contrast, the curves for the Salinas River have remained in a cluster, with no trend to the right or left. These curves suggest that flows upstream of the Estrella gage may have historically been interconnected with groundwater and subject to depletion by groundwater pumping and lowered groundwater levels. Based on a review of the available stream flow records, any depletion of surface flow within the Estrella River occurred prior to 2015, and subsequent pumping has not resulted in the depletion of stream flow. SGMA does not require that GDEs be restored to any condition that occurred prior to 2015.

Low flows and/or damp channel sediments visible in historical aerial photographs provide additional evidence of interconnection between surface water and groundwater. Along the Salinas River, flows as low as 5-8 cfs at the Paso Robles gage produced continuous surface flow all the way to the Nacimiento River, indicating negligible percolation due to a high water table. At other times, flow became discontinuous even when flow at the gage was considerably higher, probably indicating refilling of the Alluvial Aquifer after a period without surface flow.

Aerial photographs indicate a potential for variable interconnection along the Estrella River upstream of the gage. Open water or ribbons of very damp soil along the channel were commonly present at various locations from about 4 miles upstream of Whitley Gardens to about 0.5 mile downstream of Whitley Gardens and along about a 1-mile reach near Martingale Circle (about 5 channel miles downstream of Whitley Gardens) prior to 2012. This reach is referred to in this analysis as the “middle reach” of the Estrella River. Since 2012, those apparent gaining conditions along the middle reach have not been visible in dry season air photos, possibly due to the 2012-2016 drought or to long-term declines in groundwater levels. No efforts were made to ground truth or physically verify the presence of these features and there is no evidence that pumping from the Paso Robles Formation Aquifer is affecting these areas, although it is recommended that additional investigations be undertaken to further characterize this area.

5.5.3 Riparian Vegetation

Vegetation patterns along streams can also be used to map potential interconnection of surface water and groundwater because growth is more vigorous where plant roots can reach the water table. There are limitations to this approach, however. First, some plant species are facultative phreatophytes, which means they will establish and grow with or without continuous access to the water table. A second limitation is that riparian vegetation in shallow water table areas is subject to mechanical removal by flood scour. In spite of these limitations, broad patches of dense riparian vegetation stand out in aerial photographs and provide an indication of where the water table is shallow and interconnected with the root zone and possibly also the stream channel.

A source of vegetation mapping often used for preparing GSPs is the Natural Communities Commonly Associated with Groundwater (NCCAG) mapping provided in georeferenced digital formats on DWR's SGMA Data Portal. The NCCAG maps of potential riparian and wetland vegetation are statewide compilations of numerous local vegetation mapping studies, mostly from the early 2000s. However, a detailed comparison of vegetation and wetland polygons in the NCCAG maps with aerial photographs revealed that the accuracy of the NCCAG vegetation delineations is poor in the Subbasin².

For the purposes of the interconnected surface water analysis for this GSP, a new map of riparian and wetland vegetation was created by digitally outlining areas of visibly dense riparian trees or shrubs more than about 50 feet wide along river and creek channels based on May 2017 aerial photography. The photography represents non-drought conditions in a year close to the start of the SGMA management era (January 2015). For isolated wetlands, mapped polygons in the NCCAG data set were compared with the 2017 aerial photographs and retained as potential groundwater dependent wetlands if they exhibited open water or bright green herbaceous vegetation in the dry season and were natural features (as opposed to constructed stock ponds).

The resulting map of groundwater-dependent vegetation is shown in **Figure 5-16**. In-channel riparian and wetland vegetation is mapped as polygons accurately delineating the perimeter of the vegetation patch. Isolated wetlands are shown using symbols because many of them would otherwise be too small to see on a basin-scale map. The vegetation distribution is generally consistent with the conceptual model for interconnected surface water. Dense riparian vegetation is most abundant along the Salinas River, which has relatively large and persistent surface flows as well as consistently shallow depth to groundwater in the adjacent Alluvial Aquifer. These conditions also result in a relatively high abundance of in-channel wetlands. Riparian vegetation along the Estrella River is generally sparser but is more abundant along the middle reach than the upper and lower reaches. Patches of sparse and dense riparian vegetation and even potential wetlands are present along San Juan Creek at locations more than about 10 miles upstream of Shandon. No efforts were made to ground truth or physically verify the presence of these features and there is no evidence that pumping from the Paso Robles Formation Aquifer is affecting these areas.

² Methodology for Identifying Groundwater Dependent Ecosystems (Reference Document)

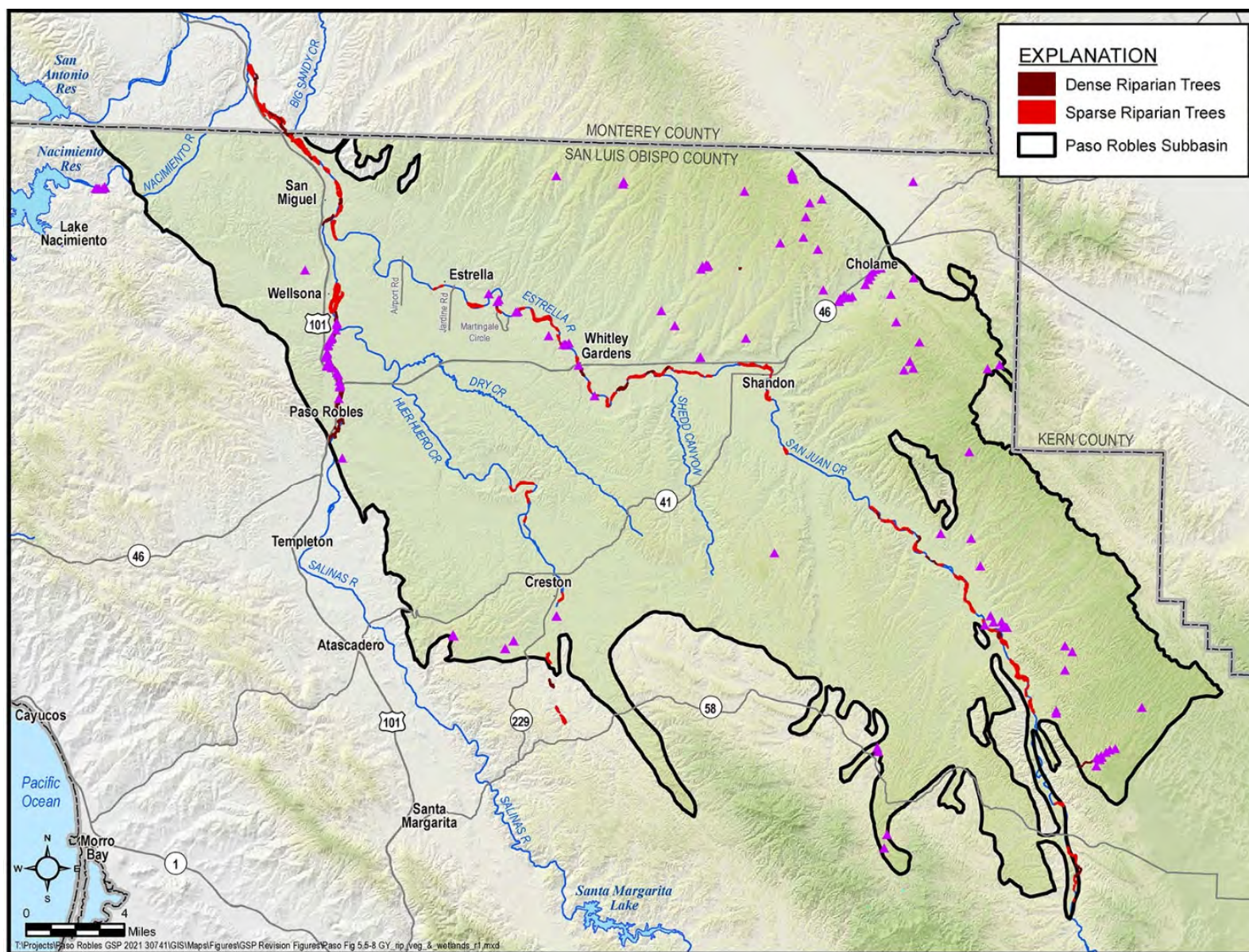


Figure 5-26. Groundwater-Dependent Vegetation in Paso Robles Subbasin

Riparian vegetation conditions in 2018 was compared with conditions in 1994 along the entire lengths of the Salinas River, Estrella River, Huer Huero Creek and San Juan Creek using aerial photographs. Both of those dates were 2-4 years after the end of a major drought, and the droughts were of similar intensity and duration. In other words, precipitation and stream flow conditions during the years immediately preceding the two photographs were similar, but groundwater levels were different. Between those two periods, there were cumulative water-level declines in Paso Robles Formation Aquifer wells of 25-70 feet in the eastern part of the Subbasin. Water levels in Alluvial Aquifer wells along the Salinas River remained stable until 2011, declined 12-18 feet during 2012-2016 and then recovered (see **Figure 5-14**). The density and extent of patches of riparian vegetation along the waterways in 2018 was visually classified as “more”, “the same” or “less” than in 1994.

The results of the vegetation comparison are shown in **Figure 5-17**. Where there were differences along the Salinas River, they were all decreases in vegetation coverage. Review of additional photographs between 1994 and 2018 indicated that the decrease in vegetation occurred almost entirely during 2013-2017. This suggests that the relatively small and temporary declines in alluvial water levels during 2012-2016 were large enough to adversely impact vegetation. Along the Estrella River, vegetation coverage mostly declined near Shandon and along the downstream end toward the Salinas River, and the declines occurred over a longer period. Along the middle reach, however, vegetation coverage unexpectedly increased in a number of locations. This is the same river segment where evidence of gaining flow could be seen in aerial photographs up until 2012, indicating a near-surface water table. Although that river segment is thought to be east of the extensive near-surface clay layers in the Paso Robles Formation Aquifer, some aspect of hydrogeology and recharge appears to be sustaining a high water table in spite of large water-level declines in deeper wells in that region. No efforts were made to ground truth or physically verify the river geology in this area and additional investigations would be required to further characterize this area.

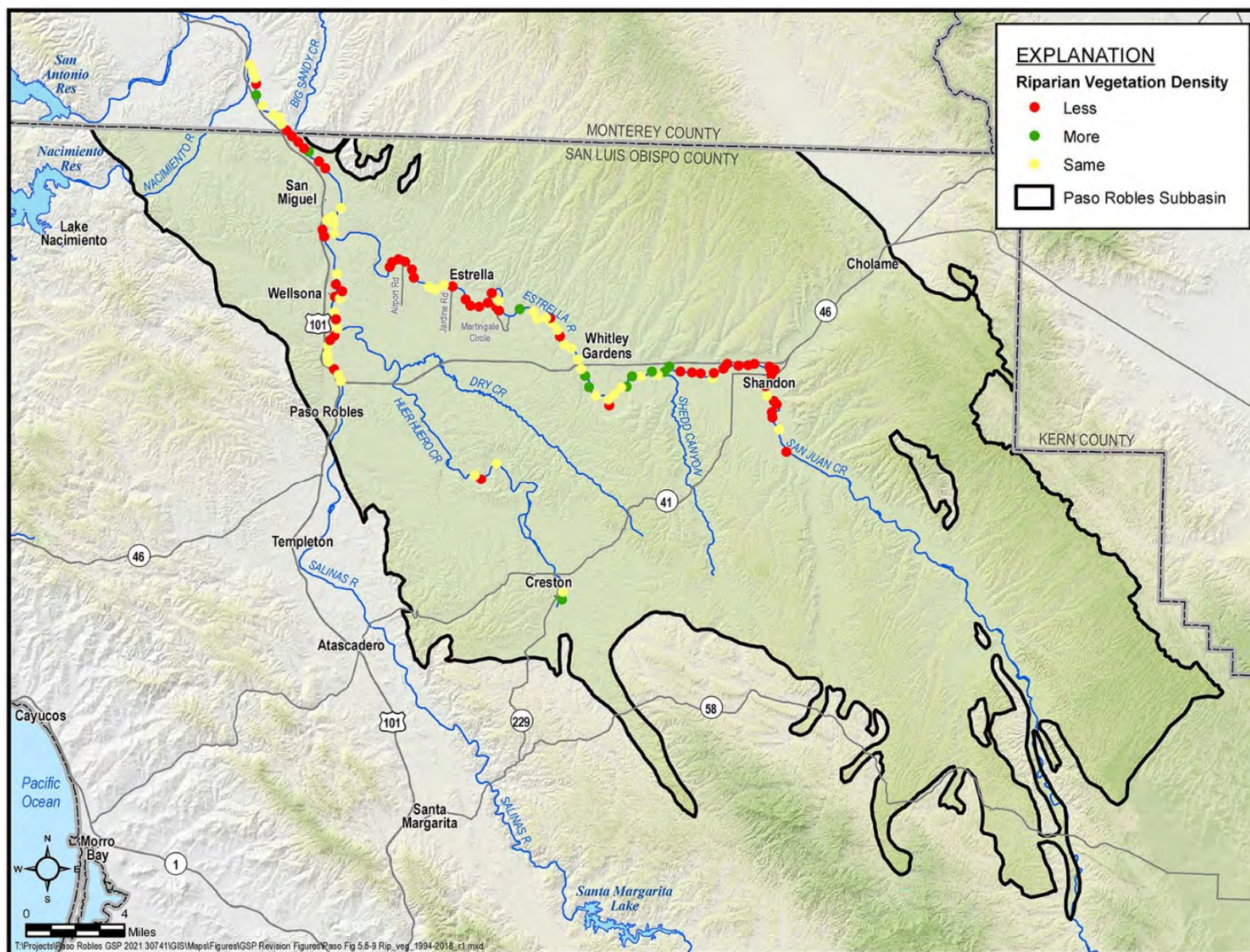


Figure 5-37. Density of Riparian Vegetation, Paso Robles Subbasin

Additional vegetation data were evaluated for indications of changes related to groundwater levels³. Briefly, high-resolution aerial photographs for 2013 and 2017 were inspected to identify four limited locations where riparian trees appear to have died during the recent drought. These locations generally occur where Paso Robles Formation Aquifer groundwater levels had been declining for a few decades or where Alluvial Aquifer groundwater levels declined by over 10 feet for a few years between 2013 and 2017.

An Enhanced Vegetation Index (EVI) trend analysis was performed for the sparse and dense riparian vegetation areas presented on Figure 5-16 for the purpose of identifying and evaluating trends in riparian vegetation health as an indicator of potential long-term trends in surface water-groundwater interactions within stream reaches. EVI data provide an indicator of healthy, well-watered vegetation. It is calculated from the proportions of visible and near-infrared sunlight reflected by vegetation. EVI values typically range from zero to over 0.7. Healthy, or well-watered, vegetation absorbs most of the visible light that hits it and reflects a large portion of near-infrared light, resulting in a high EVI value. Unhealthy, dry, or dormant vegetation reflects more visible light and less near-infrared light, leading to a lower EVI value.

The EVI analysis was processed in Climate Engine⁴ using Landsat data from January 2009 through present. This analysis period is considered representative of recent hydrologic conditions as it begins and ends with similar hydrologic conditions and includes dry, wet, and average periods. The results of this study indicate that riparian vegetation health has generally remained stable over the analysis period suggesting that Alluvial Aquifer groundwater levels have remained a reliable water source within the rooting zone depth of the established riparian communities. Observed cyclical patterns of increasing and decreasing riparian vegetation health correlate strongly with water year type indicating that water levels in the Alluvial Aquifer operate independently from the long-term declining water levels induced by groundwater pumping in the underlying Paso Robles Formation Aquifer⁵.

5.5.4 Simulated Groundwater-Surface Water Interconnection

Results of groundwater modeling provide additional clues regarding the location and timing of interconnected surface water. Stream cells where annual groundwater discharge from the Alluvial Aquifers into the stream averaged 10 AFY or more are shown on **Figure 4-17**. Those locations included the Salinas River above Huer Huero Creek and along a 3-mile reach below San Miguel. They also included the middle reach of the Estrella River. Those locations are

³ Methodology for Identifying Groundwater Dependent Ecosystems (Reference Document)

⁴ Climate Engine (Huntington et al., 2017) is an online tool for cloud computing of climate and remote sensing data powered by Google Earth Engine (Gorelick et al., 2017) (<https://app.climateengine.org/climateEngine>)

⁵ Paso Robles Basin Riparian Health Trend Analysis as an Indicator of SW-GW Interaction, GSI, (Reference Document)

consistent with the water level and vegetation data presented above. However, the model also had gaining stream reaches along Huer Huero Creek and parts of the upper reach of the Estrella River (from Shandon down to Shedd Canyon), where historical vegetation does not indicate the presence of shallow groundwater. This might indicate a bias in modeling results toward slightly high Alluvial Aquifer groundwater levels along those rivers. Conversely, the model did not simulate gaining flow where the San Juan Fault crosses San Juan Creek, where a perennial spring is located in the channel.

The locations of simulated gaining and losing reaches were also compared for 1998 and 2016, representing years with relatively high and low groundwater levels, respectively. The locations of simulated gaining reaches in 1998 closely matched the locations of simulated groundwater inflow shown in **Figure 4-17**. As expected, the lengths of the gaining reaches were much shorter in 2016 but still included part of the middle reach of the Estrella River near Whitley Gardens, where a dense patch of riparian vegetation is present.

5.5.5 Delineation of Interconnected Surface Water

Stream reaches where groundwater may potentially be interconnected with surface flow or the riparian vegetation root zone are shown in **Figure 5-18**. The delineation is based on an interpretation of the data and analyses described in the preceding sections. This involved some subjective assessments such as differentiating “dense” from “sparse” riparian vegetation or estimating how frequent and persistent interconnection may be designated “interconnected”. Along stream channels, two categories of interconnection were assigned: interconnection with surface water and interconnection with riparian vegetation. The former requires higher water levels and typically occurs less frequently or for shorter periods of time. The latter includes areas where the water table is less than about 25 feet below the stream bed most of the time. Empirically, this is the root zone depth associated with the presence of dense riparian vegetation. These considerations are discussed by stream reach below. No efforts were made to ground truth or physically verify the presence of actual interconnection and there is no evidence that pumping from the Paso Robles is affecting these areas.

The entire length of the Salinas River from Paso Robles to the confluence with the Nacimiento River was classified as interconnected with surface water and shallow groundwater in the Alluvial Aquifer. The presence of very stable water levels close to the riverbed elevation in all Alluvial Aquifer wells along that reach supports this designation, as does the presence of sparse to dense riparian vegetation along most of the reach. Even small inflows to the upper end of the reach commonly extend along the entire length of the reach, which also indicates that the water table is at or near the riverbed elevation along the entire length of the reach. There is no evidence that pumping from the Paso Robles is affecting these areas.

The Estrella River below Estrella (near Jardine Road) was classified as not interconnected. This classification reflects the very small amount of riparian vegetation along the entire reach throughout the analysis period (1989-2021). Although shallow clay layers are thought to be present in this area and the new shallow monitoring well at Airport Road confirms the presence of a water table 30 feet below the ground surface, this depth to water appears to be too great for vegetation to readily establish given the low frequency and duration of surface flow in the river.

The middle reach of the Estrella River, from Jardine Road up to Shedd Canyon contains alternating segments that appear to be not connected or are potentially connected to the vegetation root zone. These segments were classified primarily on the density of riparian vegetation. The only confirmation of groundwater levels is at a single well near the downstream end of the middle reach, where the depth to water was consistently about 10 feet below the riverbed. Emergent flow appeared to be present in some dry-season aerial photographs along a segment below Shedd Canyon, about 2.5 to 4 miles upstream of Highway 46. Open water or wet channel sediments appear to be present in some aerial photos in winter or spring but not during the dry season since about 2012. Thus, that segment was not classified as interconnected with surface water as of the start of the SGMA management period (2015).

The Estrella River from Shedd Canyon up to Shandon and the lowermost 10 miles of San Juan Creek were classified as not interconnected. Although sparse riparian vegetation is present in places, the depth to groundwater in Paso Robles Formation Aquifer wells has been declining for decades and now exceeds the rooting depth of riparian vegetation. The vegetation that remains probably consists of facultative phreatophytes or is vestigial mature vegetation that has managed to survive declining water levels. In any case, recruitment of new phreatophytic riparian vegetation is very unlikely under current conditions. Many of the data used in the analysis pre-date 2015, which was the start of the SGMA management period. SGMA does not require that GDEs be restored to any condition that occurred prior to 2015.

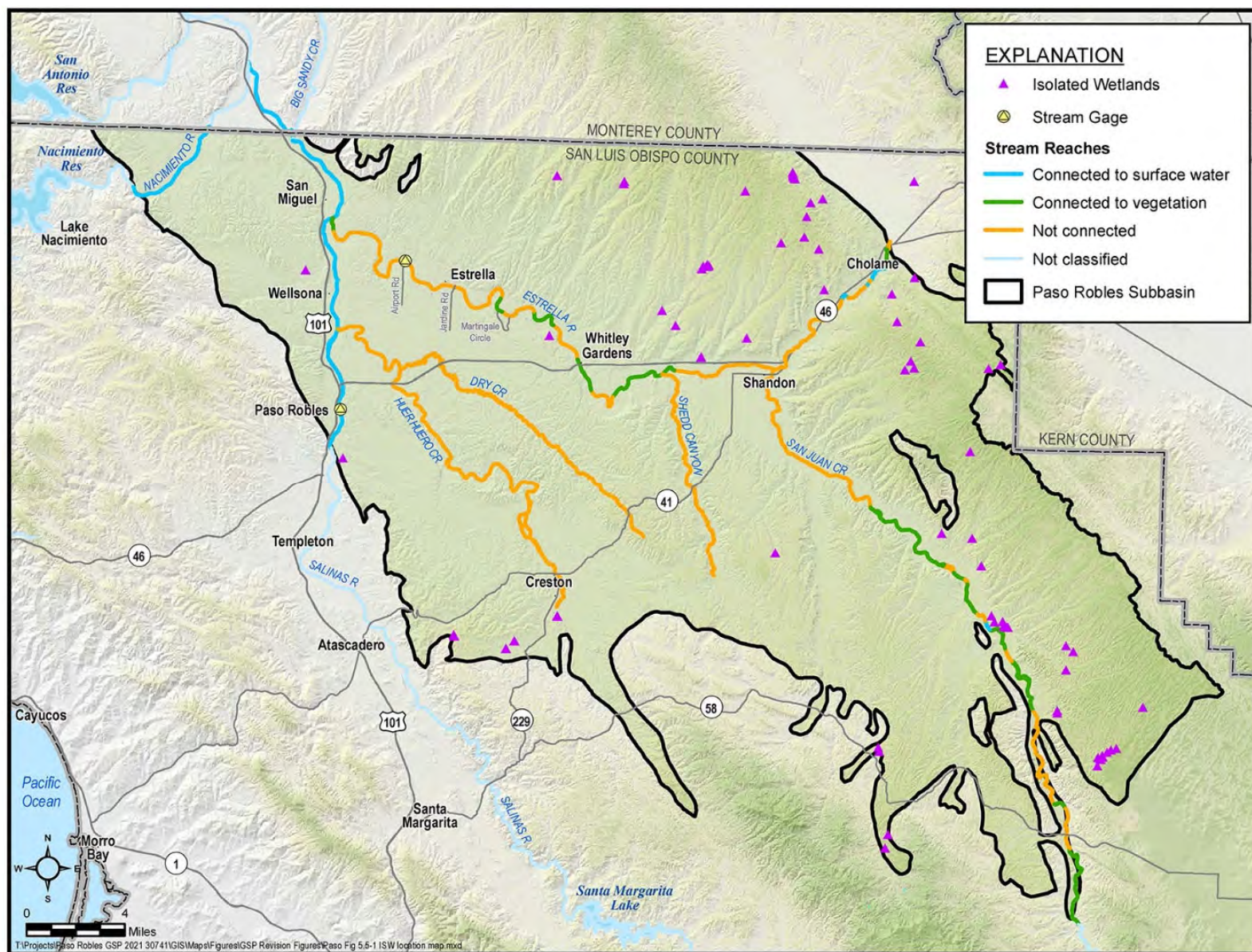


Figure 5-48. Locations of Potential Interconnection Between Groundwater and Surface Water

Much of San Juan Creek more than 10 miles upstream of Shandon appears to be potentially interconnected to riparian vegetation based on the presence of sparse or dense vegetation along most of the reach. One short reach where the San Juan Fault crosses the creek was classified as interconnected to surface water because it usually has emerging groundwater along a low-flow channel bordered by wetland vegetation. The one well with water-level data along this reach has water levels that are usually within 10 feet of the creek bed elevation.

The lowermost 5 miles of Cholame Creek were delineated as not connected based on the absence of significant riparian vegetation and water levels in the sole monitoring well that average about 30 feet below the ground surface. Farther up the creek, however, is a reach several miles long that has open water or wetland vegetation in most historical aerial photographs. Shallow groundwater along that reach could be caused by faults that pass through the area (see Figure 4-4). For unknown reasons, the shallow water table and surface flow conditions have not caused the establishment of dense riparian vegetation.

Riparian vegetation is generally absent along Huer Huero Creek, Dry Creek and Shedd Canyon and is typically sparse where it is present. The depth to water in wells in those parts of the Subbasin is uniformly too deep to support riparian vegetation. Accordingly, those waterways were all classified as not connected to groundwater.

The reach of the Nacimiento River that traverses the northwest corner of the Subbasin was classified as interconnected to surface water because reservoir releases during the dry season are more than sufficient to sustain a high water table adjacent to the river. That reach is far from major pumping centers in the Paso Robles Subbasin and hence unlikely to be significantly depleted by pumping.

Isolated, off-channel wetlands shown on the interconnected surface water map (Figure 5-14) are the subset of the NCCAG wetlands where distinctly green vegetation was visible in dry season aerial photographs and the feature appeared to be a natural depression, not a constructed stockpond. These areas are not considered to be connected to groundwater and are not subject to depletion by pumping.

5.5.6 Groundwater Dependent Animals

Many fish and wildlife species use aquatic and riparian habitats that are supported by groundwater. For the purpose of this GSP, beneficial use for habitat is limited to native species present in the Subbasin as of 2015, when SGMA took effect. The focus was on species that are state or federally listed as threatened, endangered or of special concern. This implicitly assumes that non-listed species will probably also be sustained if hydrologic conditions are suitable for sustaining the rarer species.

The reference document entitled Methodology for Identifying Groundwater Dependent Ecosystems documents a review of several sources of habitat information. Those sources often disagreed regarding which species are present within the Paso Robles Subbasin. For GSP purposes, it was concluded that animals that depend on riparian vegetation will probably be in good condition if the vegetation is in good condition. The one listed aquatic species seasonally present in streams that cross the Subbasin is southern steelhead which migrates up and down the Salinas River in winter and spring. Analysis in the above-mentioned reference document shows that groundwater pumping does not materially impact passage opportunity for steelhead because passage is only possible during relatively high flows and pumping from the Paso Robles Formation Aquifer has little effect on Salinas River flows because of clay layers beneath the alluvium along the Salinas River.