Stream and Well Impact Considerations and Options;

including Review for CEQA, Well Interference and Sustainability

Recent court actions and state directives have resulted in a need to take into consideration the following factors when issuing well permits:

- Impact to surface water flow and related public trust values
- Impact to nearby wells (subsidence is not an issue in Santa Cruz County)
- Consistency with applicable groundwater sustainability plans
- Applicability of the California Environmental Quality Act (CEQA) when there are discretionary aspects of well permit approval.

The current update of the Santa Cruz County well ordinance is proposed to address these factors in a way that is adequately protective of groundwater and surface water resources and that creates minimal additional burden on staff and applicants, particularly for de minimis wells and replacement wells. Staff propose a tiered approach to address these factors in the evaluation and approval of well permits. To better inform this process, staff have reviewed and summarized background information from local groundwater sustainability plans and other sources that relate to wells and surface water interactions.

Background and Current Conditions

1. Recent Court actions considered public trust values to be related to navigable waterways. Although both the San Lorenzo River and Soquel Creek could be considered navigable at times, it is more practical and protective to consider that all streams have public trust values, providing flow that supports steelhead, coho salmon, and other species (see figures for map of fish bearing streams). Even if a stream is not fish-bearing, its flow may contribute to the habitat value of downstream fish-bearing streams. Of particular importance locally is the objective to provide dry period flow for fish-rearing and maintenance of temperature and other water quality parameters. Following are particular areas of concern for protecting streamflow and dependent resources, where flow could be impacted by groundwater pumping:
    - Soquel Creek, a steelhead stream and coho recovery stream, potentially has lost 33% of median dry season flow due to cumulative basin groundwater pumping.

- Bean Creek, which potentially has lost 18% of median dry season flow and is very sensitive to pumping from the Santa Margarita aquifer. It is a steelhead stream and has historically supported coho.

2. There are three ways that wells can impact streamflow:
    - Cumulative impacts of total pumping in a groundwater basin, resulting in a general lowering of groundwater levels and reduction in streamflow by reduced groundwater contribution to streamflow and/or induced recharge from the stream to groundwater. If the groundwater level drops so far that the stream is no longer hydraulically connected, the stream will continue to lose flow to percolation, but the rate of loss will not be further related to the amount of groundwater pumping. The amount of depletion is best assessed through groundwater modelling.
    - In areas with a relatively flat groundwater gradient and permeable material, the cone of depression from a pumping well may extend to the stream and the pumping well actually draws water from stream causing acute depletion. The amount of potential depletion can be calculated with streamflow depletion equations.
    - A well may intercept and reduce groundwater flow that would otherwise contribute to the stream. This is the most likely mechanism in more mountainous rural areas of the county with de minimis wells. The amount of depletion can be estimated by calculating a water budget for the basin and deducting the amount extracted by groundwater pumping. Gradient, permeability, and evapotranspiration are also factors affecting the amount of groundwater reaching a stream.

3. Santa Cruz County has three groundwater basins designated as medium or high priority by the State. Groundwater sustainability plans (GSPs) have been developed and approved by the State for all 3 basins. The number of wells and estimated water use within each basin and the rest of the county are shown in the following table (Also see figures for well locations and GSA boundaries):

GSA Basin	**Well Records****		**Water Use (af/yr)**		**Well Permits (2018-23)**	
PAJARO VALLEY*	2,301	20%	24,300	70%	42	21%
MID-COUNTY	2,497	21%	5,200	15%	40	20%
SANTA MARGARITA	1,260	11%	3,000	9%	13	7%

Outside GSA Basins	5,626	48%	2,000	6%	102	52%
Total	11,684		34,500		197	

*Note: Well records and water use are for the Santa Cruz County portion of the Pajaro basin.
** Well records are from County and DWR and may underestimate total existing wells by 10-20%

4. The GSPs anticipate some future reduction in water use through increased water efficiency and implementation of various management measures, but none of the GSPs propose restrictions on new wells or mandate reductions in pumping from existing wells.
   a. The Basin Management Plan for Pajaro Valley projects that rural residential pumping would remain the same and that agricultural pumping would decline as a result of water conservation and additional sources of water. Municipal pumping would increase 22% by 2069 as a result of population growth (note that municipal pumping is done within the City of Watsonville which is outside the jurisdiction of this Well Ordinance).
   b. The GSP for the Santa Cruz Mid-County Groundwater Basin projects no future increase in institutional or agricultural pumping and a slight increase in rural domestic pumping (use of 0.35 af/yr/unit and population increase of 2.1-4.2%/yr (actual increase has been 0.2%/yr)). Municipal demand would remain flat.
   c. The GSP for the Santa Margarita Basin projects no significant net increase in future pumping for any sector.

5. Although groundwater pumping has decreased and is projected to decrease further in the basins, historical pumping has resulted in reductions in streamflow, as indicated by modelled water budgets and observed groundwater levels (see figures for maps of interconnected surface water):
   a. Historical overdraft in the Pajaro Valley has lowered groundwater levels to the extent that there is no hydraulic connection between underlying groundwater and surface water in most of the basin. The GSP concludes there is no potential for further depletion of interconnected surface water, but it does include a measurable objective to increase the extent and frequency of connectedness "where reasonably achievable."
   b. For the Mid-County Basin, most streams in the basin except Trout Gulch and middle Valencia Creek are considered to be hydraulically interconnected to

groundwater more than 5% of the time. There have been many efforts to estimate the amount of depletion of groundwater flow to Soquel Creek based on flow records, pumping records and measured groundwater levels. However, it has been challenging, given that measured flow is very much influenced by other factors, including seasonal rainfall and riparian evapotranspiration. It has been suggested that amounts of depletion less than 0.5 cfs can probably not be measured.

Groundwater modelling for the basin suggested that the potential surface water depletion from groundwater pumping could be as much as 1.4 cfs, or 33% of the estimated median dry season flow without groundwater depletion (4.3 cfs) (see Flow Table). This depletion is primarily a result of cumulative impacts of municipal pumping, with the groundwater level observed to be drawn down below the stream level at times in the lower reaches of Soquel Creek and measured losses in flow from upstream to downstream during dry periods. Modelling indicated that eliminating all the inland non-municipal pumping would only increase flow by 0.1 cfs and moving pumping up from the deeper zone into the shallow alluvial zone would reduce flow by an additional 0.1 cfs. Eliminating all non-municipal pumping in Soquel Valley and Bates Creek valley would increase Soquel flow by 0.15 cfs. Rural non-municipal pumping is thus only reducing median dry season flow by 5% (which is considered low depletion in the Sonoma County approach (Kobor and O'Connor, 2023)) and less than the 10% presumptive standard suggested by Gleeson and Richter (2017).

It should be noted that the MGA GSP includes measures that will significantly increase groundwater levels under Soquel Creek within the next few years and should result in increased groundwater contribution to surface flow. Additional monitoring of flow and shallow groundwater levels is also being done to better characterize groundwater/surface water interactions along Soquel Creek. In the Natural Flows Database, observed dry season median flows in Soquel Creek are 7% less than estimated natural flows, but observed 10 percentile flows are 65% less than the 10th percentile estimated natural flows. It should be noted that Soquel Creek has numerous riparian stream diversions and surface water rights have been fully adjudicated. Periodically drops in flow from diversions appear to amount to 0.5-0.7 cfs. It was estimated that total surface water demand in Soquel Creek above Bates Creek was 267 af/yr (0.7 cfs in 6 months, RCDSCC, 2019).

c. Practically all streams in the Santa Margarita Basin are considered to be interconnected to groundwater. Groundwater modelling suggests that if there was no groundwater pumping, an additional 1000 af/yr (1.4 cfs) would be released to surface water. In Bean Creek, the flow would increase by 0.5 cfs, about 18% of the modelled unimpaired dry season flow. The majority of the pumping impact is from municipal pumping. (Only 8% of the pumping in the Santa Margarita Basin is attributable to non de minimis wells.) More shallow monitoring wells are being installed to better characterize groundwater/surface water interactions. (Measured flows in Bean Creek are currently more than 300% of the estimated dry season natural flows from the Natural Flows Database.)

6. Although SGMA and the current County code utilize a cut-off of 2 af/yr for de minimis wells, the average amount of water used is much less, typically 0.3-0.5 af/yr, based on metered records from rural small water systems and metering on some individual wells. A significant amount of water pumped by rural domestic users is returned to the basin as shallow recharge through onsite wastewater disposal. The GSP for the MGA estimated that 70% of rural domestic pumping was for indoor use and that 90% of that returned to the basin as shallow recharge. With the typical domestic user pumping 0.35 af/yr, 0.22 af would be returned to the basin, for a net consumptive withdrawal of 0.13 af/yr/unit. The return flow is also released at a shallower depth than the well extracts from, making it more available for the creeks. A review of 62 permits issued for non de minimis agricultural wells, showed that the average amount of pumping was 50 af/yr, with a maximum of 224 af/yr and a median of 28 af/yr.

7. Most rural areas of the county outside the Pajaro Valley are characterized by variable non-alluvial dipping geology with steep surface slopes and sloping groundwater gradients. This makes assessing any potential for well interference in many areas challenging and not very useful. Most newer domestic wells are 150-300 ft deep and very few draw from alluvial materials. There was a significant occurrence of older, shallow wells going dry in the droughts of 1976-77 and 1987-92, but very limited and scattered reports of wells going dry in recent drought periods. The State dry well database shows no reports of dry wells in Santa Cruz County going back to 2013. In the last five years, only 7% of wells drilled are less than 200 feet deep and 73% are deeper than 300 feet.

8. Moore Creek is an example of a typical rural basin with significant de minimis groundwater use. It is a 1.5 square mile basin that drains to Soquel Creek, with a measured late dry season flow of 0.15-0.3 cfs, for dry and wet years, respectively. (The Natural Flows database estimates a natural dry season flow range of 0.05 cfs (10^{th} percentile) to 0.45 cfs (90^{th} percentile).) The basin is mostly underlain by the Purisima AA unit, with groundwater depth increasing from 10 ft near the stream to 40 ft on the midslopes to 100 ft near the ridgetops. The basin includes 105 rural dwelling units, with landscaping, vegetable gardens, and some livestock. It also has a small public water system serving an institutional facility that extracts 2 af/yr. Well density in Moore Creek watershed is 70 units/sq.mi., compared to a maximum density of 52/sq.mi. in parts of Santa Margarita and 144/sq.mi. in parts of Mid-County (see figures). Well density would not be expected to change significantly in the future, as the area is at least 90% built out. Applying the water use factors and return flow estimates used in the MGA GSP, total consumptive indoor water use would be 0.225 af/month and total outdoor water use would be 1.75 af/month during the 6-month summer period. That would amount to 2 af/month in the driest month of September, or 0.03 cfs., 9-14% of the measured dry season streamflow. Applying the Sonoma County method of estimating streamflow depletion, groundwater use divided by recharge equals 8%, which is comparable to a July-September streamflow depletion rate of 14%, which is considered medium depletion and is less than the 20% depletion considered adverse for steelhead streams (Kobor and O'Connor, 2023). It should also be noted that not all of the 0.03 cfs that is being intercepted by groundwater pumping would become streamflow, as a portion would be lost to riparian evapotranspiration.

9. From 1987 to 2009, well permits in Santa Cruz County were subject to CEQA review, although the majority qualified for exemptions as small wells or replacement wells. Since 2009, well permits are only discretionary if other discretionary approvals are required for the project or if the well will serve a public water system with more than 199 connections.

10. The County has promoted the use of wells for irrigation on properties with active riparian water rights, as a less-detrimental alternative to direct diversion. Any attempts to make well permitting more expensive and onerous may drive streamside property owners to switch back to surface water for irrigation.

Conclusions Relative to Well Permitting:

- Current county well standards already specify a minimum 50 ft well seal, 50 ft setback from a creek, and wells should be located outside of flood plains and riparian woodlands. Well seals are nearly always much deeper and are required to be deeper in Pajaro Valley where single zone completion is required. Water efficiency measures are required for all non-de minimis wells. Well permit applications are sent to affected water agencies, including GSAs, for review and comment.
- Most of the current impact on streamflow in Santa Cruz County is a result of cumulative impact of basin-wide pumping, which is mostly municipal and agricultural. De minimis pumping has had limited impact on streamflow, with some moderate impact in parts of the county. Additional impacts will be negligible, as indicated by the very limited amount of new development occurring in rural areas (10 permits/year for new domestic wells).
- Based on the GSPs, new de minimis wells and non-de minimis replacement/supplemental wells with no significant increase in groundwater use are consistent with the GSPs and will have minimal impact on basin sustainability. These can be treated ministerially, with some standard requirements to reduce or mitigate impacts on streams and other wells, such as increased separation and deeper seals.
- Non-de minimis wells serving new uses were not factored into the GSPs and should require a higher level of evaluation and potential mitigation.

Proposed Options for Tiered Evaluation/Mitigation of Wells near Streams and Wells

Applicable Streams:

- Require some level of mitigation/evaluation for all wells near all streams?
- Exempt wells near streams that do not flow into fish-bearing streams (e.g. Rodeo Gulch)?
- Exempt wells near streams or reaches that are hydraulically connected to groundwater less than 5% of the time (e.g. lower Valencia Creek, lower Corralitos)?

Tier 1: (New and replacement de minimis wells)

- Exempt? (Sonoma) NOTE: if a new de minimis well is associated with a development project it may require additional reviews by Zoning and Environmental Planning.
- Minimum stream setback of 100 ft from bank (or flood plain?)

- If setback can't be met, require minimum well seal of 100 ft or into first impermeable material, whichever is less (most new wells meet this standard anyway)
- No well could be completed in alluvium in a known and definite channel.
- Required setback from existing wells: 100 ft? or 50 ft (San Mateo)

Tier 2 (Replacement/supplemental non-de minimis wells, no increase in water use)

- Exempt? (Sonoma)
- Increased stream setback: 200 ft?
- If setback can't be met, minimum well seal of 100ft or into first impermeable material, whichever is less
- Increased setback to existing wells (100 or 200 ft?), but not less than existing setback
- Required water efficiency measures (required under current code).

Tier 3 (New non-de minimis wells consistent with GSP or wells that do not meet Tier 1 or 2 requirements):

- Calculated setback/seal depth for minimal drawdown at nearby well (<10%?) and minimal stream depletion (<5% of 90th percentile dry season flow?): based on aquifer characteristics and resource value (similar to Glenn , Monterey, Sonoma Counties),
- Apply to whole sub-basins for high risk and resource value streams (e.g. Bean Creek).
- Need to determine applicable method(s) of calculation
- Consider additional methods of mitigating impact, such as increased recharge

Tier 4 (Wells that do not meet Tier 1, 2, or 3 requirements; in designated Groundwater Concern Areas; Public water system wells serving 200 or more connections)

- Well impact analysis by hydrogeologist
- CEQA review
- Special conditions in specific designated groundwater concern areas
- Possibility of denial

Proposed Level of Review and Mitigation Required for Various Types of Well permit Applications					
Tier	**Criteria**	**Averge Number of Permits/year**	**CEQA Review Required?***	**Connected Stream Setback**	**Nearby Well Setback**
Tier 1	De Minimis < 5 connections; <2 AFY	44	Ministerial	100 ft or deep seal**	50 or 100 ft
Tier 2	Non-De minimis Replace/Supplemental	11	Ministerial	200 ft, or deep seal, not less than existing	200 ft, not less than existing
	Public Water system 5-199 connections	1			
Tier 3	New Non-De minimis wells that are consistent with GSPs and meet setbacks	2	Ministerial	Using depletion model (Reeves, 2008), 10th percentile dry season flow shall not be depleted by more than 5% after 60 days of pumping ***	Calculated minimum setback so that impact on nearby well is less than 1 foot****
	Wells that do not meet Tier 1 or 2 minimum, but do meet calculated setbacks	?			
Tier 4	Wells that do not meet Tier 1,2,or 3 requirements; or located in gw concern area	?	Yes	Analysis, including effect on streamflow in overall basin	Analysis
	Public Water System Serves > 199 connections	1			

Notes:	
*	Well permit is discretionary if other discretionary permits are requried by other sections of County
**	Deep Seal is 100 ft or first impermeable layer, whichever is less.
***	Streamflow depletion model, STRMDEPL08, Reeves, 2008: https://mi.water.usgs.gov/software/groundwater/strmdepl08/
****	Use modified Theis Non-Equilibium Equation (Cooper-Jacob), with proposed well parameters and regional aquifer proeprties. Calculated drawdown at proposed distance of nearby well should not exceed 1 foot after 60 days of pumping.
Water use efficiency measures are required for all non-de minimis wells; other mitigation measures may be required.	

Proposed Applicable Code Language:

7.70.110 Groundwater protection.

....

(E) Each application for a new, supplemental, or replacement well shall be evaluated and specific measures shall be required to ensure that the well will not have significant adverse impacts on groundwater sustainability, nearby wells, surface water or the environment. The level of evaluation and required measures will depend on the Tier in which the well falls, based on the type of well, the location, and the aquifer characteristics. The Health Officer shall establish specific criteria and procedures for assigning the Tier and the extent of required evaluation and protective measures. The Health Officer may deny applications for Tier 3 or 4 wells that will have a significant adverse impact on groundwater sustainability or the environment.

(1) Tier 1 will include de minimis wells and non-domestic wells using less than 2 acre-feet per year that do not require any discretionary review under other chapters of the County code and that meet the minimum standards for preventing impacts on streams and nearby wells based on aquifer characteristics, well characteristics, depth of well seal, and location.
(2) Tier 2 will include supplemental and replacement non-de minimis wells with no significant increase in water use and that meet the minimum standards for preventing impacts on streams and nearby wells based on aquifer characteristics, well characteristics, depth of well seal, and location.
(3) Tier 3 will include new non-de minimis wells serving new uses and de minimis wells that do not meet the Tier 1 or Tier 2 requirements.
(4) Tier 4 will include wells that do not meet the Tier 1, 2, or 3 requirements or are located in a groundwater concern area, as designated by the Health Officer or groundwater sustainability agency.

(F) A well permit shall not be approved for a well that poses a significant conflict with the implementation of a groundwater replenishment project or other project specified in an adopted groundwater sustainability plan, as determined by the affected water district or groundwater sustainability agency.

(G) If a well is proposed in a known karst area or if karst is encountered during the drilling process, further drilling shall be suspended, and the Health Officer shall evaluate whether a well can be completed without causing adverse impacts on groundwater resources, surface waters or other water users. The Health Officer shall establish procedures for such evaluation and may require analysis at the expense of

the applicant by a professional geologist familiar with occurrence and movement of water in karst landscapes. Recommendations may include procedures for destroying the borehole without adversely affecting subsurface conditions.

7.70.200 Promulgation of policies.

Any policy, specification or procedure which the Health Officer is authorized by this chapter to adopt shall be in writing with copies made available to the public. Such policies, specifications or procedures shall be made available to the public 30 days before their implementation by the Health Officer.

References:

- **K**obor, J., and O'Connor, M., 2023, Sonoma County Well Ordinance Public Trust Area Delineation. https://permitsonoma.org/Microsites/Permit%20Sonoma/Documents/Divisions/Engineering-construction/Well-Septic/Well%20Ordinance%20Update/April%204%20Board%20MeetingSignificant%20Interest/Att%20H%20Public%20Trust%20Review%20Area%20Deliniation%20Report.pdf
- Santa Cruz Mid-County GSP: https://www.midcountygroundwater.org/sustainability-plan
- Santa Margarita GSP: https://www.smgwa.org/media/GroundwaterSustainabilityPlan/SMGB_GSP_Final_2021-11-11.pdf
- Pajaro Valley Basin Management Plan Groundwater Sustainability Update 2022: https://www.pvwater.org/images/about-pvwma/assets/SGM/GSU22_20211229_MainBody-web.pdf
- Santa Cruz County GIS: https://gis.santacruzcounty.us/gisweb/
- California Environmental Flows Framework Technical Team. (2021). The California Environmental Flows Framework website. http://ceff.ucdavis.edu
- California Environmental Flows Working Group (CEFWG). *California Natural Flows Database: Functional flow metrics v1.2.1*, May 2021. https://rivers.codefornature.org/ (1/14/24)
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- Yarnell SM, Willis A, Obester A, Peek RA, Lusardi RA, Zimmerman J, Grantham TE and Stein ED (2022) Functional Flows in Groundwater-Influenced Streams: Application of the California Environmental Flows Framework to Determine Ecological Flow Needs. *Front. Environ. Sci.* 9:788295. doi: 10.3389/fenvs.2021.788295; https://www.frontiersin.org/articles/10.3389/fenvs.2021.788295/full
- Gleeson T, Richter B. (2017) How much groundwater can we pump and protect environmental flows through time? Presumptive standards for conjunctive management of aquifers and rivers. River Res Applic. 2018;34:83–92. https://doi.org/10.1002/rra.3185; http://www.groundwaterscienceandsustainability.org/uploads/5/6/1/7/56172195/62._gleeson_and_richter_2018_rra_presumptive_groundwater_environmental_standards.pdf

- Resource Conservation District of Santa Cruz County. December 2019. Soquel Creek Streamflow Assessment Study, with Trout Unlimited.
- Reeves, 2008: Streamflow depletion model, STRMDEPL08, https://mi.water.usgs.gov/software/groundwater/strmdepl08/
- Julie K.H. Zimmerman, Daren M. Carlisle, Jason T. May, Kirk R. Klausmeyer, Theodore E. Grantham, Larry R. Brown, Jeanette K. Howard. *California Unimpaired Flows Database v2.1.2*, 2023. The Nature Conservancy. San Francisco CA. https://rivers.codefornature.org/ (1/22/24))

Table of estimated natural flows and depletion based on Natural Flows Database, Streamflow measurements, local groundwater modelling, and water budgets:

Estimated Surface Water Depletion from Groundwater Pumping in Selected Santa Cruz County Streams

		Dry Season Flows, cfs (All Years)			
Creek		**10th Percentile**	**Median**	**90th Percentile**	**Source**
Bean Cr. @ Mt Hermon Rd (USGS)	Estimated Natural Flow*	0.509	1.08	1.89	FF model*
	Observed *	1.9	2.25	2.82	FF Database*
	Est.depletion by total gw pumping	0.5	0.5	0.5	GSP model
	% depletion**	21%	18%	15%	
	Est depletion by Non-Mun pumping	0.08	0.08	0.08	Apply Basin-wide proportion from GSP Model
	% Non-muni depletion	4%	3%	3%	
San Lorenzo River @ Big Trees (USGS)	Estimated Natural Flow*	15.2	20.2	23.7	FF model*
	Observed*	12	19	32	FF Database*
	Est.depletion by total gw pumping	1.5	1.5	1.5	GSP model
	% depletion**	10%	7%	4%	
	Est depletion by Non-Mun gw pumping	0.23	0.23	0.23	Apply Basin-wide proportion from GSP Model
	% Non-muni depletion	2%	1%	1%	
Moore Cr	Estimated Natural Flow*	0.0542	0.153	0.452	FF model*
	Observed	0.15	0.3	0.5	Estimated based on Occasional Measurements
	Est.depletion by Non-Mun gw pumping	0.03	0.03	0.03	Water Budget
	% depletion	17%	9%	6%	
Soquel Cr. @ Soquel (USGS) ***	Estimated Natural Flow*	2.44	3.05	5.28	FF model*
	Observed *	0.84	2.86	8.05	FF Database*
	Est.depletion by total gw pumping***	1.4	1.4	1.4	GSP model
	% depletion	57%	33%	15%	
	Est depletion by Non-Mun pumping	0.15	0.15	0.15	GSP Model
	% Non-muni depletion	15%	5%	2%	

Notes

* Estimated Natural Flow and Observed Flow is provided by the California Unimpaired Flow Database, v2.1.2 (Zimmerman, et.al., 2023)

** % depletion is the estimated depletion divided by the greater of the estimated natural flow, or the observed flow plus the estimated depletion

*** Soquel Creek experiences signficant riparian surface diversions, potentially 0.5-0.7 cfs (RCDSCC,2019).

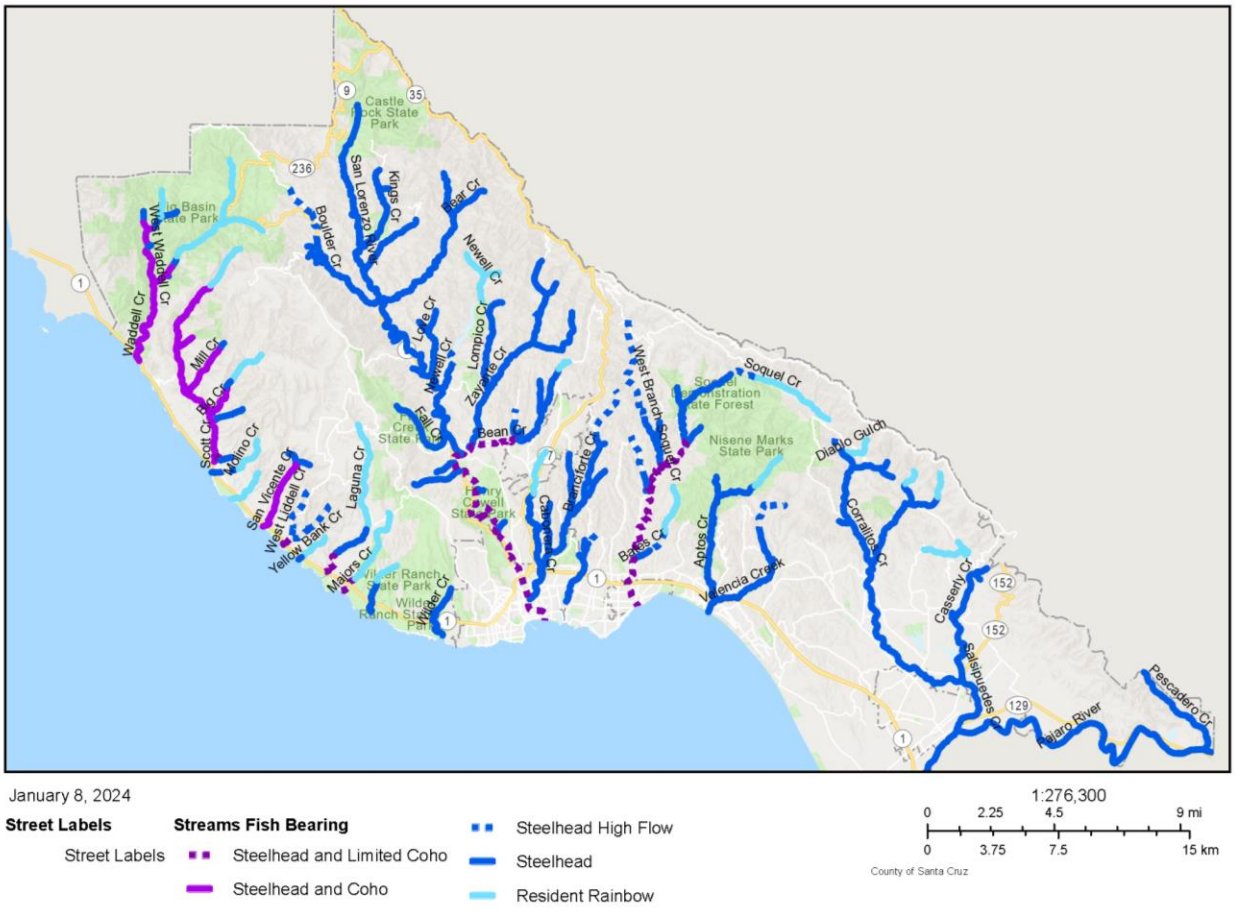
The potential effect of surface diversions has not been factored into this table, other than where the estimated natural flow is used.

Figures:

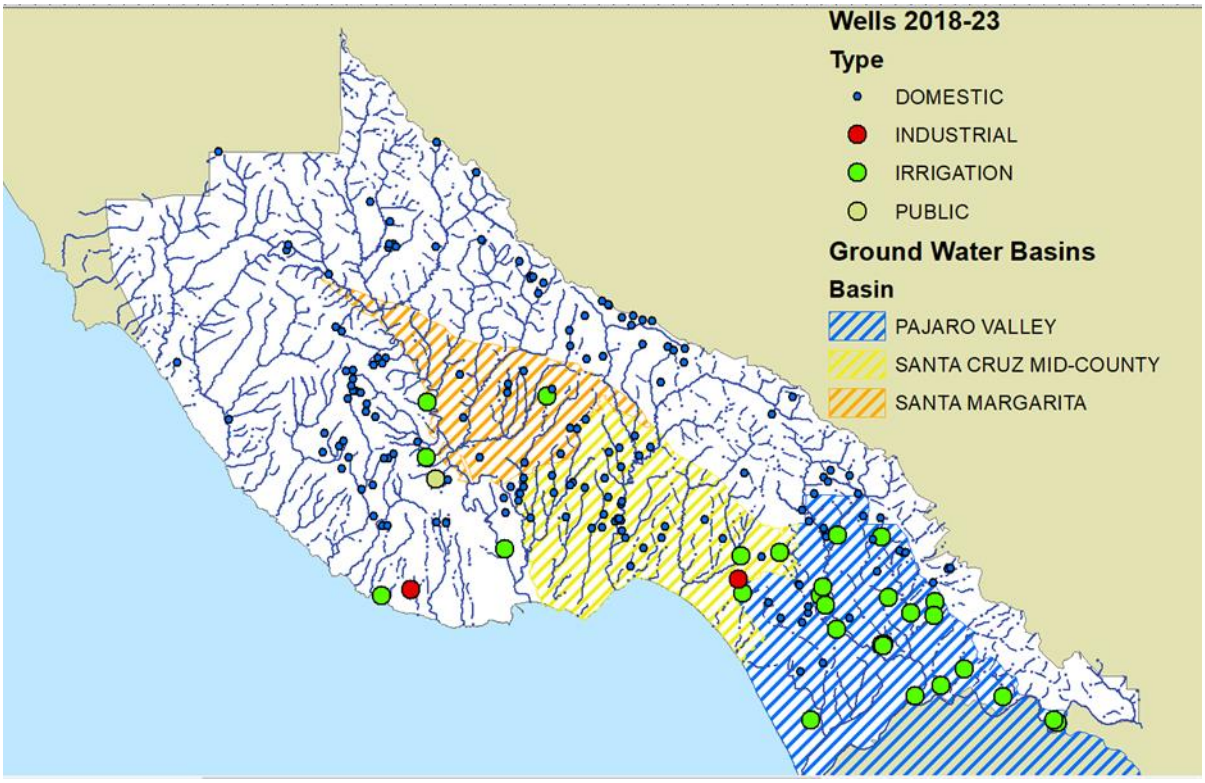
Fish-bearing Streams:

- Dark Blue: Steelhead
- Purple solid: Coho
- Purple Dashed: Coho and Steelhead
- Light Blue: resident trout

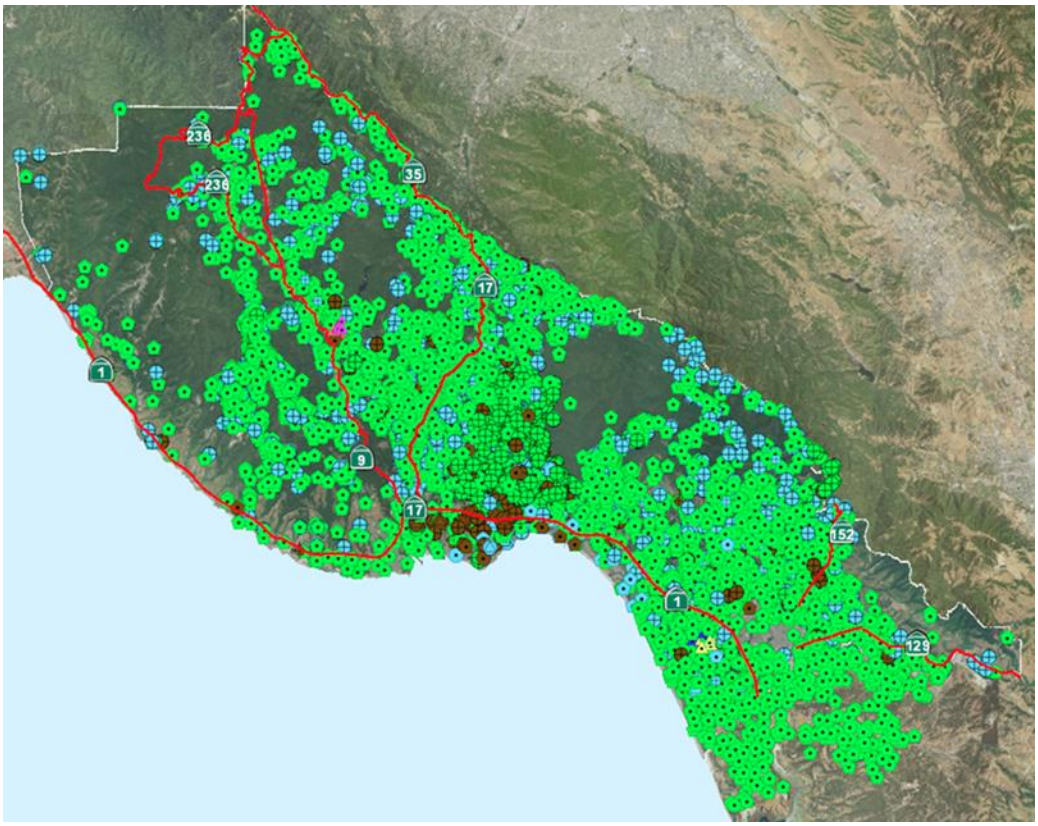
Salmonid Bearing Streams



GSA Boundaries and Wells Installed 2018-2023



Total Wells in Database:



Interconnected Groundwater and Surface Water, Mid-County Basin

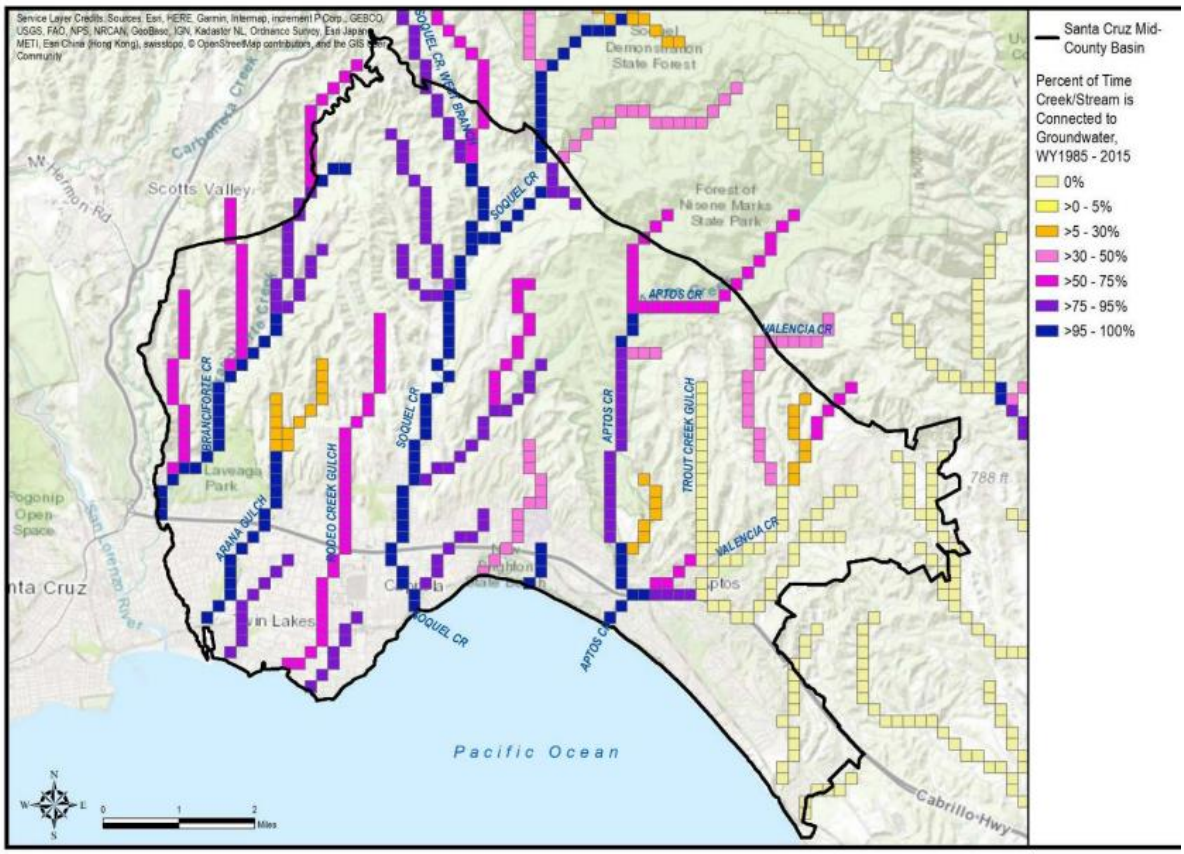
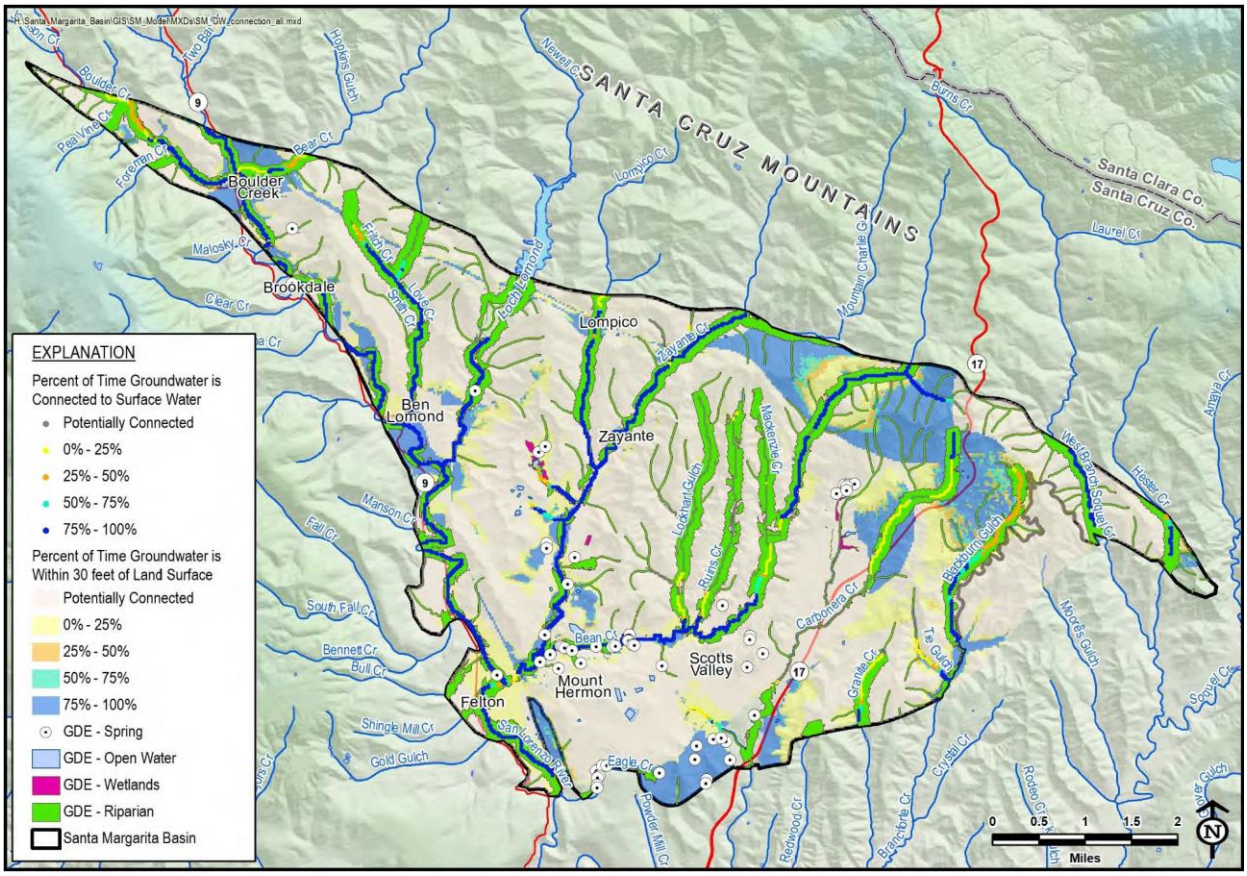


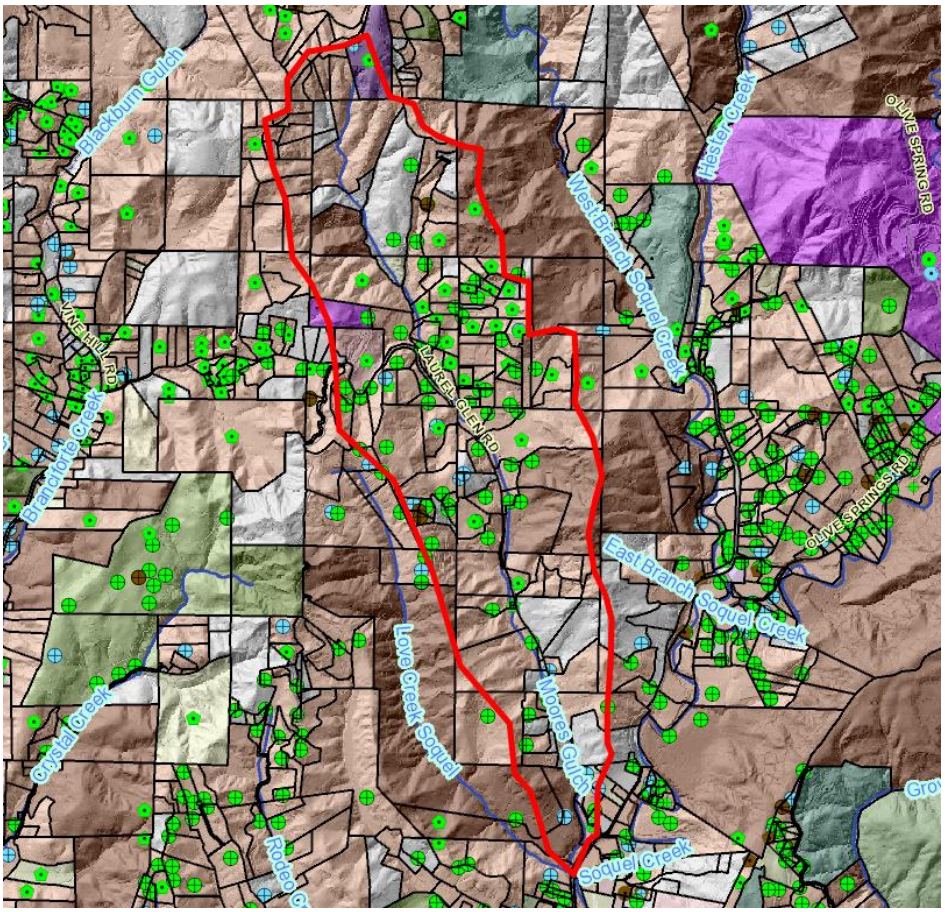
Figure 2-10. Percentage of Time Surface Water and Groundwater are Connected (Water Years 1985-2015)

Proximity of Existing Wells to Streams

Wells in Database		9,089	
Wells with Site Location		2,604	
	Setback to Stream(ft)	Number	Percent
	<50	60	2%
	<100	145	6%
	<200	327	13%
	<250	413	16%
	<500	820	31%
	<750	1,198	46%

Interconnected Groundwater and Surface Water, Santa Margarita Basin





Moore' Gulch Watershed (in red)

Wells are green and blue. Wells without records are not shown (estimated 10-20%)

Vacant parcels are white, all others are developed.

Average Well Density is 70/sq.mi. (including parcels likely served by unrecorded wells)

Well Density per squae mile
Mid-County Groundwater Basin

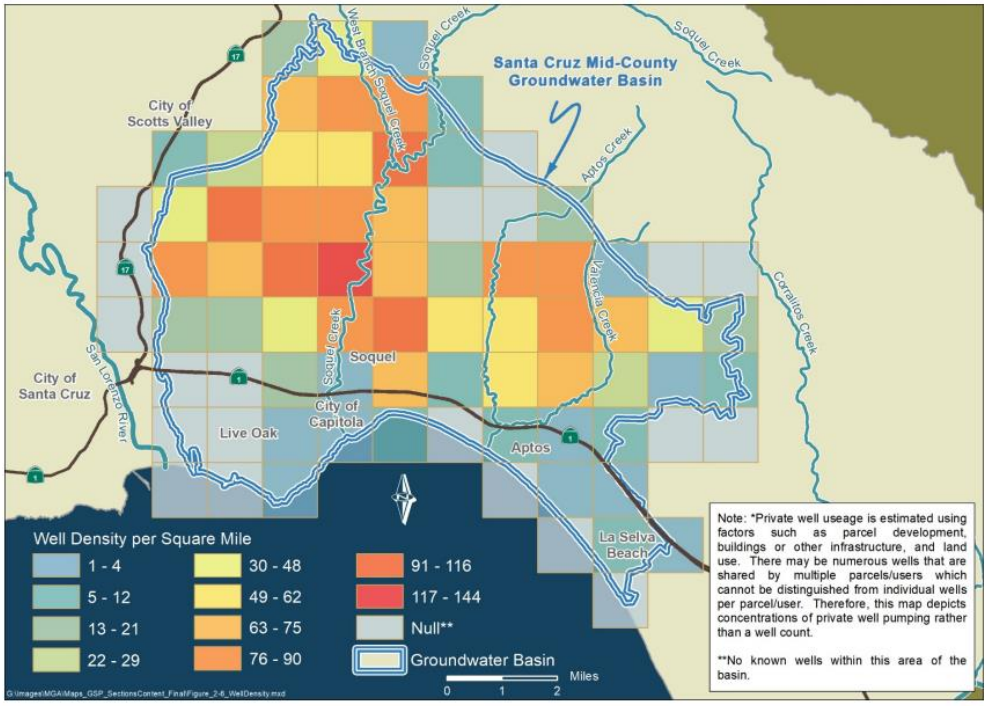


Figure 2-6. Well Density per Square Mile

Santa Margarita Groundwater Basin

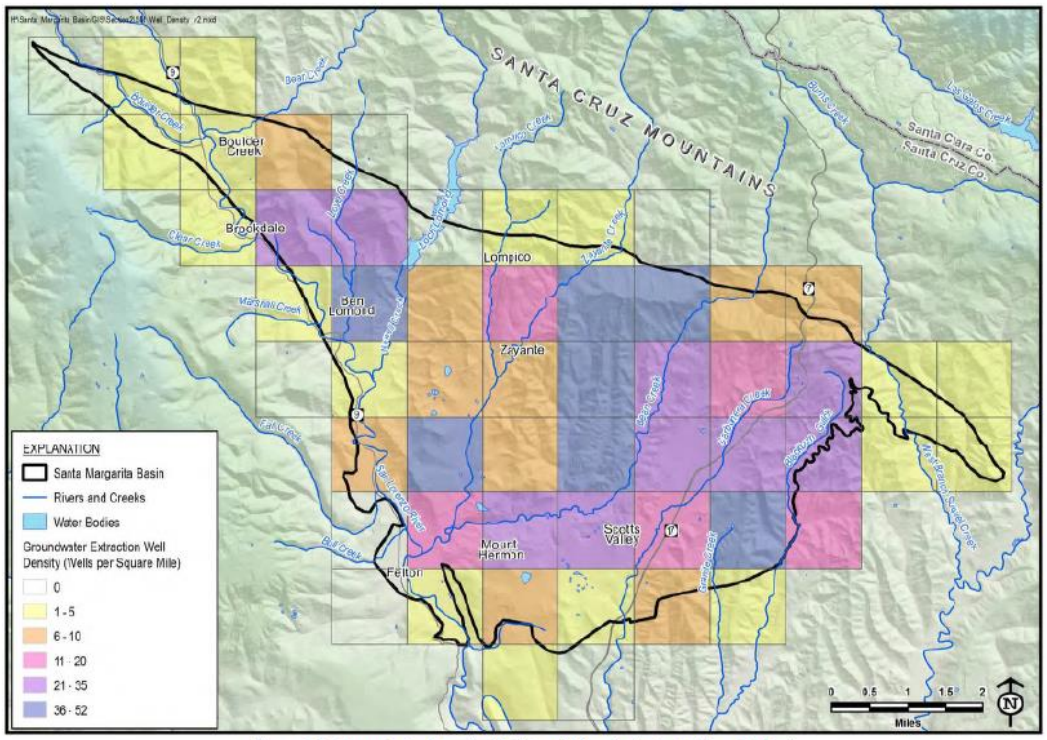


Figure 2-32. Groundwater Extraction Well Density Map for the Santa Margarita Basin