Map-based Agricultural Risk Assessment
for
Ventura County, California

Produced by
Conservation Biology Institute

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EXECUTIVE SUMMARY

To inform the on-going development of an ***Agriculture Conservation Planning Strategy for Ventura County (the Strategy)***, Conservation Biology Institute (CBI), as a part of the Cultivate Team, conducted a map-based agricultural risk assessment focusing on two primary tasks:

(1) Conduct a risk assessment based on the identified current and future stressors in the region, and
(2) Develop criteria to help prioritize the existing agricultural lands based on the combination of these stressors.

There are numerous stresses on agriculture in the County with water availability and projected climate change instrumental in driving many of the other factors such as sea-level rise, saltwater intrusion into groundwater, exotic species infestation, crop diseases, and increased wildfire frequency and severity.

An important deliverable for the Strategy is the development of an online mapping resource (Ventura County Sustainable Agriculture Conservation Project Gateway) based on Data Basin technology so users can easily access the numerous relevant map layers (~200), including the model results from the analysis, and take full advantage of the many easy-to-use technical and collaboration features provided by the system well-beyond the completion of the project final report. The Project Gateway provides a tool for the community to continue to use, now and in the future, to implement agreed upon strategies to secure the County's agricultural future.

All of the modeling was conducted using software called *Environmental Evaluation Modeling System* (EEMS), which consists of a highly transparent fuzzy logic framework that supports the close involvement by outside participants. Numerous webinars were held over the course of the modeling exercise to obtain insight from the local community. A model was created to map the relative importance of agricultural land in the County followed by a series of primary stress models differing by the different climate future projections. Three climate general circulation models (CNRM-CM5, MIROC5, and GFDL-CM3) were evaluated for the 2010 – 2039 time period. All models used a 90-meter spatial resolution and can be accessed in the gateway. Since groundwater is so vital to agriculture in the County, our project stakeholder subgroup agreed that summarizing many of the findings using sub-basins was beneficial.

Results from the Agricultural Value model showed ***Oxnard, Las Posas Valley, Filmore, Santa Paula***, and ***Pleasant Valley*** sub-basins containing the highest total acres of agriculture classified as "Very High" to "Moderately High."

Although EMMS logic models reflect results in terms of relative rather than absolute values, **the three stress models show the County under considerable stress even under the mildest future** (warm, wet future |CNRM-CM5); however, the level and types of stress were not distributed uniformly across the County – some sub-basins showed more stress than others. **We also found the modeled sub-basin stress pattern remained the same regardless of the climate future evaluated**. The difference between the three stress models was essentially one of degree.

From a purely climate perspective, the sub-basins that are projected to experience a muted response in terms of changes in temperature and precipitation are those influenced by the proximity to marine environments (*Oxnard, Mound*, and *Lower Ventura River Valley*). Unfortunately, these are the same locations projected to be **impacted by rising sea-levels**. Sub-basins located further inland showed the most significant temperature and precipitation impacts over the next two decades. The most notable negatively impacted sub-basins are ***Piru, Filmore, Tierra Rejada***, and ***Arroyo Santa Rosa Valley***.

The prioritization analysis aimed to provide practical insights into which agricultural lands **were more likely to remain resilient and productive given future conditions (based on climate projection impacts, water stresses, and other factors) compared to the higher stressed agricultural lands**. The Cultivate Team worked with the project stakeholder subgroup to select 13 criteria, many chosen from the models, to inform sub-basin condition. Summarizing criteria included:

- *Groundwater resource stress*
- *Impaired soil chemistry*
- *Number of extreme heat days*
- *Maximum annual temperature*
- *Annual precipitation stress*
- *Water recharge deficiency*
- *Climatic moisture stress*
- *Climatic water deficit*
- *Potential flooding risk*
- *Invasive plants*
- *Wildfire risk*
- *Housing burden*
- *Poverty level*

Summaries of current crop types (aggregated into six categories using the latest Cropsnow dataset) were also included in the sub-basin profiles, which help inform levels of agriculture sensitivity. Text summaries and potential response strategies specific to each sub-basin are provided in the 'Results and Discussion" section of this report.

INTRODUCTION

Agriculture is a critical economic and cultural component of life in Ventura County, California. Ventura County is a leader in the commercial production of strawberries, lemons, avocados, and a variety of other crops. At the same time, there are numerous and growing threats to farmers in the region from water shortages, crop diseases, labor issues, global competition, and wildfire (Ventura CCA 2019). To inform the development of an ***Agriculture Conservation Planning Strategy for Ventura County***, Conservation Biology Institute (CBI), as a part of the Cultivate Team, conducted a map-based assessment focused almost exclusively on the non-socioeconomic threats affecting agriculture viability in the County.

The map-based assessment pertaining to agriculture viability is based on two primary tasks: (1) conduct a risk assessment based on the identified current and future stressors in the region for which reliable spatial data exists and (2) develop criteria to help prioritize the existing agricultural lands based on the combination of these stressors. The goal of the analysis was not to develop a plan. Rather, the goal was to aggregate the relevant spatial datasets, generate useful agriculture value and stress models that would inform the ***Agriculture Conservation Planning Strategy for Ventura County*** and other planning going forward. To this end, all of the datasets and model results are provided using a dedicated online Data Basin platform (Ventura County Sustainable Agriculture Conservation Project Gateway) so users can continue to use the map products independently and beyond the scope of this project.

There are numerous stresses on agriculture in the County with water availability and projected climate change instrumental in driving many of the other factors such as sea-level rise, saltwater intrusion into groundwater, exotic species infestation, crop diseases, and increased wildfire frequency and severity. This conclusion was reinforced by the project participants and the analyses that CBI carried out, which focused most heavily on these two critical components: climate and water availability. A previous study on climate change clearly demonstrated the potential impact a changing climate is having and will continue to have on Ventura County agriculture (Oakley et al. 2019). This report highlights numerous recommendations for future work. The mapping assessment addressed two of these recommendations, including:

- Precipitation, temperature, or evapotranspiration could be overlain on maps of a specific crop, vegetation, or habitat type. This could aid in determining the spatial extent to which the particular topic of interest is impacted by climate change.

- Education on climate change and its potential impacts to the community and resources can empower people to be informed voters and to participate in the decision-making process.

DATA AND METHODS

Data Basin Gateway

The analyses carried out for the project relied heavily on synthesizing available, spatially explicit datasets. Rather than limiting these datasets for internal use only, we chose to provide them as an important resource that would be provided for independent use beyond the final report. To do this, we designed and constructed a Data Basin Gateway (https://vcsalc.databasin.org/) specifically dedicated to this project (**Figure 1**).

Data Basin is a web-based mapping platform, which was first publicly launched in 2010. Data Basin is a highly sophisticated platform that meets many science and technical demands, but was developed to greatly expand usability; you do not need to be a GIS professional to effectively use Data Basin, which makes it ideal to help a wide range of users for multiple purposes. Data Basin is global in scope, but it also supports customized, branded copies of the technology (called gateways) that focuses on a particular region and/or topic.

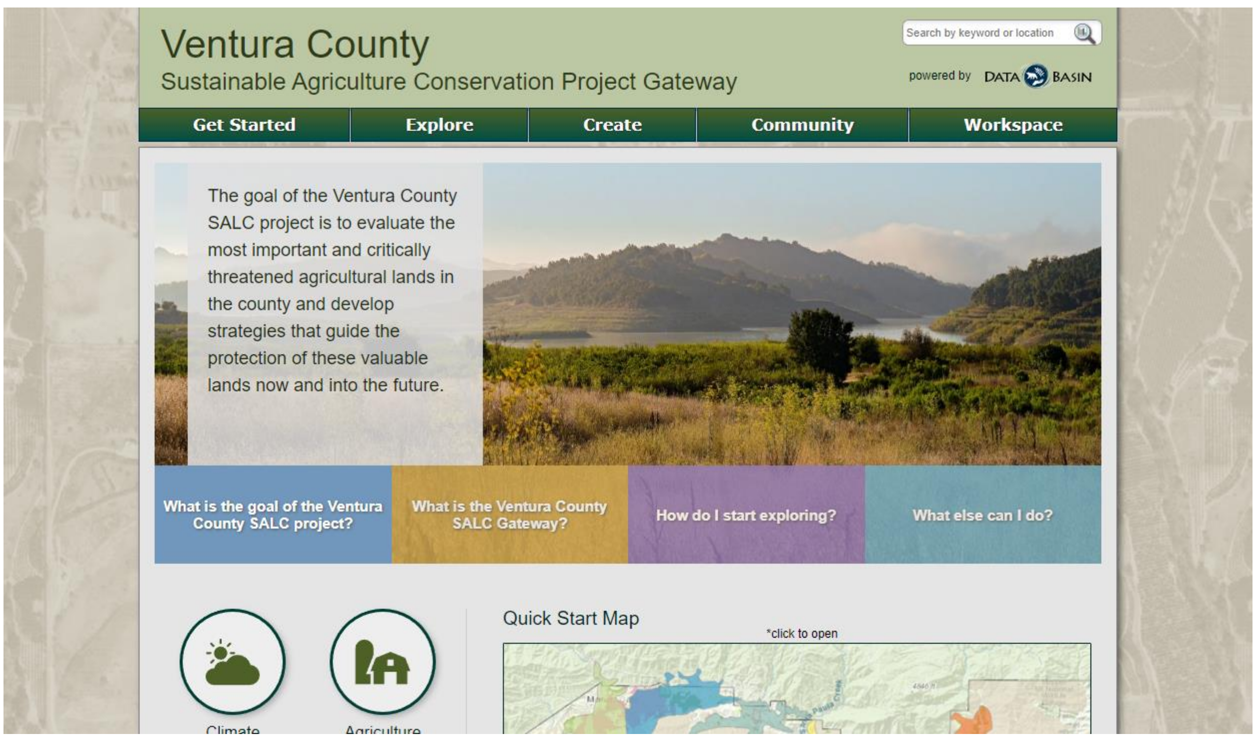


Figure 1. Screen capture of the Ventura County Sustainable Agriculture Conservation Project Gateway.

The Project Gateway has nearly 200 individual datasets, most of which are curated into one of six folders (or galleries): Agriculture, Climate, Water, Natural Lands, Fire, and General. Each dataset, regardless of its origin, includes standardized metadata so all users have adequate detail for effective use (see **Appendix**

A). Some datasets can best be described as raw data while other datasets are results from different assessments, including the models from this project.

Fuzzy Logic Modeling

Environmental Evaluation Modeling System (EEMS) is a fuzzy logic modeling system developed by the Conservation Biology Institute (Sheehan and Gough 2016) and was used to produce a series of agricultural value and risk models for the project assessment area, which focused on the agricultural region of Ventura County as defined by the state Farmland Monitoring and Mapping Program (**Figure 2**). Fuzzy logic is a powerful modeling approach that is well-suited for addressing complex, spatially explicit questions (Zadeh, 1973) and has been successfully applied in a variety of environmental and natural resource contexts (Bojorquez-Tapia, et al. 2002; Boclin and de Mello 2006). EEMS relies on a logic modeling framework that combines any number of spatial datasets into a logical arrangement to answer specific questions. An important feature of EEMS modeling is that all map components (or nodes), regardless of where they occur in the designed tree diagram, can be viewed and explored. Another advantage of this approach is that updates to specific datasets can be included in a previously constructed model with minimal effort. This open source software is highly transparent, easy to update, and readily accessible to non-technical users (Click for more information).

As part of the EEMS modeling exercise, participants were invited to review and comment on various aspects of the models, including input data, model design, and model logic controls. The review process was assisted by providing participants direct access to the draft models in an online application called EEMS Online (https://eemsonline.org/) where participants could explore all aspects of the models and alter logic operators, input thresholds, and weighting to test various assumptions. Draft models were also reviewed using a series of webinars and one-on-one reviews to obtain feedback. Numerous revisions were made based on participant comments to create the final models, which were uploaded into the Ventura County Sustainable Agriculture Conservation Project Gateway so the model results can be integrated with other datasets in the platform.

Important Agricultural Lands Model

The first, relatively simple EEMS logic model was to define the **relative agricultural value lands** in the County. The extent of the model concentrated on the non-federal lands, which included the agricultural and urbanized portion of the landscape. Resolution of the model was 90 meters. Model diagram included nine datasets arranged hierarchically (**Figure 3**). **High Agricultural Value** was defined by combing Favorable Farmland Status based on County level Farmland Mapping and Monitoring Program (FMMP) data and Good Soil Capacity based on Impaired Soil Chemistry (Salinity and Sodicity), Soil pH, and Soil Capacity based on Irrigated Capability Class and Storie Index. Results were then masked by an Exclusion component derived by combining Urban Areas, Protected Lands, and Rivers and Streams. Datasets used in the model are listed in **Appendix B**.

Agriculture Stress Models

There are numerous current stressors on agriculture in Ventura County; some can be attributed to socioeconomic factors, others on physical limitations of the land, and still others on previous and current management practices, especially as they pertain to water use. Mapping future conditions based on changing socioeconomic conditions and management decisions is extremely difficult – there is inadequate spatially explicit data from which to build a model. **Therefore, our agricultural stress modeling focused exclusively on physical threats to agriculture in the County**. Some included stress factors that are somewhat fixed (e.g., soil characteristics) while others are very much impacted by a changing climate.

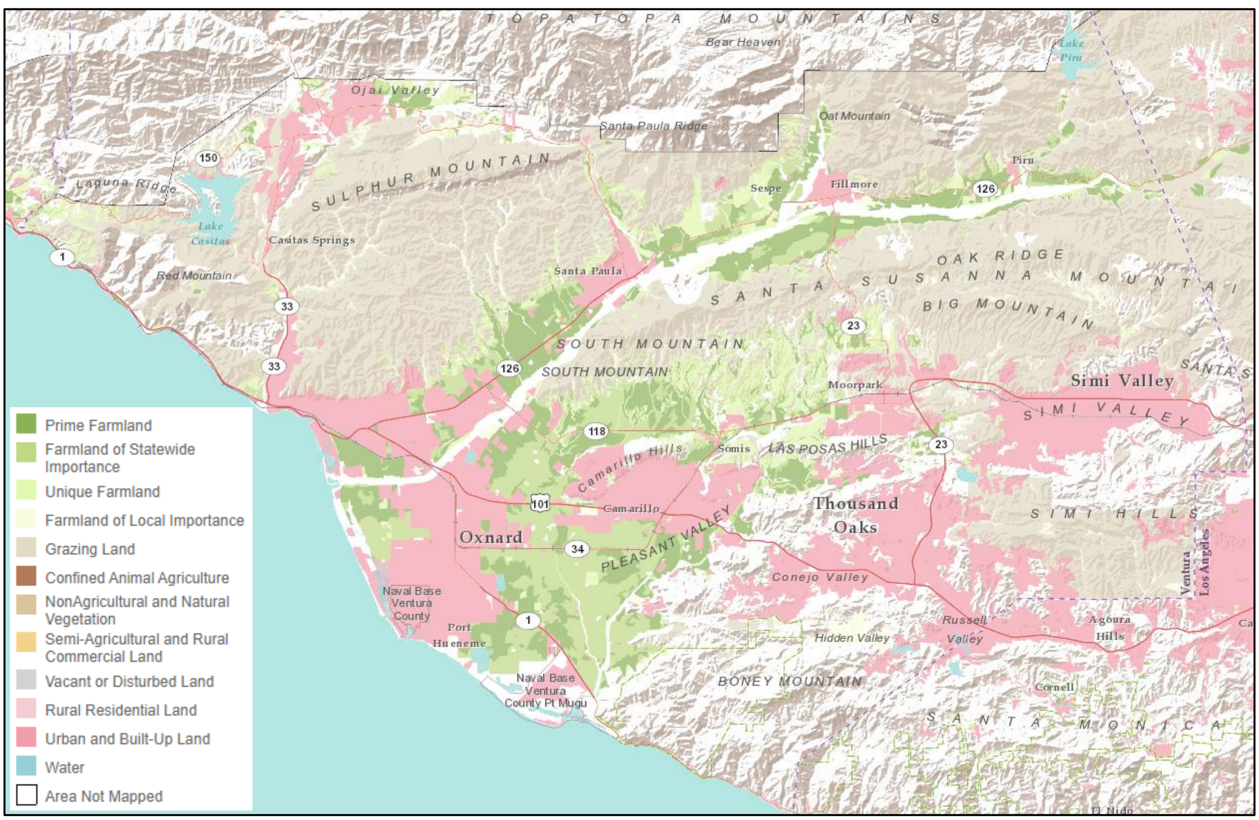


Figure 2. Map showing the project assessment area defined by the most recent (2016-2018) state Farmland Monitoring and Mapping Program dataset.

Climate Change EEMS Model Inputs

Modeling climate change impacts is complex. Thankfully, California has been a leader in examining climate change research as it relates to the state having completed four climate assessments since 2006 with a fifth assessment underway (Bedsworth et al. 2018). With every update, more refined data are made available and our understanding of current and projected impacts greatly improves. Climate and climate impact data are routinely published via a collection of online tools maintained by Cal-Adapt (https://cal-adapt.org/tools), and these data were the source for our analysis.

There are over 35 General Circulation Models (GCMs) developed by different global research labs to consider. For California, ten of these models have been tracked over time with updated results published on Cal-Adapt. Our study chose three of these climate models to evaluate – CNRM-CM5, MIROC5, and GFDL-CM3 – over three time steps (2010-2039, 2040-2069, and 2070-2099) under the high emission scenario (representative concentration pathway or RCP 8.5)[1] . Only the first step is included in this report.

[1] RCP 8.5 is a no-mitigation scenario where global GHG emissions continue to rise throughout the 21st century. In California, annual average temperatures are projected to increase 4-7 degrees Celsius by the end of the century.

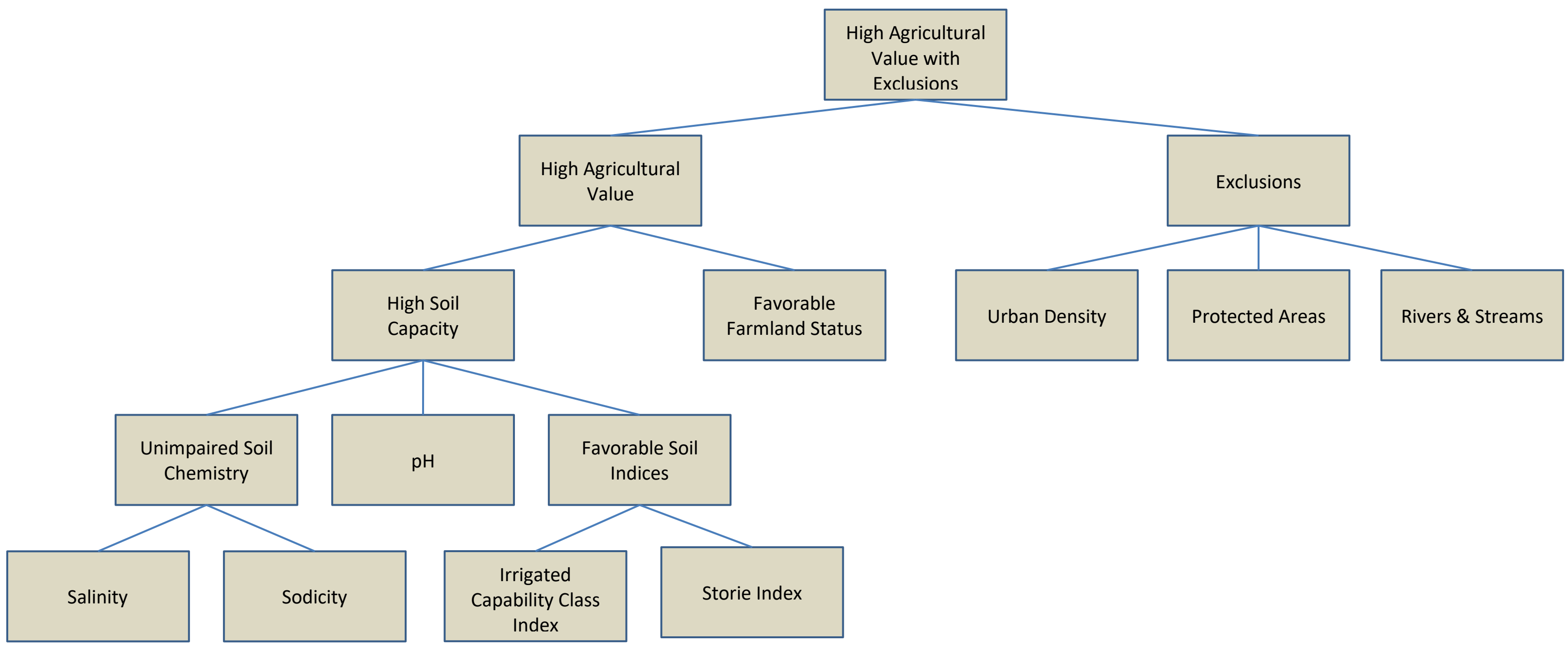


Figure 3. General EEMS model diagram for mapping Agricultural Value for Ventura County, California.

CBI generated EEMS logic models for the near-term and mid-term time steps; again at 90-meter resolution. CBI used annual and seasonal datasets from the three GCMs for maximum temperature, precipitation, and number of extreme heat days. These data were provided by three sources: (1) downscaled climate data (Pierce et al. 2018), (2) observed meteorological data (Livneh et al. 2015), and (3) derived products such as number of extreme heat days (Thomas et al. 2018).

For all GCMs, there is agreement that maximum temperature is increasing into the future; the difference between them is one of trajectory and magnitude. For example, the three models we selected for our assessment, when graphed annually, show GFDL-CM3 to be the warmest model; CNRM-CM5 is the coolest; and MIROC5 lies generally in-between but closer to CNRM-CM5 (**Figure 4**).

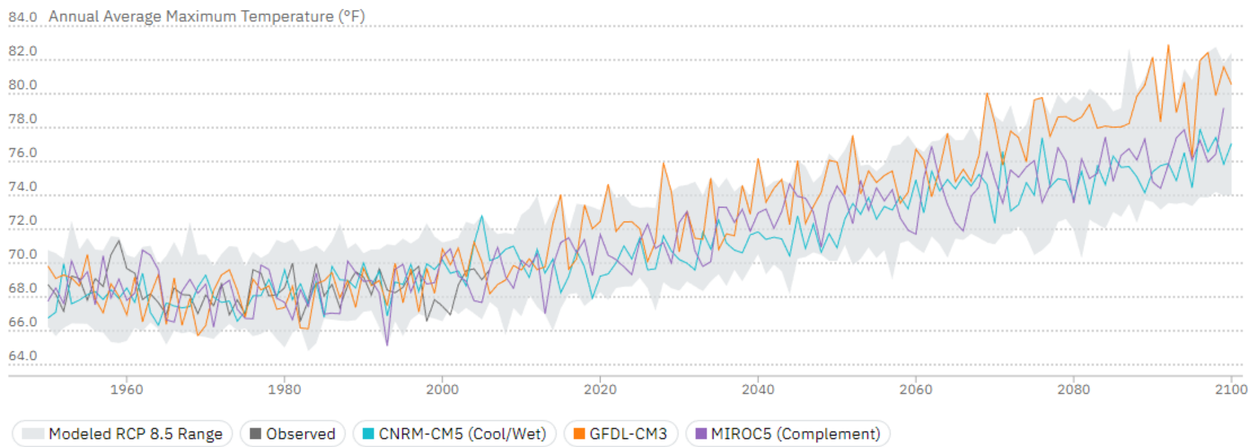


Figure 4. Screen capture from Cal-Adapt showing annual average maximum temperature for observed historic values and projections for CNRM-CM5, MIROC5, and GFDL-CM3 for Ventura County, CA under the RCP 8.5 scenario (https://cal-adapt.org/tools/annual-averages).

GCMs show much greater variability in projecting future precipitation both in terms of moisture volume totals and delivery patterns. CNRM-CM5 portrays a wetter future for Ventura County over the next century although mid-century is a dry period for all three models we chose to include in our assessment. MIROC5 projects a slightly wetter near-term period, a very dry mid-term period, and somewhat wetter long-term period. GFDL-CM3 is drier for all three time periods.

Data on the number of extreme heat days were downloaded from the Cal-Adapt online tool for Ventura County watersheds or census tracts for each of the three models for the three time steps. A total of 23 different regions were assigned extreme heat day data for each of the GCMs (**Figure 5**). In every case, the number of extreme heat days (defined as days that exceed 90 degrees) increased with some regions in the County showing much greater increases than others (**Table 1**).

Another important source of climate-driven input data for our stress EEMS models came from Basin Characterization Modeling (Flint and Flint 2014). The Basin Characterization Model (BCM) is a grid-based model (270m resolution) that calculates the water balance for any given time step using GCM inputs, including precipitation, minimum and maximum temperature. We obtained BSM data for our assessment area for the three chosen GCMs via the California Climate Commons (http://climate.calcommons.org/bcm). BCM outputs used in our EEMS models included Climatic Water Deficit, which is defined as the annual evaporative demand that exceeds available water, annual water recharge, and annual water runoff.

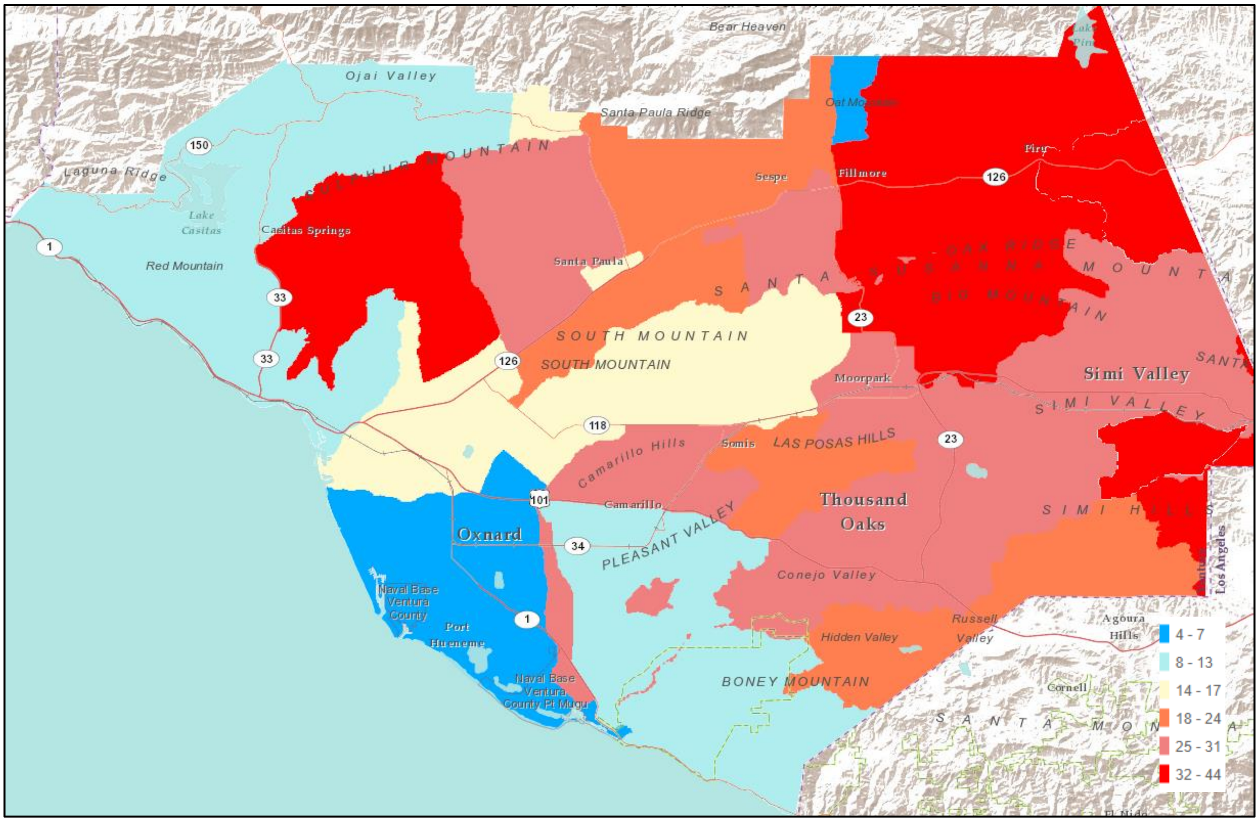


Figure 5. Relative number of extreme heat days from the EEMS model for the early time step of the GFDL-CM3 GCM (RCP 8.5).

Table 1. Summary of the number of extreme heat days (>90 degrees F) for each GCM for the four time periods. Min and max values correspond to values assigned to the 23 individual subareas.

	Historic			2010-2039			2040-2069			2070-2099		
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
GFDL-CM3	1	53	13	4	90	37	20	121	60	54	168	110
MIROC5	1	53	13	3	82	28	7	103	41	22	129	60
CNRM-CM5	1	53	13	2	63	22	4	103	36	20	120	55

Agriculture Stress Model Details

Agriculture Stress was defined by three high-level components: High Climate Stress, Low Soil Resilience, and High Water Stress. The Low Soil Resilience component did not change between the different models as the inputs under this heading were based on factors unaffected by projected climate futures (**Figure 6**). Components of this node include: Soil Erodibility based on High Water Runoff and Wind Erodibility; Impaired Soil Chemistry based on Sodicity and Salinity; and Poor Available Water Storage. The remaining two high-level components are impacted by the data from the examined GCMs (CNRM-CM5, MIROC5, and GFDL-CM3). Downscaled resolution of the climate data was 270 meters.

The High Climate Stress node is composed of Extreme Heat Days, Annual Climate inputs and Seasonal Climate inputs. Annual Climate inputs tracked in the model include Maximum Temperature and Low Precipitation. Projected changes in Annual Minimum Temperature were not included as the majority of the agricultural lands in the County are not impacted by freezing temperatures and all climate models project minimum temperatures increasing over time. Seasonal Maximum Temperature and Seasonal Low Precipitation were evaluated using four three-month intervals used by hydrologic modelers rather than basing the divisions off the annual calendar. Seasonal inputs were: Dec-Jan-Feb, Mar-Apr-May, Jun-Jul-Aug, and Sep-Oct-Nov. The EEMS logic model was constructed so the model could easily be edited to weight specific seasons to address specific crop sensitivity questions.

High Water Stress was modeled using three high-level inputs: Surface Water Stress, Groundwater Stress, and Climatic Moisture Stress. The Surface Water Stress node was based on surface water contamination and, given its minimal importance to supplying water for agriculture, it was not weighted heavily. The High Climatic Moisture Stress node was based on results from the Basin Characterization Model and included projections of Climatic Water Deficit, Annual Runoff, and Annual Recharge based on the three examined GCMs (Flint and Flint 2014). High Groundwater Stress was comprised of two factors: Groundwater Pollution and the amount of Groundwater Resource available.

Based on the available groundwater monitoring data, groundwater quality is somewhat mixed (Burton et al. 2011). Trace inorganics (i.e., arsenic, boron, and vanadium) occurred at high concentrations in only around 3% of the primary aquifer system. Naturally occurring radioisotopes from uranium and thorium were present at high concentrations in 14% of the samples and at moderate concentrations in 11% of the samples. Perchlorate, which is an ingredient in rocket fuel, fireworks and even some fertilizers, was present at moderate concentrations in 12% of the samples. Organic compounds were found at low concentrations throughout the study area. Volatile organics were found at moderate levels in 2% of the samples and the pesticides atrazine and simazine at low concentrations in 17 and 26% of the aquifer system, respectively.

The Groundwater Resource node was informed by the inherent groundwater banking index as well as the current groundwater status according to the California Department of Water Resources monitoring of the main aquifers in the region. The current status of groundwater was heavily weighted in the EEMS model. All datasets used in the Agriculture Stress Models are listed in **Appendix C**.

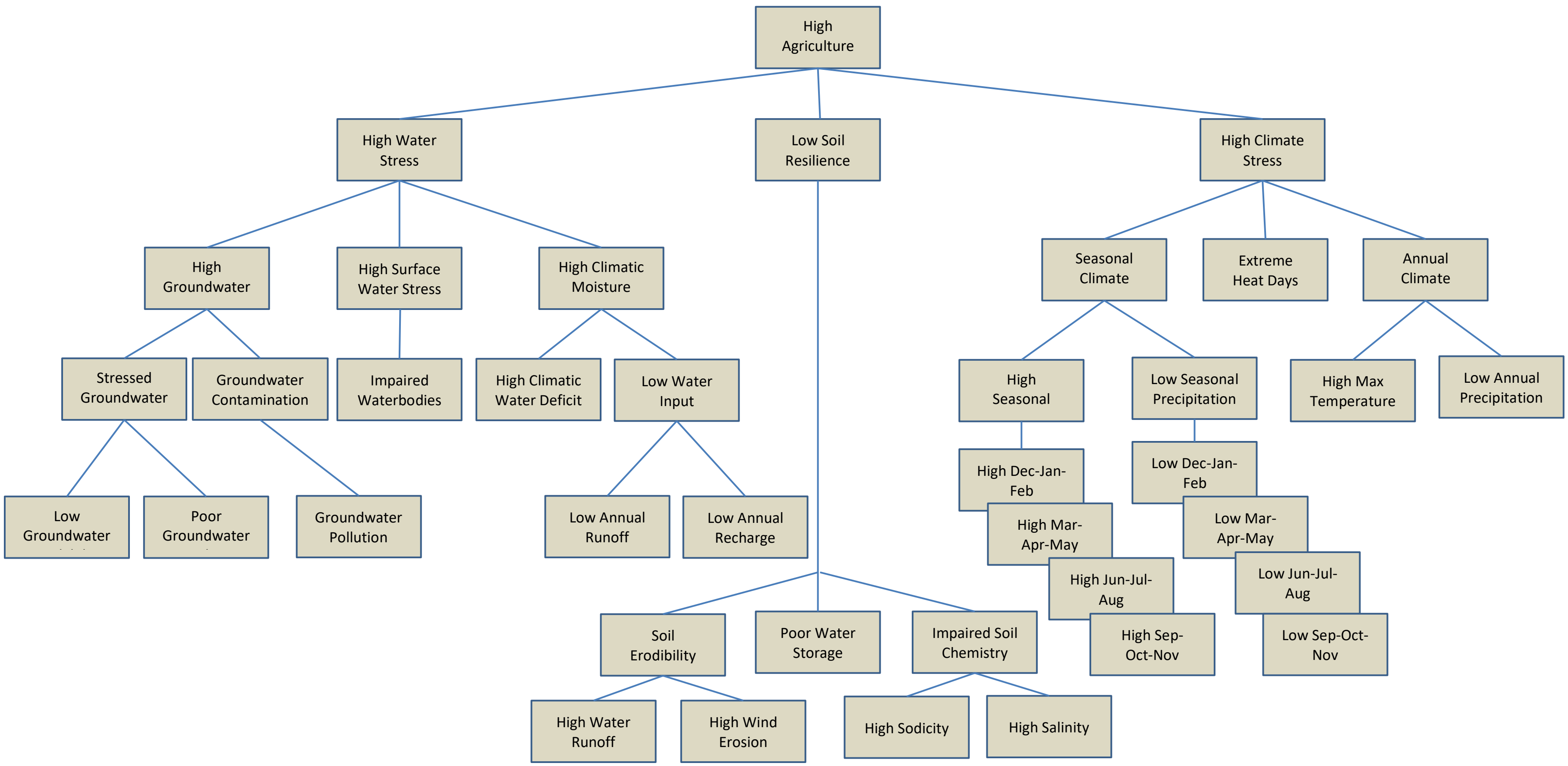


Figure 6. General EEMS model diagram for mapping agriculture stress for Ventura County. Different versions of the model were run using specific climate change and Basin Characterization Model data for each of the three GCMs (CNRM-CM5, MIROC5, and GFDL-CM3) for the different time periods.

Prioritization Analysis

The purpose of the prioritization analysis is to inform development of the **Agricultural Conservation Planning Strategy for Ventura County**. Results from these analyses allows the community to identify the agricultural lands in the County that are likely to remain resilient and productive given future conditions and the higher stressed agricultural lands that will be most impacted by climate, water stresses, and other factors. The goal of this work is to ultimately identify strategies and actions that can be taken to strategically protect the lands that have local and even global significance to food production. For the marginal lands that are at high risk, the goal is to seek opportunities to incentivize gradual shifts from crops that may no longer thrive, to practices that avoid or lower water use, recharge ground water supply, restore habitat, or other "natural capital" benefits that enhance the resiliency of Ventura County. The prioritization analysis is provided as one step in the process to develop Strategies and follow on actions as a pathway for the County's agricultural lands and economy to serve and sustain the County's growth and further climate adaptation and GHG emission reduction goals – with strategic actions through integrated policies, programs, innovative incentives and investments, and collaborative partnerships.

Using EEMS logic models, the Cultivate Team worked with a project stakeholder subgroup to develop criteria for identifying and prioritizing agricultural land for its best use given current conditions and future projections. To summarize the findings for the development of a Ventura County agricultural conservation strategy in a way that best informs subregional priorities, the Cultivate Team elected to use the major sub-basins as the reporting unit since so much of agriculture viability in the County is tied to the groundwater basins (**Figure 7**). The Cultivate Team identified a total of 13 sub-basins to report the findings; five sub-basins were omitted since they contained very little agriculture (Conejo, Simi, Hidden Valley, Russel Valley, and Thousand Oaks).

From the EEMs models and other relevant datasets assembled for this study, the Cultivate Team worked with the project stakeholder subgroup and selected 13 criteria to create individual sub-basin profiles that represented important yet different potential stressors (**Table 2**). Each criterion was evaluated and classified into one of seven classes (Very Low, Low, Medium Low, Medium, Medium High, High, and Very High) to simplify the profile presentation. In addition, CBI generated crop statistics for each sub-basin based on the 2022 Cropsnow dataset from Ventura County. Crop types were aggregated into six categories: berries, citrus, avocados, rotation crops, rangeland, and other. Landscaped areas such as golf courses and planted roadsides were omitted. Two socioeconomic criteria – Housing Burden and Poverty – were included from CalEnviroScreen version 4.0. Scoring was based on the area-weighted mean values for the 13 sub-basins and categories assigned using standard deviations around the mean, which received a score of "Medium".

Table 2. Criteria for Identifying and Prioritizing Agricultural Land

Criterion	Characterization
Groundwater Resource Stress	Combination of relative degree of groundwater banking index & groundwater availability
Impaired Soil Chemistry	Combination of relative concentration of salinity & sodicity in soil

Number of Extreme Heat Days	Combination of current number of extreme heat days & change in number of extreme heat days
Max Annual Temperature	Relative mean value of future projected max annual temperature
Annual Precipitation Stress	Combination of historic mean annual precipitation & projected future precipitation
Water Recharge Deficiency	Relative groundwater banking index
Climatic Moisture Stress	Combination of projected future water input from precipitation & projected future climatic water deficit
Climatic Water Deficit	Combination of historic & projected future climatic water deficit, which is potential minus actual evapotranspiration
Housing Burden	Summarized from CalEnviroScreen
Poverty Level	Summarized from CalEnviroScreen
Potential Flooding Risk	Relative percent area within FEMA flood hazard zones
Invasive Plants	Mean number of 10 invasive plant species evaluated
Wildfire Risk	Relative percent area within wildland-urban interface and intermix

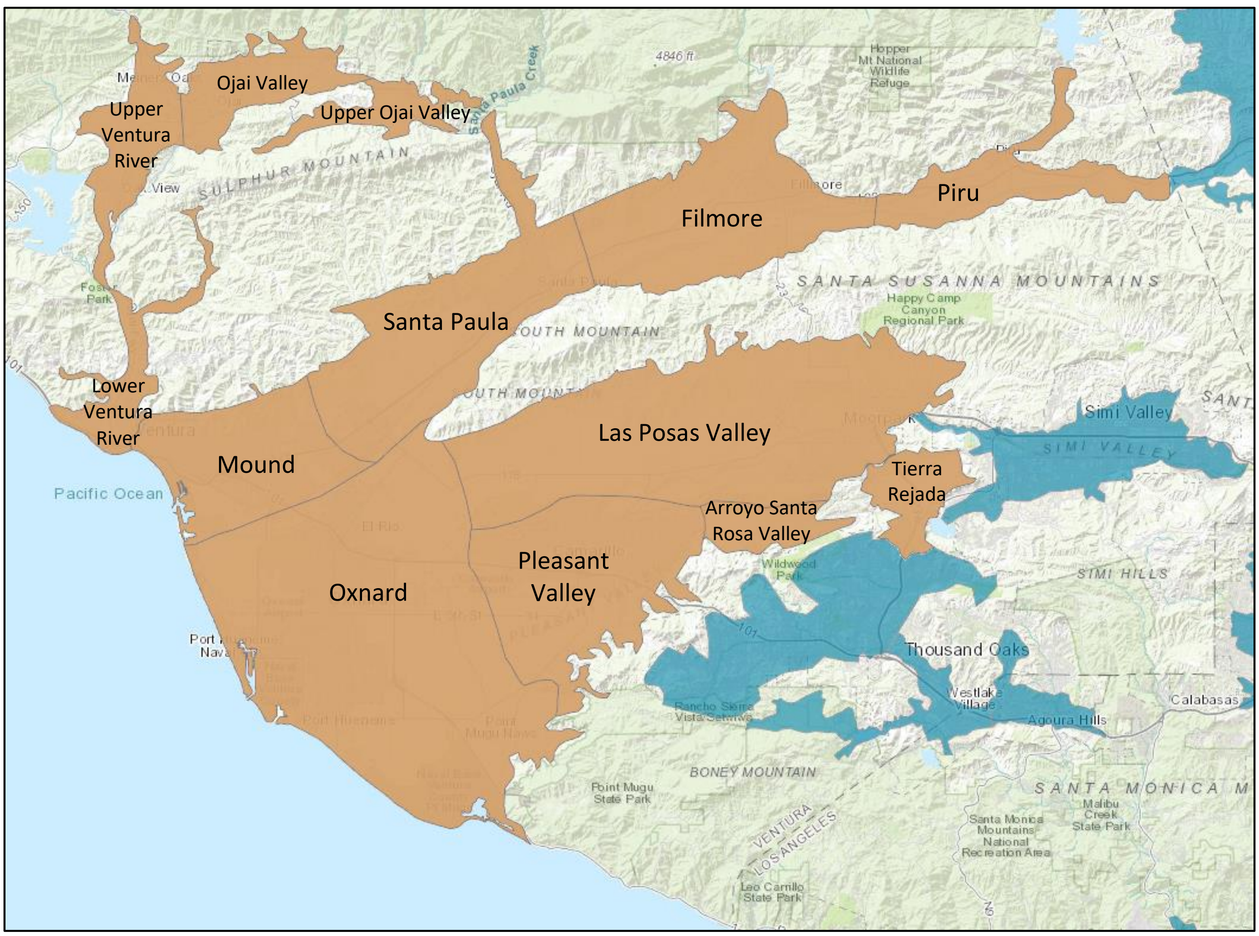


Figure 7. Map depicting the 13 sub-basins evaluated in the prioritization analysis (labeled and in brown).

Three other criteria not included in the EEMS models were Potential Flooding Risk, Wildfire Risk, and Invasive Plants. Potential Flooding Risk was derived by calculating the percent of flood risk area (based on the most recent National Flood Hazard data from the Federal Emergency Management Agency) compared to total area of each sub-basin. Wildfire Risk was based on percent area of each sub-basin that fell within the combined area of Wildland-Urban Interface and Wildland-Urban Intermix (Li et al. 2022). CalWeedMapper, which is an online application organized by 1:24,000 quads and managed by the California Invasive Plant Council, was accessed and data downloaded and aggregated for 10 invasive plant species (**Table 3**). For all three of these criteria, scoring was based on the area-weighted mean values for the 13 sub-basins and categories assigned using standard deviations around the mean, which received a score of "Medium".

Table 3. List of invasive plant species aggregated from CalWeedMapper.

Scientific Name	Common Name
Arundo donax	Giant Reed
Centaurea solstitialis	Yellow Star-thistle
Centaurea stoebe	Spotted Knapweed
Dittrichea gravelons	Stinkwort
Eucalyptus globulus	Tasmanian Blue Gum
Linaria dalmatica	Dalmatian Toadflax
Onopordum acanthium	Scotch Thistle
Rhaponticum repens	Russian Knapweed
Spartium junceum	Spanish Broom
Tamarix ssp.	Saltcedar

Eight criteria were selected from the Agriculture Stress EEMS model. Two criteria are not influenced by the climate General Circulation Models (GCMs): Groundwater Resource Stress and Impaired Soil Chemistry. The remaining six criteria were dependent upon the climate projections: Extreme Heat Days, Maximum Annual Temperature, Annual Precipitation Stress, Low Annual Recharge, Climatic Moisture Stress, and Climatic Water Deficit. Four climate driven criteria were intermediate nodes in the EEMS model; the other two were direct outputs from the source data. Mean values for each criterion were calculated for each sub-basin and assigned to one of the seven categories according to the EEMS value ranges (**Table 4**).

To compare overall scores of the sub-basins, CBI assigned numeric values for each criterion based on category (Very High=7 to Very Low=1) with climate change criteria doubled. CBI created two composite scores: one with all criteria and one without the two socioeconomic criteria.

Table 4. EEMS value ranges and category assignment.

EEMS Range	Scoring Category
-1.0 to -0.75	Very Low
-0.75 to -0.50	Low
-0.50 to -0.25	Medium Low
-0.25 to 0.25	Medium

0.25 to 0.50	Medium High
0.50 to 0.75	High
0.75 to 1.0	Very High

RESULTS AND DISCUSSION

EEMS Model Findings

High Agricultural Value

Map results for the EEMS High Agricultural Model show the concentration of the highest quality agricultural land in seven of the 13 sub-basins summarized, including Oxnard, Las Posas, Santa Paula, Pleasant Valley, Fillmore, Mound, and Piru (**Figure 8**). The model includes Favorable Farmland Status based on County level Farmland Mapping and Monitoring Program (FMMP) data as well as Good Soil Capacity based on Impaired Soil Chemistry (Salinity and Sodicity), Soil pH, and Soil Capacity based on Irrigated Capability Class and Storie Index. The dark blue areas (very low value) are the result of the excluded areas (Urban Areas, Protected Lands, and Rivers and Streams) masking the other results.

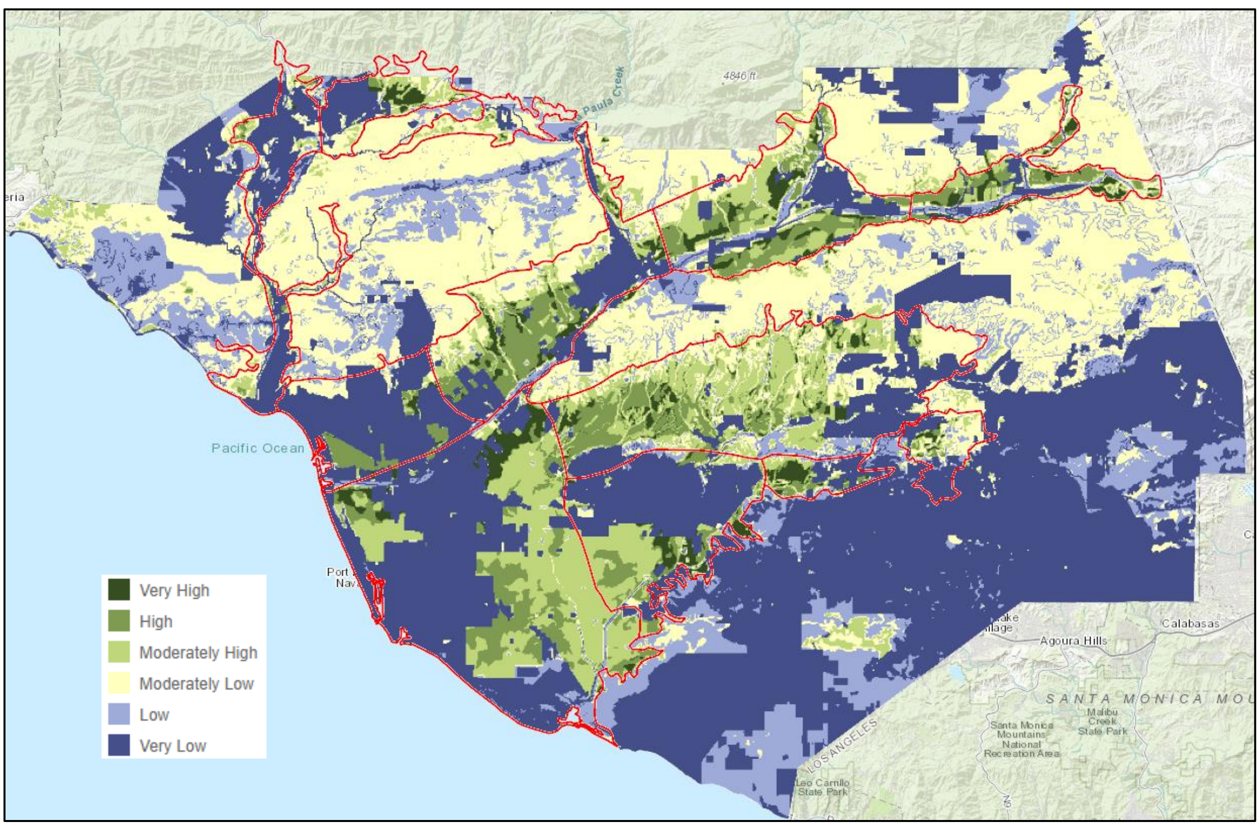


Figure 8. Map showing results from the EEMS High Agricultural Model and the 13 summarized sub-basins.

The overall distribution of agricultural value classes for the 13 sub-basins (~332,500 acres) showed that 5% was classified as Very High with Oxnard, Las Posas Valley, Santa Paula, and Filmore leading all other sub-basins. Approximately 14% of the total sub-basin area was classified as High value with both Oxnard and Las Posas Valley having more than 10,000 acres mapped. A total of 22% of the area was classified as Moderately High with Oxnard and Las Posas Valley possessing nearly 60% of this total – 24,214 acres and 18,774 acres, respectively. The Moderately Low class was 14% of the total sub-basin area with Las Posas and Santa Paula accounting for nearly half of this area. Low value covered 5% of the total area and was largely lands in close proximity to developed areas. The remaining 40% (nearly 133,000 acres) was mapped as Very Low. These were the developed portions of the sub-basins. Adding up the acres classified as Very High through Moderately High, Oxnard, Las Posas, and Filmore contain the most acres of high value agriculture lands (**Table 5**). Moderately Low classified lands are best suited for ranching and perhaps some tree crops.

Table 5. Number of acres classified as Very High, High, and Moderately High for the 13 sub-basins evaluated.

	Very High	High	Moderately High	Total
OXNARD	3,308	10,334	24,214	37,856
LAS POSAS VALLEY	2,346	10,144	18,774	31,264
SANTA PAULA	2,282	7,472	5,246	15,000
PLEASANT VALLEY	1,430	3,684	6,672	11,786
FILLMORE	2,406	7,002	8,644	18,052
MOUND	302	2,396	400	3,098
PIRU	1,824	3,316	2,610	7,750
UPPER VENTURA RIVER VALLEY	68	248	698	1,014
OJAI VALLEY	994	332	1,676	3,002
LOWER VENTURA RIVER VALLEY	0	158	872	1,030
TIERRA REJADA	254	342	620	1,216
UPPER OJAI VALLEY	34	106	756	896
ARROYO SANTA ROSA VALLEY	986	764	946	2,696
Totals	**16,234**	**46,298**	**72,128**	**134,660**

Individual profiles for agricultural value based on the EEMS model are provided for the seven largest sub-basins (**Figure 9**). Oxnard (50%), Pleasant Valley (56%), and Mound (77%) contain the largest proportion of the Very Low class out of this subgroup, which includes both developed and protected lands. The remaining sub-basins in this group showed much lower proportions of the Very Low category.

Individual profiles for agricultural value for the remaining smaller sub-basins had similar proportions of the Very Low category (37-65%) except for the Upper Ojai Valley (13%) (**Figure 10**). Also, the Moderately Low category was more dominant among these sub-basins except for Arroyo Santa Rosa Valley compared to the larger sub-basins.

Figure 9. Individual histogram profiles (acres) for the seven larger sub-basins showing agricultural value results from the EEMS logic model. Note: Y-axes are in acres and are not identical.

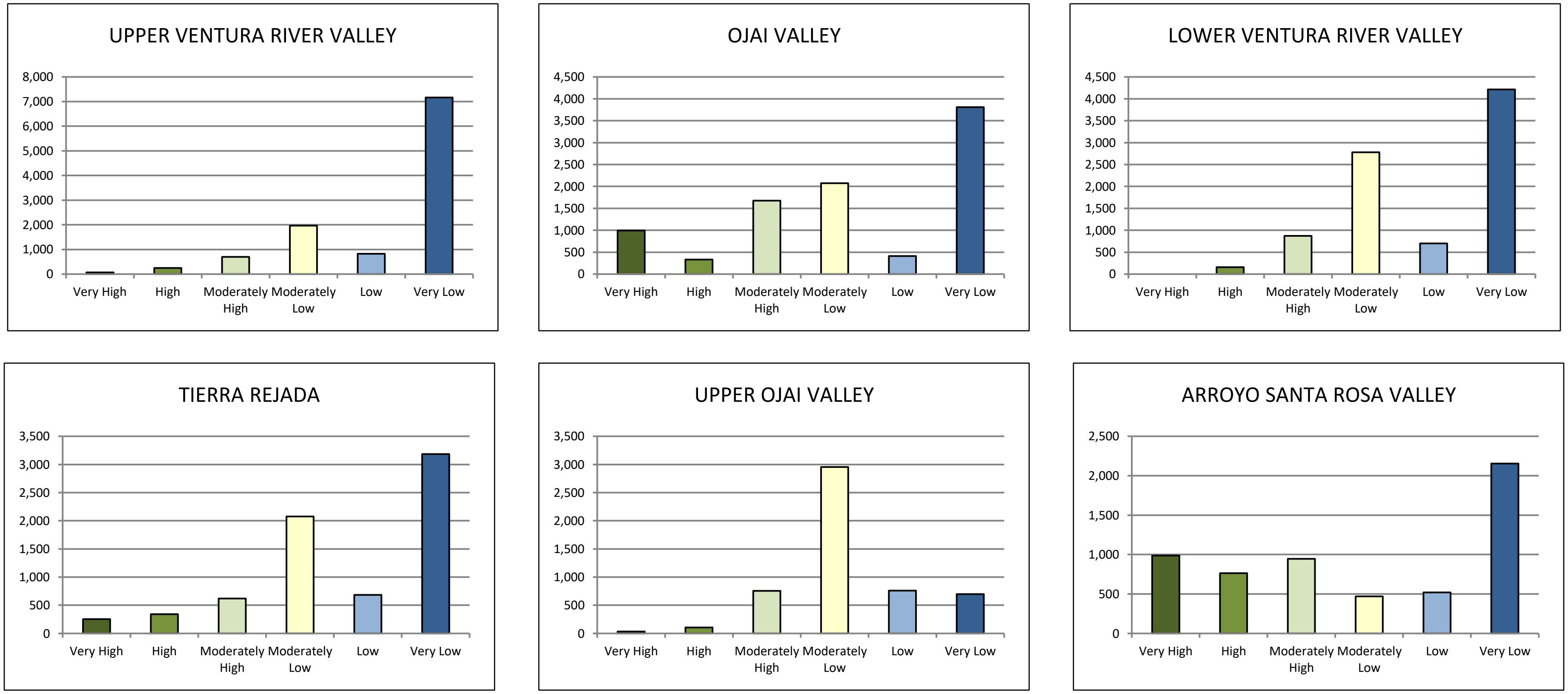


Figure 10. Individual histogram profiles (acres) for the six smaller sub-basins showing agricultural value results from the EEMS logic model. Note: Y-axes are in acres and are not identical.

High Agriculture Stress

Results for the three GCMs analyzed (CNRM-CM5, MIROC5, and GFDL-CM3) for the early time step (2010 to 2039) show a progression of increased climate change stress on the region (**Figure 11**). Although EMMS logic models reflect results as relative rather than absolute values, the three models do show the region is projected to be under considerable stress even under the mildest potential future (warm, wet future |CNRM-CM5). One important observation is that the spatial pattern of relative stress on the 13 sub-basins remains consistent across the models; the observed difference is in the degree of stress overall. For the profile summaries, we chose the EEMS values for the MIROC5 model with the exception of the Extreme Heat Days node where we used the GFDL-CM3 model results. Dynamic versions of the EEMS models that can be altered with regard to input thresholds, node weighting, and logic operators can be accessed using the links in **Table 6**.

Table 6. EEMS Online links to the three High Agriculture Stress logic models for the early time step (2010 to 2039) for the three GCMs.

EEMS Model version	URL
CNRM-CM5	http://eemsonline.org?model=KpO9cGlrYRq2UymflfEpppuYDjbnbvY0
MIROC5	http://eemsonline.org?model=PgOuXeHYC05EqN7FV6sK6jIZqaifhpNF
GFDL-CM3	http://eemsonline.org?model=8z39B5B0rtE7txKIlAX5Hdu1LTfXFjiw

As described in the Methods, most of the criteria used in the sub-basin profile summaries relied on area-weighted means calculations of model results with a spatial resolution of 90 meters. This seems adequate for basin-level reporting purposes and for evaluating comparative levels and types of stress for each subregion. Results for some sub-basins are fairly uniform in values for a particular criterion; others should a fairly wide range. For more detailed examination within each sub-basin, we recommend using the more spatially detailed EEMS models and ancillary datasets in the Gateway. To illustrate this point, consider the Las Posas Sub-basin in the maps shown in **Figure 11**. Regardless of the model, stress results show a progression from better to worse moving from west to east. Similar results can be observed in other sub-basins as well.

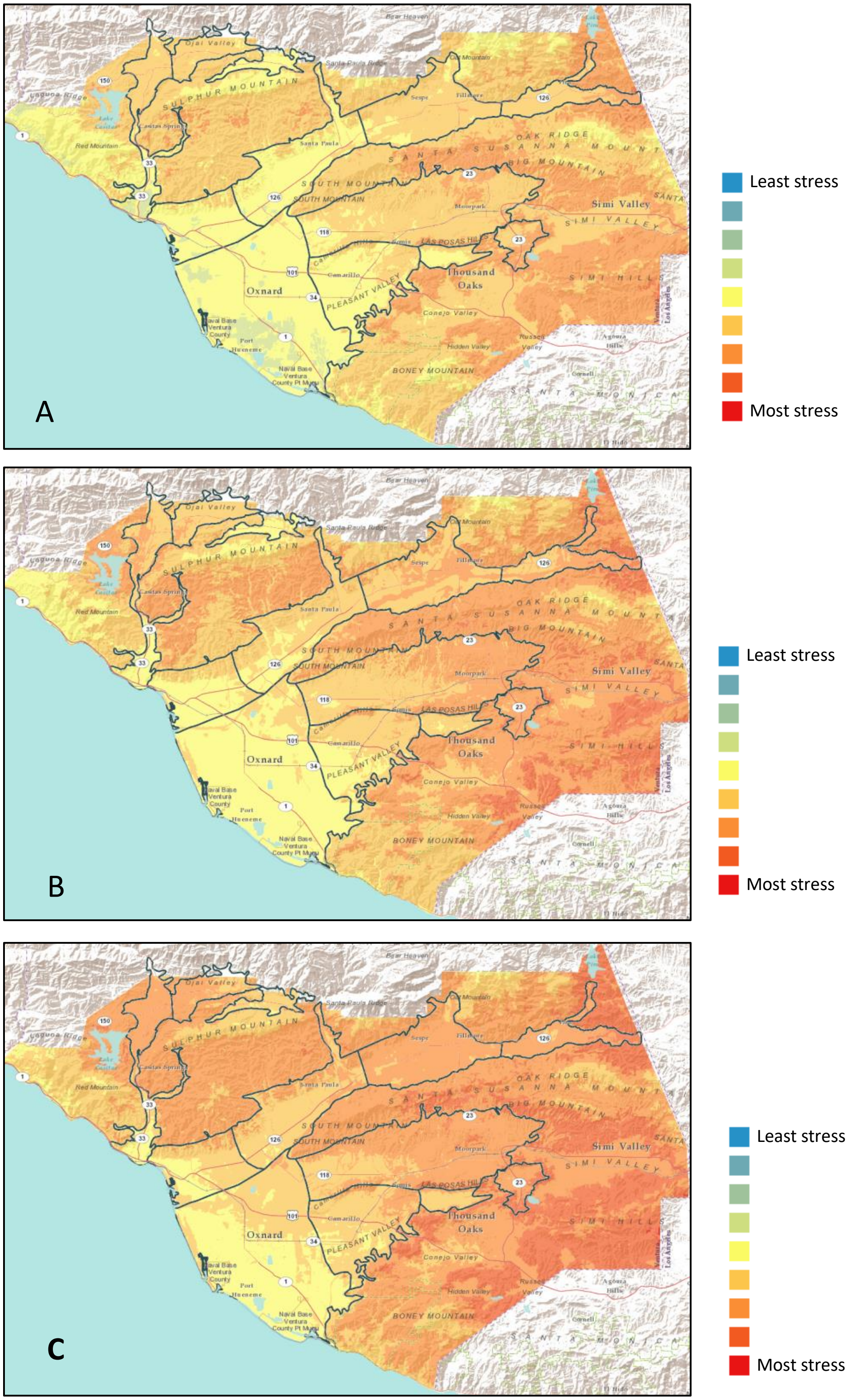


Figure 11. High Agriculture Stress model results showing the influence of climate change (A-CNRM-CM5, B-MIROC5, and C – GFDL-CM3). Outlines of the 13 sub-basins are also shown.

Regional Contextual Findings

From a climate change perspective, sub-basins that are impacted by marine influences, especially Oxnard, Mound, and Lower Ventura River Valley, are somewhat buffered against the most dramatic climate changes projected to occur in the County as can be visualized in the series of model results in **Figure 11** (areas in light green and yellow). These are potentially important refugia areas for agriculture in Ventura County. However, these are also locations that have other current and projected stresses that need to be addressed if long-term viability can be achieved. Most notable is the state of the groundwater aquifers in this sub-basin, which are classified as being critically over drafted according to the California Depart of Water Resources (2020). Another potential serious viability issue unique to coastal areas is the projections of sea-level rise. In Ventura County, the Oxnard sub-basin has the most to lose without intervention to protect both the built environment and well as valuable agricultural lands where as much as 20% of the existing agriculture lands in the sub-basin could be routinely flooded (**Figure 12**).

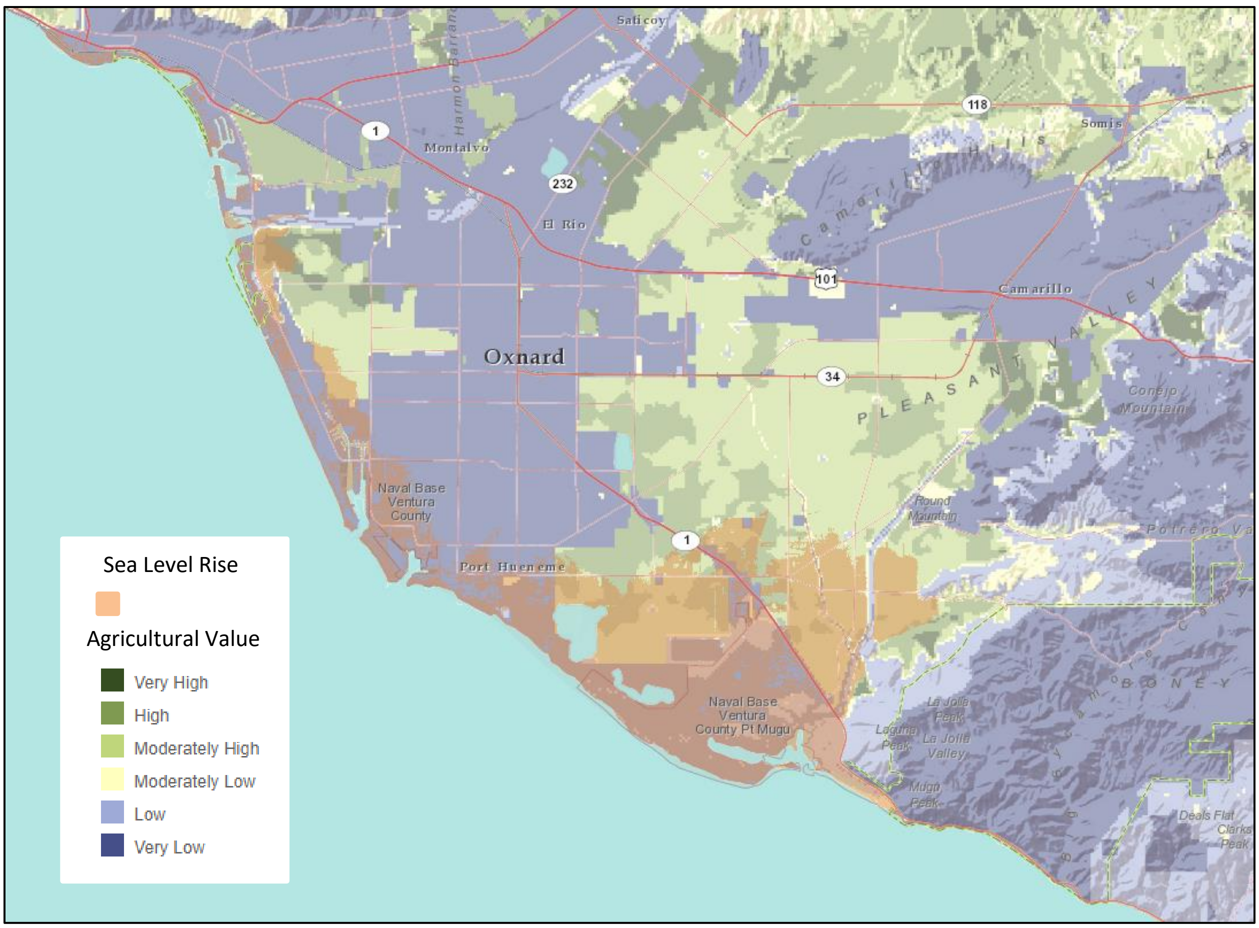


Figure 12. Map of agricultural value based on the project EEMS model and sea level rise 100 flood projection in 2100 based on a 1.4-meter sea-level rise (Philip Williams & Associates 2008).

The Oxnard sub-basin is already impacted by the ongoing saltwater intrusion into the underlying aquifers, but projected sea-level rise will significantly exacerbate this problem.

Public policy exists that prioritizes coastal agriculture in California. The Coastal Act (particularly Sections 30241 and 30242) aims to protect the productivity of agricultural lands while also protecting and promoting other coastal resources and land uses in the coastal regions of the state. The Coastal Act identifies coastal agriculture as one of several priority land uses; other priorities include public access and recreational facilities, visitor-serving facilities, and commercial fishing (California Coastal Commission 2017). To achieve the most positive outcome this policy promotes, addressing the ongoing threats to groundwater is the most important issue.

In other portions of the study area, sub-basins are projected to experience significantly harsher conditions the further you move away from coastal influences and up the Santa Clara River Valley and in and around the small interior valleys such as Simi, Thousand Oaks, Hidden Valley, and Conejo where current agriculture is minimal.

Sub-Basin Profiles

Based on the 2022 Cropsnow dataset (minus the non-commercial entries such as landscaped parks and fallowed lands), the total agricultural area in the County was over 107,000 acres. Approximately 87% of this area (104,755 ac) occurs in only five sub-basins (Oxnard, Las Posas, Santa Paula, Pleasant Valley, and Filmore). Eight percent of the agricultural lands (8,673 ac) occur in two sub-basins (Mound and Piru) and the remaining 5% in the remaining six sub-basins (Arroyo Santa Rosa Valley, Ojai Valley, Upper Ojai Valley, Upper Ventura River Valley, and Lower Ventura River Valley).

Results for the composite scores minus the two socioeconomic criteria showed Arroyo Santa Rosa Valley as having the greatest overall threat to the current agriculture present; however, it only impacts less than 2% of the total croplands based on the 2022 Cropsnow dataset (**Figure 13**). Of the larger agricultural sub-basins, Piru and Fillmore showed the highest level of overall stress; Pleasant Valley showed moderately high stress levels; Las Posas and Santa Paula showed moderate stress levels; and Oxnard and Mound showed moderately low stress levels. The least stressed sub-basins regardless of size were the two Ojai sub-basins.

To help define more targeted strategies informed by the Agriculture Stress modeling, individual sub-basin profiles rather than a composite overview provide a convenient means to easily review the findings. **Figures 14 thru 26** present the individual sub-basin profiles in descending order based on total sub-basin area. Each profile provides a thumbnail map of the sub-basin, summary area total for the sub-basin and proportion that is currently in agriculture, crop type percentages, and categorical scoring for each of the 13 criteria selected from the models and other ancillary data.

From these profiles, we provide textual highlights and offer potential planning and implementation strategies to address specific concerns relevant to each sub-basin (**Table 7**).

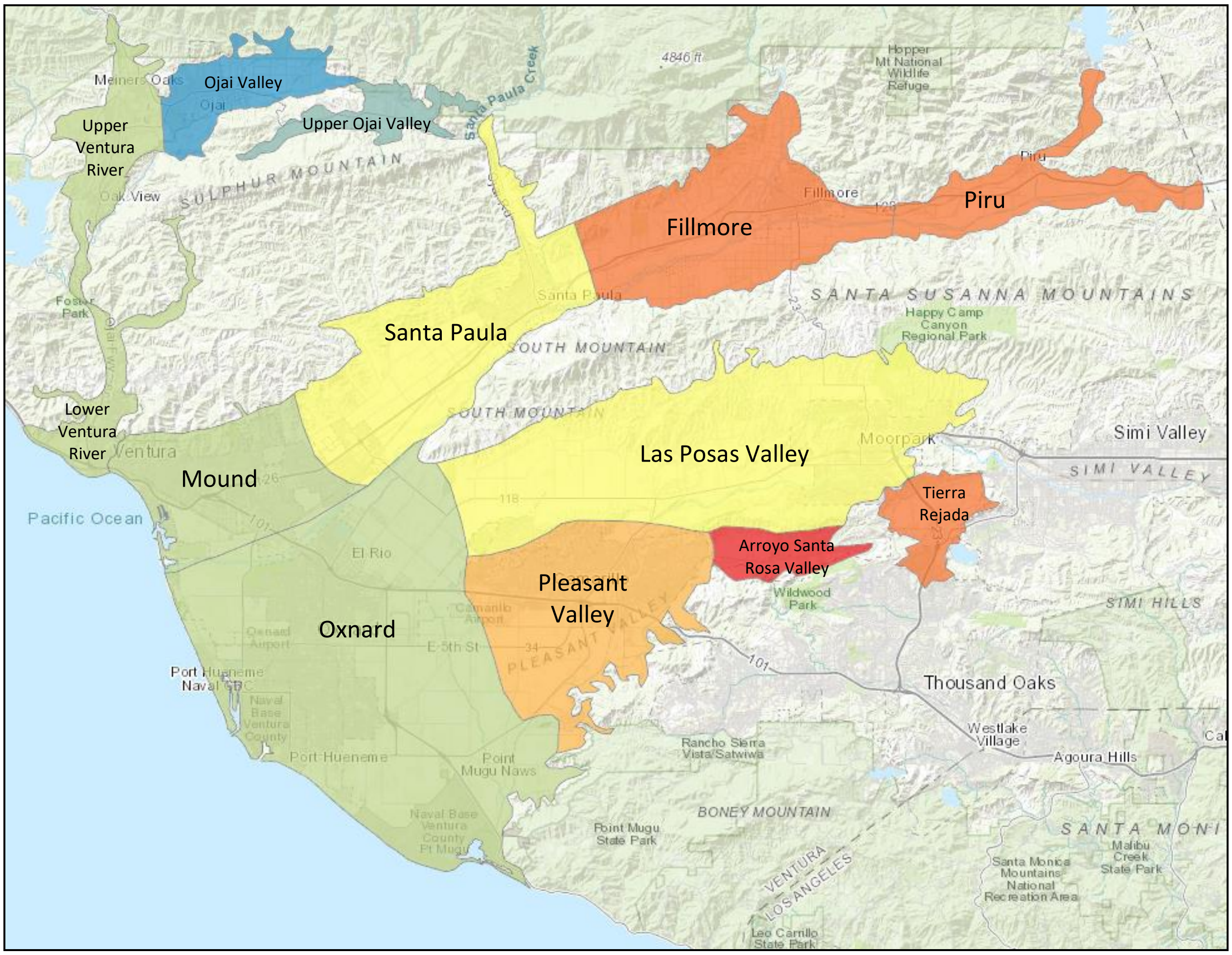
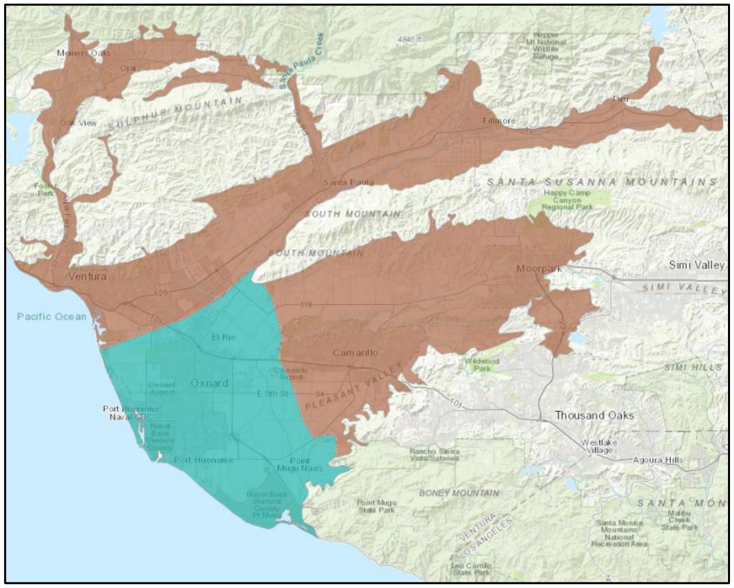


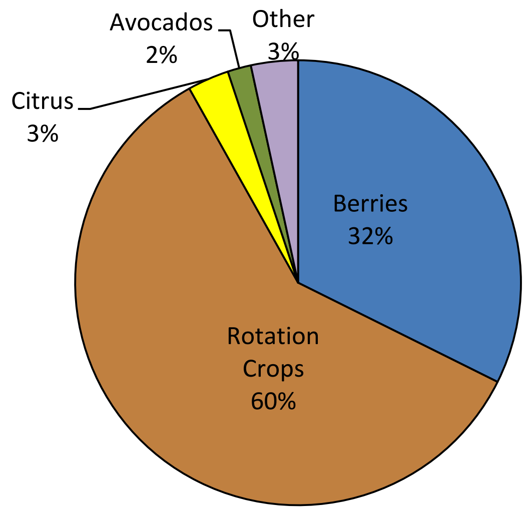
Figure 13. Composite Agriculture Stress scores based on the summary criteria minus the two socioeconomic inputs.

OXNARD



Total Sub-basin Area = 85,071 ac

Total Agriculture Area (2022) = 42,011 ac (49.5%)

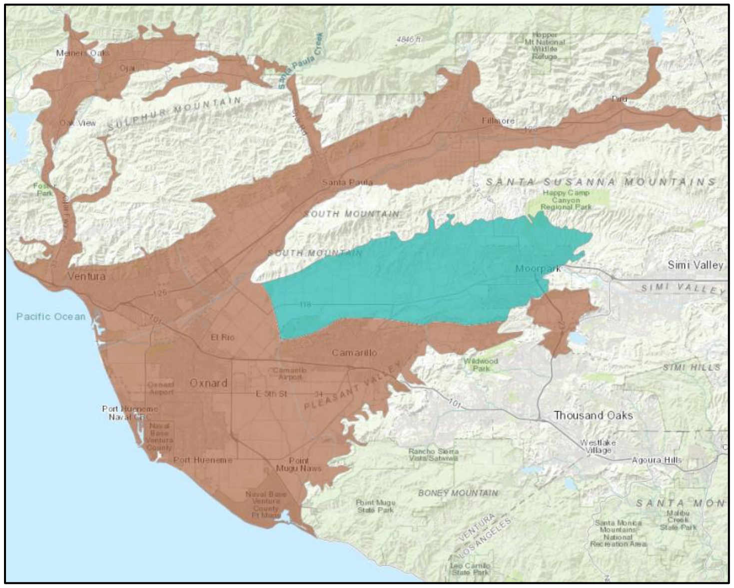


Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
H	VH	M	H	VL	VH	H

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
L	VL	VH	VH	M	L

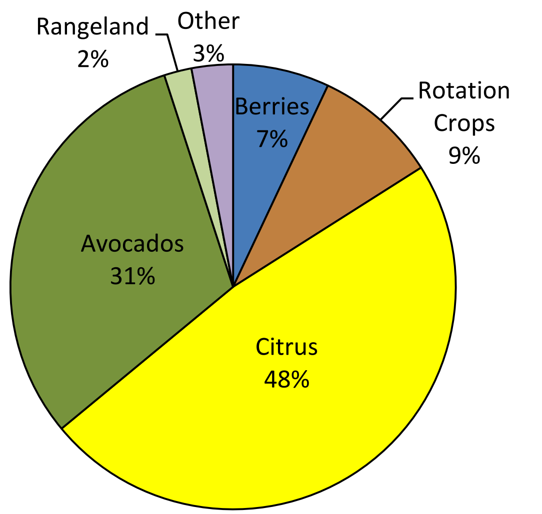
Figure 14. Profile risk summary for the Oxnard Sub-basin.

LAS POSAS VALLEY



Total Sub-basin Area = 62,030 ac

Total Agriculture Area (2022) = 18,363 ac (26.6%)

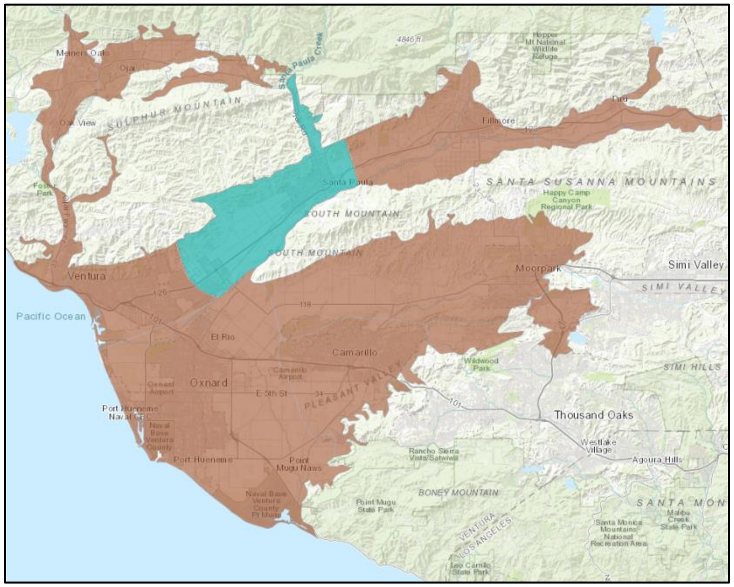


Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
ML	L	VL	M	M	H	L

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
M	MH	H	MH	M	M

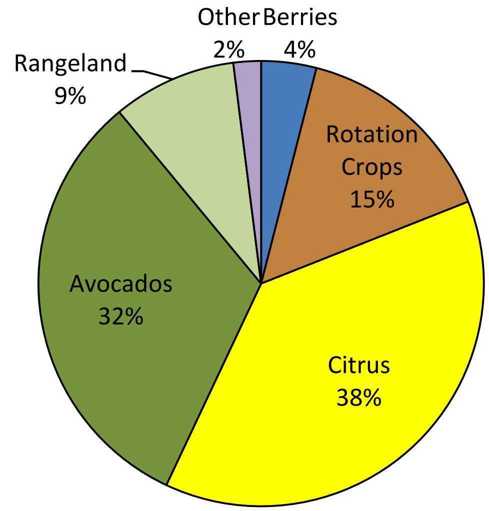
Figure 15. Profile risk summary for the Las Posas Valley Sub-basin.

SANTA PAULA



Total Sub-basin Area = 33,586 ac

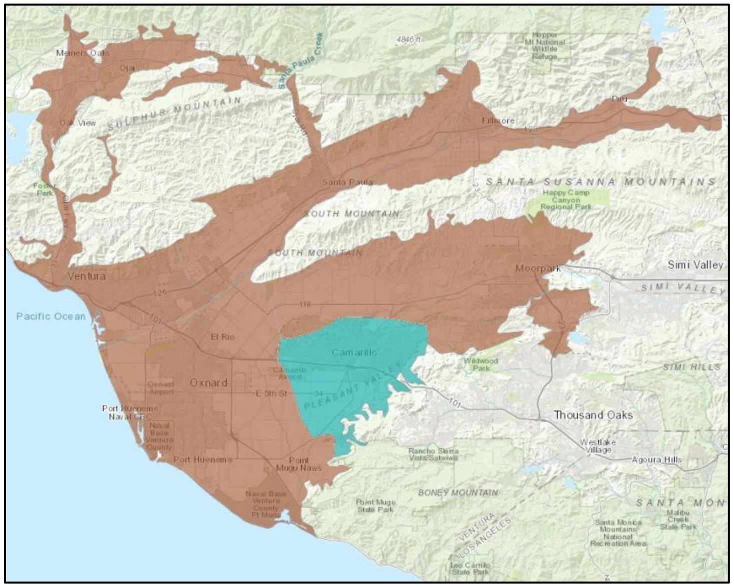
Total Agriculture Area (2022) = 11,497 ac (34.2%)



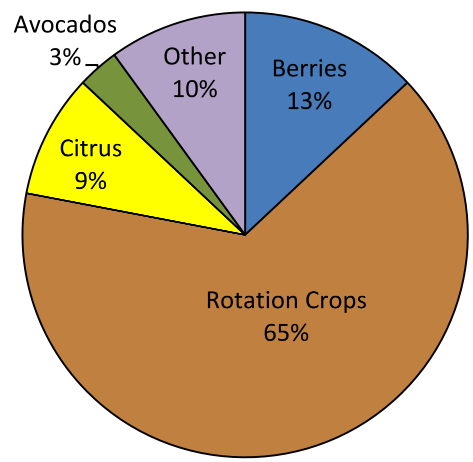
Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
MH	MH	L	M	MH	ML	ML
Extreme Heat Days	**Max Annual Temperature**	**Annual Precipitation Stress**	**Water Recharge Deficiency**	**Climatic Moisture Stress**	**Climatic Water Deficit**	
H	M	MH	MH	M	M	

Figure 16. Profile risk summary for the Santa Paula Sub-basin.

PLEASANT VALLEY



Total Sub-basin Area = 31,665 ac
Total Agriculture Area (2022) = 10,921 ac (34.5%)

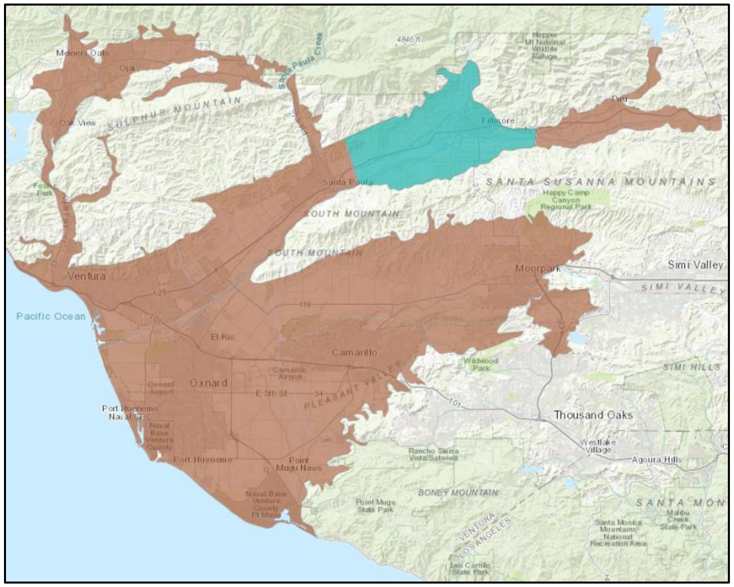


Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
M	ML	M	M	M	VH	M

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
L	ML	VH	H	MH	M

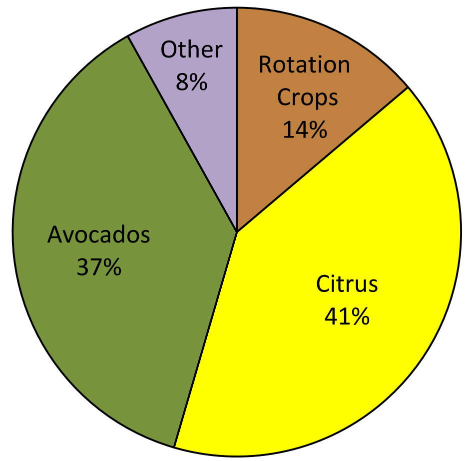
Figure 17. Profile risk summary for the Pleasant Valley Sub-basin.

FILMORE



Total Sub-basin Area = 30,600 ac

Total Agriculture Area (2022) = 10,363 ac (33.8%)

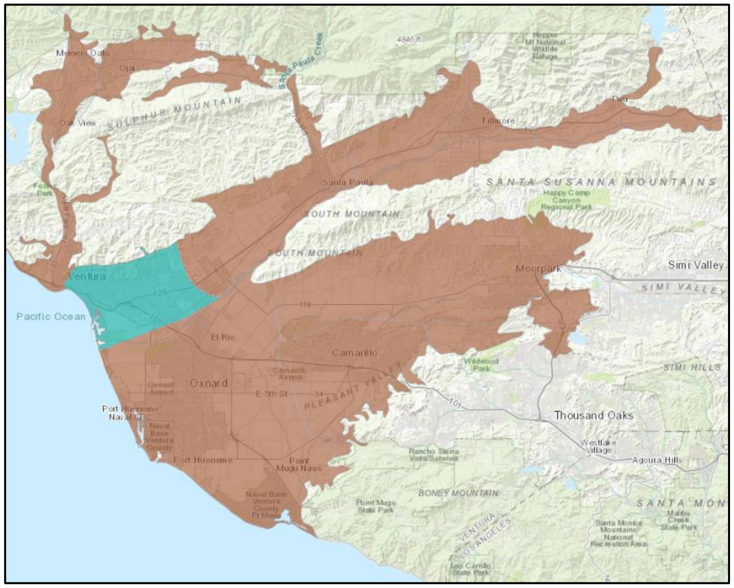


Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
MH	MH	VH	M	M	MH	L

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
VH	H	ML	MH	MH	M

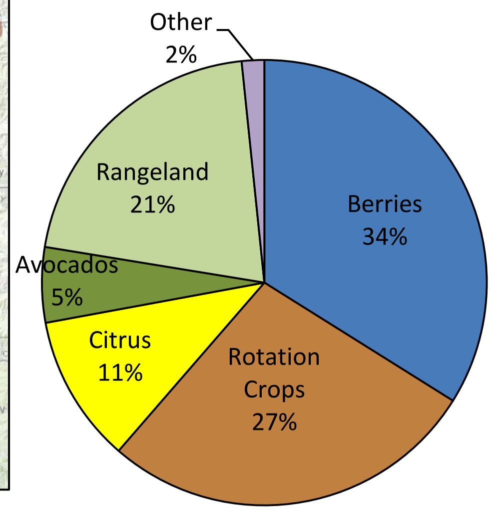
Figure 18. Profile risk summary for the Filmore Sub-basin.

MOUND



Total Sub-basin Area = 21,746 ac

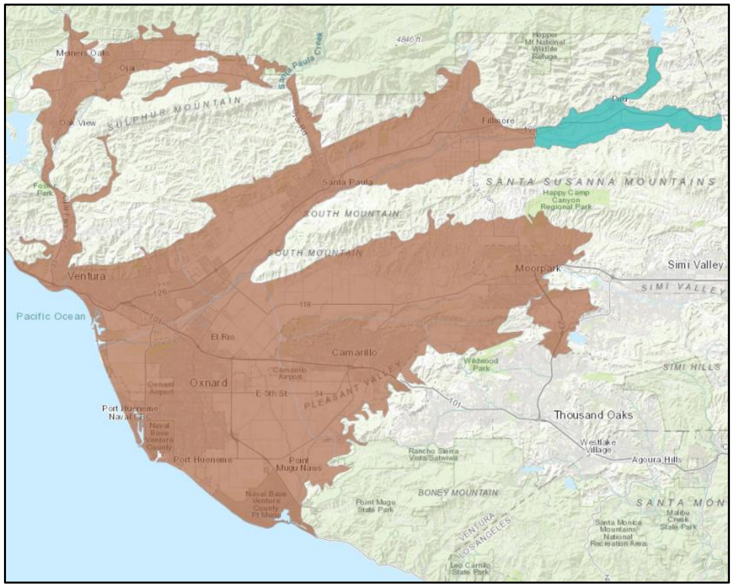
Total Agriculture Area (2022) = 4,513 ac (20.7%)



Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
M	M	L	H	MH	H	ML
Extreme Heat Days	**Max Annual Temperature**	**Annual Precipitation Stress**	**Water Recharge Potential**	**Climatic Moisture Stress**	**Climatic Water Deficit**	
M	ML	H	MH	M	ML	

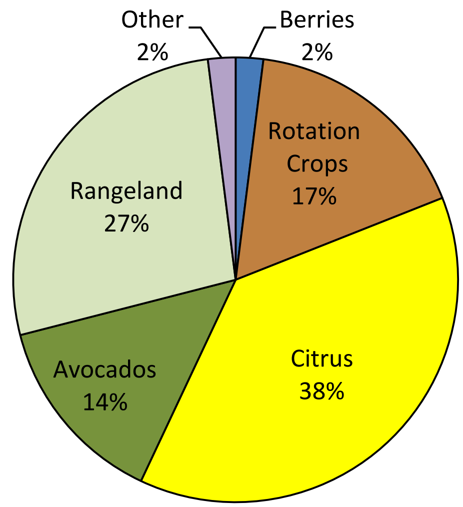
Figure 19. Profile risk summary for the Mound Sub-basin.

PIRU



Total Sub-basin Area = 13,091 ac

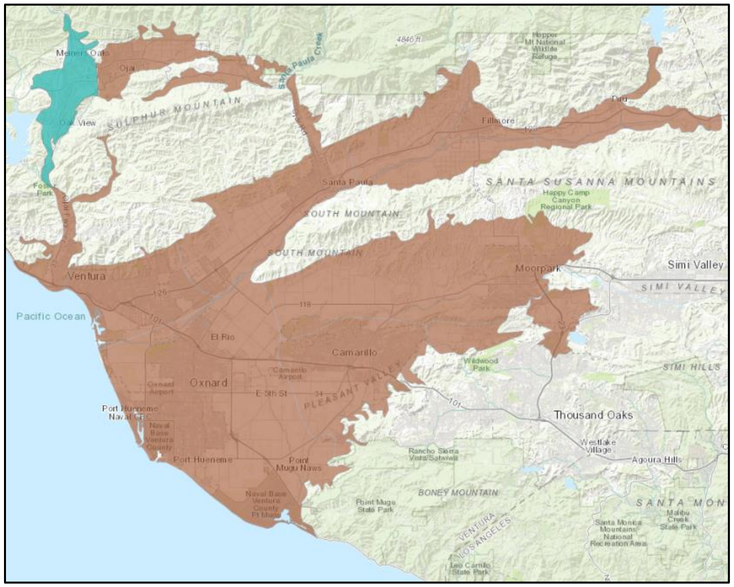
Total Agriculture Area (2022) = 4,160 ac (31.8%)



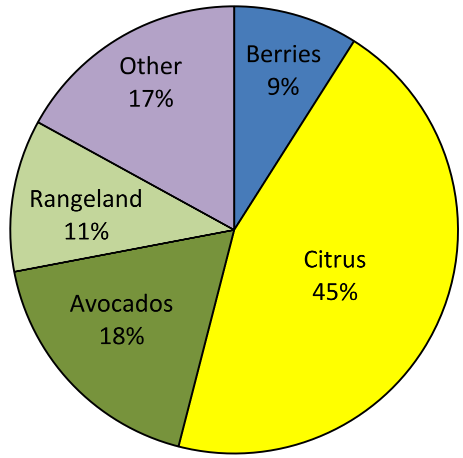
Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
H	H	H	M	ML	MH	ML
Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit	

Figure 20. Profile risk summary for the Piru Sub-basin.

UPPER VENTURA RIVER VALLEY



Total Sub-basin Area = 10,924 ac
Total Agriculture Area (2022) = 689 ac (6.3%)

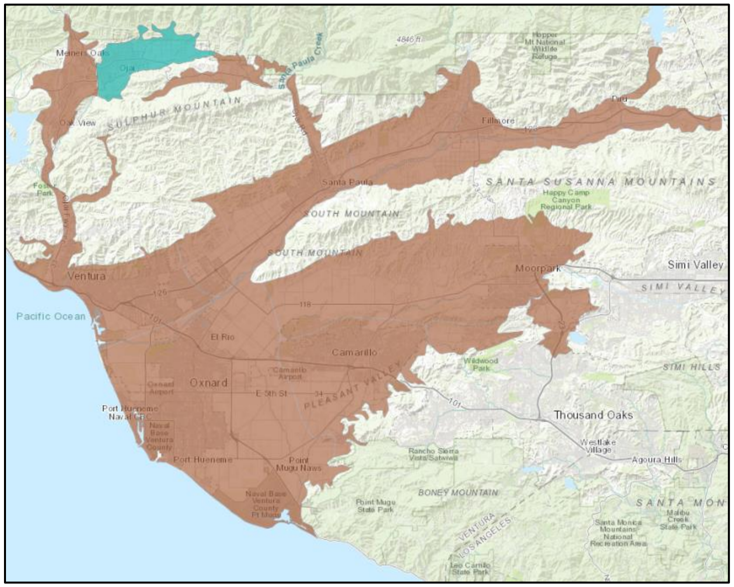


Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
MH	M	MH	MH	VH	H	VL

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
M	H	M	ML	ML	M

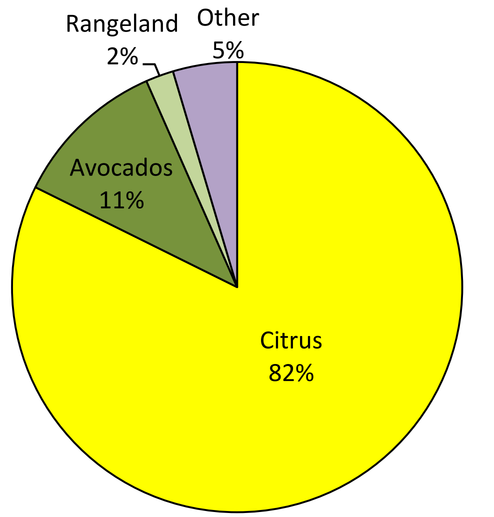
Figure 21. Profile risk summary for the Upper Ventura River Valley Sub-basin.

OJAI VALLEY



Total Sub-basin Area = 10,077 ac

Total Agriculture Area (2022) = 1,133 ac (11.2%)

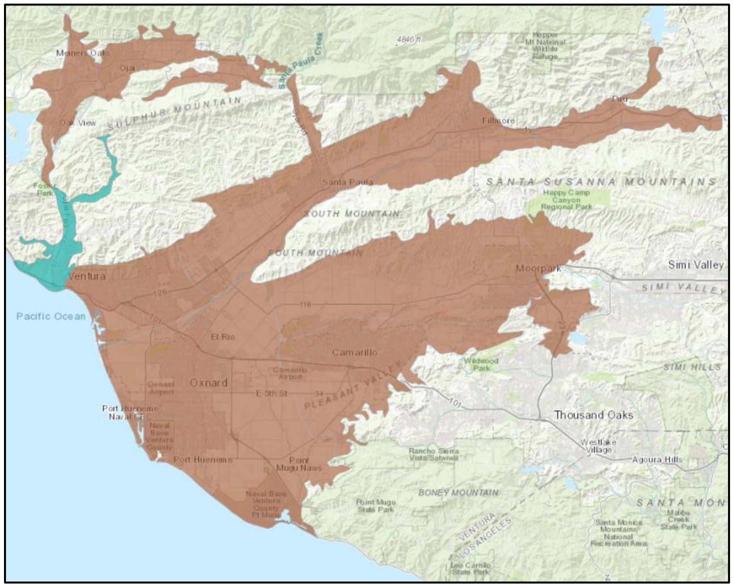


Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
H	M	M	ML	VH	M	VL

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
M	VH	ML	VL	L	ML

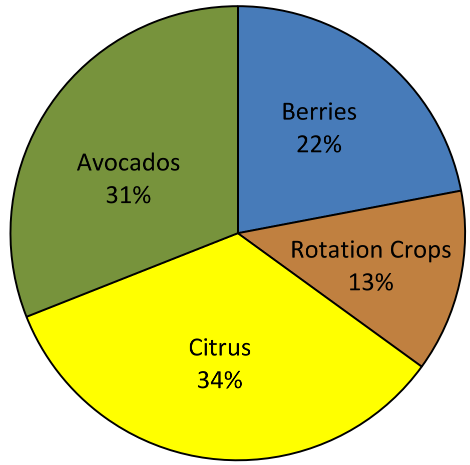
Figure 22. Profile risk summary for the Ojai Valley Sub-basin.

LOWER VENTURA RIVER VALLEY



Total Sub-basin Area = 7,789 ac

Total Agriculture Area (2022) = 518 ac (6.6%)

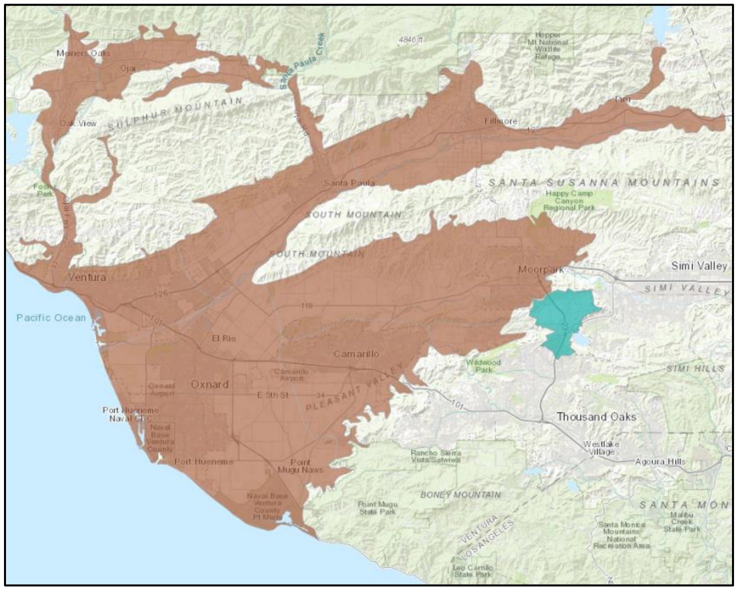


Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
VH	VH	M	MH	MH	ML	L

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
M	ML	MH	MH	M	ML

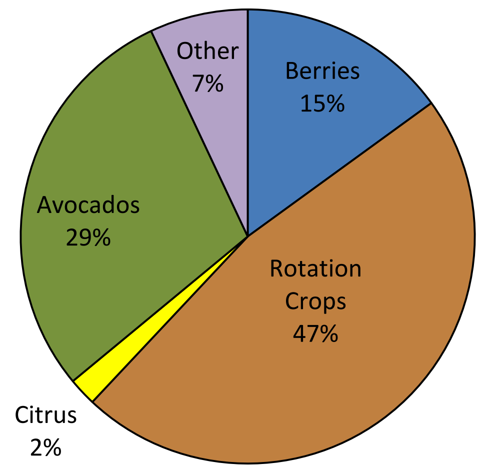
Figure 23. Profile risk summary for the Lower Ventura River Valley Sub-basin.

TIERRA REJADA



Total Sub-basin Area = 6,747 ac

Total Agriculture Area (2022) = 489 ac (7.2%)

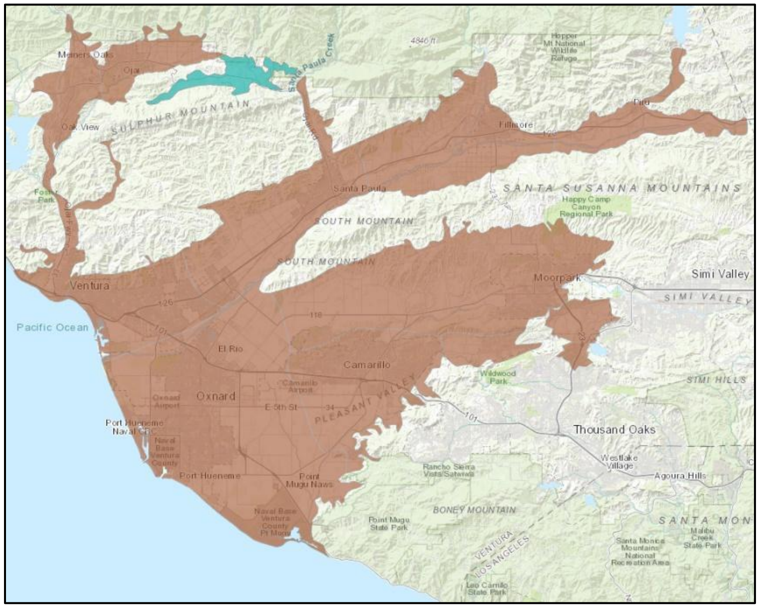


Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
VL	VL	VL	L	L	M	L

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
H	H	H	H	H	MH

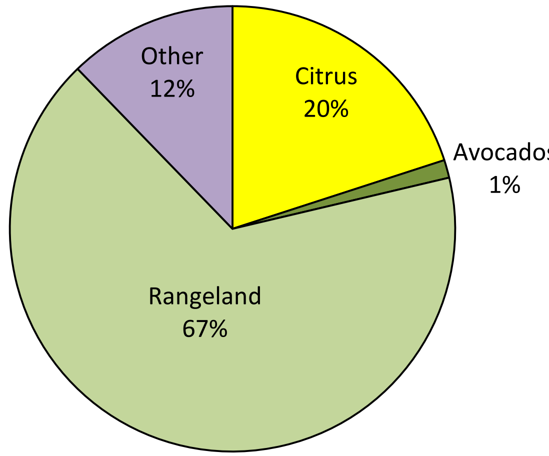
Figure 24. Profile risk summary for the Tierra Rejada Sub-basin.

UPPER OJAI VALLEY



Total Sub-basin Area = 5,609 ac

Total Agriculture Area (2022) = 703 ac (12.5%)

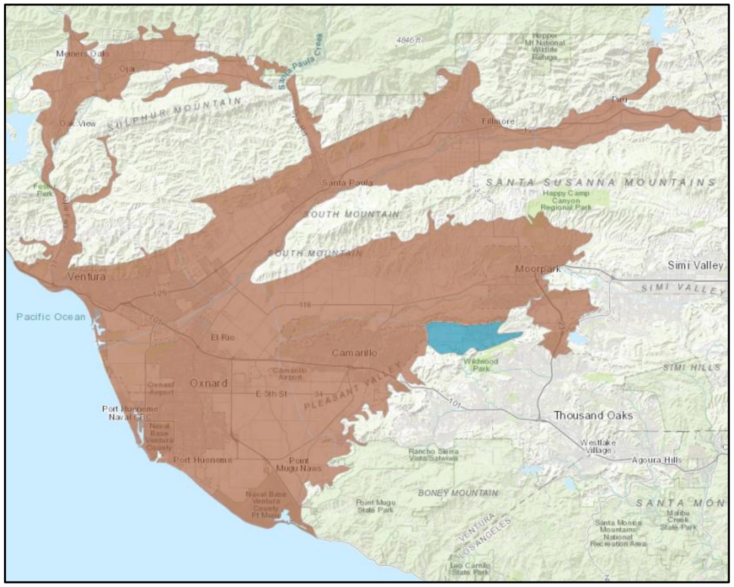


Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
MH	M	M	VL	MH	M	L

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
MH	H	VL	VH	L	ML

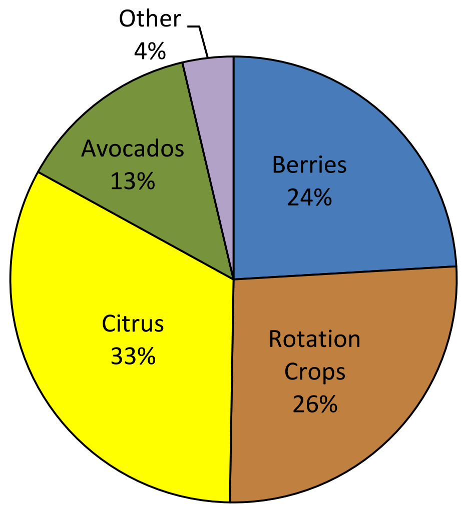
Figure 25. Profile risk summary for the Upper Ojai Valley Sub-basin.

ARROYO SANTA ROSA VALLEY



Total Sub-basin Area = 5,482 ac

Total Agriculture Area (2022) = 1,782 ac (32.5%)



Housing Burden	Poverty	Potential Flooding Risk	Invasive Plants	Wildfire Risk	Groundwater Resource Stress	Impaired Soil Chemistry
VL	VL	ML	M	H	M	L

Extreme Heat Days	Max Annual Temperature	Annual Precipitation Stress	Water Recharge Deficiency	Climatic Moisture Stress	Climatic Water Deficit
H	M	VH	H	MH	M

Figure 26. Profile risk summary for the Arroyo Santa Rosa Valley Sub-basin.

Table 7. Text summaries and potential response strategies specific to each sub-basin analyzed in Ventura County, California.

Major Agriculture Sub-basins (>10,000 of agriculture acres)	
OXNARD	● The most important sub-basin in terms of crop area and overall resilience to projected climate change ● Dominated by rotation crops and berries allowing for quicker responses to changing conditions ● Precipitation has always been low leading to reliance on groundwater - that will be more challenging in the future ● The current situation of overdraft of the aquifers and the continuing threat from saltwater intrusion will be made worse by rising sea levels *Consideration:* Continue to explore opportunities to increase groundwater recharge in the sub-basin with water from other areas and make improvements on water conservation measures
LAS POSAS VALLEY	● Dominated by tree crops - avocado more vulnerable than citrus ● Western portion of the sub-basin shows higher resilience than the eastern section ● Number of extreme heat days in the moderate range compared to some other sub-basins - tree crops can likely be maintained into the short-term future ● If extreme heat events continue, consider converting some tree crops growing on marginal soils to less sensitive species or convert to natural plant cover, especially in the eastern portion of the basin ● Address groundwater overdraft issues ● Invasive species impacts and wildfire risk at moderate levels - control measures may be more effective than in some other sub-basins *Consideration:* Redirect water conserved from other sub-basins to this area
SANTA PAULA	● Dominated by tree crops - avocado more vulnerable than citrus ● Similar to Las Posas in terms of crop profile and climate change sensitivity - marine influence helps moderate projected climate change ● Potential for increase in extreme heat days will place high stress on tree crops ● Groundwater Resource in very good shape even while supporting a large agricultural footprint *Consideration:* Convert sensitive tree groves to other crop types or to natural cover *Consideration:* Moderate invasive plant pressures and moderately high wildfire risk, especially on the northwest edge of the sub-basin - exploring strategies to mitigate extreme fire events is encouraged
PLEASANT VALLEY	● Dominated by rotation crops and berries

	● Other than low precipitation, this sub-basin benefits from its proximity to marine influences and shows relatively high climate change resilience ● Groundwater Resource stress is very high and the main stressor to agriculture in the sub-basin ● Expanding greenhouse farming will allow for more predictability in crop harvests under extreme conditions *Consideration:* Consider improving water holding capacity of crop soils to combat high moisture stress
FILMORE	● Dominated by tree crops - avocado highly vulnerable from high annual maximum temperatures and large increases in number of extreme heat days ● Consider transitioning to more heat tolerant crops ● Annual precipitation increases as maritime influences give way to higher precipitation events ● Potential for flooding is extremely high - development in low lying areas will be put under greater risk in the future ● Opportunities to recharge groundwater supplies on site or for use downstream may be increasing over time *Consideration*: Reduction in the area committed to avocado groves may be warranted, starting with most vulnerable soils first
Agriculture Sub-basins (2,000-5,000 of agriculture acres)	
MOUND	● Dominated by berries and rotation crops but a relatively small acreage footprint ● Projected climate change impacts comparatively low due to marine influences ● Precipitation totals have always been low compared to other portions of the County leading to vulnerability of local groundwater withdrawals ● Expanding greenhouse farming would allow for more predictability in crop harvests under extreme events and would help curb invasive species *Consideration:* Consider additional management measures to conserve groundwater resources
PIRU	● Highly mixed crop profile with tree crops making up over 50% ● Tree crops (especially avocado) will be under extreme stress ● The most climate stressed sub-basin of those with considerable area of sensitive croplands ● Potential for flooding is extremely high – any development in the floodplain will be put under great risk in the future *Consideration*: Assess opportunities to recharge groundwater supplies on-site or for use downstream, which may be increasing over time

Minor Agriculture Sub-basins (<2,000 of agriculture acres)	
UPPER VENTURA RIVER VALLEY	● Nearly two-thirds in tree crops (~400 ac) will be more viable than in many other sub-basins ● Precipitation levels in the future are projected to be higher than in most other portions of the region, but groundwater stress is currently still high ● Surface water capture strategies may be adequate to support existing agriculture in this sub-basin *Consideration*: Wildfire risk is very high – exploring practical strategies to mitigate extreme fire events may prove to be extremely effective
OJAI VALLEY	● Heavily dominated by tree crops (93%) mostly citrus ● With the exception of projected very high exposure to annual maximum temperatures, the sub-basin is less impacted by climate change than most other sub-basins due to increased moisture ● Groundwater resource stress is moderate and opportunities for surface water capture strategies may be adequate to support the highest quality crop operations ● Avocado groves (~125ac in 2022) are the most vulnerable crop due to periods of high temperatures *Consideration*: Wildfire risk is very high – exploring practical strategies to mitigate extreme fire events may prove to be extremely effective
LOWER VENTURA RIVER VALLEY	● A small agriculture footprint (~7%) of a small sub-basin ● Heavy marine influence on projected climate change – mild temperatures but continuing low precipitation ● Groundwater resource stress is also low *Consideration*: Wildfire risk is moderately high due to the proximity of urbanized lands to local rangelands – exploring practical strategies to mitigate extreme fire events may prove to be extremely effective
TIERRA REJADA	● A small agriculture footprint (~7%) of a small sub-basin ● The most heavily impacted sub-basin based on climate change projections ● Tree crops under extreme stress at least over the short-term *Consideration*: Majority of crops rotation crops and berries - expanding greenhouse farming will allow for greater reliability
UPPER OJAI VALLEY	● Small agriculture footprint - mostly rangeland ● Very limited extent of tree crops (mostly citrus) will be subjected to higher temperatures *Consideration*: Wildfire risk is moderately high due to the proximity of urbanized lands to local rangelands– exploring practical strategies to mitigate extreme fire events may prove to be extremely effective
ARROYO SANTA ROSA VALLEY	● Smallest sub-basin being summarized with 1/3 in agriculture ● Good mix of crop types (including 46% in tree crops) which will be heavily impacted by future climate, especially avocado groves

	Consideration: Expanding greenhouse farming may be necessary to maintain consistent yields of most non-tree commercial crops *Consideration*: Wildfire risk is high due to the proximity of urbanized lands to local rangelands – exploring practical strategies to mitigate extreme fire events may prove to be extremely effective

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APPENDIX A – LIST OF SPATIAL DATASETS IN THE VENTURA COUNTY GATEWAY

Gateway Dataset Title	Gateway URL Link
Agricultural Land Conversion 2001-2016 - American Farmland Trust	https://vcsalc.databasin.org/datasets/27e6791c57234f6499ca8ce04ae4fad6/
Biological Integrity of Constrained Streams by Stream (linear feature)	https://vcsalc.databasin.org/datasets/ea5b880de45d4d7bbb7c9d03bfbf5f94/
Biological Integrity of Constrained Streams by Watershed	https://vcsalc.databasin.org/datasets/8b687b1fd9ad4eefa1603957a037dc81/
Block Level Housing Density Raster 1990 (HUDEN90)	https://vcsalc.databasin.org/datasets/623f20b12f954dec9369163a0bb64327/
Block Level Housing Density Raster 2000 (HUDEN00)	https://vcsalc.databasin.org/datasets/798313a947864b7499fc70df236d54bd/
Block Level Housing Density Raster 2010 (HUDEN10)	https://vcsalc.databasin.org/datasets/db6bfef0d5454f3fbb9c68af7fd68aaf/
CAL FIRE FRAP Reducing Wildfire Threats to Communities, California	https://vcsalc.databasin.org/datasets/02b725e6cdb047f7ab9a295cfc511d5a/
CalEnviroScreen 4.0	https://vcsalc.databasin.org/datasets/9755da0fd48d4e86af0ab79331b64561/
California - Farmland Mapping and Monitoring Program (FMMP),2016	https://vcsalc.databasin.org/datasets/6b4568bf2a8f40e3990fd1d621e4c350/
California Agricultural Value (2018)	https://vcsalc.databasin.org/datasets/f55ea5085c024a96b5f17c7ddddd1147/
California Building Footprints, Santa Barbara & Ventura Counties	https://vcsalc.databasin.org/datasets/8df40d7976924c0d902302da48261f51/
California Canals and Ditches - NHD Flowline	https://vcsalc.databasin.org/datasets/1e583fd4a1474442a101c8781555100d/
California City and County Boundaries (BOE, 20210414)	https://vcsalc.databasin.org/datasets/f7031feee93e401a850e1446eb3723fb/
California Cropland 2019 (USDA Cropscape)	https://vcsalc.databasin.org/datasets/bb45f39fa5334b27b9c4aaa45e6a3dc8/

California Fire Perimeters (CALFIRE; 1878 - 2020)	https://databasin.org/datasets/fbbc0115307748bab3887dcfc81e1aa5/
California Freshwater Conservation Blueprint - prioritization results, version 1.0 June 2018	https://databasin.org/datasets/b03819ca45bc46aa912966bb062763ee/
California Freshwater Species Database, v2.0.7 - Richness Summary	https://vcsalc.databasin.org/datasets/0137173fd63045c1886150d102e36bae/
California Lands Enrolled in Williamson Act, 2019	https://vcsalc.databasin.org/datasets/7aec69e6295b450388b17b8cfb92f9ea/
California Protected Areas Database (CPAD), 2021b - December 2021	https://databasin.org/datasets/0da515cfc4ba45d3bf28cbb719579b73/
California Rare, Threatened, or Endangered Species (CNDDB & USFWS, Non-Impervious)	https://vcsalc.databasin.org/datasets/0bbdb9cbe4124f44b3ef0a40350acdb9/
Change in Future Climatic Water Deficit, California (CNRM RCP 8.5), Ventura County	https://vcsalc.databasin.org/datasets/8736bc06a3494ec2930ea0f2cf9e4b6d/
Change in Future Climatic Water Deficit, California (GFDL-A2 RCP 8.5), Ventura County	https://vcsalc.databasin.org/datasets/e0c74a7b2d354ae9961c5a688e2f258f/
Change in Future Climatic Water Deficit, California (MIROC-ESM RCP 8.5), Ventura County	https://vcsalc.databasin.org/datasets/d9a3708a37d745f29fef8cef4163f2d8/
Change in Groundwater Well Levels, North Central California	https://vcsalc.databasin.org/datasets/33ee5d261f0b4239a738f627751cb3b8/
Change of Mean Projected Annual Aridity for 2016-2075, California	https://vcsalc.databasin.org/datasets/53225e9eb19d4a688061fcd046e28cb0/
Change of Mean Projected Annual Maximum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/dc22e1cba1b2471fb225bc9afa77430f/
Change of Mean Projected Annual Minimum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/04cbd27113e5494ab74efb251930e9b8/
Change of Mean Projected Annual Total Precipitation for 2016-2075, California	https://vcsalc.databasin.org/datasets/42cc090543af4fe1839fedf0699ab223/
Change of Mean Projected April, May, June Aridity for 2016-2075, California	https://vcsalc.databasin.org/datasets/3dc0206969b646808768ba46470654fe/
Change of Mean Projected January, February, March Aridity for 2016-2075, California	https://vcsalc.databasin.org/datasets/6d6e1aa9026946b2888cfdeb1227ff91/
Change of Mean Projected July, August, September Aridity for 2016-2075, California	https://vcsalc.databasin.org/datasets/a4fcc76cfe95416d93a45e9dcbeba693/

Change of Mean Projected October, November, December Aridity for 2016-2075, California	https://vcsalc.databasin.org/datasets/afbe1e7a257e434eb6ceb86953ffd6eb/
Common Weed Species Presence - Ventura County, California	https://vcsalc.databasin.org/datasets/7db92bbce5e4404b84d642e3953d9f93/
Community Fire Planning Zone (CFPZ) California	https://vcsalc.databasin.org/datasets/3a85fd0bdcf84922b0edde625709511f/
County Boundaries, California	https://vcsalc.databasin.org/datasets/43c435df8ed2403cbe003927ba169407/
Critical Habitat for Braunton's Milk-Vetch (Astragalus Brauntonii) within Jurisdiction of the Ventura Fish and Wildlife Office (VFWO)	https://vcsalc.databasin.org/datasets/99463b3daa3a4f47aac7c16773634203/
Critically Overdrafted Groundwater Basins in California	https://vcsalc.databasin.org/datasets/68c79a05a4bf4f2790392a18307ab1c3/
Cropsnow 2018 - Ventura County, California	https://vcsalc.databasin.org/datasets/f4a91ddeb0e1460a823191cf76f19cca/
Cropsnow 2019 - Ventura County, California	https://vcsalc.databasin.org/datasets/2ea433a237aa4d1183c674b5e1535330/
Cropsnow 2020 - Ventura County, California	https://vcsalc.databasin.org/datasets/6f113c8b48e44eedb7a178ef7177590a/
Cropsnow 2021 - Ventura County, California	https://vcsalc.databasin.org/datasets/dbaf86e923e645298ed838731e3dd405/
Cropsnow 2022 - Ventura County, California	https://vcsalc.databasin.org/datasets/750f1be6df71478eb7c9d9bf9aeb96a9/
Density of groundwater dependent wetlands and vegetation alliances in California	https://vcsalc.databasin.org/datasets/979c1af07a494246b1b517d36b5e7755/
Density of springs in California	https://vcsalc.databasin.org/datasets/10512b92aefa48d6a4b9400a08fd358f/
Developed, High intensity land use	https://vcsalc.databasin.org/datasets/7c5f987bda034ab09308664bfbd5b4a3/
Drinking Water Contamination Levels	https://vcsalc.databasin.org/datasets/41f860c0a66f406895aa7d05d9532653/
Ember Load Index, California	https://vcsalc.databasin.org/datasets/53da679f24c74ebda2a7da9a0523649d/
Fire Hazard Severity Zones in State Responsibility Areas	https://vcsalc.databasin.org/datasets/e8cdfbb7dff34b4a88ee957e9f2d93ac/

Fire Perimeters, 2020	https://vcsalc.databasin.org/datasets/701fd628ee22446ab97e11dffd147dce/
FRAP Vegetation, California	https://vcsalc.databasin.org/datasets/66c423fdbda24bf69d69de5f71206ad6/
Fuel Hazard Ranking	https://vcsalc.databasin.org/datasets/e78399212a504fd68cd97a4db5ae2b87/
General Land Use Plans for California, USA	https://vcsalc.databasin.org/datasets/1cda3056a4ad4ece86eb5eda4ef17e82/
gNATSGO Irrigated Capability Class, Soils, California	https://vcsalc.databasin.org/datasets/d56f4af887b247db933ce85349b736c5/
gNATSGO Non Irrigated Capability Class, Soils, California	https://vcsalc.databasin.org/datasets/77657504ded64efcbc4d6037f72c0b4f/
Groundwater Basin Boundaries 2016, California	https://vcsalc.databasin.org/datasets/b25167d2a88e463ebed2dd73768cae28/
Groundwater Basins Subject to Critical Conditions of Overdraft	https://vcsalc.databasin.org/datasets/8cf9f129dfef497bb2acecc888169d8c/
Groundwater Contamination Levels	https://vcsalc.databasin.org/datasets/3cb9500acf614839acf820288fce2f08/
Groundwater Level Percentile Class Points	https://vcsalc.databasin.org/datasets/1eac4a040e09463299af6857c2c46ef8/
gSSURGO Available Water Storage (0-150cm) - Ventura County, California	https://vcsalc.databasin.org/datasets/543892510d8142d296f4a35deeffeffb/
gSSURGO Cation Exchange Activity Classes - Ventura County, California	https://vcsalc.databasin.org/datasets/1017cb42525c4357aa8e82ce9fb78a06/
gSSURGO Drainage Class - Ventura County, California	https://vcsalc.databasin.org/datasets/bf9d6de87f39468a8801fcfbd677e79d/
gSSURGO Soil Textures - Ventura County, California	https://vcsalc.databasin.org/datasets/1958d0ec8c1845029be46afa8c567901/
Historical Climatic Water Deficit (CWD), Ventura County	https://vcsalc.databasin.org/datasets/b5da3bd8ebc340ef9ff9b06a182ca51d/
Housing Density Class from 2000 Census Tiger Files	https://vcsalc.databasin.org/datasets/6ac2e44a0772474d85ac7f358c4d0e34/
Housing density classes for California in 2010	https://vcsalc.databasin.org/datasets/192d7d85c2c9479fb38e2ef7f9b8de48/

Housing density classes for California in 2020	https://vcsalc.databasin.org/datasets/f8afd8e8ca504633a388af7f2f75dbae/
Housing density classes for California in 2030	https://vcsalc.databasin.org/datasets/9d38519a94e3410cb55fce85148279ff/
Housing density classes for California in 2040	https://vcsalc.databasin.org/datasets/866f2861632244f1a2e63d154c546172/
housing density classes for California in 2050	https://vcsalc.databasin.org/datasets/5b7e3cb4d27045e9afe5560ad66047c5/
housing density classes for California in 2100	https://vcsalc.databasin.org/datasets/f450686b838441fb9048a4b1dc5cefed/
Housing Vacancy Rate, California Census Tracts, American Community Survey (2015-2019)	https://vcsalc.databasin.org/datasets/282b3d235811420f82f75f7512799246/
Hydrogeologically Vulnerable Area	https://vcsalc.databasin.org/datasets/df62cbd64d15490ab6ee2239335b6aa7/
Incorporated Cities (CENSUS 2019) with ACS 2017 population (Shapefile)	https://vcsalc.databasin.org/datasets/2e85241791144ded9bba064b7d196f7b/
Land Use Designations - General Plan 2040 Ventura County, CA	https://vcsalc.databasin.org/datasets/b10d3ec7e72142edac12f619a700a496/
Landscape Evaporative Response Index (LERI), 2021, California	https://vcsalc.databasin.org/datasets/b2a580a0fba747f6bbd7477d45e465b2/
Landscape Evaporative Response Index (LERI), April - October 2021, California	https://vcsalc.databasin.org/datasets/db7b6de1eb3649aebcddaa643526dd56/
Landscape Intactness (1 km), California	https://vcsalc.databasin.org/datasets/e3ee00e8d94a4de58082fdbc91248a65/
Livestock grazing allotments and resource use areas managed by the U.S. Forest Service in California, USA.	https://vcsalc.databasin.org/datasets/df266d465b734d6a8b8d0d6b7c6c7b1e/
Mean Annual and Seasonal Maximum Temperature from PRISM for 1971-2000, California	https://vcsalc.databasin.org/datasets/99027758b33b47649306e15e81e089dd/
Mean Annual and Seasonal Minimum Temperature from PRISM for 1971-2000, California	https://vcsalc.databasin.org/datasets/a49e5756a12b439c98833a743287b3f4/
Mean Annual and Seasonal Total Precipitation from PRISM for 1971-2000, California	https://vcsalc.databasin.org/datasets/901304723480477baf71cc669bf0714f/
Mean Projected Annual Maximum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/7cfeb9c9c64d41c5a65ba320220f7aaa/

Mean Projected Annual Potential Evapotranspiration for 2016-2075, California	https://vcsalc.databasin.org/datasets/c9fbbf0c359443efb91a105e4421c200/
Mean Projected Annual Total Precipitation for 2016-2075, California	https://vcsalc.databasin.org/datasets/5a524af535f548b79f9be8e6fab0af4f/
Mean Projected April, May, June Maximum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/296b44d2f6ec4db087f116f1384dcdd9/
Mean Projected April, May, June Minimum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/fbc4abe2b0f0401ca7c23272ef872de8/
Mean Projected April, May, June Potential Evapotranspiration for 2016-2075, California	https://vcsalc.databasin.org/datasets/b45e1dd7ba0c4f71a4e4277e13be87d6/
Mean Projected April, May, June Total Precipitation for 2016-2075, California	https://vcsalc.databasin.org/datasets/0ddea4e8812d4351bf1ef1abdfea3d7b/
Mean Projected January, February, March Maximum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/c0854a3bf7c24807b2f5685c55cc3268/
Mean Projected January, February, March Minimum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/6795aea6105348f3b81075cad5af66bf/
Mean Projected January, February, March Potential Evapotranspiration for 2016-2075, California	https://vcsalc.databasin.org/datasets/a5ef38a379934c029ffcd1ebab58d491/
Mean Projected January, February, March Total Precipitation for 2016-2075, California	https://vcsalc.databasin.org/datasets/082ad3c37cc04a4f8a45c6adf7e7c60f/
Mean Projected July, August, September Maximum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/57d93b4a48a54a69a1a86272728555a0/
Mean Projected July, August, September Minimum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/7e83bce796d54f7295c6a500463985b1/
Mean Projected July, August, September Potential Evapotranspiration for 2016-2075, California	https://vcsalc.databasin.org/datasets/55fc8ad812d846a58dfb42312992f4b4/
Mean Projected July, August, September Total Precipitation for 2016-2075, California	https://vcsalc.databasin.org/datasets/188775f8d7e740e19ec1db549a0a1c11/
Mean Projected October, November, December Maximum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/41c9aee8d79d40338ef0d608ed9ae09e/
Mean Projected October, November, December Minimum Temperature for 2016-2075, California	https://vcsalc.databasin.org/datasets/ec043325888340f782b50a870b8c23a6/
Mean Projected October, November, December Potential Evapotranspiration for 2016-2075, California	https://vcsalc.databasin.org/datasets/45d65e743e2948899474ac3c4fb56185/

Mean Projected October, November, December Total Precipitation for 2016-2075, California	https://vcsalc.databasin.org/datasets/d1e949f07c6f4288839ab31deb3ee10d/
Median Year Housing Units Built, California Census Tracts, American Community Survey (2015-2019)	https://vcsalc.databasin.org/datasets/a81620970edc48e4b26837c5b9be6fd4/
National Conservation Easement Database (NCED) - August 28, 2020	https://databasin.org/datasets/366fb887144645a7afbf78b3b5d23b43/
National Flood Hazard Layer (NFHL), California (Shapefile)	https://vcsalc.databasin.org/datasets/845bd265f7604fd499da8620b5d6009f/
Nationally Significant Ag Land, 2016 - American Farmland Trust	https://vcsalc.databasin.org/datasets/105ed96a79dd4e2ab73a320f2953fb67/
Native Freshwater Species, Analysis Units for the California Freshwater Species Database, v2.0.7	https://vcsalc.databasin.org/datasets/00e19615c0774e22a83aca7b7502353f/
NHD Flowlines for California, USA	https://vcsalc.databasin.org/datasets/54c065848eea4234a9baa4e062e3420f/
NorWeST Predicted Stream Temps	https://vcsalc.databasin.org/datasets/f71e99fb5e624d43ad25fcd919383420/
NPScape housing density data sets for the conterminous U.S. (1970, 2010, 2050, and 2100)	https://vcsalc.databasin.org/datasets/0523341d31b144ee8ceb81c99afa9be1/
Pattern of Birds Species Richness - Analysis Units for the California Freshwater Species Database, v2.0.7	https://vcsalc.databasin.org/datasets/82a053d82b994627b3f64342005e7ad4/
Pattern of Fish Species Richness - Analysis Units for the California Freshwater Species Database, v2.0.7	https://vcsalc.databasin.org/datasets/e30f4ddd3b504b449f8d7b5efe68e7e9/
Pattern of Herpetofauna Species Richness - Analysis Units for the California Freshwater Species Database, v2.0.7	https://vcsalc.databasin.org/datasets/b4812b476e47420dbeb1a4c0ba463211/
Pattern of Mollusks/Crustaceans Species Richness - Analysis Units for the California Freshwater Species Database, v2.0.7	https://vcsalc.databasin.org/datasets/dd0aa116ec894be2a9a3be5af0916f4a/
Pattern of Plant Species Richness - Analysis Units for the California Freshwater Species Database, v2.0.7	https://vcsalc.databasin.org/datasets/c88d91ab77de4aff999a631f3355b703/
Pollution Burden - CalEnviroScreen 4.0	https://vcsalc.databasin.org/datasets/34abce97636a4340a0cfc53e5e1afb8e/
Populated Places, California	https://vcsalc.databasin.org/datasets/caf36f97ba4142b6a3a5096c63a284d0/
Population Characteristics - CalEnviroScreen 4.0	https://vcsalc.databasin.org/datasets/7053ff1f2f304e33b05e6f08648ce395/

Probability of Extreme Fire Behavior, California	https://vcsalc.databasin.org/datasets/6d6d9455c67e45ac8ad0cf0908d2dfa5/
Projected housing density (2020)	https://vcsalc.databasin.org/datasets/c02e018639474be8b77b4a9c90f6eeba/
Projected housing density (2050)	https://vcsalc.databasin.org/datasets/c83d5734afb94387a2802038074dd74c/
Projected housing density (2100)	https://vcsalc.databasin.org/datasets/f2f629402b0b441ab8d6a8d328dc57e4/
Reducing Wildfire Threats to Communities, California	https://vcsalc.databasin.org/datasets/02b725e6cdb047f7ab9a295cfc511d5a/
Renter Occupied Households, California Census Tracts, American Community Survey (2015-2019)	https://vcsalc.databasin.org/datasets/73a5d7e4701e4cc9831658519543b78a/
Risk to Potential Structures, California	https://vcsalc.databasin.org/datasets/983b21eedc6345aca3c1390eff3c225b/
Save Open Space and Agricultural Lands - Ventura County SOAR	https://vcsalc.databasin.org/datasets/4779759de5f14258877fdf9d84c963dd/
SGMA 2019 Basin Prioritization	https://vcsalc.databasin.org/datasets/c79c4e7054454d22a3a4ef37d50e2c97/
Simplified HUC5 Watershed Boundaries, California	https://vcsalc.databasin.org/datasets/a06f72a59e094231a2a20e6648d3d903/
Site Sensitivity in the Western US	https://vcsalc.databasin.org/datasets/459319b477ea40568ae08663f54f643b/
Soil Agricultural Groundwater Banking Index (SAGBI) - 2015, UC Davis	https://vcsalc.databasin.org/datasets/f92b336471dd43d6bdf3343c7721a94f/
SSURGO CA Storie Index, Ventura County, California	https://vcsalc.databasin.org/datasets/98c85098e9044b9baecfb47e70fe188d/
SSURGO CA Storie Index, Ventura County, California	https://vcsalc.databasin.org/datasets/98c85098e9044b9baecfb47e70fe188d/
SSURGO Chemical and Physical Properties, Soils, Ventura County California	https://vcsalc.databasin.org/datasets/7f2062e260934826aa6b184d0c1a8e65/
SSURGO Soil Orders, Ventura County, California	https://vcsalc.databasin.org/datasets/65f03d12673744e8aaa9e3e224e03d05/
SSURGO Soil Orders, Ventura County, California	https://vcsalc.databasin.org/datasets/65f03d12673744e8aaa9e3e224e03d05/

State and Local Facilities for Wildland Fire Protection, California	https://vcsalc.databasin.org/datasets/847661dcd5c847e59fc7f24316d35121/
State's Best Agricultural Land in 2016 - American Farmland Trust	https://vcsalc.databasin.org/datasets/d5ff519139f747c58dc58c5afc4e9550/
Streams, Canals, Dams - California NHD Area	https://vcsalc.databasin.org/datasets/5e8350b5acd5458281239067852a0d0b/
Suppression Difficulty Index, California	https://vcsalc.databasin.org/datasets/845fd4647aac445c932fd6fd68b52706/
United States Important Bird Areas - National Audubon Society Authoritative Data	https://vcsalc.databasin.org/datasets/fdb91971a11d46d39661f0a56c3585ca/
Updated General Plan	
USDA Cropscape 2020 - California	https://vcsalc.databasin.org/datasets/51ad32430d5a493295b98c3d96859407/
USFWS Critical Habitat (Line)	https://vcsalc.databasin.org/datasets/97752bf57d844572b57071f98965c00e/
USFWS Critical Habitat (Polygon)	https://vcsalc.databasin.org/datasets/d71f67e654c641a6be3ac8860f881ab0/
Vegetation Burn Severity, California (1984 to 2017)	https://vcsalc.databasin.org/datasets/2002ca2d12ea4bd4a7ced2e4578645b6/
Ventura Historical Ecology Study, California	https://vcsalc.databasin.org/datasets/604af46b11d44943b6e2e4ea3971fe1d/
Water Quality Monitoring Stations in California	https://vcsalc.databasin.org/datasets/695561a68a9a45eebeab6f10a07b425d/
Watershed Boundary Dataset (WBD) (12-digit HUC, level 6, California, USA)	https://vcsalc.databasin.org/datasets/42bc6342ed794f5b90d91494b508462f/
Watersheds with dams, California	https://vcsalc.databasin.org/datasets/9958acb41e404e2d84f1e859c1feba8c/
West-Wide Economic Atlas, Headwaters Economics - 3 Classes	https://vcsalc.databasin.org/datasets/b44aaa70af564e31824f97f298f8d92e/
WFIGS - Current Wildland Fire Perimeters (NIFC)	https://vcsalc.databasin.org/datasets/24eda9b68d534806a2ac104d9b6354c8/
Wildfire Hazard Potential, California	https://vcsalc.databasin.org/datasets/122f9ea555e844fc9e2621e7db743275/

Wildland Fire Threat (fthrt14_2), California	https://databasin.org/datasets/3e212f5ef628492bb6d3b75b86c8a72c/
Wildland-Urban Interface (2010), Southern California - Interface Class	https://vcsalc.databasin.org/datasets/1192840cde924382bc5c3767eea2883d/
Wildland-Urban Interface (2010), Southern California - Intermix Class	https://vcsalc.databasin.org/datasets/05e3fc06574c434aa76faf6ec17604f1/
Wildland-Urban Interface (2010), Southern California (reclassified)	https://vcsalc.databasin.org/datasets/9d5d873f28284df9bb1db1f2afd21a99/

APPENDIX B – LIST OF SPATIAL DATASETS USED IN THE AGRICULTURAL VALUE EEMS LOGIC MODEL

Gateway Dataset Title	Gateway URL Link
California - Farmland Mapping and Monitoring Program (FMMP), 2018/2016	https://vcsalc.databasin.org/datasets/d863409b007d4f6589975103da32df3e/
SSURGO CA Storie Index, Ventura County, California	https://vcsalc.databasin.org/datasets/98c85098e9044b9baecfb47e70fe188d/
SSURGO Chemical and Physical Properties, Soils, Ventura County California Soil pH Sodicity (Sodium Absorption Ratio) Salinity (Electrical Conductivity)	https://vcsalc.databasin.org/datasets/7f2062e260934826aa6b184d0c1a8e65/
gNATSGO Irrigated Capability Class, Soils, California	https://vcsalc.databasin.org/datasets/d56f4af887b247db933ce85349b736c5/
NHD Flowlines for California, USA	https://vcsalc.databasin.org/datasets/54c065848eea4234a9baa4e062e3420f/
CPAD_2021b_Holdings, GreenInfo Network	https://vcsalc.databasin.org/datasets/f158d3770f004959a6ce4b415b71dda9/
Populated Places, California	https://vcsalc.databasin.org/datasets/caf36f97ba4142b6a3a5096c63a284d0/

APPENDIX C – LIST OF SPATIAL DATASETS USED IN THE AGRICULTURE STRESS EEMS LOGIC MODELS

Gateway Dataset Title	Gateway URL Link
SSURGO Chemical and Physical Properties, Soils, Ventura County California	https://vcsalc.databasin.org/datasets/7f2062e260934826aa6b184d0c1a8e65/
Soil pH	
Sodicity	
Salinity	
gSSURGO Available Water Storage (0-150cm) - Ventura County, California	https://vcsalc.databasin.org/datasets/543892510d8142d296f4a35deeffeffb/
SSURGO Soil Runoff	https://vcsalc.databasin.org/datasets/2a11d8cc62da475e81a14b6a0ff2c590/
SSURGO Wind Erodibility Index	https://vcsalc.databasin.org/datasets/f272f4cc398d4d5b8f31730836cae44e/
Annual Maximum Temperature – Ventura County, CA	https://vcsalc.databasin.org/datasets/a8236b3779ca47c894d007f56fbc1960/
Historical Average	
CNRM-CM5 Average	
MIROC5 Average	
GFDL-CM3 Average	
Annual Precipitation – Ventura County, CA	https://vcsalc.databasin.org/datasets/e0c322a8b656460ebef181927ceb1bca/
Historical Average	
CNRM-CM5 Average	
MIROC5 Average	
GFDL-CM3 Average	
CNRM-CM5 Seasonal Climate Models (2010-2039) – Ventura County, CA	https://vcsalc.databasin.org/datasets/0eaade36e2264c0980c5609e95a8b594/
Average Max Temperature Dec Jan Feb	

Average Max Temperature Mar Apr May	
Average Max Temperature Jun Jul Aug	
Average Max Temperature Sep Oct Nov	
Average Precipitation Dec Jan Feb	
Average Precipitation Mar Apr May	
Average Precipitation Jun Jul Aug	
Average Precipitation Sep Oct Nov	
MIROC5 Seasonal Climate Models (2010-2039) – Ventura County, CA	https://vcsalc.databasin.org/datasets/1f2656ae0e244a45bf445eae65a8f403/
Average Max Temperature Dec Jan Feb	
Average Max Temperature Mar Apr May	
Average Max Temperature Jun Jul Aug	
Average Max Temperature Sep Oct Nov	
Average Precipitation Dec Jan Feb	
Average Precipitation Mar Apr May	
Average Precipitation Jun Jul Aug	
Average Precipitation Sep Oct Nov	
GFDL-CM3 Seasonal Climate Models (2010-2039) – Ventura County, CA	https://vcsalc.databasin.org/datasets/93e3be09867d4ce6a7829065ee8154b9/
Average Max Temperature Dec Jan Feb	
Average Max Temperature Mar Apr May	
Average Max Temperature Jun Jul Aug	
Average Max Temperature Sep Oct Nov	
Average Precipitation Dec Jan Feb	

Average Precipitation Mar Apr May	
Average Precipitation Jun Jul Aug	
Average Precipitation Sep Oct Nov	
Number of Extreme Heat Days – Ventura County, CA	https://vcsalc.databasin.org/datasets/d090d65bbf634779b2e8ed2d8345b645/
Historical Average	
CNRM-CM5 Average	
MIROC5 Average	
GFDL-CM3 Average	
CalEnviroScreen 4.0	https://vcsalc.databasin.org/datasets/9755da0fd48d4e86af0ab79331b64561/
Impaired Waterbodies	
Impaired Waterbodies Percent	
Groundwater Pollution	
Groundwater Pollution Percent	
Soil Agricultural Groundwater Banking Index (SAGBI) - 2015, UC Davis	https://vcsalc.databasin.org/datasets/f92b336471dd43d6bdf3343c7721a94f/
Historical Climatic Water Deficit (CWD), Ventura County	https://vcsalc.databasin.org/datasets/b5da3bd8ebc340ef9ff9b06a182ca51d/
Change in Future Climatic Water Deficit, California (CNRM RCP 8.5), Ventura County	https://vcsalc.databasin.org/datasets/8736bc06a3494ec2930ea0f2cf9e4b6d/
Change in Future Climatic Water Deficit, California (MIROC-ESM RCP 8.5), Ventura County	https://vcsalc.databasin.org/datasets/d9a3708a37d745f29fef8cef4163f2d8/
Change in Future Climatic Water Deficit, California (GFDL-A2 RCP 8.5), Ventura County	https://vcsalc.databasin.org/datasets/e0c74a7b2d354ae9961c5a688e2f258f/
Annual Recharge – Ventura County, CA	https://vcsalc.databasin.org/datasets/55dd6fe18717453ba5c1526993eea544/
CNRM-CM5 Average	
MIROC5 Average	
GFDL-CM3 Average	

Annual Runoff – Ventura County, CA	https://vcsalc.databasin.org/datasets/437626399eb147c5816aef77438550f9/
CNRM-CM5 Average	
MIROC5 Average	
GFDL-CM3 Average	