Jalama Valley Ranch Water Resilliency Plan

ENV S 137
Spring 2025

By: Aidan Flynn, Sofia Lebensohn, Sean Shruhan, Nora Smith, and Kai Suzuki
University of California, Santa Barbara, Environmental Studies Department

Executive Summary

Project Vision

Jalama Valley Ranch (JVR) is looking to apply for the Land Resiliency Partnership Grant, which has an emphasis on native species restoration. We also wish to increase the water resiliency on the property as approximately 10,000 gallons of water is used every two days to prevent the well from drying up. We want to do this by implementing the following: water catchment systems for rainwater, increasing native vegetation species presence on the property, improving water use efficiency, using alternative water sources, and evaluating the watershed the property lies on.

To increase recycled water on the property, systems can be implemented to capture rainwater to use for irrigation. This could involve gutters directed towards rain barrels set to collect rainwater from the northern roof of the horse stables. The collected rainwater can be used without filtration for irrigation. If desired, all roofs on property, including the home, can utilize gutters to collect rainwater for use in dry seasons.

The images below are not an exact representation of our desired final product, but they offer good examples of potential designs, as the desired water feature will be made to mimic natural settings as much as possible. Following the construction of the feature, native fish and vegetation will need to be introduced, thus meeting one of our goals of increasing species richness. The new natural vegetation will also filter runoff, keeping the features water quality clean, and providing an area for pollinators. The feature will be situated just below the horse stables, in the vegetated area. Eco-friendly soap is recommended for washing the horses as this runoff water will be collected as greywater.

The greywater infrastructure will recover water used in the household and recycle it into irrigation water. The system will collect water from sinks, laundry, and the horse pasture. The greywater will then be run through a progressive water filter or a sand and gravel filter to treat the water or impurities. After which the water can be stored and used for drip irrigation.

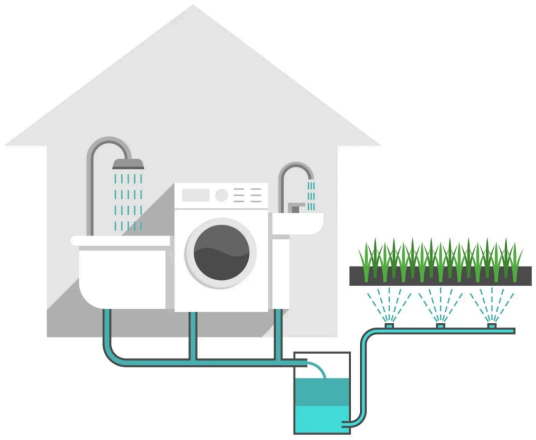
Examples of water feature(s):

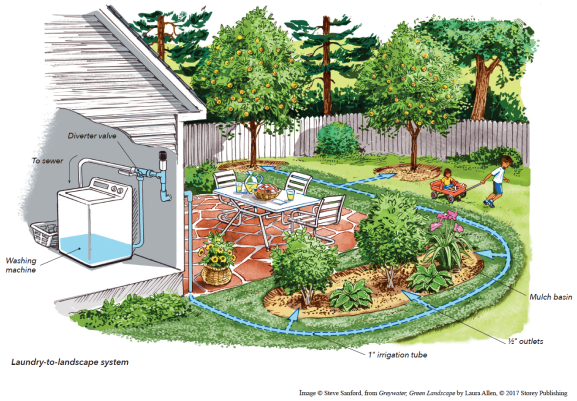





Examples of rain catchment system(s):

Examples of greywater recycling system(s):





Project Overview

Water management on the property is imperative. Especially because the property is located in Central California., an area known for its low precipitation in a Mediterranean climate. This project includes analyzing water catchment systems and drainage patterns, possibly adding water capture features, and examining the soil. Many of our goals are looking to increase water resiliency by implementing more sustainable practices and managing the water the best way possible. This includes reverting the property back to a more natural state which will provide positive externalities, such as reducing erosion and dust on the property.

Progress Summary

This section summarizes progress on the overall project.

OVERALL PROGRESS REPORT

Details: We have completed our Situational Analysis, organized our Fundamental Objectives table, determined our range of strategies and from that created a consequence table and performed a multiple criteria decision analysis. We compiled all of our background and findings into our initial conservation plan draft. At this point, we are waiting to hear back about the budget of the project and still need to determine the suitability of the site for our desired water catchment pond feature. We also need to discuss the JVR's willingness to alter their landscape and incorporate more native species to increase their resilience, habitat connectivity, and likelihood of receiving their desired grant.

Lessons Learned

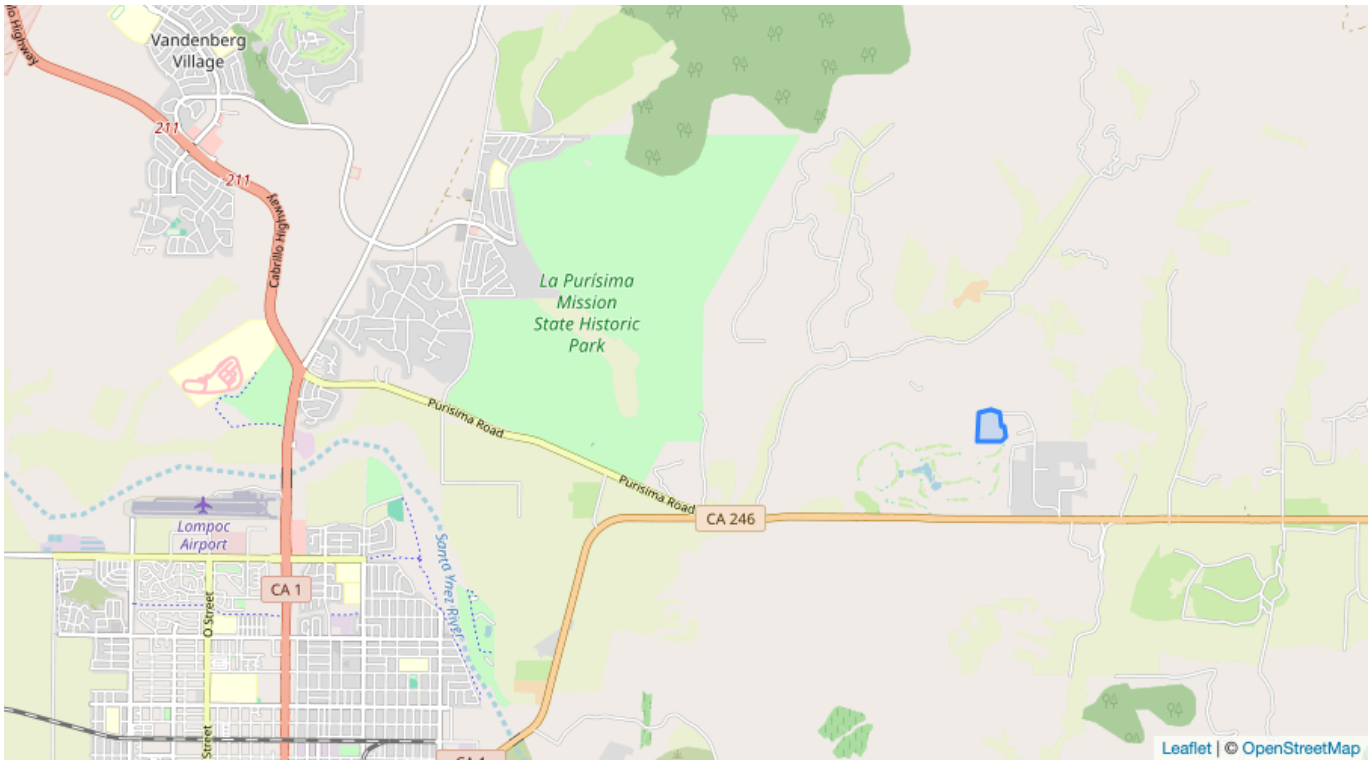
Communication and vision is vital to formulate a cohesive plan. Multiple factors come into play when working on a plan of this size and ensuring the vision and overall goal of the plan is being maintained can be challenging. New goals bring forth new obstacles that may prohibit previous ones or alter the project in the grander scheme of things. We found that in order to maintain the overall focus of a project and ensure the project's goals are being met, open communication and a clear vision from the beginning are essential to success.

Next Steps

We still need to finalize our proposed steps in order to implement some of our strategies, as well as discuss some of our ideas with JVR for their approval.

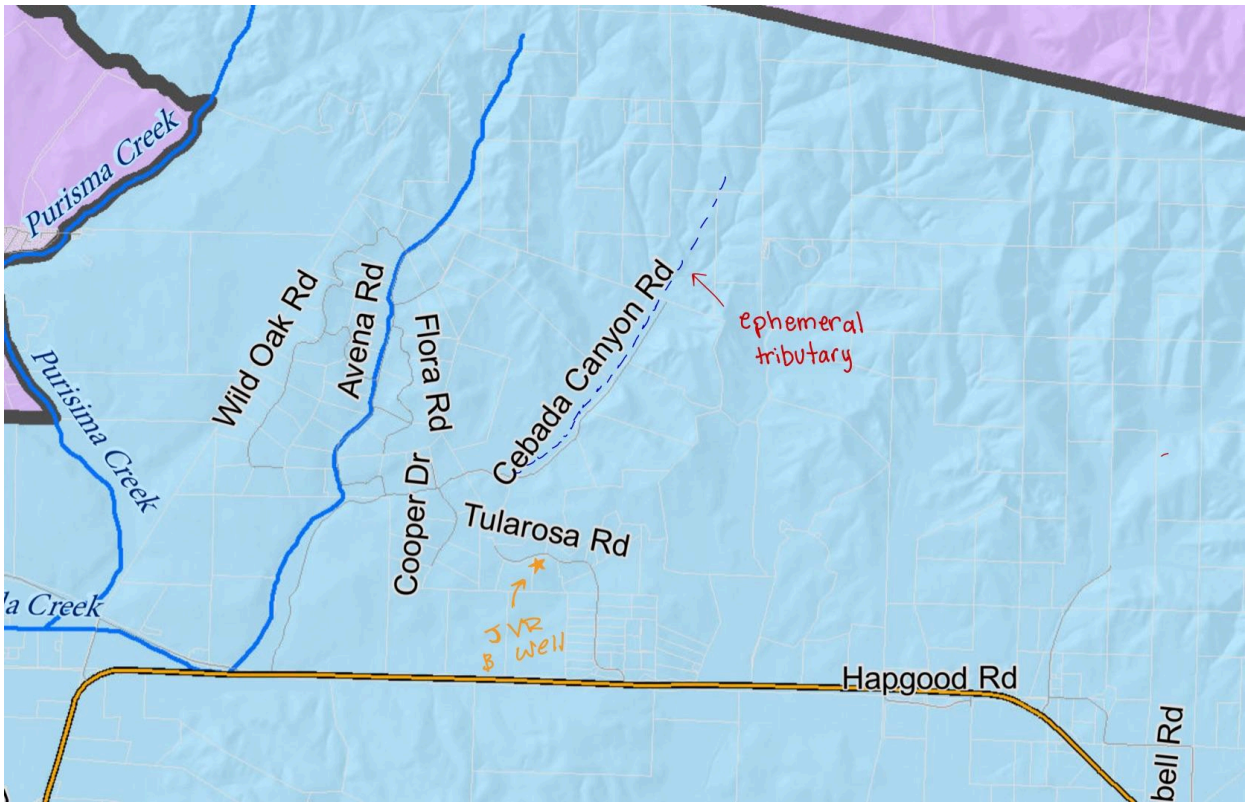
Project Location

The Jamala Valley Ranch is located at 2191 Tularosa Rd in Lompoc, California. This property is part of the Chumash National Heritage Site and will work as the headquarters for the Northern Chumash Tribal Council (NCTC).



(photo taken from Google Maps)

JVR is located approximately half a mile south of the unnamed creek running down Cebada Canyon. The property is about a mile east of the larger Cebada Creek, which is surrounded by mixed riparian zones and small-scale ranch properties before entering a canal. The canal section is surrounded by large-scale agriculture just outside the city centre of Lompoc; remaining water enters the Santa Ynez River. The property pulls from, and is a contributor to the Santa Ynez River Valley Basin.



(photo taken from Santa Barbara County's Surveyor's Office, information about the small ephemeral tributary came from Ernest Houston)

Project Targets and Goals

A target is the ecological, social, and/or cultural values, features, or assets that we most care about improving, protecting, restoring and keeping healthy. Targets can include ecological systems, habitats, communities, or species that represent the full suite of biodiversity in the project area, as well as cultural targets such as local knowledge, customary laws, language and traditions. This section summarizes the conservation and human wellbeing targets that are the focus of our conservation efforts. For each target, one or more goals identify the desired future health of the target.

Target Summary

(photo from wateruse.org)

25% of water for irrigation is recycled

CURRENT STATUS: Fair

Desired Future Status: Very Good

By reducing the water used for irrigation we can reduce the amount of water being taken from the well. This will help increase the water resiliency of the property.

(photo from northernchumash.org)

Chumash community makes up >40% of shareholders

CURRENT STATUS: Good

Desired Future Status: Very Good

A place like JVR can help provide Chumash peoples a place to work together and connect with each other, as well as allow them to give their input in designing its future for generations to come.

(photo taken from metzger-group.com)

Decrease the amount of water used per acre by 15%

CURRENT STATUS: Fair

Desired Future Status: Good

If less water goes into irrigation, the well water usage should drop naturally, but the decrease will help reduce the risk of it drying up during drought seasons. This 15% reduction will also help increase the water resiliency of the property.

(photo taken from Zillow)

Increase species richness by 15%

CURRENT STATUS: Fair

Desired Future Status: Good

Species richness is important in any ecosystem since they rely on balance between the community. With higher species richness the ecosystem will have more opportunity for all the native species residing in the area.

(photo taken by Sofia Lebensohn)

Maintain a healthy water quality of creek and well

CURRENT STATUS:	Good
Desired Future Status:	Good

Better water quality in the creek will help promote healthy ground water supplies, further supporting natural processes, and in the well it is beneficial for those using it since the water will have less contaminants in it.

(photo taken from pacifichorticulture.org)

50% of all vegetation on property is native

CURRENT STATUS:	Fair
Desired Future Status:	Good

Striving for half of the vegetation to be native will help promote natural biodiversity on the JVR property and increase its drought and fire tolerance, since native plants are specially adapted for California's conditions. Native plants can be planted on the hillside where there is no vegetation yet.

Priority Actions

A strategy is a broad course of action designed to maintain and/or restore the targets, reduce threats, and/or develop capacity. A strategy is typically used as an umbrella term to describe a set of specific conservation actions and their intended collective outcome.

Strategies

Involve Chumash people in planning process

The hope is to establish an area for Chumash people to get involved with the community, whether it be building and designing new features on the property or participating in events and other happenings around the property.

Build water capture infrastructure

With the construction of a water capture feature, we can reduce the amount of well water being used and catch and filter agricultural runoff before it seeps into the groundwater supply or runs into the nearby creek. Rain gutters and barrels can also be installed around the property, most notably for the roof of the horse stables. Satellite imagery suggests the roof is approximately 3600 square feet; each square foot of roof can collect over half a gallon of water per inch of rain (LA Sanitation).

Design water feature

The Chumash peoples should be involved in the designing process of the water feature. This will increase community involvement and allow more opportunities for connection within the community. The Chumash should be consulted in the design process in order to efficiently select which native flora and fauna to add to the feature. The native flora should serve as a natural filter for the feature. The feature should appear to mimic the natural landscape.

Mulching

By adding mulch (hay) in various areas of the property, we will reduce the amount of cement, which will help regenerate groundwater supplies and reduce runoff since water will soak into the mulch instead of running off the cement.

Riparian buffer for creek

Agricultural runoff is the principal non-point pollution stressor in the San Miguelito Creek sub-watershed. Native riparian buffers at Jalama Valley Ranch (JVR) will intercept this runoff before

it reaches the creek and on-site well. The program is organized by restoration targets, with benefits listed beneath each target.

One of the methods we suggest is utilizing natural Hydrologic Attenuation (Runoff Control). This is a method used to slow down the flow of water infiltration. Thus, limiting water runoff, erosion, dust, and nutrient loading into water sources. With the JVR being located near a creek that their well uses as a water source, we would recommended this methodology be applied in the vicinity of the creek with steps provide below:

Target action: Install 12-m-wide buffers with ≥ 50 % cover. Primary vegetation: willow; secondary options: mixed deciduous woodland or deep-rooting native grasses.
Expected benefits:

1. Flattened hydrograph, slower, more diffuse flow reduces flash-flood peaks.
2. A greater contact time to allow more water to infiltrate, supporting the planned recharge basin.

    Supporting data: This riparian buffer could reduce storm-runoff by the following: ≈ 49 % (willow), ≈ 46 % (woodland), and ≈ 33 % (grass) vs. unbuffered plots (Dunn, et al. 2022).

Sediment & Nutrient Filtration (Water-Quality Control)
Target action: Use dense root mats and roughness elements to trap sediment and attached pollutants.

Expected benefits:

1. Lower particulate phosphorus loads (sediment is the primary P carrier).
2. Reduction in Nitrate concentrations trend toward the.
3. Reduced pesticide-laden sediment entering San Miguelito Creek.

    Supporting data: Sediment trapping of 44 % (willow), 30 % (woodland), 29 % (grass)(Dunn, et al. 2022).

Habitat & Cultural Corridor Enhancement
Target action: Re-establish native canopy, including culturally significant Chumash species (Table 4), along continuous stream reaches. Remove invasive species.

Expected benefits:

1. Stream shading can lower summer water temperatures in excess of 1-3 °C, improving steelhead trout habitat.
2. Continuous native corridor supports pollinators and other wildlife.
3. Improved soil structure boosts groundwater recharge and counters overdraft.
4. Reinforces Chumash stewardship, language, and traditional plant use.

    Supporting data: Evidence suggests significantly higher hydraulic conductivity under willow and woodland buffers than in upslope cropland (Dunn, et al. 2022).

    With the reintroduction of native species along the creek we would establish riparian buffers along known sources of runoff. Thus providing a low-cost, environmentally friendly strategy to capture nutrients and sediment before entering surface water.

Planting of native species

Adding native vegetation around the Ranch will help promote not only habitat connectivity but also support drought and fire tolerance. This will also help increase the species richness of the area and reduce water usage, since the vegetation is adapted to the climate. Furthermore, native Californian vegetation suitable for Lompoc's Mediterranean climate also tend to be good at naturally filtering water, especially when compared to the water-intensive vegetation (i.e. palms, roses, orchards) already on the property (County of Ventura, Planning Division). Certain native species should be used for the riparian buffer also suggested as a strategy. Below we have provided a comprehensive list of native species that will be used to populate the hillside, which is not currently vegetated. The Land Resilience Plant (Overview—Land Resilience Program, n.d.) guidelines and the California Native Plant database (n.d.) will be referenced when choosing species to plant.

Scientific name	**Common Name**	**Traits/Roles**
Artemisia californica	California Sagebrush	Drought-tolerant, habitat for birds, fire-resilient, improves soil porosity
Baccharis pilularis	Dwarf Coyote Bush	Pollinator support, quick soil colonizer, erosion control
Eriogonum fasciculatum	California Buckwheat	High nectar value, erosion control, tolerates dry soil, drought resilient
Rhamnus californica	California Coffeeberry	Bird forage, deep-rooted, thrives in full sun
Salvia leucophylla	Purple Sage	Fire adapted, attracts pollinators
Carex praegracilis	Clustered Field Sedge	Ideal for riparian buffers, tolerates seasonal flooding
Elymus glaucus	Blue Wildrye	Perennial bunchgrasses, stabilized slopes and improves infiltration
Romneya coulteri	Matilija Poppy	Fire-resilient, fast growing, attracts pollinators
Juncus patens	Common Grey Rush	Key rain garden species, filters runoff, promotes

		infiltration
Encelia californica	Bush Sunflower	Fast-spreading, attracts pollinators, tolerates full sun, compacts soil
Cleomella arborea	Bladderpod	Pollinator friendly, fast-growing, adaptable
Adenostoma fasciculatum	Chamise	Erosion control, fire adapted, medicinal use
Ceanothus cuneatus	Buckbrush	Strong pollinator host

Table 1. *List of plants native to JVR area*

Build greywater use infrastructure

Water used from the horse pasture, sinks, and laundry will be collected in a water tank. A diverter valve will have to be installed to direct water to either the sewage or the filtration system and tank (Sorenson, 2024). Then a progressive filtration system will be utilized to intercept lint or any other impurities. This filtration system allows for the treatment of water without chemical use. The water can then be pumped out and used for irrigation. We suggest adding this infrastructure to the property's water system in order to recycle the water used on the property and lessen the demand on the well for freshwater.

Who is Involved?

The following individuals and organizations have been involved in this project. Please contact our primary contact for more information. For those with the Northern Chumash Tribal Council, more information can be found here https://northernchumash.org/team/ and via the "Connect" tab on the website.

Partners and Shareholders

- Land Resilience Partnership
- Staff of the Ranch
- Horse pasture community
- Conservation planning team of students from the Environmental Studies department at UCSB
- Northern Chumash Tribal Council

Project Team

Primary Contact: Prof. Dawn Murray, email listed below

Name	Organization	Position	Email
Dawn Murray	Chumash Heritage National Marine Sanctuary, University of California, Santa Barbara	Professor	murray@bren.ucsb.edu
Violet Sage Walker	Northern Chumash Tribal Council, Chumash Heritage National Marine Sanctuary	Chairwoman and Spokesperson	
Ernie Houston	Northern Chumash Tribal Council, Chumash Heritage National Marine Sanctuary	Geologist, Cultural Monitoring Consultant	

Table 2. *Project team and contacts*

Planning Context

Introduction

The Jalama Valley Ranch (JVR) is a part of the Chumash National Heritage Site planning on applying for the Land Resiliency Partnership Grant, which has an emphasis on native species restoration. They are focused on an increase in Water Resiliency on the property. Currently JVR is averaging about 10,000 gallons of water used every two days (Walker, 2025), and expressed interest in preventing the well from drying up in the future due to high water use. The increase in the resiliency of water throughout the property can be done by looking at the watershed, hill slopes, orchard, water feature, and species present. This plan seeks to address a way to save as much water as possible so that the property continues to flourish while taking into account the grant that may give JVR funding.

Figure 1. *Property lines of Jalama Valley Ranch (Zillow)*

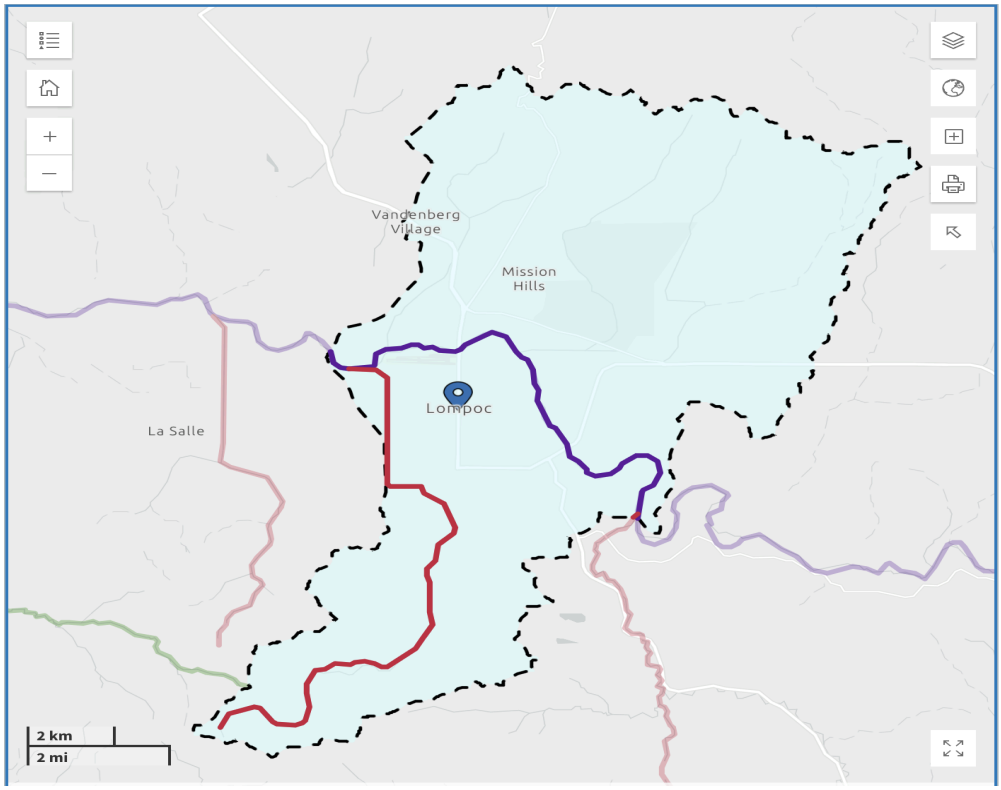


Figure 2. *Boundaries of the San Miguelito-Creek Watershed, which is part of the greater Santa Ynez Watershed (EPA, 2020)*

Planning Team and Management Process

Decision Makers and Target Audience

JVR property owners, shareholders, and grant reviewers.

Planning Team

The planning team is responsible for formulating the most efficient plan to carry out the goals for the property, in this case, improving the water resiliency of the Jalama Valley Ranch property. In order to do this, we have to break down the targets, or goals, and find solutions to achieve them, as well as ways to measure whether or not these strategies are working. We also have to evaluate the feasibility of some of the objectives and determine if they are within the scope of our abilities and the overall budget and capabilities of the project.

Member	Skillset	Organization	Role
Aidan Flynn aidanflynn@ucsb.edu	Sustainability, project planning	UCSB, ES Dept.	Strategy evaluation

Sofia Lebensohn sofialebensohn@ucsb.edu	Outreach, landscaping	UCSB, ES Dept.	Communicate with the shareholders, assist with landscaping selection
Sean Shruhan seanshruhan@ucsb.edu	GIS map making, Hydrology expert	UCSB, ES Dept.	Water enhancement strategies
Nora Smith n_smith@ucsb.edu	Botany, statistics	UCSB, ES Dept.	Assist with deciding the plants most suitable for the area, general planning
Kai Suzuki kaisuzuki@ucsb.edu	Restoration, plant selection	UCSB, ES Dept.	Wildlife consulting, restoration coordination

Table 3. *Planning Team*

Community/Interested Partner/Shareholders

The primary community involved in this project is the Northern Chumash Tribal Council (NCTC) in Lompoc, California. They work to reclaim Chumach ancestral land through the Land Back efforts throughout the California Central Coast, nurture relationships with Nature and the Ocean, as well as continuing on the Chumash legacy of stewardship and advocacy to maintain their relationships with coastal ecosystems. The NCTC partners with private and public organizations in order to utilize cultural and environmental restoration and protection in order to preserve and protect the Central Coast; most recently partnering with the National Oceanic and Atmospheric Administration (NOAA) to designate a new national marine sanctuary within the ancestral territory. They also participate in collaborative stewardship to implement traditional practices throughout their territory in order to heal their land, contribute fresh foods to local communities, and create tribal job security. With this, they also aim to increase housing security to reduce tribal relocation to non-traditional areas which results in cultural dislocation.

Partner Organizations/Shareholders

- Jalama Valley Ranch
- Northern Chumash Tribal Council
- Chumash Heritage National Marine Sanctuary
- Northern Santa Barbara County
- San Luis Obispo County Coastal Band of Chumash Nation

Member	Skillset	Organization	Role

Violet Sage Walker	Environmental and Tribal Law	Northern Chumash Tribal Council, Chumash Heritage National Marine Sanctuary	Chairwoman and Spokesperson, interact with her for Information on the vision of the project.
Ernie Houston	Geologist	Northern Chumash Tribal Council, Chumash Heritage National Marine Sanctuary	Expert in Geology to consult the science behind the plan, information about the watershed and well.
Dawn Murray	Marine Biologist	Chumash Heritage National Marine Sanctuary, UCSB ES Professor in Conservation Planning	Primary contact, bridge between students and the CHNMS
Land Resilience Partnership	Funding	Land Resilience Grant	Provides funding through a grant

Table 4. *Shareholders*

Decisions, opportunities, sideboards, and constraints

Constraints: The wishes of the JVR to maintain the rose garden and non-native plant gardens, palm trees, and lawn. One of the leading strategies of the Land Resiliency Partnership Grant (LRP) is to revert non-native vegetation on a property back to native. Although, at this point in time we are unclear if this is a requirement for the grant. However, with the information we have now we do believe the presence of water intensive, non-native species could create challenges with the LRP. More so, this need for water is further exacerbated by the soil texture and type being sand, which is very poor at holding water.

Opportunities: Working with the Northern Chumash Tribal Council to create JVR as a site for Chumash involvement. With the hope of creating a hub for gatherings, hosting events, and acting as a center for traditional knowledge.

Decisions: Create water catchments and ways to increase water resiliency. In addition to creating a water feature using a sea container. Which, if successfully implemented, could work as a model for other sites moving forward.

Sideboards: Location of JVR being on a hillside and the property size is 20 acres. The climate of the area having short dry summers and cold, semi wet winters. The rainfall of the area averaging 16 inches per year (weatherspark). The groundwater and watershed of the area.

Situation Analysis

Jalama Valley Ranch is located within the San Miguelito-Creek watershed, which is part of the greater Santa Ynez watershed, however, there are some documented water issues in this area. The Northern Chumash Tribal Council, which owns the property, has encountered water resiliency issues on this property, including depleted groundwater, excessive water usage, contaminated surface waters due to agricultural runoff, and erosion. These issues can threaten the overall structural integrity of the Chumash property since prolonged drought periods and wildfires associated with water mismanagement can contaminate and deplete necessary resources. We aim to address these issues through the implementation of water catchment systems, addressing overharvesting of groundwater, and improving the natural biodiversity of plants. They also wish to add a water feature on the property, which could possibly double as a water catchment system for some of the runoff that is generated through the agricultural and irrigation practices.

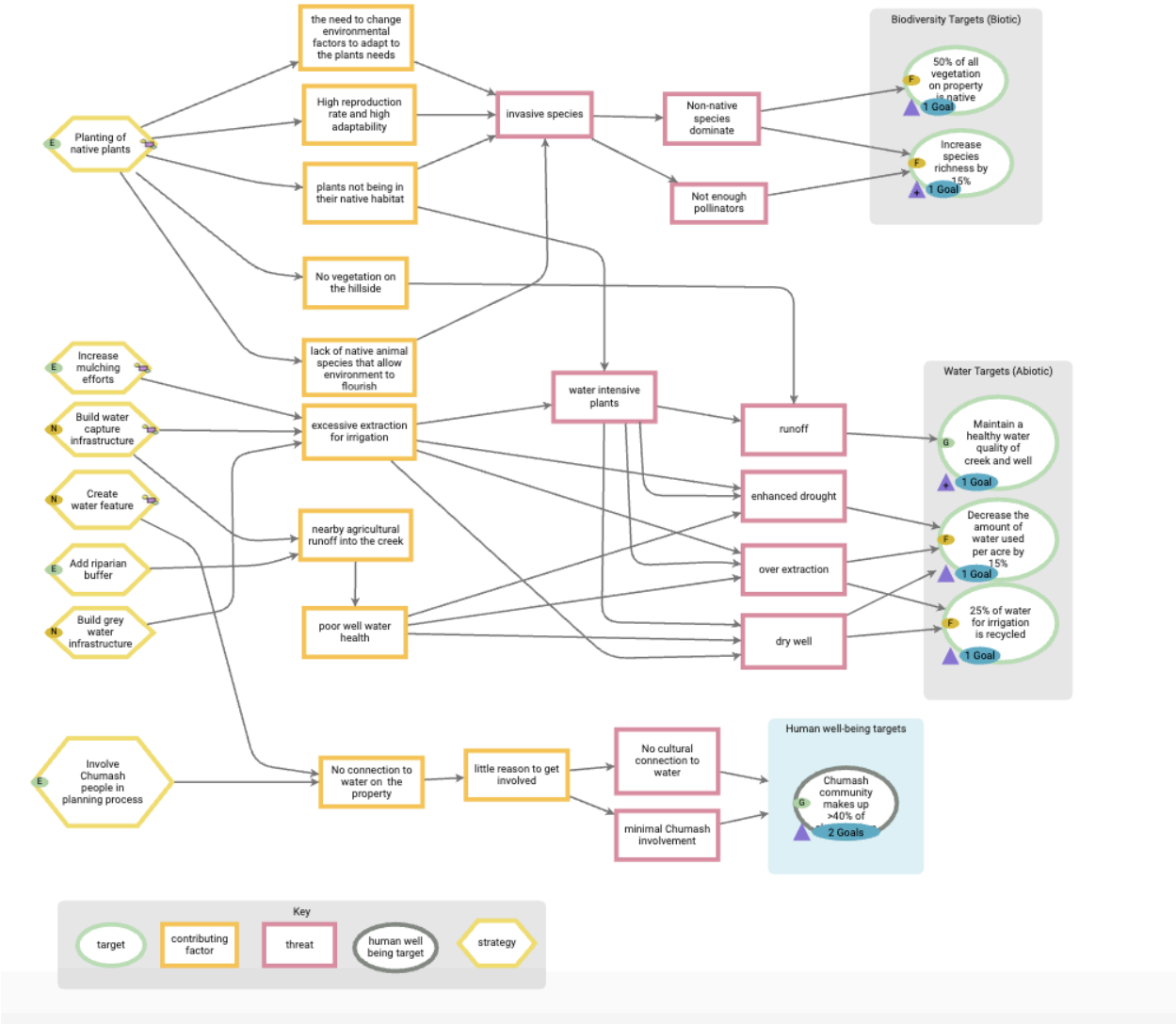


Figure 3. *Situational Analysis of the JVR property with strategies, results, and targets*

This situational analysis focuses on three groups of targets, human well-being, biotic, and abiotic targets. To address the fundamental objective of increasing native vegetation on the property while maintaining the landscaped grounds with the rose garden and grass, the two strategies are preventing non-native vegetation in the empty landscape (the hillside) and planting of native species. By doing this, there are intermediate results which allow the property to be better suited to live under the natural conditions and climate of Jalama Valley Ranch, which would create more drought and fire resistant vegetation, a riparian buffer for the well, and reduce land fragmentation which will in turn decrease the water usage and increase the percentage of the native species—plant, animal, and pollinator—on the property. Mulching is another strategy that could be implemented that would be done to address the water retention of the soil, it would allow for more water to be retained,

which would lead to less amount of water needed to be drawn from the well and used for irrigation for all of the plants on the property. Building infrastructure and a water feature is another strategy to have more water capture, to decrease the amount of water extracted from the well, it shifts to a more sustainable use of irrigation and water use. This will lead to an increase of native fish species, decreasing the water use, and help create a cultural hub for the Chumash. Finally, increasing the amount of tourist infrastructure will increase the tourists visiting the site, which would lead to an increase in revenue which would be beneficial to be able to maintain the property.

Project Scope

The scope of this project is the entire 20 acre, mixed-use area of the Jalama Valley Ranch. Proving recommendations and guidelines that would help support water resiliency issues present on the JVR property. For this project we have chosen to focus on the following: building rainwater capture infrastructure, creating a water feature, utilizing greywater, utilizing ecosystem services from native vegetation, introducing sustainable water use practices, transforming the JVR into a Chumash peoples cultural hub.

The implementation and conversion of the JVR property, we expect to take 2 years. During which monitoring of the water uses, area covered by native vegetation, amount of water produced by greywater and rain catchment, and water quality of the creek and well will all take place. Below is a detailed outline of the expected schedule:

Schedule (24 months):

Quarter	**Overview**
Q1 2026	-Site surveys -Final design for water feature, greywater infrastructure, rainwater capture infrastructure,and planting layout
Q2 2026	-Begin painting native species on empty landscape -Begin building all necessary infrastructure -Prepare sites for buffer and basin installation
Q3 2026	-Install infiltration basin and begin planting native riparian species
Q4 2026	-Install outdoor education space -Begin seasonal watering and point surveys
Q1-Q2 2027	-Supplement planting and follow up control -Mid-Project review; ensuring goals are being

	met and adjust accordingly
Q3-Q4 2027	-Conduct final planting where needed -Wrap up monitoring and produce final report -Present results to Chumash Community and explore long-term stewardship funding

Table 5. *Proposed Schedule*

Fundamental Objectives and Desired Outcomes

We selected Fundamental Objectives through analyzing the priorities of the project and determining what actions would be the most effective given the property and the constraints of the project. All of our Fundamental Objectives can be found in Table 3 below, along with what they would do for the property and how they can be measured.

JVR	Fundamental Obj (what & direction)	Features (what can be measured)	Indicators (how we measure 'what')	Targets (goal & time)
Enviro. - Biodiversity	Increase native plants	Amount of native species	Number of native species	50% of all vegetation on property is native to the area
	Increase species richness	Species richness of plants and animals	Number of different species on property	Increase species richness by 15%
Enviro. - Ecological Processes	Increase water resiliency	Amount of water used per acre	Number of gallons used for irrigation	Decrease the amount of water used per acre by 15%
	Increase water recycling	Amount of water captured and reused	Number of gallons captured and reused	25% of water for irrigation is recycled
Enviro. - Ecosystem Services	Increase water quality	Water quality in the creek	Amount of nitrate, phosphorus and pH level in creek and the well	Maintain healthy water quality of creek and well
Social	Increase cultural connection to water	Amount of Chumash community members involved in the planning process of the water feature	Number of local Chumash people working in the design for the water feature	Chumash community makes up >40% of shareholders

Table 6. *Fundamental Objectives and Desired Outcomes*

After visiting Jalama Valley Ranch and discussing with shareholders, the values were documented and organized as categories of fundamental objectives reflecting desired conservation plan outcomes. The categories are: Environmental Biodiversity, Environmental Ecological Processes, Environmental Ecosystem Services, Economic, and

Social. In the category of 'Environmental Biodiversity' the fundamental objective is to increase the amount of native vegetation. In 'Environmental Ecological Processes', there are two fundamental objectives, including improving water quality in the creek and improving water retention in the soil. The 'Environmental Ecosystem Services' category also has two fundamental objectives, which are to increase the habitat for the native species on the property and increase the habitat for pollinators. For the 'Economic' category, the two fundamental objectives are to decrease water usage and increase the revenue from tourists. Finally, the 'Social' category focuses on the Chumash by having the two fundamental objectives be increasing community engagement and increasing the cultural significance for the Chumash people.

Conservation Features

For the Fundamental Objective (FO) of increasing the amount of native vegetation at the JVR the feature is the planting of native vegetation and the indicator is to record successful plants 6 months after planting. Our goal is to increase the vegetation on the property to be 50% native after 6 months. For the FO of increasing species richness, the species richness of plants and animals on the property is the feature. The indicator is the number of different species and the target is to increase species richness by 15%. Another fundamental objective is to improve the water quality of the creek on the property. The feature will be the water quality in the creek, which will be assessed by measuring the nitrate, phosphorus, and pH. Our target for this FO is to maintain the creek's health. Next, improving water resiliency on the property is a fundamental objective. We will measure this by the number of gallons used per acre for irrigation. Similarly, our FO of increasing water recycling will be measured by the amount of gallons of water captured and reused. Lastly, our FO to increase cultural connection to water will be measured by the number of local Chumash people working on the water feature design. Our target for this FO is to increase Chumash shareholder percentage to 40%.

Range of Strategies

Strategy	**Description**
Mulching	Covering soil around irrigated areas with organic material to encourage soil moisture retention, negate weeds, and reduce soil temperature.
Riparian Buffer	Riparian vegetation works as a natural

	filtration system and works to slow down infiltration of groundwater reducing erosion.
Involve Chumash people in planning process	Invite Chumash community members to be a part of designing the water feature and the planting process.
Build grey water infrastructure	Wastewater from sinks, bathrooms, and horse pasture are captured and treated.
Create water feature	Building man-made water infrastructure to be used to support native species and recreation.
Plant native species	Increase the presence of native vegetation on JVR.
Rainwater catchment systems	Build infrastructure that captures rain water.

Table 7. *Range of Strategies*

No Action

Not taking any action towards water resilient practices on the property would exacerbate water use and resilience issues. Stagnant any community engagement process and cultural hub goals. Limit the amount of native vegetation on the property and make the JVR more vulnerable to drought and fires. While also limiting the species richness of the property.

Mulching

Much of the JVR is covered with vegetation with the goal to increase the area covered with native vegetation. This level of irrigation is water intensive and requires efficient water use. Spreading out a layer of organic material (mulching) over the irrigated areas of the JVR would work to conserve water moisture, suppress weeds, reduce temperature of the soil, and reduce erosion.

Riparian Buffer

One of the major threats to water resiliency at JVR is agricultural runoff polluting the creek, which feeds the well. In order to address this threat, we suggest planting a riparian buffer along the creek to naturally filter out pollutants.

Involve Chumash people in planning process

Community engagement, especially with local Chumash people, is core to the overall mission of JVR. In order to increase community engagement, we suggest increasing cultural connection to water via involving Chumash people in the design process for the new water feature. We also suggest involving them in the planting process. The Chumash know the land and the native flora the best so their guidance in the planting process will be essential.

Build grey water infrastructure

Much of the water used in household activities can be recycled and used for irrigation. Since irrigation is a major aspect of the JVR any strategies available that would reduce the amount of water used from the well for irrigation should be utilized. This greywater would come from sinks, laundry machines, showers, and s. After being collected it would be treated through a progressive filtration system that would treat the water without the use of chemicals. Then the water could be pumped and used for drip irrigation.

Create water feature

The new water feature should serve as a water catchment system, habitat for native species, and recreational spot. The water feature will be adjacent to the pool, per request by JVR owners, but will not share water.

Plant native species

California native species (see Table 4) in the coastal sage scrub and chaparral ecosystems can survive year-round with minimal or no additional irrigation. Actively propagating and supporting conditions for native species, while controlling invasive species, will promote recharge of the local aquifer. As part of this strategy, we strongly recommend that all invasive and non-native species be prevented from growing in the empty landscape to prevent unnecessary water usage.

Rainwater catchment system

Water capture infrastructure can come in many forms, including collection from rooftops into rain barrels or tanks and retention ponds. Periods of heavy rainfall can be taken advantage of over an extended period to reduce stress on the on-site well.

Strategy Selection

Consequence Table

Our fundamental objectives from Table 3 were evaluated through their indicators by 8 strategies, including a 'No action' counterfactual scenario. Each outcome was evaluated as having negative, neutral, or positive impact towards each objective, with equal weight. Positive or negative impacts were evaluated equally regardless of their magnitude in either direction, and outcomes were neutral if no clear consequence was found.

Fundamental Objectives	Increase native plants	Increase water resiliency	Increase water recycling	Increase water quality	Increase cultural connection to water	Increase species richness	Net Impact
Strategy ↓ Indicator →	Number of native species	Amount of utilized water capture infrastructure	Amount of water usage	Amount of nitrate, phosphorous and pH level in creek and the well	Cultural gatherings and incorporation of water feature	Number of native pollinators, birds...	
No action	-	/	/	-	/	-	-3
Increase mulching efforts	/	(+)	(+)	(+)	/	/	3
Build water capture infrastructure	/	(+)	(+)	/	(+)	/	3
Build graywater infrastructure	/	(+)	(+)	/	/	/	2
Plant native plants	(+)	(+)	/	(+)	(+)	(+)	5
Add riparian buffer near creek	(+)	/	/	(+)	/	(+)	3
Create water feature	(+)	/	-	/	(+)	(+)	2
Involve Chumash people in planning process	/	/	/	/	(+)	/	1

Table 8. *Consequence Table*

The most positively impactful strategy was found to be planting native plants, which was evaluated to have five positive impacts on our indicators, while having little impact on two indicators. No action, or the counterfactual scenario, is projected as having the highest number of negative consequences. The negative outcomes were attributed to the overarching trends of decreasing biodiversity and increasingly severe drought that need to be actively addressed. Some strategies had mixed results, such as the creation of a water feature. This was evaluated to increase native species and social well-being, but generally hurt water usage habits.

Multiple Criteria Decision Analysis

Fundamental objectives from Table 3 were individually assigned weights from 1-5, with higher numbers indicating their priority for the property. Strategies were evaluated from 1-10 based on their impact on each objective, to find the most effective strategy. Therefore, strategies that positively impact high-priority fundamental objectives would be found as most effective.

Fundamental objective	Strategy ——— Weight (1-5)	No action	Rain encatchment systems	Plant native plants	Involve Chumash people in planning process	Increase mulching efforts	Create water feature	Add riparian buffer to creek	Build grey water infastructure
Increase native plants	2	2(1)=2	2(1)=2	2(10)=20	2(7)=14	2(4)=8	2(6)=14	2(8)=16	2(1)=2
Improve water quality	4	4(1)=4	4(3)=12	4(6)=24	4(3)=12	4(3)=12	4(1)=4	4(9)=36	4(2)=8
Increase water resiliency	5	5(1)=5	5(7)=35	5(8)=40	5(3)=15	5(8)=40	5(5)=5	5(3)=15	5(9)=45
Increase water recycling	5	5(1)=5	5(9)=45	5(1)=5	5(3)=15	5(5)=25	5(5)=5	5(9)=45	5(10)=50
Increase cultural connection to water	4	4(1)=4	4(2)=8	4(8)=32	4(10)=40	4(2)=8	4(7)=24	4(2)=8	4(2)=8
Increase species richness	3	3(1)=3	3(2)=6	3(9)=27	3(7)=21	3(2)=6	3(3)=6	3(4)=12	3(1)=3
Totals		23	105	148	117	93	58	87	116

Table 9. *Multiple Criteria Decision Analysis*

In order to weigh the fundamental objectives, we went back to the original request from the JVR property owners for this project. They wanted their property to be more water resilient to be eligible for a grant. With this in mind, our top two objectives became “Increase water resiliency” and “Increase water recycling.” Following those objectives came “Increase cultural connection to water” and “Increase water quality” because during our visit to the site, it was expressed that community engagement is very important to the owners and they’re hoping to bring more people to the property. The objectives with least weight are “Increase native plants” and “Increase species richness.” These fundamental objectives were found least important because our group’s main focus was on water resiliency and then the growth of the property itself.
As strategies were compared to fundamental objectives, the ones that would most definitely help meet the objectives were given values between 8 -10. Those that had the potential to benefit objectives, but could not be determined definite were 4 - 7. Finally strategies valued 3 and below were thought to likely have no effect on the objective.

The strategies that resulted in the greatest overall scores were (in order from greatest to least): plant native plants, reach out to potential Chumash shareholders, and build greywater infrastructure. Planting native plants scored the highest because that strategy will make the property more water resilient, involve Chumash community members, and increase species richness. Considering the water needs of the more water-intensive plants

on the property compared to the water needs of native plants, we would recommend this approach be taken first. All untouched land – that has yet to be vegetated – should be planted with native plants. By increasing the amount of native vegetation on the property, more pollinators and native animals will be attracted, thus increasing the species richness.

Reaching out to the Chumash community is an important strategy as well because their involvement is essential to the water resiliency of the property. They can consult the property owners on which species of native plants to plant and where. They can also consult property owners on how to design the water feature so that it has some cultural significance.

Building grey water infrastructure will allow the property owners to recycle water and be more water resilient. By capturing used water from laundry, sinks, showers, and the horse pasture, filtering it, and then reusing for irrigation – the property will become less reliant on the well and more capable of planting new native plants.

Data and Knowledge

Riparian Buffer:

- ➔ https://pmc.ncbi.nlm.nih.gov/articles/PMC9828206/
  - ◆ Riparian buffer zones are found to be effective in bioremediation of agricultural pollutants, water filtration, and erosion control while supporting wildlife.

Documented watershed impairments:

- ➔ https://www.santaynezwater.org/files/0a439c9d4/WMA+JAN+2022_ExcecutiveSummaryOnly.pdf
  - ◆ Western management area of Santa Ynez River Valley groundwater basin.
- ➔ https://www.santaynezwater.org/files/2ac5d7f95/AR3-EMA-WY2023.pdf
  - ◆ Eastern management area of Santa Ynez River Valley groundwater basin.
- ➔ https://mywaterway.epa.gov/community/93436/overview
  - ◆ Overall condition of the 4 waterbodies in San Miguelito Creek-Santa Ynez watershed.
- ➔ https://storymaps.arcgis.com/stories/b3886b33b49c4fa8adf2ae8bdd8f16c3
  - ◆ Groundwater levels and conditions across California

Mulching:

- ➔ https://www.mdpi.com/2073-4395/12/8/1881
  - ◆ Mulching can help retain water and prevent evaporation.
- ➔ https://www.valleywater.org/accordion/placing-greywater-mulch-basins

- Breakdown of mulch contributes to soil organic matter and can filter large greywater particles.

Water feature catchment system:

- ➔ https://urbangreenbluegrids.com/measures/rainwater-ponds/
  - Rainwater ponds can help manage flood risk and retain water between storms for irrigation use.
- ➔ https://www.thepondguy.com/learning-center/how-to-build-a-stormwater-retention-pond/#:~:text=It%20consists%20of%20a%20rainwater,areas%20like%20roads%20and%20yards.
  - Retention ponds can support native aquatic plants and promote resiliency by reducing dependence on wells or municipal water sources.
- ➔ https://www.sciencedirect.com/science/article/pii/S0301479721009117
  - This focuses on a much larger scale, but offers insights on determining site suitability and a cost/benefit analysis that we can draw from

Water capture infrastructure:

- ➔ https://sanitation.lacity.gov/san/faces/home/portal/s-lsh-wwd/s-lsh-wwd-wp/s-lsh-wwd-wp-gin/s-lsh-wwd-wp-gin-hr?_afrLoop=232284461384651&_afrWindowMode=0&_afrWindowId=null&_adf.ctrl-state=6ykbxhno_74#!%40%40%3F_afrWindowId%3Dnull%26_afrLoop%3D232284461384651%26_afrWindowMode%3D0%26_adf.ctrl-state%3D6ykbxhno_78
  - Different kinds of water capture infrastructures and their pros and cons

Risks and Uncertainties

As with any project, the possible risks and limitations need to be evaluated before proceeding with action. Some of the possible risks and uncertainties that this project might be affected by are the following: budgetary constraints, shareholders' willingness to alter landscaping, and the overall cost/benefit of some of the undertakings being considered. Some of these are easier to mitigate than others, such as the cost/benefit issue, where we can analyze the expected results from certain actions and decide which ones are feasible to proceed with. However, some risks and uncertainties are not as simple; they are detailed below.

Risk 1 (moderate)
The conservation plan would require considerable landscape alterations. Although they would be performed for the sake of making the property more water resilient and improve overall ecological health, there may be difficulties getting all the shareholders on board with such ideas. Significant landscaping may be required for concrete removal, grading, and water collection.

Risk 2 (severe)
Funding and following through on any environmental restoration work is difficult. Numerous variables may be out of your hand, like weather, permits, materials cost, and so forth. Ensuring the project stays on budget is extremely important.

Bibliography

Admin. (2019, July 14). *Guidelines for efficient irrigation after drip irrigation installation*. Metzer. https://www.metzer-group.com/orchard-irrigation-principals/

California Invasive Plant Council (2012). *Preventing the Spread of Invasive Plants: Best Management Practices for Transportation and Utility Corridors.* https://www.cal-ipc.org/docs/bmps/dd9jwo1ml8vttq9527zjhek99qr/BMPsTransportUtilityCorridors.pdf

California Native Plant Society. (n.d.). *Calscape: Restore nature one garden at a time*. https://calscape.org/

County of Ventura, Planning Division. (n.d.). *Guide to native and invasive streamside plants*. rmadocs.venturacounty.gov. https://rmadocs.venturacounty.gov/images/pdf/planning/conservation/guide-to-native-streamside-plants.pdf

Dunn, R. M., Hawkins, J. M. B., Blackwell, M. S. A., Zhang, Y., & Collins, A. L. (2022). Impacts of different vegetation in riparian buffer strips on runoff and sediment loss Hydrological Processes, 36(11), e14733. https://doi.org/10.1002/hyp.14733

EPA. (2020). *Green Infrastructure Performance Summary: Runoff Reduction and Water Quality Benefits.* U.S. Environmental Protection Agency, Office of Water. https://www.epa.gov/green-infrastructure

Fross, D., & Bornstein, C. (2024, May 10). *Native Plant Care*. Pacific Horticulture. https://pacifichorticulture.org/articles/native-plant-care/

Houston, Ernest. Ernest@NorthernChumash.org

LA Sanitation (2025). *Harvest Rainwater.* City of Los Angeles. https://sanitation.lacity.gov/san/faces/home/portal/s-lsh-wwd/s-lsh-wwd-wp/s-lsh-wwd-wp-gin/s-lsh-wwd-wp-gin-hr

Home. Northern Chumash Tribal Council. (2023, June 30). https://northernchumash.org/

Northern Chumash Tribal Council. (2023, June 30). https://northernchumash.org/

Overview–Land Resilience Grant. (n.d) Land Resilience Partnership. https://landresiliencepartnership.org/

Salinity Management Guide. Salinity Management Guide: Select an irrigation system. (n.d.). https://watereuse.org/salinity-management/si/si_7.html

Sorensen, J. (2024, June 11). *The Complete Beginner's Guide to Greywater Systems*. Elemental Green | Dream Discover Design. https://elemental.green/complete-beginner-guide-to-greywater-systems/

Walker, S. Violet. violetsagewalker@gmail.com

Weatherspark.com. Lompoc Climate, Weather By Month, Average Temperature (California, United States) - Weather Spark. (n.d.). https://weatherspark.com/y/1262/Average-Weather-in-Lompoc-California-United-States-Year-Round

Zillow, Inc. (n.d.). *2191 Tularosa Rd, Lompoc, CA 93436*. https://www.zillow.com/homedetails/2191-Tularosa-Rd-Lompoc-CA-93436/124205804_zpid/