Erosion Control: Jalama Valley Ranch

Executive Summary, Fundamental Objectives, Situation Model, Results Chain, Consequence Table, and Multi-Criteria Decision Analysis

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Fig. 1: Overview of the Jalama Valley Ranch site, where this conservation plan will be implemented.

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Executive Summary

Project Vision

Fig. 2: An example of the dirt paths winding around the Jalama Valley Ranch.

This project will focus on erosion control for the Jalama Valley Ranch (JVR) in Lompoc, California, where natural soil cycles have been altered, resulting in soil instability.

This project aims to holistically reduce erosion as well as to satisfy the need for a water feature, curated walking trails, and enhancement of already established decorative gardens. The property slope, sun aspect, and soil types need to be mapped first. The goals are to manage erosion through planting native plant gardens and evaluating fire resilience. This project also encompasses a Landscape Design component as JVR aims to create an activity course on the back hillside of the ranch in addition to a walkway around the property guiding visitors through native plant gardens, food gardens, and sanctuary space.

Project Overview and Scope

Soil samples from the project area indicate the soil in the area is primarily composed of Arnold sand and Marina sand (Web Soil Survey, n.d.) which consist of drained soils formed from weathered soft sandstone from wind-blown sand and quartz grade sand. Water is easily evaporated from the soil, resulting in dry and loose sand that needs to be stabilized with both

organic and inorganic material. The ranch currently uses irrigated water, mulch and horse manure, and straw to keep the soil from blowing and washing away. In addition to sandy soil composition contributing to erosion through gullying, there are additional factors such as human activity and foot traffic, poor rooting depth of non-native annual grasses, a lack of pathing infrastructure and water collection, and wind erosion that contribute to soil degradation in the area.

The Jalama Valley Ranch hopes to build a running trail and activity course on the back hillside of the ranch with the most erosion. There is also a sloped trail lined with rocks that contributes to an excessive overflow of rainwater that floods into the neighboring property. The land has a 7-8 degree tilt resulting in a 15% slope. As soil is the measure of stability of the land, it is essential to the integrity of the property that the degradation is addressed.

Project Location

The Jalama Valley Ranch is located at 2191 Tularosa Rd, Lompoc, California. The area is 20 acres consisting of a home and office space, gardens, orchards, outdoor recreation areas, and a horse stable and paddocks, along with plenty of beautiful open outdoor space. The surrounding area has been thoroughly developed; a golf course has been established south of the conservation site. Historically, this region was covered by the unique chaparral plant community found in moderate-to-high elevation ranges.

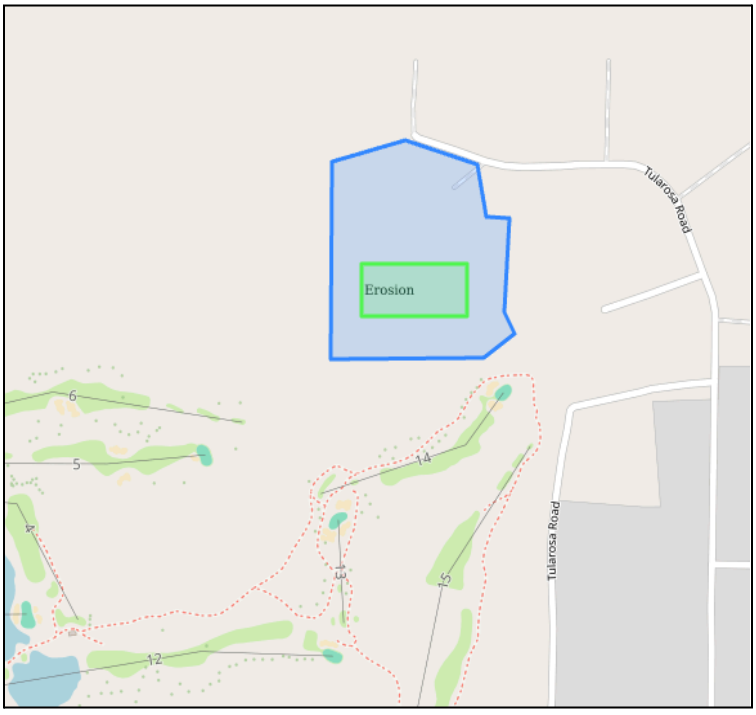


Fig. 3: A digitized representation of the conservation site. The property in its entirety is outlined in blue; the eroded hillside is shown in green.

The specific area of interest is a large hill towards the back end of the property. The hill slopes downward facing southeast, and is largely unshaded, however there are few sparse groups of trees (likely oak) providing some shade in the areas where they are located. There are areas of grasses across the hill (species unknown), and no visible shrubbery

being grown at this moment in time. The hill is located between a landscaped part of the yard, and the area at the southernmost end of the property where horses are kept.

It was reported that the previous owners of the ranch (timeframe unknown) had a river that ran horizontally through the property and into the neighboring yard, located roughly around the bottom of the hill.

Progress Summary

This section summarizes progress in the overall conservation project.

OVERALL PROGRESS REPORT	**STATUS:** Conservation Plan in Progress **DATE UPDATED:** 25-05-13

We have personally visited the ranch and inspected the property. We worked with those living on the ranch to determine their needs and with Ernie Houston, a geologist, on the soil types and topography. We have identified direct and indirect threats to erosion within the ranch and have created fundamental objectives to address these threats. A consequence table was created to assess the net impact of different actions and possible shareholders have been outlined, in addition to a multi-criteria decision analysis. A results chain diagram has been created to help us visualize the effects of different strategies.

Lessons Learned

Due to the time constraint of the conservation planning course, we were unable to outline possible trails, pools, or fitness courses desired in the area. We are currently unsure how to continue with this restoration and conservation process for JVR, but are immensely grateful for the opportunity to participate in this process. This project has provided us with valuable, real-world experience in conservation planning: its challenges as well as its satisfaction in mapping out and thinking through the conservation and restoration process.

Suggestions for next steps and specific conservation measures to take are described in the following section.

Next Steps

We plan to get in touch with the shareholders and ranch owners soon to discuss the viability of implementing different actions within the most degraded areas. We recommend starting to build the suggested water management infrastructure first, followed by pathing infrastructure and any desired recreation areas. Following this, we recommend that the slope be revegetated with a variety of native plants that would not only enhance the gardens and aesthetic experience, but would also hold down the hillside soil.

Project Targets and Goals

The main focus of this project was to reduce erosion in the Jalama Valley Ranch area. However, we also chose to focus on fire resilience, wildlife habitats and human well-being as conservation targets alongside erosion. We chose to focus on wildlife habitats as a target because we wanted to preserve the ecosystem in order to address erosion. Additionally, fire resilience is important because increasing the capacity of an ecosystem to recover from disturbances such as fires, prolonged ecosystem degradation and erosion overall. Because the space is primarily residential and is part of a Land Back Initiative, our human well-being target included promoting human connection and appreciation to the natural spaces on the property, as well as increasing human health and outdoor enjoyment.

Target Summary

Erosion

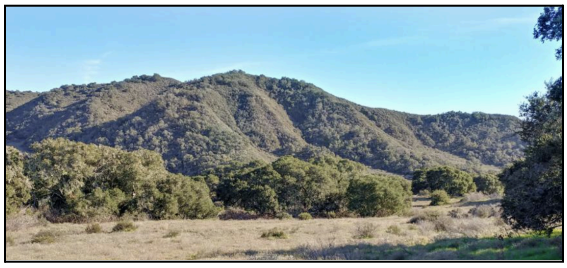
CURRENT STATUS:	Poor
DESIRED FUTURE STATUS:	Good

Insert information on erosion target here

Fire Resilience

CURRENT STATUS:	Fair
DESIRED FUTURE STATUS:	Good

Insert information on fire resilience target here



Wildlife Habitats

CURRENT STATUS:	Fair
DESIRED FUTURE STATUS:	Good

Insert information on wildlife habitat target here

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

Erosion Control

Erosion control tubes made of hemp cloth can be used to help reinforce the hillside and prevent gullying. More research is needed to figure out the best way to implement this strategy so that it is well-suited to the property and to shareholders' goals.

Adding terraced steps cut into the hillside also can help reduce erosion. This terraced hillside would be built such that there are steps cut into the hillside; this controls water runoff in addition to supporting sculpted, landscaped areas for human use on the terraces. Holding these terraces with rock walls can also support the structural integrity of the hillside.

Fig. 4: A terraced hillside supported by rock walls.

A gravel-covered terraced path down the terraced hillside can help prevent excessive wear-and-tear on pathways, reducing soil compaction and helping to preserve soil health. If a gentle, sloping water feature on the hillside is desired, it could potentially be built in between the gravel walkways and connect to multiple watering holes.

The capture, storage, and safe release of water is another suggested strategy for erosion control. This involves installing rain barrels, cisterns, or other water catchment infrastructure. The stored water runoff can be repurposed around the property, which also contributes to our fire resiliency target. This strategy helps prevent gullying and water runoff in undesired areas.

Continuing to add mulch around the property will also help control erosion, since mulching adds organic matter into the soil. This is crucial considering that the soil type on this site is mostly sand. This helps to restore soil integrity and fertility, which allows more plants to thrive in the sandy soil. This strategy is already being implemented; horse manure is used for compost and fertilization on the property.

Wind erosion can be mitigated by planting windbreaks: stands of native plants that work together to stall winds and reduce overall wind speed. Native shrubs that may be effective as a windbreak include California sagebrush (*Artemisia californica*), blue elderberry (*Sambucus cerulea*), coyote brush (*Baccharis pilularis*), lemonade berry (*Rhus integrifolia*), and laurel sumac (*Malosma laurina*). California sagebrush and coyote brush in particular are also great for general erosion control (U.S. Department of Agriculture, n.d.). Various species of oaks may also be well-suited to a windbreak in this location, such as coast live oak (*Quercus agrifolia*). An oak stand exists on the property; it would be helpful to know what species of oaks are already living there.

Enhancing Wildlife Habitat

Vegetation care and restoration can help enhance wildlife habitat as well as support our human wellbeing, fire resiliency, and erosion control targets. Removal of non-native annual grasses that may overcrowd other plants is key, although complete removal of these species is not feasible. Despite this, it can help to restore native grass species to the landscape—such as purple needlegrass (*Stipa pulchra*)—since they are drought- and heat-tolerant and can grow in poor soil conditions. *Stipa pulchra* in particular is a valuable plant for habitat restoration, erosion control, and stabilizing hillsides (California State Capitol Museum, n.d.).

Cultural and controlled burns of non-native species is a useful method for clearing out non-native grasses and forbes. Not only does this help native, soil-stabilizing plant species establish, but it is important that traditional ecological knowledge practices are implemented in this project as an extension of our human well-being target. We intend to honor the Chumash ecological knowledge held by Chumash shareholders and partners in this project.

In order to protect new plants during revegetation, installing gopher cages around new plants can help prevent gophers and other burrowing animals from eating the young plants.

Supporting Human Well-Being

Visitor education and enjoyment can be enhanced through the installation of the gravel path in addition to other walkway and road infrastructure. This also reduces erosion due to foot and vehicle traffic.

Enhancing the existing decorative gardens is also crucial; native species can be planted alongside the decorative roses to enhance the space. Native species that may enhance the aesthetic value of the space are California rose (*Rosa californica*), sticky monkeyflower (*Diplacus aurantiacus*), California lilac (*Ceanothus* sp.), golden yarrow (*Eriophyllum confertiflorum*), native

lupines (*Lupinus* sp.), and manzanita (*Arctostaphylos* sp.). These plants produce beautiful flowers when in bloom.

Other important hillside design strategies include the implementation of the desired water feature, activity spaces, and installation of signs educating visitors about traditional ecological knowledge (TEK) as they walk along the gravel path.

Fire Resilience
Overall fire resilience of the site can be enhanced with a combination of installing water cisterns or rain barrels to store water for emergency use, planting fire-tolerant chaparral or coastal scrub plants, and initiating controlled and cultural burns on the hillside when needed.

Who is Involved?

Partners and Shareholders

Shareholder List:	**Vision/Mission:**
Northern Chumash Tribal Council	● Land Back Initiative/sustainability, leading Indigenous land management ● Holistic reduction of erosion at JVR by planting native plants and evaluating fire resilience. Enhancing this gathering space and previous vegetation, such as the rose gardens already present, with pollinator gardens, food gardens, and a visitor walkway through the gardens with interpretive panels ● Conserving and restoring this space with a long-term timeframe for large gatherings of people to enjoy
Lompoc Community	● Reducing health risks to surrounding area (excess dust in the air, etc.), minimize impacts of erosion control on daily life, reduce fire danger in the area ● Establishing a community gathering space for the local people to enjoy
UCSB Students (ES 137 groups)	● Aiding the Northern Chumash Tribal Council in building the

	conservation plan for JVR ● We are budding conservationists with another complementary mission of successfully developing a conservation plan for a final project for the ENV S 137 course
Geologists familiar with the Lompoc area	● Conserving the natural soil composition and nutrient cycling, improving soil health and stabilizing existing soils
Ecologists familiar with JVR ecosystem	● Utilizing erosion reduction to conserve the natural ecosystem, reduce invasive plants, ensure plans being made do not interfere with existing ecosystem functions
Wildlife specialists familiar with the Lompoc area	● Investigate how local species are affecting land stability, and what types of native species live along the hillsides
Hydrologists familiar with local watershed	● Determine ideal water collection, storage, and release based on the hydrological history of the site ● Provide information on the watershed that JVR is connected to

Project Team

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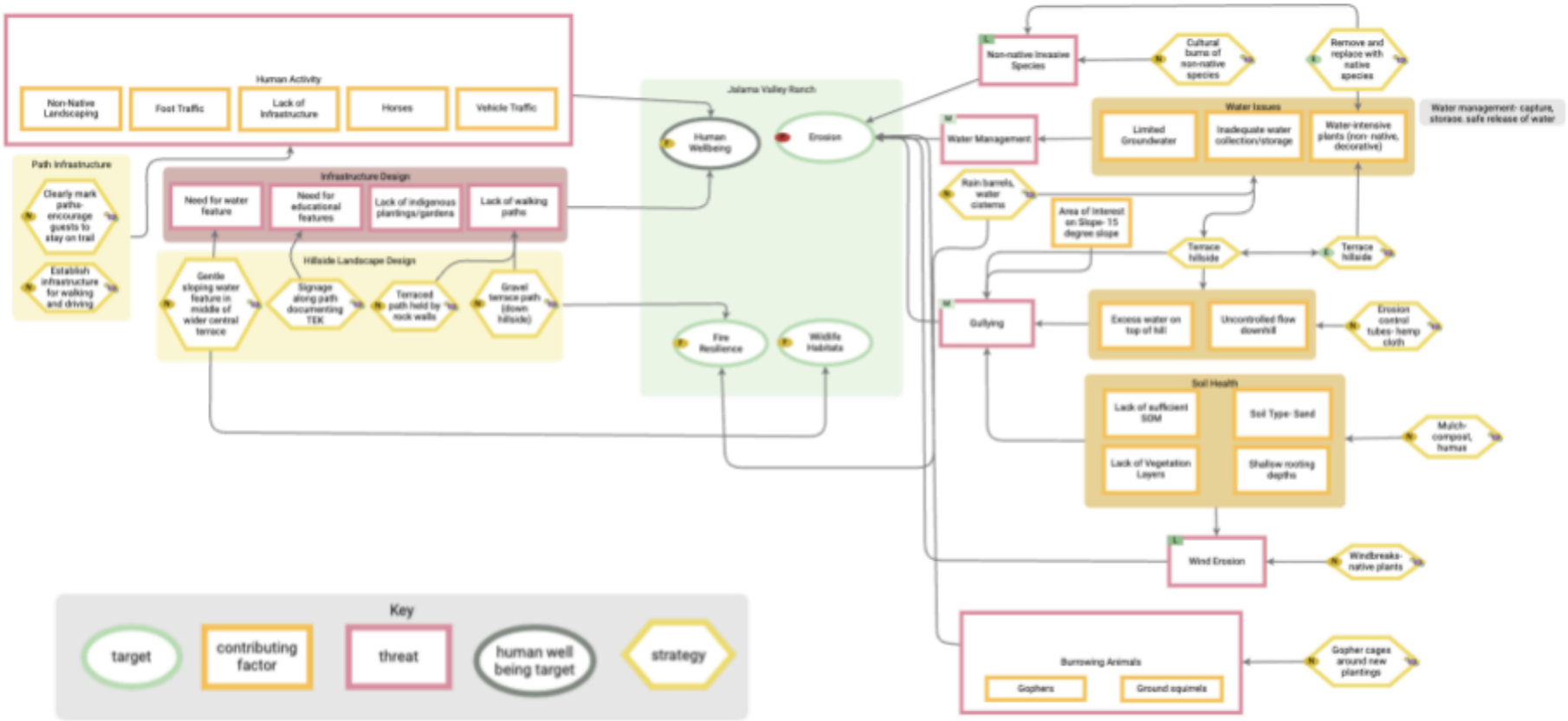
References

California State Capitol Museum. (n.d.). Purple needlegrass (Nassella pulchra). California State Capitol Museum. Retrieved May 27, 2025, from https://capitolmuseum.ca.gov/state-symbols/grass-purple-needlegrass/

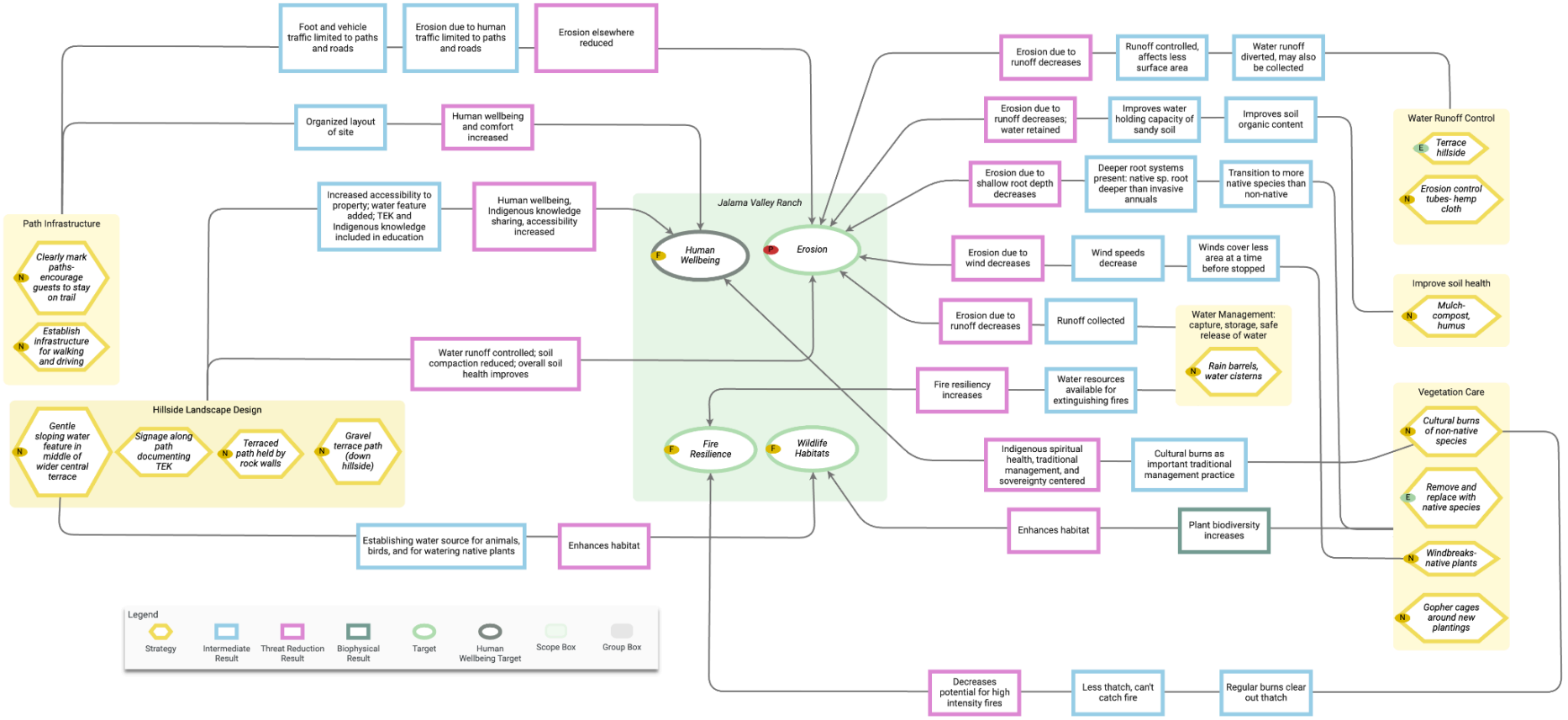
U.S. Department of Agriculture, Natural Resources Conservation Service. (n.d.). California sagebrush (Artemisia californica) plant guide. Retrieved May 27, 2025, from https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_arca11.pdf

U.S. Department of Agriculture, Natural Resources Conservation Service. (n.d.). Coyotebrush (Baccharis pilularis) plant guide. Retrieved May 27, 2025, from https://plants.usda.gov/DocumentLibrary/plantguide/pdf/pg_bapi.pdf

Situation Model Diagram



Results Chain Diagram



JVR Erosion Control - Fundamental Objectives

JVR Erosion Control	Fundamental Objectives	Features	Indicators	Targets
Environmental - Biodiversity	Increase native plant population: purple needle grass (Stipa pulchra), coyotebrush (Baccharis pilularis) and California sagebrush (Artemisia californica) etc.	1. Number of native species / the size of the area where the native species grow 2. Populations of native species	1. Via sub-sampling methods, count the number of individuals 2. Via sub-sampling methods for percent coverage, count the number of different species present	1. Increase native plant species by 10% each year, for 5 years 2. Increase populations of native plant species by 10% each year, for 5 years
Environmental - Ecological Processes	Restore soil health and fertility Increase surface water resources	soil organic matter in soil Watering and swimming hole	Measurements of soil organic matter Established watering and swimming hole at the bottom of slope; on larger terrace step	Increase soil organic matter by 10% each year, for 5 years Establish watering and swimming hole within first 3 months
Environmental - Ecosystem Services	Flood control/water management	1. Water infiltration	1. Incorporating permeable or semipermeable concrete/surfaces; increase SOM	1. Convert at least 50% of impermeable surfaces to permeable alternatives within 2 years

		2. Runoff diverted from impermeable surfaces	2. Implementing bioswales, cistern, rain barrels	2. Divert at least 10 inches of rainwater into cistern/bioswale/rain barrels each year
	Reduce hillside erosion	Native plant cover	Increase in percent cover of vegetation	Increase vegetation coverage by 30% over the course of 5 years
	Improve fire resiliency	1. Number of fire-resilient native plants	1. Number of oaks present	1. Number of new oak recruits increase by 25% each year
		2. Increase water cisterns present	2. Number of water cisterns on property	2. Install 1-2 water cisterns within the first year
	Reduce upland flow	Reduce gullying events	Count number of gully locations following rain season	Reduce gullying events by 50% each year, eliminate gullying completely within 5 years
Social	Increase human health and outdoor enjoyment	1. Presence of walking trails	1. Increase area of winding trail down hillside	1. Establish gravel trail within first 3 months
		2. Implement native gardens	2. Increase curated native garden space	2. Start development of curated native garden within first 3 months
		3. Maintain current planting	3. Stable population of decorative gardens already present	3. No change to decorative garden population within first 5 years
		4. Water feature (swimming and watering hole)	4. Following implementation, note	

	Promoting human connection, gratitude, appreciation to natural spaces	Addition of signs/education feature on curated trail	number of people/animals enjoying water feature Number of signs implemented, number of different visitors	4. Water feature used by guests stable/increases each month Establish signs within first 2 years

Consequence Table

Fundamental Objectives	**Increase population of native species; increase native vegetation cover - #**	**Increase soil organic matter - #**	**Stabilizing soil on hillside - #**	**Enhance water diversion - #**	**Increase aesthetic value of property - #**	**Increase in bookings for educational field trips - #**	**Increase amount of time that visitors spend outside while on property - #**	**Creation of educational panels and curated trail through property - #**	**Net impact**
Indicator → **Strategy ↓**	Sub-sampling number of species and individuals; percent cover vegetation total	Measurements of soil organic matter relative to entire soil composition	Long-term monitoring topography of site	Taking measurements of runoff at hillside base (tipping buckets)	Satisfaction of residents as vegetation grows	Number of tours booked	Time spent on site for recreational use	Number of signs implemented	
No action	(-)	/	(-)	/	/	/	/	/	-2
Establish infrastructure for walking and driving	/	/	(+)	/	(+)	(+)	(+)	(+)	5
Plant native species/ reduce soil exposure	(+)	(+)	(+)	/	(+)	/	/	(+)	5
Capture, storage, and	/	(+)	(+)	(+)	(+)	/	/	/	4

safe release of water									

Multi-Criteria Decision Analysis

Fundamental objective	Strategy ———— Weight (1-5)	Establish infrastructure for walking/driving	Adding organic matter	Plant native plant species/reduce soil exposure	Bioswales	Rain Barrels/ Cisterns	Building with permeable material	No action
Reduce hillside erosion	**5**	3(15)	8 (40)	8 (40)	8 (40)	3(15)	6(30)	1 (5)
Increase water collection	**5**	5(25)	6 (30)	8 (40)	10 (50)	9(45)	3(15)	1 (5)
Increase water permeability	**5**	5(25)	6 (30)	9 (45)	9 (45)	3(15)	10(50)	
Increase native plant population	**4**	5 (20)	10 (40)	10 (40)	5 (20)	2(8)	7(28)	1 (4)
Promoting human connection. Gratitude, appreciation to natural species	**4**	10 (40)	5 (20)	6 (24)	4 (16)	1(4)	2(8)	1 (4)
Increase human health	**3**	7 (21)	6 (18)	5 (15)	6 (18)	1(3)	6(18)	1 (3)
Increase outdoor	**3**	10 (40)	5 (15)	5 (15)	4 (12)	1(3)	3(9)	1 (3)

enjoyment (walking trails, gardens)								
Increase fire resiliency	**2**	2 (4)	7 (14)	7 (14)	3 (6)	2(4)	7(14)	1 (2)
Total		**190**	**207**	**233**	**207**	**97**	**172**	**26**