West More Mesa

RESTORATION MASTER PLAN

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PROJECT OVERVIEW

PURPOSE

The purpose of this project is to increase the resilience of the ecosystem in West More Mesa by increasing the number of native species.

Goals: By the end of 4 years, the following objectives will be met:

1. Reduce non-native cover to <15%, and increase native cover to >65%.
2. Remove over 50% of current non-native annual grasses using the seed bank removal method and maintenance via field crew weeding.
3. Preserve the characteristics of the grassland and increase diversity by seeding and planting.
4. Improve the quality of the human-nature relationship at the site by maintaining pathways, but increasing protocol to lessen human waste and soil compaction.

USE POLICY

The project site is located in More Mesa, an area recognized for its environmental, biological, and recreational resources. The use of the site will be consistent with public access while implementing measures to regulate and mitigate undesirable impacts. Signage will be installed throughout More Mesa to inform the public of the sensitivity of the area and to request that visitors stay on designated paths and refrain from bringing dogs into the project boundaries to minimize their impact on the wildlife and habitats. Additionally, off-highway vehicle (OHV) use will be strictly prohibited within More Mesa. This prohibition aligns with existing regulations that already make OHV use illegal in undesignated areas, protecting the environmentally sensitive habitats. Legally, the site is protected under the 1982 Local Coastal Plan and the 1993 Goleta Community Plan, which include specific policies and standards to safeguard its critical resources. Development is restricted to specific areas, and any proposed projects must undergo rigorous environmental review to ensure compliance with these policies.

PERMITTING

Permits would be required in order to go through the process of removing the seed bank and replacing those seeds with native vegetation. This would be a very in-depth process, so gaining permission in order to carry out our restoration is imperative. UCSB researchers will need to obtain land permits, and an environmental review from the USFS, in accordance with the National Environmental Policy Act (NEPA). These steps are important because if our restoration plans do not align with the required legal steps, the whole project could be shut down. According to the County of Santa Barbara, the researchers should also consult the Planner's Guide to Conditions of Approval and Mitigation Measures, and obtain a Planning Permit from the county. In addition, collecting seed or plant material would require collecting a permit from the USFS to collect any plant materials or seeds on USFS land.

SITE INVENTORY AND ANALYSIS

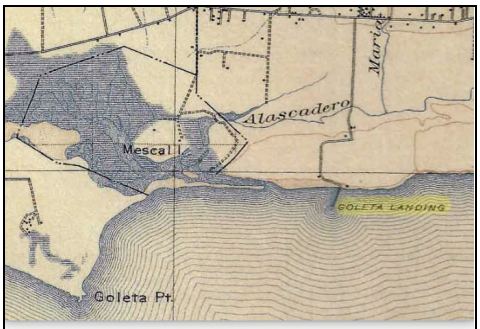
Regional Context

Location Description - West More Mesa

West More Mesa is a charming and environmentally diverse undeveloped space located on the Coast of Southern California. The Project is centered at 34°25'17.7"N 119°47'52.1"W, and is located within a larger plateau, locally known as “More Mesa”(1). This parcel of land is located in unincorporated Santa Barbara County, California, between the cities of Goleta and Santa Barbara. To the north and west of the parcel are residential neighborhoods belonging to Goleta, and to the east is the East More Mesa Plateau. To the south of the parcel is a beach, called More Mesa Beach and the Santa Barbara Channel. The site is also boarded by Atascadero Creek to the north, and is accessible primarily through small paths from the surrounding residential neighborhoods. Specifically, West More Mesa can be accessed from 5200 Shoreline Drive and has the closest access to More Mesa Beach (2).

Land Use History

John Finley More owned More Mesa and utilized the land to build a road for valley farmers to haul their products to More’s Landing for export. This area went largely untouched as developments in other areas of More’s parcel became housing, the airport, and roads. Owned for nearly 30 years by Robert Earl Holding, a developer who pursued several attempts to develop homes on the plot, which failed to make traction and were met with opposition from the neighborhood and environmentally-minded community members (3). During Holding’s ownership, a part of the land was bought by the Santa Barbara Land Trust in 1991, and the More Mesa Preservation Coalition was formed in 2003 (5). Since the Santa Barbara Land Trust has gotten involved and the MMPC was formed, restoration efforts like weeding and preservation efforts have occurred. Then, More Mesa was bought in 2012 by Khalid Bin Saud Al Shobily from a real estate investment group (4). Overall, this parcel of land has largely remained untouched by agriculture or other developments, with the extent of the use including roading for agricultural export and recreational opportunities. Both of these uses could cause soil compaction as it was used as a road and cliff erosion as the bluffs are disturbed by human recreation. Upkeep of native plants growing on the bluffs has occurred to prevent further erosion, and postings on the website let local recreational users of the site know about possible dangers of cliff erosion.



This Map from 1903 not only shows Campus Point and Mescaltitlan Island, but also the location of More's Landing.

Climate

West More Mesa's location has a Mediterranean climate. This means that the area experiences dry, hot summers and cool, wet winters. Rain mostly falls in the winter, with rarely any rain in the summer. Temperatures peak around August, with a daily average of 28 degrees celsius, and dips in December and January, with a daily average of 18 degrees celsius. There is no snow in the winter, but gusty winds in the fall that heavily affect the area. The West More Mesa's proximity to the ocean also creates constant contact with the coastal marine layer. (14)

Geology

West More Mesa is primarily composed of soils from the order Mollisol, with two of its major series present there: Baywood and Concepcion (8).The Baywood soils, comprising roughly ten percent of the area, are loamy sands (9). Whereas the Concepcion series, which covers almost the rest of West More Mesa, is a fine sandy loam. These soils have little horizonization, contain high amounts of organic matter, and are deep (6)(7). These soils are also well drained to excessively well drained. The soil here formed on steep sandstone terraces from sandy material deposited from nearby beaches (9).

Vegetation

The vegetation at West More Mesa is vast and diverse, and flourishes in various habitats including oak woodlands, coastal bluffs, and grassland habitats. Within these habitats, there are many different types of plants, some of which are native and invasive. There are 108 rare plant species that are threatened by invasive plant species. The native plant species in West More Mesa are accustomed to longer fire cycles, therefore recent frequent fires have made native plant species recovery difficult. For example, the South African Ice Plant is an invasive species that thrives in West More Mesa (amongst most of coastal California), due to its ability to grow quickly and change soil composition. More dominant invasive species at West More Mesa include many grass species like Bromus Diandrus, Festuca perennis, and Avena barbata, all of which cover the midland section of the plot. Some trees that are commonly seen at West More

Mesa's Riparian Woodland include Willows, Cottonwoods, Sycamores, and Oaks. Additionally, at West More Mesa's Coastal Bluff Scrub habitat, there is a large community of flowering vegetation, including the California Brittlebush. The largest habitat at West More Mesa is Grasslands, which primarily consists of Grassland Tarweed, Foothill Needlegrass and Purple Needlegrass. The line between where invasive and native species interact at West More Mesa is a clear one, as most of the midland area of the plot is covered in invasive grasses and annuals whereas the coastline and riparian habitat are biodiverse strips of oak woodland and salt brush species. In the areas blooming with native species, not many invasive species are to be found, and in the areas covered in invasive grasses, only some native shrubs or wildflowers are present.

Disturbance

In the last decade, More Mesa has faced the disturbance of rapid cliff erosion. The strip of land along the bluffs in this area is home to more native plant species than the majority of the plot, and this bluff is eroding quickly, as the West More Mesa is a younger formation and has demonstrated 12 inches of sea cliff retreat per year (11). A recent case of the unstable cliffs in this area was a sinkhole that opened in 2017 right along the cliff (12). Further inland from the bluff trail, the domination of invasive grasses serves as a disturbance to the More Mesa plot. Another source of disturbance is human use. There are neighborhoods and roads that surround the area, so urban runoff and pollution could disturb the natural habitats. There are also some pathways throughout the land for human use. This location is also often influenced by drought, which is a disturbance that some vegetation is adapted to, but changing climatic conditions have made these droughts more severe (13).

Map of West More Mesa

Map 1: Map of West More Mesa, including key elements that will be crucial to consider in our restoration plans

Site Visit

Image 1: Our RMP group at the site!

Inventory Methods We conducted a site visit on May 3rd, 2024. Researchers walked through the West More mesa, recording all plant species found along a transect line in three different ecosystem types. Recording data in the three different ecosystems is important because the processes within each system greatly vary. These varying processes interact to make up the overall ecosystem, and it is crucial to understand each role in order to best maintain the resilience of the site. The first ecosystem type was grassland, the second was coastal sage scrub, and the third was coastal live oak woodlands. A 20 meter transect was taken in each place, for a total of 3 transects. At each meter point on the transect line, species types were recorded, and at each transect location, soil types were recorded. Pictures were taken to back up recordings. Soil texture was determined by hand, using a soil texture triangle.

Topography

The topography of the site was uniform. The grasslands were at the same elevation and there were very minor changes in the landscape. The only slopes that our group observed was the first transect, in the Northwest part of West More Mesa, there was a bit of a gradient to reach the woodland area. In the open space, it was flat grassland. Below is a map of the topography in More Mesa and show that there are not any overall changes in elevation. This will be important to consider in our project because topography influences different natural processes such as fire, succession, nutrient cycling, and more. Furthermore, it will influence our restoration efforts through the different methods we can use and the machinery that we can employ. For example, on the steeper slopes, it will be impossible to use large machinery, so we will have to be mindful of the topography as we discuss specific restoration actions. We can account for these factors by splitting up restoration actions by topography as well as other factors such as vegetation and soil

type. Considering topographic features allows restoration projects to mimic natural processes, promote ecosystem resilience and sustainability over time.

Map 2 (left): Topographic map of West More Mesa. The dark solid line marks 100 ft elevation and is pretty consistent throughout the parcel of land.
Image 2 (right): The homogeneous, flat grasslands at West More Mesa

Microclimate

.. During our site visit to West More Mesa, we observed several important microclimate characteristics that will be critical to our restoration project. The overall weather was mild, with temperatures in the mid-60s, overcast skies limiting direct sunlight, and minimal wind except for an occasional light breeze. However, the microclimate of the area exhibited distinct variations due to the landscape's topography and vegetation. The site features a mix of slopes and flat areas, which creates a variety of microclimates. For example, south-facing slopes receive more sunlight throughout the day, resulting in warmer and drier conditions compared to north-facing slopes, which remain cooler and more shaded. This aspect difference significantly affects plant selection, as species that thrive in sunny, dry conditions will be more suitable for the south-facing slopes, while those that prefer cooler, moist environments will do better on the north-facing slopes. Additionally, the presence of barriers such as large trees and shrubs influences wind patterns and provides varying degrees of shade across the site. In areas with dense vegetation, wind is blocked, creating a more sheltered microclimate that can support different plant species than more exposed areas. These sheltered spots also tend to have higher humidity and cooler temperatures due to the shade, which benefits shade-tolerant and moisture-loving plants. Certain parts of the site are heavily shaded by the tree canopy, creating cooler, low-light conditions, whereas open areas receive more sunlight and have higher temperatures. Understanding these light conditions will help us determine the most appropriate plant species for each area, ensuring they receive the optimal amount of sunlight for growth.

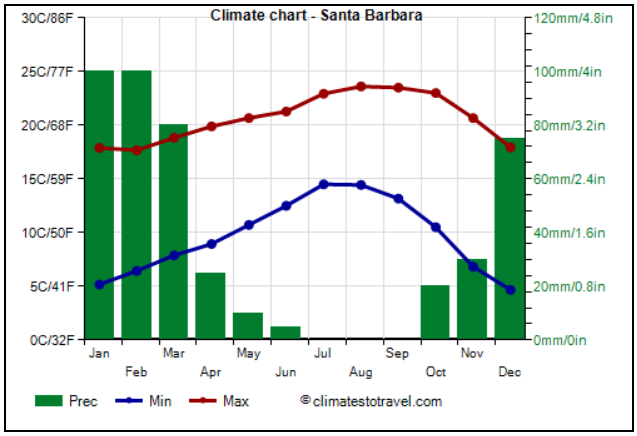


Image 3 (left): The overcast and cloudy skies at West More Mesa. The imagery is telling of the microclimate and localized variation in the landscape at West More Mesa

Graph 1 (right): Chart indicating the climate in Santa Barbara throughout the year. Although not specific to West More Mesa, it follows a similar pattern and temperatures.

Soils

We noticed three different soil types at our site. In the grassland area (transect 1), hard pan clay soil was observed. In the coastal sage scrub area (transect 2), sandy silt was observed, and in the oak woodland area (transect 3), clay loam was observed. In the oak woodland area, there was a high amount of organic matter in the soil due to leaf fall from the coast live oaks. This leaf litter provides nutrients to the soil and keeps in moisture. Paths throughout the site created soil compaction, and cliff erosion in degraded areas revealed different soil layers. We observed that the soil was drier and lacked vegetation along the cliffs, which we suspected increased the degradation. The soil health will be important to consider in our project because if the soil health is poor, the rehabilitation of new, native plants will be extremely difficult. Therefore, we will need to restore soil health in places where nutrients are depleted, or in locations where the soil texture does not meet the preferences of the native species.

Image 4 (left): Hardpan clay soil observed in the grassland area

Image 5 (middle): Sandy silt soil observed in the coastal sage scrub area
Image 6 (right): Clay loam soil observed in the oak woodland area

Hydrology

A stream was observed to be running through the site. This explains the more hydrated soils observed near the stream, in the coastal woodlands area of the site. Compacted soils from pathways could decrease water infiltration, because compaction reduces the pores that allow water to enter the soil. Decreased water infiltration will increase runoff because the water that does not percolate into the soil has nowhere to go other than running off the site. Steeper slopes throughout the site would increase surface runoff, and paths of erosion were observed on those slopes, seen below. Nearby neighborhoods, and therefore surrounding paved roads, decrease infiltration and increase runoff. Hydrology is important to consider for our project because different plant types have different root structures and needed moisture levels.

Image 7 (left): The sudden change in topography on the Northwestern border of West More Mesa. One of the steeper slopes (if any) in West More Mesa
Image 8 (right): A closer look at the slope within the woodland area

Fauna

During the site visit, fauna observed include several species of invertebrates and vertebrates. Invertebrate species include Helix Aspersa (common garden snail), Armadillidium Vulgare (isopod), Estigmene Acrea (salt marsh moth) in the larval stage, and Eleodes Acuticauda (darkling beetle). Vertebrae sightings was dominated by bird species including, Melozone Crissalis (california towhee), Haemorhous mexicanus (house finch), Melospiza Melodia (song sparrow, Geothlypis Trichas (common yellowthroat), Calypte Anna (Anna's hummingbird), Pelecanus Occidentalis (brown pelican), and Aphelocoma Californica (California scrub jay). Sylvilagus Bachmani (brush rabbit) was also observed at West More Mesa.



Image 9 (left): California Scrub Jay (Aphelocoma Californica)
Image 10 (middle): Common Garden Snail (Helix Aspersa)
Image 11 (right): Roly-Poly (Armadillidium Vulgare)

Flora

Dominant vegetation groups at this site are coastal grassland, coastal sage scrub, and oakwoodland. In the grassland dominant species are primarily invasive grasses, such as Avena barbara, Bromus diandrus, Festuca perennis, and Avena Fatua. Additionally non-native herbaceous species such as Erodium Botrys and Vicia Satia also dominate in these open grassland systems. In coastal sage scrub, dominant species include shrubby and sub-shrub natives such as Eriogonum Parvifolum, Acmispon Glaber, Croton Californicus, and Baccharis Pilularis. As well as some native wildflowers like Phacelia Distans and Amsinckia Spectabilis. Finally, the oakwoodland is characterized by the large presence of Quercus agrifolia (Coast Live Oak) which dominates this ecosystem. Its understory has large amounts of herbaceous plants such as Conium Maculatum and Tropaeolum majus, as well as toxicodendron diversilobum (Poison Oak). It will be important to consider the flora of this area, because if we know there is an existing community of a native species, we would continue to incorporate them in the restoration plan.

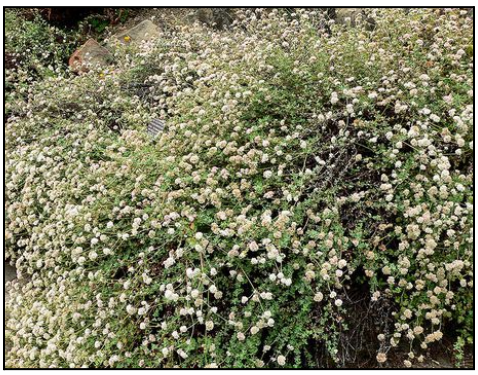




Image 12 (left): Hordeum Murinum, a common invasive grass in the coastal grassland habitat
Image 13 (middle): Coast Live Oak (Quercus Agrifolia), common in the riparian habitat
Image 14 (right): Sea Cliff Buckwheat (Eriogonum Parvifolium), a dominant species in the sage scrub habitat

Cultural Resources and Human Use

West More Mesa is frequently visited for activities such as running, walking, biking, and for access to the beach below. Lots of people park in the adjacent neighborhood (More Mesa Shores) and walk, and many people living in the neighborhood frequent More Mesa to walk their dogs or see the beach. Due to human usage of the park, trash was found during the site visit in bushes along the sides of the trails including food packaging and paper towels as well as evidence of people not picking up after their dogs. Some dogs are off leash, and bikers ride along the bluff trail most often. Human use is almost completely confined to the thin trails, so those trails are much more noticeably compacted than the surrounding soil. Specifically, the bluff trail that allows access to the beach below shows more cliff erosion than other trails in More Mesa.



Image 15 (left): Used toilet paper found in bushes
Image 16 (middle): Litter found on trails
Image 17 (right): Dog excrement on the side of the trail

Sensitive Resources

Commonly known as Coyote thistle, *Eryngium jepsonii* populations have been found in vernal pools in the more inland portions of More Mesa. *Eryngium jepsonii* is ranked as 1B.2 as rare, threatened, or endangered in California.

Table 1: Species Identified Along Transect 1: Coastal Grassland

Substrate: Thatch and Hard Pan Clay
Note: species listed in red are native

Transect Meter Mark	Species Identified
1	*Avena barbata, Vicia sativa, Plantago lanceolata, Festuca perennis, Vulpia microstachys*
2	*Bromus diandrus , Avena barbata , Festuca perennis, Nassella pulchra*

3	*Avena barbata, Erodium botrys, Vulpia myuros , Rapistrum rugosum*
4	*Avena barbata , Erodium botrys, Bromus diandrus Plantago lanceolata*
5	*Vicia sativa, Bromus diandrus, Festuca perennis*
6	*Vicia sativa, Bromus diandrus, Festuca perennis, Erodium botrys, Hypochaeris glabra, Avena barbara, Trifolium hirtum*
7	*Vicia sativa, Bromus diandrus, Festuca perennis, Hypochaeris glabra, Avena barbara, Ambrosia psilostachya*
8	*Avena barbara, Vicia sativa, Hypochaeris glabra, Erodium moschatum*
9	*Ambrosia psilostachya, Medicago polymorpha, Avena barbara, Vicia sativa, Hypochaeris glabra, Erodium moschatum*
10	*Festuca perennis, Bromus diandrus*
11	*Festuca perennis, Bromus diandrus*
12	*Hypochaeris glabra, Ambrosia psilostachya, Festuca perennis*
13	*Ambrosia psilostachya, Festuca perennis, Vicia sativa*
14	*Festuca perennis, Vicia sativa, Bromus diandrus*
15	*Avena fatua, Bromus diandrus*
16	*Erodium cicutarium, Bromus diandrus, Avena fatua, Atriplex lentiformis*

17	*Trifolium hirtum, Festuca perennis, Avena fatua, Nassella pulchra*
18	*Nassella pulchra, Festuca perennis, Avena fatua, Bromus diandrus*
19	*Festuca perennis, Avena fatua*
20	*Avena Fatua, Nassella pulchra, Festuca perennis*

Table 2: Species Identified Along Transect 2: Coastal Sage Scrub
Substrate: Sandy Silt

Transect Meter Mark	Species Identified
0	*Lupinus bicolor, Croton setige, Eriogonum parvifolium, Phacelia distans, Amsinckia spectabilis, Spergula arvensis, Acmispon strigosus*
1	*Eriogonum parvifolium, Phacelia distans, Nassella pulchra*
2	*Eriogonum parvifolium , Acmispon strigosus , Hypochaeris glabra, camissoniopsis micrantha*
3	*Camissoniopsis micrantha*
4	*Croton californicus , Camissoniopsis micrantha*
5	*Baccharis pilularis, Eriogonum parvifolium, Croton californicus*
6	*Eriogonum parvifolium, Vicia sativa*
7	*Acmispon glaber, Bromus carinatus, Croton californicus, Baccharis pilularis*
8	*Baccharis pilularis, Bromus carinatus*
9	*Croton californicus, Eriogonum parvifolium*
10	*Croton californicus, Acmispon glaber, Avena fatua, Ambrosia psilostachya, Phacelia cicutaria*

11	*Croton californicus, Acmispon glaber, Avena fatua*
12	*Acmispon glaber, Avena fatua*
13	*Eriogonum parvifolium, Acmispon glaber, Avena fatua, Phacelia cicutaria*
14	*Acmispon glaber, Avena fatua, Phacelia tanacetifolia, Phacelia cicutaria*
15	*Acmispon glaber, Avena fatua, Baccharis pilularis, Eriogonum parvifolium, Phacelia cicutaria*
16	*Eriogonum parvifolium, Acmispon glaber*
17	*Erigeron sumatrensis, Bromus diandrus, Acmispon glaber, Nuttallanthus texanus*
18	*Acmispon glaber, Ambrosia psilostachya, Silene gallica, Carpobrotus edulis*
19	*Acmispon glaber, Lupinus bicolor, Ambrosia psilostachya*
20	*Carpobrotus edulis, Stipa pulchra*

Table 3: Species Identified Along Transect 3: Oak Woodland
Substrate: Clay Soil

Transect Meter Mark	Species Identified
0	*Quercus agrifolia, Malva parviflora, Toxicodendron diversilobum*
1	*Quercus agrifolia, Malva parviflora, Toxicodendron diversilobum, Oxalis pes caprae, Bromus diandrus*
2	*Quercus agrifolia, Malva parviflora, Toxicodendron diversilobum, Oxalis pes caprae, Bromus diandrus*
3	*Quercus agrifolia, Malva parviflora*
4	*Rubus armeniacus, Tropaeolum majus, Quercus agrifolia, Oxalis pes caprae*

5	*Rubus armeniacus, Tropaeolum majus, Quercus agrifolia, Toxicodendron diversilobum*
6	*Tropaeolum majus, Quercus agrifolia, Toxicodendron diversilobum*
7	*Tropaeolum majus, Quercus agrifolia, Toxicodendron diversilobum*
8	*Tropaeolum majus, Quercus agrifolia, Toxicodendron diversilobum*
9	*Tropaeolum majus, Quercus agrifolia*
10	*Tropaeolum majus, Quercus agrifolia*
11	*Tropaeolum majus, Rubus ursinus, Bromus diandrus*
12	*Carduus pycnocephalus, Tropaeolum majus, Rubus ursinus, Bromus diandrus*
13	*Carduus pycnocephalus, Tropaeolum majus, Rubus ursinus, Sambucus cerulea*
14	*Hordeum murinum, Rubus ursinus, Tropaeolum majus, Carduus pycnocephalus*
15	*Malva parviflora, Bromus diandrus*
16	*Tropaeolum majus, Quercus agrifolia, Hordeum murinum*
17	*Tropaeolum majus, Quercus agrifolia, Hordeum murinum*
18	*Bromus diandrus, Quercus agrifolia*
19	*Bromus diandrus, Quercus agrifolia, Hordeum murinum*
20	*Quercus agrifolia, Hordeum murinum, Tropaeolum majus, Bromus diandrus*

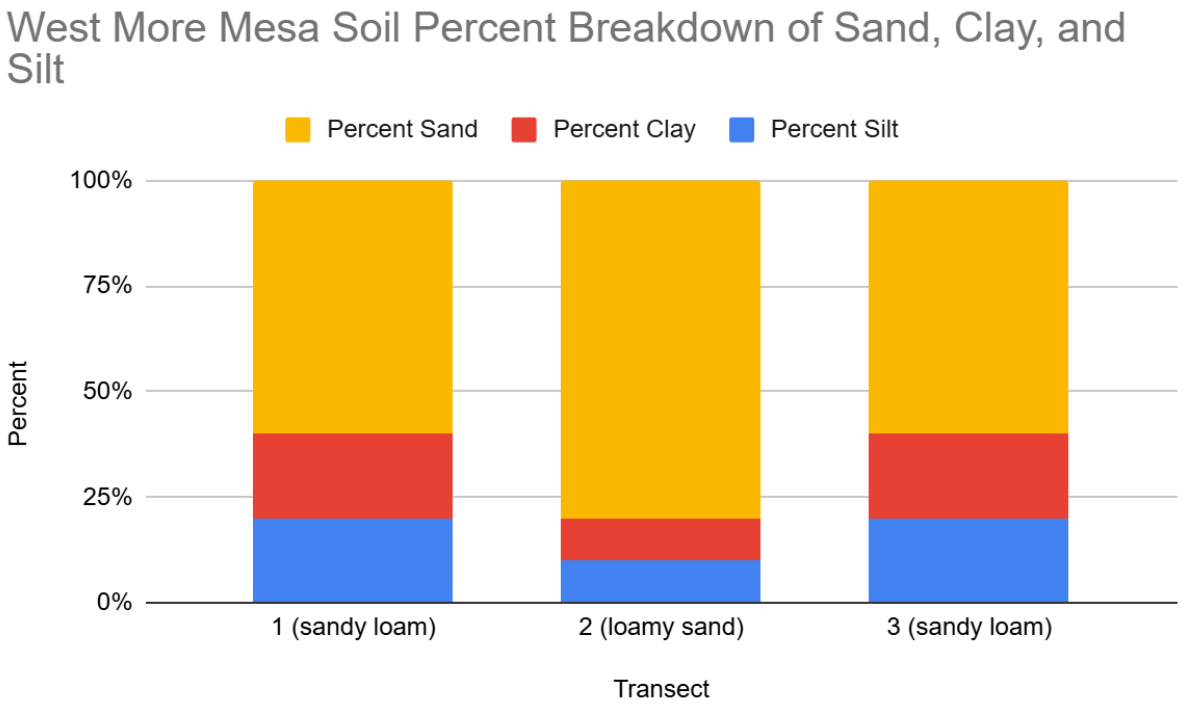
Table 4: All species observed during the site visit

Native Species	Non Native Species

Pseudognaphalium californicum	*Brassica nigra*
Baccharis pilularis	*Carpobrotus edulis*
Juncus bufonius	*Raphanus raphanistrum*
Hordeum brachyantherum	*Vicia sativa*
Heterotheca grandiflora	*Erodium botrys*
Amsinckia spectabilis	*Plantago lanceolata*
Lupinus biocolore	*Tropaeolum majus*
Nuttallanthus texanus	*Sonchus asper*
Acmispon glaber	*Silphium laciniatum*
Croton californicus	*Trifolium hirtum*
Eriogonum parvifolium	*Rumex crispus*
Phacelia distans	*Hordeum marinum*
Rubus ursinus	*Lythrum hyssopifolia*
Quercus agrifolia	*Carduus pycnocephalus*
Eryngium jepsonii	*Cynodon dactlyon*
Ambrosia psilostachya	*Carduus acanthoides*
Atriplex lentiformis	*Lysimachia arvensis*
Nassella pulchra	*Fumaria capreolata*
Acmispon strigosis	*Conium maculatum*
Artemisia Californica	*Bromus diandrus*
Encelia Californica	*Avena barbata*
Heterotheca grandiflora	*Festuca perennis*
Toxicodendron diversilobum	*Vulpia myuros*

Nassella pulchra	*Rapistrum rugosum*
Croton setige	*Hypochaeris glabra*
Camissoniopsis micrantha	*Trifolium hirtum*
Baccharis pilularis	*Erodium moschatum*
Bromus carinatus	*Avena fatua*
Phacelia cicutaria	*Elymus condensatus*
Phacelia tanacetifolia	*Medicago polymorpha*
Sambucus cerulea	*Spergula arvensis*
	Erigeron sumatrensis
	Malva parvifola
	Oxalis pes caprae
	Rubus armeniacus

Map 3: Cyan markers representing the locations of the three transects taken. Top left marker is Transect 3, upper middle marker is Transect 1, and bottom left marker is Transect 2



Graph 2: Bar chart describing the soil makeup of each transect; specifically the soil percentages consisting of sand, silt, and clay. The x-axis represents which transect and the y-axis represents the percentage of the soil.

Image 18 (left): Grey and cracked hardpan clay soil along the trail
Image 19 (right): Yellowish sandy silt soil on the West More Mesa bluffs

JUSTIFICATION AND SOLUTIONS

CHALLENGES AND OPPORTUNITIES FOR RESTORATION

Challenges

I. One potential challenge at West More Mesa is the human disturbance. West More Mesa has multiple trails that are heavily traveled, indicated by soil compaction, and traces of human activity throughout the space. With the presence of people in West More Mesa, it might be difficult to keep them away from sensitive restoration projects. Additionally, humans track invasive species into West More Mesa (seeds stuck to clothing) and cause soil compaction that can really damage the restoration project. It has been reported that humans have tripled the amount of paths through the open space and have also widened paths.

II. Another potential difficulty for restoration is the presence of non-native species. Of the species that we observed in West More Mesa, there were more non-native species than native species. It will be difficult to permanently remove and pick through the non-native species, without disturbing the existing native species communities. Furthermore, there are many different invasive species at West More Mesa, so implementing one strategy for invasive species removal might prove challenging.

III. Lastly, the drought in California is significantly impacting the plant communities in West More Mesa. Prolonged reduced rainfall has lowered soil moisture, favoring drought-tolerant species like sagebrush and buckwheat while reducing moisture-dependent plants such as certain grasses. This shift also benefits invasive species like mustard and thistle, which outcompete native plants for water. Additionally, stressed plants are more susceptible to pests and diseases, further altering the ecosystem. These changes expose the need to select drought-resistant plants for our restoration project to ensure long-term resilience and ecological balance.

Opportunities

Some areas within West More Mesa do contain a community of native species. The coastal trails are lined with native coastal shrubs and herbaceous annuals; this bluff section seems to have a well-established seed bank that is holding strong against the invasive grassland behind. We know that the seed bank is well-established because based on our site visit data, there are still native species able to persist surrounded by non-native species. because In the most inland part of West More Mesa holds a different native plant community, Coastal Live Oak. These oak trees are surrounded by more native species and provide different conditions than much of the rest of the plot that will work for implementing native species that thrive in those

specific conditions. On both ends (inland and coastal) West More Mesa has the potential to be thriving with native biodiversity, the large open land between these will be the challenge.

Addressing Site Challenges

I. We can address human disturbance at West More Mesa through increased site protection and increased education. Specifically, trailhead poster boards about the effects of soil compaction and tracking in non-native species, as well as on-trail signs about staying on the trail and cleaning up after yourself. Additionally, an increased fine for littering could prove effective. Furthermore, limiting dogs at West More Mesa or ensuring that dogs stay on leash could limit the amount of ecological disturbance, because off-leash dogs often leave the paths and cause damage to the natural ecosystem (digging, eating plants/animals).

II. It will be difficult to address the widespread non-native species in West More Mesa. A phased approach using targeted removal methods such as manual pulling, mowing, and controlled burning can help manage non-native species in manageable sections. Additionally, applying selective herbicides can help control persistent non-native plants. Following removal, immediate planting of native species will help fill the gaps and reduce opportunities for non-native species to recolonize. Implementing a monitoring program to regularly check for and remove new non-native growth is also important.

III. The California drought is a challenge that is difficult to tackle because we don't have any control over it. To best address this challenge, we can replace non-native species with drought-tolerant native species like California sagebrush (Artemisia californica), California buckwheat (Eriogonum fasciculatum), and deer grass (Muhlenbergia rigens). These plants are well-adapted to low-water conditions and will help ensure that the restored areas remain resilient and competitive against future non-native invasions due to limited water resources.

PROPOSED RESTORATION ACTIONS

Reference Ecosystem

The reference ecosystems for this site are California coastal grassland dominated by perennial bunch grasses (Nasellla Spp. - Melica Spp. Herbaceous Alliance), coastal sage scrub, and coastal woodland dominated by coast live oak (Quercus agrifolia). These reference ecosystems were selected as the latter two are already quite well established plant communities at our site, which while suffering some degradation, are quite functional and healthy ecosystems that possess many native species. The choice for a bunch grass ecosystem was based on the historic profile of similar coastal plateaus in California, and is a similar ecosystem to what currently exists there. Following Restoration the site will be dominated by perennial bunch grasses and native wildflowers as opposed to its current composition of annual invasive grasses (Avena and Festuca).

Step 1: Seed Bank Removal - Due to the extremely low percent cover of native species and the absence of endangered or threatened species based on our site monitoring, our first restoration action will be mechanical removal of the top three inches of topsoil in the areas of the site dominated by grasses. The area will be demarcated using flags, and a mechanical digger will remove the top three inches of soil to ensure removal of the seedbank and living biomass, based on the recommendations for physical removal by the California Native Plant Society. While some concern related to soil organic matter and the O horizon, based on both site visit observations and web soil survey data, these concerns are likely to be minimal. Estimated percent soil organic matter for our site is roughly 2%, much lower than most soils. Some action may be taken if necessary to restore soil organic matter after soil removal, such as addition of manure or compost. However, as stated, these soils have typically low amounts of organic matter and due to the characteristics of Mollisols (which these soils are) organic matter is likely to be found quite well distributed even in deeper horizons.

https://www.cnps.org/gardening/prepping-and-planting/grass-removal#:~:text=Physical%20Removal&text=Disturbs%20soil%2C%20and%20may%20remove,three%20to%20four%20inches%20deep.

Step 2: Seed Collection- To recolonize the areas where the seed bank was removed, the next restoration action will be to collect native seeds from the pre-existing seed bank along the coastal bluffs and inland riparian zones, as well as vernal pool habitats and species. This will need to be done in collaboration with local entities who own land that contains potential seed sources. Some options include, but are not limited to: County of Santa Barbara (such as San Marcos Preserve), Cities of Goleta and Santa Barbara, Santa Barbara Botanical Gardens, and the University of California Santa Barbara (particularly CCBER). If necessary seeds can be collected from further, however this is not optimal due to potential genotypic variations that may ultimately be harmful to local biodiversity preservation efforts. Some sources include the Dangemount Preserve and Gaviota State Park. Seed collection efforts will be done by hand by volunteers, interns, and project staff. Workers will visit selected partner sites and gather seeds from existing plants there when they are releasing seed. Later, we will then separate seeds from other accidentally collected biomass using sieves, and prepare proper ratio quantities of seeds to be applied to our site.

Step 3: Hand Weeding- Hand weeding areas of West More Mesa that are already mostly native plants, like the coastal bluffs and inland riparian zones. These areas have few invasive species and would require little maintenance, but hand-weeding would be the least disturbance to the existing native species populations.

Step 4: Apply Seed Mix- Seed installation will follow the weeding of this area to allow for the recolonization of this area by native species and to prevent the exploitation of this area by more weeds. Due to the flat nature of this site, our seed mix will be applied using a rangeland seed drill. The mix will follow the composition outlined in Table 4, and is primarily composed on

native bunch grass species, along with some wildflowers. A mixed landscape of bunch grasses and wildflowers will provide more ecosystem services and have a higher biodiversity. Wildflowers can help provide more seed and food for local fauna, and can bounce back quickly after disturbance, helping to prevent soil erosion. Additionally, we believe wildflowers will promote human use and recreation in our site, allowing this site to remain an integral part of this community and a place for human environmental connection.

Step 5: Planting- Planting will occur next, adding only a few species of bushes and flowering plants that will add some heterogeneity and spatial dimension to the landscape. This will also provide greater ecosystem services, allowing for cover and perch for more species of animals and will help prevent wind erosion of the soil. This will be done in very low quantities to help preserve the characteristics of this grassland while allowing for some more diversity and helping to provide critical habitat for other species. Additionally, lupin species will help to restore soil nitrogen, and all shrub species will help to prevent soil erosion while the grasses are still growing.

Step 6: Continued Monitoring- The site will then be monitored for a period of six years or until funding runs out to ensure the continual success of this project. This will be done on a bimonthly basis, with an ecology team running transects and collecting data in a similar fashion as the initial site visit, ensuring that our restoration goals are met. Additional data will be gathered at each site visit looking at organic matter, ensuring that there is a recovery in soil organic matter after our disturbance.

Table 4: Seed and Saplings

Plant Species	**Seed Quantity (lbs/acre)**	**Plants Grown**
Nassella Pulchra	4	
Eschscholzia californica	.5	
Elymus multiseus	1	
Lupinus bicolore	.2	
Calandrinia menzii	.5	
Clarkia purpurea	.1	10
Nassella Cernua	1.1	
Melica californica	.5	
Lupinus Arborous		25
Artemisia Californica		25

calystegia macrostegia	.1	
Phacelia distans	.1	
Eriogonum parvifolium		25

Map 4: West More Mesa split into two restoration action groups. The purple polygon on the northern side represents what would be hand weeded. The red polygon on the southern side represents the area that would require seed bank removal.

MEASURES FOR SENSITIVE RESOURCES

The *Eryngium jepsonii* populations found in the vernal pools in the more inland portions of More Mesa require specific protective measures due to their rarity and ecological significance. These populations are crucial for maintaining biodiversity and the overall health of the ecosystem. Flagging the rare species with a colorful flag during the restoration process ensures that they are easily visible to workers, preventing accidental damage from herbicides, weeding, or other restoration activities. A 15-foot buffer zone around the sensitive plant populations is recommended based on best management practices for rare plant protection. This distance helps minimize the risk of root disturbance, chemical exposure, and physical damage from restoration equipment. It also provides a safeguard against accidental encroachment, allowing the plants to thrive without interference. The buffer size is informed by guidelines from ecological studies and a similar conservation project in San Diego, ensuring adequate protection for the *Eryngium jepsonii* populations.

ALTERNATE MANAGEMENT PLAN

In areas with slopes or topographies that would make it impossible for heavy machinery to access and remove the seed bank, prescribed burn plots could be utilized to recover native grass species as they are fire-adapted. Introducing prescribed burns into the site would allow native grasses to recolonize these areas. Many non-native grasses are not fire-adapted and are less likely to recover after a burn. Introducing prescribed burns into the site would create favorable conditions for native grasses to recolonize these areas. Fire removes the above-ground biomass of non-native species, reducing competition and releasing nutrients back into the soil. The heat from the fire can also trigger the germination of fire-adapted native grass seeds that are present in the seed bank. In the coastal bluff portions of West More Mesa, hand weeding and disturbing the area more may cause more erosion. If erosion rates increase through weeding coastal areas, planting deep-rooted plants for long-term structure along the bluffs.

THE HUMAN ELEMENT

This location is valued by humans for recreation and a connection to nature. While we were doing our site visit, we saw many people walking on the paths and utilizing the space for exercise. People also use the location for coastal access, and walk through the site to get to the beaches. These recreational aspects of this site have downfalls for the site itself. Frequent walking on paths leads to soil compaction, and the coastal access sites had litter and waste from human activities. Other than the litter, the space had no clear signs of other human tampering, so not much needs to be changed within the human relationship. Taking the restoration plan into consideration, we would need to keep the pathways intact to keep people's relationship with the land intact, and include a waste bin near the coastline to eliminate litter. Many homes also back up to the site, and homeowners value the aesthetics of the land itself. The restoration plan will enhance these aesthetic values, as well as the recreational ones.

BUDGET AND WORK PLAN

Task	Sub Task	Target Completion Date
1. Planning	1.1 Contracting for Tractor (Removal of Top Soil)	Fall 2024
	1.2 Obtain Plant collection permit	Fall 2024

	1.3 Native seed collection/purchasing	Early Spring 2025
	1.4 Site Inventory and Analysis	Early Spring 2025
2. Restoration Plan	2.1 Begin Native Nursery Planting	Early Spring 2025
	2.2 Top Soil Removal	Early Spring 2025
	2.2 Seed Installation	Early Spring 2025
	2.3 Weed Abatement	Spring 2025
	2.4 Plant Installation	Summer 2025

Item	**Justification**	**Total**
Field Crew	Implement and upkeep site (site inventory, seeding, planting, weeding)	$63,020
Bulk Seed Purchase	Purchase native seed (mix) to repopulate topsoil	$91,125
Topsoil Removal Service (Heavy Equipment)	Remove topsoil to remove seed bank / invasive plants (May need a second round)	$345,000
Plant Pot Purchasing	Purchase plant pots to grow native seeds in and plant established plants	$850
	Total Indirect Cost	$53,220
	Total Direct Cost	$446,775
	TOTAL COST	$499,995

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