

TRAIL DESIGN:

**Proper Constructions and
Maintenance with Connectivity and
Ecology in Mind**

UC Davis Landscape Architecture

Senior Project by

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TRAIL DESIGN:

proper construction and maintenance with connectivity and
ecological longevity in mind

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ABSTRACT

Pleasanton Ridge Regional Park acts as the major recreational area for residents of the Tri-Valley Area. The park, which is accommodating of a diverse range of users such as hikers, bikers, trail runners, dog walkers, equestrian riders, and even cattle ranchers, receives a high amount of daily traffic. Currently there is a fragmented system of trails running throughout the site. These trails consist of large fire roads or utility trails, few smaller single-track trails, and a large amount of unofficial or “volunteer” trails.

The park is in need of a formal assessment of these trails and the creation of more loops and opportunities to enjoy views that the park possesses. This report looks into the proper strategies and guidelines for building, maintaining and re-networking trails on any site and also attempts to implement these concepts into solving the problem of connectivity and longevity of the Pleasanton Ridge Regional Park. By the end of this report, my goal is to establish a framework for the creation of sustainable trails and also to formulate a simple, multi-skilled system of trails for new as well as longtime users.

ACKNOWLEDGEMENTS

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Steve Greco For helping me find what I am truly passionate and interested in

My Family For giving me strength, confidence, and an open framework to become the person I am today

DEDICATION

I would like to dedicate this document to my two brothers Matt and Chad. Growing up with you both and sharring the memories we have had is something I can never replace. Friends will come and go but family is something that stays with you forever. Thank you for both being great brothers.

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Building a constituency for outdoor recreation is vital to ensuring the future of open space. (Felton, Trails Solution) In order to preserve these places of value in our lives, it takes a constant effort of education and practice to ensure that these lands are not lost. Trails however are not always pristine and functional for an area. Issues such as erosion, poor drainage, and destructive users can harm existing sites and the species living amongst them. Without a proper understanding of the correct tools necessary to utilize during a trail designing process, people make mistakes that are costly in the future.

The East Bay Regional Park District is currently developing a Land Use Plan for Pleasanton Ridge Regional Park. The vision for the park is to provide recreational and educational opportunities appropriate for park, while rehabilitating, protecting and responding to the unique natural and cultural resources. My project explores the benefits trails bring to communities as well as the various trail building techniques that can be utilized to help create these recreational and educational opportunities desired for the park. The master plan and design guidelines will be based on extensive research of the area and the utilization of different trail building philosophies.

Trails serve a variety of different purposes and provide towns and people with a wide range of benefits. Trails are designed to connect people to places that they would like to travel to, either by their own power, or by the convenience of man made machines. Generally inexpensive to construct as well as maintain, trails add a considerable value and positive affect to any area they are in. “Bondurant, *Trail Planning for California Communities*)

Trails provide people with a better appreciation for the outdoors and show them the benefits of exercise. In recent years, trail use has increases substantially as seen through the California Recreational Trails Plan-Draft (Bondurant, *Trail Planning for California Communities*). This chapter summarizes the many ways an individual trail or network of trails can serve as a cultural, recreational, educational, social, economical, and environmental resource.

Historic and Educational Value

Trails are not a human created concept. From the earliest of times, trails have acted as a way for creatures to move from place to place in an easy fashion. These trails can serve as a learning process for many. Different flora and fauna along routes give users a taste of the vegetation diversity in the area, and unique geological formations add an enjoyable visible

atmosphere.

Recreation Value

Trails give users a wide variety of outdoor recreational activities. Either alone or in groups, people enjoy walking, running, bicycling and horseback riding. Whether people are looking for an afternoon spent in solitude bird watching, a morning bike ride with a friend, or a full day excursion with the family, trails offer people the ability to spend time outside and enjoy the natural environment. (Bondurant, *Trail Planning for California Communities*)

Trails also give people the opportunity to organize competitive races. (Bondurant, *Trail Planning for California Communities*) These races often receive hundreds of participants as well as spectators. An example of such a race is The Mount Diablo Challenge. This is a 10.8 mile races held once a year and receives around 1000 cycling enthusiasts who scale the 3,249 feet as fast as possible.

Health Value

It is common knowledge that a majority of the population, especially Americans, don't get enough exercise. This may be from a combination of improved modes of transportation that save both time and energy. The mental fatigue one endures during work often leaves people coming

home exhausted from the day and not wanting to exercise because they would rather sit and relax. “Americans aren’t overweight – they are just under-walked and under-biked.” (Bondurant, *Trail Planning for California Communities*)

Adults are not the only ones to experience this crisis. Children and adolescents also face the same problem. The surgeon General has found that daily participation in school physical education among adolescents has dropped 14 percentage points over the last 13 years – from 42 percent in 1991 to 28 percent in 2003. (Bondurant, *Trail Planning for California Communities*) This not only comes from a lack of exercise at school, but also a lack of exercise outside on the trails that surround our communities.

Walking is the best form of exercise, both in terms of longevity and availability. Many cities and towns however lack the resources around them. This shows how trails and walkways in or around towns can play a pivotal role in general physical health and mental well-being.

Social Value

Trails provide a network of connections to different geographic locations, both physically as well as aesthetically. Trails allow users to have a greater appreciation for their neighborhood

as well as those around them. How often do you say hello to a person you are taking the bus with? Now think about how many times you say hello to a person you are passing on the trail. (Bondurant, *Trail Planning for California Communities*) Trails offer people the opportunity to meet fellow people just like them that share the same interests and likes. They can also showcase the local environment and lead to increased interest and involvement in the greater community.

Environmental Value

Trails allow easy access to the outdoors and foster appreciation for wildlife as well as preservation and protection. These trail networks can effectively take users through these areas without causing harm to the surrounding habitats and species. Dissimilarly, trails can have a negative effect on the environment by fragmenting landscapes and species niches. The key is to find a sustainable balance that satisfies the human need for recreation with long-term preservation of natural ecosystems for future generations. Actions such as providing visitors with stewardship information about environmental issues can help minimize impacts while raising public awareness. (Bondurant, *Trail Planning for California Communities*).

Economic Value

Trails in a community add to the towns' desirability as a place to live or work. Having a network of outdoor trails that serve as recreational points of interest as well as connections to local amenities gives residents' home added value. Studies have found that local trails, like parks and open spaces, are a significant selling point, adding value to residential and commercial property. (Bondurant, *Trail Planning for California Communities*)

A trail system can bring many sight seeing tourists into an area. A study concluded that the Lafayette-Moraga Trail in the San Francisco Bay Area added an annual net benefit of \$1.2 million to the surrounding community. (Bondurant, *Trail Planning for California Communities*) Many restaurants, outdoor shops, and other stores enjoy the half-million trail users per year who eat, purchase, and invest their money here.

Creating Diverse Trail Systems

When designing trails, it is important to keep in mind the types of users that will be coming to the site. Good trail designs meet the needs of several types of trail participants through the implementing the concept of a diverse trail system. A diverse trail system incorporates intersecting trail loops of different difficulty that meet everyone's needs. Your trail system can have wide-open easy trails near trailhead(s) and rugged, difficult trails farther away, thus allowing you to open the network to all users who can navigate to the trails that appeal to them. (Webber, *Managing Mountain Biking*)

Advanced mountain bikers typically enjoy long, technically challenging rides where they can gain speed and be tested through single track as well as distance rides. They generally will stay off of the short trails around the parking lot, leaving those trails to slower, novice riders, as well as hikers and equestrians.

Similarly, parents taking their children on a stroll won't hike 5 miles to the start of the advanced trails that suits avid mountain bikers, backpackers, runners, and equestrians. These two groups both hope for different experiences when using trail systems and can therefore be difficult to fully please both. By implemented stacked

loops of intermixing levels and lengths, all parties can happily coexist on the trails.

Shared Use or Single Use

Many land managers believe that separate trails can eliminate user conflict. This strategy categorizes each trail for a particular user, such as one trail for hikers, one for mountain bikers, and one for equestrians. Although this may be effective, it is not the only effective solution that works. When all visitors observe basic trail etiquette, their encounters are harmonious. Below is a list of reasons created by IMBA for implementing shared use in trails.

1. Shared-use trails best accommodate the needs of the most users. Open trails disperse users across an entire trail system, while single-use or restricted-use trails tend to concentrate users, increasing negative social impacts through crowding.
2. Sharing trails helps build a trail community. Visitors are encouraged to cooperate in order to preserve and protect a common resource. Encountering other types of users on a trail offers the opportunity to meet and talk, which helps to establish mutual respect and

courtesy. Separate trails, on the other hand, can sometimes breed ill will, territoriality, and rivalries.

3. Shared trails are most cost effective for land managers. They require fewer signs and less staff, which simplifies monitoring and enforcement.
4. Shared trails empower responsible, experience users. Novices and “Outlaws” are exposed to conscientious, courteous users, and the opportunity for peer regulation is enhanced.
5. Shared-use trails take better advantage of the available space. Quite simply, they provide more trail for everyone to enjoy.
6. Shared trails require less trail miles and therefore have less impact. Building additional trails for individual user groups increases the ecosystem impacts including potential habitat fragmentation and weather sedimentation.
7. Shared-use trails manage the most visitors. Trails that lead to major destination, such as waterfalls and scenic vistas, should be shared-use, since all visitors will want to see a point of interest. For the same reason, trails that serve as major travel corridors are more efficient when shared.

(Webber, *Managing Mountain Biking*)

Benefits of Singletrack Trails

Whether you are an avid mountain biker, trail runner, horseback rider, or a casual walker singletrack trails give users a special close interaction to nature. A “singletrack trail” is defined as a trail whose tread is typically 18- to 24-inches wide, but can be as narrow as 6 or as wide as 36 inches. These trails generally have nearby obstacles around them such as trees, large rocks, and bushes. They may also give the user a tunnel of green to travel through. The personally intimate nature of singletrack trails provides exciting experiences for its users.

Singletrack Fosters Slow Speeds

Singletracks tend to slow mountain bikers especially on shared-use trails for a number of different reasons. Bikers tend to go slower because of their anticipation of encountering other users on the trails as well as the amount of focus that is required to navigate the tight and twisty routes. Speed from bicyclists more typically occurs on the larger, fire road sized trails. The reason for this is because riders feel a sense of ease when they are on a wider, less contouring road.

Whether you are constructing trails, doing routine maintenance on them, or removing and recreating them altogether, it is important to form the most sustainable trail possible. Sustainable trails provide experiences that are safe, fun, challenging, exciting and accessible for a broad range of trail users. These trails also should have minimal impact to the surrounding environment and resources in the area being planned for. Along with environmental and resource analyses performed to ensure proper routing and construction of trails, it is possible to accomplish sustainable trails by adhering to a set guidelines established by research completed by IMBA. There are eleven essential elements of sustainable trails that they have come up with. These are the half rule, the ten percent average guideline, maximum sustainable grade, grade reversal, outslope, adapting trails to soil textures, trail location: sidehill trails are the best, sustainable trail alignment: avoiding the fall line, preventing user-created trails, minimizing user-caused soil displacement, and maintenance.

Element 1: The Half Rule

When finalizing a trail, the grade should not exceed half the grade of the hillside or sideslope that the trail traverses. If the trail grade does exceed the hillside grade then the trail is said to be a fall-line trail. The problem with fall-line trails is that water will run along or down the middle of the trail, rather than across it. The problem with the water running down the middle or inside of the trail is that it will cause erosion and further increase the amount of times the trail has to be worked on for maintenance purposes.

The best way to go about measuring the sideslope of a hill is by using a clinometer. This will give you the degrees in which you will want to stay below half of to ensure good drainage. Something that often is overlooked is when trails are run through fairly flat areas. Despite the flat surfaces these trails may be routed through, if the half rule is not applied, the water will still run down the fall line.

Element Two: The Ten Percent Average Guideline

In general, a trail that is

less than or equal to ten percent is consider sustainable. This does not mean that trails necessarily have to be fewer than ten percent. Many sections of trails often exceed ten percent do to the natural slope of the site, and generally are seen in switchbacks due to there ability to climb in elevation quickly at a short rate.

Often times, trails typically will climb and descend, making finding the slope very difficult. A tool that is often used in trail design is defined as the average trail-segment grade (Felton, *Trail Solutions*). Below is an illustration showing how to calculate the average grade of a trail that climbs and descends.

So why is ten percent the number that is most sustainable? The 10 percent average figure applies to most soil types, minimizes user-caused erosion, allows for design flexibility, accommodates up-and-down undulations, and allows for future route adjustments. (Felton, *Trail Solutions*)

Element Three: Maximum Sustainable Trail Grades

When designing trails, we have previously discussed that an average grade should be ten percent, however what about a maximum grade? In general, a maximum grade is the steepest section of trail that is more than 10 feet in length. (Felton, *Trail Solutions*) When beginning to construct a new trail, or change existing ones, it is important to establish a maximum grade that you will not exceed. Typically, an average grade is 15 to 20 percent (Felton, *Trail Solutions*), but it is also site specific and can vary depending on several different factors. These factors include:

- Half Rule
- Soil Type: Soils range in type constantly. The three main components of soil are loam, sand, or clay. Soils differentially in terms of the different values of each type. Certain soils will support steeper trails grades than others.
- Rock: Rocks allow trails to be much steeper because water easily flows off of the surface without much erosion.
- Annual Rainfall Amount: In areas where rain becomes an issue, it is important to grade

trails at a lower percent to ensure that erosion does not become a problem.

- **Grade Reversals:** Grade reversals allow for steeper trail grades
- **Type of Users**
- **Number of Users:** Trails with more users should have shallower slopes due to the heavy traffic on the site.
- **Difficulty Level:** A simple rule to follow is that easier trails generally have shallower slopes and harder trails typically have steeper slopes.

(Felton, *Trail Solutions*)

Element Four: Grade Reversals

As discussed earlier, a common problem of trails occurs because of soil erosion from both users as well as water. The best way to avoid these problems is to plan in accordance to the area you are planning within. The two best ways to have proper drainage at a site is through grade reversals and outslopes.

A grade reversal is a spot at which a trail briefly changes elevation, dropping subtly before rising again. (Felton, *Trail Solutions*)

The change in grade allows for water to exit the trail as quickly as possible while minimizing disturbance because water does not have time to gain volume, momentum, and erosive power. These grade reversals divide trails up into continuous segments that effectively have their own watershed systems that do not infringe upon the ones around them. By forcing water to flow to certain locations, trails are able to retain their shape and character for longer, which in turn allows them to endure with minimal maintenance.

Along with battling erosion and helping preserve trails, grade reversal also make trails enjoyable for its users. As a hiker, equestrian, trail runner, or biker, long runs of a constant grade can become mundane and also lead to excessive speed on a downhill, primarily in the case of bikers. Short ups and downs vary a trails nature and allows for users to not become complacent.

Element Five: Outslope

The second type of trail design that helps preserve trails is outsloping. As the trail crosses a hillside, the downhill or outer edge of the tread should tilt slightly

down and away from the high side. (Felton, *Trail Solutions*) This encourages water to sheet drain across the surface of the trail in an even manner that is non-erosive. IMBA recommends that most trail treads be built with a 5-percent outslope. (Felton, *Trail Solutions*)

When existing trails are having drainage problems, it is recommended to do a formal analysis, focusing primarily on slope and soil characteristics. Often times, due to the compacting of soils from feet, tires, and horses, trails will often be more compacted in the center of the trail and loose on the outsides. In certain locations, loose, well-drained soils, may benefit from keeping water on the trail. As stated earlier, every trail is different, and every trail must be looked at to understand its problems and how to fix them.

Element Six: Adapt Trail Design to Soil Texture

There are many different types of soils, each of which has different cohesion and drainage. Throughout a site, it is not uncommon to find different types of soil. Some types drain well and

are sturdy while others may drain poorly and consequently will erode. Soils generally are made up of a mixture of sand, clay, and silt. The most ideal soil type consists of an even mixture of all three of these.

Element Six: Trail Location: Sidehill Trails Are Best

The most ideal location to put a trail is on hillsides. By doing this it offers two significant advantages:

1. It is much easier to drain water away from a trail located on a slope than one on flat ground, and
2. It is easier to keep users on the trail, thus preventing trail widening, as well as habitat destruction.

Trails located at the base of hills or on the top or ridgetops may be created due to the ease of construction; however, these trails tend to become collection basins for water. As water collects in certain locations, users are forced around them off the trail, thus widening a trail and potentially disturbing a

species home. Hillsides allow treads of trails to be sloped to create sheet drainage to ensure water does not collect.

Element Eight: Sustainable Trail Alignment: Avoid the Fall Line

Trails should not only be constructed on hillsides but they should also gently traverse the, rather than travel directly up or down it. These trails that directly ascend the hillside are known as fall-line trails. Fall line trails typically result from not enacting the half-rule during constructing. To re-iterate, the half rule is when one is creating a trail, the grade should not exceed more than half of the side slope it is being built on.

The problem with fall-line trails is that water, which follows the path of least resistance, will flow down the center of these trails. The water that filters down these trails strips the trail of soil, creating gullies, scarring the environment, and potentially dumps sediment into waterways. (Felton, *Trail Solutions*)

Element Nine: Prevent User-Created Trails

Often times, users of a particular site will forge off and create their own, cross country trails. Whether this be because they enjoy the feeling of being off trail more, or because they see a destination they want to get to, or perhaps they just don't like the route the actual trail is taking, forging off trail is both irresponsible and wrong. These visitors can cause a variety of problems, ranging from environmental damage to safety issues.

Preventing user-created trails come down to one thing: the intended trail must offer a better experience than traveling off-trail or on a user-created route. To achieve this, a trail should:

- Go to appealing destinations
- Have a stable and predictable surface
- Stay well away from areas in need of protection
- Provide a sought-after experience
- Minimize the proximity next to other trails near by to avoid "jumping" from one trail to the next

(Felton, *Trail Solutions*)

Located in Pleasanton Ridge

are many of these user-created trails that line the ridgetop of the southern section of the park. These trails are primarily single track and currently are closed to the public until further analysis can be done to determine which of any should remain open and which should not.

Element Ten: Minimize User-Caused Soil Displacement

Trails receive a beating everyday, from a variety of different users. Hooves, feet, and wheels can loosen and move soil. Sometimes soil is shifted only slightly and do not affect a trail, however sometimes soil is moved to the point that it has damaged and degraded a trail. Proper trail design can minimize soil movement, but there are three additional tactics that are used as well. They are consistent flow; insloped turns, and tread hardening.

Element Eleven: Maintenance

All trails benefit from routine maintenance. In general, following the practices presented above gives trails the best chance of low maintenance. The concept of

trail maintenance is far to complex for the purpose of this report so this presentation will be kept to the basic pieces one would go through during trail maintenance. The fundamental goal has always remained the same: get water off the trail and keep users on it. Along with this is to make sure to maintain the trail corridor. This is done by trimming overgrown vegetation, cutting and moving downed trees, removing loose rocks, and examined exposed roots to check for larger erosion problems.

The second main theme of maintenance is to identify trail problems. These includes looking at user-caused erosion problems, trail widening, trail brading and tread creep, washboard and braking bumps, the development of social or “volunteer” trails, and eroded trails. (Webber, *Managing Mountain Biking*) In each one of these scenarios it is important to identify the problem and its solution.

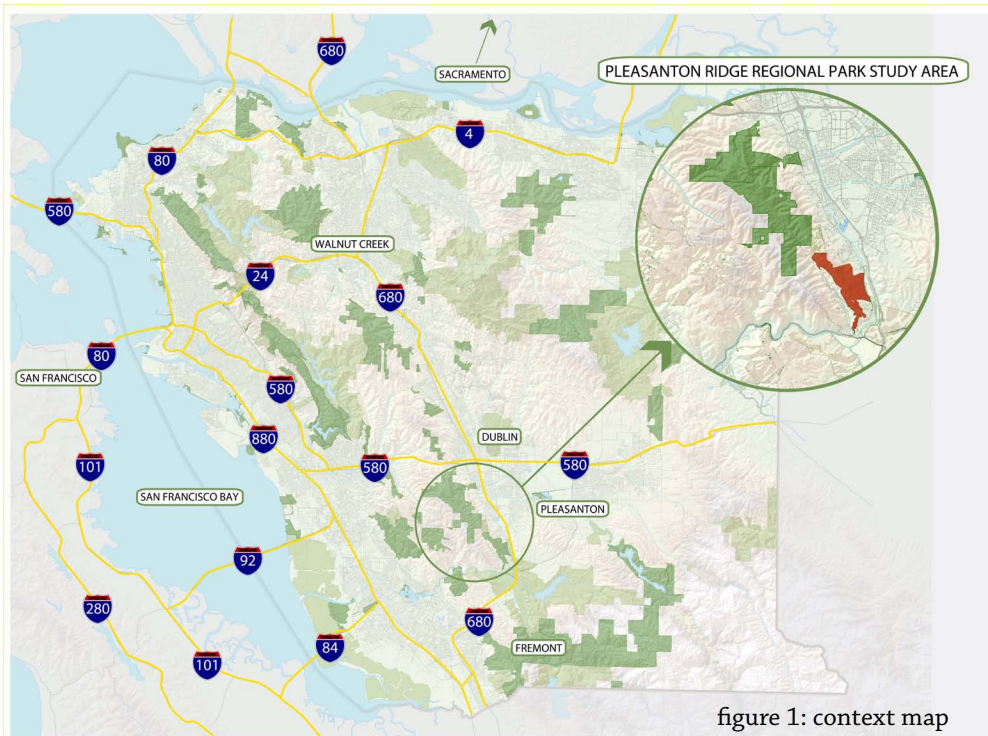


figure 1: context map

Pleasanton Ridge Regional Park is located north of the town of Sunol and west of the City of Pleasanton in Alameda County. That park is located just south of Highway 580 and slightly west of Interstate 680. These two major highways make it easy for many people to access the park if so desired.

The park overlooks the Pleasanton and the Livermore Valley from the west. Its main features are steep, verdant ridges and the valuable attributes of habitat, open space, and visual prominence throughout the area.

The entire park is 5271-acres and is managed and run by the

East Bay Regional Park District. (Northern Area Interim Land Use Plan)

The lower portion of the park, which has the only public access spot, includes the crest of Pleasanton Ridge as well as the Calaveras Ridge trail, which acts as the main regional ridgeline trail of the east bay. The Foothill Staging Area is a large entry point that welcomes many different users to the park. The area hosts mountain bikers, hikers, cross country runners, equestrians, and cattle ranchers.

Prior to European settlement, the area around Pleasanton Ridge appeared to have been occupied by two Ohlonean groups; the Tuibun to the west and the Pelnan to the east. Sunol Ridge appeared to have been the east/west boundary between these two groups. (Ridgeland's Resource Analysis, 1987) The Ohlone were hunter gatherers who migrated through their territories in pursuit of seasonally available resources (Ridgeland's Resource Analysis, 1987). The interior valleys provided plenty of game, fowl, fish, shellfish and vegetal food that allowed these societies to thrive.

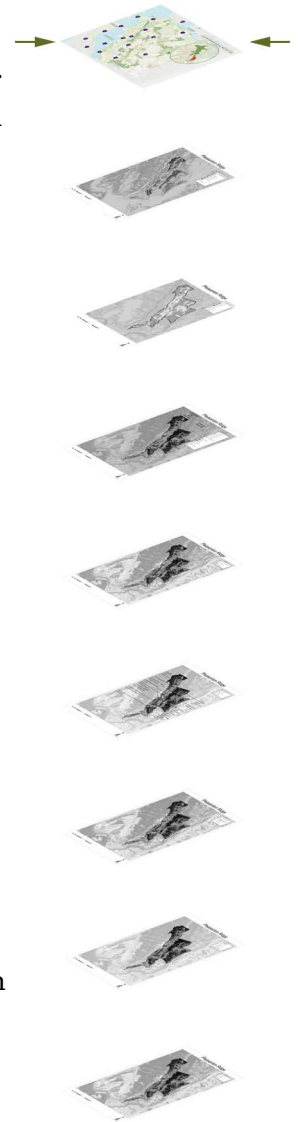
In the year of 1769, the areas Ohlone were discovered by European settlers who came from Spain on an expedition who ventured into the Southern San Francisco Bay as far as Alameda. (Ridgeland's Resource Analysis, 1987) As more Europeans ventured to California and the surrounding area, the permanent establishment of Mission San Jose was created in 1797. (Ridgeland's Resource Analysis, 1987)

Mission San Jose was the most prosperous of all the California missions, primarily because of the help of Indian labor as well as the

vast opportunities for cattle grazing. The Indians remained in the mission for the next 30 years adapting European culture and its practices. Many of these Indians eventually moved into rancheros (reservations) that were formed in the area. One of these, located on the west side of the Livermore Valley near the Castlewood Country Club, is where descendants of the indigenous population still remain in the area. (Ridgeland's Resource Analysis, 1987)

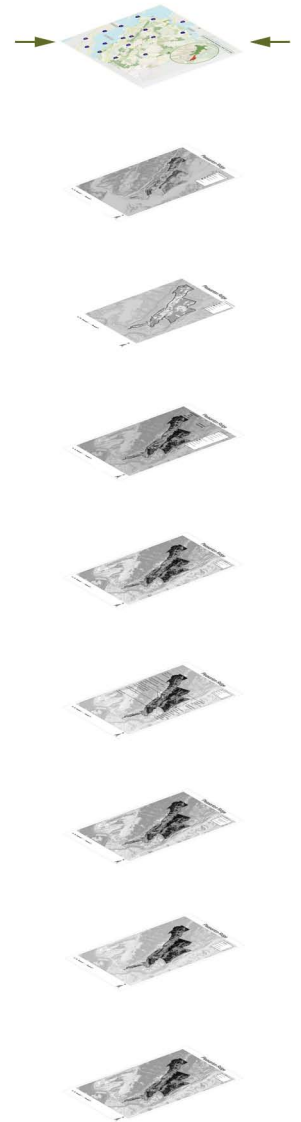
The Spanish government granted most of the former mission lands to the upper stratum of the California society. With the issuing of these lands came the establishments of large ranchos with extensive cattle grazing operations. The Ridgелands were probably used as common open rangeland by bordering landlords (Ridgeland's Resource Analysis, 1987).

In 1850, California joined the United States of America as its 31st state. All of the previous land grants were required to be approved by the California Court System. A long process of dividing up the lands took place until the mid-1850's where almost all of the ranchos had either been sold or parceled off. By 1874, all of the Ridgелands had



been surveyed and parceled out to resident farmers, stockmen and land speculators (Ridgeland's Resource Analysis, 1987).

Beginning in 1936, East Bay Regional Parks District began purchasing land for the purpose of preserving open space as well as natural and cultural resources in the region. Many feasibility and Interim Use studies were conducted around the Ridgелands such as the *Ridgелands Feasibility Study of 1985*, the *Ridgелands Resource Analysis of 1987*, the *Land Evaluation for Interim Use of 1990*, the *Land Evaluation of Sinbad Canyon of 1995*, and the *North Area Interim Land use Plan of 2008*. Currently, the park totals 5,271-acres and overlooks Pleasanton and the Livermore Valley.



Pleasanton Ridge

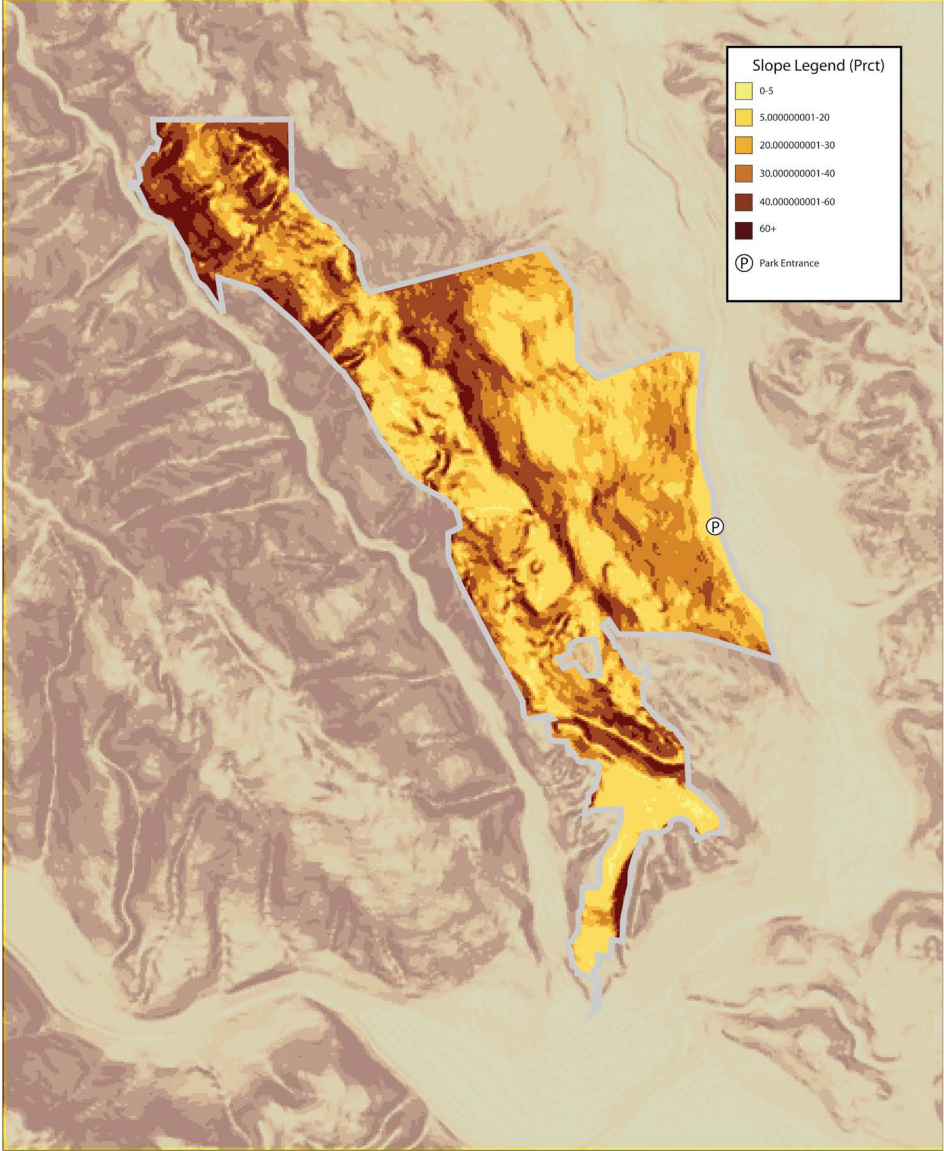
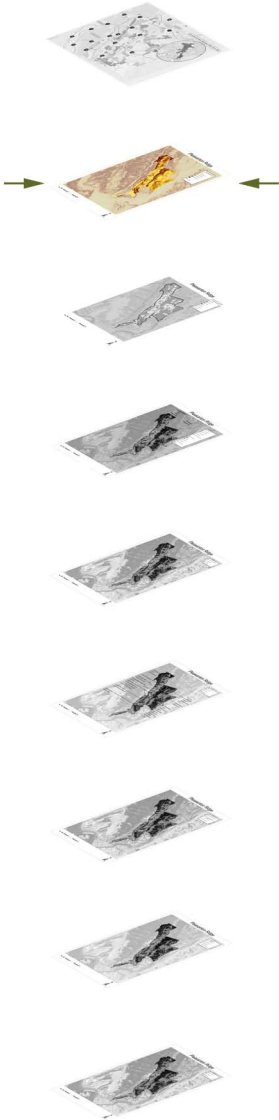


figure 2: slope map

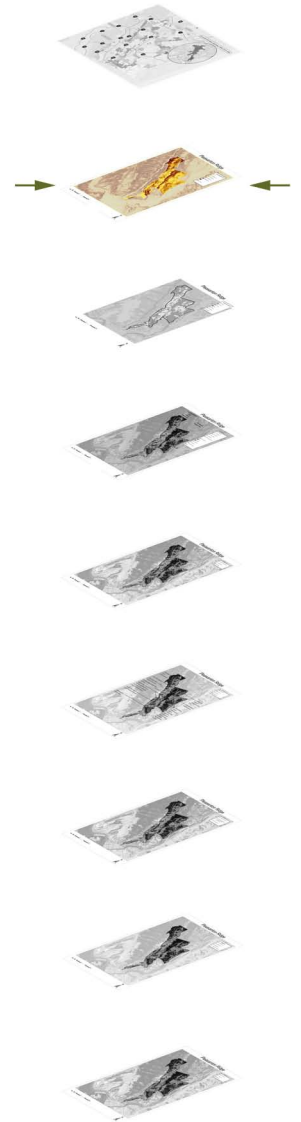
Roughly 50% of the land area is classified as unstable and is subject to debris flows, soil creep, erosion and faulting (*Ridgeland Resource Analysis, 1987*). Active and dormant landslides have been

identified within the site, with the most extensive to date occurring on the eastern side of the ridge. The landslide area is known as the Castlewood Slide, on which the Castlewood Country Club has been



built. (Land Evaluation for Interim Use, 1990)

The slope averages between 5 and 15 percent for most of the site. These areas are located around the foothill staging area as well as the top of the ridge in the upper portions of the park. There are particular areas that do have slopes over 50 percent. These areas should be avoided at all costs when exploring new trail routes.



Pleasanton Ridge

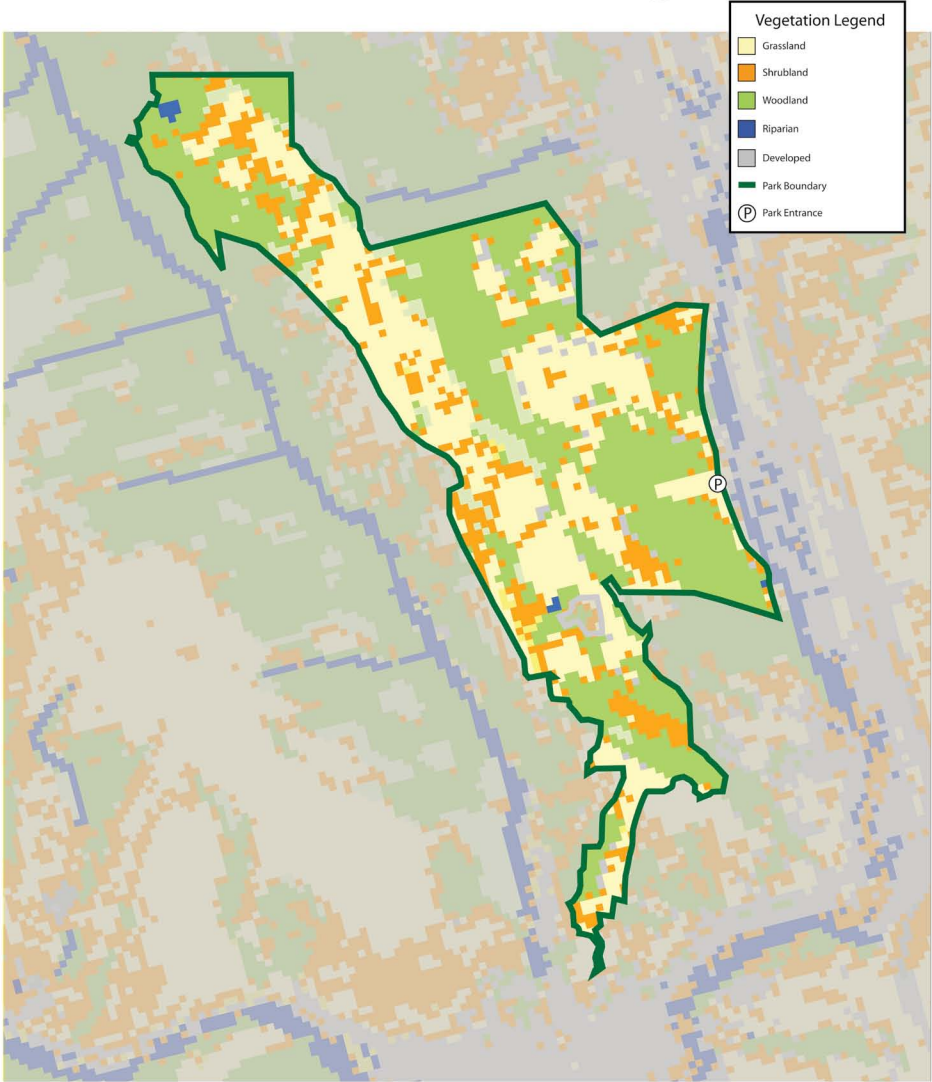


figure 3 vegetation map

Pleasanton ridge is home to a diverse range of plant communities that range throughout the area. The majority found in the park include grassland, shrubland, chaparral, foothill woodland, mixed broadleaf forest and riparian woodland. There

are also certain areas that have been altered for the purposes of agriculture and urbanization. This comes in the form of olive groves found in the central area of the park.

Grassland

Grassland is the predominant ecosystem within the Ridglands, covering approximately 40% of its area. (Ridglands Resource Analysis, 1987) These grasslands occurred primarily on the tops of the ridges and the upper elevations of the drier, westerly facing slopes that receive most of the sun. Most of the grassland is grazed seasonally by cows owned by different ranchers within the area.

Shrubland

Shrubland, also known as the northern coastal scrub or coastal brush, is widely distributed throughout the ridgeline. These shrublands typically occur in areas more predominant in grassland and woodland. Coyote Brush is the main species in this community. Poison oak also is mixed through the shrub ecosystems.

Chaparral

The only area that contains true chaparral in the entire site is located on the steep, south-facing slope near the southerly end of

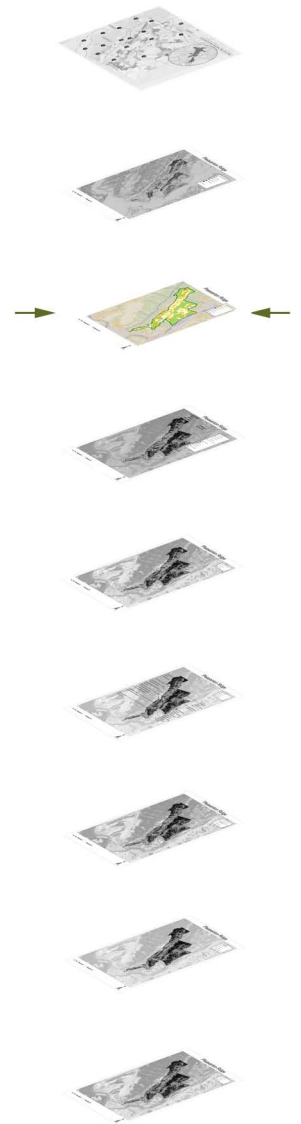
Pleasanton Ridge at the 600 foot elevation. The unit covers about 15 acres and is dominated by chemise, black sage and California sagebrush. (Ridglands Resource Analysis, 1987)

Foothill Woodland and Mixed Broadleaf Forest

The wooded communities occur in large areas on the protected east facing slopes, as well as in moist canyons along the west sides of Pleasanton and Sunol Ridges. Coast live oak dominates this plant community. Along and near the ridgeline, the woodland takes on a savanna character. No shrub understory are seen here where the oaks are spaced much further apart.

Riparian Woodland

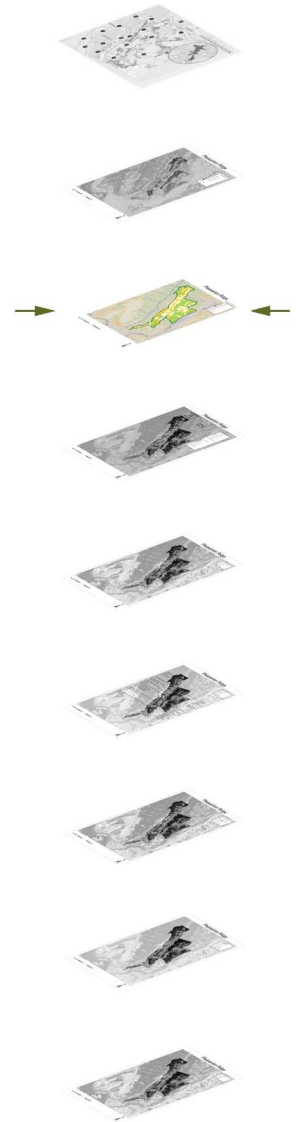
Due to the nature of the area and low amount of water systems, riparian woodland habitats are limited to protected annual and perennial stream channels where adequate amounts of soil moisture are present to support such a community. Areas that foster these types of communities are located along Sinbad Creek. (Ridglands



Resource Analysis, 1987)

Altered Plant Communities

There are currently five olive orchards located on the site. These trees are over 120 years old and still in good condition. Many grazing cattle enjoy eating many of these olive trees leaves, as evident in the figure below.



Pleasanton Ridge has historically been used for grazing and agriculture purposes. The topography on the site has allowed its steep brush and oak woodland slopes to remain in a relatively “natural” state. The ridgetop’s open grassy and heavily wooded east facing slopes provide a variety of rich wildlife habitats. The result is a diverse area of forage (grassland) and habitat (brush and woodland). Each one of these habitat types supports a wide variety of species, some of which are migratory while others live here year round. The forests support fruit, nut, and insect eating mammals and birds while the grasslands and brushlands support browsing, seed eating mammals, as well as seed, berry, insect eating and



figure 4: red tailed hawk

predatory birds. (Land Evaluation for Interim Use, 1990)

According to the United States Fish and Wildlife Services,

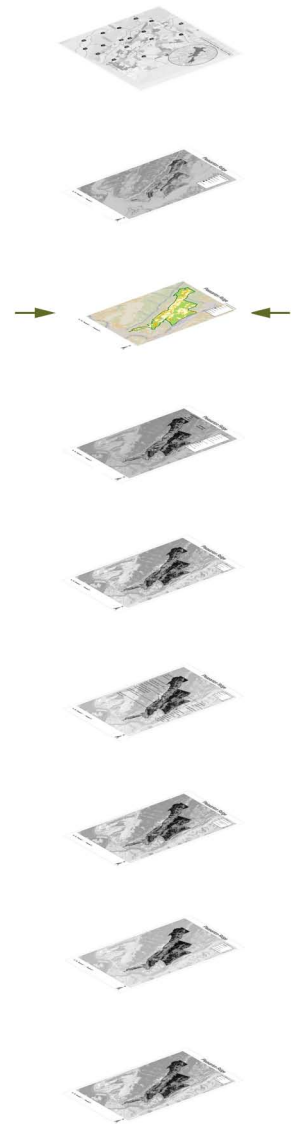
there are two species that exist within Pleasanton Ridge Regional Park that are listed as federally threatened. They are the Alameda



figure 5: cow eating Whipsnake and the California Red Legged Frog.

Alameda Whipsnake adults reach a length of 3 to 4 feet. Their back is colored sooty black or dark brown with a distinct yellow-orange stripe down each side. The front part of their underside is orange-rufous colored, the midsection is cream colored, and the rear section and tail are pinkish. The Alameda subspecies is very fast moving and alert, quickly fleeing when threatened. They spend November through March in winter hibernacula.

The snake occurs primarily in coastal scrub and chaparral communities, but suitable habitat for this species also includes communities that support mixed chaparral, coastal scrub, oak woodlands that are adjacent to



scrub habitats and annual grassland areas that are linked to scrub by rock outcrops or river corridors. (Northern Land Use Plan, 2009) Rock outcrops with deep crevices or abundant rodent burrows are important habitat components for

overnight dens, refuges from predators and excessive heat, and foraging.



figure 6: alamed whipsnake

Core areas of the Alameda whipsnake most commonly occur on east, south, southeast, and southwest facing slopes.

With this information, the following guidelines can be implemented for design of trails in respect to the needs of the Alameda Whipsnake. Areas traversing in the North or northeast areas in dense woodland areas as well as open grasslands absent of water sources and open rock cropping have a low probability of providing shelter for the whipsnake and therefore can be designed through. Areas that traverse along northwest or northeastern slopes consisting of small habitats zones of chaparral, coastal scrub, few rock outcroppings and low amount of rodent burrows

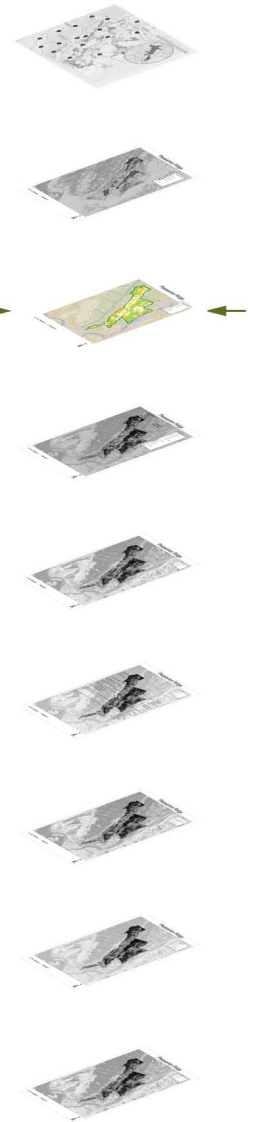
should be approached with caution, however will likely not provide shelter for this species. Areas to avoid would be habitats on south-southwest slopes that support large amounts of mixed chaparral, coastal scrub, oak woodlands that are linked to scrub by rock outcrops or river corridors.

The second species, the red legged frog, are large and are reddish-brown to gray with many poorly defended dark specks and blotches. They also have dorsal lateral folds that are easily visible along with a dark mask bordered by light a light stripe on the jaw. Their eardrums are smooth and their undersides are washed with red on their lower abdomen and hind legs. The toes are not fully webbed and males have enlarged forearms and swollen thumbs.

Their niches are a variety of aquatic zones with permanent bodies of still or slow moving water and dense, shrubby riparian or emergent vegetation associated with streams, deep pools, backwaters within stream and creeks, ponds, marches, and artificial impoundments such as stock ponds. During the periods



figure 7: california red-legged frog



of wet weather, starting with the first rains of fall and lasting into the spring, some individuals may make overland excursions through upland habitats generally at night.

Taking into consideration this information about its' ideal habitat, the areas that have landscapes with no permanent bodies of water likely have low or no red legged frogs and therefore could be designed around. Trails that are within 100' of a permanent aquatic habitat of still or slow moving water should be carefully observed

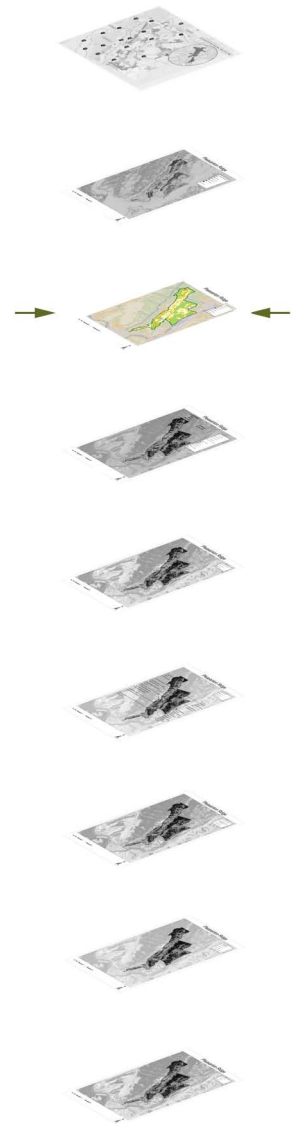


figure 8: red legged-frog habitat

and potentially moved to exceed a 100 foot barrier. Lastly, areas that are adjacent or cross aquatic habitats should be moved to provide adequate habitat space for the species to rebound to a sustainable population size.

It should be noted that the overall concept of this project is mainly focused around the construction and sustainability of a trail system. The suggestions I

am making above regarding habitat reconstruction and protection are merely suggestions. For the most part, the Alameda whipsnake most likely would not reside in the study section of the park, and the red-legged frog would only reside seasonally.



Pleasanton Ridge

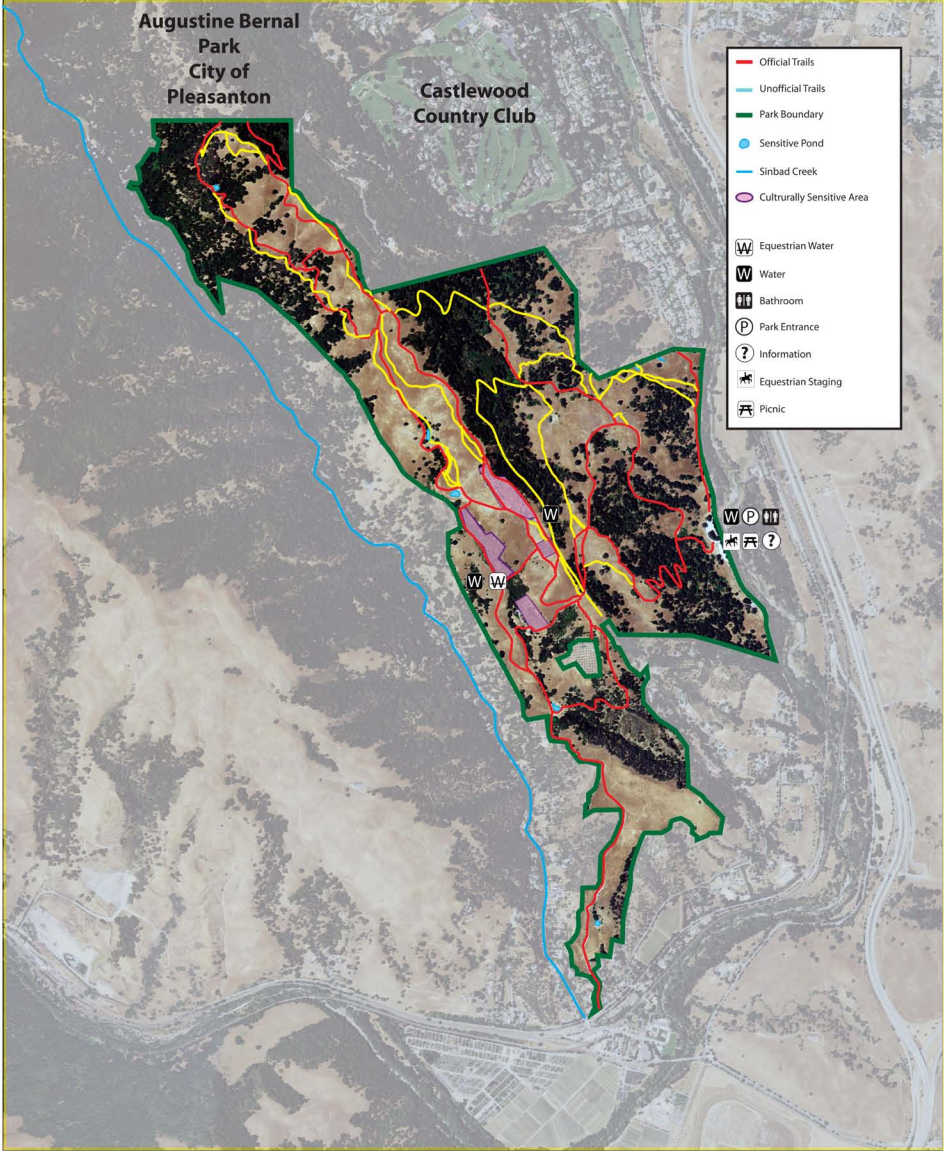
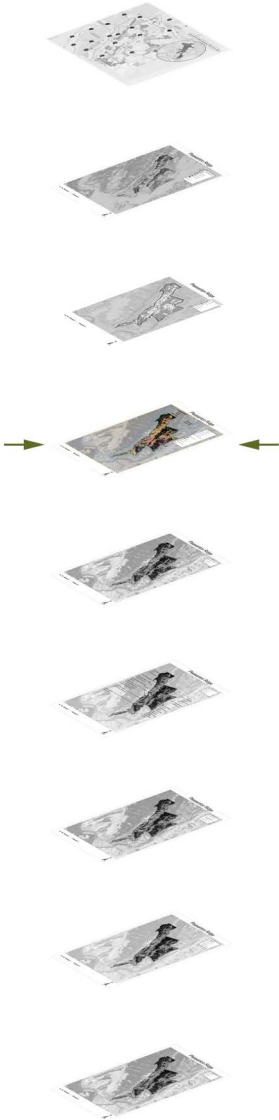


figure 9: existing conditions



In the Foothill Staging area there are two well kept port-o-potties. Along with the restrooms are a few picnic tables scattered throughout the site as well as an older water fountain. There is a large trail head sign that provides park maps for anyone who

would like to take them although does not give any large scale blow up maps of the site. In the park there are multiple water fountains as well as picnic areas, equestrian water holes, and picnic areas.



figure 10: park entrance



figure 14: equestrian staging



figure 11: park restrooms



figure 15: picnic bench



figure 12: park sign



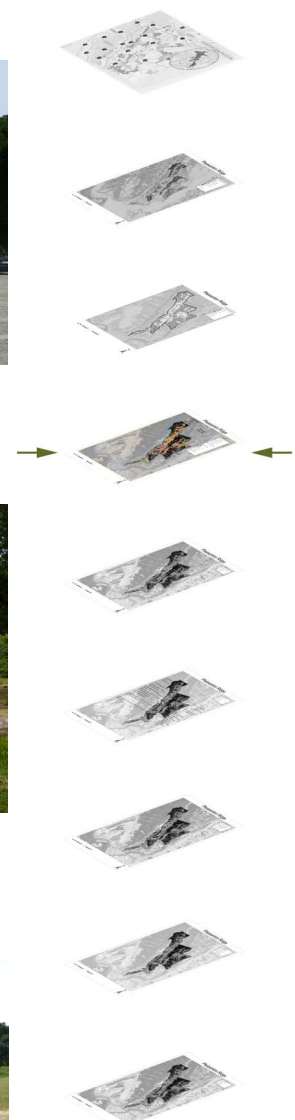
figure 16: cattle entrance



figure 13: park staging area



figure 17: picnic table 2



Pleasanton Ridge

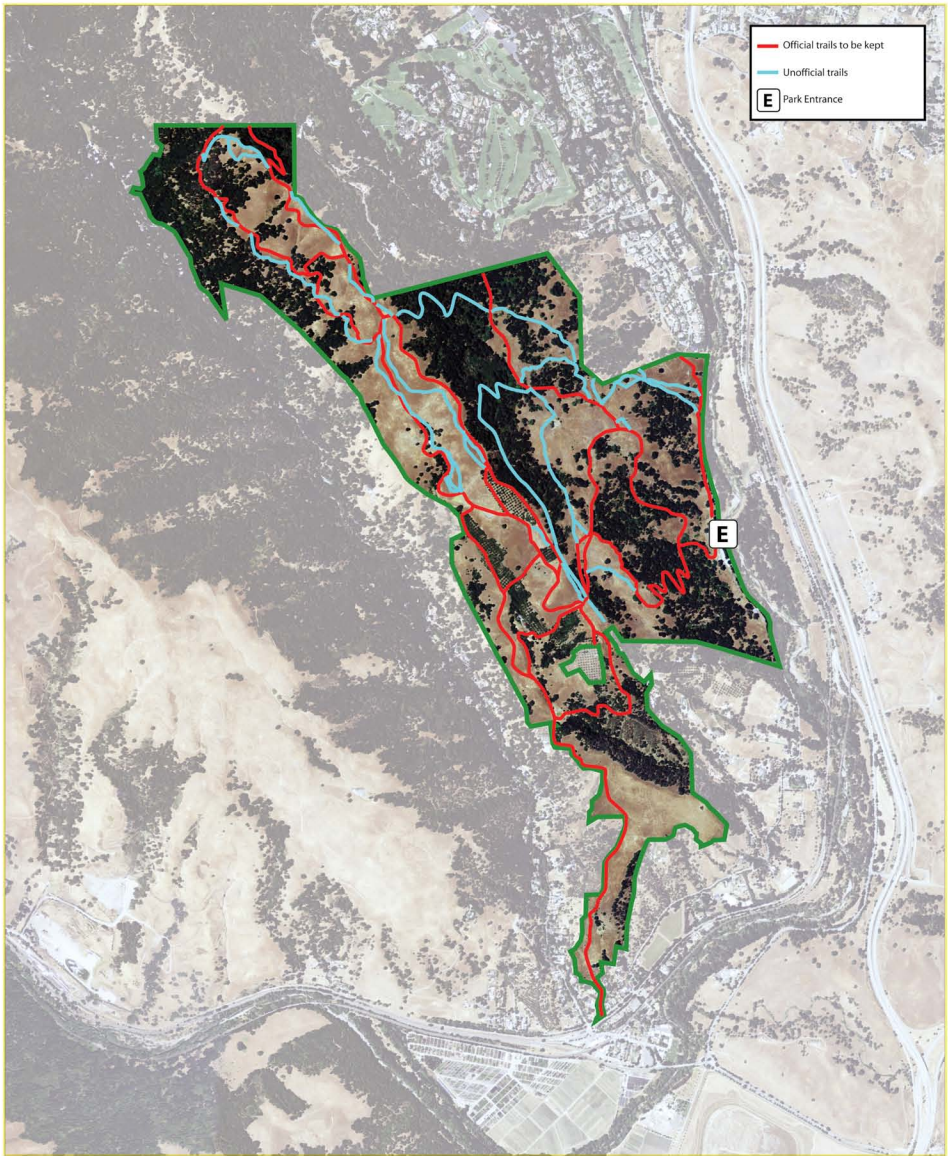
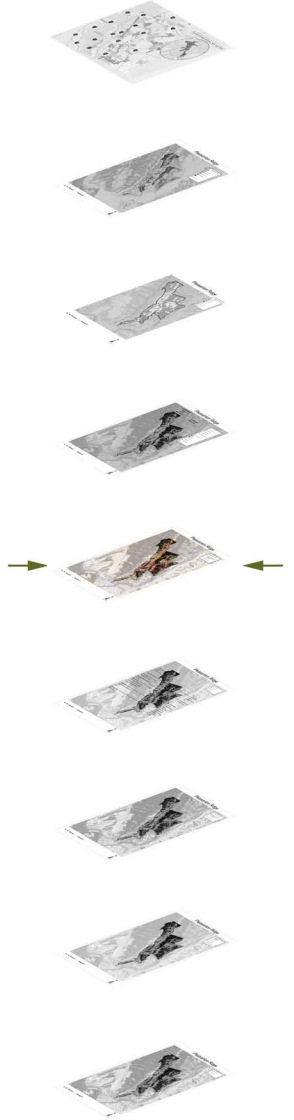


figure 18: existing trails

Pleasanton Ridge has a considerable amount of trails that run through the site. From the Foothill Staging Area, a service road trail takes you up towards the beginning of the ridgeline. Prior to reaching the summit, it offers two alternative

routes; one connecting back to the staging area traversing through thick woodland groves and the other heading north which dead ends at the park boundary. There is also another trail that takes off from the northern portion of the staging



area which also dead ends on private property. This trail follows the service foothill frontage road. When you reach the ridgeline the trails begin to open up and traverse north towards the connecting Bernal Open Space. If you reach the end of the park you are sure to have traveled on every type of trail it had to offer. Of these trails, the three main types that make up the various networks that users travel on are large fire road trails (8-12 feet), single track trails (2-4), and unofficial trails that are primarily single track.

Service Road Trails

These trails make up a bulk of the parks routes. The trails accommodate a wide range of users and easily accommodate multi-use



figure 19: utility road

for all. The trails themselves are in good shape and generally are not of a steep grade. There are no visible areas of erosion or need of maintenance within the Southern

Section of the park. The trails lack the presence of rare species to the area, primarily because of the high amount of human traffic and the areas they are located.

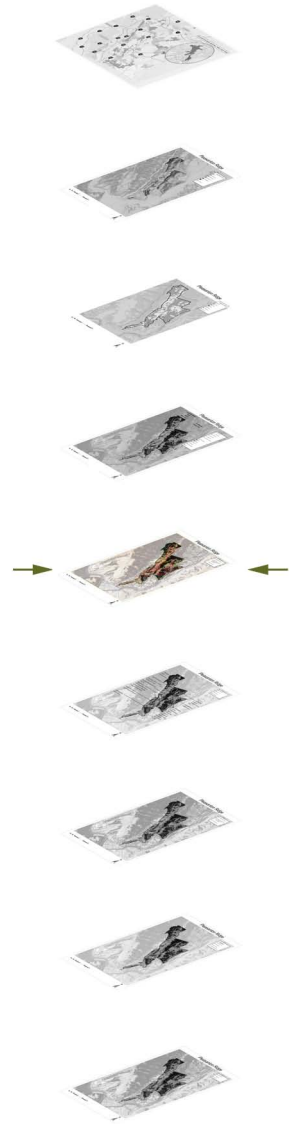
Single Track Trails

Along with the service roads within the park are some single track trails. These trails provide users with a technical challenge that



figure 20: single track

allows them to feel closer to the natural surroundings of the area. The trails, some of which connect back to the service road and others that dead end at the boundary of the parkland range from being multi-use as well as being for hikers only. The trail looping the beginning trail back to the staging area currently is closed to bicyclist primarily because of its steep grades that could cause erosion if riders used it. This trail is also very close to the foothill staging area and becomes very heavy with users making it difficult for riders to



pass. Below are some examples of these single track trails in the area.

“Volunteer” or Unofficial Trails

These trails are primarily seen throughout the park, from close to the foothill staging area and becoming very common along the ridgeline leading up to the Bernal Public Open Space. Currently these

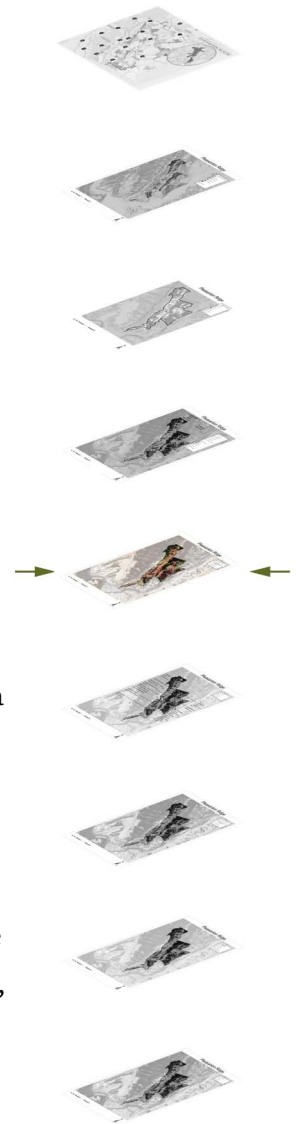


figure 21: unofficial trail

trails are closed due to studies that EBRPD is performing for the purpose of categorizing and classifying these trails in terms of environmental sensitivity, sustainability, and appropriateness for the park. The goal is to determine which trails could be opened to the public, whether or not they should be restricted to particular users, and seeing if there are options for improvements or additions to them to make them adequate and exciting for users. Below are some examples of these trails within the park.

Of the unofficial trails that are currently within the park, many of them appear to provide beneficial loops for users as well as exciting views of the park and beyond.

Beginning in the lower section of the park, coming off of the lower foothill frontage road are trails that connect to the Sycamore Grove Trail above. These trails are located on an eastern facing grassland slope of <10% that does not disturb or traverse through any habitat zones of species and has the potential for a unique connective loop. Moving up towards the ridgeland is a trail that connects to the Sycamore Grove Trail that would provide another loop, although longer and a bit more challenging. On the top of the ridge, a few major trails traverse directly down the center of the two main utility roads. These routes offer a remote route that logically connects back to the main trail. These trails also showcase vista points that the park possesses. The final unofficial trail that appears to offer a connective solution is located in the northern most portion of the park. This trail connects the two main utility roads that exit the park.



Beginning in May of 2009, East Bay Regional Parks issued out a user survey asking participants many questions about Pleasant Ridge Regional Park. 433 people filled out the questionnaire as well as 62 community members from a public scoping meeting held on June 29th, 2009. The questionnaire took place during various morning and afternoon outings both on weekdays and weekends. This questionnaire was designed to help evaluate the park's existing resources and facilities and also provide critical feedback from its users about what they felt were necessary future recreational opportunities and programs needed within the park. Below are the questions and results I felt were pertinent to the development of the parks new master plan. The data was collected by the East Bay Regional Park District and the analysis completed by myself.

Listed below are the primary reasons users had for visiting the park. (mark all that apply)

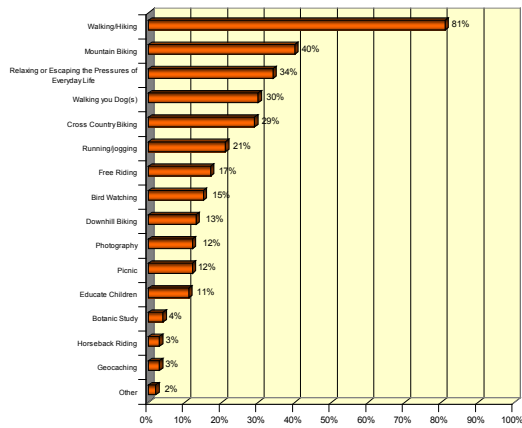


figure 23: reason to visit park

Listed below are the following types of trail experience would you prefer? (mark all that apply)

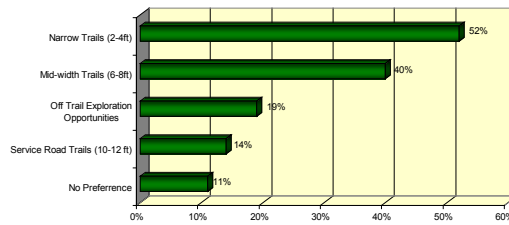


figure 24: trail experience

Should ALL or at least SOME of the trails in this regional park be designed as multi-use; thus, designated for some combination of mountain biking, jogging, horseback riding, and dog walking?

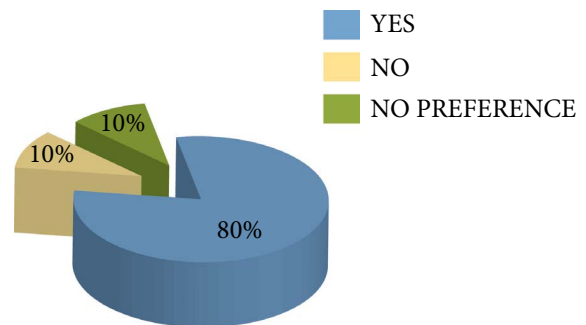


figure 25: multi use trails

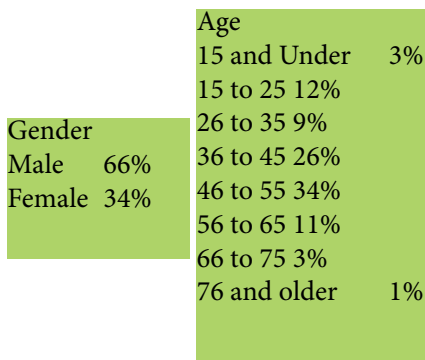


figure 22: user demographics

This question asked which of the following uses should be designated for multi-use?

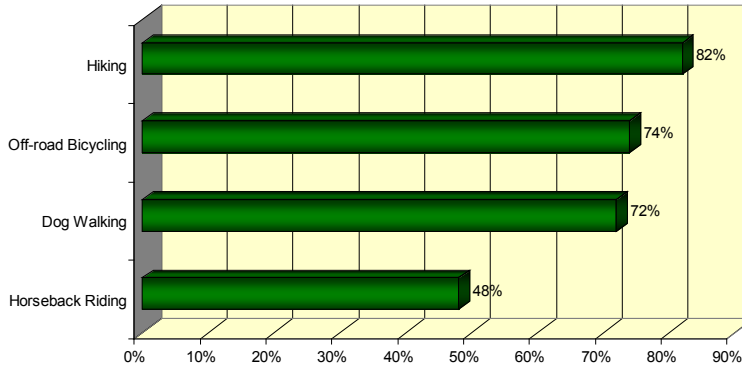


figure 26: multi-use trail preference

During the survey, 44% stated they were aware of these “volunteer” or unofficial trails in the park. These people were then asked a series of questions pertaining to these trails.

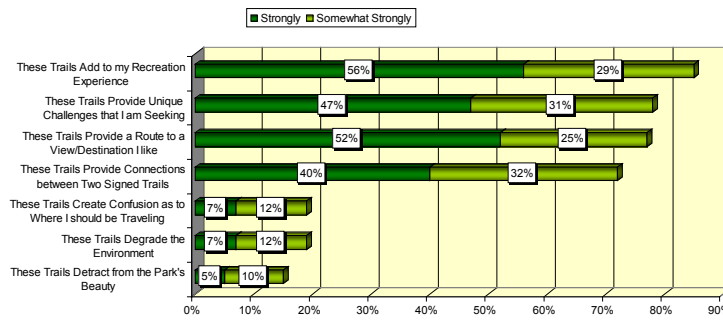


figure 27: unofficial trail opinion

Please select which trail you feel EBRPD has enough of currently in the park.

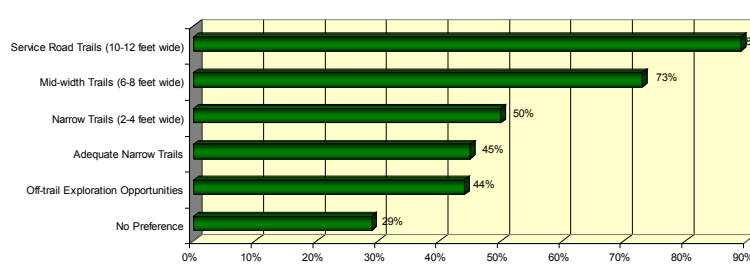


figure 28: trails users like in park

What criteria should be used to decide if a trail should be included in the EBRPD Trail System?

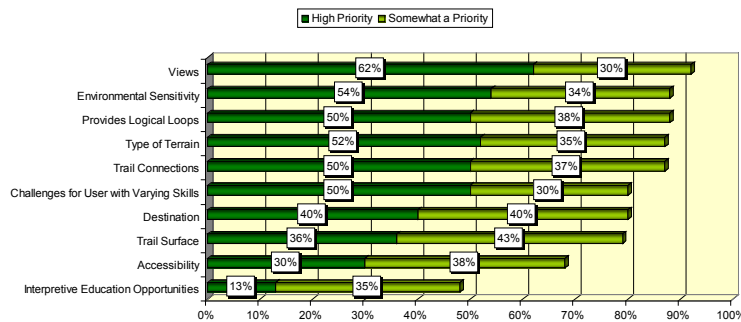
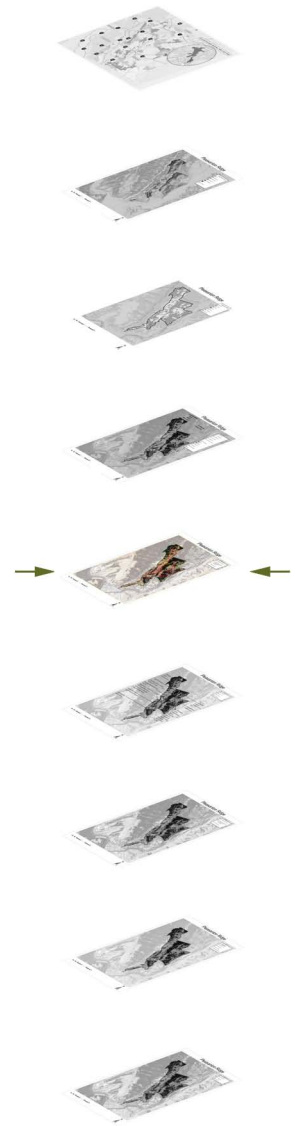


figure 29: trail criteria

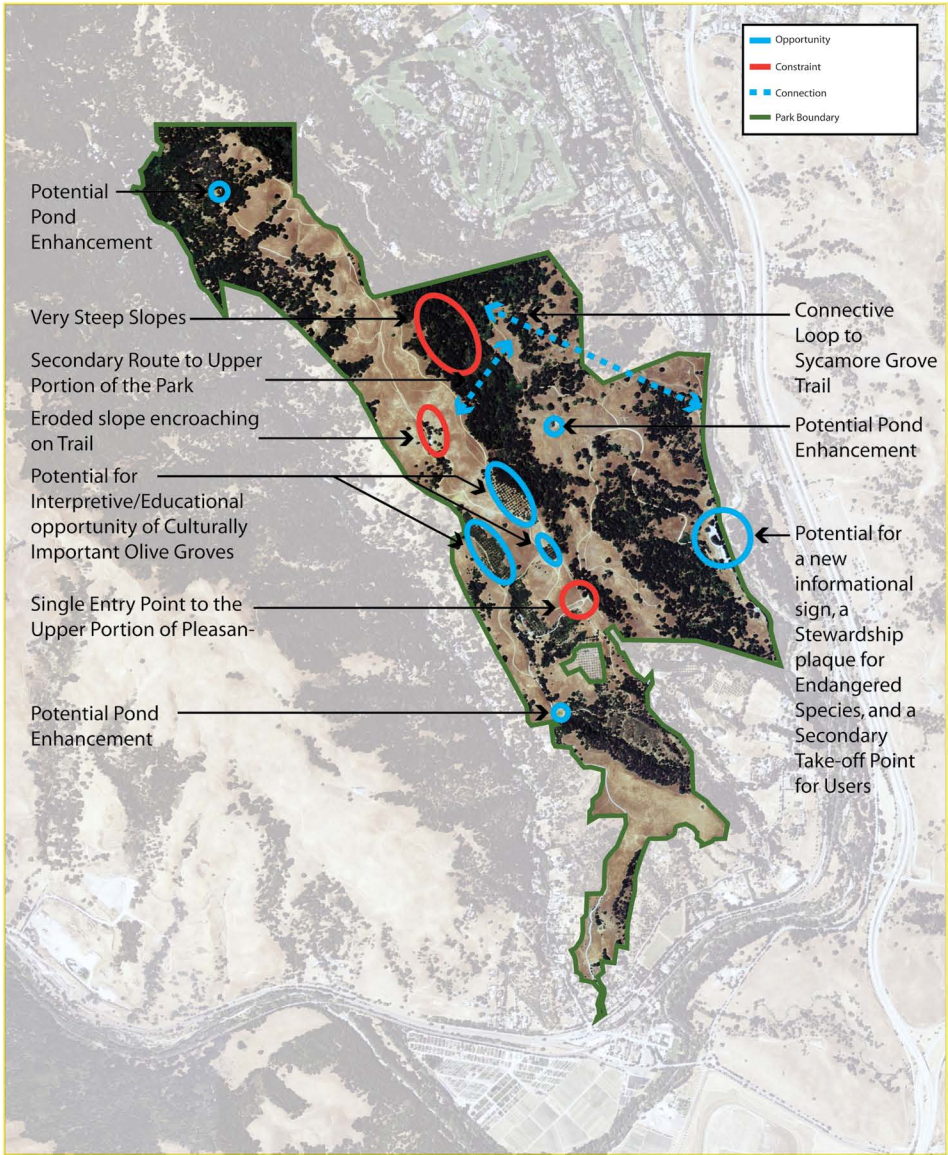
After reviewing the data that was collected during the user survey, it is evident that there are many apparent themes many people agree upon. People enjoy hiking, bicycling, trail running and horseback riding when they come to visit the park. A large portion of users would like the trails to be multiuse, in particular utility roads and some single track routes as well.

Another feature the users wanted to see more of was the identification of more viewpoints within the park. These views would act as a destination points for many park enthusiasts as well as serve to make the park more appealing for more people.

The last main them I drew out from this user survey is that people would like to see more single track. Many of the current unofficial trails located on the site are single track and have the possibility of working within the trail network currently if done well.



Pleasanton Ridge



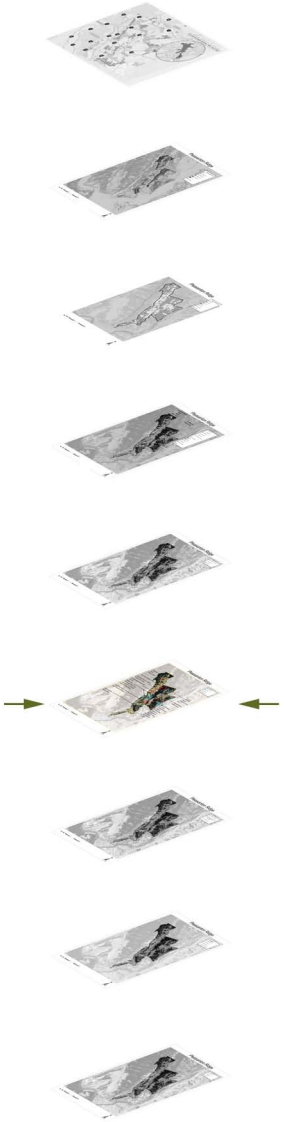
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figure 30: opportunities and constraints

Pleasanton Ridge has the possibility of created a very unique and exciting stacked looped system. Above, there are specific areas that act as constrains such as steep slopes as well as one way dead ends. Despite these disadvantages, the park

has many directions it can move forward towards to improve. There are many areas that could be looped together, forming fluid systems appealing for all users. The next section takes all of my research and utilizes it into a finalized master trail plan.



Pleasanton Ridge

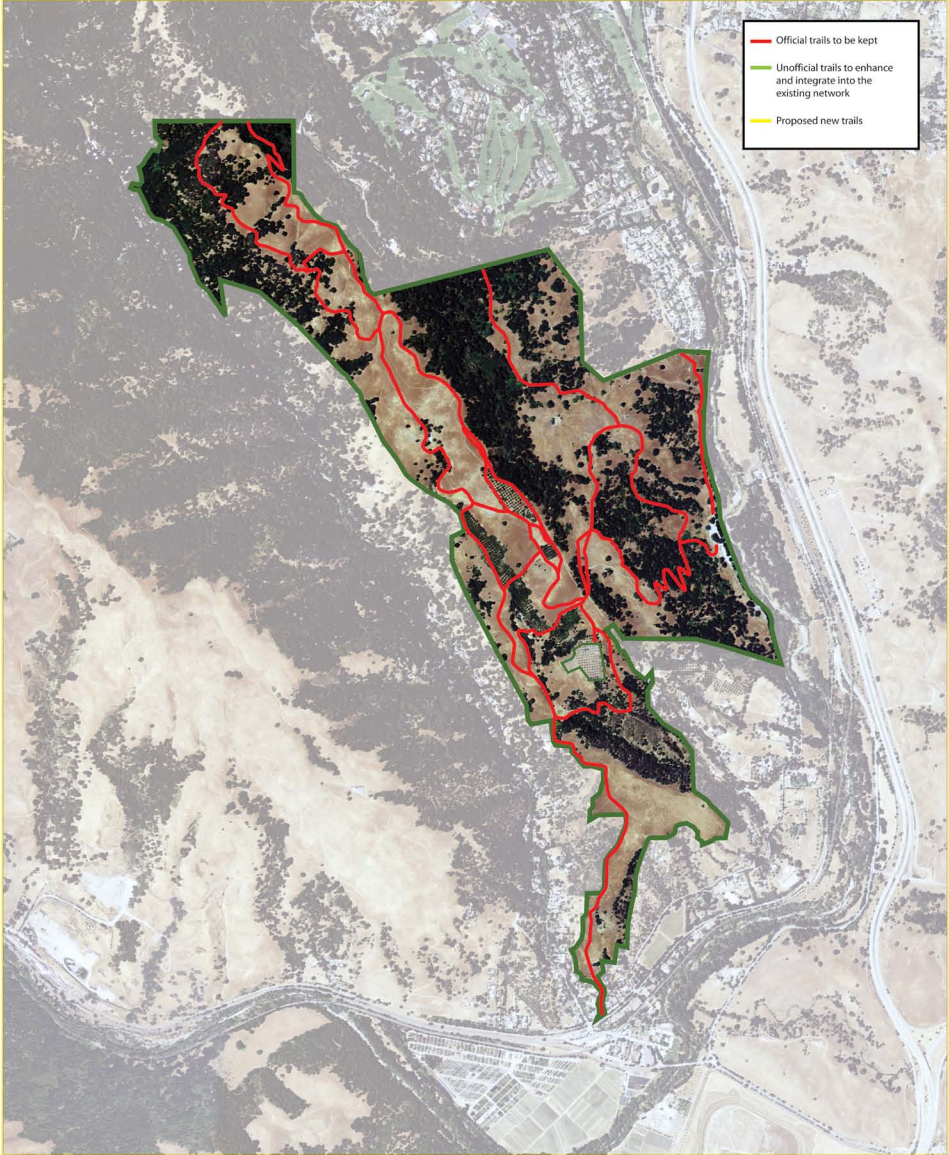
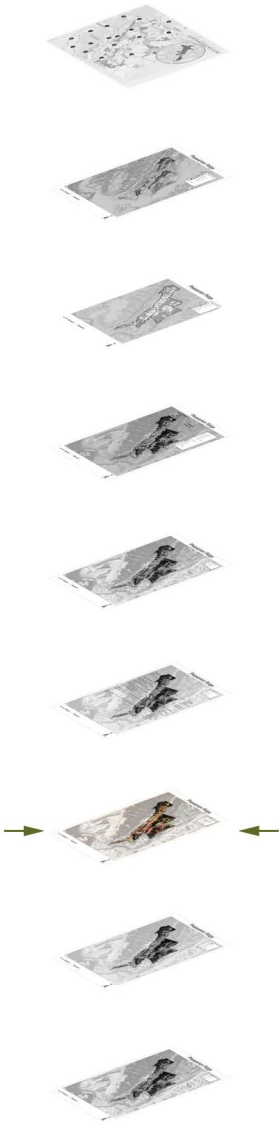


figure 31: official trails

Step one of the new trail design is to classify which of the official trails will remain in the system. Due to their current conditions and existing loops, all trails have been kept.



Pleasanton Ridge

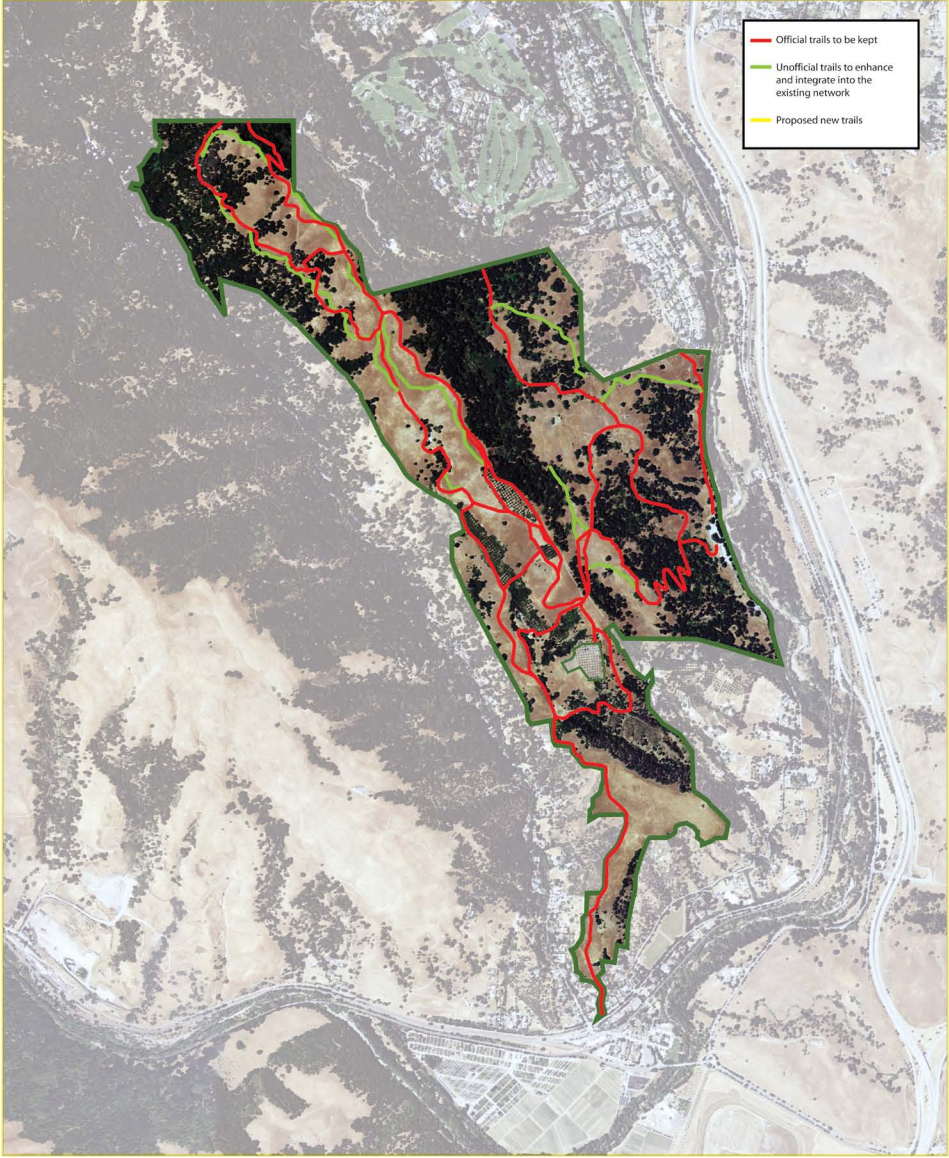
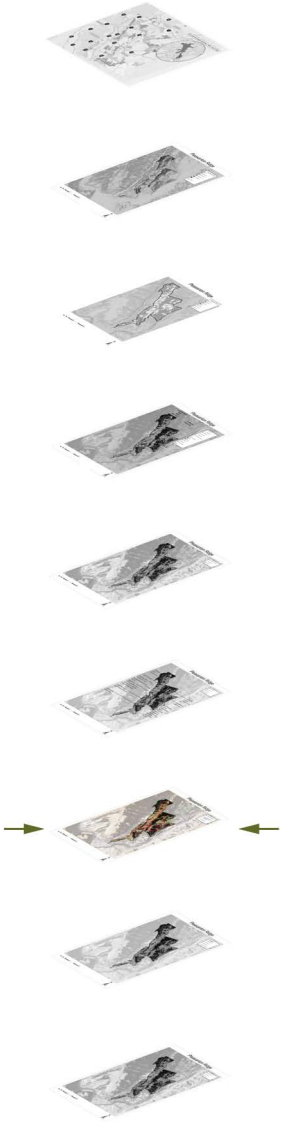


figure 32: official + unofficial trails

Step two of the process was to discover which unofficial trails integrated the most efficiently and logically into the new program. Above are the combinations of the currently official and unofficial trails that will all be open.



Pleasanton Ridge

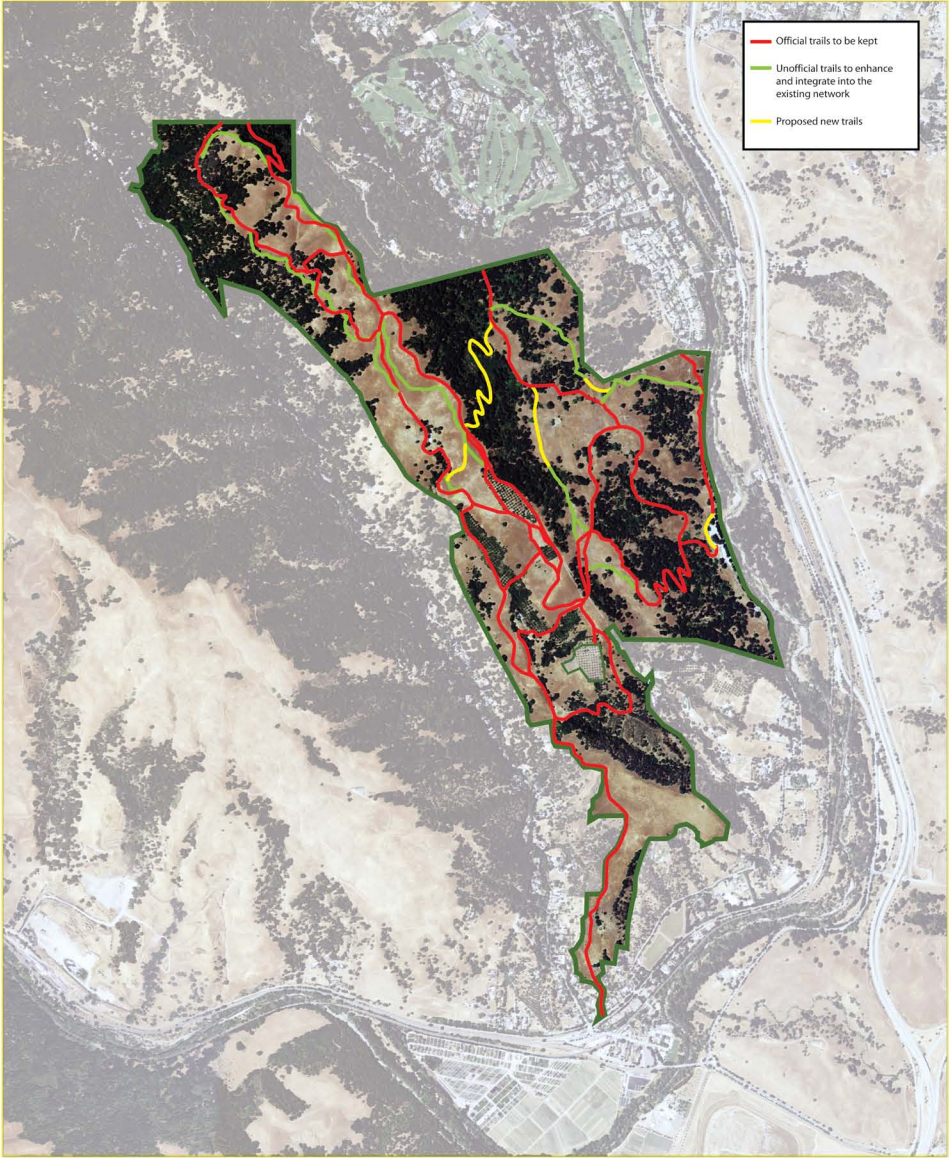
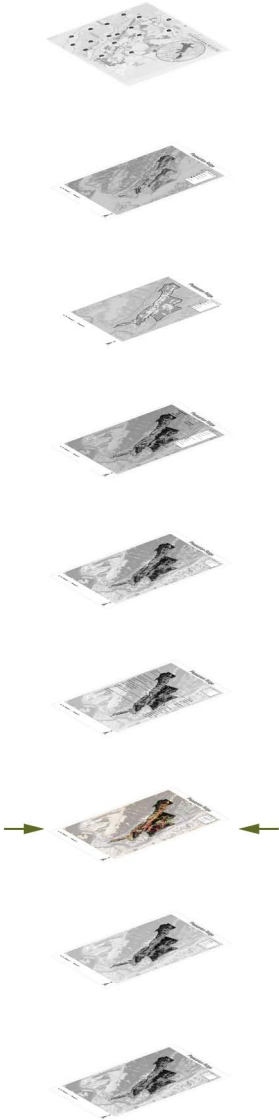


figure 33: official + unofficial + new trails

Step three was the connect all of the gaps in a logical and environmentally friendly way. The yellow lines that were created represent the connection of the new and improved Pleasanton Ridge Regional Park.



Pleasanton Ridge

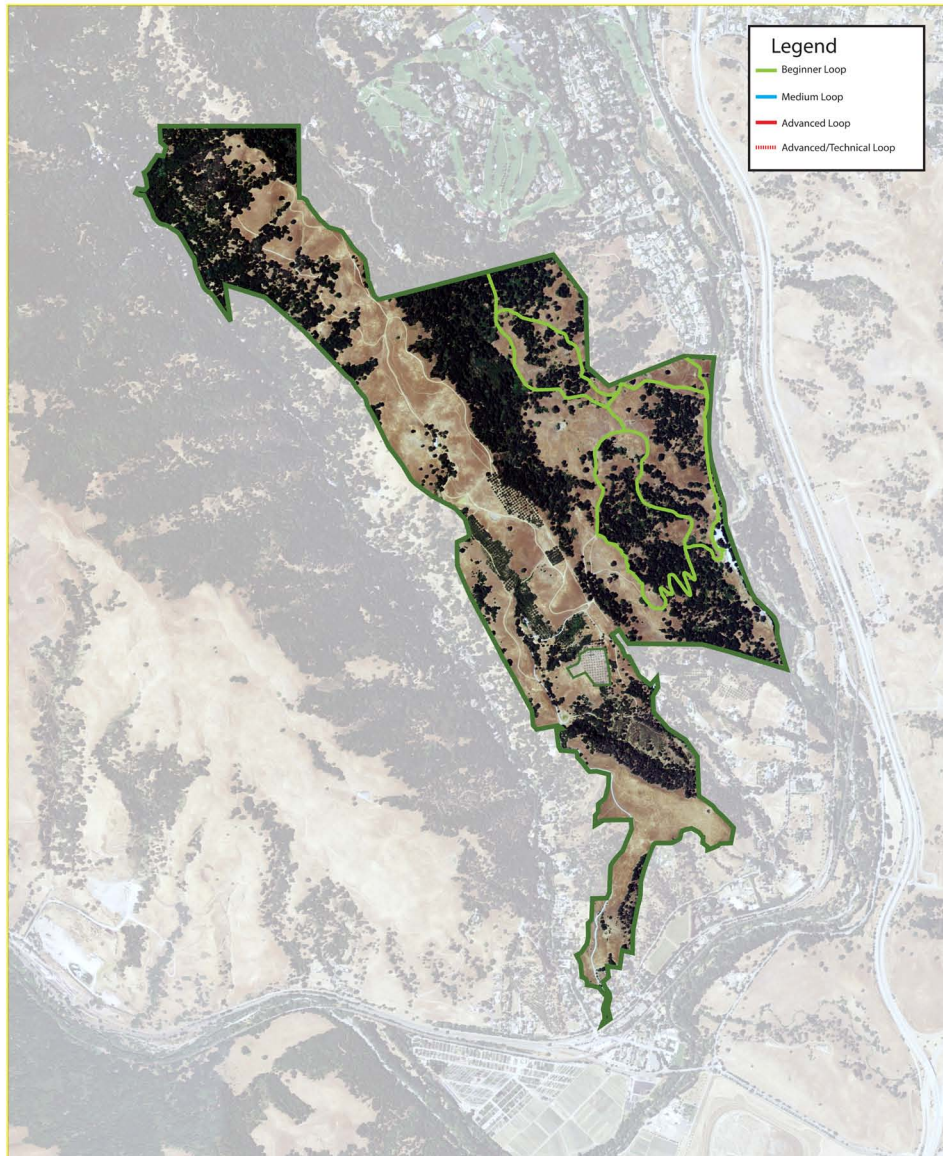
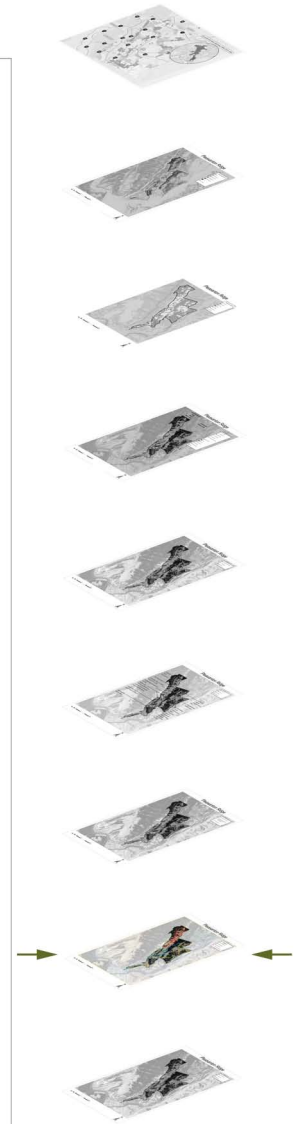


figure 34: beginners loop



The overall goal of this project was to create a logical stacked loop system that worked for a variety of different users. The image about shows the initial “beginners” loop, or step one of this process.

Pleasanton Ridge

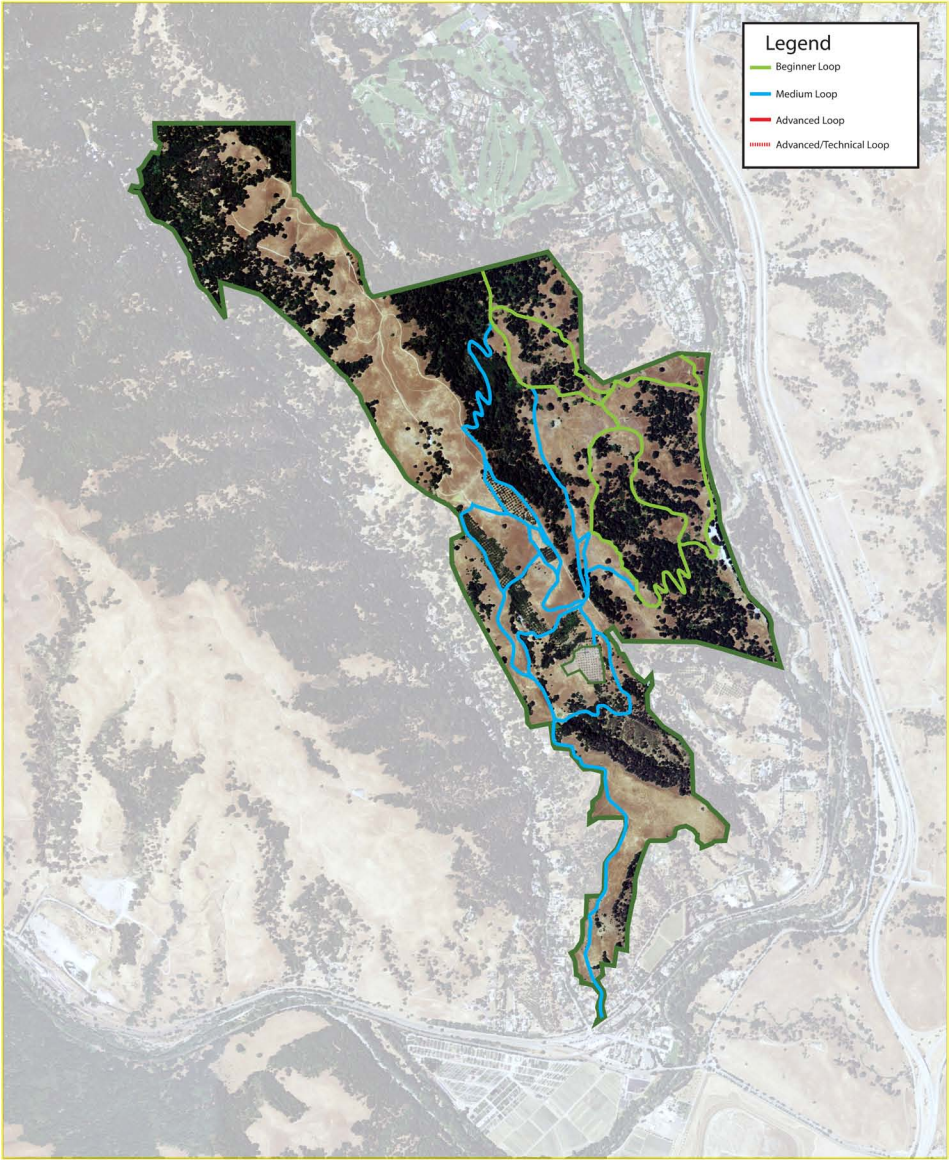
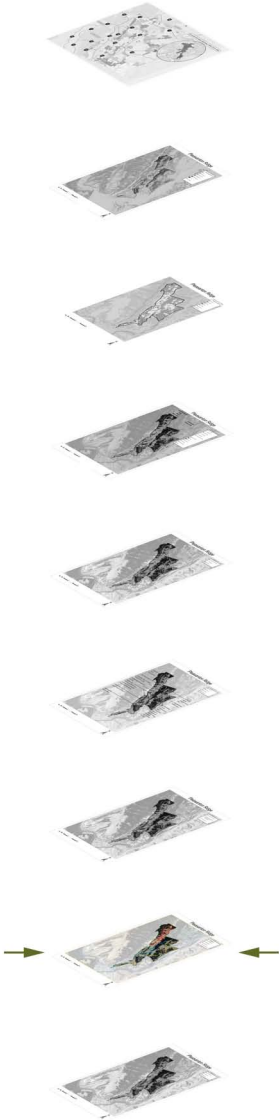


figure 35: beginners + medium loop

Moving deeper into the park the trails begin to get more advance, however still can be used by most of its users. This image shows the “beginner” and “medium” loops.



Pleasanton Ridge

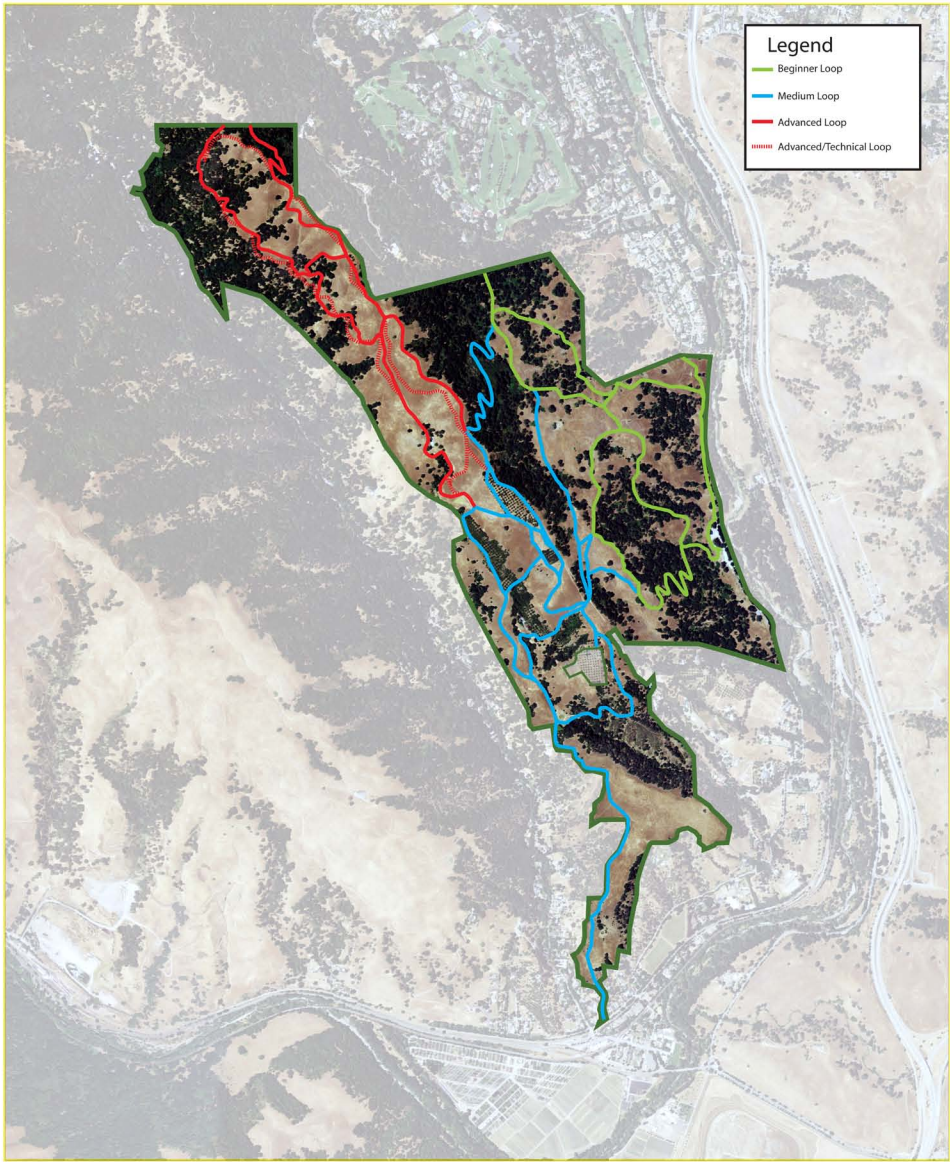
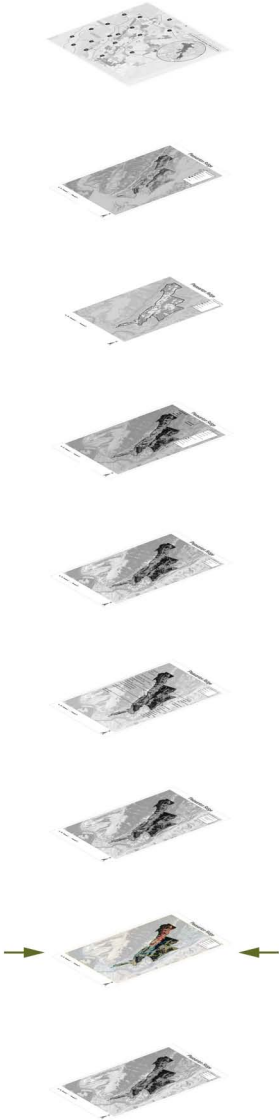


figure 36: beginners + medium + advance loop



The final stage was to establish the last loop which is the furthest away from the entry point. This portion of the park is for the more advance participants who like more technically challenging experiences.

Pleasanton Ridge

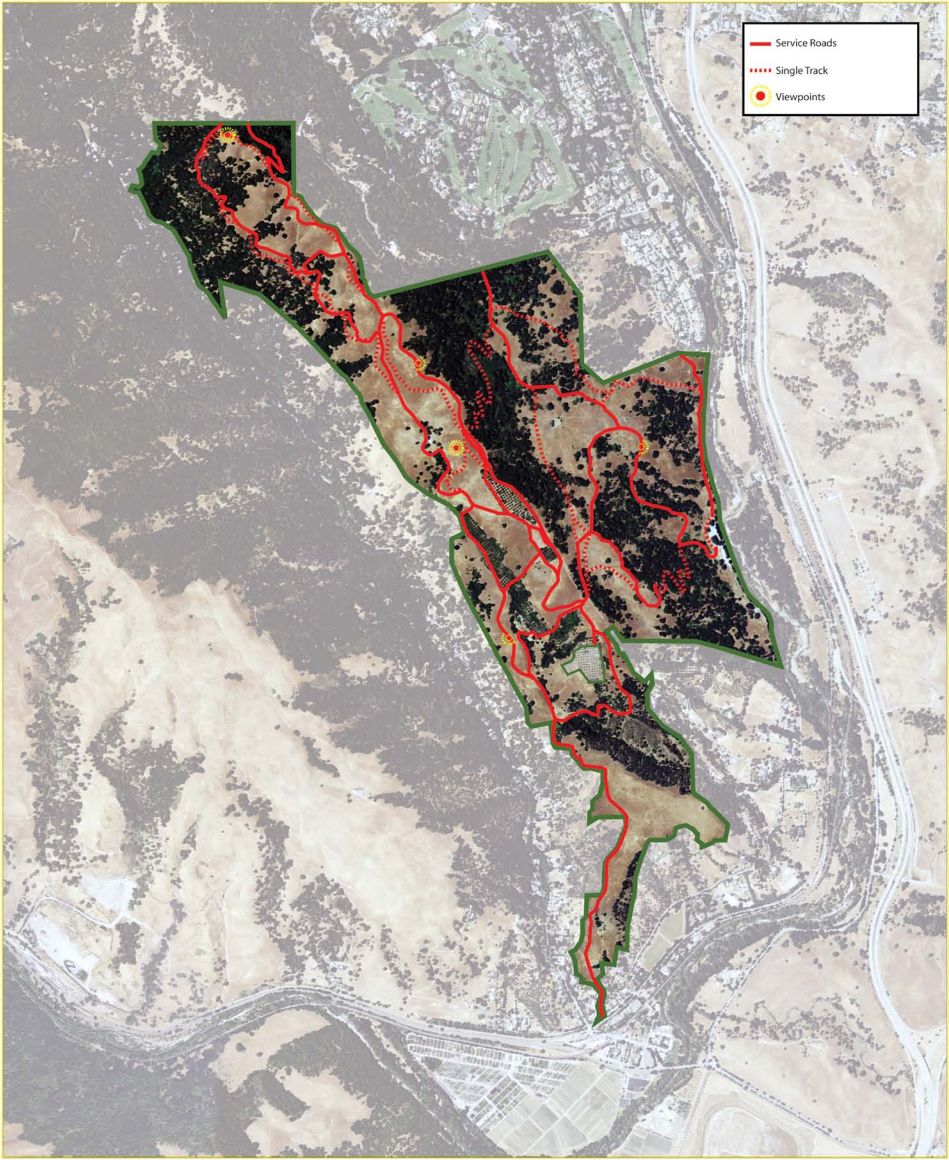
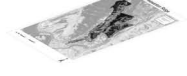
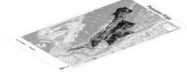
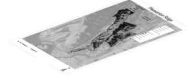
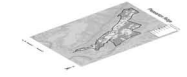
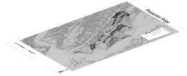


figure 37: master plan

When creating a final master trail plan, I wanted to focus on three things; provide users with a simple, easy to understand network of loops that appeal to multiple users, offer particular destinations

that showcase areas of the park and its views, and make the park appealing for multiple users. If I could successfully accomplish these three goals, I felt this park's value as well as appeal would increase



dramatically.

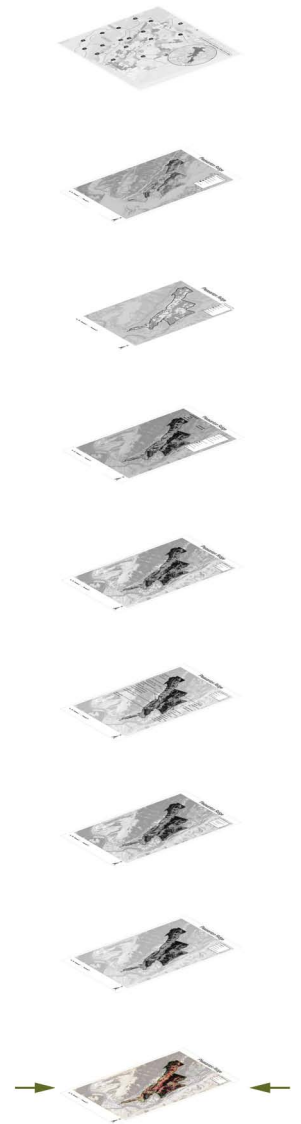
Provide a Park that has Logical Loops that Appeal to Multiple Users

Upon reviewing Pleasanton Ridge's current trail network, I was impressed to see some exciting routes that offered users the ability to not take the same trail twice in the same visit. This offered users to continuously travel through areas they hadn't yet. Despite some of these loops, the overall plan was not fluid, and was also very difficult to understand from the standpoint of a first, second, or even long time user. To compound the issue of trail ambiguity is the unofficial trails located in the lower elevations of the park as well as on the ridgeline.

A problem I noticed when first stepping foot on the Canyon trail was both its immediate steep take off grade as well as it being the only route one could take. To solve the puzzle of these two questions, I looked into creating a second take off point from the staging area located in the north section of the parking lot. For the purpose of this design I will call this trail

the Foothill Frontage Trail. A few of these unofficial trails departed from the Foothill Frontage Trail that offered the opportunity to connect back up with the Sycamore Grove Trail. This route creates a simple loop hike that parents could take their young five year old child on. The route utilizes one of the unofficial trails and connects back to the Sycamore Grove trail in two locations; one being a shorter loop closer to the Grove Trailhead and the other making it all the way to the end of the Sycamore Trail. This route appeals to a wide range of users as it is easy and logical.

Staying on the Sycamore Grove Trail I began searching for a second alternative that would traverse to the main portion of the ridgeline, offering users a second access point to this area. Currently there is a switchback trail that is unofficial however due to the ridges excessively steep grades (50+ degrees) I felt it was necessary to avoid this trail and look for an alternative route. I came up with a technical single track traversing through the Woodlands that follows the shallowest grades this portion of the ridge has. This trail would be a single track open to both hikers



and bikers, as it offers a challenging technical path that ascends the ridge. This portion of the park offers another loop spawning from the Sycamore Grove trail that reduces the traffic load that currently is seen where all of the trails “bottleneck” at the start of the upper portion of the park.

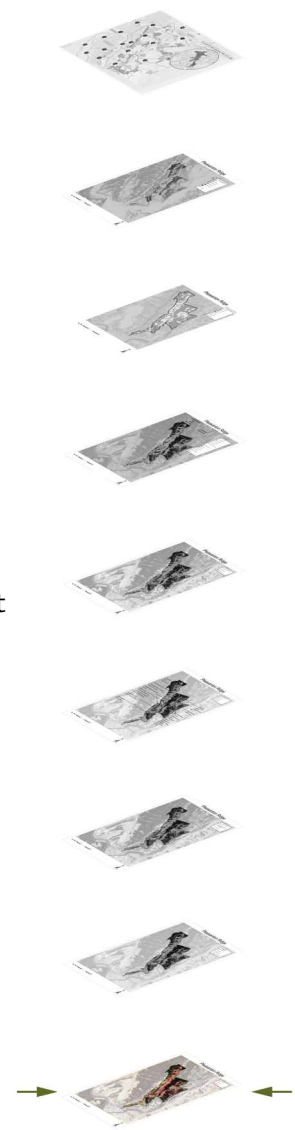
Moving up to the upper portion of the park the main goal was to classify the unofficial trails into a logical system. Many of the shorter trails I took out because they were unnecessary and didn’t offer any benefit to the trail system. The main trails that I have kept are designated by dashed lines. The first “feature trail”, I would like to call the Rolling Ridge Trail. This trail traverses along the spine of the ridgeline and is reminiscent of “The Sound of Music” hillsides. The trail incorporates many rolling dips and turns and gets people off the sometimes boring utility roads. The second trail is located to the west of the Rolling Contour Trail. This trail serves the same purpose as its neighbor as it gets people off the wide utility road and into fun singletrack appealing to many different users.

Finishing with the Northern most portion of the site there were two trails that entered the Augustine Bernal Park that did not connect back to each other until further into the park. Due to the natural human desire to connect these two trails, there is currently an unofficial trail that bridges this gap. My design proposes to keep this connection as it offers a logical path and also moves through an exciting peak that offers a stunning view of the entire upper ridgeline.

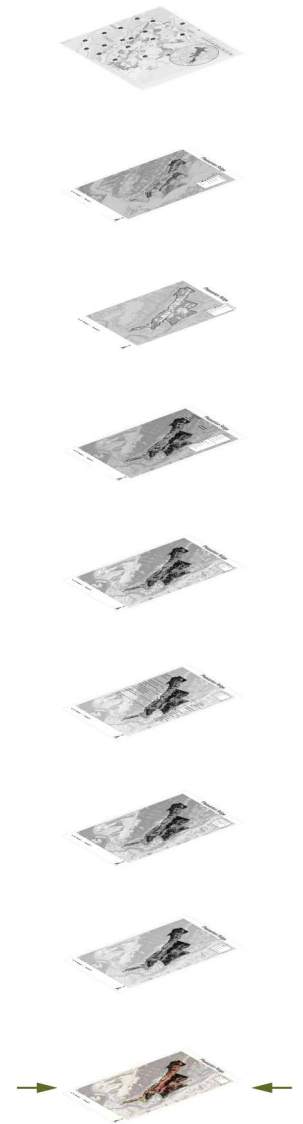
Offer Destinations or Viewpoints

Located on the map are specific belvederes and half belvederes that showcase specific areas that offer wonderful views of the park as well as the surrounding area. The driving force for highlighting these areas was to ensure that multiple types of users with varying skill levels could reach one of these destinations. The current design of the trails does just that.

Make the Park Appealing for Multiple Users



Many successful trail systems utilize the concept of a stacked trail network. This conceptual idea focuses on making the park appealing for users with very different skill sets. Trails closest to the staging area are shorter and more open. The second set of trails begins to become more technical and is also located further away and therefore may be more difficult to get to. The third set of trails, advanced, is generally very technical and requires more effort to reach. The final system implemented here at Pleasanton Ridge incorporates each system of loops, ensuring that it will be appealing for all types of users.



The uniqueness of this project is its ability to not have to look into the politics of land planning and trail design, but can rather focus on creating successful trails that work. The new routes and connections I have proposed in the park I feel are reasonable alternatives to the system that is currently in place. I feel that the strong conceptual looped system approach will give all varieties of users a sense of comfort that the park currently does not offer. With this new design, I feel it will challenge the parks new and long time users to explore the site with a sense of vigor and excitement they have never experience before.

- Bondurant, Julie, and Laura Thompson. *Trail Planning for California Communities*. Point Arena, Calif.: Solano, 2009. Print.
- Felton, Vernon. *Trail Solutions: IMBA's Guide to Building Sweet Singletrack*. Boulder, Colo: IMBA, 2004. Print.
- Land Evaluation for Interim Use*. Rep. Oakland: East Bay Regional Park District, 1990. Print.
- Land Evaluation, Sinbad Canyon*. Rep. Oakland: East Bay Regional Park District, 1995. Print.
- Northern Area Interim Land Use Plan*. Rep. Oakland: East Bay Regional Park District, 2008. Print.
- "Pleasanton Ridge Land Use Plan." *East Bay Regional Park District | Embrace Life!* Web. 11 June 2010. <<http://www.ebparks.org>>.
- Ridgeland Feasibility Study*. Rep. Oakland: East Bay Regional Park District. Print.
- Ridgeland Resource Analysis*. Rep. Oakland: East Bay Regional Park District, 1987. Print.
- Webber, Pete. *Managing Mountain Biking: IMBA's Guide to Providing Great Riding*. Boulder, CO: International Mountain Bicycling Association, 2007. Print.