

Bob & Patty Bryant Historic Tunnel Trail Restoration Project



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Table of Contents

PROJECT INFORMATION

Introduction	4
Project Summary	5-6
Trail History	7
Purpose & Need	8-11
Design Principles	12-17
Trail Restoration	
Tunnel Trail	18-31
Jesusita Trail	32-35

SECTION MAPS

Segment 1 - Juncal Shale	20
Segment 2 - Matilija Sandstone	22
Segment 3 - Cozy Dell Shale	24
Segment 4 - Upper Coldwater Sandstone	26
Segment 5 - Lower Coldwater Sandstone	30
Segment 6 - Jesusita Trail	32

APPENDICES

A. Management Agencies	36
B. Land Ownership	37
C. Trail Charts	38
D. Multi-Use Guidelines	39
E. Trail Design & Maintenance Publications	40
F. SBTC Resume	41-42

Restoring a Treasure

Mission Canyon. The words stir the imagination. There are numerous canyons to be found in our local mountains but none quite like this one. Flanked on either side by twin towers of sandstone, Mission Canyon leads up into the very bedrock of the Santa Ynez Mountains.

Along the way there are artfully sculptured formations, etched by millions of years of relentless weathering, the wind and water working their magic, until just quite right — the result of which is to be found in the cascading pools of Seven Falls, the boulder-filled escarpment of La Cumbre Peak, the jumble of rocks so aptly titled the “Rock Garden.”

Whether it is the hike up to Mission Falls for lunch, enjoyment of the the awesome views from Inspiration Point, a quick dip in the pools at Seven Falls, a ride by horseback up to the crest or a trip down down by mountain bike — there is so much to be discovered in Mission Canyon.

It is the trails that leads us to these places and none are more spectacular than the historic Tunnel Trail, constructed in the early 1900s as a supply route for the construction of Gibraltar Dam, and enjoyed by hundreds of thousands of visitors over the past century.

It is a testament to those who came before us that they built and maintained Tunnel Trail for so many decades. Now it is our turn to make a commitment to restoring the trail for the next generation to enjoy as we have.

Bob & Patty Bryant

**Historic Tunnel Trail
Restoration Project**

Introduction

On a windy afternoon in May 2009, a small fire was kindled by sparks from a weed whacker being used to cut grass along Jesusita Trail. Pushed by gusting winds, the flames raced uphill out of San Roque Canyon towards Inspiration Point. Over the next two days the fire spread into Mission Canyon, destroying scores of homes, then reversed itself and headed up towards La Cumbre Peak, where it expanded east across Rattlesnake Canyon and Gibraltar Road and west across the upper part of San Roque Canyon.

While the greatest tragedy was to the homeowners (80 homes destroyed; 15 homes seriously damaged; estimated cost \$17 million), after the fire had been contained and the hillsides were cool enough to assess other damage, it was evident that a number of our local trails had also been heavily impacted. More than 95% of Jesusita and Tunnel trails had been burned to mineral soil, leaving denuded hillsides.

Over the span of several weeks and multiple visits to both trails, it became clear that major reconstructive efforts would most likely be needed, partly due to the impacts of the Jesusita Fire but especially because of the lack of maintenance over the past few decades.



Fire fighter looks down on Tunnel Trail as the Jesusita Fire works its way uphill towards East Camino Cielo. Virtually all of the vegetation below him burned.

Commitment to Restoration

In January 2010, members of the Santa Barbara Trails Council (SBTC) conducted a survey of Jesusita and Tunnel trails to assess the fire damage, identify problems caused due to lack of maintenance and focus on potential ways to solve them. What we discovered were long sections of trail with serious gullying, major erosion due to water flowing down the trail and narrow tread with no place for users to pass one another, some located along steep dropoffs, many others with tread worn down to bedrock. In short, it was clear something needed to be done.

In February 2010, SBTC decided to launch a major effort to restore Jesusita and Tunnel trails. Shortly after this, we contacted Bob and Patty Bryant, leaders of the local *Summit for Danny* hike and other youth-oriented community projects, to gauge their interest in serving as Honorary co-chairs for the fund raiser. Bob and Patty had lost their home in the Jesusita Fire, were keenly aware of the damage done to their nearby trails and were ready to help.

With their enthusiastic support, the Trails Council, Bob and Patty Bryant and a host of local supporters have set out to raise \$200,000 for the purpose of restoring Tunnel and Jesusita trails to a condition we can all be proud of.

Project Summary

Together, Tunnel and the Inspiration Point trails are arguably the most visited of our front country trails. Easy access, spectacular views, connections to other trails — all combine to lure hundreds of visitors to them every week. Conservative estimates indicate they receive 30,000+ visits a year.

The large numbers of trail users — combined with fire damage, lack of maintenance and poor trail condition — point to the need for a major trail reconstruction effort to restore both trails to sustainable, safe conditions. As an example of this, a record number of Search & Rescue calls occurred on Mission Canyon trails this year. These included ankle and knee injuries attributable to poor trail conditions.

SBTC proposes a trail restoration project to meet three key goals: reducing long-term environmental impacts; incorporating design features that keep future maintenance requirements to a minimum; and restoring the trail in a way that avoids user conflicts. Simply put, the goal is to provide safe, sustainable use for all trail users.

- Sustainability — Minimize the long-term impact on the surrounding landscapes and natural resources. Restoration efforts should be focused on reducing erosion, minimizing damage to the trail tread and reducing the need for on-going trail maintenance. This includes use of erosion-control techniques such as out-sloping the trail tread, adding rolling grade dips and grade reversals and armoring the trails to reduce the impacts of both water flow and heavy use.
- Safety — Reduce user conflicts and maximizing user safety. Where possible, this should include widening the trail to four feet, moving the trail away from steep dropoffs, adding step outs, increasing line of sight and use of natural features to reduce speed.
- Enhancing User Experiences — Incorporate the above design features and techniques to enhance the trail experience for all user groups, age ranges and abilities. Both Tunnel and Inspiration Point trails are used by a wide range of user groups, ages and for a variety of purposes. Design techniques should focus on ensuring all users are provided with a quality experience.

Project Sections

Taken as a whole, the restoration project includes parts of two front country trails: the 3.18 mile section of Tunnel Trail that begins approximately 3/4 mile beyond the locked gate at the end of Tunnel Road and ends at the crest of the Santa Ynez Mountains on East Camino Cielo; and a .9 mile section of Jesusita Trail that begins just west of the lower Tunnel trailhead and extends to Inspiration Point.

For ease of laying out and eventually beginning the actual work needed to restore the two trails, the project has been divided into six distinct sections, described from the upper Tunnel trailhead downhill to the lower trailhead and then continuing on Jesusita Trail uphill to Inspiration Point (See the detailed section descriptions beginning on Page 17).

SBTC has also included funding to support Mission Canyon Association's efforts to mitigate issues relating to parking at the Tunnel trailhead and concerns about fire danger. SBTC will be working with the Association to identify ways to address these issues and will be providing additional information relating to these issues at a later date.

Project Need

Extensive surveys of both Tunnel and Jesusita trails have shown the need for major reconstruction to alleviate problems caused by the recent Jesusita Fire as well as long-term issues relating to lack of erosion control and maintenance. As described later, the overall condition of the trails is extremely poor, with the need to add water control features, remove gullies and widen the trail. A major goal of the current front country multi-jurisdictional process is to improve user safety and reduce conflict on the trails. The project is specifically designed to address those issues.

Budget & Time Frame

A total budget of \$200,000 has been developed to support the restoration project. This includes funding for development of the trail design, permits and environmental costs, equipment and materials, trail reconstruction and parking solutions.

The project will be divided into three phases:

- Fund Raising — We estimate this phase will last 6-9 months, beginning in early Summer 2011 and ending in late Spring 2012. As a part of this effort SBTC would like to put a temporary kiosk near the locked gate that includes information about the project and ways the public can contribute or get involved in helping support it.
- Project Review — While the fund raising effort is underway, SBTC will be working with the front country staff to seek public input, incorporate staff, public and local trail organizations input into design revisions and to provide the necessary environmental studies, permits or approvals needed to finalize the plan of work.

It is expected during the review process that staff will work with the Trails Council to develop a workable plan that we can take to the Multi-jurisdictional Task Force for preliminary review in June 2011 and final review in September 2011.

- Trail Reconstruction — while the fund raising effort and review process is underway, SBTC will be working with staff to include revisions and other input into the plan with the goal of having a final plan in place by Winter 2012.

Trail Design Committee. SBTC envisions collaborating with staff to assemble a small group of key volunteers from our local trail organizations to identify the specific locations and techniques to be used in restoring the trail and monitoring the work to assure it meets project goals and standards.

Project construction is planned to begin in Fall 2012 as funding becomes available and weather conditions allow.

Trail History

In 1904, the city of Santa Barbara embarked on an ambitious project to construct a tunnel through the heart of the Santa Ynez Mountains to connect into a proposed reservoir on the Santa Ynez River. At the turn of the century, with a population of barely 6,000 people, Santa Barbara was experiencing its first water crisis. The water shortage was brought on partly because of the increased numbers of people coming to the area after the Southern Pacific Railroad completed a branch line here from Los Angeles in 1887. Droughts in the late 1890s also contributed to the problem.

The city hired J. B. Lippincott, head of the hydrological branch of the U. S. Geological Survey, to investigate the possibility of developing water storage facilities on the Santa Ynez River. His recommendation was to construct a tunnel from Mission Canyon through the Santa Ynez Mountains to the Santa Ynez River near the Gibraltar Narrows.

Initial work began in 1904, when Santa Barbara contracted with the water company to build the tunnel. Workers on both sides burrowed deep into the mountain flanks for eight long years, encountering many obstacles. Despite these hardships the tunnel was completed in 1912.



Once a year city water inspectors walk through the tunnel to check for damage to the ceiling and walls. The tunnel is four miles long and in places less than five feet high. Considering the tunnel was built a century ago, it is in amazingly good condition.

To support the construction of the tunnel from the north side of the mountains, a rugged trail was blasted through thick layers of sandstone so that men, supplies and construction materials could be hauled over the crest and down to the river.

The trail served the project well while the tunnel was completed. After that, supplies and materials were transported through it by a narrow-gauge electric railroad through the tunnel. No longer needed for the construction of Gibraltar Reservoir, Tunnel Trail took on another purpose, serving as an important access route for Forest Rangers, fishermen, horse packers and others to the upper Santa Ynez River valley for many years.

A hundred years later, Tunnel Trail still plays an important role in supporting recreational use of our front country and along with Jesusita Trail is a vital link to our city's history.

Purpose and Need

In late spring and the summer of 2010, SBTC commissioned a survey of Tunnel Trail to gather data relating to current trail conditions. Using a Magellan Mobile Mapper CX hand-held GPS and ESRI software to map the trail conditions, data was gathered on a series of three trips down the trail from Camino Cielo.

The information collected included trail grade, tread width, amount of gullyng, locations of dangerous dropoffs, line of sight and, where needed, the space available to widen the trail.

The purpose was to provide an assessment of current conditions and importantly, to point out where the most serious problems were located.

We were also interested in understanding the challenges that would be encountered in restoring the trail and what design features might be most appropriate.

The surveys pointed out the obvious: Tunnel Trail is far too steep and has been seriously degraded over time due to the impacts related to the trail grade, lack of maintenance and cumulative effects of erosion.

Ideal Trail Grade

In designing the ideal trail, a number of factors are taken into account. However, a trail's steepness, or grade (which represents the rise or fall in elevation for each 100 feet of trail), is the single most important factor in determining if the trail will perform well over time.

A well designed trail will generally have a grade of between 6-8%. Guidelines adopted by the Santa Monica Mountains Recreation Area for multi-use trails recommend the following: maximum trail grade of 10%, with longer sections of the trail not more than 12% grade and shorter sections no more than 15%.

The chart on the next page clearly shows that Tunnel Trail falls well outside what experts consider ideal. Less than a quarter of the trail falls within the ideal grade of 10% grade. Just under half of the trail (45.7%) has a grade over 16% and incredibly, 18% of Tunnel Trail actually has a grade in excess of 21%.



This section of Tunnel Trail passes through Coldwater Sandstone. Note La Cumbre Peak (Matilija Sandstone) in the background. These formations make trail building in the Santa Ynez Mountains a difficult proposition and re-routing the trail more difficult.

Grade impacts the quality of the trail, user experience and the ability to maintain it over time in a number of ways. In general, steep trails are more susceptible to erosion, are more prone to gully-ing as water runs down the trail and need much more maintenance to keep them in usable condition.

As the number and types of users increases, grade also can have a major impact on user conflicts and safety, especially where speed on the trail is a factor.

Impacts on Trail Tread

Tunnel Trail provides a case study in what occurs when trail grade exceeds 15% or more for long sections of a trail.

This is especially evident where it passes through two major sandstone formations, the Matilija and Coldwater Sandstones. Average grade through both sandstone layers exceeds 20%. The gullying in both sections is also the most severe, averaging from 20-30" through the Matilija Sandstone and 15-20" through the Coldwater Sandstone. In places the gullies exceed 48" in depth with outside berms 8-10 feet in width.

The long terms effects of grade and gullying are both serious and difficult to repair. Not only is water channelled directly down the trail, as the outside berm grows larger it becomes more labor intensive to construct channels through them. When faced with hundreds of feet of gullying that averages 24" or more in depth, the repairs can only be done using mechanized equipment.

Gullying also exacerbates user conflict issues. In places where the channels are narrow and deep there is no way to step off the trail and allow another users to pass. Unfortunately, in terrain as steep and rugged as in our front country, there isn't much that can be done to lessen the grade.

However, there are a number of design features that can be used to mitigate the effects of steep grade One of these is the use of "s" curves that are created by cutting through the outside berm and filling alternating sections of the gully areas. Short grade reversals, rolling grade dips and pinch points to control speed can also be effective tools in shedding water off the trail and slowing users down.

Erosion to Bedrock

Grade, gullying and poor erosion control features have also led to erosion of the trail to bedrock along large portions of Tunnel Trail. While valued by some users who like the challenge of negoti-

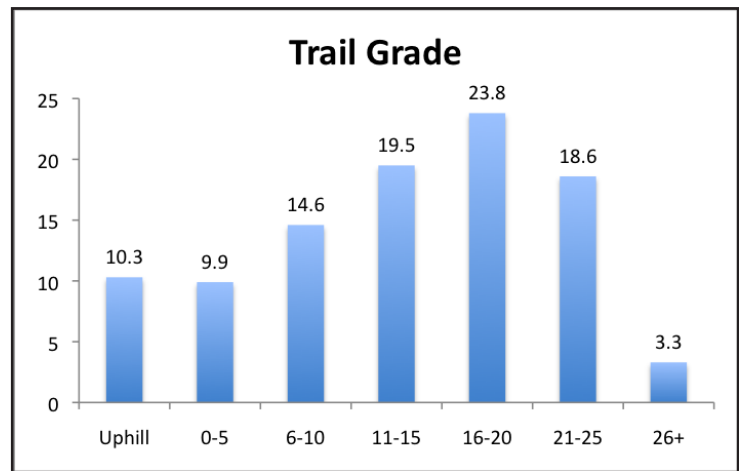


Chart 1. Almost half of Tunnel Trail has a sustained grade of 16% or more, with 25% of the trail grade in excess of 20%. This impacts user safety and erosion issues immensely.

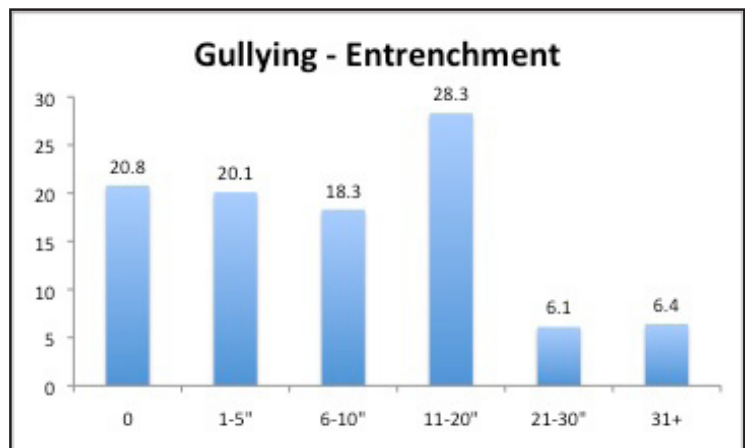


Chart 2. Almost 70% of Tunnel Trail has gullying at least 6" deep and 40% of the trail tread is gullied to a depth of a foot or more. Many sections are 2-3 feet deep, making restoration difficult.



Post-fire images taken June 2, 2009 not only show the extent of the damage but how deeply entrenched much of the trail is. The grade on these sections ranges from 15-30% (about 40% of the total trail length) and the gullying is from 18-30" deep. Several of these sections will need short re-routes to rehabilitate them.

ating their way through the boulder and rock fields, they can be extremely difficult for many trail users. Trail conditions such as these can only get worse over time.

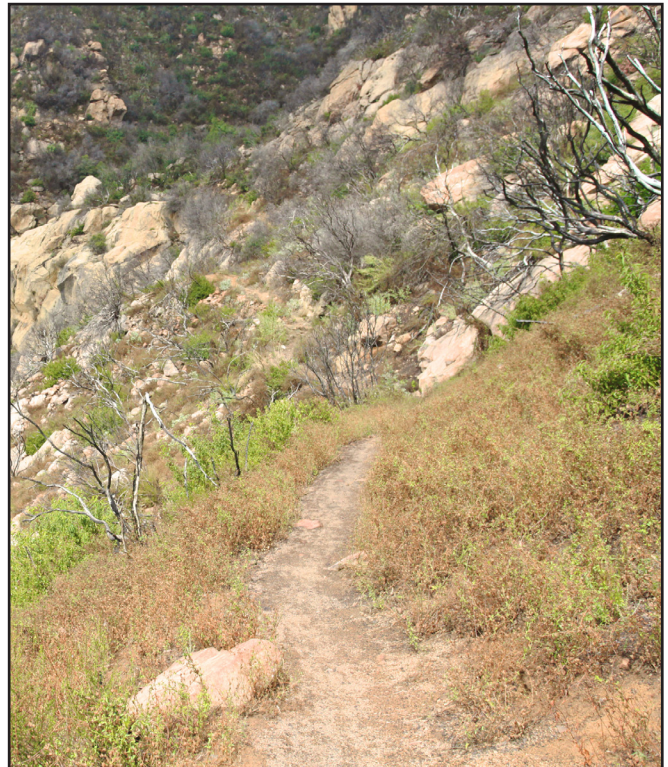
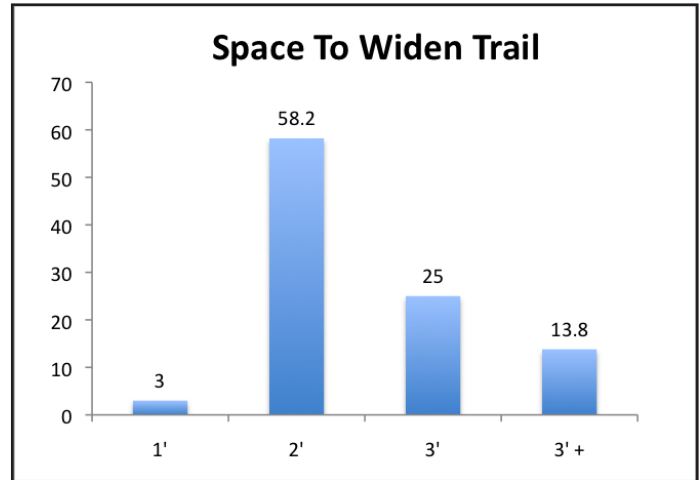
Steep Dropoffs

While gulying and erosion-related problems are the most critical ones to deal with, there are a number of sections with dropoffs steep enough to create a major hazard for some trail users, including a hundred-yard-long section below Mission Falls and one extremely dangerous section below the Tunnel Connector intersection.

Room for Improvement?

Along with identifying the major problems confronting restoration of Tunnel Trail, we also collected two other important pieces of data: tread width and space available to widen the trail. The data showed that Tunnel Trail is relatively narrow, averaging less than 24" for more than 80% of its 3.18 mile length.

Current standards for multi-use trails call for a minimum tread width of 48", especially where the trail is steep and speed can be a factor. Despite this the data, as shown in the chart on the right, also indicated that almost 60% of the trail could be widened an additional 24" and 40% widened 36" or more. Clearly there is both a need to widen the trail — it appears there is room to do it.



Sections of trail with dropoffs and space to widen the trail quite a bit or add step outs for users to pass each other.

Design Principles

Currently, there are numerous sources for information relating to trail design, construction and maintenance practices, principles and standards (See Appendix E, Trail Design & Maintenance Publications, page 40).

Challenges

Santa Barbara area trails provide unique challenges to developing a simple set of practices that can be applied in all situations.

- Geology — The thick layers of Coldwater and Matilija Sandstone make trail building through them difficult, time consuming and expensive. Use of some techniques, including re-routing around difficult spots is often impossible.
- Terrain — All of the main trails leading from the Santa Ynez Mountain crest to town are extremely steep. This complicates erosion control efforts and increases speed and user conflict issues.
- Popularity — Both Tunnel and Jesusita Trails are heavily used, thus necessitating more focus on user conflict and safety issues. The trail design techniques employed may also have an impact on user experience. Different user groups may object to practices supported by other user groups.

Techniques

Outsloping

Outsloping the trail 5-8% allows water to flow off the trail rather than running directly down it. This helps maintain the integrity of the trail by allowing the water to sheet off it over much larger areas and doesn't allow the water to focus in specific places. This can help minimize creation of side gullies.

Trail Watersheds

By adding grade reversals, nicks and rolling grade dips, a trail can effectively be divided into segments. Even where water does flow horizontally along the trail these techniques minimize the distance it is able to do so. This is especially important because it provides erosion control when the trail becomes entrenched or out-sloping is no longer effective.

Grade Reversals

When designed into new trail construction, by reversing the trail grade to include up and down undulations along the trail, water is forced off the trail at any point where the trail takes an uphill turn. While easily incorporated into new trail design, if there is sufficient width — as little as 3-4 feet — small turns and short uphill can be added to provide a similar though lesser impact.

Rolling Grade Dips

Typically, rolling grade dips provide an impact similar to that of a grade reversal (though not as effectively) by carving out a basin that is below the trail grade, allowing the water to flow down into the basin then off the trail. Longer dips may be 20-25 feet in length with gently grades in and out of the basin, making them almost unnoticeable to the user. Shorter dips, often called nicks, may be 8-10 feet long and have a more pronounced look and feel to them.

Both are extremely effective in minimizing erosion and if built correctly require minimal maintenance. However they are much more difficult to add on trails with steep grades.

Outside Berms

More than 50% of Tunnel Trail is gullied to the point that an outside berm has been created, ranging from a few inches in height and width to as much as four feet high and eight feet in width. Effectively this has made it impossible to use the above mentioned techniques for long term solutions or to solve using manual labor.

The good news is that with the aid of mechanized equipment to move rock and soil, a number of techniques can be used.

- For trails with less than 12" of entrenchment it is possible to remove the outside berm, out-slope the trail and widen it.
- Trails with more extensive gullying require moving material from the outside berm over to fill in the gully parts of the trail and re-establishing the trail on the outside.
- For sections with wide berms it may be possible to cut into the berm, fill in sections of the gullies and create more of an "s" pattern to the trail that includes dips, slight grade reversals and step outs.

Retaining/Crib Walls

Many sections of Tunnel Trail will need to have crib walls constructed along them to deal with exposed bedrock, dropoffs, narrow sections that need widening and switchbacks. Where possible, natural materials will be used.

Speed Control

Due to the steep grade and user safety concerns, frequent choke points will be added to control speed, especially in areas with dangerous dropoffs, poor line of sight and steep grade. Choke points utilize two or more landscape features (trees, rocks), usually spaced the same width of the trail, that serve to control mountain bike speed and provide a more intimate trail experience. While use of choke points may be objectionable to some mountain bike users who are looking for a different trail experience, controlling speed is critical in allowing shared use and in enhancing all users' trail experiences.

Trail Width

Due to large numbers of trail users and nature of shared multi-use trails, widening the trail tread a minimum of 36" allows for users to pass one another safely, minimizes the impact of steep dropoffs and extends the life of the trail tread before hillside slumping narrows it down again. Use of chokepoints along with variations in width and flow can help to provide a more natural experience and reduce speed.

Step Outs

In combination with other techniques to minimize the impact when users pass one another, step outs provide a safe location off the main tread for users to wait for others to pass by. They are especially valuable where the line of sight is poor or it would be otherwise difficult to get off the trail. Generally, they will be incorporated in places where there are naturally-occurring wide spaces or locations where the trail can be widened without disturbing the natural feel of the trail.

Out-slope — this section of Tunnel Trail is just below the intersection with the Tunnel Connector. The trail is 18" wide, has sections with steep dropoffs and a very slight amount of entrenchment. Multiple techniques could be used (dips, widening, out-sloping) to improve erosion control and ensure safe sharing. Boulders can be moved to locations along this section to serve as choke points as needed to control speed.



Gullying — located just above the power lines, this part of the trail averages 15% grade, which is part of the reason for the gullying (about 12-15" deep). The outside berm could be removed and the trail out-sloped. A better solution would be to alternate this with sections where the berm removed and the gully filled in to create a series of "S" turns, with water being forced off the trail where the "S" curves to the outside.

Reinforcement — the most dangerous section of the trail is at the start of the Coldwater Sandstone along the base of the Mission Crags. One several hundred yard long section has the potential for serious injury or death. While it will be difficult to widen this section, step outs can be added in places, the interior rock chipped out to widen the trail as much as possible and the most dangerous parts of the trail reinforced with crib walls. These will help armor the outside edge of the trail and prevent erosion.



Stabilization — To the right is another part of the Upper Coldwater section that needs to have the outside edge of the trail stabilized through use of retaining walls and widening the trail wherever possible. If the trail should wash out here it would be very difficult to rebuild given the precarious bench upon which it was constructed.

Below, numerous sections like this steep boulder field are the result of erosion of the tread to bedrock. Outside retaining walls can be used to



stabilize the outer edge of the trail and steps built to keep the material in place and from creeping down the trail.

Gullies & Berms — The bottom picture shows the impact of a century of water flowing unchecked



down this part of the trail, located in the Matilija Sandstone. The trail grade here is 22% making a fix difficult. By cutting the trail through the berm to the outside then curving it back into the gully and filling parts of the gully to create an “S” flow, it is possible to move water off the trail.





Above is an example of re-flowing the trail by cutting into the berm, moving material from the berm into the gully and continuing the “S” pattern up the trail. This effect can work well when the berm is wide as it is here. Long stretches of this section (Matilija Sandstone) are steep and gullied but because the outside berm is so wide, it is possible to create this type of flow.

To the right, the image shows a deeply gullied section of trail that appears difficult to fix but actually there is enough room on the outside left to add an “S” type flow, creating a curvilinear trail rather than one that goes straight downhill. This can help control speed while at the same time creating a flow that is more natural and helps get water off the trail.





Trail has eroded down to bedrock, leaving a narrow shelf that is barely passable. This section will require use of hammer drills to chip out the rock and/or rock retaining walls built on the outside edge to hold the trail in place. There are many similar sections like this in the parts of the trail that pass through the Matilija and Coldwater sandstones.



One picture often says it all. By burning away the vegetation the Jesusita Fire of 2009 exposed what poor trail design, lack of maintenance and improper erosion control techniques can do to a trail over time.

Trail Restoration — Tunnel Trail

The restoration plan for Tunnel Trail divides the project into five separate sections, each with their own unique issues and challenges. This provides the opportunity to treat the project as a whole yet begin construction section by section as permits for each section are approved and funding becomes available.

It is anticipated that more detailed plans for the how the specific techniques described in the plan will be used and in what locations will be developed as we work with staff and other local trail organizations to flesh it out.

Each section is identified by the geologic formation through which it passes.

Section 1 Juncal Shale

Length: 1,879 feet (.36 miles); average grade 5.5% over 104' of elevation loss. This part of the trail is in the best condition of the entire length. The grade is relatively mellow and the tread is in excellent condition. Sight lines need to be improved somewhat and the tread is narrow in places and should be widened. View section gallery at: <http://galleries.sbtrails.org/Tunnel/Juncal/>.

Section 2 Matilija Sandstone

Length: 4,106 feet (.78 miles); average grade 15.6% over 640' of elevation loss. The biggest issue is the steep drop, deep gullies and lack of erosion control. Average depth of the gullies is 24" for the entire length of the section. Major trail reconstruction is needed. View section gallery at: <http://galleries.sbtrails.org/Tunnel/Matilija/>.

Section 3 Cozy Dell Shale

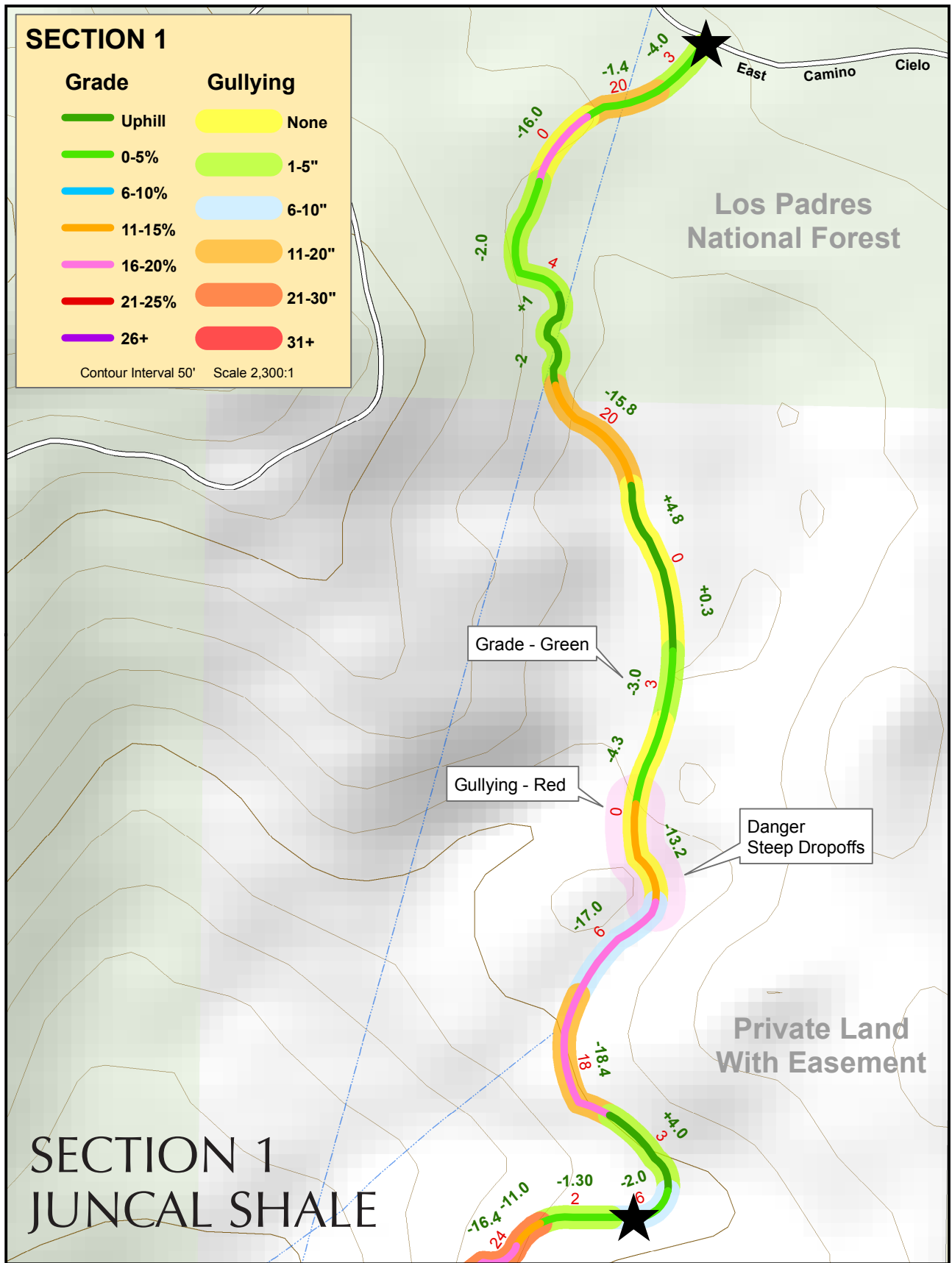
Length: 4,100 feet (.78 miles); average grade 6.6% over 269' of elevation loss. Includes sections with steep dropoffs that require the trail to be widened and moved away from the edge, step-outs added and erosion control measures implemented. View section gallery at: <http://galleries.sbtrails.org/Tunnel/CozyDell/>.

Section 4 Upper Coldwater Sandstone

Length: 4,899 feet (.93 miles); average grade 16% with lower section 20%+ over 787' of elevation loss. One section has an extremely dangerous dropoff, much of the rest of the section is eroded to bedrock with deep gullies, poor tread condition and lack of drainage. One re-route around a deep gullied area is recommended. Major trail reconstruction is needed. View section gallery at: <http://galleries.sbtrails.org/Tunnel/UpperColdwater/>.

Section 5 Lower Coldwater Sandstone

Length: 1,492 feet (.28 miles); average grade 21% over 313' of elevation loss. There are major gullying issues along the entire section and very poor drainage that require extensive use of erosion control techniques to mitigate. One re-route around a deep gullied area is recommended. Major trail reconstruction is needed. View section gallery at: <http://galleries.sbtrails.org/Tunnel/LowerColdwater/>.



Section 1 — Juncal Shale

The Juncal Formation is composed of alternating layers of sandstone and shale that are 4,000 to 5,000 feet thick. They are of the Eocene Age (58 to 36 million years ago). The shale predominates and weathers easily, forming rounded clay hills.

The upper Tunnel Trail begins at a small saddle formed in the easily eroded Juncal Shale and follows a series of ups and downs through its characteristic rounded clay hills to a point where it begins a downhill run and exits the shale formation.

Total length of the section is 1,879' (.36 miles). Elevation loss is 104' for an average grade of 5.5%, though this is a bit misleading as the section includes a number of short downhill and uphill as it winds its way through the formation.

In general, this section of the trail is in the best condition of the entire route. The primary need is to widen the trail, especially along the parts that have steeper downhill



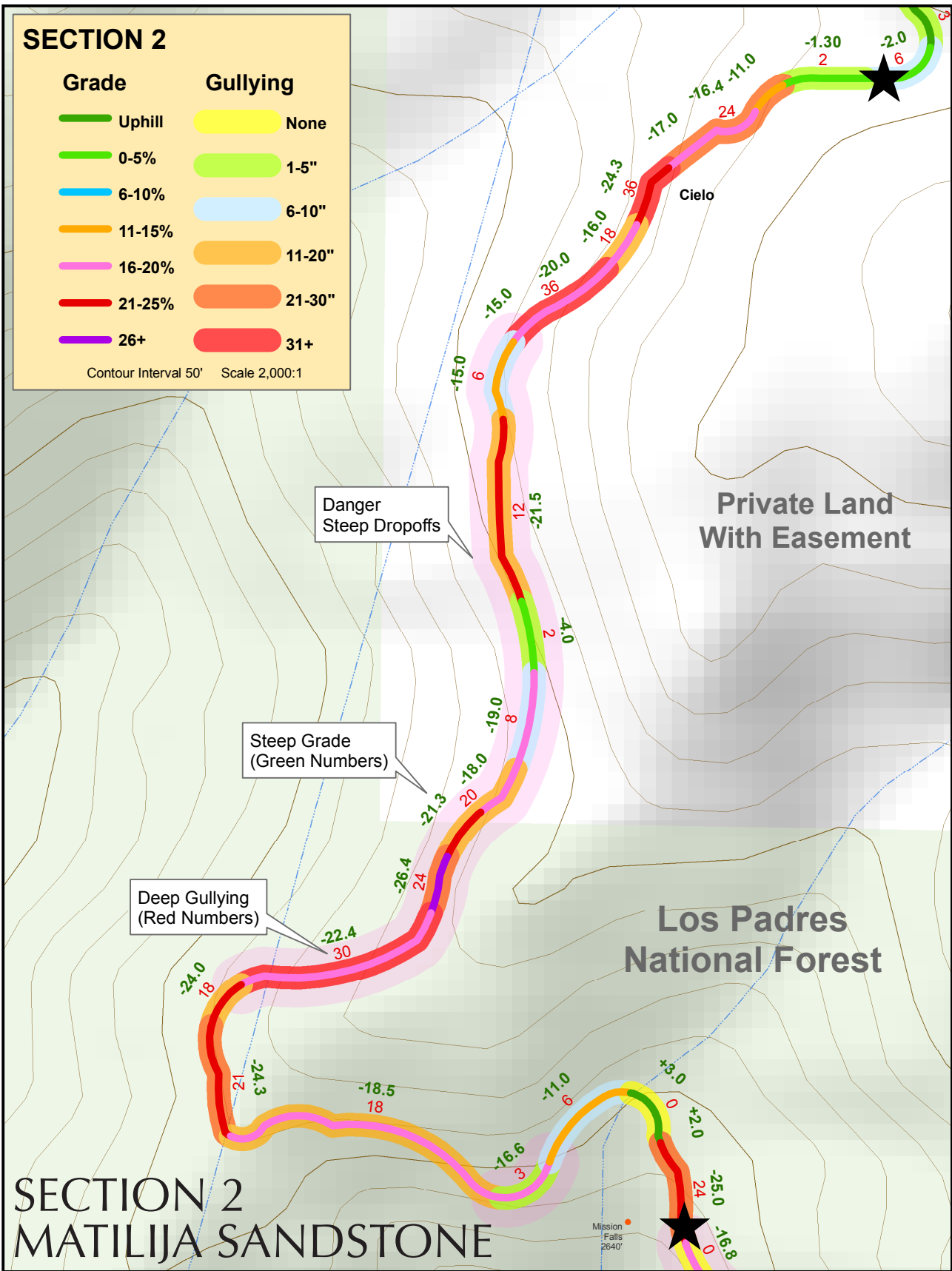
runs and to improve user safety and improve sight lines by removing brush that is crowding the trail. Water drainage, dips and grade reversals can be added along with eliminating the small amount of gullying and outloping the trail.

View image gallery at: <http://galleries.sbtrails.org/Tunnel/Juncal/>.

SECTION 2

Grade	Gullyng
Uphill	None
0-5%	1-5"
6-10%	6-10"
11-15%	11-20"
16-20%	21-30"
21-25%	31+
26+	

Contour Interval 50' Scale 2,000:1



Section 2 — Matilija Sandstone

Matilija Sandstone is the thick, resistant layer of sandstone that forms the 3,985' high La Cumbre Peak. It is 2,000 feet thick at this point. This sandstone is grayish-white, weathers to a creamy buff color, and is extremely hard. This makes it highly resistant to erosion, and allows it to form the most rugged, craggy, and scenic strata found in the Santa Ynez Mountains.

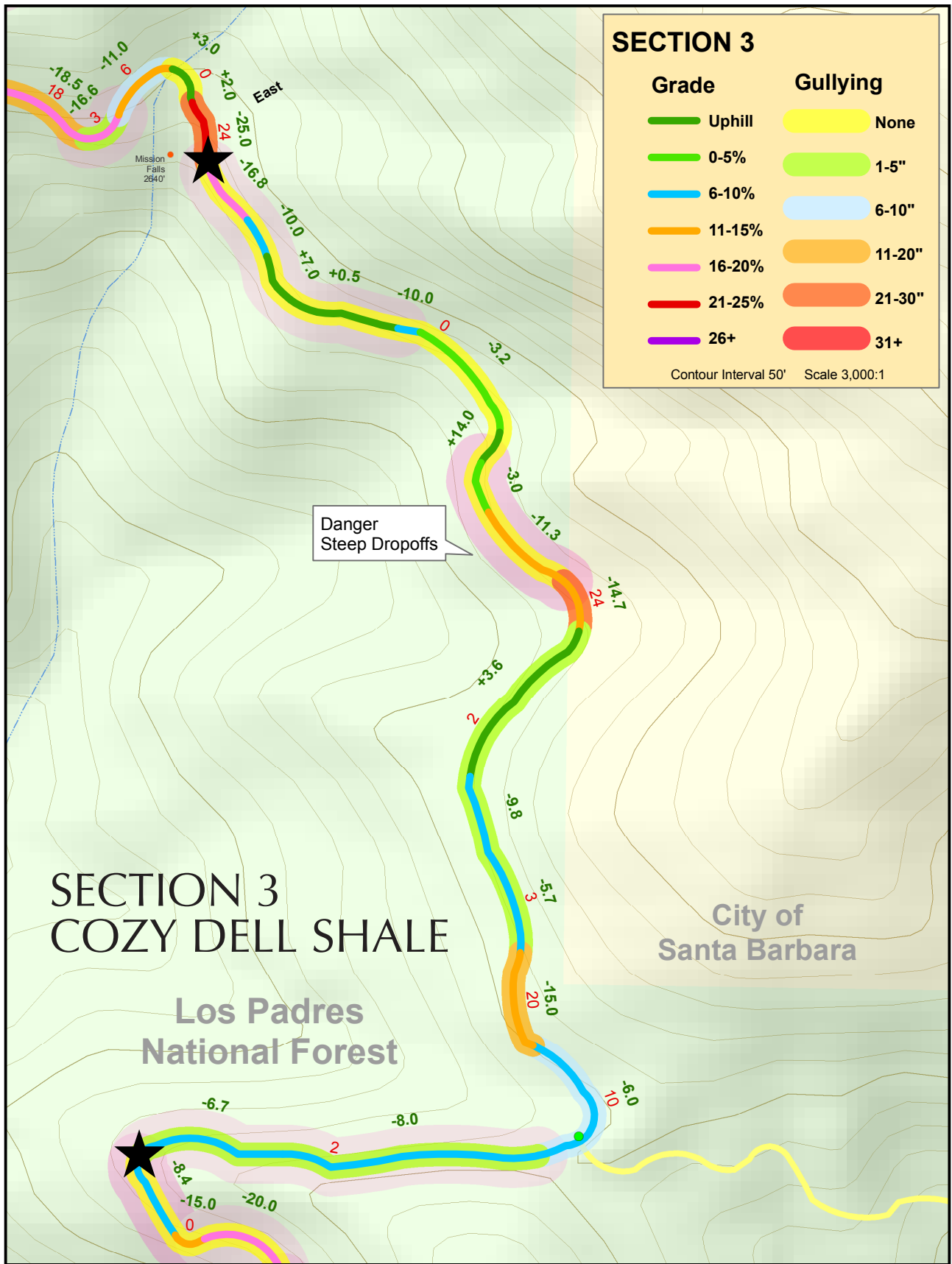


Unfortunately, it is also difficult geology through which to build a trail and as a result, this section was built at an extremely steep grade so the trail would pass through the sandstone as quickly as possible. The result over time has been the creation of one long almost continuous gully that varies from 18" to more than 48" in depth.

The Matilija section is 4,106' long (.78 miles) and drops 640 feet at an average grade of 15.6%. Gullying averages over two feet in depth with many parts of the trail more than three feet below ground surface. The outside berm is often more than 6-8' wide, making it difficult to divert water off the trail. On the plus side, this outside buffer provides quite a bit of space to widen the trail as needed and to add features that could slow users down and get water off the trail.

Use of the "s" curve technique described earlier will allow for a curvilinear flow that can help deal with the deep gullies, get water to flow off the trail and control speed. There are also many sections of trail that have eroded down to bedrock and will require installation of crib walls. Excavation equipment will be needed to move rock and soil along the entire section. View image gallery at: <http://galleries.sbtrails.org/Tunnel/Matilija/>.





Section 3 — Cozy Dell Shale

Cozy Dell Shale is almost 1,700 feet thick and disintegrates readily into small fragments. This causes it to form markedly recessive topography, most graphically the deep saddles you can see in between the Matilija and Coldwater sandstones. It is dark gray and weathers to a brownish-gray or olive gray color. While the Coldwater and Matilija sandstones form spectacular peaks and cliffs, the Cozy Dell saddles have their own gentle grace.

Almost immediately below Mission Falls, Tunnel Trail turns a corner and heads east into the Cozy Dell Shale formation. For the next 4,100' (.78 miles) the grade is much more gentle (6.6%) as the trail winds clockwise around the hillsides. The elevation loss along this section is 269'.

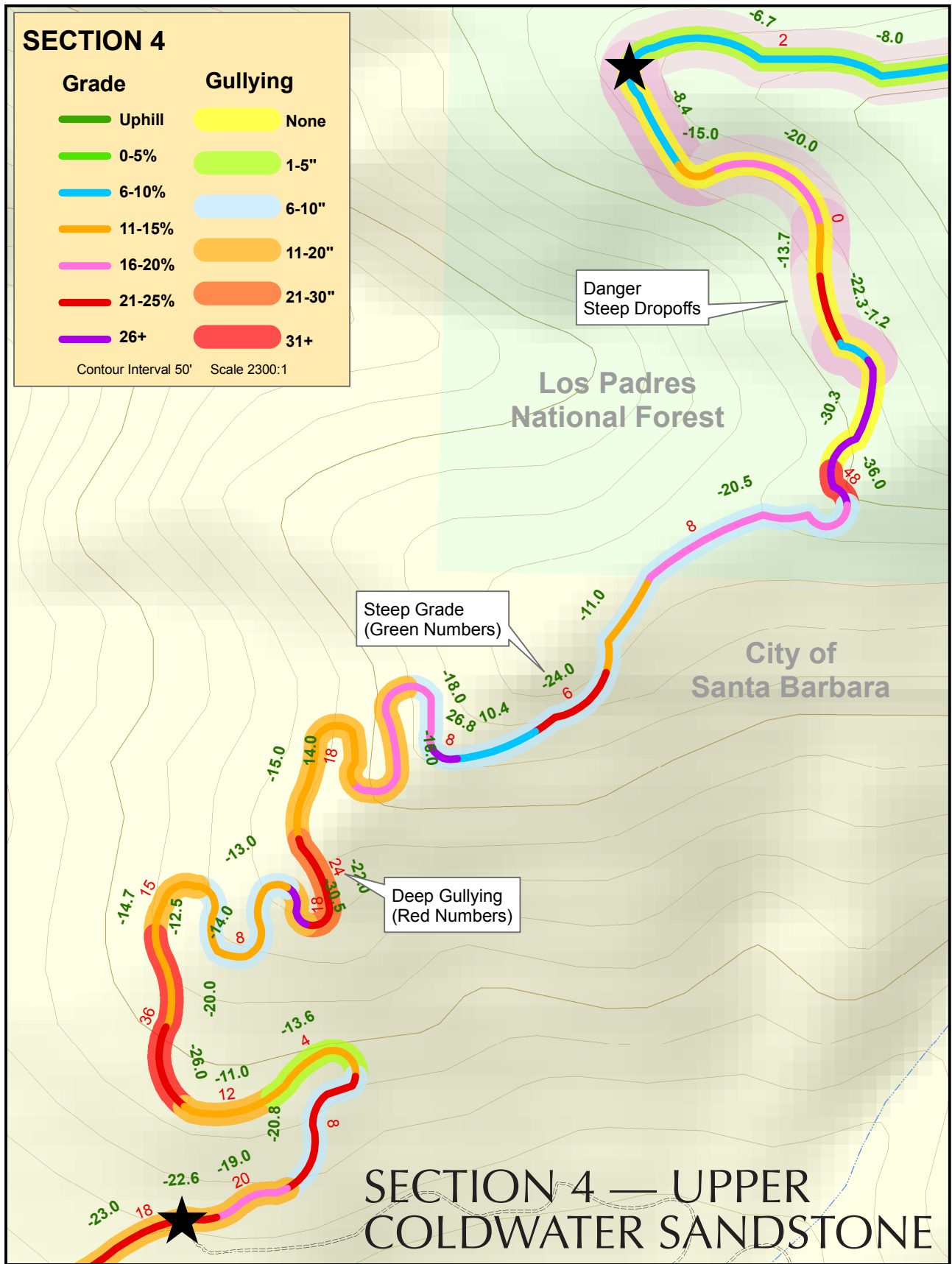
Ironically, despite the gentle grade, the outside slope for the first third of the section have been classified as “extremely steep.”

The primary work along this part will be to widen the trail to meet Forest Service standards, adding step outs and move the trail away from the outside edge where possible to minimize exposure to the dropoffs.



The balance of the trail work will focus on adding erosion control features (outsloping the trail, adding dips and including choke points to control speed and create a more natural flow).

View image gallery at: <http://galleries.sbtrails.org/Tunnel/CozyDell/>.



Section 4 — Upper Coldwater Sandstone

Coldwater Sandstone is the thickest of the marine sandstones found in the Santa Barbara area. Averaging 2,700 feet in thickness, it is composed mostly gray-white sands which weather on the outside surfaces to a buff color.

Though not quite as resistant as Matilija Sandstone, it is extremely hard. The sandstone forms the picturesque ledges, cliffs, and boulder fields on both sides of Mission Canyon, including the Mission Crag, Arlington Peak and Cathedral Peak. Coldwater Sandstone also forms narrow canyons featuring large pools and waterfalls. The most well known of these is Seven Falls in the west fork of Mission Canyon.

At the lower end of the Cozy Dell section the trail turns a corner at the point where an off-trail route heads east up along the Mission Crag. This ridgeline marks the beginning of the Coldwater Sandstone and the start of two long downhill sections that lead to lower Tunnel trailhead.

The first of these, the upper Coldwater Sandstone, leads across the front face of Mission Crag and then begins to work its way down the main ridge through layer after layer of sandstone to a point where the trail meets the Edison power tower.

Average grade for the Upper Coldwater section is 16% as the trail drops 787' over its 4,899' length (.93 miles). This section is filled with twists and turns, plenty of exposed bedrock, tread that is in extremely poor condition due to erosion, and serious erosion issues for almost the entire length.

The most dangerous portion of the entire trail occurs immediately after you turn the corner at the along the front face of the Mission Crag. The trail drops steeply for 10' then follows a narrow bench around a series of dropoffs and chutes until it reaches the main ridge. This part of the trail will need to be widened and crib walls placed along long sections to prevent future problems.

Once below these dropoffs, the trail begins a series of switchbacks that are steep, eroded to bedrock and extremely gullied. Near the lower part of this section several hundred yards above the Edison tower the trail passes through a section with an erosion gully 8-10' wide and 48" deep. A re-route approximately 250 yards long is recommended to bypass the gully. View image gallery at: <http://galleries.sbtrails.org/Tunnel/UpperColdwater>.

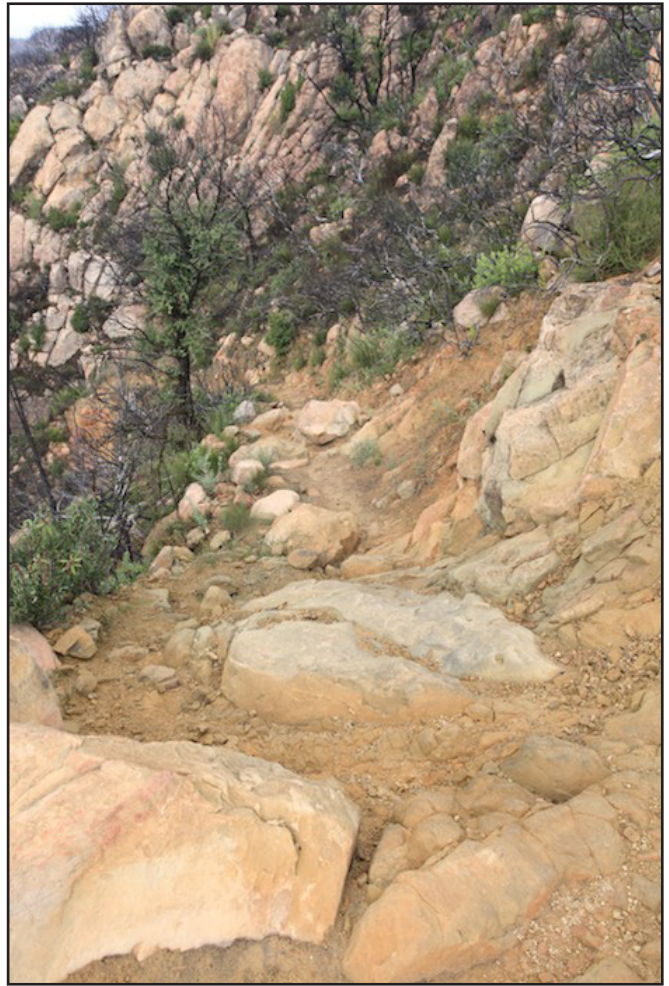
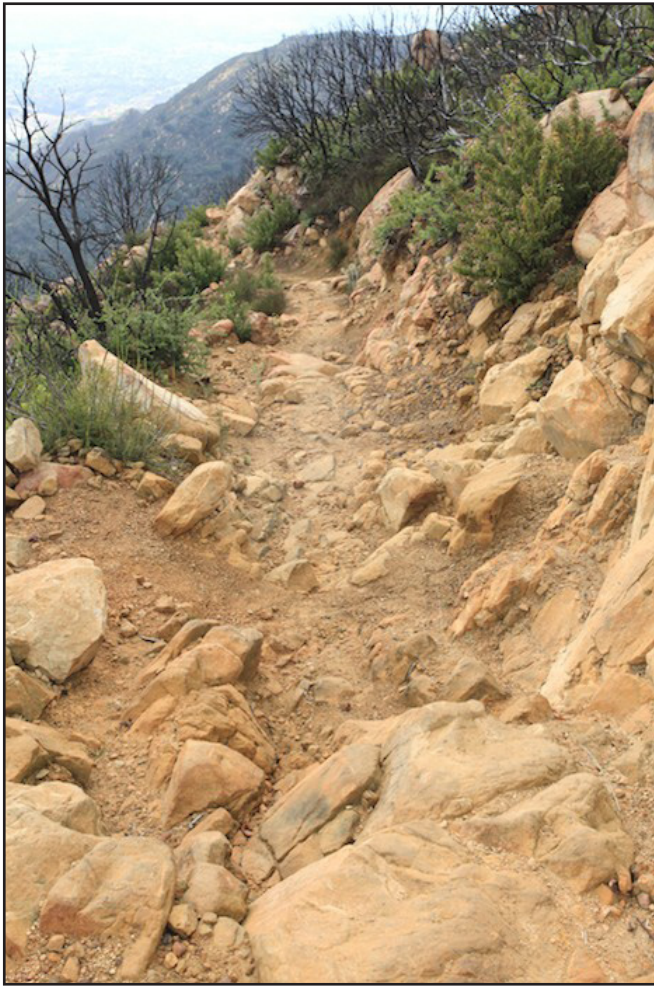


This part of the trail is extremely dangerous as it meanders across the front side of the Mission Crag. Adding additional crib walls and reinforcing existing ones will help

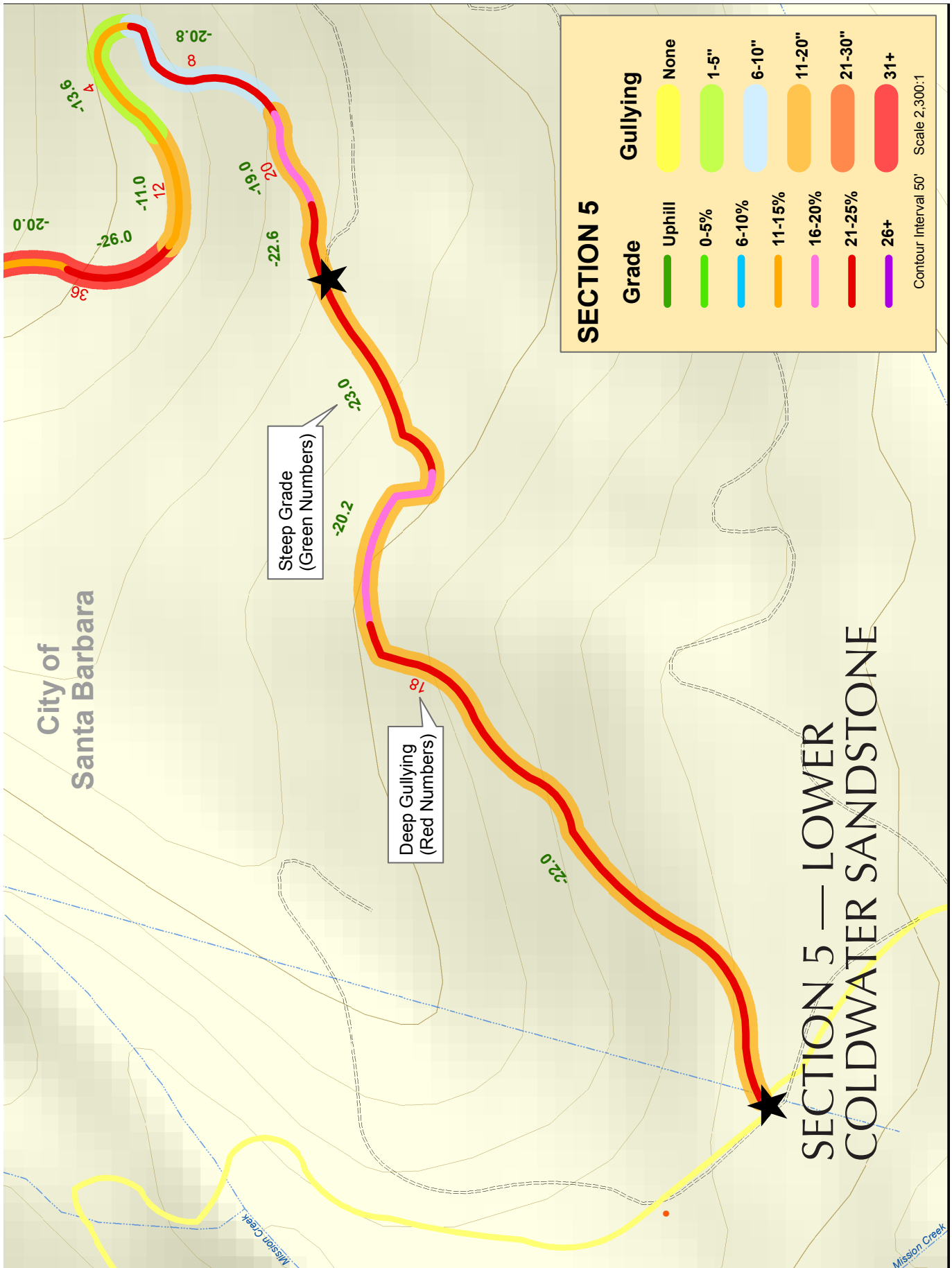
The Upper Coldwater section of Tunnel Trail presents major challenges to designing for multi-use. Steep grade, narrow tread with dangerous dropoffs, major gullies and long segments of the trail eroded to bedrock all contribute to create serious problems.

Rock work to chip out the inside sandstone walls, crib wall construction, building sandstone steps in steeper locations, removing long sections of gullying, addition of erosion control features and in at least one location re-routing the trail around one major section of deep gully will be needed to restore the trail.





While the upper part of this section has steep dropoffs and narrow tread as it works its way along the base of the Mission Craggs, the lower part has severely eroded gullies, long sections eroded down to bedrock and the need for major tread work.



Section 5 — Lower Coldwater Sandstone

The last section of the Tunnel Trail restoration project consists of a long, steep downhill section that begins at the point where the trail crosses the Edison Catway and ends at the lower trailhead. The section is 1,492' long (.28 miles) dropping 313' for an average grade of 21%.

The result of this continued steep grade is more than a quarter mile of deeply gullied trail, in places 10'+ wide and chest deep. As with many of the other heavily eroded parts of the trail, excavation equipment will be needed to move rock and soil and a re-route approximately 400 yards long is recommended near the start of the section.

The primary issue along most of the section is the long, almost continuous gullying, much of it 15-24" deep. Addition of "s" curves, removal of the outside berm and use of outsloping to get water off the trail, addition of choke points and boulders to control speed are all needed to improve drainage and enhance user safety.

View image gallery at: <http://galleries.sb-trails.org/Tunnel/LowerColdwater/>.



Trail Restoration — Inspiration Point

The hike from the locked gate at the end of Tunnel Road up to Inspiration Point is one of, if not the single most popular short hikes in the Santa Barbara area. Combining three-fourths mile of road walking, just over a half mile of hiking up a section of Jesusita Trail to the Inspiration viewpoint and 500 feet of elevation gain, the hike provides spectacular views and a great workout. The trail is also popular among mountain bikers, with most of them riding up to the viewpoint from the Mission Canyon side and then continuing down Jesusita Trail into San Roque Canyon to complete a 2-3 hour loop ride.

The .65 mile trail portion of the hike to Inspiration Point winds its way up through a series of rock

outcroppings and interbedded layers of softer shales where the Coldwater Sandstone is in the process of transitioning to formations deposited not too long before the time when what were marine sediments were about to emerge from the Miocene Seas.

The result is a mixture of formations, with rocky layers and steep trail in some places and longer smooth sections predominantly composed of clays and shales in others.

Like Tunnel Trail, the route is far steeper than it should be, averaging 15.6% from the low point at the Seven Falls creek crossing to the promontory at Inspiration Point.

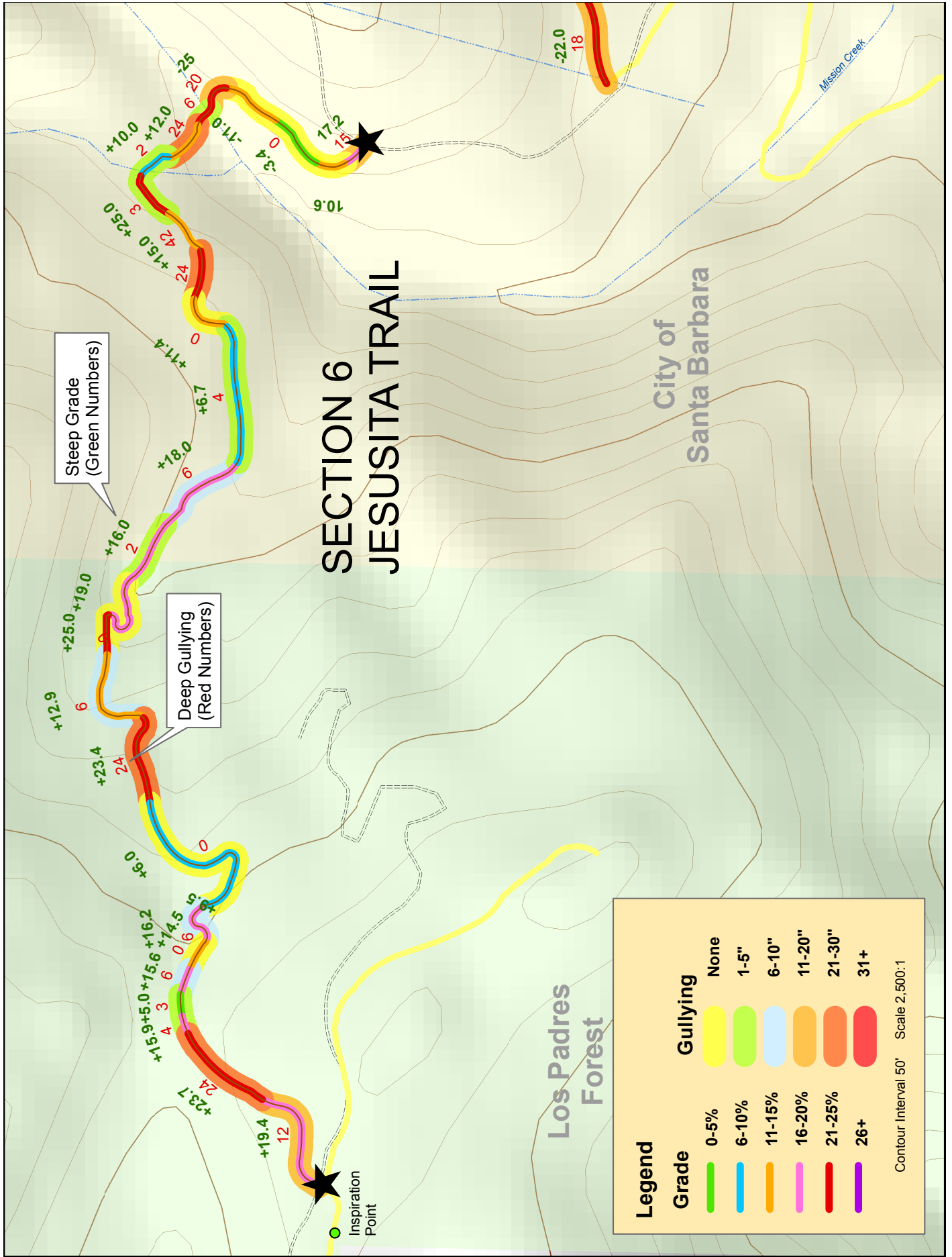


While erosion control and dealing with issues relating to gullying are the main concerns along Jesusita Trail, many parts of it could be widened to alleviate user conflict issues and steep dropoffs such as this.

The steeper parts of the trail reach grades of 20% and as a result there are numerous gullied sections, some of these very narrow where they pass through boulder-filled sections of trail and others much wider where large gullies up to 30" deep have been created.

While the primary need along the Inspiration Point section of Jesusita Trail is to deal with the gullied sections of the trail, many parts of the trail are also relatively narrow, and given the popularity of the route, this should be dealt with as well. In addition, there are three sets of switchbacks along the trail that need improvement, especially in armoring the outside edges of them to prevent erosion and one section at the start of the trail that has a very steep and dangerous dropoff that can be improved by widening the trail.

The focus of most of the restoration project for this part of Jesusita Trail will be on eliminating gullies, off-sloping the trail and adding dips and improving the three sets of switchbacks. There are several short sections where small re-routes of from 50' to 200' could solve erosion issues where the trail grade exceeds 18-20%.







The pictures on both pages illustrate the type of work that needs to be done along the .65 mile section of trail leading to Inspiration Point. Most of it relates to gullying that has created major channels in places or exposed bedrock that makes it difficult to walk along some parts of the trail.

The upper picture on the opposite page and lower picture on this page show several of the switch-backs that are in poor condition and contribute to safety concerns given the numbers and types of uses.

Immediately to the left is an example of a section that could be improved by closing this gullied part and re-routing the trail around it. There are several other locations along the trail where short re-routes could eliminate safety issues and solve erosion concerns.

Fortunately there is plenty of rock along the trail to provide the materials to use for these projects.



APPENDIX

Appendix A. Management Agencies

Los Padres Forest Service

Santa Barbara Ranger District
Contact: Kerry Kellogg
(805) 967-3481 Ext. 231
kkellogg@fs.fed.us

Santa Barbara City Parks & Recreation

Contact: Jill Zachary
(805) 564-5437
jzachary@santabarbaraca.gov

Santa Barbara County Parks

Contact: Erik Axelson, Deputy Director
(805) 681-5651
Axelson@sbparks.org

Front Country Trails Coordinator

Contact: Rebecca Mordini
(805) 968-5455
sbftc1@gmail.com

Front Country Multi-Jurisdictional Task Force

Santa Barbara Parks & Recreation Commission

Beebe Longstreet, Task Force Chair

Scott Burns, Parks Commissioner

Santa Barbara County Parks Commission

Suzanne Perkins, 1st District

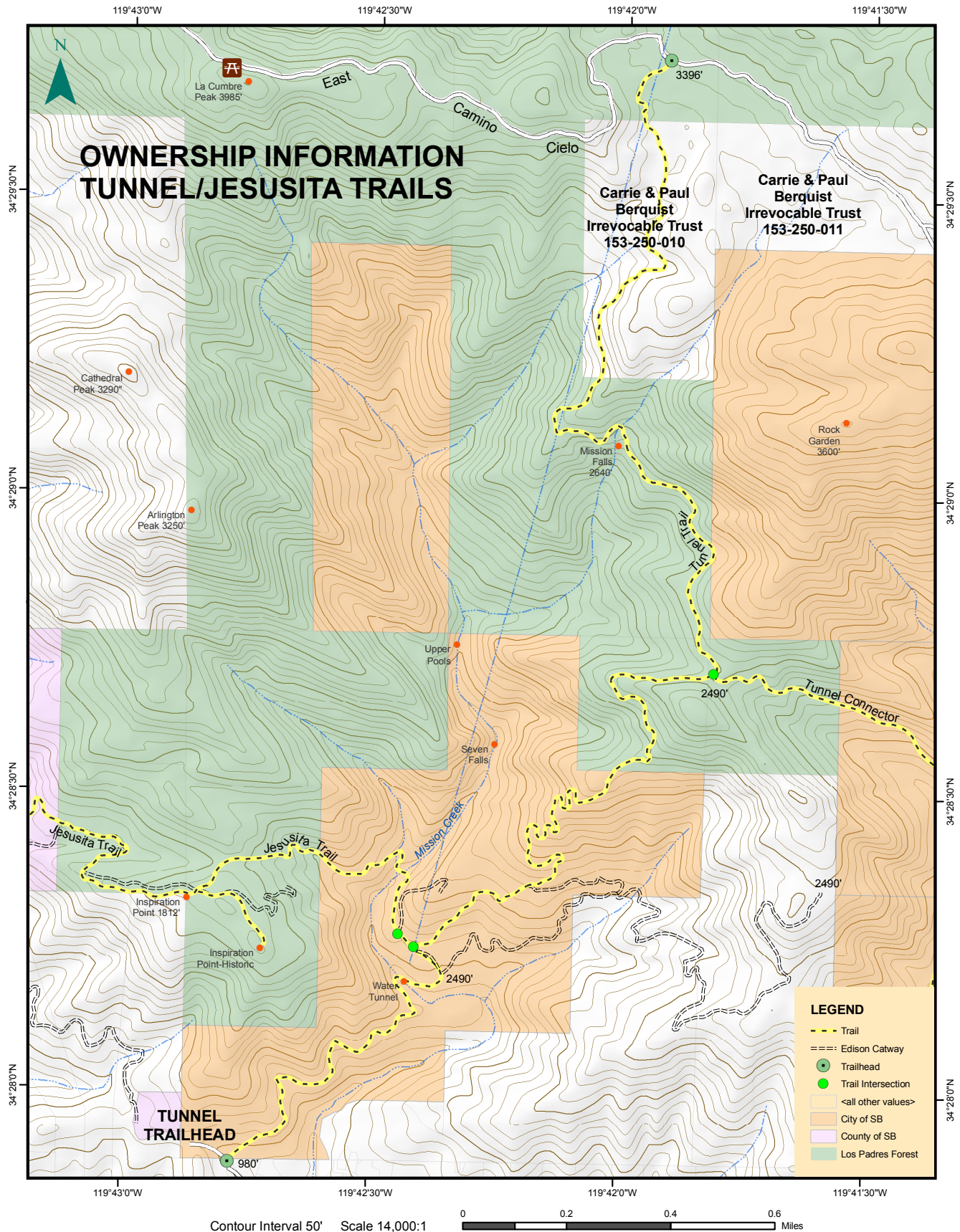
Judith Dale, 3rd District

Los Padres National Forest

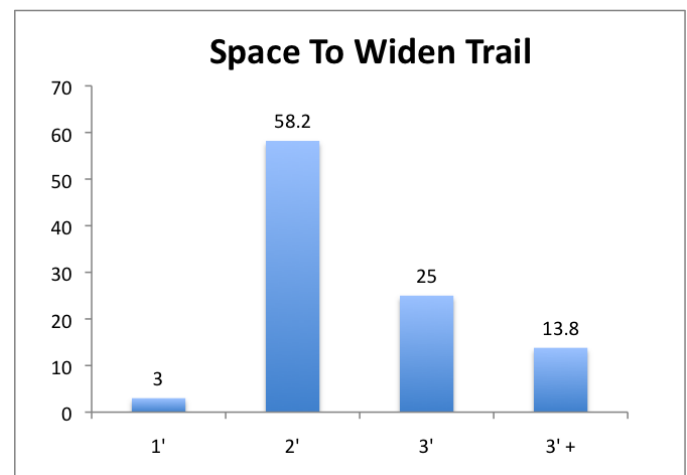
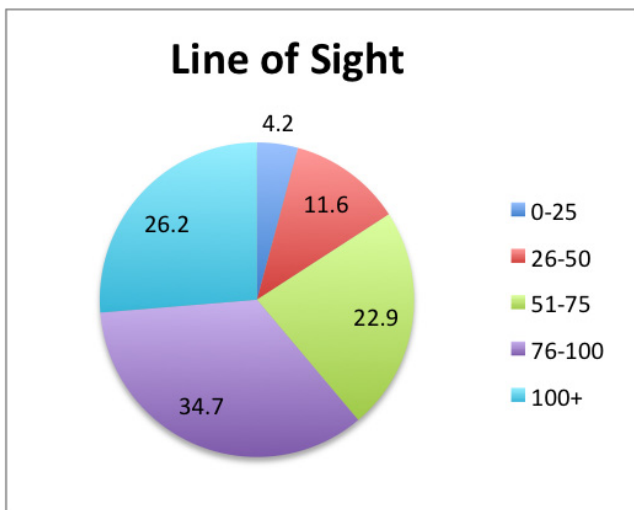
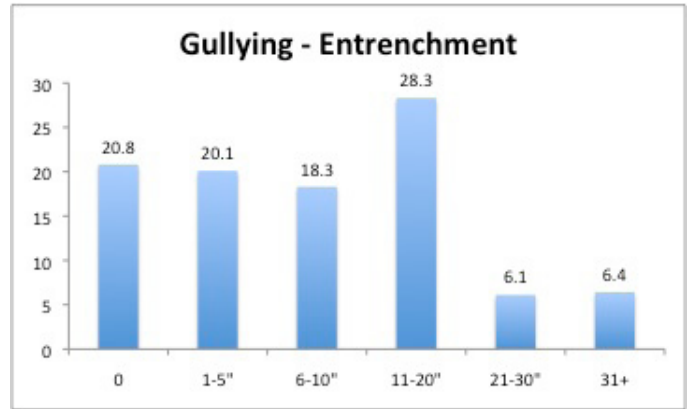
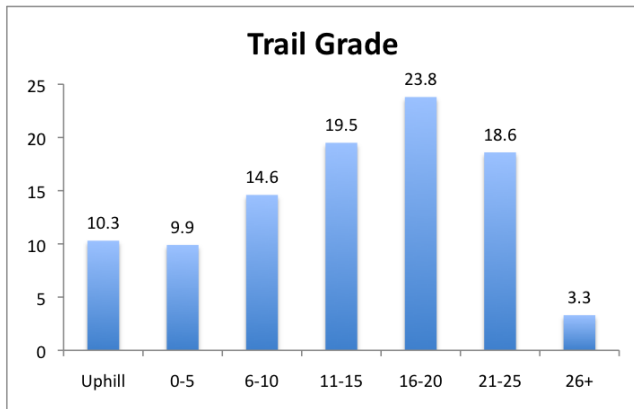
Bruce Emmons, Public Use & Facilities Staff Officer

Jeff Benson, Assistant Forest Recreation Officer

Appendix B. Land Ownership



Appendix C. Trail Charts



Appendix D. Trail Design & Maintenance Publications & Resources

USDA Forest Service

Trail Construction and Maintenance Notebook, 2007, 166pp.

IMBA — International Mountain Bike Association (www.imba.com)

Trail Solutions: IMBA's Guide to Building Sweet Singletrack, 2004, 272pp.

Managing Mountain Biking: IMBA's Guide to Providing Great Riding, 2007, 256pp.

Natureshape (www.natureshape.com)

Natural Surface Trails by Design, Troy Scott Parker, 2004, 78pp.

Professional Trailbuilders Association (www.trailbuilders.org)

Appendix E. Santa Barbara Trails Council Resume

Profile

The Trails Council (SBTC) was founded in 1967 by George and Vie Obern as an advocacy organization for supporting and acquiring new trail access in Santa Barbara County. Currently SBTC is actively involved in trail access and management issues, fund raising, trail maintenance and trail restoration.

Major Historic Achievements

- Creation of CRAHTAC the county's Riding and Hiking Trails Advisory Committee in the 1960s
- Establishment of the Parks Recreation and Trail layer (PRT) as a part of the County Master Plan
- Completion of many of our local area bikeways. The section along San Jose Creek from Modoc Road to UCSB is now officially designated the Obern Trail in honor of the services of our founding members, Vie and George Obern.

Current Achievements

- Reconstruction of Oak Grove Trail for the City of Santa Barbara at the Douglas Family Preserve (2009).
- Development of a Lake Los Carneros Management and Trail Maintenance Plan for the City of Goleta (2009-Present).
- Review of Management Plan for Ellwood Mesa and successful completion of four major beach access and trail projects at the Mesa (2009-Present).
- Development of Volunteer Center (sbvolunteers.org) to assist agencies with recruiting community members for various outdoor volunteer projects (2010).
- Development of several connector trails at San Marcos Foothills Preserve for SB County Parks as a part of a rehabilitation effort after the Jesusita Fire (2009-2010).
- Design and construction of new San Antonio Creek Connector Trail that now links the Preserve to the Tucker's Grove area for SB County Parks (2010).
- Construction of new Baron Ranch Trail as a joint project with SB County Public Works and Parks that should be open to the public soon (2008-Present).
- Construction of P-Line Trail (preliminary route) on the west ridge of Baron Ranch to the SY Mountain Crest thanks to a \$15,500 grant from Goleta Valley Land Trust that when completed will increase public access along the Gaviota Coast (2010-Present).
- Rehabilitation of the Arroyo Burro Trail in partnership with County Parks and the Youth Corps.
- Rebuilding of the Hidden Valley Trail in partnership with the City of Santa Barbara Parks & Rec Department.
- Construction of the Franklin Trail P-Line on the Horton Ranch in partnership with the Friends of the Franklin Trail.

Current/Upcoming Projects

- \$200,000 Fund Raising Project for Tunnel and Jesusita Trails sponsored by SBTC and directed by Honorary CO-Chairs Bob & Patty Bryant.
- Rehabilitation Project for Jesusita Trail from Cater Filtration Plant to Moreno Ranch to improve equestrian access to the trail and decrease user conflict issues.
- Continued work with Montecito Trails Foundation to open access to the Franklin Trail in Carpinteria.
- Rehabilitation Project Fall 2011 for Rattlesnake Trail in partnership with the City of Santa Barbara Parks & Rec Department.
- Rehabilitation Project Fall 2011 for Gaviota State Park Trails in partnership with CA State Parks.
- Rehabilitation Project Fall-Winter 2011 for Goleta open space areas in partnership with the City of Goleta Parks Department.

Recent Grants

In the past three years the Trails Council has received \$127,000 in grants from a number of funding sources, including \$80,000 in grants in the first half of 2011.

- \$5,000.00. Planning & Mapping of the Gaviota Coast. Goleta Valley Land Trust 2009.
- \$2,000.00. Trail Management Plan for the City of Goleta 2009.
- \$6,000.00. Trail Rehabilitation & User Safety Grant. UCSB Coastal Fund 2009.
- \$3,500.00. Trail Re-route Construction and Survey for Jesusita Trail. Friends of the Jesusita Trail 2010.
- \$15,000.00. Development of Preliminary Route to Crest at Baron Ranch. Goleta Valley Land Trust 2010.
- \$15,000.00. Trail Rehabilitation Project for the Bill Wallace Trail in partnership with CA State Parks. WWW Foundation 2010.
- \$45,000.00. Development of Preliminary Route to Crest at Baron Ranch including Environmental Analysis and trail construction. Goleta Valley Land Trust 2011.
- \$15,000.00. Funding for Environmental Analysis for the Baron Ridge Trail. UCSB Coastal Fund 2011.
- \$20,000.00. Additional funding for the Bill Wallace Trail rehabilitation project and Baron West Ridge project. WWW Foundation 2011.

TRAILS COUNCIL CAPABILITIES

Santa Barbara Trails Council is ready and able to assist all public agencies in the county to support fund raising, trail management, trail design and trail construction efforts. SBTC is a 501(c)(3) organization, has taken a leadership role in advocacy for trail access and support for the maintenance and improvement of our existing trails.

RAY FORD

Executive Director, SBTC

Author of numerous books and maps on hiking, backpacking and mountain biking in the Santa Barbara area including Santa Barbara Day Hikes (1975-present), Trails of the San Rafael Wilderness (1974), Santa Barbara Mountain Biking (1992) and Santa Barbara Wildfires (1991). Currently Outdoor Editor for the Santa Barbara Independent. More than fifteen years experience coordinating volunteer trail projects and ten years experience designing, rehabilitating and repairing Santa Barbara area trails

EXPERIENCE

Host, Front Country Trails Working Group on Behalf of Los Padres Forest Association 2002-2005

As President of LPFA, hosted a four-year-long series of meetings dealing with user conflict issues that was a precursor to the current Multi-jurisdictional process.

Trail Crew Leader, LPFA

2002-2008

Developed both volunteer trail programs for the Association and a professional trail crew to assist both Los Padres National Forest, Santa Barbara City and Santa Barbara County with their trail maintenance programs. Leader of numerous 7-10 day long "Working Vacations" to reconstruct wilderness trails in the backcountry.

Trail Crew Leader, Montecito Trails Foundation

2002-2006

Maintained trails supervised by MTF including trail maintenance, reconstruction and trail design. Currently working with a Task Force composed of Forest Service, City and County members to help design safe multi-use trails.

Trail Crew Leader, Trails Council

2008-Present

Has worked with the City of Santa Barbara and Land Trust for SB County, SB County Parks and the City of Goleta on various trail projects as described above including San Marcos Preserve, Lake Los Carneros, Ellwood Mesa, the Douglas Family Preserve and other county trails. Is currently working on a fund raising and trail restoration project for Tunnel Trail.

AUTHOR & WRITER

1974-Present

Well-known writer of outdoor and recreational guides to trails in Santa Barbara County, Outdoor Editor for the Santa Barbara Independent, webmaster for the Santa Barbara Trails Council website (sbtrails.org). Ray is well known for his coverage of the Zaca, Gap, Tea and Jesusita fires.

AWARDS

National Trail Volunteer of the Year, U.S. Forest Service 2003; State Trail Worker Award for California 2006.



"One picture often says it all. By burning away the vegetation the Jesusita Fire of 2009 exposed what poor trail design, lack of maintenance and improper erosion control techniques can do to a trail over time."