LAND MANAGEMENT PLAN

CASCADE CANYON AND WHITE HILL OPEN SPACE PRESERVES

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Prepared for: **Marin County Open Space District**
Marin County Civic Center
San Rafael, California 94903

Prepared by: **Leonard Charles and Associates**
7 Roble Court
San Anselmo, California 94960
415.454.4575

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I. INTRODUCTION

The Cascade Canyon and White Hill Management Plan establishes goals, operating policies, and recommended management actions for the Cascade Canyon and White Hill Open Space Preserves. These two adjacent preserves are owned and managed by the Marin County Open Space District (MCOSD). This document is intended to be an informational and an operational handbook. The management actions recommended in this Plan have been reviewed per the California Environmental Quality Act (CEQA). This Final Management Plan includes amendments of the Draft Plan given the results of the CEQA review and the public review.

The following format is used to describe the Plan goals, policies, and recommended actions.

- This first section (Introduction) provides an overview description of the open space preserves and their existing natural and man-made resources. It describes the history of the preserves and the planning process. Finally, it describes the goals guiding this draft management plan.

- The Biodiversity Management Program describes existing natural resources on the preserves and how those resources will be protected and enhanced.

- The Fire Management Program describes the methods to be used to decrease the risk from fire ignition and the damage that could be caused by a fire starting on the preserves.

- The Access Program describes public access to the preserves.

- The Trails Program describes the existing and proposed trail system on the preserves.

- The Use Program describes allowed and prohibited preserve uses.

- The Sign and Information Program describes the type and location of signs recommended for the preserves.

- The Enforcement Program describes proposed methods of enforcing preserve rules and regulations.

- The Monitoring Program describes monitoring actions required for the other programs.

- The Implementation Program describes administration of the preserves and the schedule for recommended improvements.

- Background reports used to prepare this plan are separately bound as the *Appendix to the Draft Plan*. This separately-bound Appendix can be obtained from MCOSD.

A. Site Description and Location

1. Cascade Canyon Open Space Preserve

The Cascade Canyon Open Space Preserve consists of approximately 497 acres. As shown on Figures 1 and 2, the preserve is located west of the Town of Fairfax. The preserve is drained by three streams - San Anselmo Creek, Cascade Creek, and Carey Camp Creek. These creeks join to become San Anselmo Creek in the canyon bottom located west of the end of Cascade Drive. The canyon floor is the most heavily used portion of the preserve. In addition to being a major attraction in and of itself, the Cascade Fire Road and trails leading from that road are used by hikers, bicyclists, and equestrians to access public lands west, north, and south of the preserve.

The canyon bottom is located at an elevation of approximately 200 feet. The preserve includes uplands to the west, south, and north of the canyon floor with elevations reaching 1,042 feet. Roads and trails beginning on the canyon floor are relatively steep as they climb the surrounding ridges. Vegetation includes large areas of oak woodland, mixed hardwood woodland, grasslands, chaparral, and some redwood forest. The three main streams plus feeder streams support a riparian habitat.

The most used public access to the preserve is from the end of Cascade Drive in Fairfax with less-used accesses from the end of Canyon Drive, Toyon Road, and Bolinas-Fairfax Road. The public can also access the preserve from roads and trails on the Marin Municipal Water District to the west and south and from the adjoining White Hill Open Space Preserve to the north. Members of the Friends of Tamarancho can also access the preserve from Camp Tamarancho (a property owned and operated by the Boy Scouts of America property) to the north.

2. White Hill Open Space Preserve

The White Hill Preserve abuts the north edge of the Cascade Canyon Preserve. The preserve consists of approximately 390 acres that wrap around the west side of the Camp Tamarancho property. Elevations range from 320 feet along the preserve's east edge to 1,430 feet at White Hill.

The preserve is mainly uplands and contains feeder streams of Cascade Creek and other creeks to the east and north. Vegetation types consist of redwoods, chaparral, extensive grasslands, and oak and mixed hardwood woodlands.

Public access is provided from Sir Francis Drake Boulevard at the east end of White Hill Fire Road. Public access is also possible from Cascade Canyon Open Space Preserve to the south, the Gary Giacomini Preserve to the west (though there are two small private ownerships on the road between the Giacomini Preserve and the White Hill Preserve), and, for Friends of Tamarancho, from Camp Tamarancho to the south or east.

B. History of Preserves

1. Cascade Canyon Open Space Preserve

The Cascade Canyon Preserve was historically a part of the Rancho Canada de Hererra Land Grant. This Mexican land grant encompassed about 6,600 acres. The land grant was originally granted to Domingo Sais in 1839. The land passed to other owners at the end of the nineteenth century. Around the turn of the century, the Cascade Canyon area was included in the Bottini Ranch. In 1924, the Cascade Land Development Company took control of the ranch and began subdividing much of it for residential use. The core of the Cascade Canyon Preserve that includes the bottomlands along San Anselmo Creek was acquired after World War II by Floyd W. and Roberta B. Elliott.

The Elliott Family agreed to sell the land to the County in December, 1973. The agreement to sell divided the 474-acre property into three parcels and set forth the immediate purchase of Parcel 1 (261 acres; AP #197-100-11 and 15) which was acquired by the County on January 2, 1974. In December, 1974, the County acquired Parcel 2 (175 acres; AP# 197-100-06 and 16). This parcel, also known as Pam's Blue Ridge, was purchased with a donation from the Ettinger family in memory of a daughter who died in an automobile accident. In January, 1976, the third parcel consisting of 38 acres (AP# 197-100-05) was purchased with the Town of Fairfax under a Joint Powers Agreement. The County, in recognition of the Town's contribution to the purchase of the smaller 38-acre parcel, conveyed that 38-parcel to the Town for use as a Park and Nature Preserve. This conveyance included MCOSD easements over the property and the requirement that the 38-acre parcel would be managed per MCOSD's "Open Space Management Policies." This parcel was designated the "Elliott Nature Preserve." The total price for these properties was about $950,000 of which the Town of Fairfax contributed about $80,000; the sellers also gifted approximately $30,000 worth of property value.

In 1978, five small parcels were purchased totaling 12 acres (AP# 001-011-01, 001-012-01, 001-041-02, 001-042-01, and 001-042-02) at a cost of $270,000. In 1987, one parcel (AP# 003-053-15) comprising 2.1 acres was purchased at a cost of $30,000.

In 1987, the Town of Fairfax transferred title of the Elliott Nature Preserve (AP# 197-100-05) to MCOSD in order to facilitate management of that property. In this same year, MCOSD purchased a small (2.1 acres) parcel for $30,000 (AP# 003-014-10).

From 1994 to 1995, the County purchased 16 small parcels totaling about 7 acres located on the south-facing slopes above Pine Drive and below the Toyon Tanks Fire Road at the end of Toyon Drive (AP# 003-053-15, 003-061-04,05,06,&07, 003-063-01, 003-071-14,16,17,18,19,24,&25 and 003-072-03&04). The total price paid for these parcels was about $230,000 of which about $56,000 was money from the local community.

2. White Hill Open Space Preserve

This preserve was also part of the original Canada de Hererra Land Grant. White Hill was named after Lorenzo E. White, a rancher who raised livestock in the San Geronimo Valley area from 1850 to 1855. Portions of the preserve were a part of a 1,250-acre ranch owned by Phoebe Apperson Hearst at the turn of the century. Eventually, the land was incorporated into the 880-acre Camp Tamarancho owned and operated by the Boy Scouts of America. Camp Tamarancho is used by the Boy Scouts and other groups about 32 weekends per year beginning in March. In 1994, the County purchased 120 acres from the Boy Scouts of America (AP# 197-110-02 [portion]); the cost was $500,000 and paid for by MCOSD funds. This property forms the north end of the White Hill Preserve. In 1997, the County purchased Boy Scout properties totaling 270 acres (AP# 197-110-01 [portion] and 197-110-04 [portion]) for $860,000. These properties form the southern portion of the White Hill Open Space Preserve.

In 1994, the County obtained a 600-foot easement from the San Francisco Girl Scouts Council on AP# 197-110-03 to allow access across Girl Scout property to the 120 acres of Camp Tamarancho previously purchased.

3. Use of the Preserves

In historic times, both preserves were originally used for livestock grazing. The canyon bottom on the Cascade Canyon Preserve was used for picnicking and camping during the early part of the century. When the Cascade Canyon bottomlands passed to the Elliott family after World War II, Mr. Elliott used the land for a private hunting preserve. The area immediately west of the Cascade Drive entrance was used for quarrying river gravel during the period the Elliotts owned the land. The area that is currently the small meadow immediately west of the Cascade Drive entrance was used for loading trucks and as a vehicle turnaround area. As previously noted, the land passed into public ownership in the early 1970s.

Since the preserve was purchased by the County, it has been used in a fashion typical of all MCOSD's preserves, namely for pedestrian, bicyclist, and equestrian use of fire roads, equestrian and pedestrian uses of single track trails, exercising dogs, picnicking, birdwatching, botanizing, and similar passive uses. The canyon bottom, Cascade Falls, and the Inkwells area (on MMWD property upstream from Cascade Falls) have been popular destinations not only for neighbors of the preserve but by other area residents. Cascade Fire Road is the main artery through the lower part of the preserve. In addition to receiving relatively heavy use by preserve visitors, this road has a particular reputation as one of the birthplaces of mountain bike riding. One of the first mountain bike races (reputed by some to be the "first") occurred on this road, nicknamed "Repack Road," in 1976. The race was held every year thereafter until 1984 after which time MCOSD and MMWD prohibited the race due to the number of accidents. The road is still esteemed in the bicyclist community as one of the birthplaces of mountain biking. Increased use of both preserves by mountain bicyclists has resulted in significant controversy between those who would limit bicycle access, or ban it entirely, opposed to those who would prefer expansion of mountain biking opportunities.

The White Hill Preserve was historically part of Camp Tamarancho, an 880-acre property owned and operated by the Boy Scouts of America. The preserve was part of the backcountry of the camp and was used by the Boy Scouts and other visitors for hiking, nature study, and other camp activities. Since the preserve was purchased from the Boy Scouts, it has been used in a fashion similar to Cascade Canyon, except that this preserve contains one single-track trail (the Wagon Wheel Trail) that is open to bicycle use. However, due to its limited public road access and lack of loop roads/trails, this preserve receives much less visitor use than Cascade Canyon.

C. Goals for Preserve Management

MCOSD staff and the preparers of this Plan identified a list of preliminary goals. These goals were presented to the community at a public scoping meeting. Attendees of the meeting were asked to comment on the recommended goals. No one who attended the public scoping meeting expressed disagreement with the goals or suggested additional goals. The plan preparers did not receive any additional comments on the goals in the period subsequent to the initial scoping meeting. Thus, the following goals have guided the preparation of this document. The goals are listed in order of their priority, with Goal 1 being the most important and Goal 4 the least important.

Goal 1 Preserve and enhance the native plant and animal communities, geologic, hydrologic, and historic resources, and the scenic values of the Cascade Canyon and White Hill Preserves.

Goal 2 Consistent with Goal 1, maintain and enhance opportunities for public recreation, education, and aesthetic enjoyment of the Cascade Canyon and White Hill Preserves.

Goal 3 Consistent with Goal 1, reduce the threat of wildfire to the surrounding community.

Goal 4 Consistent with Goals 1 and 2, minimize and reduce the impacts of preserve use on the surrounding community.

To determine whether the existing use of the preserves as well as the recommendations of this Final Management Plan are consistent with these goals requires some additional discussion of how these goals are interpreted. The principal goal is to preserve and enhance the natural resources of the preserves. Public use is allowed consistent with there not being a substantial conflict with the principal goal. MCOSD does not have any specific guidelines regarding what level of disturbance or loss of natural resources is considered acceptable given public use. Obviously, any public use results in some loss of vegetation, erosion, and potential displacement of wildlife; however, public use is allowed on all MCOSD preserves. Thus, to determine whether use of the preserves has caused damage to natural resources to the degree that Goal 1 is not being met, the authors of this Plan have made judgments regarding the severity of these impacts. The judgments are based on the level of impact typically considered significant under the California Environmental Quality Act (CEQA) and comparison with the impacts resulting from public use of other parks and preserves in the area.

The programs presented in the remainder of this report describe how the preserves may be managed to meet these goals.

II. BIODIVERSITY MANAGEMENT PROGRAM

The primary goal guiding future management of the preserves is to "Preserve and enhance the native plant and animal communities, geologic, hydrologic, and historic resources, and the scenic values of the Cascade Canyon and White Hill Preserves." The following chapter describes existing resources on the preserves, identifies impacts and problems resulting from existing and future use, and recommends actions to maintain and enhance biodiversity.

A. Vegetation

1. Existing Vegetation

A detailed description of the types of plants and plant habitats occurring on the preserves is included in Appendix B (this Appendix is separately bound) and in the EIR that was prepared for the Plan; the following is a summary of those data.

As shown on Figure 5, the dominant plant cover on the preserves is mixed oak and/or evergreen forest dominated by coast live oak, California black oak, California bay, madrone, and Douglas fir with scattered blue oak and buckeye in the more exposed areas and occasional tanbark oak, bigleaf maple, and coast redwood in more shaded areas. Where forest is present, the forest cover is relatively mature with large trees providing a nearly complete 100 percent canopy coverage. This complete canopy coverage results in heavy shading and a relatively sparse understory, though there is frequently a somewhat pervasive thin lower understory layering of old (shaded out and senescent) brush, small trees and shrubs, and a patchy, but often abundant, distribution of poison oak. There are a number of typical herbs and grasses scattered beneath the general forest canopy, but actual ground coverage by vegetation is frequently less than 50 percent.

Between the forest stands are large areas of grasslands and chaparral. On the White Hill Preserve, large grass stands occur along the northwest edge of the northern section, much of the central section centered on White Hill, and on slopes south of Wagon Wheel Trail. There are fewer grassland areas on the Cascade Canyon Preserve; they include an area north of Middle Road Fire Road (east of Cascade Creek), south of Middle Road Fire Road near its west end, the north side of Happersberger Ridge, and the east slope of Pam's Blue Ridge.

These grasslands are typical of the larger region's grasslands in that much of the native species have been displaced by non-native species. The dominant cover is now comprised generally of weedy non-natives though native species such as needlegrass, blue wildrye, and other native grasses do occur. These grasslands also support a

variety of typical wildflowers including lupines, clarkia, checkerbloom, fiddleneck, poppies, tarweed, soap plant, and clovers. North slopes in particular tend to support a higher percentage of native grasses while most south-facing slopes are vegetated mainly by non-natives.

A few areas on the rockier, dry south slopes support mixed chaparral and coastal scrub communities. Most of these communities are dominated by species of the "hard" chaparral type such as chamise, common manzanitas, toyon, and scrub oak with occasional chaparral pea, silktassel, and ceanothus. In slightly wetter habitats, coastal scrub species are also present, including bush monkeyflower, black sage, coastal sagebrush, coyote brush, deerweed, and poison oak. Coyote brush in particular often forms small pure stands and sometimes larger expanses, especially on north slopes and along the edges of grassy clearings.

Of special interest are several areas of serpentine chaparral which support an assemblage of endemic and several rare shrubs, including Mt. Tamalpais manzanita, leather oak, Jepson's ceanothus, black sage, toyon, and smaller amounts of chamise. These rocky serpentine areas also support distinctive herb communities found on the more barren parts of these outcrops. Typical herbs here include star lily, coyote mint, and several other common species. Endemic and/or rare species include serpentine reedgrass, Tiburon buckwheat, Marin County navarettia, and one of the rare jewelflower species. These serpentine habitats also provide suitable habitat for other rare species that were not identified during the field surveys; these species, known to the area, include Brewer's milk-vetch, Oakland star tulip, Marin dwarf flax, and Marin checkerbloom.

The preserves contain a relatively small amount of riparian woodland, and this woodland is relatively poor in terms of development and species composition. Most drainages on the preserves are ephemeral and support mainly oaks, bay, and other essentially non-riparian trees and shrubs. Because of the dense canopy cover, there is relatively little understory. Most creekbed zones are moderately to heavily scoured and thus largely devoid of vegetation. The main stem of San Anselmo Creek in the canyon bottomland has widened and supports little riparian vegetation, likely due, in come part, to past quarrying activities in this area. The most shaded creekbed areas support only scattered ferns and a few other herbs. The lowermost sections of Cascade and San Anselmo Creek that contain water much or most of the year support the typical oak-bay canopy plus scattered Oregon ash, white alder, and a very few willows. Herbaceous growth on these creekbanks is still relatively meager, consisting largely of common non-riparian grasses and herbs along with poison oak, cream bush, hazelnut, and young oak and bay seedlings. The creekbanks themselves are almost completely bare due to heavy scour, heavy shading, and lack of soil, but they do support scattered umbrella sedge, rushes, cocklebur, infrequent silver sedge, and several common weeds.

In general, the vegetation on the preserves is a mosaic of plant communities that is typical of the area. The potential problems involve the spread of broom and other exotics, some loss of vegetative diversity due to Douglas fir invasion of oak woodlands, and general loss of vegetation due to trail and road use. These problems are discussed in more detail below.

2. Existing Problems

a. Broom

The most significant vegetation-related problem on the preserves is the existence and spread of broom populations. This invasive, non-native shrub has spread through many of the public and private lands in Marin County and other parts of the Northwest. While broom occurs on the two preserves, it generally does not form extensive stands as are found on many other MCOSD preserves, the MMWD watershed, and other public lands in the County. While broom is not widespread when compared to many neighboring public and private properties, there are several large invasive stands along Toyon Tanks Fire Road, the area from the eastern boundary of the Cascade Canyon Preserve to Toyon Fire Road, and the area along the eastern boundary of the White Hill Preserve from Sir Francis Drake up to White Hill Fire Road. The identified stands are shown on Figure 6 and include:

- scattered plants along Creekside Fire Road from its north end to the creek crossing; this includes one plant 225 feet from the Camp Tamarancho property line, 10-15 plants at 300 feet, 10+ plants at 1,025 feet, a large patch at 1,160 feet, and 25+ plants at 1,400 feet;

- scattered plants with several larger populations along much of Toyon Fire Road, particularly in the central part of the road length; there are relatively few plants in the northernmost 1,000 feet and scattered plants in the southernmost (or western) 1,200 feet;

- thick stands along Toyon Tanks Fire Road; this stand extends down the hill onto private property;

- thick stands along most of Cul-de-sac Fire Road and portions of Cul-de-sac Trail; stands in the woodlands between Cul-de-sac Trail and the MCOSD property line; the three stands along Cul-de-sac Trail include (starting at the south end at the Cul-de-sac Fire Road junction): a large patch stretching from the junction for about 360 feet to the north, a second relatively large patch that starts about 100 feet north of the first patch and stretches for about 100 feet, and a small patch located about 230 feet from the north end of the trail;

- one relatively small stand on the non-recognized connector trail between Ridge Trail and Cul-de-sac Trail, located about half way up the trail;

- scattered plants along Ridge Trail about 340 feet from its start at Ridge Road;

- scattered stands along White Hill Fire Road in the northwest sector of the White Hill Preserve; the stands along this road include a stand at the junction of the road and the non-recognized Martha McCormack Trail, a larger stand about 200 feet south of this first stand, a small stand in the woods on the north side of the road about 320 feet north of the intersection with Sherwood Forest Fire Road (this stand was pulled by the Plan authors, but should be monitored), a larger stand near the repeater

station on the west side of the preserve, and a small stand to the south near the Camp Tamarancho property line;

- thick stands on the east slope above Sir Francis Drake Boulevard in the Sherwood Forest area;
- a few scattered plants near the end of the Concrete Pipe Trail (thicker stands are off MCOSD property to the east);
- scattered plants on Middle Road Fire Road west of its junction with Toyon Fire Road and Middle Road Cut Trail;
- two stands along a non-recognized trail that joins Toyon Fire Road near its southeast corner (this trail accesses the eastern end of Toyon Drive); one stand is about 140 feet from Toyon Fire Road and the other is about 240 feet from the start. This trail also intersects larger stands near the property line which are part of the same stand that is east of Cul-de-sac Trail and extends along this entire border area;
- a relatively thick stand for about 100 feet on the north side of Pam's Blue Ridge Trail starting at Toyon Fire Road; also one large plant about 2,230 feet from the start;
- an expanding population spreading up into the preserve from private lots west of Pine Drive;
- two small plots at the Cascade Drive entrance and at the east end of Canyon Trail;
- scattered plants along Carey Camp Loop Trail;
- a plot on Cascade Fire Road near the Spit Rock Trail;
- one large plant about 200 yards north of Cascade Falls;
- a plot on Blue Ridge Fire Road north of its intersection with Middle Road Fire Road;
- volunteers or MCOSD have previously treated several broom stands, including stands at the east end of the Canyon Trail and on Middle Road Fire Road, though not all plants have been eliminated.

It is likely there are other stands of broom, particularly in the woodland understory where the preserves border private residential properties. While the preserves do not support many large stands of broom (i.e., dominating the habitat over several acres), it is essential that these existing stands be removed so that they do not spread further and displace native vegetation. A major goal of this Plan as regards vegetation is removal of this plant. There is no easy or foolproof way of eliminating broom stands. Recommended methods of eradication include pulling, cutting during certain periods of the year, burning, and chemical spraying.

b. Other Invasive Non-Native Species

There are a few areas that include small populations of the invasive yellow starthistle, including near the north end of Toyon Fire Road and at the Sherwood Forest trailhead. The meadow at the Sherwood Forest trailhead contains a number of invasive exotics including yellow starthistle, purple starthistle, fennel, broom, and hardinggrass. It is difficult to control yellow starthistle due to its dominance in many Marin grasslands. However, the stands on the study area preserves are very small and can easily be eliminated by cutting at the right period. A few other non-native invasive plants (e.g., pyracantha) were seen on the preserves and should be removed. Because yellow starthistle can quickly invade large areas of grassland, removal of the few plants that currently exist on the preserves is considered the first priority for vegetation management.

c. Douglas Fir Invasion

A secondary concern is the invasion of Douglas fir into oak woodlands and chaparral areas. Douglas fir is one of the few tree or shrub species that does not resprout after a wildfire. As such, its range was historically restrained by natural or Native American-caused fire. The long period of fire suppression has resulted in this species invading oak-dominated hardwood forests as well as some chaparral communities. The problem with this invasion is that if a long enough fire-free period occurs, the fir mature and shade out the oaks and other hardwoods. This ecological succession can lead to oak woodlands being supplanted by a coniferous woodland dominated by Douglas fir. This succession is quite visible in many areas on the MMWD watershed. While some people may look upon this change of forest type as "natural," it should be remembered that this succession has occurred in the absence of a "natural" fire regime. It also should be noted that oak-dominated woodlands are a vanishing habitat type in the area and the State. As such, it should be the goal of MCOSD to maintain its oak woodlands.

The *Mount Tamalpais Vegetation Management Plan* recommended a series of woodland understory prescribed burns to remove invading firs as well as to reduce understory vegetation in the woodlands. The extent of the invasion is not as widespread or serious on the Cascade Canyon and White Hill Preserves. As such, woodland understory burning is not recommended. In addition, the recent attack on oaks by Sudden Oak Death (SOD) may substantially reduce oak populations in the coming years. If this were to occur, the presence of Douglas fir in oak habitat might be beneficial. The District should monitor its oak woodlands. If the current epidemic ends or does not appear to kill substantial numbers of oaks, it is recommended that invading firs in oak woodlands be cut or pulled by staff and/or volunteers and that the status of the succession be monitored to ensure the long-term survival of these oak woodlands.

d. Trail and Road Use Effects

i. Discussion

The preserves total about 887 acres. There are approximately 10 miles of fire roads, 6 miles of recognized trails, and 5 miles of major non-recognized trails on the preserves. Assuming an average width of 10 feet for fire roads and 2 feet for trails, the total amount

of land that has had vegetation removed is 14.25 acres (12.1 acres of this total is the result of fire road construction) or 1.6 percent of the total preserve acreage.

Some residents of the area report that increased preserve usage over the past 10-15 years has resulted in the widening of the High Water Trail, the Canyon Trail and Cascade Fire Road in the canyon bottom area as well as trails and roads in other areas. These commenters note that this trail and road widening has reduced or even eliminated populations of locally uncommon wildflowers along these trails and road, especially along the High Water Trail. Two particular areas of damage were noted, at the east and west ends of the High Water Trail. These commenters have stated that portions of the Cascade Fire Road between its eastern end and Cascade Creek have widened 1-2 feet due to increased usage and grading practices. They have also noted widening of both trails through the canyon bottom, with consequent loss of vegetation.

Other areas that neighbors and other commenters have identified as locations where trail widening and loss of vegetation have occurred include:

- Portions of Happersberger Trail were widened by illegal bicycle use a number of years ago. This widening resulted in the substantial depletion of a small population of white ground iris at one location along this trail. This iris is not a special status plant species, though the white variety is a rare color variation. This widening has been essentially eliminated by previous MCOSD efforts, plus this trail is not now being used by bicyclists. The area is essentially restored, though one can see traces of the past widening where revegetation has not been completed. Recently, there is some evidence that bicyclists may again be using this trail.

- The construction of the illegal Split Rock Trail in the 1990s resulted in the loss of a number of trees and the overall loss of about 0.1 acre of vegetation on the preserve (about 1,500 feet of trail x 3 feet of trail width plus clearing of bordering trees and shrubs).

- Loss of vegetation by use of the old fire trail that leads from near the top of White Hill north to White Hill Fire Road. This is about an 800-foot trail through grassland that has been widened by past use.

- The authors of this report have noted the loss of vegetation along other non-recognized trails on the preserves.

While there is little question that road and trail widening have occurred in some areas, the overall impact on vegetation has not been substantial. Assuming that all fire roads were originally 8 feet wide and trails 1.5 feet wide and that all roads have been widened by 2 feet and trails by 0.5 feet due to heavier use patterns over the past 10-15 years, 2.7 acres of vegetation have been lost due to this widening. This is not considered a significant loss of vegetation. In addition, this estimate is very conservative as individuals who have noted trail and road widening state that such widening has occurred in restricted areas such as the canyon bottom, in the area where the illegal Split Rock Trail was constructed, and a few other locations. Most trails and roads are not heavily used and likely have not widened to the degree assumed in the above estimate.

In the canyon bottom area (between the Cascade Drive entrance and the junction of San Anselmo Creek and Cascade Creek), the amount of vegetation lost due to road and trail widening is about 0.16 acre. This estimate assumes that the amount of widening has been 2 feet for the entire 0.46 miles of Cascade Fire Road and the 0.37 miles of the Canyon Trail and the High Water Trail were widened by as much one foot.

The overall loss of vegetation due to existing roads and trails plus potential widening that has occurred through increased use over the past 10-15 years is not substantial. There is no evidence that any special status species of plants have been lost. There is reported evidence that locally uncommon plants have been lost. As described below, this plan includes recommendations to address this loss.

To reduce impacts to vegetation and wildlife and reduce the amount of soil erosion caused by use of the preserves, this Plan recommends that 10 non-recognized trails and 2 recognized trails, plus a portion of a third recognized trail, be closed. The Plan also recommends that one fire road be converted to a multi-use trail. The proposed closures are listed below along with the basic reasons for these closures; the trails proposed for closure are shown on Figure 7. Additional rationale for the closures will be provided in the subsequent sections on Wildlife and Geology. Recommended closures include:

Recognized Trails

1. Cut Trail. This 600-foot long trail is a shortcut trail between Cascade Fire Road and Middle Road Fire Road. This trail is not needed for access, and the trail contains areas of erosion plus its closure would provide additional wildlife and vegetative habitat.

2. Happersberger Ridge Trail. This 2,000-foot long trail is very lightly used and traverses an area that otherwise receives little human intrusion. It is recommended for closure to provide additional wildlife habitat. West of the preserve boundary, this trail travels across MMWD lands. The trail on MMWD property is a non-designated and non-maintained trail which MMWD does not sign at its western terminus.

3. Burnt Tree Trail. This trail is not heavily used, and the north-south section of the trail is quite steep, particularly as it nears the intersection with Creekside Fire Road. It is recommended that a new trail section be constructed from the northeast corner of the trail to extend east to meet Creekside Fire Road near the intersection of Creekside Fire Road and the Connector Fire Road. The north-south section of the trail will then be closed. This closure is recommended to reduce erosion and to provide additional wildlife habitat.

Non-Recognized Trails

4. White Hill. A steep trail that follows an old firebreak down the north side of White Hill should be closed. The south end of this trail should be blocked to prevent people from traveling downhill.

5. Northeast Corner of White Hill Preserve. A non-recognized trail has been constructed to connect two sections of White Hill Fire Road where it leads off public property. A new trail constructed to meet MCOSD trail standards is proposed to the south of this existing trail, and the existing trail should be closed as it is too steep and eroding.

6. Trails Paralleling White Hill Fire Road. There is a series of trails that parallel White Hill Fire Road north of White Hill. Most of these non-recognized trails are acceptable, but there is one section that cuts a road switchback that has a deep gully likely caused by bike use; this trail should be closed.

7. Trail Between Cascade Creek and Wagon Wheel Trail. This trail is very steep, following an old firebreak for part of its length. It has the potential for significant erosion and should be closed. The south end of this trail is very indistinct and does not need to be signed, but the north end should be signed.

8. Cascade Canyon. This trail starts at the top of Cascade Falls at the northern end of the recognized Cascade Canyon Trail and extends about 1,600 feet on MCOSD property and then onto MMWD property to the Inkwells location. The section of the trail on MCOSD property is recommended for closure to eliminate erosion and to enhance wildlife use of the canyon bottom area. If MMWD agrees, that portion of the trail on its property should also be closed.

9. Connector between Cul-de-sac Trail and Ridge Trail. This trail contains steep slopes which are eroding and are unsafe for travel. The trail accesses Ridge Trail that is not on MCOSD property and which some neighbors in the Ridge Road area wish closed.

10. Extension of Blue Ridge Fire Road. Immediately north of the east end of Wagon Wheel Trail, users are developing a new trail up an old firebreak to connect two sections of Blue Ridge Fire Road. This trail is excessively steep and eroding, and should be closed.

11. Two Parallel Trails on Toyon Fire Road. One trail parallels Toyon Fire Road near its southeast corner and climbs a very steep grade to a rock outcropping and then to Pam's Blue Ridge Trail. It is very steep and eroding. The southern extension of this trail that extends off MCOSD property should also be closed to enhance wildlife use of the area. The second trail is a short-cut trail that crosses a loop in the road.

12. Canyon Trail Skid Road. An old skid road that intersects Canyon Trail about 100 yards from the bridge should be closed. This road is steep and eroding.

13. Trails West of Pam's Blue Ridge Trail. There is a trail system that starts near the southern or eastern terminus of Pam's Blue Ridge trail and travels west and north through the heavily wooded canyon area between Pam's Blue Ridge Trail and Middle Road Fire Road. This trail system should be closed primarily to enhance wildlife use.

While these closures are not recommended solely on the grounds of preserving vegetation, the closures will result in increased vegetation on the preserves, assuming that users obey the closures. The closures would allow the potential revegetation of about 15,000 feet of trail or about 0.7 acres.

ii. Cascade Canyon Bottomlands

To address the loss of vegetation along Cascade Fire Road and the two main trails in the area, the road and trails should be reduced in width to allow revegetation of native species. This reduction can be accomplished by placing logs, trunks of dead trees, or other suitable material along the road and trails in areas where widening is evident. While in most cases it is best to leave dead trees where they fall, as these dead trees are an important component of the ecosystem functioning, there are likely locations where there are a number of dead trees, some of which could be removed. The inventory of dead trees is likely to dramatically increase on the preserves given the current epidemic killing tanoaks, live oaks, and, possibly, other oaks in the area.

The area immediately west of the Cascade Drive entrance (at the east end of the High Water Trail) is an area where some individuals believe that excessive roadway and trail widening have resulted in a loss of vegetation. This grassy area was formerly the equipment turnaround when quarrying was conducted in the adjacent area. MCOSD staff uses this meadow for equipment staging during patrolling, emergencies, and maintenance. As such, District staff does not believe that logs or other material should be placed along the road in this area. However, the District recognizes the erosion and loss of vegetation in this area and may in the future consider converting this meadow area to a woodland.

To further reduce widening of fire roads in this area and elsewhere, MCOSD should instruct equipment operators grading the roads to not grade the entire width of the road in locations where the road has become too wide. Grading should minimize the amount of road surface to allow revegetation of road edges. MCOSD staff states that they currently request grading operators to minimize the road surface, and this practice should be continued. MCOSD staff will need to monitor the grading to ensure that only necessary grading occurs.

The reader should also refer to the subsequent Use Program. This program discusses several options for realigning Cascade Fire Road, providing new bridge crossings, and possibly closing the High Water Trail. While the benefits to vegetation and other sources are compared for the several options, the recommendation of this Plan is that the road not be realigned, no new bridges be constructed, nor any recognized trails in the area be closed.

iii. Illegal Trail Construction

The construction of illegal trails results in the loss of vegetation. MCOSD should patrol the preserves on an ongoing basis to identify any new illegal trail. If illegal trail construction is found, the trail should be immediately blocked. Where feasible, the trail should be restored to its pre-existing condition as soon as time and resources are available.

e. Impacts on Special Status Species

Most special status plant species on the preserves are located in chaparral areas, generally chaparral situated on serpentine soils. No new trails are proposed through such areas. Existing trails, even those that have been identified by commenters as being widened by increased use, do not pass through areas with known special status plant species. A botanical inventory of the trails and roads was conducted for the EIR for this Plan to determine the location of all special status species. No special status species were identified along roads or trails

3. Effects of Other Management Recommendations

a. New Trails and Roads

Subsequent sections of this Management Plan recommend reconstruction of one fire road, construction of two new trails, and relocation/reconstruction of portions of three trails. The effects of this construction on vegetation are summarized below.

- This Plan recommends the reconstruction of the southernmost 500+ feet of Blue Ridge Fire Road to eliminate an overly steep and eroding road segment (see subsequent subsection on Geology for more discussion of this reconstruction). The new road alignment would travel east to connect with Middle Road Fire Road so as to eliminate this steep section. Reconstruction of this road would require removal of some trees and other vegetation. The area where the road would be realigned is oak woodland, and the loss of a few trees in this area would not be significant, particularly given the benefits realized by the reduction in ongoing erosion. The section of the road to be abandoned would be available for regrowth of trees and other vegetation so that, over the long term, the amount of native vegetation removed would be mitigated by the amount of area available for revegetation.

- Subsequent sections of this plan also call for construction of a new connector trail between Sir Francis Drake Boulevard and Sherwood Forest Fire Road. This trail would be about 3,500 feet long. It would travel through oak woodland and grassland both of which have heavy stands of French broom. Part of the route would follow an old road bed. In general trees can be avoided when constructing this trail, though it may be necessary to remove a few small trees.

- A second new trail is proposed to connect two portions of White Hill Fire Road where it crosses onto private property near the northwest corner of the White Hill Preserve. This new trail would be 2,000-3,000 feet long. It would replace an existing 1,200-foot long non-recognized trail that would be available for revegetation. This new trail

would cross through more densely forested area, and it may be necessary to remove a few small trees to allow its construction.

- The subsequent Trails Program recommends the eventual designation of the Martha McCormack Trail that traverses the Sherwood Forest area on the White Hill Preserve as a recognized trail and to reconstruct the easternmost 300 feet of this trail, as it is currently too steep. This will require constructing about 500-800 feet of new trail in this area.

- The Trails Program recommends that the southernmost section of the Burnt Tree Trail be closed and a new section of trail be constructed to connect the remaining section of Burnt Tree Trail with Creekside Fire Road near that road's intersection with the Connector Fire Road. It is estimated that approximately 2,200 feet of new trail will be constructed and 1,600 feet of existing trail will be closed.

- This Plan recommends reconstruction of the southernmost 300+ feet of the short connector trail between the Concrete Pipe Fire Road and the Carey Camp Loop Trail. This reconstruction is recommended to address a hazardous trail section that has substantial erosion. The trail reconstruction would probably require construction of 500-800 feet of new trail with the old trail section being abandoned.

- This Plan recommends that Creekside Fire Road be closed as a fire road and reconstructed as a multi-use trail. This reconstruction would reduce erosion and allow revegetation of much of the existing road bed. The road is not needed for fire response.

In total, there would be the potential construction of as much as 10,300 feet of new trail and 1,050 feet of new fire road. However, there would be the abandonment of about 15,000 feet of existing recognized and non-recognized trails and 500 feet of existing road. Thus, less new trail and road would be constructed than would be closed.

4. Recommended Actions

a. Broom

When broom is removed, removal should be per the following priority list:

BV-1. In constructing the fuel reduction zone system, broom plants within the treatment zone should preferably be pulled, and, if this is not feasible, given the size of the patch, cut. Cut or pulled plants can be spread on the surface and burned after the first rains make it safe to do so. "First rains" mean the first autumnal rains that typically occur in October or early November. These rains typically provide sufficient moisture in standing vegetation to retard the ability of fire escaping the burn pile from quickly spreading into nearby standing vegetation. The roads would not be muddy or impassable after these early rains. The piled plants must be sufficiently dry prior to burning. The plants that are cut will resprout and new seedlings will sprout. New plants should be pulled and resprouts cut about every two to three years. Several thick stands along the proposed Toyon Fire Road fuel reduction zone and the Cul-de-sac

Fire Road fuel reduction zone are south facing grassland stands. These stands can be cut in the late summer rather than pulled; the cut plants should be subsequently burned.

It is recognized that there will be a tendency to cut these broom plants rather than pull them in order to facilitate fuel reduction zone construction. However, MCOSD should be aware that cutting these large plants will cause them to resprout, and the resprouts are more difficult to pull then the original plants. In addition, fuel reduction zone construction can open up areas to the spread of broom. Given the goal of eradicating this plant, MCOSD should strive to pull as many broom plants within the fuel reduction zones as possible.

BV-2. Annually remove new broom seedlings from the area historically free of broom, namely the west half of Cascade Canyon Preserve and the south half of White Hill Preserve.

BV-3. Monitor the small patch where plants were removed in February, 2000. This patch is located approximately 325 feet west of the junction of White Hill Fire Road and Sherwood Forest Fire Road. Handpull any new seedlings. Monitor the stands where volunteers or MCOSD have previously removed broom, including Canyon Trail and Middle Road Fire Road. Pull the few plants along the Concrete Pipe Road, the single invader on Pam's Blue Ridge Trail, and the single plant on Middle Road Fire Road.

BV-4. Pull or cut the large broom plants on White Hill Fire Road near the repeater station. Cut or pull smaller plants. Many of these plants are on a south-facing slope where cutting could be successful. This action should include removing the smaller population to the south near the property line with Camp Tamarancho. Large plants that are cut should have the remaining trunks cut vertically by a knife or machete or otherwise have the bark between the cut and the ground macerated. This technique has been shown to substantially reduce the ability of these large plants to resprout. Ideally, large plants are cut in the late summer or early autumn while their food stores are at their lowest point. Remove new seedlings as they appear. If resources are available, the large broom plants would be piled on top of the seedbed and burned to "flush" the seedbed. New seedlings resulting from "flushing" can be removed with a weedeater.

BV-5. Pull or cut plants along Creekside Fire Road.

BV-6. Pull the scattered plants west of Ridge Trail (a trail on private property to the east of the preserve boundary) and the one patch on the non-recognized connector trail between Cul-de-sac Trail and Ridge Trail.

BV-7. Pull the broom in the one patch on Cul-de-sac Trail north of the junction with the non-recognized connector to Ridge Trail.

BV-8. Pull plants along the non-recognized trail that intersects the Toyon Fire Road near its southeast corner.

BV-9. Pull the broom on Cul-de-sac Trail in the first patch south of the junction with the Ridge Trail connector trail. Remove invading seedlings from the larger patch to the north along this trail.

BV-10. Once the Toyon Fire Road fuel reduction zone is constructed, broom plants north and west of this road should be pulled or cut to prevent broom from extending into the interior of the preserve.

BV-11. As resources become available, the following stands should be attacked; they are listed in order of priority: 1) the two stands east of the intersection of White Hill Fire Road and the non-recognized Martha McCormack Trail; 2) stands along Toyon Fire Road that were not removed during fuel reduction zone construction; 3) stands not removed during construction of the fuel reduction zone along Toyon Tanks Fire Road; 4) stands in the woodlands on the Cul-de-sac Trail Ridge down to Ridge Trail; 5) stands along the east side of the White Hill Preserve between Sir Francis Drake Boulevard and White Hill Fire Road; and 6) stands along the south edge of the Cascade Canyon Preserve between the Middle Road Cut Trail and the Toyon Tanks Fire Road.

BV-12. All the stands listed under No. 11 above should be visited to remove young seedlings that are expanding the populations. While the main stands may not be treated until more efficient control techniques are identified and/or substantial resources are available, every effort should be made to ensure that these stands do not expand.

BV-13. The District should establish a process whereby visitors can report new broom populations not identified in this report. It is possible that this work could be done by the Environmental Stewards. The stewards or District staff should handpull or cut these small populations. The stewards or District staff should monitor treated areas each year to remove new seedlings. The stewards or District staff should establish a volunteer program to pull and cut broom and to monitor treated areas. It is recognized that there are many public land agencies who have volunteer programs for broom removal and other restoration activities and that there is likely not a large pool of available volunteers. However, it is possible to sign up local residents who have a particular interest in the preserves in their neighborhood. Many of the broom stands are small and can be removed and monitored by a small number of people. The main aim is to provide the volunteers with a target stand that can be removed and monitored within a reasonable amount of effort. One does not want to start with some of the large stands that would require thousands of hours to treat.

b. Yellow Starthistle and Other Exotics

BV-14. Wherever possible, yellow starthistle plants should be hoed out or cut. If cut, the cutting should occur when the flowers have opened and plants should be cut at ground level. The area should be revisited to re-cut any plants that reflower. At this time, the only known populations are a few plants at the north

end of Toyon Fire Road and a small population in the flat area at the Sherwood Forest entrance to the White Hill Preserve.

BV-15. The small number of other invasive exotics should be hoed out, when identified. Any pyracantha should be cut.

c. Douglas Fir Invasion

BV-16. The District should periodically monitor its oak woodlands. If the current fungus/beetle epidemic ends or does not appear to kill substantial numbers of oaks, it is recommended that, as time permits, invading firs in oak woodlands be cut or pulled by staff and/or volunteers and that the status of the succession be monitored to ensure the long-term survival of these oak woodlands. Small firs can be handpulled or lopped off (since they do not resprout). Larger trees can be cut down with a chainsaw. If there is access to the area where the trees are cut, they can be removed and used for roadway lining or other uses on the preserves or provided as firewood.

d. Meadow Restoration

BV-17. Additional trees should be planted in the small meadows along the Cascade Fire Road between the first and fourth crossings of that creek to provide shading of the stream. Consider converting the meadow inside the entrance gate off Cascade Drive to a woodland.

BV-18. The area that is located at the Sherwood Forest entrance should be restored. In the past, spoils from roadwork on Sir Francis Drake Boulevard have been spread in this area. With these spoils came seeds of several non-native invasive plants. All these invasives should be removed, the site disked or otherwise prepared, and the area reseeded with a perennial grass and wildflower mix, using species native to the Preserves.

BV-19. An area at the west end of the High Water Trail (shown on Figure 11) should be replanted with grasses and herbs, using species native to the Preserves. Temporary fencing will be needed to establish the new planting. Signs will be needed to inform people to stay on the trail in this area.

e. Trails

BV-20. The 13 trails listed in Section-C-1-c (Trail and Road Displacement of Vegetation) above should be closed. Trail closure should include signing and where necessary structural blocking. When it can be demonstrated that users are obeying these closure rules, MCOSD should monitor the trails to determine if they are naturally revegetating. If they are not, then MCOSD should consider replanting these trails as resources become available.

BV-21. During construction of new trails and the road realignment, every effort will be made to eliminate the need to remove trees. Trails and roads shall be constructed no wider than needed for safety so as to minimize vegetation loss.

BV-22. When the southernmost section of Blue Ridge Fire Road is realigned, revegetate the abandoned section.

BV-23. To reduce the effects of trail and road widening in the Cascade Canyon bottomland, the District could line sections of the trails and Cascade Fire Road that have been widened or are in danger of being widened with logs, downed trees, or other available material to reduce the travel width. Trees may need to be placed on supporting rocks or other material so that runoff from trails and roads can travel beneath the trunks. By lining sections of Canyon Trail, Cascade Fire Road, and High Water Trail with these downed trees, users will be restricted to narrower road and trail sections, thus reestablishing the historic trail and road widths.

BV-24. Future grading of fire roads shall be limited to grading only that portion of the fire road actually needed for vehicle travel. Equipment operators shall be instructed to follow best management practices for wildland dirt roads, including not grading the edges of the roads except where needed to provide proper road drainage.

BV-25. Erosion-control netting shall be placed on the old fire trail that has become a non-recognized trail that leads from near the top of White Hill to the White Hill Fire Road. Native grasses and wildflowers shall be planted on this netting to control erosion and reestablish native vegetation.

BV-26. District staff and/or Environmental Stewards shall monitor the preserves on an ongoing basis to identify any illegal trail construction. If such construction is found, MCOSD should immediately block the completed trail and, where practical, restore the trail to its pre-existing condition.

f. Oak Mortality

BV-27. If and when methods for controlling the current epidemic attacking oak trees on a landscape scale are identified, MCOSD shall consider implementing those techniques if the epidemic is shown to affect large numbers of trees on the preserves.

vi. Special Status Species

BV-28: The MCOSD staff ecologist will visually survey all construction sites (trails, fuel reduction zones, etc.) for special status species before the project begins. If special status species are found, the staff ecologist will recommend measures to avoid impacts and assess the area after completion of the project to determine the effectiveness of the mitigation.

B. Wildlife

1. Introduction

Wildlife surveys and analyses were conducted on the property as part of preparing this Plan; the complete wildlife report is included in Appendix C (this Appendix is separately bound). This complete report fully describes the wildlife habitats on the preserves, observed, probable, and possible wildlife species, the official status and presence of special status species, and likely impacts to wildlife.

The wildlife survey indicated that there is a diverse and healthy wildlife community, including several sensitive species, inhabiting the variety of habitats on the preserves. In general, past and existing use of the preserves does not appear to be substantially affecting most wildlife species. However, human use and presence on the preserves undoubtedly have displaced some wildlife from the area nearest heavily used trails and roads. In general, most mammals and reptiles are unaffected by human use of trails and roads since they tend to be nocturnal. The habituation of bobcats to human presence on the GGNRA indicates that even large carnivores make use of these types of areas. The recent spread of mountain lions into the area, a species typically considered sensitive to human presence, is another indication that the preserves provide useful habitat for most mammals and reptiles.

Most bird species are similarly tolerant of human presence, particularly when it occurs along known routes as most birds become habituated to routine human intrusion. However, some species will not construct their nests near roads or trails where the activity levels are too high. Tolerance to human presence varies from species to species (raptors are considered to be among the most sensitive birds as regards presence of humans near their nest). In general, a buffer of 150 feet between a trail and a nest is considered sufficient buffer for most raptors, except eagles, but eagles do not nest on the preserves (Winter, personal communication).

A number of commenters at the public scoping meetings indicated that the preserves should be better managed to preserve habitat for wildlife, even if this required a reduction of use on the preserves. This opinion was not explicitly countered by other attendees of the meetings. While there is no indication that existing use of the preserves is substantially affecting wildlife and that such use is similar to the use of other recreational wildlands in the county, it is recognized that reducing human presence in certain portions of the preserves could benefit many species of wildlife. The reduction of use and creating additional wildlife sanctuaries is addressed in more detail in Section 3 below.

Other management issues center on effects upon several sensitive wildlife habitats including streams and streambank vegetation, the redwood grove near the north end of White Hill Preserve (often called Sherwood Forest), and some of the chaparral areas. Another important consideration is the effect of free-roaming dogs on wildlife. Finally, there are the possible effects of other actions recommended in this Plan. All these issues are addressed in more detail below.

2. Special Status Species

Seven sensitive wildlife species were identified on the preserves, including northern spotted owl, winter-run steelhead, Cooper's hawk, white-tailed kite, horned lark, wrentit, and the common poorwill. The locations where these species were found has been provided to MCOSD; the locations are not specifically shown in this report to reduce the chance that these sensitive species would be harassed or bothered. It is noted that no red-legged frogs were observed on the preserves. This conclusion was subsequently corroborated by a field survey conducted by the MCOSD staff naturalist to examine potential red-legged frog habitat in the Cascade Canyon area (Petterle, personal communication).

3. Sensitive Wildlife Area

As was mentioned above, wildlife typical of the area continues to use the preserve despite human use. Birds sensitive to human presence have habituated to that presence and likely make nests at an appropriate distance from roads and trails. To enhance wildlife habitat, particularly for birds and other animals sensitive to human presence, it is recommended that several trails be closed and that Cascade Canyon Preserve be designated a "sensitive wildlife area."

Currently, as shown on Figure 8, trails and roads divide the preserves into a number of discrete blocks of habitat. The existing blocks of wildlife habitat are defined as un-trailed or un-roaded blocks at least 150 feet from a trail or road. While wildlife cross these trails and roads to access adjacent blocks, closure of some of these trails and roads would provide additional habitat where wildlife could nest and forage with minimal human interruption. While it is still possible that the occasional hiker could pass through the area off a trail, this occasional presence would not likely seriously affect wildlife in the area.

Figure 8 also shows the resulting wildlife habitat blocks that would result if the trail closures previously identified above in the Vegetation section of this program were implemented. These closures would substantially increase the areas where there would not be a constant human presence.

MCOSD allows the designation of Sensitive Wildlife Areas (SWAs) on its preserves. There are no specific guidelines for what uses are allowed in these areas. On other preserves where the designated areas have been established, the general rule has been to require that dogs be on leash at all times within the areas. Signing is placed to inform the public that the areas are SWAs. Some SWAs include fencing to protect particularly sensitive habitat. MCOSD staff has stated that additional restrictions could be enacted including a prohibition on dogs, trail closure, and/or requiring that users stay on designated trails within the areas.

While preparing this Plan, the authors identified five potential SWAs for the preserves. After further conversations with MCOSD staff, it was determined that, given the presence of a number of special status wildlife species on Cascade Canyon Preserve, that the entire preserve warranted designation as a Sensitive Wildlife Area. This is the recommendation of this Plan. Within the Cascade Canyon Preserve, dogs will be

required to be on leash at all times. The Preserve will be signed to inform the public of its status as an SWA. Trail closures previously recommended will be implemented and signed. Dogs will continue to be allowed off leash (but under voice control on the fire road) in the White Hill Preserve (on White Hill Fire Road).

4. Chaparral

The chaparral habitat may be the most sensitive wildlife habitat on the preserves. Birds which breed in chaparral either nest on the ground or in low shrubs. During the period of incubation and while the fledglings are in the nest, the entire brood is vulnerable to disturbances from humans and domestic animals. Chaparral generally forms a dense, structurally intertwining, and almost impenetrable shrub habitat.

Sensitive ground nesters possible in the chaparral include the wrentit, common poorwill, Bell's sage sparrow, and the California thrasher; there are also several common ground nesting species. The wrentit was recorded in several of the chaparral habitats on the preserves. The wrentit is a secretive bird which remains in a 1 to 2.5-acre area for its entire life span. Male wrentit show strong site tenacity to breeding territory, even if the habitat is markedly changed. This aversion to leaving an established breeding area could have significant implications if the area is disturbed by trail construction.

In general, the nature of this habitat reduces human intrusion and disturbance. No new trails are proposed through chaparral habitat. However, there are several non-recognized trails that lead into or thorough significant chaparral stands. These trails allow hikers and dogs into the sensitive wildlife habitat. As such, this plan recommends closure of non-recognized trails intersecting the Wagon Wheel Trail and Blue Ridge Fire Road. Dogs will be required to be on leash in chaparral areas all year.

5. Streams and Streambank Vegetation

Historically, much of San Anselmo Creek, Cascade Creek, and major tributaries to those streams were used by steelhead for spawning. Steelhead are currently listed as threatened species for this area under the Federal Endangered Species Act. The National Marine Fisheries Service declared the Corte Madera Creek Watershed, which includes the streams on the Cascade Canyon Preserve and most of the White Hill Preserve, as critical habitat for steelhead.

While steelhead use the lower sections of San Anselmo Creek and Cascade Creek and portions of Carey Camp Creek for spawning, these lower sections of the creeks do not provide year round habitat. San Anselmo Creek dries up most years to a point near its confluence with Cascade Creek. In many years, all three creeks dry up in the flatter sections in the canyon bottom. Some years, there is a remnant population of these steelhead (rainbow trout) occupying portions of San Anselmo Creek, Carey Camp Creek, and Cascade Creek. A recently completed study of the fishery in the Corte Madera Creek watershed found that Cascade Creek in the area where it joins San Anselmo Creek upstream to Cascade Falls offers the best trout habitat in the entire watershed. While this area does not provide spawning gravel, the pools that remain in this section in many years provide rearing habitat. A variety of age classes of trout were

noted in this area (from report prepared by A.A. Rich & Associates for Friends of Corte Madera Creek).

This population was assessed by Kim Fitts, consulting wildlife biologist, and Bill Cox of the California Department of Fish and Game. It was determined that the population was not at risk from current use of the preserves. The one potential risk identified was additional sedimentation of the streams due to erosion from trails and stream crossings. Recommendations are offered below to maintain and/or decrease erosion affecting the stream.

In general, streambank vegetation has not been significantly affected by use of the preserves. This streambank vegetation is important habitat for many species of birds and other mammals and Pacific giant salamander and other amphibians. The trees along the creeks are important in moderating stream temperatures, providing large woody debris to the channels, and providing other important attributes necessary for healthy streams. So long as trees are not removed, this habitat does not require any particular management actions.

The principal concern regarding steelhead is erosion and sedimentation which affect downstream sections of San Anselmo Creek and Corte Madera Creek. The authors of this management plan visited the preserve with two representatives of the National Oceanic and Atmospheric Administration (NOAA – Fisheries) to obtain their opinion of the status of the stream and recommendations for improving it. The NOAA - Fisheries biologist stated that the areas suitable for steelhead spawning did not appear to be substantially affected by preserve use. He recommended some improvements to the Cascade Fire Road stream crossings plus some erosion control work along this road and the High Water Trail to minimize sedimentation of the creek (Daugherty, personal communication and see letter in Appendix A**)**. These recommendations are included in the recommendations of this Plan.

The main problem along the creek is the five stream crossings on Cascade Fire Road. All vehicles and bicycles are currently required to use these stream crossings to access the preserve and other public lands to the west. When a vehicle drives through the creek, it dislodges fine sediments which then cloud the water downstream (that is, increase the turbidity). These dislodged sediments can then silt in spawning habitat downstream. However, it was determined that this impact was minimal because the crossings contain relatively large rocks in the substrate; that is, the tread where vehicles travel is not dirt, mud, or sand. The amount of fine materials dislodged is not great. In addition, motor vehicles primarily use the road during the dry season when water is not flowing in the stream. Bicycles, due to their much lower weight, produce substantially less sediments than motor vehicles.

6. Redwood Forest

The only redwoods on the preserves affected by proposed improvements is the small redwood grove on the White Hill Preserve called Sherwood Forest. This grove could support spotted owls. As described in the subsequent Trails Program, a new trail is recommended to the north of the Sherwood Forest and the existing trail through the

forest is recommended for improvement. So long as large trees are not removed in this area, no adverse effects are predicted from construction of a trail through the area.

7. Dogs

Dogs running out of control chase, scare, and potentially harm wildlife, especially smaller animals and nesting birds. The effect of dogs on wildlife is well known and is one reason why dogs are not allowed in wilderness areas of most national parks. MMWD prohibits free-roaming dogs on its property, and all dogs must be kept on leash at all times.

Observations of park use showed that most dogs were not on leash, either on fire roads or single-track trails. MCOSD requires that dogs be kept on leash on trails and within voice command on fire roads (this means that dogs must stay on the fire road; they are not allowed to stray from the fire road). Many incidences of dogs not being within voice control as well as dogs straying off the fire roads were witnessed. During the increased patrolling done by MCOSD rangers in April/May 1999, there were 19 warnings given to people with dogs off leash.

It is recognized that many people, including many residents living near the preserves, use the preserves as places to exercise their dogs. While such locations may be desirable, the two preserves assessed here, particularly Cascade Canyon Preserve, are not ideal locations for such use. Other MCOSD preserves may be better suited to allowing dogs off leash on fire roads (with the frequent escape from control). These preserves include preserves that contain fire roads along the top of a ridge in open grassland.

This is not a minor problem. User counts in the Cascade Canyon bottom areas (see user data in the subsequent Use Program) showed that the number of trips by dogs through this area was greater than the number of bicyclist trips. There is heavy dog use of the preserves (relative to overall use patterns), particularly in the canyon bottom area.

As described previously under the section on Sensitive Wildlife Area, it is recommended that dogs be kept on leash on all trails and roads in the Cascade Canyon Preserve. It is recommended that MCOSD clearly sign all entrances to the Cascade Canyon Preserve to inform users of District rules regarding dogs. The entrances to the White Hill Preserve should be signed to inform users that on the preserve dogs are to be kept within control on the fire road. The signs should state that such controls are necessary to protect wildlife from injury or harassment, as it is hoped that people will be more willing to obey the restrictions if they know the reason why the restriction is required. As noted previously, signs should be placed on trails through chaparral requiring dogs to be on leash at all times.

8. Past Restoration Efforts

In the past, MCOSD has conducted a number of restoration projects in the Cascade Canyon Preserve. Some of these efforts include:

- Annual installation and monitoring of waterbars and other trail/road improvements to address erosion problems.

- Armoring of the banks of San Anselmo Creek to prevent streambank erosion and failure. These control structures appear to be functioning as designed.

- Construction of sediment detention structures in the lower section of Carey Camp Creek. The mouth of this creek was armored to prevent further downcutting. These sediment control structures appear to be functioning as designed.

- Trees have been planted on several of the flats along San Anselmo Creek between the Cascade Drive entrance and the fourth stream crossing on Cascade Fire Road. These trees have been provided with deer protection. A review of these trees showed that some were dead and need to be removed.

- Waterbars and seeding of areas damaged by illegal bicycle use were established in the Happersberger Meadow on the Happersberger Ridge Trail. Field surveys in late 1999 showed that these improvements were successful as the trail has mostly been restored to a single-track width, and there is no sign of significant erosion in this area.

- MCOSD staff conducted erosion control work on the northern part of the non-recognized Split Rock Trail. MCOSD conducted most of this work despite the fact that this part of the trail is on MMWD property.

9. Recommended Actions

a. Dogs

BW-1. All entries to the Cascade Canyon Preserve shall be signed that dogs are required to be on leash at all times within the preserve. Entrances to White Hill Preserve shall be clearly signed that dogs are to be kept on leash unless on fire roads. The signs should state the penalty for uncontrolled dogs, and state that the preserves are patrolled and citations are issued.

BW-2. The following trails/roads should be signed at both ends to state that dogs must be kept on leash on these trails/roads to avoid harm to groundnesting birds.

a. Blue Ridge Fire Road from the west junction with Wagon Wheel Trail to the Camp Tamarancho property line and then from the east end of Wagon Wheel Trail to Middle Road Fire Road
b. Wagon Wheel Trail
c. Pam's Blue Ridge Trail
d. Cascade Fire Road west of Cascade Creek
e. Burnt Tree Fire Road
f. Split Rock Trail

BW-3. Periodically patrol the preserves and issue citations to dog owners not complying with restrictions. Monitor dog use.

b. Sensitive Wildlife Areas (SWA)

BW-4. Designate the Cascade Canyon Preserve as a Sensitive Wildlife Area. Require that dogs be on leash and not be allowed off trails or roads within the preserve. Signs will be placed at existing entrances to the preserve (on recognized trails, fire roads, and non-recognized trails) denoting that the area is an SWA. Non-recognized trails recommended for closure will include information on the closure sign that use of this trail is prohibited due to its entry into an SWA.

c. Steelhead

BW-5. Depending on the annual resources available, MCOSD should conduct erosion control actions recommended in the Geology Section. The approaches of Cascade Fire Road to each stream crossing should be rocked and runoff from the road above the approaches should be diverted so that it does not flow down the road into the creek. Rocking these approaches and conducting other recommended erosion control actions on Cascade Fire Road, High Water Trail, and other trails near the main stems of San Anselmo, Cascade, and Carey Camp Creeks are the first priority.

BW-6. MCOSD should minimize use of the Cascade Fire Road during the period that there is water in the creek. Rangers patrolling the area should walk the area except in case of an emergency. All non-emergency trips should be eliminated when there is water in the creek at the road crossings.

BW-7. Work with the Friends of Corte Madera Creek, the Town of Fairfax, MMWD, and other interested parties to seek funding to prepare a Steelhead Restoration Plan for Corte Madera Creek and funding to implement actions recommended in that plan. To the degree resources are available, implement restoration actions recommended for the Preserves.

BW-8. Develop a steelhead monitoring program. The monitoring will evaluate steelhead habitat and develop baseline data on the condition of San Anselmo and Cascade Creeks within the Preserve. The monitoring will also identify problems, if any, that may be interfering with steelhead migration and reproduction. Finally, the monitoring will include habitats adjacent to the streams to establish baseline conditions of these areas, and to characterize existing impacts to steelhead trout habitat. The monitoring of adjacent habitat will focus on the trails, roads, and biologically sensitive areas near the creeks within the Preserve. Since the issue of steelhead trout management is a watershed issue, the District will work with the Friends of Corte Madera Creek, MMWD, Department of Fish and Game, National Oceanic and Atmospheric Administration, and other relevant organizations to finalize the monitoring protocol, fund, and implement this program.

d. Spotted Owl

BW-9. If the MCOSD spotted owl annual breeding survey indicates an active spotted owl nest within 0.25 mile of a proposed trail, road, or fuel reduction zone construction area, the trail, road, or fuel reduction zone construction shall be conducted between September 1 and February 1 in any year or until after MCOSD monitoring shows that fledglings have left the nest. No trees over 9 inches in diameter at breast height (DBH) shall be removed, except for public safety requirements.

e. Woodrats

BW-10. When constructing the new connector trails at the north end of the White Hill Preserve, the route shall be checked by a biologist familiar with woodrat nests. The trail should be routed to stay at least 50 feet away from any woodrat nest unless it is simply not feasible to relocate the trail section.

f. Environmental Stewardship Program

BW-11. Environmental Stewards should be educated regarding wildlife use of the preserves and the presence of special status species.

g. Public Education

BW-12. Any brochures should describe these species and how certain non-recognized trails have been closed to enhance wildlife use. The brochures should particularly point out the potential impacts of free ranging dogs and the need to keep dogs on leash on all trails, especially through chaparral areas.

C. Soil Erosion

1. Introduction

A detailed field assessment of the preserves was conducted by Mike Dwyer, a consulting engineering geologist. His complete report along with his detailed recommendations for erosion control are included in Appendix D; the following is a summary of the more important conclusions of his analysis. Figure 9 shows the areas of the most substantial erosion; the numbers on Figure 9 refer to the text in Appendix D.

- In general, past use of recognized trails and fire roads has not caused substantial erosion, and the overall amount of erosion is not unusual for a recreational area. Where soil erosion problems occur, they are generally caused by excessively steep slopes, wet areas, poor drainage construction, and/or inadequate maintenance.

- Some non-recognized trails show more severe erosion. Recommendations are made to close several non-recognized trails, all of which are included in the list of trails recommended for closure in the previous section on Vegetation.

- Bicycle use of Wagon Wheel Trail has not caused substantial erosion. Due to the topography of this trail and its rocky substrate, it is performing well, and continued bike use is not predicted to cause substantial erosion.

- Bicycle use of fire roads has caused some areas of rutting and erosion, but these localized erosion incidences are not substantial and can be remedied by implementing the recommended erosion control actions.

- Bike use of several non-recognized and recognized single-track trails is causing substantial erosion. This erosion is caused by too steep slopes, soft substrate soils, the tendency for bicycles to follow the same track down a trail which over time causes a depression which collects and transports runoff, and the tendency for some bicyclists to lock their brakes on steep downhill pitches (this braking causes rutting, particularly on wet soils).

- The High Water Trail has two sections that are hazardous due to steep drop-offs. These sections require repair. Once these sections are repaired, continued use of this trail by hikers is acceptable.

- The stream crossings along Cascade Fire Road generate some erosion to San Anselmo Creek. This erosion can be substantially reduced by rocking the approaches to the crossings and diverting runoff from the roads so that it does not travel down the approaches.

- Horses can cause substantial erosion on trails when the soil is wet. Horse use of the two preserves is relatively low, and there was no evidence of substantial erosion caused by horses.

2. Discussion

Many areas of potential concern regarding erosion have been identified; however, overall the condition of the roads and trails on the preserves is similar to the condition of similar roads and trails on other MCOSD preserves, MMWD watershed, and State or Federal parks in the county. These erosive conditions are mainly the result of trail and road construction techniques and routes that do not meet current design standards. Trails and roads are often too steep, not properly surfaced, not properly outsloped, and not provided with proper drainage controls. These inadequacies largely occur because the roads were originally constructed as ranch or access roads or as firebreaks; the builders likely did not have the advantage of proper design documents or field oversight. As such, the roads often travel uphill by a shorter, and steeper route than is desirable to control erosion. Similarly, most trails were originally constructed by hikers or equestrians using the same route until a trail was established; often, the objective was of getting from one point to another by the quickest route. Again, often little or no attention was paid to the route's slope nor appropriate drainage improvements.

Erosion from several roads and trails has been exacerbated in the past 10-15 years by increased use. Most of these trails are not suitably designed for even hiker or equestrian use, let alone bicycle use. The gradient of many of these trails as well as the soft soils in many locations result in the creation of depressed sections of trail which

then funnel runoff down the trail. As time and resources permit, existing problems should be addressed and illegal use of trails controlled so that erosion problems do not increase in the future.

On fire roads, the main contributors to erosion are the improper construction and drainage of the roads and motor vehicle use. Most roads have a relatively firm substrate (the areas where this is not the case and mitigation is required are identified). While bicycle use can create erosion on fire roads, the areas where this occurs are generally limited in extent and would largely be remedied by implementing the erosion control measures that are required for continued motor vehicle use. Motor vehicles cause substantially more damage to road surfaces than bikers and hikers, despite the fact that there are many more bikers and hikers than motor vehicles. Because of their weight, motor vehicles break down the surface of the road, thus initiating rutting.

The recommendations summarized below require remediation of specific locations on trails and roads. Some non-recognized and recognized trails are recommended for closure as previously described. Sections of three trails need to be realigned to reduce erosion and improve safety. The southernmost 500 feet of the Blue Ridge Fire Road need to be realigned and reconstructed due to its excessively steep slope and erosion.

3. Recommended Actions

BS-1. As time and resources permit, all improvements recommended in Appendix D should be implemented. Priority ranking should be given to fire roads beginning with Cascade Fire Road and then extending to Middle Road Fire Road, Toyon Fire Road, Blue Ridge Fire Road, White Hill Fire Road, and Creekside Fire Road. All road improvements (i.e., waterbars, outsloping, rolling dips, etc.) shall be constructed using best management practices, which are currently described in the guidelines recommended in the *Handbook for Forest and Ranch Roads* (Weaver and Hagans, 1994). All trail erosion control shall be conducted using best management practices, which are currently described in the guidelines set forth either in the *Trail Manual for the Maintenance and Operation of Trails in the East Bay Regional Park District* (McDonald, 1995), *A Handbook on Trail Building and Maintenance* (Griswold, 1996), or *Trails Handbook* (California Department of Parks and Recreation, 1998).

District staff shall prioritize recommended improvements to concentrate on the most significant problems, recognizing that when working on a significant problem on one road or trail, it may be more efficient to do other work in that area even if the nearby problem areas are not as significant as problems elsewhere. Priority shall be given to roads and trails nearest the main stems of San Anselmo Creek, Cascade Creek, and Carey Camp Creek. The roads and trails in the canyon bottom should be addressed first.

BS-2. Realign and reconstruct the southernmost 500 feet of Blue Ridge Fire Road as shown on Figure 7.

BS-3. Realign and reconstruct the southernmost 300 feet of the connector trail between the Concrete Pipe Fire Road and the Carey Camp Loop Trail (see the subsequent Trails Program for additional discussion of this trail realignment).

BS-4. Realign and reconstruct the easternmost 300 feet of the Martha McCormack Trail (see the subsequent Trails Program for additional discussion of this trail realignment).

BS-5. The list of recommended actions was based on field surveys conducted during a specific period. New erosion locations are likely to occur in the future and will need to be addressed as they become evident. In addition, the list of actions does not identify each small area of rutting. These areas should be addressed in the field when crews are moving between the larger, more important erosion control projects. In general, these smaller areas of erosion can be controlled with the addition of waterbars.

BS-6. All existing single track trails, except for the Wagon Wheel Trail, should continue to be off limits to bicycles. If new multi-use trails are considered in the future, MCOSD will construct the trails using best management and design practices, which currently are described in the *MCOSD Multi-Use Trail Demonstration Design Guidelines* (adopted on October 27, 1993).

BS-7. In conjunction with routine patrol and maintenance, MCOSD should monitor roads and trails for erosion and implement control practices as warranted. Non-recognized trails causing significant erosion or damage to other resources shall be closed. Control measures that are completed shall be monitored to ensure they function properly. Non-recognized trails that are closed should be monitored for use, and additional fencing or blockading should be provided if warranted. If trails show excessive erosion due to horse use, then these trail sections shall be closed to horses during the period the soils are wet. All multi-use trails should be monitored. If bike or equestrian use causes significant erosion that cannot be managed with typical management practices, the trail section(s) shall be closed during the period when the soils are wet.

D. Water/Hydrology

1. Discussion

The Cascade Canyon Preserve and the southern portion of the White Hill Preserve contain portions of the headwaters of Cascade Creek, Carey Camp Creek, and San Anselmo Creek. These three creeks support flows through most of the year and in many years carry water through some portions year round. The preserves contain numerous ephemeral feeder streams to these three named creeks. The northern portion of the White Hill Preserve contains ephemeral feeder streams that eventually flow to Fairfax Creek or Lagunitas Creek.

A principal concern regarding water is water quality for wildlife. Erosion from trails and roads can result in sedimentation and increased turbidity which can adversely affect

steelhead and other aquatic species. Erosion control problems were addressed in the previous sections on Wildlife and Geology.

A second concern has to do with downstream flooding caused by the sediment load deposited in the creeks from natural sources as well as roads and trails. This sediment, plus sediment from other wildlands and developed areas in the watershed, may exacerbate flooding conditions in Corte Madera Creek (San Anselmo Creek flows into Corte Madera Creek which then flows into the Bay). Most sediment entering the creek is from natural landslides near stream channels, other natural erosion processes, and the continuing results of historic gravel mining, logging, and livestock grazing.

In the past, MCOSD has constructed a number of erosion control projects along San Anselmo Creek. These projects include the placement of large rocks and concrete pieces on curves in the creek where high water was eroding the streambanks. An initial phase of this streambank armoring was conducted before 1990, and a second phase was constructed in 1991. The geotechnical review of the preserves conducted while preparing this Plan did not include a survey of natural landsliding and other natural erosion sources. The consulting geologist did note that those sections of San Anselmo Creek that have been armored or had erosion control structures constructed appeared to be functioning adequately.

In 1992, MCOSD also constructed five rock check dams along the lower section of Carey Camp Creek (the lower 550 feet of the creek). These structures captured sediment to reduce downcutting of the stream. These structures appear to function as planned since the gradient of the creek has flattened out behind the several check dams. MCOSD also stabilized a streambank landslide located west of the mouth of Carey Camp Creek between San Anselmo Creek and Cascade Fire Road.

As described in the previous section, erosion from trails and streams can enter San Anselmo Creek and exacerbate sedimentation problems. This Plan contains recommendations to minimize the amount of sediment entering the streams from human use of the preserves. However, this plan does not address erosion and sedimentation caused by natural processes. A geotechnical review of the entire Corte Madera Creek watershed is currently being conducted through a grant received by the Friends of Corte Madera Creek Watershed. This study, which will be completed sometime in the autumn of 2000, will identify potential sedimentation sources in the watershed, including the two preserves addressed in this Management Plan.

Regarding drainage off the preserves, it appears that runoff from the preserves is flowing in natural channels or as sheet flow across undisturbed hillsides adjacent to the preserve boundaries. Runoff does not appear to be causing significant problems for neighboring landowners, and no members of the public mentioned runoff problems at public meetings or in private conversations. However, preparation of this Plan did not include detailed investigations of drainage off the site.

2. Recommended Actions

BH-1. Review the final geologic report prepared for the Friends of Corte Madera Creek Watershed once it is completed. If that report recommends landslide

remediation or other sediment control reduction on the two preserves beyond those recommended in this Plan, MCOSD shall consider implementing those recommendations, as resources become available.

E. Cultural Resources

1. Discussion

The Cascade Canyon Preserve contains one archaeological site – a petroglyph site. This site is not near a trail or road. One historic-era feature is present - the old North Pacific Coast Railroad tunnel dug through the ridge that extends north from White Hill. Archaeological sensitivity of the preserves was mapped as shown on the map in Appendix E.

2. Recommended Actions

BC-1. Any trail or road construction, fuel reduction zone construction, or prescribed fire in areas of "high" sensitivity (as shown on the map in Appendix B) shall be done only after the area to be disturbed is inspected by a professional archaeologist. The archaeologist should recommend what actions should be taken to investigate, protect, and/or record any identified cultural resources prior to constructing the improvement.

BC-2. If archaeological or historical resources are uncovered during any trail construction, fuel reduction, or other action, a qualified archaeologist shall examine the find and make recommendations regarding its treatment.

BC-3 MCOSD shall monitor the existing petroglyph site to ensure it is not being damaged. If warranted, MCOSD shall fence off the site to prevent damage.

F. Aesthetic Resources

1. Discussion

Trails and roads on the preserves provide vantage points for a wide variety of views. There are innumerable foreground views of woodlands, grasslands, chaparral, and riparian areas. Roads and trails on the ridges provide panoramic views of undeveloped public lands in all directions as well as long distance views of settled areas in Fairfax, San Anselmo, the San Geronimo Valley, and more distant locales. The highest points along the White Hill Fire Road and from other areas in the White Hill Preserve provide splendid panoramic views of the Bay, Mt. Diablo, and San Francisco.

In general, there is no need to construct trails to additional vantage points as existing trails and roads lead to most locations where long distance or panoramic views are possible. Unlike some trails and roads on MMWD property or other public lands in the area, roadside vegetation has not grown to a height that blocks these long distance views.

The only unsightly improvements on the preserves are the fire roads. To some viewers, these roads are likely scars on the landscape. However, these roads must be maintained to provide fire and emergency access. In a few locations, there are unsightly scars on trails resulting from overuse of non-recognized trails or the remains of old firebreaks. For example, the old firebreak leading from near the top of White Hill north to the White Hill Fire Road is a visual scar on the viewscape. Other sections of this Plan contain recommendations for closing these trails and restoring areas with resource damage.

One aesthetic impact not previously addressed concerns the concentration of dog feces in the area immediately west of the end of Cascade Drive. As noted previously, this area is heavily used by dog owners exercising their dogs. Many of these dogs tend to defecate in the first available "natural" location, which is this area. Frequent field trips showed that there were usually several droppings in this area. This is aesthetically displeasing, particularly since this meadow is one's entrance to the preserve.

2. Recommended Actions

BA-1. A sign should be installed in the area immediately west of the Cascade Drive entrance requesting dog owners to collect their dog's feces and to remove those feces from the preserve.

III. FIRE MANAGEMENT PROGRAM

A. Introduction

A principal management concern is the risk of a wildfire starting on or crossing the preserves and destroying neighboring residences. The combination of steep slopes, flammable vegetation, restricted emergency vehicle access, and periods of severe fire weather create a substantial fire hazard on the two preserves. Because the Cascade Canyon Preserve is bordered on the south and east by homes, there is a significant risk if a wildfire ignites. To determine the risk to residential areas, fire modeling was conducted by staff of the Marin County Fire Department (MCFD) with input from Carol Rice, the consulting fire ecologist for this Plan. The complete report prepared by MCFD staff is included in Appendix F. When reviewing this report, the reader should be aware that this modeling is a management tool and is not meant to be a precise description of fire behavior nor a description of fire behavior from fires starting in various locations on the preserves. The modeling shows the likely spread of a wildfire for a three-hour period after ignition in specific locations.

Modeling was conducted for three likely ignition locations: near the top of White Hill, in the chaparral along Blue Ridge Fire Road to the southeast of White Hill, and in the chaparral on Pam's Blue Ridge. These ignition locations were selected because the White Hill and Pam's Blue Ridge locations were where fires have ignited in the past. The Blue Ridge location was selected to determine the effects of a fire starting near the top of the ridge in chaparral (which, from a fire perspective, is the most hazardous vegetation type on the preserves).

The modeling indicates that the primary fire hazard would result from a fire burning to the south-southeast off the Cascade Preserve into residential neighborhoods in Cascade Canyon, on the slopes below Pam's Blue Ridge, and neighborhoods further to the south. While fire hazard exists in other locations, the fuels, topography, and weather conditions during severe fire weather do not pose as significant a risk to other areas (e.g., Woodacre, Camp Tamarancho, or the Girl Scouts property).

A fire starting at a point near the top of White Hill burning under severe weather conditions (90th percentile weather, i.e., the weather conditions that are the upper 10 percent most critical fire weather conditions) would burn off the preserve into residential areas. Starting at the same ignition location, with a fire burning under extreme weather conditions (97th percentile weather), this fire would extend off much of the southern border of Cascade Canyon Preserve into residential neighborhoods in three hours.

A fire igniting in the chaparral along Blue Ridge Fire Road, southeast of White Hill, would not spread off the preserve under 90th percentile weather conditions within three hours, but under 97th percentile weather would have a similar spread as the northern ignition point. A fire starting in the Pam's Blue Ridge area would travel off the preserves within three hours.

Following the completion of the fire modeling performed by MCFD, the consultant fire ecologist examined the preserves for ways to reduce the chance of a wildfire escaping the Cascade Canyon Preserve. While there is no way of eliminating the risk of a major wildfire, the recommendations listed below will improve the chances of MCFD and other fire suppression agencies of stopping a fire before it enters residential areas and of reducing the size and intensity of a fire.

B. Reduction of Ignition Risk

The most frequent causes of fire include:

- Fires escaping from barbecues or campfires are the most frequent cause. The preserves do not include picnic or barbecue facilities, and all forms of open fire are prohibited on the preserves.

- Fires starting from incompletely doused cigarettes are the second major cause. Smoking is prohibited on the preserves. However, there is always the chance that people will illegally smoke. Typically, fires starting from cigarettes occur adjacent to or near parking areas and trailheads.

- Use of power equipment or improperly maintained vehicles is a major cause of fires.

- Lightning is an infrequent cause in this area, but certainly possible.

- Downed powerlines is a principal cause. There are powerlines crossing several portions of the preserves.

- Other causes include children playing with matches and arson.

C. Reduction of Hazard

In addition to minimizing the risk of fire ignitions, a principal means of reducing fire hazard on public lands is to manage the vegetation on the property to reduce the amount of hazard. Two approaches are discussed below: creating a series of fuel reduction zones and directly reducing the amount of chaparral fuels on the preserves.

1. Fuel Reduction Zones

A key tool for reducing the fire hazard is to provide locations where likely fires can be safely attacked. The consulting fire ecologist has identified the locations listed below where fuel reduction zones could be constructed to facilitate fire suppression agency response to predicted wildfires. The main objective of these recommendations is to provide a fuel reduction zone along existing roads along the southern border of Cascade Canyon Preserve. These fuel reduction zones will act to slow the fire as it moves south and to provide a safer location for fire suppression agencies to take a stand. The locations of the proposed fuel reduction zones are shown on Figure 10. The basic description of these fuel reduction zones is provided below.

- Middle Road Fire Road Fuel Reduction Zone. Construct a fuel reduction zone along the Middle Road Fire Road from its western intersection with Cascade Fire Road to its intersection with the Middle Road Cut Trail. The fuel reduction zone will extend 100 feet from the road on the uphill side and 50 feet on the downhill side. Understory shrubs will be removed beneath the trees and limbs removed as high as can be reached (at least 8-10 feet).

  The length of this section of the fuel reduction zone is about 2,800 feet. The vegetation characteristics along this proposed fuel reduction zone (as measured from Cascade Fire Road) are listed below:

  - 0-100 feet - open oak woodland
  - 100-350 feet - oak savanna
  - 350-450 feet - open oak woodland
  - 450-800 feet - oak woodland with denser understory
  - 800-1,275 feet - oak woodland with dense understory
  - 1,275-1,425 feet - open woodland
  - 1,425-1,650 feet - grassland above the road and oak savanna below
  - 1,650-2,000 feet - grassland with scattered shrubs above and open woodland below
  - 2,000-2,275 feet - open woodland
  - 2,275-2,650 feet - grassland with scattered trees and shrubs
  - 2,650-2,800 feet - open woodland

  This fuel reduction zone will be relatively easy to construct given the large areas of grasslands and scattered trees and shrubs.

- Middle Road Fire Road Cut Trail Fuel Reduction Zone. Continue this fuel reduction zone down the Middle Road Cut Trail for about 200 feet; this section of the trail is an old road and is drivable by fire equipment. The fuel reduction zone will then proceed to the east along an old road bed out onto an open grassland. The fuel reduction zone will be extended to the east as far as possible to where the grassland ends and the slope descends to a stream. A bulldozer should be used to improve the old road bed to allow fire vehicle access along this old road bed; this will require only minor grading as the road bed is in relatively good shape. The old road does not need to be established as a road per se. It simply needs minor grading to allow fire truck access, and can be allowed to revegetate with grass.

  This fuel reduction zone will be about 420 feet long. Vegetation along this fuel reduction zone as measured from Middle Road Fire Road includes:

  - 0-175 feet - grassland with scattered trees
  - 175-225 - grassland with a few trees
  - 225-400 grassland

- Toyon Tanks Fire Road Fuel Reduction Zone. From the westernmost entrance of Toyon Drive, construct a fuel reduction zone along the road that accesses the MMWD water tank (Toyon Tanks Fire Road). Starting at Toyon Drive, this

fuel reduction zone will be 100 feet wide on the east or uphill side of the road until the road intersects Pam's Blue Ridge Trail. From Pam's Blue Ridge Trail, the chaparral (comprised almost entirely of chamise) on the downhill side of the trail and road would be cut and pile burned o the top of the ridge to the west or the MCOSD property line. MCOSD should investigate whether the property owner whose residence is below this chaparral patch wishes to participate in the construction of the fuel reduction zone so that the portion of the chaparral that extends onto private property can also be treated. From where the chaparral ends (traveling south) to the water tank, the woodland will be limbed, and the understory cleared for 50 feet. On the east side of the road from the water tank to Pam's Blue Ridge Trail, the understory should be cleared for 50 feet.

This fuel reduction zone will be about 1,700 feet long. Vegetation along this fuel reduction zone as measured from Toyon Drive includes:

- 0-1,000 feet - oak woodland with a relatively dense understory comprised mainly of broom. MMWD has mowed the broom along this section for a distance of 8-15 feet from the road edge so that currently the area immediately along the road is grass or cut broom.
- 1,000-1,350 feet - oak woodland with broom understory on the east and a patch of chaparral (mainly chamise) on the west.
- 1,350-1,700 feet - oak woodland with broom understory.

- Toyon Fire Road Fuel Reduction Zone. A fuel reduction zone of 200 feet in width would be constructed all along the Toyon Fire Road from Toyon Drive to the Camp Tamarancho property line. Areas of woodland will be thinned and pruned as described previously. Where shrubs occur in grasslands, scattered shrubs will be left. Areas with thicker stands of shrubs would be thinned so that shrubs do not occupy more than 30 percent of the groundcover. All broom would be removed. When selecting what native shrubs would be removed, the focus should be on removing broom, then chamise, then baccharis, and then other shrubs.

  This fuel reduction zone will be about 5,400 feet long and includes the following vegetation types as measured from Toyon Drive:

  - 0-300 feet - oak woodland with relatively dense understory
  - 300-550 feet - oak savanna/grassland with some broom
  - 550-620 feet - chaparral uphill (west) and grassland downhill (east)
  - 620-715 feet - grassland
  - 715-810 feet - grassland with scattered shrubs uphill and chaparral/oak woodland with a dense understory downhill
  - 810-1,040 feet - grassland with scattered shrubs uphill and open oak woodlands and some grass downhill
  - 1,040-1,140 feet - low sage uphill and open oak woodland downhill
  - 1,140-1,260 feet - grassland uphill and grassland mixed with scattered shrubs downhill
  - 1,260-1,370 feet - grassland uphill and woodlands downhill with relatively dense understory

- 1,370-1,600 feet - open oak woodland uphill and woodland with denser understory downhill
- 1,600-2,560 feet (at the intersection of Cul-de-sac Fire Road) - relatively dense chaparral and broom stands, some grass areas
- 2,560-2,970 feet - grassland and chaparral; about 50 percent of each type
- 2,970- 3,200 feet - grassland to the east and chaparral with a few small trees to the west
- 3,200-3,750 feet - relatively open oak woodland with substantial broom
- 3,750-4,200 feet - grassland with scattered broom; oak woodland further from the road
- 4,200-4,575 feet (Cul-de-sac Trail Junction) - oak woodland with relatively dense understory and broom
- 4,575-4,970 feet - open oak woodland with sparse understory
- 4,970-5,400 feet - grassland and chaparral; about two-thirds grassland

- Toyon Residence Perimeter Fuel Reduction Zone. A fuel reduction zone would be constructed around the private property that is located between Toyon Tanks Fire Road and Toyon Fire Road. This fuel reduction zone will be constructed at the property line and be 100 feet in width. The vegetation is relatively open oak woodland. This fuel reduction zone will connect the fuel reduction zones along the two fire roads.

- Cul-de-sac Fire Road Fuel Reduction Zone. Once the four fuel reduction zones listed above are constructed, a secondary fuel reduction zone would be constructed on the Cul-de-sac Fire Road from Toyon Fire Road to its north end. From this terminus, the fuel reduction zone would be constructed cross-country to the MCOSD property line near Ridge Road. The recommended route for this cross-country portion of the fuel reduction zone is to start about 125 feet down the Cul-de-sac Trail (from the end of Cul-de-sac Fire Road) and construct the fuel reduction zone to the east through an open bay woodland to the property line. This fuel reduction zone would be 200 feet wide (100 feet on either side of the road and then 200 feet where it travels cross-country).

  The fuel reduction zone along the fire road will be about 1,000 feet long. The vegetation along this road is oak woodland with a relatively dense understory comprised mainly of broom; there are some grassy areas.

  The cross-country portion of this fuel reduction zone will be about 400 feet long through relatively open mixed evergreen woodland.

- Cascade Fire Road Fuel Reduction Zone. A fuel reduction zone would be constructed along Cascade Fire Road west of its crossing of Cascade Creek. This fuel reduction zone is intended to enhance the safety of fire vehicles using this road and is not intended to be a fuel reduction zone. This recommendation is consistent with the recommendations of the *Mount Tamalpais Area Vegetation Management Plan* which calls for a similar fuel reduction zone on the MMWD-owned portion of this road. This fuel reduction zone would be 30 feet wide on each side. This fuel reduction zone construction should be coordinated with MMWD as there is no point in constructing it on MCOSD lands unless the fuel reduction zone is continued all the way to the western

terminus of Cascade Fire Road. The portion of this fuel reduction zone that is on MCOSD property would be about 3,100 feet long. The vegetation along this fuel reduction zone includes dense to relatively dense oak woodland understory for most of its length and chaparral near its western end.

This series of fuel reduction zones will provide a defensible zone for fire suppression agencies to take a stand against fires spreading from the north. As one can see from Figure 10, there remains an area without fuel reduction zones in the south center of the preserve. This is an area where there are no fire roads near the southern perimeter of the preserve. While MCOSD could construct a fuel reduction zone through this area, connecting the east end of the fuel reduction zone extending off the Middle Road Fire Road to the western end of the fuel reduction zone on the road to the MMWD water tank, this fuel reduction zone would have limited value. Because there is no road access, it is unlikely such a fuel reduction zone would be used by fire suppression agencies to take a stand. In addition, the fire modeling shows that the modeled fires would not quickly spread through this area due to its less flammable fuels. Fires starting near White Hill would burn west and east of this area following ridgelines with more flammable fuels. As such, no fuel reduction zone is recommended for this area. While a fuel reduction zone could be constructed along the eastern end of Middle Road Fire Road to where it intersects Toyon Fire Road, this fuel reduction zone would be of limited value due to its distance from the southern perimeter and the fact that it traverses heavily wooded areas.

a. Techniques

Fuel reduction zones can be constructed by any or all of the following techniques:

- Hand labor with small power and hand tools. Crews can conduct all the recommended work. The problems associated with hand crews are 1) they are expensive, and 2) there can be problems when working in areas of poison oak. For hand crew work, understory shrubs and vines will be cut and trees will be limbed up 8-10 feet (but no more than one-third of their height). The trimmings can be cut and mulched; alternatively, trimmings smaller than 4 inches in diameter can be cut to no more than one foot in length and left on the ground (at a depth no greater than 6 inches).

- Goats. Goats are commonly used in the East Bay for fuel reduction zone construction. The advantages of goats are that they are less expensive than hand crews and do not mind poison oak. The problems with goats are that 1) they might not be available, 2) hand crews need to follow-up goat treatment to remove stripped stems and branches 3) some individuals are opposed to goats on the grounds of aesthetic and odor impacts. Goats are typically constrained within the target area by electric fencing under the supervision of the goat herd manager. The goats are moved as they remove the target vegetation. If goats are used, hand treatment would be required to remove browsed branches. MCOSD staff believes that goats present substantial management concerns as well as generate potentially significant impacts to vegetation and wildlife. As such, the use of goats is not recommended.

- Mowing machine. A large mowing machine such as a Tiger mower can be used to cut shrubs and small trees along roads. The problem with this tool is expense and that it cannot access all portions of the recommended fuel reduction zones.

- Prescribed burning. The stand of chamise on the road to the MMWD water tank can be burned under prescription. There are no sensitive plants in this small stand of chamise, and it could easily be burned in a few hours. MCOSD should consider participating in the State's Chaparral Management Program which includes prescribed burning.

Several of the recommended fuel reduction zones contain a dense broom understory. This broom will regrow after cutting, if the plants are not pulled. MCOSD should strive to pull broom plants when constructing fuel reduction zones. Where pulling the plants is not feasible, it is imperative that the District annually or as needed re-cut this broom to maintain the efficiency of the fuel reduction zones. The broom resprouts and seedlings can be quickly cut with a weedeater or mowing machine.

b. Effects on Native Vegetation

Construction of the fuel reduction zones will purposely remove some native vegetation within the fuel reduction zones. Mainly dead material, vines, and shrubs will be cut. All species are expected to be species common to the area, and their loss is not considered significant. The removal of these intermediate-sized shrubs will provide additional habitat for grasses and forbs, including wildflowers. In addition, removal of broom in the fuel reduction zones will provide habitat for grasses and forbs.

2. Chaparral Treatment

A second approach to reducing the hazard is to directly manipulate the vegetation on the preserves to reduce the amount of flammable fuels. In general, the preserves' vegetation mosaic is not as hazardous as many locations in the region (e.g., the southern slope of Mount Tamalpais). This is because the preserves contain a limited amount of chaparral (about 85 acres). Chaparral is the most hazardous vegetation type as it burns with high intensity and, under proper conditions, burning brands are driven by winds to other locations starting new fires. The vegetation along much of the critical preserve perimeter is oak woodland or mixed evergreen woodland. This vegetation type is generally far less hazardous, though it is becoming more hazardous with the SOD-killed trees. Unless there is sufficient undergrowth or dead material beneath these woodlands, a fire will not be sustained in the crowns of the trees and will stay on the ground.

To reduce fire hazard, MCFD staff has suggested cutting and pile burning the cut material from the large stands of chaparral on the preserves. MCFD staff believes that reducing the fuel load in these chaparral stands will substantially reduce the risk of a wildfire traveling off the preserves. MCOSD should consider fuel reduction of these chaparral stands, however, even if this work were conducted there would be the need for the previously recommended fuel reduction zones. The fuel reduction zones will provide additional means to reduce the chance of chaparral prescribed burns escaping. Also,

even if the chaparral were cut and pile burned, fires could ignite in grasslands or other habitats and spread off the preserves.

D. Other Actions to Reduce Risk and Hazard

1. Improving Fire Safety of Private Properties

While the actions to reduce ignitions, develop a series of fuel reduction zones, and potential burning of chaparral will substantially reduce the risk of a wildfire traveling off the preserves into residential areas, this risk will not be eliminated by these actions. The only way of eliminating the risk is to essentially remove all wildland fuels on the preserves. As such, it is critical that homeowners adjacent to or near the preserves' perimeters take actions to improve the fire safety of their property. These actions will not only reduce the risk of a fire that starts on or crosses the preserves burning private property, but they will reduce the risk that a fire starting on one of these adjacent properties will spread to the preserves. Field observations show that many residents have initiated actions to reduce the risk to their property. However, many residents have done little or nothing. In the wildland/urban interface (that is, where homes penetrate into areas of wildland fuels), it is critical that all residences in an area be treated since if some properties are left unsafe, a fire can ignite the untreated residence thereby substantially increasing the risk to adjacent residences.

There are a range of actions homeowners can take to increase the fire safety of their homes, including removing flammable vegetation near their homes, installing safer landscaping, reconstructing homes to remove fire dangers, improving water supply, and other actions. These potential actions are all described in detail in the *Mount Tamalpais Area Vegetation Management Plan,* and the reader is directed to that plan. It is further recommended that homeowners contact their local fire agency (Ross Valley Fire Department of Marin County Fire Department) to obtain site-specific recommendations for protecting their residence.

MCOSD is working closely with Marin County Fire Department and other local fire agencies in order to identify and implement policies and practices for fire management measures on all of the Open Space Preserves in the County. These discussions include identifying the appropriate role for the District in managing open space land and adjoining private property. Once the District adopts these policies and practices, they will apply to all lands and become another tool that the District will use to identify management requirements for all of its land, including Cascade Canyon and White Hill Open Space Preserves.

2. MCOSD/Private Property Owner Coordination

MCOSD should also be responsive to requests by neighboring property owners for understory thinning and shrub thinning on MCOSD property adjacent to the private property. The creation of fire safe zones along the perimeter would be conducted per the same prescriptions recommend for fuel reduction zone construction.

3. Future Risk from Dead Oaks

It is noted that there is a disease currently attacking oak and other species of trees and shrubs on the preserves (called Sudden Oak Death). A number of oak trees have died, and it is possible that a substantially larger number of these oaks could die in the next few years. These dead oaks increase the fire risk on the preserves and in the general area. These dead trees should be removed in the fuel reduction zones. MCOSD should monitor the progress of this epidemic and potential control actions identified by the State or other agencies. If control techniques are identified which are feasible for wildlands, MCOSD should implement these techniques.

E. Recommended Actions

FM-1. The fuel reduction zone system described previously should be constructed. The higher priority for construction includes: 1) Middle Road Fire Road, 2) Middle Road Fire Road Cut Trail, 3) Toyon Tanks Fire Road, and 4) Toyon Fire Road fuel reduction zones. Fuel reduction zones should be constructed with hand crews and/or a cutting machine. The small patch of chamise off Toyon Tank Fire Road can be cut and/or a mowing machine. The use of goats is not recommended.

FM-2. Once this main fuel reduction zone is constructed, the fuel reduction zone along Cul-de-sac Fire Road and east to the preserve boundary as well as the fuel reduction zone along Cascade Fire Road should be constructed.

FM-3. If desired, chaparral stands can be cut and subsequently the cut material can be piled and burned. Any cutting and pile burning of chaparral will avoid cutting and burning of special status species of plants. In addition, the following measures would apply:

- No cutting will be allowed within 50 feet of any watercourse.
- No cutting and burning will be allowed during the bird nesting season.
- An erosion control plan shall be developed prior to cutting and implemented prior to October 15 of any year.

FM-4. Fuel reduction zones should be monitored annually. Broom seedlings and resprouts should be re-cut about every two years (or annually if resources are available). The re-cutting can either be done with a large mowing machine or by hand crews with weed whips. Broom plants that are cut or pulled should be burned in the late autumn after the first rains.

FM-5. The District should continue to provide notice to neighboring private property owners informing them of the possibility of the property owners conducting fuel reduction on MCOSD property adjacent to their property.

FM-6. MCOSD is working closely with Marin County Fire Department and other local fire agencies in order to identify and implement policies and practices for fire management measures on all of the Open Space Preserves in the County. These discussions include identifying the appropriate role for the District in managing open space land and adjoining private property. Once the District adopts these policies and practices, they will apply to all lands and become another tool that the District will use to identify management requirements for all of its land, including Cascade Canyon and White Hill Open Space Preserves. Fire management is also an evolving science and the District's fuel reduction priorities may change based on new information, scientific research, or state or county guidelines.

IV. ACCESS PROGRAM

A. Discussion

The eleven existing official public accesses to the preserves are shown on Figure 3 and described below.

1. **Concrete Pipe Fire Road.** The road itself is owned by MMWD. There is no sign at the east end of the Concrete Pipe Fire Road denoting the entrance or that public access is allowed. There also is not a sign at the trail junction with the Concrete Pipe Cut-off Trail that denotes public ownership.

2. **Canyon Road.** At the end of the pavement on Canyon Road, there is a sign stating that this is a public trail to the Cascade Canyon Preserve. At the preserve boundary, there are the standard MCOSD entrance signs. This entrance has fencing and a stepover.

3. **Cascade Drive.** This entrance has fencing, a locked gate, a wheelchair access, and standard MCOSD entrance signs.

4. **Toyon Tanks Fire Road.** This entrance has a locked gate and a stepover. There is an MCOSD entrance sign and signs warning of fire danger, no parking, and dog owners instructions.

5. **South end of Toyon Fire Road.** This entrance has a locked gate and a stepover. There is an MCOSD entrance sign and signs warning of fire danger, no parking, bike riding rules and dog owners instructions.

6. **East end of White Hill Fire Road** (Bothin Entrance)**.** This entrance has a locked gate and a stepover. There is an MCOSD entrance sign and signs warning of fire danger, no parking, bike riding rules and dog owners instructions.

7. **Sherwood Forest.** There is a cyclone fence, a locked gate, and a stepover. There are standard MCOSD entrance signs.

8. **West end of White Hill Fire Road.** There is a locked gate and no sign at the entrance to the White Hill Preserve.

9. **West end of Blue Ridge Fire Road.** There is no sign where this road enters the preserve from MMWD property.

10. **West end of Cascade Fire Road.** There is an MCOSD entrance sign at the border with MMWD property.

11. **Happersberger Ridge Trail.** There is no sign at the boundary between the preserve and MMWD property.

There are also entrances to the preserves from Camp Tamarancho. These include:

12. **North end of Toyon Fire Road**. There is an MCOSD entrance sign.

13 **North end of Creekside Fire Road**. There is an MCOSD entrance sign.

14. **Blue Ridge Fire Road entrance.** There is an MCOSD entrance sign just south of the BSA property line.

15. **Western entrance onto the Blue Ridge Fire Road**. There is no sign at the border of the preserve and MMWD property.

In addition to these entrances, there are numerous unofficial entrances where non-recognized trails have been extended from private property surrounding the preserves onto the preserves.

Parking is very limited at all access points adjacent to public streets. There are 2-10 parking spaces near the Concrete Pipe Fire Road, Canyon Road, Cascade Drive, Toyon Tanks Fire Road, and Toyon Fire Road entrances. There is no parking at the east end of White Hill Fire Road (Bothin entrance). People accessing this entrance must park on pullouts on Sir Francis Drake Boulevard. The Sherwood Forest entrance is the only access point with parking for more than a few vehicles. There is a large turnout at this entrance that can accommodate 30+ vehicles. There are also turnouts up and downhill of this entrance that can accommodate 50-100 vehicles.

MCOSD does not develop parking areas for its preserves. It is also District policy to have several minor access points to a preserve as opposed to a few, larger, concentrated or developed trailheads with the intent to serve the people in the adjacent communities rather than attracting a large number of visitors from other areas.

Conversations with representatives of user groups indicated that these groups would favor a trailhead with parking at the Sherwood Forest area. Since those conversations, the option of a trailhead just to the north of Sherwood Forest was developed. The County has constructed a pedestrian/bicycle/equestrian underpass beneath a new road section planned for Sir Francis Drake Boulevard just north of the Sherwood Forest entrance. This Plan recommends a new trail that connects beneath this undercrossing to the Loma Alta Preserve trail system to the east and the White Hill Fire Road to the west.

Near this undercrossing there is a large turnout that is currently used by people accessing Loma Alta Preserve. The authors of this plan along with MCOSD and County Department of Public Works (DPW) staff investigated this turnout as a possible parking lot. While there is adequate space at this location to develop a parking lot, DPW staff was concerned that construction of such a lot would be unsafe, expensive, and unwarranted given the few people using the area.

Other than constructing the new access described above, the only other improvement recommended for access points is additional signing which is listed in the subsequent Signs and Information Program.

B. Recommended Actions

A-1. Monitor use of the new access. Work with the Marin County Department of Public Works to monitor parking adequacy and safety at turnouts near the access.

V. TRAILS PROGRAM

The preserves contain 10 miles of fire protection road and 6 miles of recognized trails. In addition, there are approximately 3 miles of well-used non-recognized trails and several miles of little-used non-recognized trails. The existing recognized trail/road system provides adequate access to most parts of the preserves, including most significant natural features and scenic vistas.

A. Existing Fire Roads

The fire roads on the preserves are described below along with recommendations for their future use. These trails and fire roads are shown on Figure 3. Please note that recommended signing improvements for the roads are listed in the subsequent Signing Program.

- Cascade Fire Road is the main artery through the canyon bottom. It provides access to many trails and the Middle Road Fire Road as well as to MMWD property to the west. The road extends about 1.1 miles from the Cascade Drive entrance to the MMWD property line, and then another 1.4 miles to the San Geronimo Ridge Fire Road on MMWD property. The road crosses San Anselmo Creek four times and Cascade Creek once. Erosion problems from these stream crossings plus inadequate drainage were discussed previously. Once the road crosses Cascade Creek, it climbs steeply to the MMWD property line (about 400 feet elevation change in about 0.5 miles which averages about a 15 percent slope). The road is in good to very good shape, and no improvements are required except for the previously recommended erosion control.

- Middle Road Fire Road begins at an intersection with Cascade Fire Road just east of Cascade Creek. The road gently climbs for about 0.5 miles to its intersection with the Middle Road Cut Trail. From this intersection, it climbs a steep pitch for about 300 feet which has excessive erosion. MCOSD staff and the authors of this plan investigated alternative routes to bypass this steep section, but no feasible routes were identified. As such, this plan recommends treatment and ongoing monitoring for this bad section of road. The road continues through dense forest and reaches the intersection with Creekside Fire Road about one mile from its start. It then proceeds steeply uphill and finally enters grassland and chaparral near its intersection with Toyon Fire Road, approximately 1.1 miles from its start.

- Blue Ridge Fire Road begins at the Middle Road Fire Road. The first 400-500 feet of this road are very steep with substantial erosion. This section of road needs realignment. The road continues to climb steeply to its intersection with Burnt Tree Fire Road about 0.6 miles from its start; this section of the road climbs about 440 feet in elevation for an average slope of about 15 percent. Most of this elevation gain is within the first 2,000 feet of the trail which has an average slope of about 22 percent.

  The road continues off the Cascade Canyon Preserve onto the White Hill Preserve. Just north of its intersection with Wagon Wheel Trail, the road leaves the preserve

and enters Camp Tamarancho. It proceeds west on Camp Tamarancho for 500-600 feet and then reenters the White Hill Preserve. It travels northwest through chaparral and mixed woodlands for about 0.5 miles till it intersects the west end of the Wagon Wheel trail (and the Saddle Cut Fire Road that leads north onto Camp Tamarancho). From this intersection, the road climbs steeply up the southeast side of White Hill and reaches its summit at 1,430 feet. This climb has grades that exceed 20 percent. Just west of the summit, the road leads off the preserve onto MMWD property.

While this road has excessively steep slopes in several locations, the only recommended realignment is its southernmost 400-500 feet. Erosion control work is required north of this proposed realignment to the top near the boundary line between Cascade Canyon and White Hill Preserve.

- Toyon Fire Road begins at Toyon Drive and travels northeast through open woodland and grasslands for about 1,500 feet. It then climbs steeply up the slope to intersect Pam's Blue Ridge Trail and Cul-de-sac Fire road about 0.5 miles from its start. The road then gradually climbs till it meets the Camp Tamarancho property line about one mile from its start. Total elevation change is about 400 feet. The road is generally in fair condition with several segments having poor drainage and some erosion. There are scattered broom plants with some larger stands along this road. Other than erosion control improvements and broom removal, no recommendations are made for this road.

- Creekside Fire Road starts at Middle Road Fire Road. It immediately crosses a creek and rises steeply for several hundred feet and then eases off until it reaches the Camp Tamarancho property line. Total elevation change is about 150 feet in about one-third mile. The road is in fair to good shape with three areas of poor drainage and erosion. There are scattered broom plants along the road. This road is not needed for fire or emergency vehicle response.

- Connector Fire Road is a short (800 feet), steep connector between Creekside Fire Road and Toyon Fire Road located just south of the Camp Tamarancho property line. This steep road has several steep sections that are rutting.

- Burnt Tree Fire Road is a short (0.17 miles) fire road that starts at Blue Ridge Fire Road and ends near the top of Cascade Peak. There are some erosion problems in the steep section near the end of this road.

- Toyon Tanks Fire Road is a short (0.3 miles) road that provides access to two MMWD water storage tanks. The road is in fair to good condition. Some of the areas of erosion and poor drainage have been recently fixed by MMWD. The road contains extensive broom stands. Other than broom removal and erosion control, no recommendations are made for this road.

- Cul-de-sac Fire Road is a short road that starts at Toyon Fire Road and ends near the top of the ridge to the northeast. The road is about 900 feet long. It is in good condition except for extensive broom stands. Other than broom removal, no recommendations are made.

- Concrete Pipe Fire Road is a road constructed when MMWD installed a main waterline that connects one of their reservoirs to the filter plant. This road is relatively level and about 3,500 feet long. It is generally in good to very good shape with just a few locations where erosion control is required. There are extensive broom stands along portions of this road. Broom removal and remediation of erosion are the only recommendations for this road. This road is owned by MMWD who is thus responsible for any recommendations offered for this road.

- White Hill Fire Road is the main artery for the White Hill Preserve. It starts at the Bothin Access Fire Road near Sir Francis Drake Boulevard. From its start the road climbs steeply for about two-thirds of a mile, with an elevation change of about 500 feet in that distance, or an average 14 percent slope. The road has several areas of erosion along this section as well as two populations of broom. The road reaches the boundary line between the preserve and private property about 0.8 miles from its start.

  The road then traverses private property for about 1,200 feet and then re-enters the preserve at its northwest corner. The road then gradually descends for about 1,600 feet till it enters Camp Tamarancho. This road section also has some erosion problems and a stand of broom. After the road travels for abut 750 feet through Boy Scout property, it reenters the preserve. From here it climbs steeply to the west and then south until it leaves the preserve onto private property. This last section has some rutting on the steep section.

  This plan recommends a new trail section to provide a connector where the road first leaves the property. A new trail section for the section where the road crosses Boy Scout property is not recommended. Erosion control and broom removal are recommended.

- Sherwood Forest Fire Road is a short (0.25 miles) road that starts at White Hill Fire Road and travels to the top of a knoll near the northeast corner of the preserve. This plan recommends a new trail to connect the east end of this road with Sir Francis Drake Boulevard. The road is generally in good shape and needs minor erosion control and broom removal.

B. Recognized Trails

The preserves include 14 recognized trails; recognized trails are trails that are maintained by MCOSD. Each trail is described below and shown on Figure 3. Again, signing recommendations for trails are included in the Sign and Information Program.

- Canyon Trail starts at the MCOSD property line; there is an extension of this trail across private property (though it is a "paper" street and, thus, a legal public access) that connects the preserve trail to the road end on Canyon Road. The trail is level and travels along the south side of San Anselmo Creek through open woodlands till it ends at the Cascade Fire Road west of Carey Camp Creek, about 1,100 feet from the MCOSD property line. The trail is fairly wide (3-4 feet) and, generally in good shape. No improvements are required.

- Carey Camp Loop Trail starts and ends on the Canyon Trail (part of the loop trail is also a part of Canyon Trail). The loop trail climbs the southern hillslope above San Anselmo Creek, crosses two small stream channels on bridges, and descends the ridge to the west bank of Carey Camp Creek and rejoins Canyon Trail. The entire loop trail is about one mile long. The trail is mostly in good condition and has a few locations requiring erosion control.

- Concrete Pipe Road Cut Trail is a short (700 feet) steep trail that connects Concrete Pipe Trail to Carey Camp Loop Trail between the two bridges on that trail. This trail is in fair condition and has two relatively long sections requiring erosion control. Portions of this trail may be on private property. The southernmost 500 feet are very steep and hazardous to walk on when traveling downhill. As time and resources become available, MCOSD should reconstruct this trail with switchbacks to provide a more gentle gradient. This is not a high priority as this trail receives very little use.

- Happersberger Ridge Trail begins on the Carey Camp Trail and travels up Happersberger Ridge to the west until it leaves the preserve. It extends onto MMWD, but MMWD has closed this train and does not maintain it. The first 600+ feet showed rilling in the past, but waterbars have been constructed in the last year or so, and the trail is in fair to good shape. Scars from bicycle activity have been repaired in the meadow near the top of the first rise and appear to be functioning properly. Some additional waterbars are required on a steep section for about 350 feet east of the first meadow, but otherwise the trail is acceptable, though it is slippery due to the gradient, loose dirt, and leaves on the trail. As was described previously in the Wildlife section, it is recommended that this trail be closed to enhance wildlife habitat.

- San Anselmo Creek Trail is a short (0.2 miles) trail that starts at Cascade Fire Road and proceeds along the north bank of San Anselmo Creek until it deadends. The trail gradient is gentle to moderate. It has two areas requiring erosion control.

- High Water Trail is a heavily used trail that borders the north bank of San Anselmo Creek from near the Cascade Drive entrance to its intersection with Cascade Fire Road north of the fourth stream crossing along that road. The trail is narrow but stable. There are two sections that are hazardous and recommendations are offered to fix these sections as well as a few areas that are eroding into the stream. The trail is about one-quarter mile long and relatively level.

- Cut Trail is a short (700 feet) trail that connects Cascade Fire Road with Middle Road Fire Road. The trail is in good condition except for the southernmost 100 feet where it intersects Cascade Fire Road; this section needs erosion control measures. This trail is recommended for closure to eliminate erosion and provide wildlife habitat.

- Cascade Falls Trail starts at Cascade Fire Road as an old fire road that borders the west side of Cascade Creek. At its north end, the trail includes several series of wooden steps. In winter, these steps are treacherous as there is erosion and mud covering the treads which make the steps slippery. There are two areas of erosion that need attention, and the steps themselves should be restored so they are stable. The trail ends at the top of Cascade Falls about one-quarter mile from Cascade Fire

Road. A non-recognized trail extends further up the creek; this trail is discussed in the subsequent section on non-recognized trails.

- Middle Road Cut Trail is a trail that starts at the Middle Road Fire Road and ends at the District boundary to the south. A trail continues off the south end of this trail across private property to Cascade Dive. This trail is relatively steep, especially at its north and south ends. The trail climbs about 200 feet in elevation in 800 feet in length for an average gradient of 25 percent. As this trail extends onto private property, it is recommended that the trail be signed at its intersection with Middle Road Fire Road to indicate that it is a dead-end trail and that a sign be placed at the preserve boundary indicating the end of the trail and that private property lies beyond the sign.

- Pam's Blue Ridge Trail connects Toyon Tanks Fire Road with Toyon Fire Road via Pam's Blue Ridge. This 0.55 mile trail is about 3,300 feet in length. The eastern third of the trail is relatively steep (about a 280-foot climb in 1,100 feet or about an 18 percent grade) while the remainder is relatively level. The trail is in fair condition due to seasonally soft soils and several areas of severe erosion; four main areas of erosion control are recommended.

- Cul-de-sac Trail connects the north end of the Cul-de-sac Fire Road with Toyon Fire Road. This trail travels north-south along the top of a ridge for a distance of about one-third of a mile. It is about 2,500 feet long with a gentle to moderate gradient. The trail is in good condition, and no recommendations are made except for removal of the broom stands.

- Burnt Tree Trail connects Middle Road Fire Road with Burnt Tree Fire Road. This 0.5 mile long trail is very steep where it starts at Middle Road Fire Road. To the north are other steep and eroding sections. It is also steep as it ascends to Burnt Tree Fire Road to the west; again, there are areas requiring erosion control. It is recommended that the southern 1,600 feet of this trail be closed with a new trail connecting the east end of the trail with Creekside Fire Road near its intersection with the Connector Fire Road.

- Wagon Wheel Trail connects with Blue Ridge Fire Road. The trail is about 1.32 miles long, making it the longest trail on the preserves. It is built mainly on contour so its gradient is gentle to moderate. The soils are rocky and show little erosion. No recommendations are made for this trail.

C. Non-recognized Trails

1. General Discussion

There are numerous human-made trails that are not maintained by MCOSD. In many cases, these trails are small trails that have been developed by preserve neighbors to provide access from adjoining residential neighborhoods to the preserves. Other trails have been developed to provide access to desirable natural features or locales where access is not provided by a fire protection road or recognized trail.

The preparers of this report have not provided a map of all of these non-recognized trails so as to discourage increased use of such trails. In addition, a review of these trails shows they are infrequently used and show little sign of erosion or other resource damage. It is recommended that MCOSD continue to monitor these trails. If the trails become more heavily used or show signs of resource damage, then the District should post signs that officially close the trails.

While most of these trails are not a major concern, there are several trails that have resulted in resource damage. As previously recommended in the Biodiversity Management Program, ten non-recognized trails are recommended for closure. These trails should be officially closed. Closure should include signing the trails to explain why they are closed; in some cases, physical blocking of the trail may be warranted. The signing may describe the location of other trails providing similar access.

2. Ridge Trail

There is an existing trail that travels from the north end of Ridge Road in Fairfax to Camp Tamarancho. Surveys of the preserve boundary line in this area show that the trail is outside the District boundaries and is not part of the preserves. As such, no recommendations are made in this Plan regarding that trail. Though it does not concern this Plan, it is noted that the public has been using this trail for many years. There is a disagreement about whether the trail is open to public use. The trail alignment is within a "paper" street that was offered for dedication to the Town of Fairfax but never accepted. While MCOSD may have some authority in this area, the extent of its rights are not clear. Therefore, it is possible that it is within the power of the private landowners who own the properties the trail crosses to decide on future use of this trail. Future decisions regarding continued use of this trail will be made by those landowners and/or the Town of Fairfax.

D. Re-designation of Non-Recognized Trails

1. Split Rock Trail and Upper Cascade Creek Trail

Two non-recognized trails provide access to the popular Inkwells area on Cascade Creek (the Inkwells are on MMWD property). Because the Inkwells is such a popular destination, one of these trails should be designated as a recognized trail while the other one should be closed. As described previously in the Biodiversity Management Program, this Plan includes closure of the upper Cascade Canyon Trail in order to provide a Sensitive Wildlife Area. The Split Rock Trail would be designated as a recognized trail for pedestrian use. Split Rock Trail intersects Cascade Fire Road west of the intersection of Cascade Creek and San Anselmo Creek. The trail is about 1.6 miles long (from Cascade Fire Road to the Inkwells). Approximately 0.5 miles of the trail is on MCOSD property, and the remainder is on MMWD property. This trail was illegally constructed by users several years ago. MCOSD has the trail signed as "closed," but it is still used by many people.

This trail travels in a generally northwesterly direction up the east side of the ridge between Cascade Fire Road and Cascade Creek. In general, the trail is well

constructed as regards slope, though there are a few overly steep pitches. The main problem with this trail is that it is used by bicyclists. Bicycle use has caused central depressions in several sections of the trail. These depressions have concentrated runoff and caused rutting, and this rutting will increase over time unless these trail sections are recontoured (i.e., outsloped) and/or provided with waterbars. A review of the trail between Cascade Fire Road and the trail's intersection with Cascade Creek in January, 2000 showed approximately 1,300 feet of trail that show moderately severe rutting and another 800 feet with less severe rutting.

The second trail that accesses the Inkwells area is the Cascade Creek Trail. This trail will be closed. This non-recognized trail starts at Cascade Falls and runs up the east side of Cascade Creek to the Inkwells. From Cascade Falls to the Inkwells is about one mile. This non-recognized trail has several overly steep pitches with unstable surfaces; these sections would need to be rerouted to provide safe access if this trail were not closed. In addition, there is the need for some brush removal and erosion control. A review of the trail shows five sections that need to be rerouted plus the addition of some stairs in one location and construction of a safe trail across the rocks at the north end. The sections requiring relocation total about 900 feet of trail; approximately half of the area requiring relocation is on MMWD property.

There are pluses and minuses associated with each of these trails. The benefits of the Split Rock Trail are that it is on the average less steep than the Cascade Creek Trail and renovation of this trail would be easier and less expensive, since it requires very little trail relocation. The disadvantages of this trail are that it does not provide access to the diversity of habitats and views possible on the Cascade Creek Trail and the fact that by designating the trail a recognized trail, MCOSD would be "legitimizing" an illegally built trail. This was of particular concern to several attendees at the Cascade Canyon field trip.

The advantages of the Cascade Creek Trail are that it is an historic, if non-recognized, trail and it provides access to a variety of habitats and views. The disadvantages are that it would be more costly to construct this trail to MCOSD standards, and unless the trail were reconstructed, it is hazardous in several locations. More importantly, closure of this trail would result in a large area within the canyon bottom that could be used by wildlife with minimal human intrusion.

To close the Cascade Creek Trail, a fence will be needed at the south end at the head of Cascade Falls. Similarly a fence could be constructed near the north end where the trail descends out of heavy brush to the rocks above the creek. Erosion control work will not be required for this trail, other than a few small sections.

To conclude, this Plan designates the Split Rock Trail as a recognized trail. The trail would continue to be closed to bicycle use and existing erosion problems would be addressed. The Cascade Canyon Trail above Cascade Falls will be closed.

2. Martha McCormack Trail

The area immediately to the west of the grassy flat at the Sherwood Forest entrance contains a grove of relatively large second-growth redwoods (the Sherwood Forest). A

trail from this location to the White Hill Fire Road (see Figure 3) was constructed as an Eagle Scout project by Steve Chipman in the late 1970s. Mr. Chipman dedicated the trail to Martha McCormack, a neighbor of Mr. Chipman and a former scout leader. The first 300 feet of the trail as it travels from the flat to the west is relatively steep and needs to be realigned to provide proper gradient and prevent future erosion problems.

This trail should be designated a recognized trail, and the first 300 feet should be realigned and reconstructed. This trail will provide hiker access to the top of the ridge for hikers who wish to avoid traveling on multi-use trails (if the new connector trail described below is approved for multi-use). It is not a high priority to designate this trail as a recognized trail, and this work can be done once MCOSD has implemented more pressing management actions.

E. New Trails and Fire Roads

As discussed below, there are four locations where new trails were considered, and two new trails are recommended. In addition, one fire road section and two trail sections are recommended for realignment.

1. Connector Trail Between White Hill Fire Road and Blue Ridge Fire Road

The existing Blue Ridge Fire Road crests White Hill and intersects White Hill Fire Road west of White Hill. Blue Ridge Fire Road leaves the White Hill Preserve after cresting White Hill and travels onto MMWD lands. White Hill Fire Road then travels northeast off MMWD property onto the Gary Giacomini Preserve and then back onto the White Hill Preserve. The problem is that prior to entering the White Hill Preserve, the fire road travels through two privately-owned parcels. To avoid the crossing of private properties, MCOSD was interested in the possibility of constructing a connector trail between Blue Ridge Fire Road and White Hill Fire Road so that the connector would be entirely on MCOSD-owned property.

Field surveys indicated that constructing this trail solely on the White Hill Preserve is not feasible. The slope on the north side of the Blue Ridge Fire Road as it nears White Hill is excessively steep. There is an existing non-recognized trail that follows an old fire trail down the north slope of White Hill. This trail is very steep and shows signs of significant erosion, and it is recommended for closure. There is not adequate space or slope above (south) of the two private properties to construct a trail in this location.

The recommendation is that MCOSD seek to acquire a formal public easement over this road section so the public can continue to use White Hill Fire Road as it traverses these two private properties. It is evident that the public has used this road for public access for a considerable period of time, and it is likely that the public has the legal right to continue this historic use.

2. White Hill Fire Road Crossing of Camp Tamarancho Property

The second location where White Hill Fire Road leaves the Preserve and crosses private property is near the center of the White Hill Preserve where the road dips onto the Boy Scouts of America property for a few hundred feet. Again, it would be very difficult to construct a connector trail at this location due to steep slopes. As such, MCOSD contacted the BSA who have agreed in principle that the public would be allowed to continue to use that section of White Hill Fire Road that crosses their property. As such, no new trail is needed or recommended at this location.

MCOSD will need to enter into a formal agreement regarding public access along this section of the road. BSA representatives have stated that the BSA will want to discuss issues of liability, maintenance, and, possibly, recompensation for this public use.

3. Northwest End of White Hill Fire Road

The final location where White Hill Fire Road travels off the Preserve is in the northwest corner of the Preserve as shown on Figure 7. Here, the road travels across privately-owned land for about 1,600 feet. Currently, there is a non-recognized trail that connects the two portions of the fire road that are on the Preserve. This trail travels up a steep slope near the preserve property fenceline and shows signs of significant erosion. This trail is excessively steep and should be closed and restored.

A new connector trail can be constructed to follow the contour to connect the two sections of White Hill Fire Road as shown on Figure 7. Approximately 2,000-3,000 feet of trail would be constructed. The new trail could be developed for multi-use. The eastern half of the trail would be through grassland, and the western half through mixed evergreen forest. Alternatively, a shorter trail could be constructed nearer the fenceline. However, this trail, particularly if it were developed for multi-use would require extensive switchbacks up the relatively steep slope in order to provide adequate gradient.

4. Connector Between Sir Francis Drake Boulevard and White Hill Fire Road

Currently, White Hill Fire Road terminates just to the west of Sir Francis Drake Boulevard on the road leading into Bothin Camp. There is no parking along this road so that people with vehicles must park on Sir Francis Drake and then cross that busy street and/or walk along it to reach the White Hill Fire Road access.

As was described in the previous Access Program, the County has plans to construct a new roadway section on Sir Francis Drake Boulevard. This new roadway section will include an undercrossing. It is recommended that a new trail be constructed starting at the west side of this undercrossing and extend up the ridge to meet the Sherwood Forest Fire Road. MCOSD staff has developed a preliminary route for this trail as shown on Figure 7. This new trail would be approximately 2,500 feet long. The new trail could be developed for multi-use.

This trail has many advantages, including:

- It will provide safe access between Loma Alta Preserve and the White Hill Preserve. MCOSD staff has stated that if this trail were constructed, then MCOSD would

extend a trail from the existing fire road access on Loma Alta Preserve to the undercrossing, thus allowing users to travel between preserves beneath Sir Francis Drake Boulevard.

- There are numerous turnouts near the undercrossing that allow visitors to park.
- The trail would meet the long-term plans for the Bay Ridge Trail and provide an important connector for that trail.

5. Realignment of the Concrete Pipe Road Cut Trail

The 300 feet of trail immediately north of the Concrete Pipe Road should be reconstructed. This trail is little used, and this reconstruction is not a high priority. During reconstruction, the trail should be sited to ensure that it is on public property.

6. Realignment of Burnt Tree Trail

The southern 1,600 feet of the Burnt Tree Trail will be closed to reduce erosion and provide additional wildlife habitat that is not traversed by a trail. The east end of Burnt Tree Trail will be extended east to connect to Creekside Fire Road near that roads intersection with the Connector Fire Road. This will require construction of approximately 2,200 feet of new trail. This trail will continue to be open only to pedestrians and equestrians.

7. Realignment of a Section of Blue Ridge Fire Road

The southernmost 400-500 feet of Blue Ridge Fire Road contain excessively steep slopes which are resulting in substantial erosion and are difficult for emergency vehicles to traverse. MCOSD staff has determined that this section of road could be realigned to the east to connect with Middle Road Fire Road about 500 feet northeast of the current intersection of the two fire roads. The proposed realignment, as shown on Figure 7, will provide a safer and less erosive road alignment. This road construction is recommended along with restoration of the abandoned road section.

8. Construction of a Multi-Use Trail on Creekside Fire Road

This 0.35-mile long fire road has erosion sources and is not needed as an emergency vehicle response route. The road will be closed, and a multi-use trail will be constructed to meander along the road bed. This will allow revegetation of the unused portion of the road bed, a reduction in erosion, and a reduction in maintenance requirements.

F. Trail Construction Techniques

MCOSD is experienced in constructing trails and has its own procedures and guidelines for trail construction. If there is any question about appropriate slope, drainage,. surfacing, or other factors, the District can refer to the construction guidelines in *A Handbook on Trail Building and Maintenance for National, State and Local Natural Resource Managing Agencies* (Griswold, 1996), *Trail Manual for the Maintenance and*

Operation of Trails in the East Bay Regional Park District McDonald, 1995), and *Trails Handbook* (California Department of Parks and Recreation, 1998).

If one or more of the two new trails will be used by bicyclists, then the trail should be constructed per MCOSD standards for multi-use trails. The trails should be constructed to minimize erosion.

All trails and roads should be periodically monitored, particularly after the winter storm season. New substantial sources of erosion should be recorded and addressed prior to the onset of the next rainy season.

G. Bicycle Use of Trails and Roads

The controversy concerning bicycle use of roads and trails on MCOSD and other public lands in Marin County and elsewhere is well known. This controversy has been continually documented in the local newspaper (the *Marin Independent-Journal*) and other media sources. Similarly at public scoping meetings, at other meetings with concerned groups and individuals, and in individual conversations, it was evident that bicycle use is the most contentious issue regarding future management of the preserves.

This issue has become focused on these preserves due to the fact that when the County purchased a portion of Camp Tamarancho from the Boy Scouts of America, there was an existing single track trail (the Wagon Wheel Trail) on the purchased property that had been constructed and legally used by bicyclists. At the time this property was purchased, there was considerable controversy and debate over whether MCOSD should continue to allow bicyclist use of this trail since the general policy of MCOSD was not to allow such use. The conclusion of this debate was that MCOSD would allow continued bicycle access to this specific trail.

This Management Plan was prepared under the direction of MCOSD that all future bicycle access to trails on the preserves would be consistent with the District's general policies regarding bicycle access. The District's policy regarding bicycle use is that bicycles are permitted on fire roads, with speed limits of 15 mph and 5 mph when passing other users. The District may at its discretion also designate single-track trails for bicycle use (Policy 3 d3 of the District's *Open Space Management Policies*) This discretion was included in District policies to cover those situations where short connectors may prove necessary between adjacent fire roads, and where certain situations would make this multi-use the best solution to recognized problems (this interpretation of the intent of the District's "intention" is taken from a letter dated September 29, 1992 from Frances Brigmann of MCOSD to the District's Board of Directors; this intention was re-confirmed by MCOSD staff while this Plan was being prepared).

Given the District's policies, bicycle use of the preserves will continue to be limited to fire roads, Wagon Wheel Trail, and, if the District Board approves, the two new connector trails on the White Hill Preserve. If the two new connector trails recommended above are constructed, MCOSD could consider multi-use for these trails as they appear to meet the criteria established for multi-use consideration. If multi-use is allowed, the trails shall be constructed to meet specifications for such trails. The trails should be

monitored for excessive erosion. If such erosion occurs, the trails should be closed to bicyclists and/or equestrians during periods when the soil is wet.

H. Equestrian Use of Trails

In general, there is low use of the preserves by equestrians. Virtually no equestrians were counted during the official user counts or unofficial counts conducted by the fieldworkers working on this Plan. Nevertheless, equestrians do use preserve trails as evidenced by hoof prints on roads and trails as well as anecdotal reports.

When the soils are wet, heavy equestrian use can cause major erosion of single track trails. At this time, horse use of the preserves is sufficiently low that no actions to restrict horse use are warranted. However, it is recommended that MCOSD and/or Environmental Stewards continue to monitor trail and road usage patterns to identify any horse-caused damage. If the damage is sufficiently severe and cannot be remedied by typical road/trail annual maintenance, then MCOSD should close the affected trails when the soils are wet.

The new connector trail between Loma Alta preserve and the White Hill Fire Road is likely to be heavily used by equestrians as it will provide a safe and convenient route between public lands east and west of Sir Francis Drake Boulevard. In addition, the turnouts or parking lot near this trailhead could become a staging area for equestrians. As such, it is essential that the new connector trail as well as the other new connector trail further to the west on the White Hill Fire Road be constructed with sufficient substrate to withstand equestrian traffic. These trails must be closely monitored. If the trails begin to erode or are damaged by equestrian use, then additional rock must be added to the substrate to eliminate the erosion or the trails should be closed to equestrian use during the period of wet soils.

I. Recommended Actions

T-1. Construct a new trail from Sir Francis Drake Boulevard to the Sherwood Forest Fire Road (within the trail corridor shown on Figure 7). Consider multi-use of this trail. If multi-use is allowed the trail shall be constructed per MCOSD standards for multi-use, and the trail shall be constructed and maintained so as not to generate substantial erosion. Consider closing this trail to bicyclists and/or equestrians when soils are wet, if there is evidence of significant erosion.

T-2. Construct a trail connector in the northwest corner of the White Hill Preserve within the trail corridor shown on Figure 7. Consider this trail for multi-use. If multi-use is allowed the trail shall be constructed per MCOSD standards for multi-use, and the trail shall be constructed and maintained so as not to generate substantial erosion. Consider closing this trail to bicyclists and/or equestrians when soils are wet, if there is evidence of significant erosion.

T-3. Finalize an agreement with the Boy Scouts of America to allow public access over the approximately 750 feet of White Hill Fire Road that crosses their property.

T-4. Coordinate with MMWD regarding maintenance of Split Rock Trail. Provide fencing and a stile at the north end of this trail to block bicycle use. The fencing can be placed at the preserve boundary or, with the permission of MMWD further to the north (for example at the crossing of Cascade Creek). The trail will be signed to prohibit bicycle use.

T-5. Designate the Martha McCormack Trail as a recognized trail.

T-6. Seek to acquire a public easement over the two private properties crossed by White Hill Fire Road west of the White Hill Preserve.

T-7. Construct a new eastern section of the Burnt Tree Trail within the corridor shown on Figure 7. Close the southern section of that trail as shown on Figure 7.

T-8 Close Creekside Fire Road and construct a multi-use trail on a portion of the road bed.

T-9 Re-designate Split Rock Trail as a recognized trail for pedestrian (hiking) only. Other uses such as biking and equestrian uses may be considered at a future time.

VI. USE PROGRAM

A. Current Use Policies

This program describes existing and proposed uses of the preserves consistent with Goal 2 which states "Consistent with Goal 1, maintain and enhance opportunities for public recreation, education, and aesthetic enjoyment of the Cascade Canyon and White Hill Preserves."

The use of the preserves is guided by Marin County's *Open Space Land Use Regulations*. These regulations are presented in their entirety in Appendix A. Some of the more pertinent regulations are summarized below.

- Allowable uses are restricted to those uses having no impact or minimal impact on the natural environment.
- Pedestrian and equestrian access to preserves should be provided wherever possible and reasonable.
- It is preferable to have several minor access points to a preserve as opposed to a few larger concentrated or developed trailheads with the intent to serve the people in the adjacent communities rather than attracting a large number of visitors from other areas.
- Bicycle use is allowed on roads or trails designated as bicycle routes by the District. Bicycle users must yield right-of-way to pedestrian and equestrian traffic under all circumstances. Bicyclists shall not exceed 15 miles per hour.
- Group use of the preserves is allowed with the issuance of a permit that contains various restrictions.
- Overnight camping is allowed only by permit and groups of six or more people must camp in designated Enhanced Areas. No open fires are permitted.
- Dogs are permitted on leash on trails and within voice command on fire roads (this means dogs are to stay on the fire road and be within voice command).
- The preserves will be patrolled and maintained by District personnel. Law enforcement is provided by the appropriate jurisdiction (in this case, the County).
- The District may engage in landscape restoration where the natural landscape has been altered or degraded through misuse.
- The District will attempt to reduce the threat of wildfire. Measures to implement this policy include:
    - Open fires and smoking are not allowed.

- Fire roads and trails will be maintained for access and as fuel breaks.

- Monitor plant communities to determine if high hazard fuels are developing. If they are, the District will carry out specific studies to determine what corrective measures should be taken.

- Preserves can be closed during high fire hazard periods.

- Grazing can be used to reduce fire hazard conditions.

- Property owners living adjacent to a preserve can be granted permission to clear flammable fuels on MCOSD property adjacent to their property.

For the Cascade Canyon and White Hill Preserves, bicycles are currently allowed only on fire roads and the Wagon Wheel Trail.

This management plan recommends closing certain trails as well as increased restrictions on dogs. Other than these recommendations, use of the preserves will be consistent with the County's overarching open space land use regulations.

B. Use of the Preserves

1. Results of User Counts

A number of residents have expressed their concern that the preserves' trails and roads, and the preserves themselves, are being "overused," and that this heavy use is causing damage to the natural resources of the preserves. Because these perceptions are anecdotal, that is, they are not based on actual counts of the number of users over the years since the preserves were opened to public use, it is difficult to gauge the veracity of these claims.

To provide a quantitative assessment of preserve usage, the preparers of this management plan conducted user counts. MCOSD wished to have these counts conducted to obtain some idea of the actual number of users. As importantly, these counts can be used as a baseline to determine growth in use in the future. Originally, the plan was to count the number of users at all entrances to the preserves for four days. However, the logistics of getting counters to each of the 15 official and major unofficial access points proved unmanageable. In addition, it was determined that four counts would not provide sufficient data regarding the number of users. Table 1 shows the results of the one count that was done with a counter at each official entrance (plus the non-recognized entrance from Split Rock Trail) to the preserves. Table 1 shows the number of users entering the preserves at each access point.

Based on this count, as adjusted per the assumptions presented in Appendix G, it is estimated that on a high-use weekend day, the preserves are used by approximately 200 people. As Table 1 shows, more hikers use the preserves than bikers. Table 1 also indicates that almost two-thirds of the hikers enter and use the Cascade Canyon bottom

area while bikers tend to enter the preserves in the area near Wagon Wheel Trail. The table clearly shows that the northern part of the White Hill Preserve receives little use.

Table 1

User Count for Saturday, 8/19/98

Access Point	Time of Count	Hikers	Bikers	Dogs
Sherwood Forest	8:30-5:00	0	1	0
Bothin	8:30-5:00	1	0	0
N. end of Toyon Fire Road	9:00-8:30	7	4	10
East End of Wagon Wheel Trail	9:00-8:30	7	22	0
West End of Wagon Wheel (at B17 entrance and coming from White's Hill)	9:00-8:30	4	10	0
East end of Cascade Fire Road	7:00-8:30	18	9	12
East end of High Water Trail	7:00-8:30	18	2	3
East end of Canyon Trail	8:30-8:30	26	2	17
Lower Toyon Fire Road (2 entrances)	8:00-8:30	5	3	6
Split Rock Trail	8:30-8:30	2	1	0
West end of Cascade Fire Road	8:30-8:30	2	7	1
San Anselmo Creek Trail	8:30-8:30	2	0	6
Walnut (Middle Rd. Cut Trail)	8:30-5:00	0	0	0
Carey Camp Loop/Happersberger as measured at bottom of trails	8:30-8:30	3	0	0
Total		**95**	**61**	**55**

Subsequent to the August, 1998 count, it was decided to conduct more counts at the access points that receive the most use. Thirteen additional counts were conducted, and the results are shown in Table 2. The number of users traveling each way at seven different locations are described. The count locations are described below.

- The east end of Cascade Fire Road. The counter at this location was able to count people entering and leaving the preserve via this fire road.

- The east end of the High Water Trail. The counter near the east end of Cascade Fire Road was able to count people entering and leaving the preserve via this trail.

Table 2

Table 2

- The east end of Canyon Trail. The counter near the east end of Cascade Fire Road was able to count people entering and leaving the preserve via this trail.

- The east end of Wagon Wheel Trail. The counter at this location counted people traveling east and west on Wagon Wheel Trail, north and south on Blue Ridge Fire Road, and east on the Serpentine Trail which is a trail on Camp Tamarancho that extends east from near the east end of the Wagon Wheel Trail.

- The north end of Toyon Fire Road (at the Camp Tamarancho boundary line). This counter could observe people traveling north and south on Toyon Fire Road at the Camp Tamarancho line.

- The north end of Ridge Trail where it enters Camp Tamarancho. This trail does not provide a direct (or, recognized) access to the preserves. Counts were made at this location to determine the use of this private trail.

Based on the counts and the assumptions described in detail in Appendix G, it is estimated that for the average day an average of 90 hikers and 56 bikers enter the preserves. This is a total of 146 users per day. This estimate, which is likely a high estimate for the average day will be used in subsequent comparisons with use rates at other parks.

2. Preserve Use Compared to Other Parks

MCOSD has not developed use estimates for its other preserves. However, Sonoma County Regional Parks (SCRP) has developed use estimates for a number of its parks. SCRP is currently preparing an *Outdoor Recreation Plan* for the entire County. As part of this Plan, SCRP has provided Countywide estimates of use rates of their various types of parks. These are presented below along with the amount of increased usage from 1990 to 1999 (from Sonoma County Regional Parks, 1999, Appendix 4).

- Regional Recreation Areas - Active (that is, these facilities include active recreational facilities including picnic areas, swimming, tennis, or other active uses). These parks are about 300 acres in size or smaller. Use of these parks increased from 1,380 visitors per acre per year to 1,615 visitors per acre per year. For purposes of comparison, the Cascade Canyon and White Hill Preserves total about 887 acres. If one assumes an average of 146 users per day, or 53,290 users per year, the per acre average use rate would be 60 visitors per acre per year.

- Regional Open Space Parks - Passive (that is these parks include trails and allow picnicking, but do not include any active recreational facilities). These parks are 300 acres in size or larger. SCRP estimates that use of this type of park increased from 225 visitors per acre per year to 291 visitors per acre per year. From 1988/89 to 1996/97, increase in use on this type of parks was 29 percent.

In addition to the data SCRP provides in its *Draft Outdoor Recreation Plan*, SCRP provided use estimates for several regional parks in a report prepared in 1994 (SCRP, 1994). The estimates for the four regional parks are presented below.

- Foothill Regional Park. This is a 211-acre regional park adjacent to a residential neighborhood in Windsor. It contains trails and roads open to all user groups, but does not contain picnic facilities or recreational facilities. This park is similar to the preserves in that it is adjacent to residential development; however, it does not contain rugged terrain and wildlands similar to the preserves. SCRP estimated 1990/1991 use rates at 96,247 people per year. Adjusting this rate by 30 percent to reflect SCRP's estimated increase in use, current use would approximate 125,121 people per year or 343 people per day or 593 visitors per acre per year.

- Shiloh Ranch Regional Park. This 845-acre park is located in the foothills south and east of Windsor. The park is a regional open space park without recreational equipment or play fields. There are trails available for all user groups and a small picnic area. The park is not near a neighborhood and most users must drive several miles to access the park. The park is similar to the preserves in terms of size and wildland quality, but is not near residential development. SCRP estimated 1990/1991 use at 46,310 people per year. Adjusting this figure by 30 percent equals a current use rate of 60,203 people per year or 165 people per day or 71 visitors per acre per year.

- Helen Putnam Regional Park. This is a 216-acre park located southwest of the City of Petaluma. The park is in rolling hills. One must drive several miles to access the park as it is not near any neighborhoods. SCRP estimated the 1990/1991 use rate at 80,686; adjusted, the current use rate is estimated to be 104,892 people or 287 people per day or 486 visitors per acre per year.

- Lafferty Ranch Park. This is a 270-acre park that is proposed for development by the City of Petaluma (SCRP made use estimates at a time when SCRP was considering developing a park on this site). The park is proposed as a wilderness park with trails open only to hikers and no dogs allowed. No picnic or other facilities will be provided. The proposed park is located 3.5 miles from Petaluma near the top of Sonoma Mountain. Access to the park will be by a steep, narrow road. The park is not near any neighborhood or population center. The predicted use for this park is 28,620 visitors per year, or 72 people per day or 106 visitors per acre per year.

Comparing the estimated use rates of Cascade Canyon and White Hill Preserves with these various Sonoma County Regional Parks shows that the use rates are substantially lower than the SCRP-estimated user rates for Passive Regional Open Space Parks, despite the fact that most of the larger parks that have similar facilities to the preserves are considerably more distant from population centers. However, the higher use rates in Sonoma County parks is partially a reflection of a larger population and the scarcity of public lands in that county as compared to Marin County.

The use rates of the preserves (60 visitors per acre per year) is at the bottom of the range of the more distant passive regional parks described above (71 to 593 visitors per acre per year) and less than one-quarter of the average use rate for such parks (291 visitors per acre per year).

In general, use rates of the preserves is low when compared to similar parks in Sonoma County. Sonoma County has reported a 29 percent increase in use of Open Space Parks over the decade of the 1990s. It is uncertain what the reasons for this increase

are. The population grew 10.8 percent during the same period, so two-thirds of the increase has to do with increased demand by the existing population for passive open space. The Marin County population has grown less than in Sonoma County plus there is considerably more public open space available to Marin County residents.

3. Conclusions

A review of the data leads to the following observations.

- The preserves as a whole are not heavily used. Use rates are near the bottom of the range of use for similar parks/preserves.

- More hikers than bikers use the preserves. The counts indicate that about 3 hikers use the preserves for every 2 bicyclists.

- While the preserves as a whole are not heavily used, there are two areas that receive relatively heavy use. These are the Cascade Canyon bottom land and the Wagon Wheel Trail. It is estimated that approximately two-thirds of the hikers who use the preserves mainly use the canyon bottom area. For the 13 days when travelers were counted in both directions, there were 1,320 trips by hikers, 323 trips by bicyclists, and 355 trips by dogs traveling east or west on Cascade Fire Road, High Water Trail, or Canyon Trail. The canyon bottom is mainly used by hikers (80 percent of the trips). There were more trips by dogs than bicyclists.

- Use of Wagon Wheel Trail is almost entirely by bicyclists. There are a number of reasons why this occurs. First, the trail is part of a series of bicycle trails (which are all on Camp Tamarancho except for Wagon Wheel Trail), and this trail system attracts bicyclists from a large area. For hikers, the trail is a relatively long walk from public access points. Many hikers tend to avoid trails and roads with heavy bicycle traffic.

- Use of the preserves is heavier on weekends, especially for bicyclists. Use of the canyon bottom area by hikers is relatively constant, though there is some increased use on weekends. This supports the observation that the canyon bottom is heavily used by members of the local community for taking a daily walk or exercising their dogs.

- Of the 323 bicycles traveling through the Cascade Canyon bottom area during the 13 count days, 40 of those bicycles traveled illegally over the High Water Trail or Canyon Trail. Thus, 12 percent of the bicyclists in the area illegally rode on single-track trails. Bicyclists illegally use these trails more frequently when the water in the creek is higher. While only two counts were done during the winter/early spring (December 5 and March 6), these counts showed 21 of 51 bicyclists illegally used trails on these two days. Illegal trail use decreases during the later spring, summer, and fall, but it still occurs (15 of 272 trips, or 5.5 percent). The fact that bicyclists were observed illegally using these two trails should not be viewed as indicative of the percentage of bicyclists using other trails on the preserves since the trails where these counts were conducted are more likely to experience illegal use due to the

required creek crossings on the legal fire road access and the fact that the trails provide direct access to Cascade Drive and Canyon Road.

C. "Overuse" of the Preserves

1. Introduction

Several residents living near the preserves have stated in correspondence, at public meetings, or in private conversations with the Plan preparers that the preserves are being "overused" with consequent adverse impacts to the resources of the preserves. While some commenters who expressed this opinion felt the preserves were being overused by all user groups, many expressed that the overuse was caused by the increasing popularity of mountain bicycling on the preserves. Residents opposed to bike use of trails have stated that MCOSD is not adequately protecting the preserves' resources, contrary to the primary goal of management. The complaints regarding bicycling fall into three categories: 1) resource damage, 2) user conflicts and safety, and 3) impacts to neighbors living next to or near the preserves. These issues are discussed below; also, see Appendix H which contains additional observations on bicycle use.

2. Impacts on Natural Resources from Increased Use

At the most, possible increased use of the Cascade Canyon bottom area has resulted in the loss of 0.16 acres of native vegetation and the loss of 2.7 acres on the preserves as a whole. This loss of vegetation is due to increased use by all users as well as past grading practices. The loss of vegetation is minor, less than 0.3 percent of the total acreage of the preserves. In addition, it is likely that this loss is substantially overstated as it assumes that all fire roads have been widened by an average of 2 feet and all trails by 0.5 feet over the past 10-15 years. Field observations indicate that this widening has occurred only in a few locations. This Plan presents a variety of actions to replace this lost vegetation and reduce the chance of additional loss.

Trail and road widening that has occurred has not resulted in the loss of any special status species of plants, though in some locations locally uncommon plants may have been lost. In addition, as noted previously, some vegetation has been lost due to illegal construction of trails. In summary, it is estimated that 1-3 acres of vegetation have been lost due to increased use of the preserves. This includes increased use by all user groups. This is not a substantial loss of vegetation, and the loss can be reversed in many cases by implementing recommendations of this Plan.

3. Bicycle Use Conflicts

As discussed in more detail in Appendix H, bicycle use of single-track trails can cause safety problems and user conflicts. This Plan follows MCOSD policy regarding bicycle use of roads and trails and does not recommend bicycle access to single-track trails (with the possible exception of the two new connector trails which, if bicycle use is allowed, would be constructed to meet multi-use standards). The problems of bicyclists illegally using other trails can be addressed by increased enforcement (see the subsequent Enforcement Program for recommendations) and by education. MCOSD

should encourage biking clubs to publicize through their newsletters, web pages, meetings, and other outlets that bicyclists should not use single-track trails on the preserves that are closed to bicycles. They should request that bike shops in the area similarly recommend against such use. MCOSD should monitor illegal bike use (see Enforcement Program). If MCOSD determines that illegal bike use is not declining, then MCOSD should consider closing one or more trails to bike use (assuming that multi-use of recommended new connector trails is approved).

3. Impacts to Adjacent Neighborhoods

A final problem involving use is that some residents complain that the preserves have attracted people from a wide area. Some bicyclists trespass across private property to access the preserves. The number of bicyclists has resulted in bike and vehicle traffic on certain public streets that provide access to the preserves. This is perceived to have a corresponding negative impact on the character of the neighborhoods along these streets.

In response to this problem, it is noted that the problem is caused in part by the limited number of access points available to bicyclists. If the new connector trail between Sir Francis Drake Boulevard and Sherwood Forest Fire Road is constructed to allow bicycles, this will provide a means of accessing the preserve that does not rely on the current main access points (i.e., Cascade Drive and Ridge Road). There is ample parking in this area. The recent construction of a new access trail on private property from Camp Tamarancho to Iron Springs Road should also alleviate the pressure on the two primary accesses.

As regards trespass over private property, this Plan recommends closure of two non-recognized trails (the Middle Road Cut Trail extension and the trail system extending off the west end of Pam's Blue Ridge Trail) that currently lead off the preserve to Cascade Drive which should alleviate problems in that area. The issue of bicycle access over Ridge Trail is a matter to be determined by the owners of the property across which this trail travels and the Town of Fairfax.

MCOSD allows public use of its preserves, which were purchased by the public to preserve the lands and prevent development of said lands. This Plan does not contain recommendations to increase bicycle or other use in the neighborhoods most affected in the past.

A few people have stated that the increase in bike use on the preserves and through their neighborhoods is the result of MCOSD allowing bike use on the Wagon Wheel Trail. These individuals claim that because of the paucity of single-track trails open to bicyclists, the Wagon Wheel Trail has attracted a large number of bicyclists who otherwise would not use the preserves. In this regard, it is noted that bicyclists have long used the preserves. Cascade Fire Road is considered the birthplace of mountain biking. Second, even if Wagon Wheel Trail were closed to bicyclists, bicyclists would continue to be attracted to the area given the 7 miles of constructed or planned single-track trails open to bicyclists on the adjacent Camp Tamarancho. Wagon Wheel Trail is a minor part of this trail complex. If it were closed, it is entirely possible that a parallel

trail would be constructed on Camp Tamarancho to close the gap that would result from the trail closure.

As was previously noted, this Plan is not intended to be a study of MCOSD policy regarding bicycle use. Bicycle use on fire roads and allowed trails would be restricted or eliminated in this Plan only if the damage to resources is "substantial' as defined earlier in the discussion of the Goals for the preserves. While there has been some loss of resources due to bicycle use, as well as use by other users, the amount of resource loss is not considered substantial, and what resource damage has occurred can be substantially reduced by implementing actions recommended in this plan.

To conclude, in general the preserves are not heavily used. Impacts to resources in the heavily-used areas as well as in the preserves as a whole will be significantly reduced by recommendations included in this Plan. Similarly, user conflicts and impacts to adjacent neighborhoods will be reduced by implementation of this Plan's recommendations.

4. Cascade Canyon Bottomland

As noted previously, the area receiving the most use and the area most people felt showed the effects of overuse is the canyon bottom between the end of Cascade Drive and Cascade Falls. The main problem with this area is the presence of Cascade Fire Road. This road dominates views along much of the canyon bottom. This road is the primary cause of loss of vegetation and a "natural" appearance in the area. Bicycles using this road for legal access must cross the creek four times (the fifth crossing does include a bridge, though bicyclists often cross the creek rather than using this bridge). As noted earlier, these creek crossings prompt bicyclists to illegally use trails for access, especially when water is high.

It is not possible to close this road as it provides an important travel route for fire and other emergencies. The Plan authors investigated a variety of options to reduce the visual and environmental effects of this road, as well as the two trails in the area. This analysis also had the aim of identifying ways to reduce illegal trail use by bicyclists. Each option is discussed below.

- Option 1 is to install railcar bridges across the five stream crossings. These bridges would eliminate the need for vehicles and users to travel through the streambed. National Marine Fisheries Service (NMFS) representatives felt these bridges were not warranted given the condition of the stream, the low volume of traffic, and the adverse environmental effects of installing the bridges. In addition, the aesthetics of the area would be marred by these large bridges. This option is not recommended.

- Option 2 consists of rerouting Cascade Fire Road between the first and fourth crossing as shown on Figure 11. The road would be routed to the south and cross Carey Camp Creek at the location of the existing footbridge. This road relocation would eliminate two of the stream crossings. The existing bridge over Carey Camp Creek would be enlarged to carry motor vehicles. The advantages of this option are the elimination of the two worst stream crossings which would benefit water quality and reduce the number of crossings by bicyclists and other users.

The option has the following disadvantages:

- Relocating Cascade Fire Road will attract bicyclists to the south bank of the creek and may encourage increased illegal use of Canyon Trail as well as possible illegal use of Carey Camp Loop Trail.

- Relocating the road will result in loss of vegetation, though this loss would be somewhat offset by revegetating the closed section of the road. A few madrone saplings and a few larger bay trees would need to be removed.

- Relocation would eliminate one of the few areas in the canyon bottom where hikers can walk absent the presence of bicycles.

- There would be the cost of road relocation plus construction of a widened bridge.

- Option 3 is to not allow bicycle traffic on Cascade Fire Road. This option is not recommended as the amount of resource damage in the canyon bottom is insufficient to be deemed "substantial." Thus, closure would be inconsistent with MCOSD use policy.

- Option 4 is to allow bicyclists to use the Canyon Trail thus eliminating three stream crossings. This option has merit because it reduces the number of stream crossings for bicyclists. This option could include construction of a bridge over the fourth crossing, thus allowing bicyclists the ability to travel the canyon without crossing the stream. However, the City of Fairfax does not allow bicycles on that portion of Canyon Trail between the preserve and the end of Canyon Road. Unless, the Town altered its position, this option is considered infeasible. It is highly likely that residents along Canyon Road would be strongly opposed to this option as it would increase traffic on this narrow street which has several hazardous sections. This option would also encourage more bicycle use of the area, since bicyclists would not need to cross the stream. The option would eliminate an existing bike-free trail, and require reconstruction of the trail to meet multi-use standards.

- Option 5 is to construct pedestrian/bicycle bridges across the first and fourth crossings in addition to the road relocation described above. The two bridges would be at least 36 feet in length; the bridge at the first crossing may need to be 80 feet long (i.e., two 40-foot sections to avoid one end being within the floodplain). An advantage of this option is it would provide access for both hikers, equestrians, and bicyclists without the need to travel through the creek. This should eliminate or significantly reduce illegal trail use by bicyclists in the area. Under this option, the High Water Trail would not be needed and could be closed and revegetated. This would reduce the amount of bared surface in the canyon bottom. Access through the canyon would be reduced to one road plus the short trail connector from the road to the end of Canyon Road.

  This has the following disadvantages, in addition to those already listed under the discussion of Option 2, are:

- This option would eliminate most of the single track trail system in the canyon bottom. All users would travel via Cascade Fire Road. Many people would be opposed to this arrangement as the two trails are lovely, relatively level trails that are popular destinations. High Water Trail was walked with a group of residents during the September, 1999 field trip. All but two of these people agreed that the trail was a lovely trail that they frequently used. They did not see any major problems with it. Other people would be opposed to this option because their only travel route would need to be shared with bicyclists, and many hikers prefer to travel routes that do not have bicycle traffic.

- This option could facilitate bicycle traffic through the area, particularly during periods when the water is high in the creek. Because the area already receives relatively heavy use, potentially increasing use could adversely affect vegetation as well as increase the potential for user conflicts and effects on nearby residents from increased vehicle traffic along Cascade Drive. However, MCOSD staff does not believe that many bicyclists currently avoid the area because of these stream crossings.

- There would be the costs of road relocation, construction of two new bridges, widening a third bridge, and restoration of closed trail and road sections.

A variation on this option would be to allow bicyclists to use the existing Canyon Trail between the first and fourth crossing and not relocating the road along this trail alignment. This variation would improve bicycle access. However, it would not allow closure of the fire road. Bicyclists would likely use both the fire road and Canyon Trail. This variation is not recommended as it does not meet the primary objective of moving the road out of the creek, and it would impact current users of Canyon Trail.

- Option 6 is to limit bicycle use of the area during the period when water is high in the creek. Under this option no improvements would be made to Cascade Fire Road. This option would include posting signs at the west end of Cascade Fire Road (on MMWD property), the junction of the east end of Wagon Wheel Trail and Blue Ridge Fire Road, and the junction of Toyon Fire Road and Middle Road Fire Road stating that Cascade Canyon Fire Road through the canyon bottom is closed. The closure could either be a set period of November 1 to April 30 (or whatever dates MCOSD believes accurately represents when there is substantial water in the creek), or the signs could be uncovered during actual periods of high water, as determined by MCOSD staff. The latter approach would provide additional flexibility so that the road was not closed during a dry early winter or late spring.

  The advantages of this option are that there would be a slight decrease in effects on water quality and, more importantly, a decrease in illegal trail use. There would be a decrease in use generally in the canyon bottom. The disadvantages are that it would restrict bicycle access through the area. The 88 percent of bicyclists who legally stay on the fire road would be prohibited from using the road during the period of closure. It is possible that such a closure would increase bike access at other access points. It is also very likely that some bicyclists will continue to use the road thus resulting in increased pressure on District staff to enforce the closure.

- Option 7 is to maintain the status quo. The road would remain where it is, but it would be rocked and provided with proper drainage. The trails would remain in their present location. The previously-recommended erosion control measures would be implemented. No bridges would be constructed. Other previously-recommended measures to reduce the width of the road and trails would be done, along with revegetation of the meadow and other areas. The one additional recommendation would be to place signs at the locations listed under Option 5 to inform bicyclists that the Cascade Fire Road exit requires four stream crossings that can be hazardous during high water conditions. The signs should state that patrols of trails in the canyon bottom are conducted and citations issued for bicycles that use those trails. This option would reduce the effects of users on the canyon bottom resources. It would not encourage additional use of the area. There would not be the costs to the District for constructing the improvements of other options. The disadvantages are that hikers entering from Cascade Drive are unable to access the south bank of the stream (including Carey Camp Loop Trail) during high water. Bicyclists using the canyon bottom will still be forced to ford the creek four times, which could result in a continuation of illegal use of the two trails.

Options 1 to 5 were discussed with the public at the second public scoping meeting. There was no clear expression of favoring one option over another. Several commenters expressed concerns about each option. There are no strong reasons for or against any of these options, and all are feasible (except Option 4). However, the conclusion of the Plan preparers is that Option 7 is the recommended option. This conclusion was reached on the following grounds:

- The amount of resource damage caused by the stream crossings is minor and can be remediated by other actions recommended in this Plan.

- Loss of vegetation along trails and the road can also be remediated by other actions recommended in this Plan.

- In general, there are not sufficient environmental grounds to recommend major new construction in the area.

- It would be undesirable to eliminate trails that are appreciated and heavily used by many hikers.

- Closing the area to bicyclists is not warranted given the amount of damage caused plus the improvements recommended in this Plan will address most of these concerns.

- The area is already heavily used, so improvements that may encourage more use are unwarranted.

- The relocation of the road and construction of bridges would transform the area into a much more "developed" park. While the improvements can be constructed to be aesthetically pleasing, there would still be the "feeling" of a developed park rather than an open space preserve.

- There will likely continue to be illegal bike use, but this can be reduced by the recommended signing plus increased enforcement (see subsequent Enforcement Program).

- The option would be much less expensive than the options that include road relocation and bridge construction.

To conclude, Option 7 is recommended. However, MCOSD staff favors Option 5 (which includes Option 2). These options were assessed in the EIR prepared for the Plan, and Option 7 was determined to be environmentally superior to Option 2.

D. Recommended Actions

Use of the preserves will continue to conform to MCOSD use policies. The only additional recommendation not described in other programs is described below.

U-1. Place signs at the west end of Cascade Fire Road (on MMWD property), the junction of the east end of Wagon Wheel Trail and Blue Ridge Fire Road, and the junction of Toyon Fire Road and Middle Road Fire Road stating that the Cascade Canyon Fire Road exit requires four stream crossings which can be hazardous during high water. The signs should state that patrols of trails in the canyon bottom are conducted and citations issued for bicycles that use those trails.

VII. SIGNS AND INFORMATION PROGRAM

A. Existing Signing

MCOSD has an adopted signing program for access points to its preserves and for trails. Signs explain allowed and prohibited uses (e.g., no motorcycles, dogs on leash allowed, no camping, no smoking, no bikes on trails, etc.). A review of the official public access points (i.e., accesses from paved public roads) indicates that most access points contains all the signs typically used by MCOSD. Table 3 describes what access points need additional entrance signing. The only major new signing that is required at these entrances is a sign that clearly explains the rules as regards dogs and bike use/restrictions.

While some trail junctions on the preserves are signed, others are not. In addition, trail junction signs, where they do exist, usually simply indicate that the route is a "trail." They do not describe the trail's destination, that is, the direction to another road or trail. As such, the trail junction signs, where they occur, are only useful to local residents who know the area, or visitors supplied with either a MCOSD map of the preserves or a commercial trail map.

While clear trail signing is often appreciated by preserve users, especially those not familiar with the preserves, comprehensive trail signing has several disadvantages. First, many people do not like the "clutter" of signs as it detracts from the wilderness experience and the undeveloped viewshed. Second, such signs are costly to produce and install. Finally, signs are inevitably damaged or removed thus requiring additional staff time to monitor and replace. Recognizing these disadvantages, this Plan takes a middle approach of recommending trail signs at important junctions. Less used junctions can be signed in the future as resources become available and when MCOSD determines that such signs are warranted and can survive a reasonable length of time. The existing and recommended signing at each trail junction is listed in Table 3. It is recommended that MCOSD consider using the signs currently used by MMWD at trail junctions. These are rectangular posts that have an arrow on each side that tells the direction to a location or another trail. MCOSD will consider the need for signing these trails on a case-by-case basis.

MCOSD currently installs a logo at single-track trail junctions that has a picture of a bicycle with a line drawn through it to indicate that bicycles are not allowed on the trail. It is recommended that where new "no bike" signs are installed at new junctions or to replace old signs that a new sign be installed similar to the type used on MMWD. This sign should state that bicycles are not allowed to be ridden, walked, or carried over the trail and that citations are issued.

B. Information

MCOSD publishes a small map/guide to the preserves. The map is quite small scale and does not clearly label access points to the preserves. If and when MCOSD reprints this map/guide, the map should have all access roads and access points clearly described. If new trails are constructed or existing trails are designated as recognized trails, these trails should be included on the map. The descriptive portion of the guide should be amended to clearly state prohibitions on bike riding on single-track trails, limits to dog travel, and prohibitions against using trails that are signed as closed. The guide should explain the reasons for these prohibitions based on impacts to the preserves' natural resources.

A new book titled *Open Spaces - Lands of the Marin County Open Space District* (Spitz, 2000) was published by the District. This excellent trail guide describes all the recognized trails and fire roads on the two preserves. It is noted that in publishing this book, MCOSD is promoting wider public use of its preserves. While the MCOSD preserves have always been open to all members of the public, there are some individuals who believe that the preserves are primarily for the use of the local neighborhood. While MCOSD policy is not to create large parking areas to attract large numbers of outside visitors, publication of this book recognizes that these preserves are open to all residents.

MCOSD has installed a display case at the Cascade Drive entrance. This display case contains interpretative information as well as the rationale for use prohibitions.

It is recommended that MCOSD maintain contact with the various user groups and inform them of trail closures. MCOSD should request that bicycling and equestrian groups inform their members of closures as well as request that users obey MCOSD restrictions on bike use of single track trails.

C. Recommendations

1. Signs

S-1. The signs recommended on Table 3 should be installed when MCOSD has the time and resources. In general, signs are a low priority for this Plan given the other more important improvements required for resource protection, fire hazard reduction, and public access. All signs listed in Table 3, except for signing to prohibit bikes on single-track trails, trail closure signs (when the trail is closed), and new signs at public entrances, are Priority 3; the no bike and new entrance signs are Priority 1). MCOSD shall determine whether Priority 3 signs are needed on a case-by-case basis. Table 3 designates the priority of each sign, so that the District knows which signs to install first as time and resources allow. Table 3 describes four types of signs: 1) a sign that simply denotes "trail" with a directional arrow, 2) a no bike logo sign, 3) a trail sign which should include arrows with destinations, and 4) MCOSD entrance signs which describe allowed and prohibited uses and use restrictions. Table 3 presents a separate priority ranking for signs, ranging from Priority 1 to 3.

Table 3

Table 3

Table 3

Table 3

Again, all signs except bike signs, trail closure signs, and new entrance signs are Plan Priority 3. In addition to the signs described in Table 3, the following signing is recommended (most of these recommended signs have been listed in previous recommended actions. They are summarized here:

S-2. Signs on newly constructed trails shall inform users if the trail is closed to bicycles and/or equestrians for all or part of the year, if appropriate.

S-3. All entrance signs should include the new sign that clearly describes allowed dog use. The sign should explain that dogs are to be kept on leash at all times in Cascade Canyon Preserve and on all single-track trails in the White Hill Preserve. On fire roads dogs are to be kept within voice control on the fire road and that they cannot stray from the fire road. The signs should state that such controls are necessary to protect wildlife from injury or harassment, as it is hoped that people will be more willing to obey the restrictions if they know the reason why the restriction is required. The signs should state the penalty for noncompliance and that the District patrols for compliance and issues citations.

S-4. Public entrances should be provided signs that describe bike use on the preserves. It should state that citations are issued.

S-5. All non-recognized trails traversing chaparral areas should be closed and signed to indicate that human presence on these trails can displace or injure ground-nesting bird species.

S-6. All recognized trails and fire roads through chaparral should be signed to require that dogs be kept on leash to avoid injury to ground-nesting birds. The previous section on Wildlife listed the trails affected by this requirement.

S-7. Signs will be placed at existing entrances to the Cascade Canyon Preserve denoting that the preserve is a Sensitive Wildlife Area. Non-recognized trails recommended for closure will include information on the closure sign that use of this trail is prohibited due to its entry into an SWA.

S-8. On “Red Flag” days, the District will temporarily install large, clear signs at most entrances warning users that there is fire hazard on the Preserves.

S-9. A sign should be placed at the intersection of Middle Road Fire Road and Middle Road Cut Trail stating that the trail deadends at private property and there is no access to Cascade Drive.

2. Information

S-10. The MCOSD website and map for the preserve shall be amended to clearly show public access, recognized trails, and roads and to explain use restrictions.

S-11. MCOSD should maintain contact with the various user groups and inform them of trail closures. MCOSD should request that bicycling and equestrian groups inform their members of closures as well as request that users obey MCOSD restrictions on bike use of single track trails.

VIII. ENFORCEMENT PROGRAM

A. Discussion

The preserves are administered by the MCOSD. MCOSD has 8 Open Space Park Rangers (hereafter called rangers) assigned to maintenance and patrol, 2 rangers assigned to trail work, one chief ranger, and 1 deputy sheriff who is assigned to open space properties. Rangers periodically patrol and inspect the preserves. MCOSD properties are divided into four patrol areas. Cascade Canyon and White Hill Preserves are part of the west patrol area which also includes the Gary Giacomini, Roy's Redwoods, Maurice Thorner, and Bolinas Lagoon preserves (and soon the French Ranch preserve). MCOSD typically has one ranger on patrol in this area on weekends and holidays. On non-holiday weekdays, there is one ranger or deputy sheriff patrolling all four patrol areas. In addition, to these regular patrols, MCOSD staff responds to complaints of illegal activities on the preserves, emergencies, and reports of resource problems.

In 1999, MCOSD documented nine complaints from the public for the two preserves: two for illegal bike use, 2 for dogs out of control, and five for other complaints. The 1999 "Enforcement Incident Reports" for Cascade Canyon (which indicates all enforcement incidents either in response to public complaints or as initiated by the patrolling ranger/deputy sheriff, shows 20 reports for dogs off leash/out-of-control, 17 reports of bicycles on single track trails, 2 special patrols (Knobular Ride on Camp Tamarancho and Thanksgiving Day Ride), 1 camping without a permit, 1 report of gunshots, 1 report of fireworks heard, and 1 tampering with property markers. Four citations for illegal bicycle use were issued in 1999.

In 1999, rangers were either on patrol, responding to complaints, or conducting work on 130 different days in the preserves. This total includes 70 days of patrolling.

As part of a legal settlement resulting from MCOSD purchase of the Boy Scout property, MCOSD rangers and deputy sheriff conducted 11 weekday and 11 weekend patrols of the High Water Trail, Split Rock Trail, the lower end of the Happersberger Ridge Trail, the Canyon Road entrance, and the network of trails between Canyon Road Entrance trail and the Concrete Pipe Fire Road. This required patrolling was conducted between April 3 and May 9, 1999. The rangers and deputy sheriff found 19 people with dogs off leash or out of control and 12 bicyclists on single track trails. No citations were issued as MCOSD staff felt that this patrol activity should be seen as a way of educating people illegally using the preserves.

This concentrated patrol effort revealed that while bicycle use of single track trails is certainly occurring, the number of illegal users is not large (except perhaps for bicyclists using the High Water Trail and Canyon Trail to avoid crossing the creek). This finding corroborates a targeted enforcement action conducted by MCOSD rangers and the deputy sheriff in April, 1997. The deputy patrolled on a Saturday morning and the subsequent Sunday afternoon while the rangers patrolled all day both days. The patrolling included stakeouts near trailheads in the canyon area and setting track traps across trails that could be checked later to determine if bikes had ridden on the trail

since the track trap was set. The staff concluded that of 100+ bicyclists seen, six were suspected (but not observed) of riding a single track trail. The track traps indicated that no bikes had crossed them in the two days when they were set; observations of older tracks indicated that one or two bikes had ridden these trails over "the last few days."

The following citations were issued by the deputy sheriff between 1988 and 1999; all citations except the one for illegal trail construction were issued on the Cascade Canyon Preserve. The citations were all for bicycles on trails.

1988	0
1989	3
1990	11
1991	1
1992	0
1993	0
1994	1
1995	0
1996	0
1997	0
1998	8
1999	4

The following citations were issued by MCOSD staff from 2000 through August 13, 2005. All citations were for bicycles except as noted.

2000	5
2001	11
2002	3
2003	2 (and 1 citations for dogs)
2004	5
2005 (partial)	1 (and 2 for dogs)

Until recently, rangers were not authorized to issue citations for park infractions**.** However, in 1997 the *Open Space Land Use Regulations* were amended to allow rangers to issue citations. Since the Regulations were amended, the Open Space Rangers have been undergoing the required training that allows them to issue citations. The first citations by rangers were issued in late 1998. By July, 2000, seven rangers were sufficiently trained to issue citations. Four other rangers are completing their training. In 1999, District rangers issued approximately 35 citations plus an additional 30 parking tickets. This is in addition to citations issued by the deputy sheriff listed above.

One of the primary comments received by members of the public during scoping meetings and plan preparation was the concern that rangers are not adequately patrolling the preserves to control illegal bicycle use of single track trails. Several people expressed concern that it did little good to have regulations for preserve use if these regulations were not enforced. It is evident from the numerous people who complained to the authors of this Plan about bicycles on trails that the actual frequency of illegal bicycle riding may be perceived as substantially greater than the documented complaints and the number of enforcement incident reports contained in the MCOSD files.

MCOSD has responded to the criticism of lack of enforcement by noting that until very recently their rangers were not able to issue citations when they observed illegal bicycle use. MCOSD expects that enforcement will increase given their rangers' current ability to issue citations. MCOSD rangers are oriented more towards being land stewards and educating the public about proper use of the preserves. Enforcement targets resource damage problems rather than just use violations.

One should also take into account that MCOSD staff is responsible for overseeing public use on 32 preserves scattered across 15,000+ acres. There will always be people who do not obey laws and regulations, no matter how many law enforcement staff are available. While enforcement may need to be increased, any argument that the preserves should be closed to certain types of users because some members do not obey the laws penalizes the majority of those users who do obey the laws.

While the authors of this Plan empathize with MCOSD's position, it appears that additional issuance of citations will be required if MCOSD wishes to enforce its regulations particularly as concerns illegal bike and dog use.

As discussed previously, this Plan recommends monitoring of trails to determine illegal trail use. If illegal use of trails by bicyclists increases, then MCOSD could consider closing one or more trails where bicyclists are allowed access. This option recognizes the need for users to cooperate in management of the preserves. It is recognized that neither the organized bicycle groups, MCOSD staff, or others have the ability to control illegal trail activities by individuals who purposely wish to flaunt use restrictions. Illegal use will likely always take place. However, the recommendations of this Plan plus cooperation of bicycling groups can limit this illegal activity.

Members of the public during public scoping meetings suggested two additional enforcement recommendations. The first was to close the preserves at night. Currently, MCOSD does not close its preserves at night. The only advantages to such a closure would be to allow additional control of illegal activities on the preserves during that period (since no one would be allowed on the preserves for either legal or illegal purposes) and to reduce "partying" by young adults. However, it is quite likely that those individuals who choose to illegally ride trails, "party," or conduct other illegal activities will continue to do so whether the preserves are closed at night or not. Again such a closure would penalize the many users who choose to visit the preserves at night and do not engage in illegal activities. This closure is not recommended.

The second recommendation was to require that bicyclists using the preserves be licensed and be required to display their licenses. The rationale for this recommendation is that it would assist District staff and members of the public in identifying illegal bicyclists. While there is merit to this idea, it would require another level of bureaucracy and administration for the District. District staff notes that if such a licensing plan were adopted, State law requires that the fees collected be used for improving bicycle facilities. MCOSD could consider instituting such a program for all its preserves, perhaps in combination with MMWD and other public landowning agencies. However, this is a District policy issue and is not recommended as an explicit action for this management plan.

B. Recommended Actions

E-1. Given the concerns of neighborhood residents about illegal bike use on the preserves, it is recommended that MCOSD continue to conduct additional patrols on the preserves until such time as complaints about illegal bike use are minimal or MCOSD determines that illegal use of trails on these preserves is no greater than other preserves equally deserving of attention. The following trails should be patrolled.

- Split Rock Trail
- Canyon Trail
- High Water Trail
- The two Cut-off trails on Middle Road Fire Road
- The two new connector trails at the north end of the White Hill Preserve

Less frequent checks can be made on trails between the canyon bottom and the Concrete Pipe Fire Road, San Anselmo Creek Trail, Cul-de-sac Trail, Pam's Blue Ridge Trail, Wagon Wheel Trail, Burnt Tree Trail, and various non-recognized trails that are occasionally used by bicyclists.

E-2. MCOSD shall continue to maintain clear records of the number of public complaints (including how many are issued by the same person), the response to those complaints, the number of enforcement incident reports, and the number of citations issued for all code violations.

E-3. MCOSD shall continue to patrol other fire roads and trails and cite users who do not obey speed limits and other use restrictions. If MCOSD determines that there is an increased number of accidents or illegal speeding involving bicyclists, MCOSD shall consider closing affected trails or roads to bicycle use.

IX. MONITORING PROGRAM

A. Discussion

To ensure that proposed uses of the preserves meet the preserves' management goals, it will be necessary for MCOSD to monitor the preserves. These monitoring responsibilities have been identified in previous recommended actions and are summarized below.

B. Recommended Actions

1. Fire Hazard

- Monitor areas where fuel reduction zones are constructed to determine when vegetation has regrown to a hazardous condition so that re-treatment is required. Because the fuel reduction zones will generally be constructed in relatively open woodlands or grasslands, it is not necessary to establish transects and quantitatively measure regrowth. The monitoring should be done by MCOSD staff in consultation with MCFD personnel.

2. Infrastructure

- Monitor signs and entrance improvements on a periodic basis. Damaged signs and entrance improvements should be fixed as soon as possible. This work can be done by either the Environmental Stewards or MCOSD staff.

- Monitor roads and trails after the winter storms have passed. Identify additional erosion control measures required to fix identified erosion sources or unstable slopes. This work can be done by either the Environmental Stewards or MCOSD staff.

3. Erosion Control

- Monitor the effectiveness of all erosion control improvements recommended in this Plan. Rehabilitate or improve control features that have become damaged or do not operate properly. This should be done following the winter storm season with corrections made prior to the onset of the next rainy season. This monitoring should be conducted by MCOSD staff.

4. Vegetation

- Monitor areas where broom has been removed. Cut new seedlings (can be easily done with a weedwhip) during the summer. Record new sightings and remove broom if a small population. Monitor larger stands and remove outliers to prevent stand expansion.

- Monitor meadow restoration and other restoration projects.

- Monitor the effectiveness of lining trails and Cascade Fire Road to prevent trail and road widening in the canyon bottom area.

5. Wildlife

- For cutting and pile burning in chaparral, monitor to ensure nesting birds are not affected.

6. Non-recognized Trails

- Continue to monitor for the construction of new non-recognized trails. When identified, these trails should be immediately closed and blocked and, if feasible, restored. Environmental Stewards and MCOSD staff should monitor to determine the presence of such trails. MCOSD staff can close the trails and conduct restoration work.

- Those non-recognized trails recommended for closure should be monitored to determine the effectiveness of the closure. If the monitoring shows the trails are still receiving substantial usage, then additional closure improvements (e.g., physical blockades and/or restoration) shall be implemented.

7. Enforcement

- MCOSD shall continue to maintain records of incidents and citations to determine whether patrolling is reducing illegal bike incidents.

- MCOSD shall continue to also keep clear records of other complaints and incidents regarding illegal use (e.g., dogs). If new trails are constructed for multi-use, MCOSD should keep clear records of all complaints about user conflicts on these trails. If after further review, MCOSD concludes that the complaints are substantial, MCOSD may choose to restrict usage of these trails.

8. Use

- MCOSD staff or interns should periodically conduct user counts at the locations surveyed for this management plan. This will allow MCOSD to determine if overall usage or usage by a particular user group increases or decreases. This information will also allow MCOSD to gain a general idea of the changes in use rates that may be applicable to other preserves.

X. IMPLEMENTATION PROGRAM

A. Introduction

Implementing the recommended actions of this Plan will be the responsibility of MCOSD and its staff. Much of the work will be conducted by MCOSD staff, though in some cases, MCOSD may contract with outside firms or individuals to implement some actions. A considerable amount of the recommended work could be done by volunteers. As such, it is recommended that MCOSD expand the Environmental Stewardship Program for the preserves as described below.

B. Environmental Stewardship Program

Environmental Stewardship Programs (ESP) have been developed by MCOSD. ESP participants work under MCOSD guidance to conduct a variety of activities, thus reducing MCOSD staff time. MCOSD should expand the ESP for these preserves. As described in previous chapters of this Plan, ESP participants could be responsible for any or all of the following tasks:

- Remove broom plants and organize broom removal work days with local residents and other interested citizens. Develop a program for preserve users to report new broom populations.

- Line Cascade Fire Road and trails in the canyon bottom with logs, tree trunks, or other material.

- Conduct resource restoration projects.

- Monitor roads, trails, and other areas for erosion or other damage and report problems to MCOSD staff.

- Conduct erosion control activities under staff direction.

- Monitor the preserves for construction of illegal trails. If discovered, assist in the restoration of those trails.

- Staff public entrances during Red Flag Days to educate people about the danger.

- Monitor trail signs and other signs for damage, and assist with repair and replacement.

- Monitor trails and roads that are officially closed to determine the need for revegetation. If revegetation is warranted, assist in doing that work.

C. Priority of Recommended Actions

This Management Plan contains numerous recommended actions. It is recognized that MCOSD has limited staff and revenues, and that the staff and resources must also be used to manage many other open space preserves. It is also recognized that all or many of its other preserves require many of the improvements recommended for these two preserves. Implementing the actions recommended in this Management Plan will add significant new responsibilities for existing MCOSD staff. These new responsibilities are extensive when compared to the existing responsibilities for routine patrolling, responding to resource damage and reported illegal actions, routine grading, trail and road maintenance, and repairing/replacing damaged signs. Unless the County approves hiring additional staff or increasing the MCOSD budget to hire outside contractors, it will take many years to implement the actions recommended in this Plan. Nevertheless, this Plan provides a long-term planning perspective to allow the District to maintain and improve the resources on the preserves.

Keeping these limitations in mind and based on input from MCOSD staff, Table 4 prioritizes the recommended actions. Table 4 includes four basic priorities, with Priority 1 being those actions recommended for implementation once the Final Management Plan is adopted. Priority 2 to 4 are recommended for implementation once the higher ranked actions are completed. Some recommendations are ongoing, as compared to one time actions. These actions are listed as 1-O, 2-O, etc. Finally, some actions are required as soon as other actions are implemented. For example, the recommendation to avoid spotted owl nests during new trail construction is a first priority action once the decision is made to conduct the underlying action (in this case, constructing the new trail). Such actions are denoted as Priority A.

Table 4

Table 4

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Table 4

D. Costs of Implementing Actions

It is extremely difficult to provide cost estimates for the various actions recommended in this Plan. Most of the actions recommended in this Plan are site-specific. Thus, it is impossible to accurately estimate the cost of constructing a new section of trail without actually surveying the precise route which is dependent on grade, trail width, types of soils, vegetation, and other factors. Also, much of the work may be done by MCOSD staff or ESP volunteers. As such, it is not possible to estimate labor costs for many of the recommendations.

The sections below provide some basic data on the range of costs for various classes of actions. These cost estimates were developed by the authors of this Plan, MCOSD staff, and staff of other public agencies. The cost estimates do not include the costs of administration, patrolling, enforcement, monitoring, contract management, and maintenance that would be provided by MCOSD staff. As noted previously, implementation of the recommendations of the Plan will annually require hundreds of hours of staff time, beyond the time currently spent managing the preserves.

1. Fire Hazard Reduction

a. Woodland Understory Clearing by Hand Crews

An eight-person Marin Conservation Corps crew costs $1,225 per day. Crews using inmates are less expensive, however, there is limited availability of such crews. It is assumed that hired crews would be used. It is estimated that pruning and thinning of woodland understory requires approximately 5-10 person days per acre. Earlier estimates prepared as part of the *Mount Tamalpais Area Vegetation Management Plan* estimated 20 person days per acre for sparse understory and up to 50 person days per acre for dense understory. Most understory on Cascade Canyon is relatively sparse (woodland areas that include large areas of oak savanna with little to no understory). In addition, the earlier estimates included burning or removal of cut material, while the current prescription allows these materials to be cut into small pieces and left on the ground. MMWD staff reports that clearing understory in woodlands similar to those occurring in the recommended firebreaks on these preserves takes 5-10 person/days per acre when the cut vegetation does not need to be removed from the site. Because removal and disposal is a significant part of the pruning/trimming process, the time required under the current prescription will be substantially reduced. It is assumed, to be conservative, that it will require 10 person days per acre to treat the understory for the main fuel reduction zones.

It is estimated that woodland understory clearing will be required for approximately 28 acres for the fuel reduction zones on Middle Road Fire Road, Toyon Tanks Fire Road, and Toyon Fire Road. Using hand crews would require 280 person days or 35 days of an 8-person crew at a cost of $43,000. The Cul-de-sac Fuel Reduction Zone would require an additional 6.4 acres of clearing at a cost of about $10,000. The fuel reduction zone along Cascade Fire Road would require 4+ acres of clearing at a cost of about $10,000.

These costs assume MCOSD bearing full fiscal responsibility for hired crews. However, there are currently cost-sharing programs available. The Cal Fire Program which uses MCC labor will provide matching grants for vegetation clearance in fuel reduction zones. If MCC crews were used under this program, the cost would be $600+ per day. MCOSD would need to make up the other 50 percent of the cost. This matching share can either be money and/or labor. In addition, grants through State programs such as the Fuel Load Reduction Program (CDF) or federal programs such as the Land Stewardship Program can provide the necessary matching funds. The Marin County Fire Department has used MCC crews and these types of matching funds to conduct fuel reduction programs in Marinview and Kent Woodlands (Julen, personal communication).

PG&E, Fireman's Fund Foundation, and other insurance industry foundations are also participating in cost share programs for this type of work. Finally, as discussed below, FireSafe Marin can provide grants to fund chippers and crews. These chipper grants can be used to offset the MCOSD share of the Cal Fire Program. Thus, it is entirely possible that through a combination of grants and committed MCOSD field crew time, the cost for these fuel reduction zones could easily be reduced by half or more (again, this does not include a consideration for staff time).

To conclude, it is possible that fuel reduction zones can be prepared by MCC hand crews, using matching State, federal, and other funds at little to no direct cost to the District beyond the commitment of additional staff time.

b. Chaparral Thinning by Hand Crews

The *Mount Tamalpais Area Vegetation Management Plan* estimated that hand crews require about 30 person days per acre to cut and dispose of chaparral. These estimates were based on dense chaparral where cut material had to be hauled to the road for chipping and disposal. The estimates for the type of cutting required for these preserves is considerably less because the chaparral is far less dense, less of it needs to be removed, and the cut material can be disposed of on site by cutting it into small pieces with hand power equipment or shredding. It is estimated that production rates will be on the order of 10-15 person days per acre.

The only location where this treatment is recommended is along portions of the Toyon Fire Road near its southeast corner and small sections along the top of the Cascade Fire Road fuel reduction zone. It is estimated that there are about 4 acres of chaparral within the Toyon Fire Road fuel reduction zone. Hand removal would take 60 person days at a cost of about $10,000.

Again, much of the cost of constructing this portion of the fuel reduction zone could be financed through existing grant programs.

c. Burning of Broom

Burning broom that is removed from the understory can be done by District staff. There would be no direct costs involved, though there would be increased MCOSD staff time required.

d. Mechanical Mower

A mower similar to the one owned by MMWD (a Pro Mac 36-inch brushcutter mounted on a Caterpillar 312b excavator) costs about $132,000. MMWD will lease the machine to MCOSD at a cost of $1,000 per day (includes operator cost). This machine has a reach of 30 feet and can travel on slopes up to 30 percent (off the road). It cuts 1-2 acres per day in heavy brush. If one assumes that about half the fuel reduction zone chaparral and woodland understory were cut at a rate of 2 acres per day (this is a reasonable estimate given the relatively light understory growth) using this machine, the cost for the main fuel reduction zone would be $7,000 (14 acres) for the machine plus $32,500 for hand crews for a total of about $40,000. The cost could be less if the machine were able to reach more of the area targeted for treatment.

Again, all or most of the costs of this type of treatment may be funded by existing grant programs.

e. Cost Share Programs

Much of the cost of constructing fuel reduction zones can be financed by programs through the State and Marin Fire Safe. The Marin Conservation Corps (MCC) has a Cal Fire Grant that allows them to provide matching labor. On past projects done through the MCFD, MCC has put up $20,000 worth of labor and was paid $20,000 to make a total of $40,000 of labor. The $20,000 in cash can be obtained through other government programs such as a grant through the Fuel Load Reduction Program (CDF) or federal programs such as the Land Stewardship Program. MCOSD has used MCC crews in constructing fuel reduction zones in Larkspur, Mill Valley, and Corte Madera over the past three years and has obtained over $300,000 in grants for this work.

Thus, it is entirely possible that the fuel reduction zones could be constructed without any direct MCOSD outlays. It is possible that a combination of State and federal grants plus MCC participation could reduce MCOSD costs to zero. It is also possible that grant money could be used to lease the MMWD mechanical mower. Again, this estimate does not include staff time for grant writing and management.

2. Trail Construction

The District has its own trail building machine and a 4-person trail crew. It is assumed that the existing machine and crew could be used for constructing the new trails recommended in this report. Another source of labor are volunteers from the various user groups. The Bicycle Trails Council has volunteered to do much of the construction of any new multi-use trails. The MCOSD crew completes approximately 50-100 feet of finished trail per day with an average of 60 feet per day. This includes the time for actual construction as well as preliminary field surveys, trail layout, flagging, signing, and closing for the first year. (Bramham, personal communication). Approximately 10,000 feet on new trail would be constructed per the recommendations of this Plan. At 60 feet per day, it would take approximately 167 days of work to construct these trails.

If the District had to hire a trail contractor to construct the trails, the cost for trail construction is unknown. The price for trail construction is very site-specific and can

range from $2/foot for a narrow single track trail in gentle terrain to $25/foot for a 42-inch wide trail in difficult terrain. The District recently obtained a bid to construct a 1.7 mile long 42-inch wide trail on difficult terrain on Big Rock Ridge; the bid was $227,000.

3. Signs

The cost of making signs depends on the size and amount of information on the sign. The 12-inch by 18-inch two color signs that MCOSD uses at its entrances cost $30 per sign in lots of 20 or more. Smaller signs will cost $5-15. In addition, there is the cost of the posts or stakes and attachments. As an average, it will be assumed that the cost of the materials will be $20 per sign. No cost is given for installation as installation would be done by existing staff or volunteers. As many as 200 signs are recommended in this Plan. If all 200 signs were installed, it would cost about $5,000 for materials.

Sign installation will take on an average of one to two hours per sign (includes the time to put the sign together, dig a hole, and set the post). If concrete is used, it would take longer. Additional time is required for staff to gather materials and travel to the site.

These estimates are for initial construction. Signs are periodically vandalized plus weathering eventually requires their replacement. Over the long term, there will be additional costs to replace these signs. In addition, there is staff time required to monitor the signs.

4. Erosion Control

The construction of waterbars is the most prevalent type of erosion control measure recommended. This work can be done by District staff, environmental stewards, or volunteers (under supervision). It can take 15 minutes to several hours to construct a waterbar depending on its length, the slope of the road/trail edge where the water will be delivered, and the hardness of the road/trail surface. In addition, there is staff time for preparation and travel to the site. MCOSD uses staff for construction of waterbars, but it also occasionally hires independent contractors to do this work.

It is even more difficult to estimate the time required for other erosion control tasks (rocking stream crossings, ditching, rocking ditches, etc.). Again, it is assumed that existing District staff or volunteers will be used for some of this work, while independent contractors will be responsible for much of the work.

The major direct expense involved in erosion control is where heavy equipment must be used to regrade roads, construct a new road segment (the southern section of Blue Ridge Fire Road), and to place crushed rock. This work would be done by an outside contractor.

It is very difficult to provide costs estimates for this work as it is so dependent on location and the nature of the task. As an example, the costs for placing crushed rock is about $2.50 per linear foot of road where access is straightforward and the road has been graded so that it is ready to receive the rock. This estimate is based on the following assumptions. One ton of crushed rock (1 cubic yard) covers 80 square feet at 2 inches thick (Osborne, personal communication). If the road surface is 8 feet wide, one ton

does 10 feet of road length. Crushed 3/4" rock costs $13.50 per ton at the source. A ten-wheeler truck costs about $58 per hour to rent. It is estimated that a round trip from the rock source to the preserve roads and back would take approximately 2 hours (Osborne, personal communication). More effective would be to hire a firm to deliver and spread the rock. It is estimated that 3/4" crushed rock can be delivered at a price of $23 per ton with an additional $2.00 per ton to spread the rock along the road (Dan Azevedo Trucking, Inc. personal communication). At $25 per ton, the cost for rocking a road 8 feet wide is about $2.50 per foot. However, the price can be higher depending on the location. Again, staff time would be required to design and mange this work.

MCOSD should seek grants to fund all or a portion of the erosion control improvements. MMWD recently received a $100,000 grant from the San Francisco Bay Area Conservancy for conducting erosion control projects on their roads in the Corte Madera Creek watershed. Given that this watershed has recently been designated as Critical Habitat for steelhead, it is likely that additional grants will become available for reducing sediment to this stream.

5. Bridges

Wooden bridges for pedestrians, bicyclists, and equestrians up to 40 feet in length typically cost MCOSD $150 per foot. If MCOSD decides to adopt the option that includes bridges, it should seek grants for these bridges since they will reduce sedimentation of Corte Madera Creek.

6. Restoration

It is assumed that removal of exotic plants at the Sherwood Forest meadow will be done by environmental stewards or with volunteer labor. It is difficult to estimate the cost for replanting this meadow as well as enhancement of the areas along Cascade Fire Road as it depends on how much seedbed preparation will be done. The two meadows could easily be prepared with heavy equipment as they are adjacent to public streets. Direct costs would include seed and the costs for any trees or shrubs to be planted. It is estimated that materials would cost less than $1,000.

Lining sections of Cascade Fire Road, High Water Trail, and Canyon Trail with logs, tree trunks, or other material can be done by District staff and/or volunteers using material available on the preserves.

Restoration of trails can be very expensive depending on the level of restoration desired. Restoration can include from simply providing waterbars and other erosion control actions to ripping and replanting the trail or road, to regrading the trail/road to mimic natural contours.

7. Summary

No attempt is made here to provide an overall cost for implementing this plan as there are so many variables involved that any overall estimate would be meaningless. In addition, it is unknown how many grant funds or other outside sources of funding may be

utilized. Suffice it to say that to implement all the actions in this plan will require considerably more staff time than is currently expended on managing this preserve.

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Persons Contacted

Aaronsen, John	MCOSD
Ambrosius, Joyce	National Marine Fisheries service
Arguimbau, Nick	Preserve neighbor
Alvillar, Terri	Preserve neighbor
Baker, Jack	Marin County Department of Public Works
Banales, Xavier	Girl Scouts of America
Berto, Connie	Marin Horse Council
Bramham, Chris	MCOSD
Cox, Bill	California Department of Fish and Game
Craine, Brian	Preserve neighbor
Dan Azevedo Trucking	Aggregate trucking firm
Daughery, Tom	National Marine Fisheries Service
Fisher, Steve	Ross Valley Fire Department
Godwin, Sara	Preserve neighbor
Guldman, Sandy	Friends of Corte Madera Watershed
Helmers, Nancy	Preserve neighbor
Jacobsen, Jim	Bicycle Trails Council of Marin
Julen, Kent	Marin County Fire Department
Lang, Chris	Velo Club Fairfax
Long, Bill	Bay Area Ridge Trail Council
Leong, Ed	East Bay Regional Parks, Park Superintendent
Martin, Mischon	MCOSD
May, Casey	MMWD
McGowin, Gerald	Bay Area Ridge Trail Council
Miska, Ron	MCOSD
Newman, Audrey	Preserve neighbor
Novy, Linda	Preserve neighbor
Odion, Dennis	MMWD
Osborne, Mr.	MMWD
Paolini, Ron	MCOSD
Patterson, Elizabeth	Fairfax Planning Department
Petterle, Steve	MCOSD
Rich, Alice	Fisheries biologist
Rubard, Gordon	Boy Scouts of America
Sandy, Nancy	Bay Area Trails Preservation Council
Silvestri, George	Boy Scouts of America
Solberg, Gurand	Girl Scouts of America
Swezy, Michael	MMWD
Thompson, Steve	National Marine Fisheries Service
Ture, Martha	Preserve neighbor
Walsh, Tim	Marin County Fire Department
White, Gwen	Preserve neighbor
Winter, Jon	Consulting ornithologist
Yoder, Barbara	Preserve neighbor

Plan Preparers

Leonard Charles, Ph.D.	Project Manager
Lynn Milliman	Analyst
Charles Patterson	Consulting Ecologist
Kim Fitts	Consulting Wildlife Biologist
Michael Dwyer	Consulting Engineering Geologist
Tom Origer	Consulting Archaeologists (Tom Origer & Associates)
Carol Rice	Consulting Fire Ecologist (Wildland Resources Management)

The following Appendix includes data about bicycle use of the preserves. These data include the observations and conclusions of the Plan preparers regarding some of the issues surrounding bicycle use. These observations were made during the time the plan was prepared. In a number of cases, conclusions regarding bike use were reached. It is clearly stated that these conclusions are based on the professional expertise of the plan preparers and apply only to the preserves under study. These conclusions do not necessarily represent the opinion of MCOSD staff.

A. History of Controversy Regarding Mountain Bicycling

The controversy concerning bicycle use of roads and trails on MCOSD and other public lands in Marin County and elsewhere is well known. The question of where mountain biking should be allowed has been hotly debated by the Marin public for the past decade. There have been numerous requests by the biking community to open up some or all trails to bike use or to allow the construction of new single-track trails that would be open to bike use. On the other side, there have been repeated requests for MCOSD to continue to prohibit bicycle access to single-track trails and to increase enforcement of this trail prohibition and increase penalties for illegal use. Some people have also requested that bicycle use be banned from both roads and trails.

All of the public land owning agencies in the county have been embroiled at one time or another regarding bike use on their trails. To date, most agencies in the County allow bike riding only on fire roads, though there are some exceptions such as on trails at China Camp State Park and on a few trails on MCOSD property.

The following list describes some of the attempts to open or close trails for bike use on the two preserves.

- In 1990, certain bicyclists requested that Canyon Trail from the end of Canyon Road onto Cascade Canyon Preserve be opened for bike use. The MCOSD files show a number of letters received in opposition to this request. The Fairfax Town Council determined that the trail should not be opened to bike use, and MCOSD concurred with this decision.

- In 1994, the bicycle community submitted a "Petition of 8,000" requesting trails be opened to bike use.

- Beginning in the early 1990s, the Bicycle Trails Council of Marin entered into an agreement with the Boy Scouts to develop trails on Camp Tamarancho that could be used by bicyclists. To use these trails, a bicyclist or other user must become a "Friend of Camp Tamarancho" which requires payment of an annual $35 fee. There are currently about 300 dues paying members (Rubard, personal communication). The agreement with the Boy Scouts is contingent on the use of these trails not causing environmental damage or serious conflicts with neighbors. To date, Boy Scouts staff believe that the program has worked without causing significant damage or impact to neighbors, though they are currently assessing a recently constructed trail section to assess potential environmental damage. The Boy Scouts are developing a management plan for the Camp, and this plan will include more specific

guidelines for new trail development as well as maintenance of existing trails (Rubard, personal communication).

- In 1996, an illegal trail (called "the Split Rock Trail") was constructed from Cascade Fire Road to an existing trail near the Inkwells. This trail ignited a firestorm of controversy. The MCOSD files contain numerous letters that the trail should be closed along with letters stating the trail should be maintained, at least for hikers if not bikers. Currently, the trail is signed as closed for restoration at its junction with the Cascade Fire Road. Despite this closure, the trail continues to be used by both bicyclists and hikers.

- The next storm of controversy arose when MCOSD purchased a portion of Camp Tamarancho in 1997. There was an existing single-track trail on this property (the Wagon Wheel Trail) that was open to bicycle use. There was controversy whether bicycles should be allowed on this trail once it was purchased by MCOSD. Ultimately, the County decided to allow continued bicycle use of this trail.

- Two local residents brought suit against the County because when the County purchased the 270 acres from the Boy Scouts, they did not prepare an environmental assessment of this purchase per the California Environmental Quality Act (MCOSD found that the purchase was a "categorical exemption" under CEQA). Specifically, the petitioners asserted that the inclusion of the Wagon Wheel Trail which was opened to bicycle use and possible widening of that trail should have been assessed per CEQA.

- This litigation was settled in 1999 with the County agreeing to conduct a series of actions until a Management Plan was adopted for the preserves.

- In the late 1990s, there was a controversy involving bike use of a trail leading from Holly Road to Camp Tamarancho. This trail crosses private property and is not a part of the preserves. One of the owners of the private property this trail crosses eventually installed a fence and gate at the trailhead.

- In early 2000, the BTC proposed construction of an experimental multi-use trail in an area on San Pedro Ridge. In June 2000, the MCOSD Trails and Open Space Committee recommended against this request, and the BTC withdrew the request.

B. Potential Problems of Bicycle Use on Single Track Trails and Fire Roads

The specific potential problems regarding bicycle use of single-track trails and the preserves in general are outlined below.

1. Does Bicycle Use Cause Trail Erosion?

Bicycle use of some single-track trails causes erosion and other environmental harm. Bicycle use of trails with soft soils, particularly on steeper slopes and particularly when the soils are wet, causes rutting. This is especially the case on longer downhill stretches where some bicyclists use their brakes causing skidding. These ruts, once formed, then

act as small stream channels that transport runoff down the ruts which defeats the planned drainage of the trail and can result in the ruts becoming deeper. Well-constructed trails that are especially designed for bicycle use do not show these and other typical signs of erosion. The Wagon Wheel Trail shows little to no erosion due to its grade and the fact that the trail base is rocky.

As described in the Management Plan, observations of trails where bicycle riding is illegal shows that on steeper slopes with soft soils, significant erosion does occur. The authors of this Plan recognize that the issue of bicycle-caused erosion is very controversial. There is no question that hikers and equestrians also cause erosion. Erosion is a common phenomenon for trails, particularly older trails that were not constructed with the proper grade and drainage features. The authors of this Plan are unaware of scientific studies of the amount of erosion caused on various types of trails and roads by the various user groups and did not conduct studies to provide such estimates. However, field observations by the consulting team's geologist and primary authors showed numerous examples of erosion on illegally used single-track trails. Some examples are several highly rutted sections of the trail that leads from the Inkwells to White Hill Fire Road**.** Conversations with a bicyclist advocate indicated that while he felt additional trails should be constructed for bicyclists, he agreed that many single-track trails were not suitable for bicycle use due to soil limitations and excessive slope, plus the need to maintain some trails for non-bicycle users (Jacobsen, personal communication).

2. Does Bicycle Use Destroy Vegetation?

Some individuals claim that bicycle use of trails causes damage to plants by bicyclists veering off the trail and running over trail-side vegetation. No evidence was found that any substantial amount of vegetation has been affected. While some trail widening has occurred both from use by bicyclists and increased use of the area by hikers, the amount of vegetation affected is minimal. One example cited by several residents was a patch of "white ground iris" destroyed by past illegal bike use on Happersberger Trail. While it is possible that rare species could be damaged by bicyclists, or other users, traveling off the trail or road, the chance of this impact being significant is low. Most of the special status plant species observed on or predicted to possibly occur on the preserves are species associated with serpentine chaparral. It is unlikely that bicycle riders or other users will stray from the established road or trail in this dense vegetation type.

Illegal trail construction causes plant destruction. Observations of the Split Rock Trail showed the cutting of shrubs and several small saplings. Mainly the vegetation removed was grasses and forbs and some branch trimming. However, loss of vegetation did occur.

3. Does Bicycle Use Result in Roadway Widening and Erosion?

Some individuals contend that roadway widening has been caused by increased bike use. The report preparers' conclusions on this matter is that widening caused by bike use is questionable. Bicyclists tend to stay away from the edge of roads except perhaps in locations where steep turns carry the bicycle to the outside or inside of a curve. On most sections of the roads, bicyclists will not ride on the edge and thereby cause

roadway widening. It is entirely possible that much of the observed widening is the result of road grading which may have widened the road either to address rutting on the road or because it was easier for the operator to grade the road wider. The one location where roadway widening was identified was on Cascade Fire Road in the canyon bottom area. This Management Plan contains recommended actions to address this widening.

Bicycle use of fire roads can aggravate existing drainage problems and concentrate runoff. However, in almost all cases, any increased erosion on roads caused by bicyclists are primarily the result of poor road and drainage construction. These roads need to be fixed whether or not bicyclists use them. If the recommendations presented in this Plan are implemented, then bicycle use of these roads will not cause substantial erosion. While there are certainly areas of erosion and poor drainage, the overall state of the roads and trails on the preserves is typical for parks and preserves. In general, the preserves appear to be in "good" shape and do not show signs of substantial overuse. All trails and roads were walked on numerous occasions by consulting team members, including a final survey in late February and early March, 2000 to determine impacts to roads and trails following two months of rain. While there are areas that need erosion control and a few trail/road sections that need to be realigned, the trails and roads appeared generally acceptable.

4. Does Bicycle Use Adversely Affect Other Users' Experience of the Preserves?

Probably the primary issue regarding bicycle use of trails and, secondarily, fire roads is the conflicts between bicyclists and other trail users. This issue was raised by many attendees at meetings, though it must be clearly stated there were also those who felt that joint use was not a significant problem. Those who perceive bike use of trails as a problem offer the following complaints.

- Single-track trails are narrow and have many blind corners. Bicyclists, particularly traveling downhill, are a danger to other users.

- Hikers are required to step off the trail to allow bicyclists to pass. While bicycle representatives have stated that they often will stop and move their bicycle off the trail, it is the experience of the Plan preparers that this is rarely the case. Stepping off the trail is sometimes hazardous given steep slopes. It is particularly hazardous for older people and young children.

- When one travels on trails used by bicyclists (legally or illegally), one is continually listening for the sound of an approaching bicyclist so that one can be prepared to avoid collision. This attention and tension significantly diminishes the experience of trail walking since at least part of one's attention must always be on the potential of an approaching bicycle. This need to pay attention to potential bicyclists detracts from the reasons that hikers take walks on these trails.

- Bicycle use of trails disrupts the tranquility of the area. Some bicyclists traveling downhill use their brakes which can be heard for a considerable

distance. The general sound of gears shifting, brakes, and other equipment-generated noise is frequently audible in the canyon areas used by bicyclists.

Despite these problems, actual or perceived, there are public land management agencies in the area that do allow bicycle access to some single track trails. The success of such multi-use is a matter of significant debate among the various user groups and the agencies, and this Plan is not the venue for assessing the pros and cons of that debate.

5. Conclusion

Legal bicycle use of fire roads and the Wagon Wheel Trail has not caused substantial resource damage. While there are localized incidences of erosion caused by bicyclists and other users and localized widening of fire roads, the overall impact has not been substantial. Illegal use of single-track trails has caused substantial erosion, which will be aggravated by continuing illegal use. Illegal construction of trails causes substantial impacts on vegetation, erosion, and diminishes the value of the area for wildlife. Illegal use of trails causes potential safety problems for other users. Illegal and legal use of trails results in a loss of an open space experience for at least some other users. For some of these other users, bicycle use of fire roads also results in a diminishment of the open space experience.

Legal use of fire roads and designated trails provides an open space experience for bicyclists. Designated single track trails are particularly valuable to the bicyclist community as they provide a more challenging experience than fire roads plus the trails lead through "wilder" or more scenic areas than fire roads.

APPENDIX TO THE

DRAFT MANAGEMENT PLAN

CASCADE CANYON AND WHITE HILL OPEN SPACE PRESERVES

September, 2000

Prepared for: Marin County Open Space District
Marin County Civic Center
San Rafael, California 94903

Prepared by: Leonard Charles and Associates
7 Roble Court
San Anselmo, California 94960
415.454.4575

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