



**MARIN COUNTY**

**MOUNTAIN BIKING**

**FACT BOOK**



# THE STATE OF MOUNTAIN BIKING IN MARIN COUNTY



THE BIRTHPLACE OF  
MOUNTAIN BIKING



**For over 100 years**, hikers and equestrians have rambled on narrow trails across the natural bounty of Marin. These trails began their lives under a varied provenance: animal paths, historic Native American footpaths, reclaimed logging, ranching and fire access roads as well as purpose-built trails.

40 years ago, mountain biking was born right here in Marin on the flanks of Mt. Tam and Pine Mountain. For a brief moment in time, mountain bikers peaceably shared all the trails of Marin with other users. Yet, through years of exclusionary legislation, mountain biking in Marin is now largely relegated to fire roads with access to narrow trails disproportionately low compared to other user groups locally as well as compared to mountain bike access in other parts of the Bay Area, California, the United States and worldwide.

This compendium draws on user surveys, peer-reviewed research, comparison studies and public lands policy in Marin County to help provide accurate, current knowledge with the goal of communicating two main points:

- **Mountain biking is a safe, healthy, low environmental- impact activity enjoyed by a significant number and wide cross section of Marin County's citizens**
- **There is no substantiated, reasonable cause to prohibit increased mountain bike access to narrow trails on public lands in Marin**



**ACCESS4BIKES'  
MISSION STATEMENT**

To motivate and empower Marin mountain bikers to act in their own self-interest, to get fair and reasonable access to our public trails and to preserve the experience of trail riding for future generations.

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**TABLE OF  
CONTENTS**

The Wagon Wheel Story ..... 1

Horses, Bikes, Sharing and Safety.....2

Our Friends in the Mid-Pen..... 3-4

Narrow Trail Access Statistics and Maps ..... 5-6

California State Trail Use Conflict Study.....7

MCOSD and MMWD Visitor Use Surveys .....8

Marin Land Managers on Recreation .....9

Literature Review.....10-20

    Overview.....10

    Cross Country Mountain Biking ..... 11

    Factors of Enviromental Impact on Trails..... 12-14

    Bicyclist Use Compared to Equestrian Use ..... 15-17

    Mountain Biking and Wildlife.....18

    Conclusions .....18

A Brief History of Bill's Trail ..... 20

Bibliography .....21

# THE WAGON WHEEL STORY



**Marin Open Space purchased** a parcel of land from the Boy Scouts of America in 1997 on which mountain bikers had built a trail by hand—Wagon Wheel.

At the time, continuing to allow bikes on Wagon Wheel had vocal opposition. Jean Berensmeier, a member of the county Open Space and Cultural Commission, said “there are a lot of concerns, but we agreed to give them a chance, but this will be monitored and if it doesn’t work we can change it.” 20 years later, Wagon Wheel Trail has proven that it did work—and it continues to work exceedingly well. Consider the following:

- When MCOSD visited the trail in 2014, it was determined the hand built nature of the trail, with its gentle contour and narrow width, would rate near zero on the evaluation criteria scoring methodology.
- Wagon Wheel cost \$2,500 to build by hand 20 years ago, (\$3700 today<sup>†</sup>) considerably less expensive than the cost to construct wider trails built to multi-use standards requiring heavy machinery.

- Bikers traveling in both directions as well as the occasional hiker have shared this trail without incident; there have been zero significant conflicts reported in 20 years.

Wagon Wheel is not explicitly a bike-priority trail, but due to its location far from a trailhead and acting as a connector for the popular, private trails of Camp Tamarrancho, Wagon Wheel could be described as a de facto bike-priority trail. Bike priority trails are an option in the current Open Space Road and Trails Management Plan (RTMP) and Access4Bikes Foundation implores land managers to consider the benefits of bike-priority trails and other trail sharing tools such as directional trails and alternate day use.

Access4Bikes Foundation supports trail sharing with all users. We do not seek access at the exclusion of others, yet we acknowledge diversity throughout a trail system which includes *some* use restricted trails may assuage the perceived tension amongst user groups.

<sup>†</sup>Bureau of Labor Statistics CPI Inflation Calculator

# HORSES, BIKES, SHARING AND SAFETY

**The myth goes** that equestrians and bikers interact poorly. Yet, documented incidents on trails are extremely rare. Examples of peaceable trail sharing can be found in the Marin Headlands, under Golden Gate National Recreation Area management. Three multi-use trails start and end at stables while another trail runs between two stables. These trails are heavily used by equestrians, hikers and bikers without conflict and the GGNRA has determined that all user groups can share these trails safely.

Dias Ridge, which runs from a stable at Muir Beach up to Panoramic Highway, was the subject of a GGNRA survey conducted from August 1 to September 30, 2015. Nearly 5,000 users were recorded, of which 45% were cyclists and 3% were equestrians. Despite the significant traffic seen on Dias Ridge, no incidents were recorded. If trails that begin or end at horse stables can be shared equitably, certainly trails that see significantly less equestrian use can be shared as well.



# OUR FRIENDS IN THE MID-PEN

## Land management is about choices.

Choices on how to balance the needs of the natural environment with the various desires and goals of user groups, choices on how to spend funds to maintain or improve the features and access to the land itself. As with any public holding or service, Marin's land managers should make choices representative of their constituents.

(ECdMC), also known as Skeggs to the mountain bike community. ECdMC boasts over 36 miles of multi-use trails and is regarded as one of the best mountain bike destinations in the Bay Area. The trails — beautiful, challenging, narrow, varied and well-maintained — are not only the very type of trails that many mountain bikers prefer, they are also the type of trails proven to be the most erosion-

Most of the District's 220 miles of designated trails are unpaved "wildland" trails in steep, rugged terrain. Approximately 65% of these trails are "multiple use" trails and are open to bicyclists, which is the highest ratio of trails open to bikes among parks and open space in the Bay Area. Many of these trails are also single-track trails, providing bicyclists with a more technical experience.<sup>†</sup>



In the Midpeninsula region of the Bay Area, land managers are doing just that.

The Midpeninsula Regional Open Space District (Mid-Pen) spans Santa Clara, San Mateo and Santa Cruz Counties and comprises over 60,000 acres of land in 26 open space preserves. Although substantially larger than Marin County Open Space and serving a much larger population, the Midpen employs much more inclusive use policies, allowing mountain bikes on a majority of the narrow trails on their lands without any increase in environmental impacts or user conflicts.

Situated between downtown San Jose and downtown San Francisco (less than 40 miles from either) is El Corte de Madera Creek Open Space Preserve

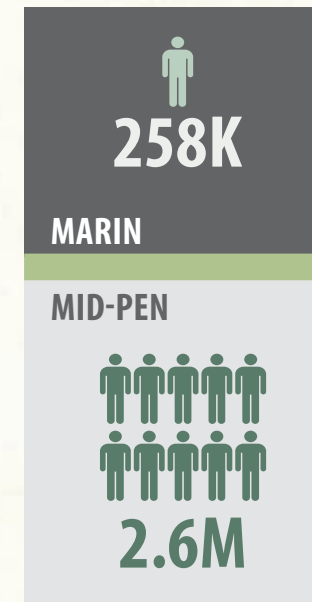
resistant, less costly to build, leave a smaller footprint and encourage lower speeds through technical features, rugged trail surfaces and natural pinch points.

Mid-Pen Open Space land managers deemed biking an appropriate usage alongside hiking and horse riding despite ECdMC being situated in the San Gregorio Creek Watershed, a vital habitat for steelhead trout and coho salmon. El Corte de Madera Creek exemplifies inclusive, responsible land management that allows numerous visitors to share the trails in a sensitive natural habitat, realistically serving the community of one of the most populous metropolitan areas in the United States while simultaneously protecting the flora and fauna it encompasses.

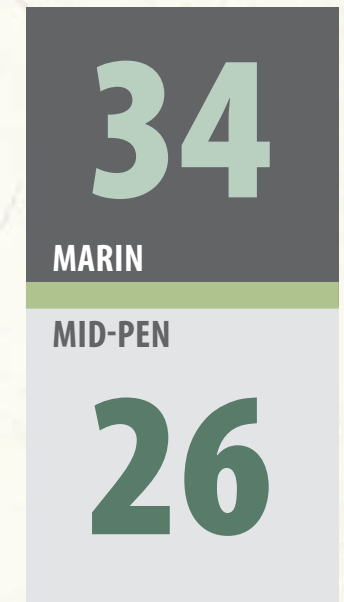
<sup>†</sup>[opensepace.org/what-to-do/activities/biking](https://opensepace.org/what-to-do/activities/biking)



## POPULATION



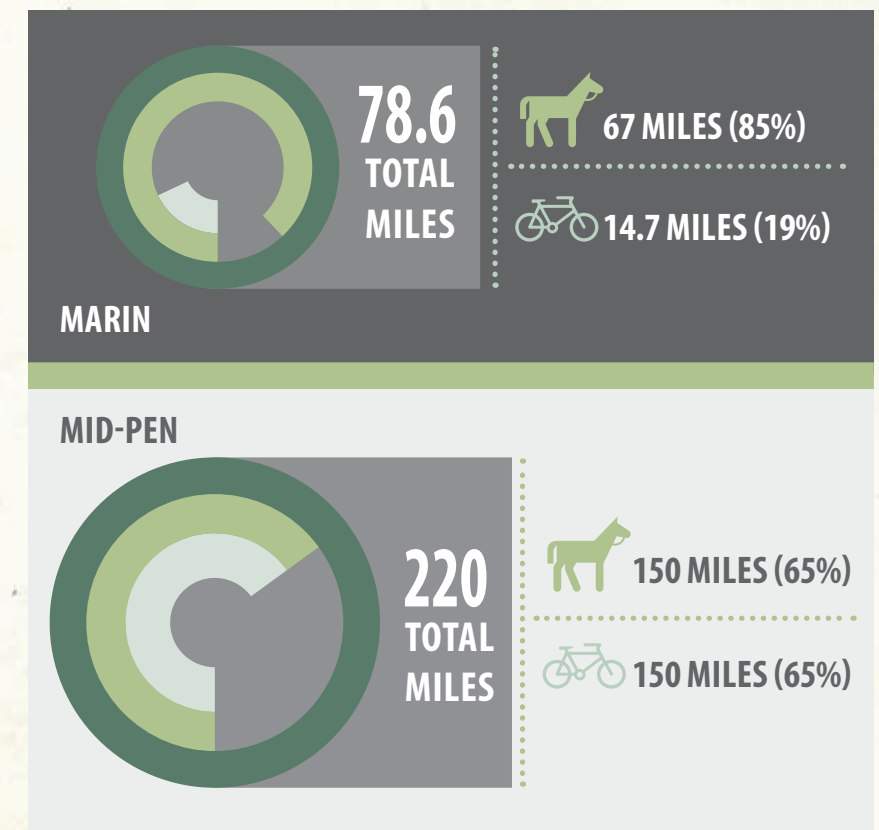
## OS PRESERVES



## ACRES OF OPEN SPACE



## NARROW TRAIL ACCESS BY USER GROUP



# TRAIL ACCESS STATISTICS AND MAPS

Land Manager	Trail Open to Hikers Miles/Percentage		Trail Open to Equestrians Miles/Percentage		Trail Open to Cyclists Miles/Percentage	
Golden Gate Natl Rec Area	37.7	100%	17.7	47%	12.4	33%
Marin Open Space	78.6	100%	67.0	85%	14.7	19%
California State Parks	72.2	100%	36.8	51%	15.9	22%
Pt. Reyes Natl Seashore	118.2	100%	117	99%	14.2	12%
Marin Municipal Water District	60.9	100%	20.1	33%	0.0	0%
<b>Total*</b>	<b>375.0</b>	<b>100%</b>	<b>262.1</b>	<b>67%</b>	<b>57.2</b>	<b>15%</b>

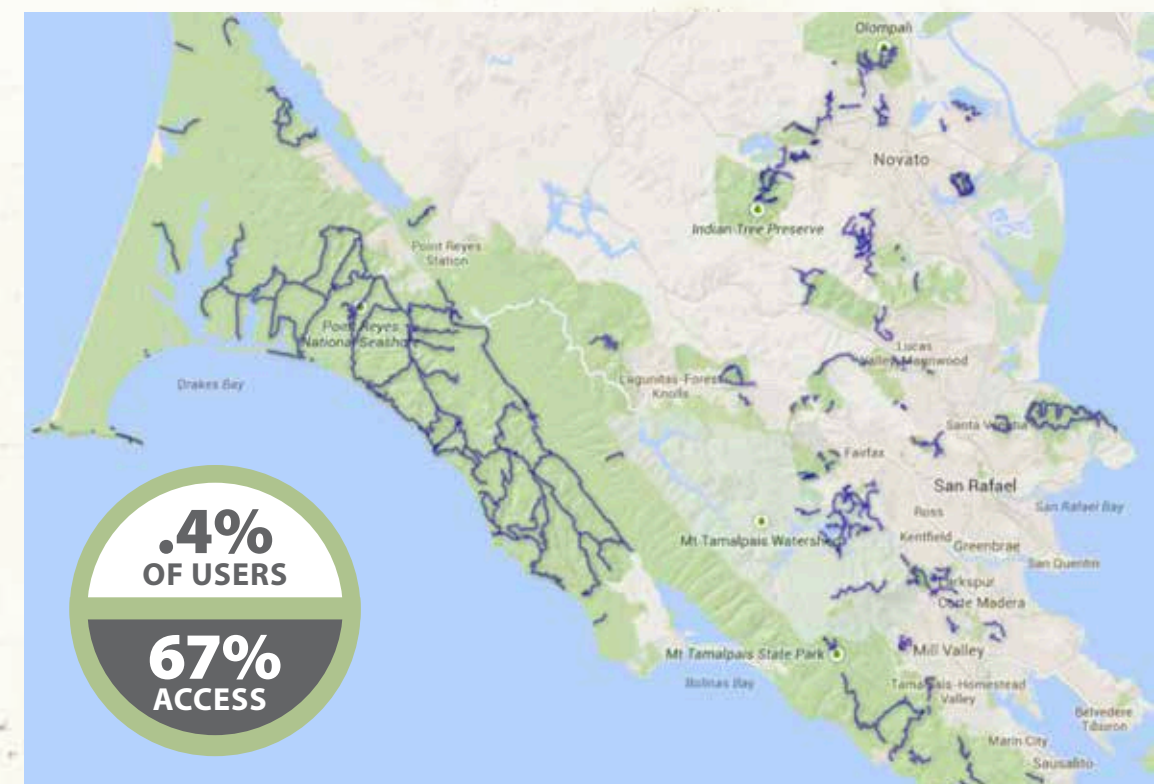
*This mileage chart was compiled to the best of our ability using geospatial data provided by land managers or the County of Marin where available. No guarantee is made for accuracy. \*Includes other land managers.*



## BIKE LEGAL SINGLETRACK



## HORSE LEGAL SINGLETRACK



# CA STATE PARKS TRAIL USE CONFLICT STUDY

In 2012, California State Parks commissioned a study in conjunction with their Road and Trail Change-in-Use process in order to quantify conflict amongst trail users and to understand how other land managers handle user conflict. The most pertinent findings are included here.

Analysis of the data collected shows that the primary management concern on multi-use trails is conflict based on users' perceptions and behaviors, and that actual accidents involving different user types were rare.



>> Conflicts between trail users are shown to be highly influenced by perception, attitudes, and behavior.

>> Conflict has been described in the literature as goal interference, which

can either be interpersonal (based on physical presence of other users) or social (based on perception of a group; no contact or sighting has to occur.)

>> Conflict has been found to be related to activity style, focus of trip, expectation, attitudes towards and perceptions of the environment, level of tolerance for others, and different norms held by others.

>> Perceptions of conflict are frequently unrelated to measurable incidents...but rather reflect an attitude towards wilderness and stereotypes of other user groups.

## Significant Findings

1. Information on trail use conflict is primarily based on opinion; little data about actual user conflicts are available.
2. Complaints and controversy about other trails users are common.
3. Actual incidents, including those involving accidents, between trail users are relatively rare.
4. Trail use conflict is an important social issue.
5. Design of trails to accommodate multiple use helps to avoid or reduce conflict.
6. User education and outreach are key methods to avoid or reduce conflict.

## Trail Conflict Management Suggestions



Separate trails and/or specialized trails // Alternate use days

Designated use-intensive trails // One-way trails

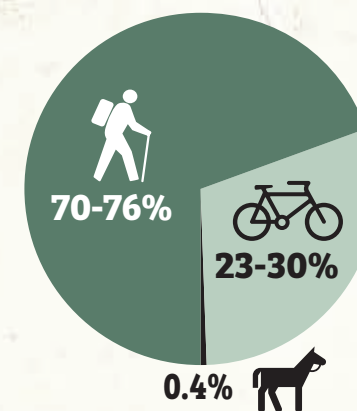
All these options are available to MCOSD via their Road and Trail Management Plan (RTMP)

All findings above from "California State Parks Trail Use Conflict Study," p.1-6 - 1-11.

# MCOSD AND MMWD VISITOR USE SURVEYS

In 2011, Marin County Open Space District (MCOSD) commissioned a visitor use census and survey. In 2012-2013 Marin Municipal Water District (MMWD) commissioned a similar survey. The intention of each was to collect usage data including type of use, time and location and finally attitudes, preferences and experiences within the preserves. Some of the findings are highlighted below.

## MCOSD AND MMWD USAGE BY USER TYPE:



82-94%

Visitors reporting good to great interactions

The low equestrian activity may suggest equestrian peak activity times differ from pedestrians and bicyclists. Other possible reasons for the low activity may be that the count locations are not those used by equestrians or that there may be little equestrian activity systemwide. — MCOSD Survey

If different usage times account for the low equestrian count from the survey, then it appears self-selection minimizes the chance for interaction and conflict between user groups—a commonly noted *perceived* issue.

If the count locations are not those used by equestrians, then an effort should be made to ascertain which areas are indeed high use areas for equestrians who currently have access to 88% of all narrow trails throughout Marin.

>> If the survey is representative of low equestrian activity systemwide, then it is time to reevaluate the trail use designations systemwide.

5  
Total number of equestrians counted at all Open Space Preserves during the survey

vs

321  
Total number of cyclists counted at all Open Space Preserves during the survey



TOP COMPLAINT FOR MCOSD AND MMWD?

DOG AND HORSE WASTE



# MARIN LAND MANAGERS ON RECREATION



## California State Parks

>> To provide for the health, inspiration and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation. ("About Us," 2017)

## Golden Gate National Recreation Area

>> The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world. ("What We Do," 2017)

## Marin County Parks

>> We are dedicated to educating, inspiring, and engaging the people of Marin in the shared commitment of preserving, protecting, and enriching the natural beauty of Marin's parks and open spaces, and providing recreational opportunities for the enjoyment of all generations. ("About Us," 2017)

## Marin Municipal Water Department:

>> The Mt. Tamalpais Watershed... is held in trust as a natural wildland of great biological diversity, as scenic open space and as an area for passive outdoor recreation for Marin and much of the Bay Area. Passive outdoor recreation is defined as those activities that are based on nature and that require little or no development or facilities." -Marin Municipal Water District's Mt. Tamalpais Watershed Management Policy. ("Visiting Watershed Lands," 2017)

# LITERATURE REVIEW // Overview



In the absence of adequate research, land and trail managers have frequently been cautious, implementing restrictive regulations in some instances. Surveys of managers have shown that they frequently perceive mountain biking to be a substantial contributor to trail degradation but lack scientific studies or monitoring data to substantiate such concerns.

*Environmental Impacts of Mountain Biking: Science Review and Best Practices by Jeff Marion and Jeremy Wimpey*

Trails are generally regarded as an essential facility in parks and recreation areas, providing access to unroaded areas, offering recreational opportunities, and protecting resources by concentrating visitor use impacts on resistant tread surfaces.

*(Marion, 2006, p. 3)*

The vast majority of studies conducted on various impacts on trails, flora, and fauna have demonstrated that by nearly every measure, mountain bikes have the same or significantly less impact than hiking and equestrian activities.

Many communities around the world have incorporated this knowledge into their land management prac-

tices and now have diverse trail networks which include sustainable access for off-road bicyclists.

Following is selected text from several peer-reviewed studies including a report commissioned by the United States Department of the Interior and written by Jeffrey Marion, a preeminent scholar of recreation ecology research, and a founding member of the Board of Directors of Leave No Trace.

## Key Terms

**Recreation ecology:** The study of the biophysical effects of recreational activity.

**Curvilinear use-impact relationship:** A nonlinear use-effect relationship which suggests that the greatest proportion of ecological effect is generated during the initiation and early use period of a new facility or infrastructural development. This phenomenon has been clearly established for a wide variety of soils and vegetation responses to activity, and suggests that **the majority of the environmental effect occurs when a trail is first developed or constructed.**



## LITERATURE REVIEW // Cross Country Mountain Biking

Cross-Country (XC) is the most common form of mountain biking, practiced on trails that feature a wide variety of terrain and routes that consist of uphill, downhill and flat sections—often on trails that were originally developed for some other intended use (e.g., hiking). Trail types can vary from flat dirt roads to technical rocky/rooty singletrack, may include technical trail features, and can vary in length. Typical XC riders are self-sufficient and looking for solitude, nature, exercise, and challenge from their recreational experience.

(Quinn & Chernoff, 2010, p. 7)



**Cross-Country type trails** represent the vast majority of bike-accessible trails throughout the world. In Marin, all of the currently bike-legal narrow trails are cross country trails. Cross country also describes nearly all the trail mileage proposed for addition via the change-in-use and road-to-trail conversions. These are trails that already exist, require little to no modification and, considering the curvilinear use-impact relationship, would have minimal environmental impact and greatly reduce siltation.

With that said, Marin cyclists are a diverse group and many seek more advanced, technically challenging trails. The variety of trails desired by off-road cyclists is similar to the range of trails enjoyed by hikers with different needs, skills and fitness. Diversity in a well managed trail network provides greater opportunities for recreation, helps disperse use across a wider area and also may help to reduce conflict, whether perceived or tangible.

## LITERATURE REVIEW // Factors of Environmental Impact on Trails

Mountain biking (at least trail-based) as an anthropogenic disturbance is similar in its environmental effects as other forms of summer season trail use.

(Quinn & Chernoff, 2010, p. 9)

One of the most frequently cited studies of soil erosion ... in Gallatin National Forest, Montana...found that **foot- and hoof-powered activities (hiking and horseback riding) had a greater erosive potential than did wheeled activities (off-road vehicles and mountain bikes)**. A similar experiment was conducted in a Provincial Park in southern Ontario, producing comparable results... The findings are consistent with the curvilinear use-impact relationship described above, and found no significant difference in the effects on soils of the two activities. **A study that was conducted on a multi-use trail network in Kentucky and Tennessee found that of all types of trails, bike trails were found to be the narrowest, to have the least amount of soil loss, and to have the least incidence of running water on the trails** (Marion & Olive 2006). (Quinn & Chernoff, 2010, p. 16)

For well-designed and constructed trails, post-construction trail impacts would be minimal in the absence of use. Rainfall might erode some soil following construction but in most environments organic litter and vegetative colonization would increasingly minimize such impacts on unused trails. **Numerous studies have documented a curvilinear relationship between amount of use and most forms of trail impact** (Cole, 1983; Sun & Liddle, 1993; Weaver, Dale, & Hartley, 1979). **Initial or low levels of use generate the majority of use-related impact, with per-capita impacts diminishing as use increases.** For example,

vegetation and organic litter are either removed during trail construction or are quickly lost from trails receiving even light traffic. Further traffic when soils are dry causes relatively little additional impact, provided the trails receive adequate maintenance to control water runoff, muddiness, and tread widening. An important implication is that substantial use reductions, or closure, must occur on heavily used trails to achieve any significant reduction in impact. (Marion, 2006, p. 4)

Some specific impacts, such as trail widening and creation of parallel treads (trail braiding) or side trails, are

Continued on page 13



Result of insufficient grade reversal. Shoreline Trail, China Camp State Park

**A trail system that facilitates access to remote destinations, provides safe, high quality recreational experiences, and concentrates traffic on durable treads maintained to minimize resource degradation can only result from professional planning and management.** (Marion, 2006, p. 7)

strongly influenced by user behavior (Hammit & Cole, 1998). Visitors seeking to avoid severe rutting or rockiness caused by soil erosion or muddiness often cause trail widening. Visitors traveling side-by-side rather than single file also contribute to this problem. Type of use has also been shown to be a significant determinant of the type and extent of trail impacts. For example, Wilson and Seney (1994) evaluated tread erosion from horses, hikers, mountain bikes, and motorcycles and found that **horses made significantly more sediment available for erosion than the others uses, which did not significantly vary from the control.** (Marion, 2006, p. 4-5)

The design of new trails and relocations should employ side-hill alignments when possible. Outsloping treads 5% (1 in. drop for every 18 in. of width) during construction allows water to drain across and off the tread, rather than accumulate and run down the trail to erode soil (Birchard & Proudman 2000, Hooper 1988, IMBA 2004). However, natural processes and trail use eventually compromise tread outsloping so ad-

**A 2001 study...found no significant differences between the vegetation and soil impacts from hiking and mountain biking, though they speculated that behavioral differences between the two groups could contribute to the belief that mountain biking has led to trail degradation problems.** (Marion, 2006, p. 4-5)

ditional measures are needed to remove water from treads. The most effective and sustainable method for removing water from trails is a grade reversal, also known as Coweeta dips or rolling grade dips (Birchard & Proudman 2000, Hesselbarth & Vachowski 2000). These are constructed by reversing the trail's grade periodically to force all water off the tread (IMBA 2004). **A principal advantage of this feature is that no future maintenance is required to ensure their continued effectiveness (in contrast to water bars).** However, these must be planned during initial design and construction so that a descending trail's grade levels off and ascends briefly before resuming its descent. These features can be added to existing trails, particularly those with grades below 10-15%. A sufficient frequency of grade dips, particularly on steeper trail grades and in mid-slope positions, is necessary to prevent the accumulation of sufficient water to erode tread surfaces. (Marion, 2006, p. 38-39)

Trail erosion and widening, soil compaction and vegetation damage on a recreational bike trail and a racing trail were recorded over 1 year in the wet and the dry season. Impacts were confined to the trail centre with few impacts to trailside vegetation, which is consistent with a past USA study (Bjorkman, 1998). Although the racing trail was wider after an event there was no widening over the longer term. The authors concluded that even though bike riders prefer downhill runs, steep slopes, curves and water stations (features related to higher impacts), **mountain biking is sustainable so long as that trails are appropriately designed, located, and managed.** (Pickering et al., 2010, p. 555)

McQuaid Cook (1978) found trail impact to be more a function of slope and trail location than a result of user type. (Marion, 2006, p. 7)

**Successful examples of collaboration between mountain bikers and protected area managers in the design, construction, maintenance and use of mountain bike specific trails highlight how collaborative approaches have worked well in some instances** (CALM, 2007; Webber, 2007; Naturebase, 2007; USDI, 2002). (Pickering et al., 2010, p. 557)

**The research shows the location, construction and maintenance of trails has significantly more impact on trail condition, sustainability and environmental impact than the subsequent usage. Yet coincidentally, the majority of mountain bike usage (cross country style riding) has one of the lowest use impact factors of usages that have been studied. In addition to both these findings, mountain bikers in Marin have proven to be engaged stewards by leading and supporting trail building, maintenance and clean up efforts throughout the county.**

Data analysis and statistical testing revealed that the impacts of hiking and biking were not significantly different for the three indicators measured. They also concluded that impacts from both hikers and bikers were spatially confined to the centerline of the lane (trail). (Marion & Wimpey, 2007)

**Under the conditions tested, researchers found no evidence that mountain bike impacts to soils, vegetation and trails were significantly greater than impacts from hikers.** (Pickering et al., 2010, p. 555)

Experimental hiking and biking were compared on an abandoned fire road in Tasmania, Australia (Chiu and Kriwoken, 2003). **No significant differences were found in erosion from low impact bike use (bike riding without skidding on flat parts of the trail and on corners) and hiking.** (Pickering et al., 2010, p. 556)

**...the curvilinear use/impact relationships suggests that reducing use is often an ineffective management practice. Thus an emphasis on proper trail design, construction and maintenance should be emphasized, though high levels of use when trail surfaces are wet should be avoided.** (Marion, 2006, p. 36)

## LITERATURE REVIEW // Bicyclist Use vs. Equestrian Use

*Trampling and erosional impacts caused by horses have been found to be significantly higher than hikers, llamas, mountain bikes and even off-road motorcycles (Cole & Spildie, 1998; DeLuca et al., 1998; Wilson & Seney, 1994)...* The greater vegetation loss from horse use tends to widen horse trails, which are often two to three times the width of hiker trails (Weaver and Dale 1978) (Marion, 2006, p. 5)

soils along trails, which have fewer problems with widening, erosion, and muddiness. Point sampling data reveals that bike trails are quite narrow at BSF with a mean width of 24 in, followed by hiking trails at 32 in. Horse trails are more than two times as wide (81 in) but ATV trails were widest at 104 in. These differences in trail width were statistically significant. (Marion, 2006, p. 20)

Off-road bicycle use of narrow trails as compared to equestrian use is of particular note in Marin as the difference in mileage of legally accessed trails between the groups is stark—57 miles for bicyclists, 262 miles for equestrians. However, upon review of the research, it appears horses have a much more significant environmental impact than bicycles.

By employing a quasi-experimental design with 66 by 66 cm sample plots and low level simulated rainfall events, the researchers found that **mountain biking generated less sediments from trails than horses and hikers.** These results are somewhat supported by a recent study in southwestern USA (White et al., 2006) as mountain bike trails were found to be similar to hiking and multi-use trails with respect to trail impact indicators such as width, incision and cross sectional area indicative of soil loss. (Pickering et al., 2010, p. 554-555)

Findings reported here related to type of use differences agree with those from other research studies. The lower weight and ground pressure of hikers and bikers creates less disturbance to vegetation and

Analyses to investigate the influence of use-related, trail design, and maintenance factors were conducted. **Type of use was found to be a substantially greater determinant of trail degradation than amount of use.** Horse and ATV trails are significantly more degraded than hiking and biking trails. For example, **mean soil loss measured at sample points are 246 in<sup>2</sup> for ATV trails, 150 in<sup>2</sup> for horse trails, 19 in<sup>2</sup> for hiking trails and 6 in<sup>2</sup> for bike trails. Similarly, the proportion of trails with severe erosion (> 5 inches deep) is 24% for ATV trails, 9% for horse trails, 1.4 % for hiking trails and 0.6% for bike trails.** (Marion, 2006, p. 34-35)



Jeff Marion made detailed summaries and suggestions for all the individual trails within his Big South Fork (BSF) study. Following are three which may be of particular interest to Marin land managers.

**Trail Name:** Collier Ridge Loop **Length:** 28,000 ft (5.3 mi) **Use Level:** High **Use Type:** Hiking (50%), Bike (50%)

Trail design is good. Grade is kept to a minimum by trail location and appropriate switchbacks. The trail was relatively clear of blow-downs. A lack of trail drainage features was noted near the few yet extensive muddy areas. A bridgeless stream crossing revealed eminent soil deposition. The loop receives routine maintenance from a local bike club. This high use hiking and biking trail was fairly uniform in width (15 to 77 inches) with a mean of 29. Mean incision (1.2 in) and cross sectional area (13 in<sup>2</sup>) measures were some of the lowest measures in the entire survey. Tread substrates were predominately organic litter. The problem assessment data revealed 14 occurrences of muddy soil affecting 712 ft (2.5%) of the trail's length. Excessive erosion was rare. (Marion, 2006, p. 62)

**Trail Name:** Lee Hollow Loop **Length:** 25,399 ft (4.81 mi) **Use Level:** High **Use Type:** Horse (100%).

Trail design quality varies. Other than the creek crossings, trail design is very good. It follows contours, traversing an exceptionally durable surface, and steepness is reasonably low. However, riparian crossings suffer badly from muddiness and excessive erosion. In these areas, the trail generally takes a direct descent route to the streams (deposition and increased water turbidity were evident). The higher portions had many more water drainage features than most other trails in the survey. Around the streams, they were not present or judged ineffective.

This heavily used horse trail was moderately variable in width (43 to 109 inches) with a mean of 77. Mean incision 2.7 in) and cross sectional area (112 in<sup>2</sup>) measures were less than the average horse trail, yet more than the average of all trails combined. Trail grades ranged up to 35% with a mean of 10.6%. Tread substrates were predominately gravel and organic litter, though substantial amounts of exposed soil were also present. Muddiness and clumped soil was a frequent problem around stream crossings and several prominent midslope seeps. The problem assessment data revealed 17 occurrences of muddy soil affecting 921 ft (3.6%) of the trail's length. There were 17 sections of excessive erosion, with 17 occurrences affecting 3.7% of the trail segment.

### Summary/Recommendations:

Findings suggest that the trail is in generally good condition. This is attributed to good trail design and maintenance for most areas. The substantial amount of gravel present seems to be effective, but subsequent monitoring will be necessary to better evaluate effectiveness. Bridges may be necessary to limit soil deposition at stream crossings, and rehabilitative efforts around water resources demands management attention. (Marion, 2006, p. 70)



Conifer Fire Road, Gary Giacomini OS. Heavily churned soil from horses across the 12 ft tread vs a small path with minimal incision from bikes on the far right.

## LITERATURE REVIEW // Bicyclist Use vs. Equestrian Use

Several USA studies report that even low levels of horse use results in more severe impacts to soils, vegetation and trails than from hikers or other users.

(Pickering, 555)

**Trail Name:** West Bandy Creek Bike Trail  
**Length:** 9970 ft (1.89 mi)  
**Use Level:** Low  
**Use Type:** Bike (90%), Hiking (10%)

This 1.89 mile section of the West Bandy Creek Bike Trail traverses the western plateau adjacent to the Bandy Creek Road. It is primarily a bike trail (90%), but does receive limited hiking traffic (10%).

Trail design is excellent. The grade, trail position, and soil type are well suited for bike use. The trail is narrow, and peripheral impacts are minimal. The trail was clear of blow-downs and other barriers. Although an isolated stretch is located on an abandoned road, the old width has been naturalized and a current narrow path persists. This trail receives maintenance from a local bike club.

This low use bike trail varied little in tread width (15-33 inches). Mean incision (1 in) and cross sectional area (6 in<sup>2</sup>) measures were slightly lower than the average hiker trail, and considerably lower than the average of all trails combined. Trail grades ranged up to 25% with a mean of 3.5%. Tread substrates were predominately organic litter, exposed soil, and substantial amounts of vegetation cover. Excessive muddiness and erosion were only recorded 2 times each.

**Summary/Recommendations:** Findings indicate that this trail is in excellent condition, and **park managers should use the bike user group maintenance actions as a positive example for other user groups to encourage trail stewardship.** (Marion, 2006, p. 78)

### THE TAKEAWAY



1.

Bike use on trails results in significantly lower levels of incision, cross sectional area, trail width and erosion than equestrian use.



2.

The effort of local bike clubs in maintaining trail has been shown to be statistically significant and worthy of emulation.

## LITERATURE REVIEW // Mountain Biking and Wildlife

A common myth about mountain biking is the notion of an outsized adverse effect on wildlife as compared to other trail users. However, the available research shows no statistical difference.



Taylor and Knight (2003) investigated the interactions of wildlife and trail users (hikers and mountain bikers) at Antelope Island State Park in Utah. A hidden observer using an optical rangefinder recorded bison, mule deer, and pronghorn antelope response to an assistant who hiked or biked a section of trail. The observer then measured wildlife reactions, including alert distance, flight

that bikers cover more ground in a given time period than hikers and thus can potentially disturb more wildlife per unit time. ("Environmental Impacts of Mountain Biking," 2007)

**Incidences of direct mountain-bike caused wildlife mortality are rare**, the most frequent casualties being insects. (Quinn & Chernoff, 2010, p. 21)

Of particular local interest, a 2016 study conducted at 241 sties throughout the Bay Area looked into the effect of non-motorized human recreation on 10 different native animal species.

We used camera traps to estimate numbers and activity patterns of ten mammal species (mule deer, mountain lions, coyote, bobcat, raccoon, grey fox, opossum,

The impacts of mountain biking on wildlife are similar to those of hikers and other non motorized trail users.

("Environmental Impacts of Mountain Biking," 2007)

response, flight distance, distance fled, and distance from trail. Observations revealed that 70 percent of animals located within 330 feet (100 m) of a trail were likely to flee when a trail user passed, and that **wildlife exhibited statistically similar responses to mountain biking and hiking.** Wildlife reacted more strongly to off-trail recreationists, suggesting that visitors should stay on trails to reduce wildlife disturbance. While Taylor and Knight found no biological justification for managing mountain biking any differently than hiking, they note

striped skunk, rabbit, feral pigs) and hikers, cyclists, equestrians, and recreationists with dogs in eight counties of the SF Bay Area. Based on results from previous studies, we expected species' response to human recreation to vary by species and type of recreation.

**Hikers, cyclists, and equestrians were not significantly negatively or positively associated with habitat use of any of the ten species in our analysis.**

(M.L. Reilly, et al, 2016, p. 119-120)

## LITERATURE REVIEW // Conclusions

Despite nearly 40 years of history, mountain biking is still a relatively new form of recreation as compared to hiking and horseback riding. Throughout that time, the legitimacy of mountain biking as an acceptable means of enjoying our public spaces has been challenged on a variety of fronts, foremost being the environment. Yet, the scientific studies conducted to date paint a clear picture that counters the negative notions of off-road bicycling as more destructive than other trail uses. In short, the perception does not match the research.

Safety on our public lands is a concern of all user groups and mountain bikers are no exception. Again, the percep-

tion of a safety issue, rather than documented, tangible proof, has influenced policy in Marin for far too long. The record stands for itself; mountain bike use in Marin does not pose a greater safety risk to trail users than other uses.

While Access4Bikes Foundation advocates for fair bicycle access to narrow trails, the preservation and safe enjoyment of Marin's public lands are intergral to our mission as well. We strongly believe greater bicycle access to narrow trails is not only compatible with the safety and environmental protection mandates of Marin's land managers, but will foster a new generation of trail stewards and increase the overall enjoyment of all trail users.

It is important to recognize that any form of recreational activity involves some degree of environmental effect on the soils, vegetation, wildlife and water of the landscape it which it takes place.

**The science strongly indicates a curvilinear relationship between use and environmental effects; regardless of the type of activity that occurs, the most detrimental environmental effects (especially to soils and vegetation) occurs when a trail is first constructed.**

*(Quinn & Chernoff, 2010, p. 21-22)*



## A BRIEF HISTORY OF BILLS' TRAIL

The 3.2 mile Bills' Trail in Samuel P. Taylor State Park is not necessarily an iconic Marin trail, though it does traverse some picturesque terrain as it ascends Mt. Barnabe. However, Bills' Trail is emblematic of the strained dynamic between user groups as well as the painfully slow pace of project adoption in Marin.

Bills' Trail is a relatively modern trail. The Marin Conservation League (MCL) presents a brief history of Bills' on their website which has it "constructed in the late 1970's as a hiking-only trail and since 1994 available also to equestrians..."

An alternative history is offered by the California Department of Parks and Recreation (DPR) found in their 2012 Environmental Impact Report (EIR) conducted as part of a change-in-use project to allow mountain bikes on the trail:

Bills' Trail is named for William "Bill" Lintow, a former park maintenance supervisor and Bill Taylor Northern Regional Maintenance Specialist (Price, 2011). The trail was constructed in 1988-1989 to connect Barnabe Fire Road to Devil's Gulch. Although now restricted to hikers and equestrians, Bills' Trail was originally constructed as a full multiuse trail open to hikers, mountain bikers and equestrians. Sometime after its opening, DPR received complaints from equestrians about conflicts with mountain bikers. To resolve the conflict DPR attempted to restrict bikes to up-hill direction only.

However, conflicts and complaints continued. Mountain bikes were finally excluded under a Superintendent's order; the trail has been used exclusively by hikers and equestrians since that time. (Hanson, 2011)

No documentation of a superintendent's order banning mountain bikes or permitting equestrians can be found. However, the trail was built with a 48" bench, the standard width for multi-use trails in California State Parks (CSP)—a compelling detail as it is highly unlikely a trail built in the 1970s, with the intent of being a hike-only trail, would use a four foot wide bench.

The muddled origination story pales in comparison to the subsequent legal and logistical tangle of Bills' Trail.



August, 2014 California Conservation Crew getting trained prior to starting work. They've worked seasonally 8 days on, 8 days off for three years to eventually open Bills' Trail.

In 2002, Jim Jacobsen, former president of Bicycle Trails of Marin, initiated a change-in-use for Bills' Trail. It then took CSP seven years to approve the multi-use conversion, at which point the Marin Conservation League threatened to sue CSP on the grounds "that allowing bikes would imperil steelhead and coho salmon in an adjacent creek." This in turn triggered the 2012 EIR which concluded the change-in-use was compliant with CEQA and could go forward, albeit with several ammendments to the trail. As of 2018, the trail work is still not complete, though it's completion is anticipated in 2019.

The vast majority of recommendations deal with bringing the trail into compliance with CEQA such as replacing failing wooden features with more durable rock substitutes in areas adjacent to the creek. The only significant bike-specific work involves adding pinch points to regulate speed. 16 years of acrimony and expenses have accrued when a willingness to share could have seen the trail maintained for free by volunteers all these years.

The contentious saga of Bills' Trail is a microcosm of mountain bike access in Marin. Disputed trail origins and intended uses, blanket prohibitions, specious arguments and expensive litigation from special interest groups which keep land managers from fulfilling their organizations' missions—mountain bikers in Marin face numerous hurdles to a mode of recreation and travel which is widely accepted and embraced the world over.

And yet, it is encouraging to see trail access for mountain bikers growing, albeit slowly, through more balanced land management in Marin. Numerous surveys and studies confirm mountain bikers as the second largest user group of public lands in Marin. It is time the pace of trail access matches the growing demographics of one of the fastest growing activities in the United States.

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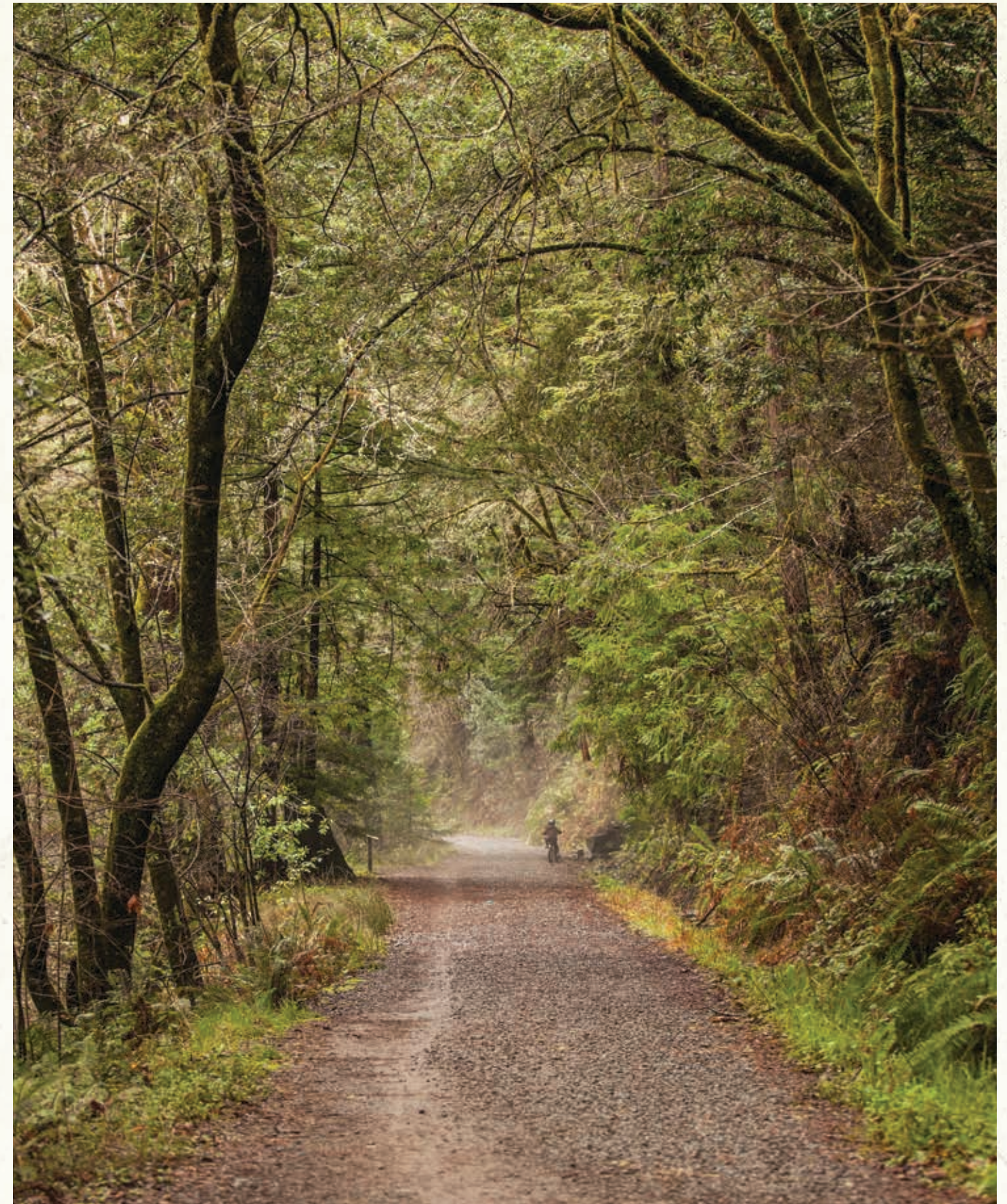
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