Introduction

The use of mountain bikes on Forest Service trails and roads is a rapidly expanding recreational activity throughout the United States. Statistics about the growth of the sport in the general population indicate surging use (Sporting Goods Manufacturing Association 1991), expanding sales (Keller 1990), and increasing use of mountain bikes off-road (Brown 1988). A 1993 study of use on six National Forests (Hollenhorst and others 1993) indicated that mountain bike riders are also using National Forests for organized events.

A 1993 telephone survey of 40 recreation officers from the USDA Forest Service and USDI Bureau of Land Management (BLM) indicated that use of mountain bikes on Federal lands was increasing and that management of such use was a concern (Chavez and others 1993). A 1991 study of mountain bike use within National Parks indicated several areas of concern to resource managers including damage to natural resources, conflicts between user groups, and safety issues (Tilmant 1991). These major issues were similar to those found by Chavez and others (1993) for Forest Service and BLM managers.

Damage to natural resources was a major concern for resource managers (Chavez and others 1993, Tilmant 1991). More than one-third of the managers from both studies indicated that increasing use had caused resource damage, but that they could not discern whether damage was specifically because of mountain bike use.

Studies by Chase (1987), Chavez and others (1993), Jacoby (1990), Tilmant (1991), Viehman (1990), and Watson and others (1991) found that conflict related to mountain bike use was an important issue to various forest users. Mountain bike riders were seen as interlopers on trails that had previously been used by hikers and equestrian groups. Watson and others (1991) found evidence of asymmetrical conflict: although one-quarter of the mountain bike riders viewed hikers as a problem, almost two-thirds of the hikers viewed mountain bikers as the problem. Tilmant (1991) found that hiker complaints about mountain bike riders included esthetics, personal beliefs, and desire for solitude, and equestrian groups raised concerns related to safety issues. Mountain bike safety issues such as speed, rider behavior, and trail conditions (Moore 1994, Pettit and Pontes 1987, Tilmant 1991) have been considered priority challenges facing trail managers.

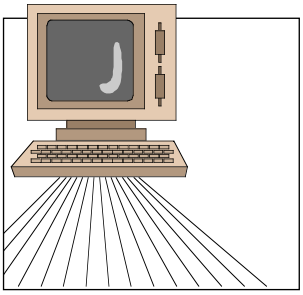
To analyze the impact of technological advances on resource management, a research project consisting of several studies was designed that included a study on mountain bike use on Federal recreation lands. Several facets of this use were examined, such as the users, their specific trail needs, and management perceptions of use. Descriptions of mountain bike riders and resource manager perceptions were previously studied by Hollenhorst and others (1993) and Chavez and others (1993). Other studies in this project examined use of specific trails to assist in the management of those areas (Blahna and others 1995, Chavez 1993), and surveyed current members of the International Mountain Biking Association (Hollenhorst and others 1995).

This study is a continuation of a National Park Service study by Tilmant (1991) that examined mountain biking on a national scale, the level of planning by resource managers, management issues as described by resource managers, and the management actions that address resource damage used by National Forest resource managers compared to those used by National Park Service managers.

By being proactive with the development of mountain bike riding trails and routes rather than reactive we have so far avoided resource damage and user conflict issues seen elsewhere. At the same time excellent recreational opportunities have been provided for the largest and fastest growing group of out-door recreationists in the U.S.—mountain bike riders. This proactive approach has also had the added benefit of creating a positive attitude and working relationship between the Forest Service and cyclists rather than one of conflict and confrontation.

-Intermountain Region respondent

Methods



With the assistance of Lyle Laverty and Steve Deitemeyer of the USDA Forest Service's Recreation Staff, the Acting Chief of the Forest Service, David Unger, in late 1993 sent a letter to all the Regional Foresters describing the goals of the study and requested they send the letter and a questionnaire, via electronic mail, to each National Forest in their Region. Each National Forest was asked to respond to the survey regardless of the extent of mountain bike use on the Forest. Responses were requested by the end of the calendar year and were to be mailed either via hard copy mail or electronically to me.

Most respondents sent in Forest-level responses while others replied by Ranger District. If at least half of the Districts replied, then their data were aggregated for inclusion in the data set—a combined response categorized as Forest-level. Replies from fewer than half the districts resulted in that Forest being excluded from the survey. All responses reported here are Forest-level *(appendix A)*.

Because of the complex nature of requesting survey responses through many layers of the National Forest System, only one request was sent. Responses were received from 90 National Forests (58 percent response rate).

The Statistical Analysis System for personal computers, edition 6.03, was used to analyze the survey data.

Survey Questionnaire

The survey questionnaire *(appendix B)* was based on the 1990 survey of National Park Service managers conducted by James Tilmant containing objectives similar to the current study. A major difference between Tilmant's work and this study was the addition of questions regarding management actions related to the issues of resource damage, user conflicts, safety, and accidents.

The amount of mountain bike riding that occurs on National Forests throughout the United States was measured by two questions: if mountain bike activity occurred on Forests and the estimated number of mountain bike riders annually.

The level of planning currently used by Forest Service managers to deal with issues related to mountain bike use was measured by 14 questions on topics such as the types of requests (use of closed roads, wilderness use, races); numbers of requests in the past year; whether concessionaires or nearby businesses rented mountain bikes and number of those types of businesses on or near the forest; whether the Forest plan had provisions for mountain bike use; and whether management of mountain bike use was ranked as the highest four or five issues on the Forest.

Management issues and actions related to mountain bike use of National Forests were measured by 13 questions including: whether the Forest managers considered control of mountain bike use a forest resource management concern, and why; if Forest managers observed or received reports of mountain bike use on closed roads or trails limited to foot traffic and, if so, how many in the past year; if Forest managers had observed or received reports of mountain bike accidents and, if so, the methods used to prevent accidents; if Forest managers had seen evidence of resource damage from mountain bikes, descriptions of that evidence, and the methods used to prevent damage; if Forest managers had observed or received reports of user conflicts, descriptions of them, and the methods used to prevent user conflicts; and, if Forest managers had observed or received any reports of safety problems, summaries of the number reported, and descriptions of the methods used to prevent safety problems.

The area and adjacent BLM lands have some excellent mountain biking opportunities. There are some local riders that make extensive use of the forest but we do not have many people visiting from outside the area to ride. Use is growing with more advertising by local tourism boards, the availability of some brochures, and visits by people to attend races. The forest needs to pay more attention to mountain biking because it will be a larger part of our road and trail use.

-Rocky Mountain Region respondent

Some Forest background information was also requested. These questions asked for the approximate number of miles of paved road open to bicycle use, paved road closed to bicycle use, unpaved road open to bicycle use, unpaved road closed to bicycle use, hiking trails overall and hiking trails open to bicycle use, specially constructed bike paths, and for forests with designated wilderness, the number of miles of trails within wilderness. Finally, Forest managers were asked to add any additional comments on management issues or other concerns related to mountain bike riding on their forest *(appendix C)*.

Results

Forest Background Information

The survey questionnaire provided information about the number of miles of trails on a National Forest that were open or closed to bicycle use (*table 1*). The results showed about 48 miles of paved road, 1,300 miles of unpaved roads, and 177 miles of hiking trails open to bicycle use. Also, 82 percent of the Forests responding to the survey had designated wilderness; number of miles of wilderness trails varied from none to 1,188.

Table 1—*Number of miles of trails and roads open or closed to bicycle use of all National Forests replying to survey questionnaire*

Road condition	Miles					
	n	Min.	Max.	Median[1]	Mean[2]	SD[3]
Paved road open to bicycle use	75	0	3300	48	209	506
Paved road closed to bicycle use	82	0	30	<1	1	5
Unpaved road open to bicycle use	80	30	8039	1284	2036	1822
Unpaved road closed to bicycle use	82	0	2427	<1	60	287
Hiking trails (overall)	85	6	8012	400	756	1003
Hiking trails open to bicycle use	84	0	7912	177	476	929
Specially constructed bike paths	79	0	60	<1	4	10

[1]The point that divides the distribution into two parts such that an equal number of scores fall above and below that point.
[2]Average number of miles. The mean may not be a useful statistic because of the large variation of responses as noted in the standard deviations.
[3]Standard deviation

Level of Activity

Responses about annual mountain bike use were received from every region of the National Forest System *(appendix D)*. At least two National Forests from every region (except Region 10, the Alaska Region) reported use of greater than 10,000 mountain bike riders per year:

Region Name/Number	National Forest
Northern—1	Gallatin Idaho Panhandle Lolo
Rocky Mountain—2	Routt Grand Mesa
Southwestern—3	Apache/Sitgreaves Carson

continued

Region Name/Number	National Forest
(Southwestern—3, continued)	Cibola
	Coconino
	Coronado
Intermountain—4	Sawtooth
	Toiyabe
	Wasatch-Cache
Pacific Southwest—5	Inyo
	Lake Tahoe Basin Mgmt Unit
	San Bernardino
	Sequoia
	Shasta-Trinity
	Stanislaus
Pacific Northwest—6	Okanogan
	Umpqua
	Wenatchee
Southern—8	Apalachicola
	Jefferson
	Nantahala
	Pisgah
	George Washington
Eastern—9	Allegheny
	Green Mountain
	Mark Twain
	Monongahela
	Shawnee

This is without a doubt one of the fastest growing uses that the Forests are seeing and must be addressed. Inconsistent or lack of direction in the management and maintenance is the issue. An industry-wide effort to educate the user to proper trail etiquette might be applied through the retail sales outlets.

-Intermountain Region respondent

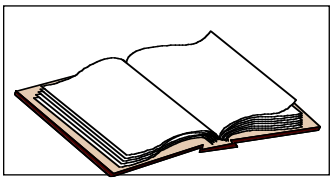
The National Forests receiving the highest amount of use were those that reported more than 10,000 mountain bike riders annually and had at least 20 riders per mile of trail (for trails available for mountain bike use) *(table 2).* Highest use was found in several regions that included the Inyo, Wasatch-Cache, and Allegheny National Forests *(appendix E).*

Nearly all of the Forests reported having mountain bike activity (98 percent). Estimated use varied greatly and ranged from 50 riders to 376,000 riders annually. The average was 21,302; however, the extremely large standard deviation (sd = 48,558) indicates the average is probably not a useful measure.

About one-quarter of the Forests reported 850 or fewer mountain bike riders annually, another one-quarter reported having 851 to 4,500 mountain bike riders annually. Another one-quarter of the Forests reported having 4,501 to 15,000 riders annually. The remaining Forests reported between 15,001 and 376,000 mountain bike riders annually. Thus, only about one-quarter of the Forests receive a high amount of use.

Planning

The Forest managers were asked if their forest plan provided for mountain bike trails or opportunities. Slightly more than half (53 percent) of the Forests responding to the survey had such provisions; 10 percent reported the management of mountain bike use as one of the top four or five issues on their Forest.



Data obtained about mountain bike use on closed roads or trails limited to foot traffic, use of wilderness, and for races and rallies indicate that Forests are receiving these requests from mountain bike riders (*table 3*); despite that, the number of requests made to the forests varies greatly.

More than one-third (36 percent) of the Forests have encountered problems with commercially advertised or sponsored bike tours coming to the Forest without permits. Almost three-quarters (72 percent) of the Forests have concessionaires or nearby businesses that rent mountain bikes for use on the Forest.

Management Concerns

Forest managers were asked if they consider control of mountain bike use a forest resource management concern and why. Almost 7 of 10 (69 percent) responded that they regarded it as a natural resources related issue (72 percent), social issue (37 percent), social structural issue (28 percent), and a policy/planning issue (13 percent). Multiple responses were allowed for this question:

Issue	Concerns
Natural Resources (n = 67)	Effects on natural resources Degradation of trails Use of designated wilderness
Social (n=33)	Conflict with other users Managers must referee conflicts Coordinating groups for multiple trail use
Social Structure (n = 25)	Safety issues Sport is growing Need to educate mountain bike riders Need to provide signing
Policy/Planning (n = 12)	Need to plan better for use Lack of personnel for mountain bike needs Legal/tort claims

Mountain bike riding/touring is becoming increasingly popular on National Forest Lands. This is a type of recreational use that we should work to accommodate in a way that will satisfy users, yet protect the resources and other forest users.

-Pacific Southwest Region respondent

Table 2—*Average number of riders per mile for National Forests reporting more than 10,000 mountain bike riders*

National Forest	Region	Combined number of miles	Number of riders	Average number riders per mile
Inyo	5	3,835	376,000	98.04
Wasatch-Cache	4	1,690	125,000	73.96
Allegheny	9	1,293	122,000	94.35
Sawtooth	4	3,710	87,000	23.45
Coronado	3	2,600	55,000	21.15
Routt	2	2,457	54,000	21.98
Pisgah	8	801	53,200	66.42
Monongahela	9	868	40,000	46.08
Lake Tahoe Basin Mgmt Unit	5	320	18,000	71.20
Mark Twain	9	448	11,400	25.45
Green Mountain	9	177	11,350	64.12

Use is increasing and management needs to be geared towards anticipating, planning for, and controlling use in the future years. We have seen what has happened in another area and although we do not have the same terrain, we need to plan for the future of bicycle use on a county-wide (not just forest) or BLM basis.

-Intermountain Region respondent

Table 3—*Types of requests from mountain bike riders for special use of forests*

Requests	n	Forests Pct Yes	Number of requests Min.	Max.	Mean	SD
Use of closed roads or trails limited to foot use	90	63	0	1020	79	167
Use within wilderness	90	47	0	180	25	40
Races or rallies	90	71	0	15	4	3

In addition to handling requests for using mountain bikes on closed roads or trails limited to foot traffic, 77 percent of the Forests reported that their staffs had observed or received reports about such use. Once again, the responses varied greatly from 1 observation or report to 500 for the past year.

Resource Damage

Forest managers were asked if they had seen any evidence of resource damage from mountain bike use. More than one-half (58 percent) of the Forests reported seeing evidence of resource damage from mountain bike use. Only 2 percent reported that they could not tell whether resource degradation was attributable to hikers, horses, livestock, motorcycles, all-terrain vehicles, 4-wheel drive vehicles, or mountain bike use. The most common types of resource degradation included trail impacts (48 percent), soil impacts (36 percent), and water related impacts (27 percent). Multiple responses were allowed for this query:

The sport is growing and we need to be educating users regarding their impacts on the land and their responsibilities as riders. I'd like to see each forest develop a publication regarding riding opportunities, Tread Lightly stuff, rider responsibilities, etc.

-Intermountain Region respondent

Evidence of Resource Damage

Resource	Damage
Trail (n = 43)	Widening Braiding Rutting Shortcuts Switchbacks User-created trails
Soil (n = 32)	Erosion from skidding and narrow tire tracks Compaction
Water (n=24)	Wet trail riding Siltation damage Tread damage Damage to drainage structures, and banks on stream crossings
Vegetation (n = 5)	
Ethics (n = 1)	Litter at mountain bike campsites Vandalism

Forest managers were asked, in an open-ended question, the methods they use to prevent resource damage caused by mountain bike use. The methods were categorized as information/education (69 percent), resource hardening (56 percent), cooperation (39 percent), and visitor restrictions (30 percent). Multiple responses were allowed for this query:

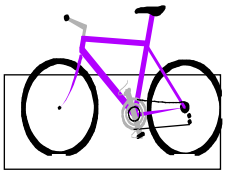
As we allow different uses of trails we need to assess the impacts and be ready to mitigate resource damage. This has not happened with bike use. There is significant use and damage occurring with little extra maintenance dollars to deal with.

-Pacific Northwest Region respondent

Category	Resource damage prevention
Information/Education (n = 62)	Posters/signs Tread Lightly Low impact mountain biking User ethics Etiquette Public service announcements Brochures Local newspaper articles Maps Educational materials

continued

Category	*Resource damage prevention*
Resource Hardening (n = 50)	Water bars (belted)
	Flip-over water bars (conveyor belt and treated timber)
	Drain dips
	Small culverts
	Low bridges
	Boardwalks
	Footbridges
	Stream coverings reinforced with rocks
	Turnpiking (elevate trail above the water table)
	Trail monitoring
	Trail reconstruction
	Good trail design
	Hardening of trail surface
	Gravel on trails
	Grades reduced
	Step and run plank installation
Cooperation (n = 35)	Involvement with managers
	Citizen task force
	Local bike club meetings
	Local and state bike groups
	Adopt-a-trail program
	Maintain trails with local groups and volunteers
	Partnerships
	Personal contacts
Visitor Restrictions (n = 27)	Close or limit use
	Mountain bike volunteer
	Limit use to old timber roads
	Seasonal closures
	Relocate or designate bike trails
	Violation notices
	Organized events that do trail maintenance
	Provisions for special use permits
	Non-issuance of outfitter/guide/event permits
	Users ride in dispersed patterns



User Conflicts

Forest managers were asked if they had observed or received reports of user conflicts; 7 in 10 Forest managers (70 percent) reported that they had. Many reported the problem was between mountain bikers and equestrian groups (41 percent), or between mountain bikers and hikers (31 percent). Another 21 percent reported that the mountain bike rider was the problem (for example, mountain bike riders' speed). Others reported or observed that hikers or equestrian group members were the problem (not the mountain bike riders; 11 percent). Other conflicts reported were between mountain bike riders and motorized groups (all-terrain vehicles, off-highway vehicles; 10 percent), and conflicts between mountain bike riders and pack animal groups (4 percent). Additional conflicts were reported between mountain bike riders and the natural resources (wildlife, vegetation; 7 percent).

Forest managers were asked, in an open-ended question, the methods they use to prevent user conflicts. The methods were categorized into

The issue of horseback riders sharing trails with mountain bikers recently surfaced when the National Recreation Area sent out a scoping letter to get input about an application for a commercial mountain bike outfitter and guide service. To their surprise, the horseback community organized and sent a strong message to the Forest Service that they did not want to share trails with mountain bikers. One of their primary concerns was that they would eventually lose trail riding opportunities to mountain bikes. Their other concern centers around safety and the fact that many horses spook at the sight of mountain bikes. They are currently in the middle of a public involvement process to reach a mutual understanding between the two groups as to which trails, if any, will be set aside for single-use.

-Southern Region respondent

information/education (63 percent), cooperation (27 percent), visitor restrictions (17 percent), and resource hardening (7 percent).

Category	User conflict prevention
Information/Education (n= 57)	Safety Multiple use Brochures Maps Trail descriptions Posters Bulletin boards Signs International Mountain Biking Association triangle Ethics Etiquette Tread Lightly Low impact
Cooperation (n = 24)	Personal interactions Volunteer patrols Partner with different groups Committees with different groups Mountain bike shops with rules and regulations
Visitor Restrictions (n = 16)	Separate user groups Separate trails Alternate use between user groups Redirect bike use to other trails Law enforcement Non-issuance of permits for events
Resource Hardening (n = 6)	Change trail to meet needs Shorter loops for hikers, longer for bikes Upgrade trails

Mountain bikers really do not understand the conflict with horseback riders.

-Pacific Southwest Region respondent

Safety

Forest managers were asked if they had observed or received any reports of safety problems related to mountain bike riding. Most Forests (59 percent) observed or reported safety problems related to mountain bike use. Those issues were related to excessive speed of the mountain bikes (39 percent). Other problem areas were safety related to pack animal groups (14 percent), mountain bikes that were too quiet (9 percent), and bikers who were too careless around vehicles (8 percent).

Forest managers, in open-ended question, were asked the methods they used to prevent safety problems caused by mountain bike use. Forest responses were categorized into information/education (58 percent), cooperation (17 percent), visitor restrictions (12 percent), and resource hardening (8 percent). Multiple responses were allowed for this query.

Category	User safety tools
Information/Education (n = 52)	Safety rules Multiple use Brochures Maps Trail descriptions Newspaper articles Club newsletters Signs with appropriate use Ethics Etiquette Tread Lightly Low impact
Cooperation (n = 15)	Personal contacts Partnerships Workshops
Visitor Restrictions (n = 11)	Separate trails Enforcement contacts Non-issuance of special use permits
Resource Hardening (n = 7)	Wider turnouts Rubber belting on water bars

The wildlife community is beginning to express concerns about bike use on closed roads maintained as linear strip wildlife openings. This concern can be partly resolved by better coordination when selecting roads to be used as strip openings or riding opportunities. There is more and more competition for a limited land base.

-Southern Region respondent

Accidents

Forest managers were asked if they had observed or received any reports of mountain bike accidents; about half of the Forests (48 percent) had observed or received reports of mountain bike accidents. Forest managers were asked, in an open-ended question, the methods they use to prevent accidents caused by mountain bike use. Methods used to prevent accidents were categorized into information/education (42 percent), resource hardening (12 percent), cooperation (7 percent), and visitor restrictions (2 percent). Multiple responses were allowed for this query.

Category	Mountain bike accident prevention
Information/Education (n = 38)	Information about safety Brochure about safety tips Brochures Public service announcements Newspaper articles Signs/posters Specific trail information Ability level recommended Safety signs (e.g., control speed) Signs for allowed use on trails Educate users about safety Etiquette pamphlet Ethics/etiquette information

continued

We believe our Ranger District has perhaps the most intense mountain bike use of any Forest in our region. The resource damage and public safety issues are of high concern. In addition, the use patterns indicate that mountain bike use is increasing at a dramatic rate. It is evident that the District needs to commit funding and personnel to manage this ever increasing recreation activity.

-Pacific Southwest Region responden

Mountain biking, and all the associated issues, is an emerging topic on the the Forest. We have probably the next to largest use in the region. We recognize the need to address user conflict, trail standards, etc. sometime in the not too distant future—but have not done anything proactive to date. We have worked with local bike clubs/shops to produce maps of popular routes and address safety issues in that publication.

-Northern Region respondent

Category	*Mountain bike accident prevention*
Resource Hardening (n = 11)	Trail maintenance Trail design
Cooperation (n = 6)	Partner with local businesses to convey ethics Personal contact with users Rider input about trail maintenance Trail safety evaluation form Work with clubs
Visitor Restrictions (n = 2)	Permittees must have safety plans Road closures during events Separate use

Other Forest Manager Comments

The last section of the questionnaire asked Forest managers to add any comments on management issues or other concerns they may have related to mountain bike riding on their forest. Of the 58 Forest managers who responded, 16 mentioned the problem areas examined in the survey (user conflicts, resource damage, safety, and accidents), and 29 mentioned the management actions related to cooperation, informa°tion/education, visitor restrictions, and resource hardening. Three Forest managers mentioned wilderness trespass as problematic. About half of the 58 Forest managers noted that mountain biking is a growth sport. Several mentioned the problem of budget allocations that did not allow for personnel, facilities, and maintenance of the resource; a tight budget and growing use may be problematic for the Forest managers.

Conclusions

Mountain bike riding is one of many technological advances that land managers must address. Studies about mountain bike use are important for several reasons: it is a fairly new use of Federal lands; we expect the use to continue and perhaps even increase; what we learn about mountain bike use may assist us in preparing for future technological advances; and finally, documentation is needed so that as growth continues, other managers can have guidelines to respond to this use.

The Forest managers responding to this study identified several major issues of concern, such as the effects of the trail users on natural resources, conflicts with other user groups, safety concerns, use of designated wilderness for riding, and the rapid growth of the sport. The survey queried in depth the effects on the natural resources, user group conflicts, and safety concerns. To that end the research identified the major issues for the forest managers and methods for effectively dealing with the growth of the sport. The study did not look in-depth at the issue of use of designated wilderness. The Forest Service and National Park Service must prohibit mountain bike travel on wilderness trails in accordance with the Wilderness Act of 1964 (16 U.S.C. 1131-1136).

There is a tremendous difference in the level of experience that users are seeking. Some want to ride on very primitive trails with a high level of risk and some folks prefer the very easy trails that are hard sur-

Management Implications

Results from this study suggest some planning directions for National Forest resource managers:

- Managers need to include provisions for mountain bike use in

Forest plans

- Managers need to develop policies for responding to the types of requests often received.

Forest responses indicated that managers can expect to get requests to use mountain bikes on mountain wilderness, closed roads, foot trails, and requests for races and rallies. Forest and District level policies are needed to help guide these decisions, and forest managers should be prepared to deal with concessionaires or nearby businesses that cater to mountain bike riders.

Results of this study indicate that mountain bike use is associated with potential problems, most importantly:

- Impacts on natural resources
- User conflict
- Safety issues.

Management actions to address the issues presented here are from forest managers. The actions can be grouped into these categories:

- Information/education
- Personal interaction/cooperation/partnerships
- Resource hardening and maintenance
- Use restriction and enforcement.

These actions, which represent the skills and knowledge of current forest managers, appear to be the appropriate ones for each problem area. For example, trail maintenance is a reasonable way to deal with safety and accident problems, and information and personal interaction are the most reasonable tools for dealing with conflict issues. This document may serve as a guide to managers for identifying management actions to address issues related to managing mountain bike use on their National Forest.

Comparing Agency Responses

The results of this study are very similar to the National Park Service (NPS) survey on mountain biking (Tilmant 1991). For example, responses from both agencies showed that use is surging, and mountain biking is considered a management concern, particularly because of resource damage from mountain bike use, user conflicts, safety issues, and accidents.

About 8 of 10 NPS units (parks, monuments, historic sites) that have mountain bike use in their area reported that control of this activity is a management concern, compared to 58 percent of Forest managers. Both groups identified the major resource impacts as damage to hiking trails, such as trail widening, increased erosion, and water-based damage. More than half (53 percent) of the NPS units receiving mountain bike use in their area reported problems with user conflicts (compared to 70 percent of Forest managers), safety (compared to 59 percent of Forest managers), and accidents (compared to 48 percent of Forest managers).

The results of this study suggest a greater amount of mountain bike use on National Forests. For example, although 57 percent of the NPS units reported mountain bike use, 98 percent of the National Forests reported mountain bike use. However, this discrepancy might be explained by Forest Service managers who may have been more inclined to respond to the survey if they had mountain bike use in their area, in comparison to National Park units responding regardless of the level of mountain bike use. Another example of use differences was shown in the estimated amount of use reported by both agencies. The highest level of estimated use reported by any

faced where there is little or no risk. Some folks want to ride and prefer roads through the forest. Some of our trail managers would like to dictate to our users where and when they should ride. Managers would like to make the decision for the users—what is safe and what is not. As many trails as possible should be open to users, and let them make the decision of whether to use it or not.

-Pacific Northwest Region respondent

Funding for reconstruction or new trail construction as well as standards for tread material and tread construction which accommodate mountain bicycles are very much needed.

-Eastern Region respondent

It is obvious that the use of mountain bikes will continue to increase and there will be continuing conflicts on forest lands. There may be a remedy in the future by increasing the opportunities available to these users. One option is developing additional trails for bikes only. A major increase in the existing budget is necessary to provide these opportunities and to provide the educational materials that will be necessary to the public.

-Intermountain Region respondent

In my judgment, mountain biking is perhaps the single most compatible recreation activity there is with general, roaded-backcountry type forest settings. The opportunities are almost limitless; the impacts and conflicts are generally negligible or, at least, manageable. As an activity, I believe it will over time become more common than either hiking or equestrian uses.

-Pacific Southwest Region respondent

NPS unit was 71,000 per year while the highest estimated use level reported by any Forest was 376,000 per year. Paradoxically, Forest Service managers, although experiencing greater use, were less concerned about mountain biking issues (58 percent compared to 80 percent of National Park Service units). This inconsistency might be the result of the Forest Service mandate of multiple use compared to the National Park Service preservation focus.

Another difference between the agencies was that only 10 percent of the NPS units with mountain bike use reported having concessionaires that rented mountain bikes for use within their areas, although almost three-quarters (72 percent) of the Forest Service respondents reported concessionaires nearby.

Only 7 percent of the NPS units reported specific management plans for the control and direction of the activity in their area, while another 25 percent incorporated specific statements about mountain bike use within the Superintendent's Compendium of Regulations. In comparison, 53 percent of National Forests reported that their forest plan had provisions for mountain bike trails or opportunities.

Future Research

I believe the Forest Service should actively and aggressively pursue enabling mountain bike use of almost all suitable National Forest lands and areas. In addition, there are many partnership opportunities with private sector entities…which could greatly enhance the bikers' experience while on National Forest lands.

-Pacific Southwest Region respondent

The impact of technological advances on resource management is a complex topic. This study examined Forest Service managers' perceptions about mountain bike use on Forest Service lands. However, studies that only address mountain bike riders or the managers' perceptions about use do not provide complete information about mountain bike use. Although other studies have examined user groups (Hollenhorst and others 1993), trail issues (Blahna and others 1995), conflict issues (Watson and others 1991), manager perceptions (Tilmant 1991), and the mountain biking activity as it relates to theoretical issues such as innovation/diffusion (Schuett and others 1994), additional research is needed in several areas.

The value of bike patrols (Schneider and Arendt 1992) and the role of partnerships to alleviate conflict or resource damage (Kulla 1991) are issues that could be studied in more depth. Similarly, other studies might focus on how trail construction can alleviate damage problems (McCoy and Stoner 1991); how mountain biking interacts with community development (Magill 1993); whether displacement of trail users is an issue; and wilderness trespass issues. A comparable survey of USDI Bureau of Land Management, National Park Service, and Forest Service resource managers is also needed *(appendix F)*.

Trail policy is "hiker only" unless designated for other uses. We are in the process of re-evaluating existing trail systems for bike use, but it's being done on a district- wide basis and some districts are farther along than others. Fortunately our local bike clubs are cooperative and helpful (rather than pounding the table and saying they have a right to use hiking trails!).

-Southern Region respondent

Some future research topics of particular interest to resource managers include: What criteria have been used to make access decisions? Are they appropriate and defendable to the user community? Does an established management plan reduce the confrontations and conflicts faced by resource managers? Does an established management plan reduce resource impacts or user conflicts? How are decisions about single versus multiple trail use made? What are the different strategies for trail management that are more or less useful in different terrains/use levels/user group compositions? How effective are the management actions that have been used for each problem area? All these issues should be studied in more depth so that Federal resource managers can make informed decisions about the most effective strategies to manage mountain biking, its effects on other issues, and its impact on our natural resources.

References

Blahna, Dale J.; Vilter, James C.; Van Patten, Susan; Von Koch, Russ; Chavez, Deborah J. 1995. **Slickrock trail mountain biker survey.** Unpublished draft supplied by author.

Brown, K. 1988. **Wheels of fortune: bicycle marketers shift into high gear to meet demand.** Adweek's Marketing Week 29(2): 2.

Chase, J. 1987. **Mountain bikes, the gnarly question of knobby tires.** Backpacker. January: 36-37.

Chavez, Deborah J. 1993. **User perceptions about mountain biking in the San Jacinto region: a management and research partnership.** Unpublished draft supplied by the author.

Chavez, Deborah J.; Winter, Patricia L.; Baas, John M. 1993. **Recreational mountain biking: a management perspective.** Journal of Park and Recreation Administration 11(3): 29-36.

Hollenhorst, Steve J.; Schuett, Michael A.; Olson, David. 1993. **An examination of the characteristics, preferences, and attitudes of mountain bike users of the National Forests: a preliminary analysis.** Unpublished draft supplied by authors.

Hollenhorst, Steve J.; Schuett, Michael A.; Olson, David; Chavez, Deborah J.; Mainieri, Tina. 1995. **A national study of mountain biking opinion leaders: characteristics, preferences, attitudes and conflicts.** Unpublished draft supplied by authors.

Jacoby, Jill. 1990. **Mountain bikes: a new dilemma for wildland recreation managers?** Western Wildlands 16(1): 25-28.

Keller, Kit D. 1990. **Mountain bikes on public land: a manager's guide to the state of the practice.** Washington, DC: Bicycle Federation of America; 68 p.

Kulla, Andy. 1991. **A new perspectives approach in National Forest recreation.** Unpublished draft supplied by author.

Magill, Arthur W. 1993. **Mountain bicyclists activities in the urban/wildland interface.** Unpublished draft supplied by author.

McCoy, Michael; Stoner, MaryAlice. 1991. **Mountain bike trails: techniques for design, construction and maintenance.** Missoula, MT: Bikecentennial; 20 p.

Moore, Roger L. 1994. **Conflicts on multiple-use trails: synthesis of the literature and state of the practice.** Report No. FHWA-PD-94-031, Federal Highway Administration; 67 p.

Pettit, B.; Pontes, Patrick. 1987. **Kepner-Trago analysis: mountain bicycle situation on Santa Barbara front trails managed by the U.S. Forest Service.** Unpublished draft supplied by author.

Schneider, Jim; Arendt, Mark. 1992. **Bike patrol: an effective tool for parks and recreation.** Connection Park and Recreation Update, Article 110. Springfield, MO: Center for Leisure Studies; 2 p.

Schuett, Michael A; Hollenhorst, Steven J.; Chavez, Deborah J.; Olson, David. 1994. **Differentiating between early and late adopters in mountain biking.** In: Watson, Alan; Freysinger, Valeria J., eds. Abstracts from the 1994 Symposium on Leisure Research, October 12-16, Minneapolis, MN; 52.

Sporting Goods Manufacturing Association. 1991. **Mountain biking—on the way up**. North Palm Beach, FL: Sporting Goods Manufacturing Association.

Tilmant, James T. 1991. **Mountain bike use within National Parks: a report on a 1990 survey.** Unpublished draft supplied by author.

Viehman, John. 1990. **Let's build trains, not walls.** Backpacker. August: 3.

Watson, Alan E.; Williams, Daniel R.; Daigle, John J. 1991. **Sources of conflict between hikers and mountain bike riders in the Rattlesnake NRA.** Journal of Park and Recreation Administration 9(3): 59-71.

Appendix A—National Forests and Ranger Districts Responding to the Survey

Forest-level responses:

Northern Region—1

Beaverhead
Bitterroot
Clearwater
Gallatin
Helena
Idaho Panhandle
Kootenai
Lolo
Nez Perce

Rocky Mountain Region—2

Black Hills
Grand Mesa
Rio Grande
Routt

Southwestern Region—3

Apache/Sitgreaves
Carson
Cibola
Coconino
Coronado
Gila
Santa Fe

Intermountain Region—4

Ashley
Challis
Dixie
Fishlake
Humboldt
Manti-La Sal
Salmon
Sawtooth
Targhee
Toiyabe
Unita
Wasatch-Cache

Pacific Southwest Region—5

Cleveland
Eldorado
Inyo
Klamath
Lake Tahoe Basin Mgmt Unit
Modoc
Plumas
San Bernardino
Sequoia
Shasta-Trinity
Six Rivers
Stanislaus
Tahoe

Pacific Northwest Region—6

Fremont
Gifford Pinchot
Malheur
Mt Baker-Snoqualmie
Mt Hood
Okanogan
Siskiyou
Umatilla
Umpqua
Wenatchee
Winema

Southern Region—8

Apalachicola
Bienville
Delta
De Soto
Croatan
Frances Marion and Sumter
George Washington
Holly Springs
Homochitto
Jefferson
Kisatchie
Nantahala
Pisgah
Osceola
Tombigbee
Uwharrie

Eastern Region—9

Allegheny
Green Mountain
Hoosier
Huron-Manistee
Mark Twain
Monongahela
Nicolet
Ottawa
Shawnee
Wayne

Alaska Region—10

Chugach
Tongass—Chatham
Tongass—Ketchikan
Tongass—Stikine

District level responses combined to Forest-level response:

Region 4—Bridger-Teton National Forest
Ranger Districts—Buffalo, Greys River, Kemmerer, Pinedale
(two non-responses)

Region 6—Ochoco National Forest
Ranger Districts—Big Summit, Prineville, Snow Mountain
(two non-responses)

Region 6—Olympic National Forest
Ranger Districts—Hood Canal, Quilcene
(two non-responses)

Region 8—Ouachita National Forest
Ranger Districts—Caddo, Cold Springs, Jessieville, Oden, Poteah, Winona, and two unnamed ones
(four non-responses)

Responses NOT included in sample:

Region 1—Custer National Forest

Ranger Districts—Ashland, Beartooth, Sioux
(four non-responses)

Region 2—White River National Forest
Ranger Districts—Dillon
(six non-responses)

Bighorn National Forest
Ranger Districts—South Ecosystem Management Unit
(four non-responses)

Region 5—Lassen National Forest

Ranger Districts—Hat Creek
(two non-responses)

Region 6—Colville National Forest

Ranger Districts—Sullivan Lake
(four non-responses)

Region 8—National Forests in Alabama.

A joint response representing four National Forests in Alabama was received. Since individual Forest responses could not be separated, none were included.

Cherokee National Forest responses from three of seven management areas—Nolichucky, Ocoee, Unaka (four non-responses)

Sabine National Forest Ranger Districts—Yellowpine. Not included in sample since response from only one Ranger District might not be representative of the Forest.

Appendix B—Survey Instrument

MOUNTAIN BIKE USE WITHIN THE FOREST SERVICE

National Forest _____ Region_____

Contact _____ Date_____

LEVEL OF ACTIVITY:

1. Do you have mountain bike activity within your forest? ____YES ____ NO

   If yes, what is the current estimated number of mountain bike riders annually?

   _____ Average number of riders per year*

   * If one person rides 10 times per year count as 10

2. Have you received any requests to use mountain bikes on closed roads or trails limited to foot use only? ____YES ____ NO

   _____ Approximate number in past year

3. Have you received any requests to use mountain bikes within wilderness? ____YES ____ NO

   _____ Approximate number in past year

4. Have you received any requests for races or rallies? ____YES ____ NO

   _____ Approximate number in past year

5. Have you encountered problems with commercially advertised or sponsored bike tours coming to the forest without permits? ____YES ____ NO

6. Do you have concessionaires or nearby businesses that rent mountain bikes for use in the forest? ____YES ____ NO

   _____ Approximate number on the forest

   _____ Approximate number nearby

7. Does your forest plan have provisions for mountain bike trails or opportunities? ____YES ____ NO

MANAGEMENT PROBLEMS:

8. Do you consider control of mountain bike use a forest resource management concern? ____YES ____ NO

continued

Why?

9. Is the management of mountain bike use one of the top four of five issues on your forest? ____YES ____ NO

10. Has your staff observed or received reports of mountain bike use on closed roads or trails limited to foot traffic only? ____YES ____ NO

    _____ Approximate number observed in past year

    _____ Approximate number reported in past year

11. Have you completed any surveys to show use patterns, documented impacts, or to reflect visitor feelings on this issue? ____YES ____ NO

    If Yes, please attach copy

12. Have you seen any evidence of resource damage from mountain bike use? ____YES ____ NO

    If Yes, please describe:

    What methods do you use to prevent resource damage caused by mountain bike riding?

13. Have you observed or received any reports of mountain bike accidents? (e.g., personal injury) ____YES____ NO

    What methods do you use to prevent mountain bike accidents?

14. Have you observed or received any reports of user conflicts? (e.g., hikers who do not wish to share trails with mountain bike riders) ____YES____ NO

    Please describe:

    What methods do you use to prevent user conflicts?

continued

15. Have you observed or received any reports of safety problems related to mountain bike riding? (e.g., mountain bike riders going too fast) ____YES ____ NO

Please describe:

What methods do you use to prevent mountain bike safety problems?

FOREST BACKGROUND INFORMATION:

Approximate number of miles of:

paved road open to bicycle use	_____
paved road closed to bicycle use	_____
unpaved road open to bicycle use	_____
unpaved road closed to bicycle use	_____
hiking trails (overall)	_____
hiking trails open to bicycle use	_____
specially constructed bike paths on National Forest land	_____

Designated wilderness? ____YES ____ NO

If yes, number of acres _____ acres

number of miles of trail within wilderness _____ miles

Please add any comments on management issues or other concerns you have related to mountain bike riding on your forest.

PLEASE FORWARD COMPLETED QUESTIONNAIRE BY DECEMBER 31, 1993 TO:

Debbie Chavez
PSW Research Station
4955 Canyon Crest Drive
Riverside, CA 92507

Or mail via DG to M.Bike:S27L05A

Questions may be addressed to Debbie Chavez at (909) 276-6285.

YOUR TIME AND ATTENTION IS VERY MUCH APPRECIATED
THANK YOU!

Appendix C—Open-Ended Comments

Respondents were told: "Please add any comments on management issues or other concerns you have related to mountain bike riding on your forest."

Northern Region:

Mountain biking and all the associated issues is an emerging topic on the the Forest. We have probably the next to largest use in the region. We recognize the need to address user conflict, trail standards, etc. sometime in the not too distant future—but have not done anything pro-active to date. We have worked with local bike clubs/shops to produce maps of popular routes and address safety issues in that publication.

This is horse country up here, so we do not have much mountain bike use yet.

Mountain bike use is increasing on and around the forest. The gondola here has been promoting mountain biking for several years. We are working with the folks on the Gondola board to incorporate many of the forest trails into the system—using the upper terminal as a major "trailhead." Another resort is promoting mountain bike races. We are behind other areas for mountain biking, but are beginning to "gear up" for more of that kind of use—as the area grows as a recreation/tourism destination, and all uses increase. We will be very interested in the product your research develops.

Rocky Mountain Region:

Use is still increasing and demand for more transportation systems for this use is increasing. Conflicts with private landowners occur where non-system routes through the forest egress or cross those private lands. Increasing concerns from State wildlife managers on unregulated mountain bike use and on proposals for building new system trails for mountain bikes to alleviate conflicts with other users. There is not sufficient information to show the public where they can ride. Also need to get more information (such as the International Mountain Biking Association Rules of the Trail, Tread Lightly, etc.) to riders. We do not have sufficient funding to get out and really find the amount of use and potential management problems that we might have related to mountain biking (or any other recreational use for that matter). With the passing of the state Wilderness Act of 1993, one of the most popular rides on the forest was closed. To mitigate this we are trying to improve our interaction with the public and are surveying the districts for alternative routes. Many areas have historically received low recreation use, including bike use, due to the remote location relative to population centers, to generally undeveloped character and to a lack of publicity about the opportunities available in the area. Due to low demand in these areas, the forest has not had to address the issues and problems associated with higher levels of bike use or develop any kind of facilities for mountain bikers. Again, in these low use areas, there is good potential for mountain biking as many of the existing trails are well suited to bike travel. These areas could absorb quite a bit of bike use before it would feel "crowded" or show signs of resource degradation, making it a potentially-attractive alternative to other, more heavily-used areas in the surrounding region.

We are in the process of developing a mountain bike prospectus for a 4-5 day trip across the forest. This permit will incorporate "Meaningful Measures" into the permit administration—together with the permittee(s), we shall be able to survey the clients to determine the quality of the trip and this information will also let the forest evaluate the permittee. Conflict resolution between the radical mountain bikers and other users is going to be critical.

The area and adjacent BLM lands have some excellent mountain biking opportunities. There are some local riders that make extensive use of the forest but we do not have many people visiting from outside the area to ride. Use is growing with more advertising by local tourism boards, the availability of some brochures, and visits by people to attend races. The forest needs to pay more attention to mountain biking because it will be a larger part of our road and trail use.

Southwestern Region:

Mountain biking is becoming more and more popular and in time conflicts between users could be a serious problem. We have very good cooperation with mountain bike outfitters and that does help considerably as far as conflicts, trail maintenance, maps and brochures, and resource impacts are concerned.

The current level of mountain bike use is not a major concern nor have any significant resource issues or conflicts in use arisen.

In the past two years we've built and opened 3 trails aimed at mountain bike use (they are multi-use paths open to hikers and equestrians also, but received mostly mountain bike use). They have been well received by the community. Lots of use. Mountain bikers have helped with trail work. Trails have been written up in local guide books and articles.

In conjunction with volunteers from a local group, we are preparing to complete a mountain bike trail system on the district of about 320 miles (most of which are old roads) and Recreation Opportunity Guide for this bike system. This should be completed this fiscal year. All non-wilderness trails are open to mountain bikes at present. We are trying to push the "trail sharing" concepts to all of our users. We hope it can remain this way in the future and that we will not have to designate and separate user groups. This would be an impossible task to enforce anyway.

Intermountain Region:

Maintaining compliance with Grizzly bear special use orders, awarding commercial use permits, evaluating competing interests, wilderness violations by general users.

Our National Forest does have some roads closed on a seasonal basis. These road closures are generally for wildlife protection purposes. Closure times are usually in the fall or spring—not during high recreational use periods. Currently there are no restrictions on mountain bikers going beyond such closures. The steep and rugged terrain of the forest limits where mountain bikers would want to go. Of the 764 miles of trail that are not closed to mountain bike use, approximately 50 percent is not suitable for bike use because it is so steep. The wilderness encompasses a large portion of the forest. The wilderness numbers above reflect only the acres and miles administered by our Forest. The acres for the entire wilderness is about 2.4 million and total trail miles are about 2400.

Use is increasing and management needs to be geared towards anticipating, planning for, and controlling use in the future years. We have seen what has happened in the another area and although we do not have the same terrain, we need to plan for the future of bicycle use on a county-wide (not just forest) or BLM basis.

ATV use on same trails as mountain bikers; outdoor ethics; narrow scenic byways used by auto and mountain bikers; lack of sanitation or restroom facilities at key areas of mountain bike use.

Our Forest Association sells a 24 page booklet for $2.00 describing trails that are good for mountain biking. We believe that mountain bike activities in

the "bud" stage. Our primary area of interest is centered on a 200 mile plus several side loops OHV trail. However, during the past couple of years two partnership sponsored mountain bike activities have had from 150 to 300 registered participants. In partnership with the State we are developing non-motorized trails for foot and mountain bike use around the forest, and expect to have $30,000 of State funds for this next field season.

Several of the districts on the Forest are actively developing mountain bike trails and user opportunities. By being pro-active with the development of mountain bike riding trails and routes rather than re-active we have so far avoided resource damage and user conflict issues seen elsewhere. At the same time excellent recreational opportunities have been provided for the largest and fastest growing group of outdoor recreationists in the U.S.—mountain bike riders. This pro-active approach has also had the added benefit of creating a positive attitude and working relationship between the Forest Service and cyclists rather than one of conflict and confrontation.

This is without a doubt one of the fastest growing uses that the Forests are seeing and must be addressed. Inconsistent or lack of direction in the management and maintenance is the issue. An industry-wide effort to educate the user to proper trail etiquette might be applied through the retail sales outlets.

Pacific Southwest Region:

The demand for single track trails is increasing. Mountain bikers really do not understand the conflict with horseback riders. The forest is attracting all levels of riders. The families that visit seem satisfied with the mountain bike opportunities. The more advanced/racing level riders would like more variety. The ski area provides some advanced rides at the bike park, however the public would like this available on the forest without a fee.

Mountain bike riding/touring is becoming increasingly popular on National Forest Lands. This is a type of recreational use that we should work to accommodate in a way that will satisfy users, yet protect the resources and other forest users. This is an opportunity to develop loop routes and tent only camping. The forest has recently developed information sheets on various rides on each district, which we hope to be available to the public for free by early spring. Mountain bikes can be compatible with other users. Presently our policy is all trails and roads are open to mountain bikes, except the Pacific Crest Trail and the trails in our wilderness. However, some of our trails are steep canyon trails and are not built for mountain bike use. As a Forest we are working on addressing this issue.

In my judgment, mountain biking is perhaps the single most compatible recreation activity there is with general, roaded backcountry type forest settings. The opportunities are almost limitless; the impacts and conflicts are generally negligible or, at least, manageable. As an activity, I believe it will over time become more common than either hiking or equestrian uses. In our lightly-populated portion of the state there is very strong local sentiment by cyclists in favor of allowing bikes on portions of the Pacific Crest Trail (PCT) there are sections which are eminently bikeable, and receive almost no hiker or horse use at all. Bikers do fairly regularly go onto portions of the PCT. Generally, the prohibition against bike use in Wilderness is accepted, though some bikers are willing to accept the risks of a ticket to sample the superb riding opportunities. Bikers' needs generally are not great or expensive—an adequate parking or staging area, some decent maps, some basic advice or other information. The activity has almost negative impacts on this Forest on either resources or other users. I believe the Forest Service should actively and aggressively pursue enabling mountain bike use of almost all suitable

National Forest lands and areas. In addition, there are many partnership opportunities with private sector entities (shops, lodging, food services, etc.) ripe for redeeming which could greatly enhance the bikers' experience while on National Forest lands.

Our primary approach to bicycle use is to keep as many roads and trails open to bicycle use as is safe and maintainable. Currently our trails open to bicycle uses unless they are signed closed or are in wilderness.

We have a resort and a boy scout camp located near a wilderness area. Mountain biking from the resort is unsupervised, with a high potential for wilderness incursions. Nearby, the boy scout camp has an adventure program with mountain bike trips using off-highway vehicle trails. This use is closely supervised.

We believe our Ranger District has perhaps the most intense mountain bike use of any Forest in our region. The resource damage and public safety issues are of high concern. In addition, the use patterns indicate that mountain bike use is increasing at a dramatic rate. It is evident that the District needs to commit funding and personnel to manage this ever increasing recreation activity. We appreciate your research help on the mountain bike plan and hope that we can continue this cooperative relationship. We currently have a successful partnership with a local cycling association.

Personally, I feel this is a recreation opportunity that we need to develop further to the extent our topography allows. The sport is growing and we need to be educating users regarding their impacts on the land and their responsibilities as riders. I'd like to see each forest develop a publication regarding riding opportunities, Tread Lightly stuff, rider responsibilities, etc. Forests could be working with adjacent agencies to develop/market opportunities so that they don't just end at the forest boundary. We need to be working with tourism agencies and user group organizations to get word out about these opportunities and to educate riders.

Need to address increasing demand in our planning efforts, in a way that is sensitive to fragile areas. Need to get input to publications. Need to work with local organizations to accomplish signing, mapping, and ethics. Additional funding would be needed to address planning and staffing requirements.

We developed a mountain bike management program in June, 1993, and have been implementing this program this past field season. We're learning some lessons, e.g., signing is critical to public awareness, enforcement is also important, support of the mountain bike community is equally critical. And, an effective program requires a commitment to appropriate trail maintenance and willingness to redesign trails and perhaps to close segments where resources cannot otherwise be reasonably protected. Finally, a distinction is needed between resource impacts caused by irresponsible bicyclists and impacts caused by improper trail design/maintenance or simply location.

Pacific Northwest Region:

As we allow different uses of trails we need to assess the impacts and be ready to mitigate resource damage. This has not happened with bike use. There is significant use and damage occurring with little extra maintenance dollars to deal with.

Local user groups have expressed an interest in trails that can be accessed directly from the urban area.

The use of mountain bikes is growing tremendously. We do not have the time or the funds to pay adequate attention to the use.

I believe that by being pro-active in our management we can allow for this type of recreational use to take place on National Forest lands. I hope that the Forest Service does not over-react as it appears a number of other agencies have and closed or overly restricted this use. I thank you for taking on this task and if I can answer any questions concerning our responses, please feel free to call me.

The forest did recognize mountain bike in the forest plan in 1988 and did not feel that special trails were the answer. The forest does have an excellent motorcycle trail system and these are the most popular trails. The main difference in these trails are the alignment, grade, water crossing, viewing opportunities, and loops have been designed in these trails. The availability of dollars from the state funds have made this possible.

Mountain bike use is on the increase on the forest. We feel that adequate construction and maintenance standards already exist that allow us to manage trails open to mountain bikes. There is a tremendous difference in the level of experience that users are seeking. Some want to ride on very primitive trails with a high level of risk and some folks prefer the very easy trails that are hard surfaced where there is little or no risk. Some folks want to ride and prefer roads thru the forest. Some of our trail managers would like to dictate to our users where and when they should ride. Managers would like to make the decision for the users—what is safe and what is not. As many trails as possible should be open to users, and let them make the decision of whether to use it or not. We need to define "resource damage." So many times we hear "resource damage" as a reason to restrict use and really what the person is saying is "I don't want you here!"

Most of the mountain bike use in this area occurs within a few miles of the cities and towns on other than National Forest Land. On our Forest, the current supply of existing and potential mountain bike opportunities exceed the demand.

Our Forest has a concern that financially we are not able to provide trail users proper information about trail opportunity availability. Currently, all four Districts on the Forest are using "make-shift" trail maps.

Mountain bike opportunities at this time are very limited as most off-highway vehicle, hiking or equestrian trails are designed with grades excessive to most mountain bike enthusiasts. I have listed all non-wilderness trails as open to mountain bikers which is to say "you can try it if you like." However, more realistically we only have an estimated 200 miles of trail which can be "reasonably" negotiated by mountain bikes.

Southern Region:

Mountain biking is a legitimate use of forest lands with a much less severe impact than off-road vehicles. We don't have much interest in mountain biking use right now. However, I see it as showing a great increase on our forest over the next 5 years.

Mountain bike riding is definitely on the rise, but due to our landscape, we're not the most desirable destination for riding. The one unpermitted bike ride chose paved roads only, but on these roads locals travel at high speeds. Their safety was a primary concern when we learned of the event.

The issue of horseback riders sharing trails with mountain bikers recently surfaced when the National Recreation Area sent out a scoping letter to get input about an application for a commercial mountain bike outfitter and guide service. To their surprise, the horseback community organized and sent a strong message to the Forest Service that they did not want to share trails with mountain bikers. One of their primary concerns was that they

would eventually lose trail riding opportunities to mountain bikes. Their other concern centers around safety and the fact that many horses spook at the sight of mountain bikes. They are currently in the middle of a public involvement process to reach a mutual understanding between the two groups as to which trails, if any, will be set aside for single-use. They are also developing a public education program that both sides feel is critical to successfully sharing trails.

Most mountain bike users would like to see more trails developed for use.

Mountain biking has not presented a serious problem so far on our Forest. However, use is growing and we want to make sure we are managing it. We will be working more closely with local bike store owners to promote trail etiquette and responsible trail use. We are just completing a Forest Recreation Guide with sections devoted to mountain bike etiquette. We are embarking on a mountain bike trail inventory under a volunteer agreements with local bike shops and individuals to identify suitable mountain bike trails as a first step toward putting a forest mountain bike trail guide together. It would be beneficial to start thinking of a national effort like Tread Lightly to promote responsible bike use. Maybe—"Soft Cycling." Also, a network would be good. Like to see some good examples of forest initiated trail guides and success stories on dealing with user conflicts Maybe all of the above exist and we are not aware.

This district has been identified as one of the top 10 areas to ride 2 years in a row according to Mountain Bike Magazine. There are 2 independently published guidebooks available specific to this district. As a result use and accompanying impacts have risen dramatically. Also riding in rainy weather has proven to be a major contributor to trail damage. General: The wildlife community is beginning to express concerns about bike use on closed roads maintained as linear strip wildlife openings. This concern can be partly resolved by better coordination when selecting roads to be used as strip openings or riding opportunities. General: Promotion of an area by national publications or independent guidebooks does more to increase use in an area than any other factor. Often it generates more use than the trail system and support facilities (parking areas, restrooms, etc.) can handle. We may be moving toward a limited permit system for some trail systems. Districts closest to the largest city in the western part of our state get the most demand for and use by mountain bikes. Bikes and horses are the fastest growing trail uses on the Forest and most of the existing trails are not suitable for either use and we are limited in our ability to create new trails. We largely depend on closed roads to provide horse and bike opportunities, but now we are being challenged by the State Wildlife Commission who mows many of the closed roads for linear strip wildlife openings. There's more and more competition for a limited land base.

I see resentment from the wildlife community to bikers. They are unnecessary disturbance. I see turkey hunters riding bikes or saying they will ride in. There is a local resort next to the forest wanting to sponsor "world class" races. I see the sport and demand for it continuing to grow. There is internal confusion over use of closed roads, especially those seeded with wildlife monies. Our trail system (was originally horse trails, now separate bike and horse trails) has been highlighted several times in national mountain bike publications as one of the best in the country. Some of the earlier articles were done without our knowledge when the trail system was for horses only. That generated a lot of bike use and a major controversy. We've resolved it with a lot of work with the two user groups and expansion of trail system. Most of our bike use problems on the forest stem from bike groups, publications etc. promoting use of the forest without checking with

us for our trail policy. Trail policy is "hiker only" unless designated for other uses. We are in the process of reevaluating existing trail systems for bike use, but it's being done on a district-wide basis and some districts are farther along than others. Fortunately our local bike clubs are cooperative and helpful (rather than pounding the table and saying they have a right to use hiking trails!).

Forest Plan went into effect in 1986. At that time there was little, if any, mountain bike use on the forest. The Forest Plan will be revised this year and direction for mountain bikes will be added. We are a small National Forest in a rural area. However it's in close proximity to several large urban areas. Mountain bike use is expected to increase when bikers "discover" the forest. We do not promote bike use now because we are not prepared for any significant increase in use.

Ours is a small coastal plain forest. Demand for trails in general is light (hot, buggy summers). Most recreation use and demand is water based. Forest Plan went into effect in 1986. At that time there was little, if any, mountain bike use on the forest. The Forest Plan will be revised this year and direction for mountain bikes will be added.

Mountain bike riders show great interest in this area, but no organized groups have shown enough interest to adopt the construction of a much needed trail. We need to develop a plan for all of the National Forests here and determine how many miles of mountain bike trail are needed and where these types of trails need to be located, (what districts). This needs to be done for all trails types on the forest as well as all recreation uses/opportunities. We need a "priority list" developed that we can go by for the entire forest in order to prioritize funding. Mountain bike trails need to be included in this list.

Our National Forest has had no request for the use of mountain bikes in the past or present.

We are planning to build a mountain bike/hiking trail on one district and connecting to another districts trail. There is a great demand for this type of activity on our forest. A lot of the use of mountain bikes on the forest is from turkey hunters riding to their hunting areas on roads closed to motorized vehicles. We also get some use outside of turkey season on roads closed to motorized vehicles as well as some bicycle riders that go cross-country in the forest.

Eastern Region:

We encourage mountain bike use on our Forest trails. This is a legitimate use and well within environmental sideboards when properly designed and constructed trails are available.

We have an issue with mountain bike riding on the National Scenic Hiking Trail. Additional places to ride that are challenging and designed for mountain bikes is an issue/concern with our using public.

Our National Forest allows use of mountain bikes and other bicycles on all Forest Roads (open and closed); oil and gas lease roads; pipelines; all hiking trails; snowmobile trails; and all-terrain vehicle/bike trails; in National Recreation Areas; and in all Management Areas in the Forest except Wilderness.

We are currently working on a proposed Forest Plan amendment which will address off-highway vehicles, including mountain bikes. The Forest Plan would be amended to include new standards and guidelines which will provide further guidance for the designation, construction, maintenance and operation of off-highway vehicle trails. Existing Forest Plan direction is very vague.

Our Amended Plan restricts mountain bikes to roads and designated all-terrain vehicle/off-highway vehicle (ATV/OHV) travelways. The Forest has received much opposition to this decision: 1) Mountain bike riders do not want to be grouped with motorized recreation; 2) Even if mountain bike riders approved of sharing the trails with ATV/OHV use, the Forest does not yet have any designated ATV/OHV travelways—and it appears that ATV/OHV designation is at least 1-2 years down the road. The Forest has not signed the closure order that would restrict mountain bikes to roads and designated ATV/OHV travelways. Therefore, mountain bikes are not yet illegal on most forest hiker/equestrian trails (outside of Wilderness and other specially designated areas). The Forest recognizes that further research and study is needed to resolve this issue. Mountain bike riding is a growing recreation activity among college students. A major university (approximately 23,000 students) is located within 10 miles of the Forest. The forest attracts a lot of student use and the demand for mountain bike trail opportunities is expected to increase.

We need more documentation and research on the effects of mountain bikes on soils, wildlife populations, etc.

Demand is growing tremendously and there is a need to accommodate this use (according to our public responses). Funding for reconstruction or new trail construction as well as standards for tread material and tread construction which accommodate mountain bicycles are very much needed. One guide permit has been recently issued to a mountain bike guide.

We are currently working with local Chambers of Commerce and other agencies to increase mountain bike use on our National Forest. We have an extensive primitive road system and a trail system that is underused. Mountain bikes seem to be a logical addition to the list of recreation opportunities the forest offers.

Alaska Region:

Overall, there is good potential for mountain biking on our existing forest road system. Many of these roads were initially constructed to access commercial timber, and have since been "put to bed" or maintained for recreational use via the small timber sale program. Currently, however, to access active timber sales and would be very dangerous to use for mountain biking. Care needs to be taken in how we portray, market and manage our road system for mountain biking. Many of our trails are steep and run boardwalk which are not ideal for bike use. Also, most trails are not wide enough for bikers and hikers together. No trails or roads are officially closed to mountain biking, but there is not any current use on trails that we are aware of.

Scoping meetings indicate that any fast moving things should not be allowed on the trail. Apparently some users feel that bikers, roller-bladers and other fast moving trail users would not be good, would spoil their enjoyment of the trail. Bikers need to learn how to pass hikers without scaring them and causing them trouble.

Appendix D—Number of Mountain Bike Riders Annually at Forests

Appendix D shows the annual number of mountain bike riders reported by the responding forests. This appendix may be used to discern which other managers have similar use levels; for example, forests reporting 4,500 riders annually could contact other forests with similar levels for management techniques.

National Forest	Region	Number of riders
Inyo	5	376,000
Wasatch-Cache	4	125,000
Allegheny	9	122,000
Sawtooth	4	87,000
Coconino	3	72,000
Grand Mesa	2	61,500
Coronado	3	55,000
Routt	2	54,000
Pisgah	8	53,200
Gallatin	1	42,000
San Bernardino	5	42,000
Monongahela	9	40,000
Okanogan	6	31,000
Carson	3	26,000
Stanislaus	5	24,600
Umpqua	6	21,350
Cibola	3	19,850
Jefferson	8	19,000
Idaho Panhandle	1	18,000
Lake Tahoe Basin Mgmt Unit	5	18,000
George Washington	8	15,000
Shasta-Trinity	5	15,000
Apache/Sitgreaves	3	13,200
Nantahala	8	11,500
Mark Twain	9	11,400
Green Mountain	9	11,350
Toiyabe	4	11,300
Apalachicola	8	11,000

continued

National Forest	*Region*	*Number of riders*
Wenatchee	6	10,750
Sequoia	5	10,000
Shawnee	9	10,000
Dixie	4	9,700
Tongass—Chatham	10	8,700
Mt Baker-Snoqualmie	6	8,000
Black Hills	2	7,500
Francis Marion & Sumter	8	7,500
Tongass—Ketchikan	10	7,500
Santa Fe	3	7,300
Cleveland	5	6,000
Manti-La Sal	4	6,000
Ashley	4	5,900
De Soto	8	5,400
Humboldt	4	5,000
Klamath	5	5,000
Mt Hood	6	5,000
Ottawa	9	5,000
Bitterroot	1	4,500
Challis	4	4,500
Six Rivers	5	3,100
Plumas	5	3,000
Siskiyou	6	3,000
Unita	4	3,000
Tahoe	5	2,667
Beaverhead	1	2,500
Kisatchie	8	2,500
Rio Grande	2	2,500
Targhee	4	2,500
Chugach	10	2,067
Winema	6	2,000
Hoosier	9	1,740
Homochitto	8	1,650
Fishlake	4	1,500
Huron-Manistee	9	1,500
Clearwater	1	1,000
Wayne	9	1,000

continued

National Forest	Region	Number of riders
Bridger-Teton	4	850
Fremont	6	700
Ouachita	8	652
Malheur	6	500
Nicolet	9	500
Salmon	4	500
Ochoco	6	408
Nez Perce	1	400
Umatilla	6	365
Delta	8	133
Croatan	8	100
Olympic	6	100
Tongass—Stikine	10	85
Holly Springs	8	75
Osceola	8	60
Uwharrie	8	55
Bienville	8	50

Appendix E—Average Number of Mountain Bike Riders Annually Per Mile of Roads and Paths

National Forest	Combined number of miles	Number of riders	Average number riders per mile
Region 1			
Beaverhead	4,428	2,500	0.56
Bitterroot	4,045	4,500	1.11
Clearwater	5,474	1,000	0.18
Gallatin	2,847	42,000	14.75
Helena	([1])	50,000	([1])
Idaho Panhandle	9,164	18,000	1.96
Kootenai	([1])	250	([1])
Lolo	([1])	150,000	([1])
Nez Perce	680	400	0.59

continued

National Forest	Combined number of miles	Number of riders	Average number riders per mile
Region 2			
Black Hills	5,392	7,500	1.39
Grand Mesa	4,822	61,500	12.75
Rio Grande	3,098	2,500	0.81
Routt	2,457	54,000	21.98
Region 3			
Apache/Sitgreaves	8,776	13,200	1.50
Carson	5,881	26,000	4.42
Cibola	1,572	19,850	12.63
Coconino	5,298	72,000	13.59
Coronado	2,600	55,000	21.15
Gila	2,511	([1])	([1])
Santa Fe	610	7,300	11.96
Region 4			
Ashley	2,161	5,900	2.73
Bridger-Teton	([1])	850	([1])
Challis	2,600	4,500	1.73
Dixie	2,422	9,700	4.00
Fishlake	2,526	1,500	0.59
Humboldt	3,440	5,000	1.45
Manti-La Sal	11,282	6,000	0.53
Salmon	2,382	500	0.21
Sawtooth	3,710	87,000	23.45
Targhee	1,970	2,500	1.27
Toiyabe	5,094	11,300	2.21
Unita	1,708	3,000	1.75
Wasatch-Cache	1,690	125,000	73.96
Region 5			
Cleveland	([1])	6,000	([1])
Eldorado	2,654	([1])	([1])
Inyo	3,835	376,000	98.04
Klamath	3,950	5,000	1.26
Lake Tahoe Basin Mgmt Unit	320	18,000	71.20
Modoc	3,217	([1])	([1])

continued

National Forest	Combined number of miles	Number of riders	Average number riders per mile
Plumas	4,498	3,000	0.67
San Bernardino	(1)	42,000	(1)
Sequoia	950	10,000	10.53
Shasta-Trinity	7,760	15,000	1.93
Six Rivers	2,619	3,100	1.18
Stanislaus	2,310	24,600	10.65
Tahoe	1,350	2,667	1.97
Region 6			
Fremont	7,797	700	0.09
Gifford Pinchot	4,952	(1)	(1)
Malheur	(1)	500	(1)
Mt Baker-Snoqualmie	2,130	8,000	3.76
Mt Hood	508	5,000	9.84
Ochoco	555	408	0.73
Okanogan	3,224	31,000	9.62
Olympic	437	100	0.23
Siskiyou	3,194	3,000	0.94
Umatilla	3,216	365	0.11
Umpqua	5,009	21,350	4.26
Wenatchee	1,120	10,750	9.60
Winema	5,085	2,000	0.39
Region 8			
Apalachicola	1,687	11,000	6.52
Bienville	818	50	0.06
Delta	(1)	133	(1)
De Soto	2,043	5,400	2.63
Croatan	193	100	0.52
Francis Marion & Sumter	1,040	7,500	7.21
George Washington	2,570	15,000	5.84
Holly Springs	2,955	75	0.03
Homochitto	975	1,650	1.69
Jefferson	925	19,000	10.54
Kisatchie	2,190	2,500	1.14
Nantahala	(1)	11,500	(1)
Osceola	877	60	0.07

continued

National Forest	Combined number of miles	Number of riders	Average number riders per mile
Ouachita	([1])	652	([1])
Pisgah	801	53,200	66.42
Tombigbee	289	([1])	([1])
Uwharrie	30	55	1.83
Region 9			
Allegheny	1,293	122,000	94.35
Green Mountain	177	11,350	64.12
Hoosier	174	1,740	10.00
Huron-Manistee	([1])	1,500	([1])
Mark Twain	448	11,400	25.45
Monongahela	868	40,000	46.08
Nicolet	5,215	500	0.09
Ottawa	2,998	5,000	1.67
Shawnee	1,200	10,000	8.33
Wayne	([1])	1,000	([1])
Region 10			
Chugach	352	2,067	5.87
Tongass—Chatham	570	8,700	15.26
Tongass—Ketchikan	1,040	7,500	7.21
Tongass—Stikine	603	85	0.14

[1] Not available

To obtain copies of brochures and unpublished reports or papers cited in the reference list, contact the appropriate source from the following addresses.

Unpublished reports:

Dale Blahna, PhD, is an assistant professor at Utah State University, Department of Forest Resources, Logan, UT 84322-5215.

Steven Hollenhorst, PhD, is an assistant professor at West Virginia University, Division of Forestry, Morgantown, WV 26506-6125.

Andy Kulla is a recreation specialist on the Lolo National Forest, Building 24, Fort Missoula, Missoula, MT 59801.

David Olson is a post-doctoral fellow at West Virginia University, Division of Forestry, Morgantown, WV 26506-6125.

Michael Schuett, PhD, is an assistant professor at Southwest Texas State University, Department of Health, Physical Education, and Recreation, San Marcos, TX 78666-4616.

James Tilmant is with the National Park Service at Glacier National Park, P.O. Box 128, West Glacier, MT 59936.

Brochures:

Tread Lightly! Inc., 298 24th Street, Suite 325, Ogden, UT 84401, (801) 627-0077.

The Forest Service, U.S. Department of Agriculture, is responsible for Federal Leadership in forestry. It carries out this role through four main activities:

- Protection and management of resources on 191 million acres of National Forest System lands
- Cooperation with State and local governments, forest industries, and private landowners to help protect and manage non-Federal forest and associated range and watershed lands
- Participation with other agencies in human resource and community assistance programs to improve living conditions in rural areas
- Research on all aspects of forestry, rangeland management, and forest resources utilization.

The Pacific Southwest Research Station

- Represents the research branch of the Forest Service in California, Hawaii, American Samoa, and the western Pacific.

The U.S. Department of Agriculture prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs, and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communications of program information (braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-5881 (voice) or (202) 720-7808 (TDD). To file a complaint, write the Secretary of Agriculture, U.S. Department of Agriculture, Washington, DC 20250 or call (202) 720-7327 (voice) or (202) 720-1127. USDA is an equal employment opportunity employer.