OFF-ROAD MOUNTAIN BIKING:

A profile of participants and their recreation setting and experience preferences

ABSTRACT

Mountain biking is a new and growing activity in off-road recreation areas. For the managers of these areas, it poses a new array of physical and social impact issues. While little research has been done on mountain biking, that which has been completed has addressed these impact issues. However, no substatial research has been undertaken to identify what actually are the preferred physical setting and recreation experience requirements of mountain bike riders. This report presents the results from a postal survey of 504 off-road mountain bike riders. The report describes their characteristics and activity levels, their preferences for settings and experiences, and some of their management-related attitudes. Riders displayed a diversity of setting and experience preferences, and many of these changed in importance with more riding experience. These changes generally emphasised an increased desire for challenge in riding experiences. Natural settings, challenging riding, variety in settings and experiences, and opportunities for excitment and speed were important components for most riders. Riders acknowledged some impacts were occurring, but considered they were exaggerated and generally misunderstood. They considered voluntary self-regulation in setting choices and riding behaviour was most appropriate for dealing with them. The report identifies some key findings from this research, and makes some recommendations for future management and research.

KEYWORDS: mountain-biking, environmental setting preferences, recreation experience preferences, effect of experience-levels, attitudes to management, conflict perceptions.

Summary Table: Mountain Bike Rider Preferences for Recreation Settings and Experiences

Setting/Experience Attributes	Novice/Beginner/Casual Riders	More Experienced Off-Road Riders	Expert Off-Road Riders
Preferred features of mountain bike riding. (as rated by riders)	*General preference for appreciating **views/scenery/nature**; **exploring** new areas; and **riding/socialising** with friends.*		
	The attribute of **exercise/fitness** is particularly important for these riders.	Attributes of **speed/excitement/risk**; **physical challenge**; **skill/technical challenge**; and **developing and improving skills** become more important for these riders.	**Increased** preference amongst expert riders for **speed/excitement/risk**; **skill/technical challenge**, and **racing/training** (latter reflects race-entry sample selection).
Statements of most preferred riding features. (from open-ended question)	*General preference for **undulating routes**; **forest settings**; **smooth/fast/open tracks**; good **scenery/viewpoints**; and rides of **2-3 hours**.*		
	Prefer **gradual/easy uphills**; tracks being **smooth/easy/open**; tracks being **not difficult/few obstructions**; and rides **1-2 hours** duration.	Preference for **technical difficulty/challenge**; downhills being **fast/smooth/open** and **fast/technical/tight**; harder uphills; and **tight/narrow/winding single-track**.	**Increased** preference for **technical difficulty/challenge**; downhills being **fast/technical/tight**; and **tight/narrow/winding single-track**.
Landscape Preferences	*Greatest preference for **native forest/bush** settings (least for farmland). Beginners had least preference for forestry (pine) areas.*		
Track-Type Preferences	Greater preference for **sealed roads**, and more **tolerant of gravel roads**. Much lower preferences for single-track.	Emphasis shifts to **less-developed** routes, and **single-track** in particular.	Distinguished by much **stronger** preference for **single-track**.
Track Condition and Difficulty Preferences	Greater preference for tracks which are **smooth/benched/open/clear**. Much **lower** preference for obstructions/difficulties on tracks, or for pushing/carrying bikes.	Preference for **rougher tracks/more obstacles**; and **rough/uneven/tight/narrow** tracks. More tolerance for pushing/carrying bikes.	Similar preferences for **rougher tracks**, but **less** interest in wet conditions and mud. Even **more tolerance** for pushing/carrying bikes.
Downhill Attribute Preferences	Strong preference for **slow/gentle/easy** downhills. **Least** preference for speed/excitement/risk.	Preference for **fast/rough/technical** downhills. **Increased** preference for **speed/excitement/risk**.	**Increased** preference for downhills which are **fast/rough/tight** and **slow/steep/more technical**, and for **speed/excitement/risk**.
Uphill Attribute Preferences	**Strong** preference for **gradual/easy/relaxed** uphills.	**Increased** preference for uphills with **short/hard/steep** sections. Little specific preference for easy uphills.	**Increased** preference for more difficult uphills with **short/hard/steep** sections, and climbs which are **long/hard/steep.**
Social Encounter Attribute Preferences	*Riders strongly preferred to **avoid motorised vehicles**, and walkers (to a lesser extent). Most are tolerant of meeting other riders.*		

EXECUTIVE SUMMARY

This provides a brief view of the main findings of this study. Additional summary sections precede each of the Results sections (3-5). Discussion (Section 6) and Recommendations (Section 7) sections review the main findings. Reference to these summaries and the concluding sections is recommended for those requiring only summary information. Closer reference to the main Results text and the appendices may be required for those requiring more detailed information.

(i) Mountain Bike Rider Characteristics

Riders are a distinct recreationist group characterised by younger male participants with professional-type backgrounds, an interest in `active' types of recreation, and a high degree of club involvement. Activity levels and experience levels amongst these riders are high, although experience (in years) is limited since mountain biking is only a recent development.

(ii) Rider Setting and Experience Preferences

Rider responses indicated preference for a variety of riding features, which are summarised in the Summary Table (opposite). Riders demonstrated their diverse needs through indicating a variety of activity preferences based upon challenging riding, natural forested settings, single-track, speed and excitement experiences, scenery, and general variety in riding conditions. The emphasis placed on these, and other preferred features varied with rider experience.

(iii) Rider Management Opinions

Riders accepted that some limits to access were necessary, but considered that social and physical impacts of mountain bikes were exaggerated. They considered self-regulation to be the most appropriate form of access and behaviour management. These attitudes generally grew stronger with greater rider experience.

(v) Management and Research Recommendations

This study generated a number of recommendations for management and research. These are briefly summarised below, and are discussed in more detail in Sections 6 and 7 of the report.

- Management Recommendations

- `core' track features which include opportunities for exploring new areas, appreciating scenery and nature, experiencing speed and excitement, native forest, undulating route variety, some socialising with others, and around 2-3 hours duration should be common elements to most tracks considered for mountain bike access.

- Riding preferences change towards more challenge and single-track riding with experience. Managers need to apply Recreation Opportunity Spectrum concepts to mountain biking to accomodate these changes.

- Management attention should focus on high-use short tracks near population centres or roads, as use by riderts and others is likely to peak in such areas..

- Prohibition of riding from more remote and difficult tracks may be unecessary due to likely low use levels. Occasional use could be considered acceptable.

- Interest in multi-day off-road routes is likely to increase. A few key backcountry tracks will be most suitable and highly preferred by riders. Managers of these tracks should consider their place in the national spectrum of recreation opportunities when deciding on access policy.

- Track maintenance features may be located in a manner similar to road `judder-bars' to manage rider behaviour where hazard potential exists, or where `managed difficulty' is being used to keep rider numbers low.

- Occasions of excessive rider speed are likely to be an ongoing problem, and managers should encourage rider self-regulation, along with taking steps to minimise hazard situations (e.g. using `managed difficulty').

- Consultation with riders and other track users should be undertaken throughout the processes of deciding riding access and use issues.

- Research Recommendations

- Complementary studies of other rider samples would assist in the definition of different rider categories, and in the range of their setting and experience preferences.

- Research on the nature and variation of walker perceptions of mountain biking should be undertaken to assist in better determining `bike-sensitive' users, and key elements in the conflicts perceived.

- Longitudunal research on any changes in conflict perceptions over time as walker and manager familiarity with mountain biking increases will be an important topic to assist in longer term planning.

- The assumption that more experienced riders will be more responsible in their riding behaviour needs to be tested. This assumption is the basis for calls for first reliance on rider self-regulation. This would represent an evaluation of self-regulation as a possible strategy.

- Research to identify trends in the patterns of rider characteristics, preferences and behaviour will be required to assist prediction of rider demand for settings and experiences as the activity `matures'.

- Identification of those key tracks most valued by riders for mutli-day riding trips will be important if opportunities are to be provided for these experiences.

- Research should be considered on the way rider behaviour may change when obstacles and track difficulties are used to moderate rider behaviour or limit use. This

would represent an evaluation of the effectiveness of `managed difficulty' as a possible strategy.

- Comparative research on the relative physical impacts of mountain bikes and walkers will be required to address the physical impact component of recreation conflicts.

- The nature of hazard perceptions and the actual risks associated with mountain biking require more investigation. This would help managers identify where real hazards occur, and cases where they are actually dealing with perceived rather than real risks.

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1. INTRODUCTION

1.1 The Department of Conservation and Mountain Biking

The Department of Conservation manages conservation lands which comprise approximately 30% of New Zealand's land area. Included in these areas are over 7500km of walking tracks. Most of these tracks are in remote areas, are managed at a low state of development, and are largely accessible only to fit and experienced back-country walkers. They are generally used for multi-day trips by visitors who are most often male, professional and from younger age-groups.

However, many tracks have been subject to greater levels of development due to their suitability and past popularity for day-use and overnight trips. The day walks in particular tend to be located closer to main roads, tourism attractions and population centres. These tracks have been constructed along well-graded routes, have relatively smooth and un-obstructed track surfaces, and pass through high-quality natural environments. These types of tracks attract a wider variety of walkers than the back-country tracks, including families, older people, children, overseas visitors, and people involved in more pasive types of recreation activity.

Such track characteristics are also attractive to the growing numbers of people riding mountain bikes off-road. Since the arrival of mountain-biking in New Zealand during the late 1980s, numbers participating in this activity have grown rapidly. According to cycle retail and enthusiast sources, up to 80% of all bicycle sales in New Zealand are now mountain bikes. The advent of such developments provides managers with an added challenge in their decision-making processes. The main questions they face relate to how any new activity interacts with existing use types and patterns, and how the new activity can be accommodated.

In general, the initial management response to recognition of mountain biking as a potential use of conservation lands has been based upon an interpretation of bicycles as `vehicles' under the legislation governing the management of these lands. This approach has been used both in New Zealand and overseas, and has generally resulted in limiting mountain bikes to legal roads only. The guidelines for mountain biking management developed by the Department of Conservation do allow some flexibility to provide access to some tracks (Department of Conservation 1994). This is possible where the activity could occur without compromising the conservation of natural and historic resources, and the experiences of other recreation visitors.

1.2 Management issues and information needs

Managers are faced with three main issues in identifying `suitable' tracks:

- what are the physical impacts of mountain-biking upon tracks, facilities and the environment?

- what are the social impacts of mountain-biking upon other users of tracks and facilities? and

- what recreation settings and experiences do mountain bikers want?

Compared to other outdoor activities, there is little research available on mountain biking. Even in America, where the issues have been prominent since the early 1980s, the limited research which has been undertaken has not usually been published. In association with this study, a review of the available research has been undertaken. This is published separately to this study (Cessford 1995), and includes some of its findings. The following three sections briefly summarise the main points identified in this review.

1.2.1 Physical Impacts of Mountain Biking

Like the physical impacts of foot traffic, those of mountain biking are concentrated on tracks. The four main impact damage problems arising from recreation use of tracks are:

- excessive erosion from enhanced water flows and disturbed soil surfaces on sloping sections of track, and at natural or managed drainage points across them.

- muddy stretches in water-saturated sections of tracks, often including major disruption of soil structure, and lateral spread of tracks.

- development of lateral spread and multiple parallel tracks, where the track surface is harder to travel on than the adjacent surfaces (e.g., too rocky, muddy, deeply incised, slippery).

- development of informal tracks, including shortcuts on corners and switchbacks, and around focal points such as huts, campsites, attractions, and viewpoints.

Although comparative research is not extensive, it appears that the `foot-action' effects of walkers may in some cases more disruptive to track surfaces (particularly on downhill sections), than are the `wheel-action' effects of mountain bikes. The distinctly unique impact effect of mountain bikes is the linear tyre-track produced, particularly in soft or wet surfaces. When this effect is accompanied by downhill skidding through over-braking, it can contribute to development of `ruts', which over time may form erosive channels for water on sloping sections of track.

However, despite the different types of effects from mountain bikes and walkers, research provides no conclusive evidence that one is any `worse' than the other in the overall degree of impact created. General impact research indicates that the location and condition of the track (particularly with regard to drainage); the number of users overall; and the individual

behaviour of these users, are more important for the development of track impacts than are differences in the type of recreation activity (e.g., walking and mountain biking).

1.2.2 Social Impacts of Mountain Biking

The social impacts of mountain biking on the recreation experiences of other users, are interpreted best through the recreation conflict concept. This occurs when the presence and/or behaviour of some users interferes with the achievement of the desired recreation experience `goals' of other users. Extensive research exists on this topic, although virtually none deals specifically with mountain bikes. The general research concludes that conflict is more complex than simply `one activity versus another'. In general however, the clearest examples of conflict are demonstrated in the inter-activity conflicts of `motorised' and `non-motorised' groups. From the limited research, article and commentary sources available, three main types of impact perceptions are clearly associated with mountain biking by other users (e.g., walkers):

- perceptions that mountain biking has too much environmental impact;
- perceptions that mountain biking represents a safety hazard to others; and
- perceptions that mountain biking is an `inappropriate' activity in settings where walking takes place.

The perceptions of environmental impact appear exaggerated on the basis of the research undertaken on such impacts (both for mountain bikes and for recreation use in general). Perceptions of safety hazard from mountain biking appear to reflect concern about the presence of mountain bikes and the possible hazards. In areas of high interaction between walkers and mountain bikes, actual accidents appeared very rare. However, the potential for hazard from the irresponsible behaviour of some riders was widely acknowledged. Generally, both these types of perceptions appeared to be associated with general feelings of disapproval toward mountain biking by walkers, and that it is an `inappropriate' activity on tracks used for walking.

The situations where walkers perceived that mountain biking was `inappropriate' appear to represent a tendency to perceptually associate mountain biking with `motorised' activity groups. In the extensive research documenting perceived conflict between `motorised' and `non-motorised' groups, the differences in activity type represented fundamental differences in user characteristics, behaviour, motivations, preferences, and environmental attitudes. However, despite strong walker perceptions to the contrary, the differences arising between walkers and mountain bike riders were much more subtle. Associating mountain bike riders with the types of characteristics commonly associated with `motorised' users was misleading.

Another finding from this conflict research was that the recreation experiences of `non-motorised' types of users were more susceptible to disturbance than were those of `motorised' types of users. This reflected their different activity motivations and expectations. It appears that this situation exists for walkers, when considering how they feel about real or potential

encounters with mountain bikes. There is also some suggestion that over time, as more actual experience of mountain bikes is achieved, some decrease of conflict perceptions does occur. However, research to date is insufficient to draw conclusions.

1.2.3 Demand for Recreation Settings and Experiences

Different activity motivations, and perceptions of the different motivations of other users, were considered to be very important in the development of recreation conflicts. However, almost no research on the characteristics, motivations and preferences of mountain bike riders has been done. When considering how to deal with mountain bike issues, and possible provision of opportunities for mountain biking, managers have had only anecdotal comments and observations to guide their judgements.

From the limited material available, it was apparent that mountain bike riders desired a variety of riding conditions. Important components often included riding in natural forested settings, experiencing scenery, and being challenged. There also appeared to be some variation in these preferences between riders with different levels of off-road riding experience.

Given the importance attributed to the role of activity preferences in the development of recreation conflict, and the need for managers to have information on mountain biking demand, this study was directed at providing a comprehensive view of rider preferences for recreation settings and experiences. Assessment of social impacts was not the focus of this study as other work is currently underway for the Department (Horn, 1994), and this type of information is more readily available from other sources. Assessment of physical impacts was not addressed as it represents a different research field, and is likely to be included in general impact assessment work being considered by the Department.

1.3 Objectives of this study

The objectives of this study were to:

- provide a profile of mountain bike rider characteristics;
- describe their preferences for recreation settings and experiences;
- determine their attitudes toward key management issues; and
- make recommendations for management options and future research needs.

The results from addressing these questions are presented in Sections 3-5, with subsequent discussion and recommendations in Sections 6 and 7. Additional analyses are presented in the Appendices. It is anticipated that those with greater interest in any of these more detailed areas will refer to the appropriate appendix.

2. RESEARCH METHODS

2.1 Data collection

The target group for the survey were those more `active' riders likely to be using tracks and facilities managed by the department. A sample of such riders was readily available from two major mountain bike races in the Wellington area. One was the `Karapoti Classic', which was first staged in 1986. It is one of New Zealand's premier mountain bike events, attracting over 700 entries in 1993 when the sample was compiled (reached 1000 in 1994). The other was the `Orongorongo Classic' which includes many of the same riders. In addition, a list of bike shop customers was used to provide a contrast between the `race' sample and more general riders.

When combined, the total initial sample comprised 786 riders. These were sent postal questionnaires to complete and return. Envelopes with postage and return-address were provided, and a letter endorsing the study from a representative of the New Zealand Mountain Bike Association was included. In addition, reminder notices were sent to encourage response. The questionnaire, the covering letter, and the reminder notice are included in Appendix 1.

2.2 Response Rate

As shown in Table 2.1, response to the survey was high, particularly amongst the more committed riders (as defined by their race class). A much lower response was received from the sample of bike shop customers (referred to as `shop' sample). This provided justification for the decision to concentrate sampling effort upon the more specific `active' riders represented by the `race-entry' sample. In the following tables, unless otherwise indicated, the sample size being referred to by the percentage figures is 504 responses.

Table 2.1: Response rate to the postal survey

RACE CLASS (based on race entry)	Original Post-out	Not received	Actual Post-out	Final Returns	Response Rate
Expert Riders	141	4	137	113	82.3%
Sport Riders	235	3	232	183	78.9%
Novice Race Riders	140	1	139	96	69.0%
Novice/Fun Riders	78	2	76	46	60.5%
TOTAL RACE SAMPLE	594	10	584	438	75.0%
Bike Shop Customers	192	12	180	66	36.6%
TOTAL OVERALL	786	22	764	504	65.9%

2.3 Analysis Notes

Most of the analysis presented in this report deals with the total response of the sample, and additional comparison of these responses based upon rider experience. The experience level groups were identified using the rider's own definition of how experienced they were at mountain biking.[1] While this was a subjective self-assessment, comparison of the `rated experience' with other experience indicators such as `years of riding', `riding trip frequency' and `number of races' indicated rider self-assessments were representative of the other experience criteria.[2] In addition, riders who indicated they were more experienced had visited a greater variety of Wellington riding sites.[3]

And while the sample was drawn from riders who had entered a race, it was not considered that they would therefore represent a group dedicated to racing. The race events providing the sample included a range of race classes (refer Table 2.1), which represented a cross-section of rider experience and orientation towards racing.[4]

[1] On this basis the responses in each group were 59 for beginners, 121 for riders with moderate experience, 222 for riders with much experience, and 102 for very experienced/expert riders (see Table 3.2).

[2] This comparative analysis is presented in Appendix 5.

[3] The number of sites used by riderts is presented in Appendix 3, along with other information about Wellinton riding sites.

[4] The sample could be split into separate `racer' and `non-racer' groups, and comparison of these enabled the type and degree of any possible bias resulting from race-orientation to be identified. Due to the extensive nature of these additional analyses, they are presented in Appendix 2 rather than in the main results.

3. RESULTS - Rider Characteristics

SUMMARY: Riders are a distinct recreationist group characterised by younger male participants with professional-type backgrounds, an interest in `active' types of recreation, and a high degree of club involvement. Activity levels and relative experience levels are high, although experience is limited as mountain biking is only a recent development.

- The age, gender and occupation characteristics of these riders were representative of `active' outdoor recreationists. Women were a small minority of riders overall, although they represented almost half those rating themselves as beginners.
- Few riders had over 5 years experience, although activity levels and self-rated experience were high.
- More experienced riders had high club involvement, more experience of overnight trips, and had spent more on their bikes and associated improvements.
- Many riders also participated in running, walking, tramping and road cycling. With experience, more riders were involved in tramping and skiing, and less involved in walking and team sports, reflecting a more `active' outdoor orientation.

The descriptive characteristics of mountain bike riders were addressed in three ways: their socio-demographic features, their experience levels, and their degree of commitment to mountain biking.

3.1 Socio-demographic characteristics of riders

The patterns of age, gender and occupation (Table 3.1) generally match those of other `active' outdoor recreationists such as trampers; being characterised by a predominance of younger age groups, and of those with higher educational and occupational status. One distinction amongst mountain bikers was the gender balance, which was weighted more heavily towards men, to levels characteristic of activities such as climbing, hunting and fishing. More general activities such as walking or tramping tend to have more even gender balances (but most often still dominated by males).[5] These characteristics can be considered to make mountain biking more representative of the other `active' types of outdoor recreation (e.g., climbing, backcountry tramping), as compared with the more `passive' types of outdoor recreation represented by walking.[6]

Table 3.1: Socio-demographic characteristics (%)

[5] Differences in responses between male and female riders are presented in Appendix 4.

[6] This distinction between `active' and `passive' orientations in activities is used later to describe some of the conflicts which may arise between mountain biking and walking in the same settings.

AGE (years)	Under 20	19	OCCUPATION	Professional/Technical	36
	20 - 29	42		Student	18
	30 - 39	27		Admin/Management	12
	40 - 49	9		Clerical/Sales/Service	10
	50 - 59	3		Labour/Transport	3
	Over 60	0		Not Working	3
				School	3
GENDER	Male	85		Agriculture/Forestry	1
	Female	15		Other (non-specific)	14

3.2 Experience characteristics of riders

3.2.1 Overall riding experience

Rider experience at off-road riding was addressed directly by the number of years they had been riding mountain bikes, the number of races they had done, and their usual number of days spent riding off-road in the year. It was also addressed indirectly by riders rating their own experience and skill levels on a scale provided (Question 4). Results of these questions for all riders are summarised in Table 3.3.
The main finding of these experience related questions was that only 10% of the sample had been riding mountain bikes for more than 5 years. This emphasises how new this activity is in the outdoor recreation environment. Although riders had not been active for many years, their activity levels were high. Almost 50% were riding off-road on over 50 days per year, representing a frequency of 1-2 times per week on average. When seasonality is considered, the activity level in the peak season (non-winter) would appear much higher.

Considering that this sample was drawn from race entrants, experience of racing is not extensive. Less than 25% had done more than 20 races. This may reflect the recent development of the activity. However, when compared to the number of days riding, these results suggest that racing is not currently a big part of mountain biking activity for most riders.

Overall, riders did consider themselves experienced, with only 12% classifying themselves as beginners.

Table 3.2: Experience characteristics of riders (%)

EXPERIENCE	Beginners	12	EXPERIENCE	1 year or less	20
(self-rated)	Moderately experienced	24	(years riding	Between 1 - 2 years	23
	Have much experience	44	a Mountain bike)	Between 2 - 3 years	19
	Very experienced/expert	20		Between 3 - 4 years	16

EXPERIENCE	None done before	12		Between 4 - 5 years	11
(races done)	Only 1 race	12		More than 5 years	10
	2 - 5	22	EXPERIENCE	Only ride on road	2
	6 - 10	14	(days off-road	Off-road under 6 days	5
	11 - 20	17	riding per year)	7 - 12 days	9
	21 - 50	17		13 - 24 days	10
	50 - 100	4		25 - 50 days	28
	Over 100 races	2		50 - 100 days	23
				Over 100 days	23

3.2.2 Variation in age and gender by experience

Changes in rider age and gender did occur across different experience levels (Table 3.3). In age, the proportion of riders aged 20-29 increased with experience. However, this may not reflect a stable pattern, as the activity is very new, and current rider numbers amongst the young may be maintained into the older age-groups with time.

High interest in mountain biking by women was indicated by their high proportion amongst the `Beginners'(42%). But their numbers declined to only 7% amongst experts. This could represent reluctance amongst women to acknowledge their experience, a high activity `drop-out' rate, or a more recent interest in riding amongst women which with time will translate into greater numbers of more experienced women riders.

Table 3.2: Descriptive characteristics by Experience levels (self-rated) (%)

PROFILE CHARACTERISTIC		Beginners (combined)	Moderately Experienced	Have Much Experience	Experienced Expert rider
AGE	Under 20	22	21	19	18
	20 - 29	24	42	43	50
	30 - 39	32	27	28	22
	40 - 49	15	7	8	8
	50 - 59	7	3	1	2
GENDER	Male	58	82	90	93
	Female	42	18	10	7

3.3 Commitment characteristics of riders

An increasing commitment of participants to mountain biking with increasing experience levels was shown by their investment in equipment, involvement in clubs, and patterns of

outdoor activities. These are listed in Tables 3.4 - 3.6. An important implication of club membership is the role clubs may play in enhancing the self-regulation of riding attitudes and behaviour.

Increased club involvement by the more experienced riders is notably high when compared with that apparent for other outdoor activities[7]. Local Wellington riding clubs dominated membership at the lower experience levels, but other clubs from elsewhere in the North Island increased their proportion as experience levels increased. However, the race events sampled are important on the national race calendar and attract many committed riders from further afield. This may explain the high membership levels with greater experience, and the presence of some members from distant clubs.

Further commitment is indicated by the increasing investments made in bikes and modifications by the more experienced riders. Amongst beginners, most modifications involved addition of minor items such as handlebar extensions (bar-ends). The more expensive bikes favoured by the more experienced riders usually came with these items. However these riders carried out other more substantial modifications (e.g., suspension forks and clip pedals).

Table 3.4: Commitment characteristics of riders

COMMITMENT CHARACTERISTICS		TOTAL %	Beginners (combined)	Moderately experienced	Have much experience	Expert/very experienced
Club Membership	Yes	33	5	22	36	55
	No	67	95	78	64	45
Bike Value ($)	Under 1000	16	46	31	9	1
	1000 - 2000	44	49	60	44	22
	2000 - 3000	24	5	4	32	38
	Over 3000	16	0	6	14	38
Done overnight trips	Yes	41	10	34	47	53
	No	59	90	66	53	47
% who have modified their bikes		22	9	11	40	56

A high proportion of riders (41%) also indicated they had done multi-day riding trips (Table 3.4), and particularly amongst the more experienced riders. This suggested riders have a high familiarity with the potential for multi-day riding, and a high interest in doing more such rides. Overall, 30% of riders did specify particular places they would like to do such rides in the future. The locations of these rides are summarised in Table 3.5, along with those places such rides had already been done.

[7] Shultis (1991) found outdoor recreation club membership of only 13% for a general public sample, 20% for a national park visitor sample, and 35% for a backcountry users sample.

Riders'initial interest in multi-day rides had been largely confined to road-rides, but they appear more interested in undertaking off-road rides in the future. The diversity of riding areas named, and the high apparent interest in more localised trips (e.g., in Wellington area), suggests that pressure on specific backcountry areas from multi-day riding trips will not be great. However, interest in having the options available to do such rides appears high.

Table 3.5: Locations of multi-day riding trips (those already done and those desired)

Locations for Multi-day riding trips (categorised) (% of the sample who specified each location)	Ride done here before (n=195)	Want to ride here (n=152)
South Island road riding	37	21
Wellington `Big Coast' event	25	1
North Island road riding	20	7
Queen Charlotte Walkway	12	5
Off-road riding (other South Island)	9	14
Off-road riding (other North Island)	9	12
Molesworth/Rainbow routes	9	5
Off-road riding (other Wellington)	9	10
Wellington coastal routes	8	8
Heaphy Track	3	7
Rimutaka Incline Track	2	0
National Parks Tracks	0	14
Other	6	17

Rider commitment to their activity was also investigated by the relative importance they attributed mountain biking in their outdoor activities. Table 3.6 summarises the top three outdoor activities indicated by riders. The % figures represent the proportion of the whole sample who indicated the activity as one of their top three.

Most riders included mountain biking in their top three outdoor activities (93%). Beginners differed mainly in that 41% did not. As experience levels increased, involvement in walking declined, while that in tramping increased. This may be indicative of a more `active' approach to walking amongst the more committed riders. Road cycling was indicated by many beginners (32%), possibly reflecting their generally greater preference for riding on sealed roads (refer Table 4.5). This road-cycling preference then decreased, but increased again amongst the expert riders (29%), perhaps reflecting the preference of many competitive mountain bike riders for road training.

These riders are active outdoor participants, and the emphasis on `physical' outdoor pursuits appears greater amongst the more experienced riders. Because mountain biking is a new activity to most, it is likely that it has generally complemented existing outdoor activity preferences, rather than being the means by which new users have been introduced to the outdoors. Over a third (37%) included tramping/walking in their top three activities, suggesting that many may be aware of the potential conflicts with other track users.

Table 3.5: Outdoor activity characteristics of riders (their top three activities)

MAIN OUTDOOR ACTIVITIES	TOTAL %	Beginners (combined)	Moderately experienced	Have much experience	Expert/very experienced
Mountain Biking	93	59	95	98	100
Running	28	37	32	26	26
Road cycling	20	32	12	17	29
Tramping	20	3	18	22	26
Walking	17	37	22	13	8
Skiing	17	9	1	18	29
Sailing/Windsurfing	6	2	4	7	8
Hunting/Fishing	6	7	3	5	10
Kayaking	6	3	3	8	5
Climbing	6	2	8	8	4
Outdoor Team Sports	15	28	23	12	8
Other Activities	39	50	31	45	36

4. RESULTS - Setting / Experience Preferences

SUMMARY: Riders demonstrated their diverse needs through indicating a variety of activity preferences based upon challenging riding, natural forested settings, single-track, speed and excitement experiences, scenery, and general variety in riding conditions. The emphasis placed on these, and other preferred features varied with rider experience.

- Setting and experience features which were consistently important for most riders included appreciating scenery/views/nature, an undulating route, forest settings (particularly native forests), socialising with others, exploring new areas, ride duration of 2-3 hours, smooth/fast/open track surfaces, some speed/excitement/risk, and some exercise/fitness workout.

- Features which were particularly more important to experienced riders were physical and technical challenge, single-track which is tight/narrow/winding, rough/technical/tight track surfaces, fast/technical/tight downhills, more challenging uphills, and racing. In addition, experiencing some speed/excitment/risk was generally more important for experienced riders than beginners.

- Features which were particularly more important to less experienced riders were gentle/gradual/easy uphills, smooth/easy/open track surfaces, ride duration of 1-2 hours, few obstructions or difficulties on tracks, relaxation/easy riding/cruising, slow/gentle/easy downhills, and riding on sealed roads. Experiencing peace/quiet/solitude was also a little more important to beginner riders.

- Most riders indicated some tolerance for carrying/pushing their bikes, although this was generally for no more than 25% of any ride.

Riders were asked about the features of mountain biking most important to them, and the setting attributes they preferred for their riding experiences. The former required riders to select their preferences from a list of feature options. The latter required riders to score the importance of listed setting attributes, and to state their favourite riding conditions in an open ended question. This chapter is divided into three corresponding sections.

4.1 Preferred Features of Mountain Bike Riding

Riders were asked to indicate their top-three features of mountain biking from the list provided. Table 4.1 (below) summarises[8] these responses for the whole sample, and also for respective-experience level groups.

While experiencing speed, exercise and scenery were the top three features for the whole sample, it is clear from Table 4.1 that preference for these features changed with increasing experience. The only features which appeared to be of generally similar importance to all riders were appreciation of views/scenery/nature, socialising with friends, and exploring new

[8] The percentage figures represent the proportion of the sample who included the feature amongst their top three. When these responses were looked at in order of preference (see Appendix 6), no particular features were dominant as first choices.

areas. The variation in the importance of the other features indicated that changes in rider preferences were occurring with their greater experience.

Features which became progressively more important with greater experience included skill challenge (technical riding), physical challenge (hard riding), and racing.
Speed/excitement/risk was also consistently important for the more experienced riders (less important for beginners). By contrast, features which became progressively less important included relaxation/easy riding/cruising, and to a lesser extent peace/quiet /solitude.

Table 4.2: Top Three Features of Mountain Biking (n = 495)

MOUNTAIN BIKING FEATURES (the top three features)	TOTAL %	Beginners (combined)	Moderately experienced	Have much experience	Expert/very experienced
Speed/excitement/risk	**43**	17	**43**	**46**	**51**
Exercise/fitness workout	**42**	**59**	**48**	**44**	23
Appreciating views/scenery/nature	**38**	**47**	37	**39**	31
Exploring new areas	33	34	**42**	33	23
Riding/socialising with friends	33	**37**	34	33	30
Racing and race training	28	0	4	21	**44**
Physical challenge (hard riding)	24	12	24	26	27
Skill challenge (technical riding)	22	4	17	21	**41**
Developing and improving skills	15	5	22	15	11
Commuting around town/transport	7	17	8	9	7
Relaxation/easy riding/cruising	7	31	7	2	3
Peace/quiet/solitude	2	19	7	2	3
Overnight trips/touring options	2	4	1	4	4
Other	2	4	2	2	2

These results show a number of features contribute to riding enjoyment. Beginners more often favoured socialising, appreciating views/scenery/nature, exercise and fitness, and relaxation/easy riding. Experienced riders more often favoured speed, technical challenge, and racing.[9]

4.2 Preferred setting attributes

[9] These general patterns of findings were repeated when riders were asked to specify their five most important of these features (see Appendix 6, Table A.6.6).

Riders scored how important they considered a number of listed setting attributes were to their riding experiences. The results here are summarised in short sections for the different attribute types. These attributes represent many of the physical and social components of mountain bike riding (e.g., landscape settings, track types, track conditions, downhill sections, uphill sections, social encounters). Variations in responses due to different levels of rider experience are tabulated fully in Appendix 7.

4.2.1 Preferences for Landscape Settings

Some of the setting attributes listed dealt with landscape settings in which rides could take place. The overall responses of riders are presented in Table 4.3.

Table 4.3: Landscape setting preferences

SETTING ATTRIBUTES - Landscape setting	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential
* Route in open farmland	2	15	64	17	2
* Route in forestry area (Pine)	1	2	40	53	5
* Route in native forest/bush	0	1	15	74	10

Rider preferences most favoured the native forest/bush settings. Most riders were prepared to ride in farmlands at some times, but active preference was for forested areas, and in particular those of native forests. This pattern of preferences varied little between riders of different experience (Table 4.4).

Table 4.4: Landscape setting preferences (by experience level)

SETTING ATTRIBUTES - Landscape setting	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential	NOTES
* Route in open farmland						Most were tolerant of this some of the time. There was little variation across experience levels.
- Beginner	7	16	54	23	0	
- Moderate experience	1	14	60	19	6	
- Much experience	1	14	68	15	1	
- Expert experience	1	20	64	16	0	
* Route in forestry area (Pine)						Most were neutral or positive towards this. Preference was least amongst beginners, but was consistently higher for more experienced riders.
- Beginner	5	3	53	33	5	
- Moderate experience	0	2	40	52	6	
- Much experience	0	1	41	54	4	
- Expert experience	0	2	33	60	5	
* Route in native forest/bush						Most riders indicated a strong preference for this, although it was not considered always essential. This was consistent across experience levels.
- Beginner	3	2	23	65	7	
- Moderate experience	0	1	14	73	12	
- Much experience	0	0	11	79	10	
- Expert experience	0	1	20	70	10	

The largely consistent responses across the experience levels, suggested common preferences for most riders. Some variation was apparent in rider preferences for forestry areas (Pine),

with beginners least interested in this setting. Higher preference was apparent for more experienced riders and expert riders.

The generally high interest in riding in all setting types suggested wide-ranging options for provision of mountain biking opportunities. Although greatest rider preference was for natural forested areas, where conservation values and other recreational uses are likely to be at highest levels, riders were also interested in other types of areas. In these farm and forestry areas, the potential management and social conflicts are likely to be less acute because of lower conservation priority or competing recreation uses. However, access to farm and forestry areas can also be difficult, because they are generally in private ownership and have management priorities which may conflict with recreation.

4.2.2 Preferences for Track Type

Riders indicated preferences for different types of tracks. Those listed in Table 4.4 represent the range of tracks possible for riding. The track types are listed in a general order of increasing development, beginning with single-track (walking type) and ending with sealed road.

Table 4.5: Track type setting preferences

SETTING ATTRIBUTES - Track type	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential
* On single-track (walking)	1	4	26	45	24
* On farm roads/tracks (4WD)	1	6	54	34	5
* On firebreaks/other (4WD)	1	4	38	48	9
* On gravel roads	2	22	58	15	3
* On sealed roads	15	47	32	4	2

Overall, riders expressed greatest preference for single-track settings for their riding. As tracks become more `developed', rider preferences declined. Results indicated that sealed and gravel roads were generally unpopular settings for riding.

When variations according to rider experience were considered (refer Table 4.6), preference for single-track riding increased strongly amongst the more experienced riders. Only the beginner riders showed any negative preference against single-track riding (26% overall). A similar preference pattern was apparent for 4WD tracks in general (farms/firebreaks/others), although it was still clearly secondary to that for single-track riding. The 4WD tracks on farms were generally less preferred than those in other areas such as firebreaks. Expert riders in particular showed greater preference for the non-farm 4WD tracks.

Table 4.6: Track type setting preferences (by experience levels)

SETTING ATTRIBUTES	I don't	I avoid if	OK some	I usually	Always	

- Track type	want this	possible	times	prefer this	essential	NOTES
* On single-track (walking)						Preference increased a lot with experience. Beginners were much less positive, tending more towards tolerance rather than preference.
- Beginner	7	19	53	17	3	
- Moderate experience	1	4	32	47	16	
- Much experience	0	1	23	48	28	
- Expert experience	0	0	9	54	37	
* On farm roads/tracks (4WD)						Most were neutral or positive towards this, and this pattern was largely consistent across experience levels.
- Beginner	7	10	54	28	0	
- Moderate experience	1	7	44	40	8	
- Much experience	0	6	59	31	4	
- Expert experience	0	2	55	37	6	
* On firebreaks/other (4WD)						Preference was least amongst beginners, and much higher amongst more experienced riders, particularly for the experts.
- Beginner	9	19	45	24	2	
- Moderate experience	0	2	34	55	9	
- Much experience	0	2	45	45	9	
- Expert experience	0	1	26	60	13	
* On gravel roads						Most were tolerant/neutral towards this. A consistent proportion were positive, while some more experienced riders were negative.
- Beginner	7	7	67	17	2	
- Moderate experience	1	27	52	16	4	
- Much experience	1	23	60	14	2	
- Expert experience	1	23	55	18	3	
* On sealed roads						Beginners were most positive towards this, while most other riders were more negative. This increased with experience.
- Beginner	5	21	41	21	12	
- Moderate experience	10	44	43	3	0	
- Much experience	19	51	28	1	1	
- Expert experience	17	58	22	3	0	

4.2.3 Preferences for Track Conditions

A large number of the setting attributes listed related to the condition of track surfaces. Overall results in Table 4.7 indicate that riders had a variety of preferences for these different conditions.

Table 4.7: Track Condition Preferences

SETTING ATTRIBUTES - Track condition	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential
* Smooth/benched/open/clear	2	7	58	28	12
* Rough/uneven/tight/narrow	2	8	36	41	12
* Root/rock/log obstructions	3	25	47	19	5
* Step/ditch/culvert obstructions	6	33	43	14	4
* Branch/foliage obstructions	5	28	54	10	3
* Mud/puddle/bog/wet conditions	7	26	48	13	6
* River/stream/creek crossings	1	14	57	21	6
* Loose gravel/sand boulders	7	46	40	6	1
* Carrying/pushing the bike	3	33	62	2	1

The condition most preferred overall was for tracks which were rough/uneven/tight/narrow. The next most preferred condition was for tracks which were smooth/benched/open/clear. This clear difference indicates that there is variety in the conditions desired by riders. This is reinforced by other results which show that while many riders want to avoid some of the obstructions possible on tracks, others are tolerant of these or prefer to encounter them. Some variation in overall responses reflects differences between riders of different experience levels (Table 4.8).

When considering track surface, riders generally appeared to tolerate both the clear/smooth and the tight/rough types of tracks. In the case of clear/smooth tracks, this represented a general tolerance by most riders, and a strong preference amongst the beginners (54%). By contrast, many of the beginner riders (50%) were negative toward tight/rough tracks, while preference increased strongly amongst the more experienced riders. Experts were least positive toward clear/smooth tracks (29%), and most positive toward the tight/rough types (78%).

Obstructions along a track were considered in the forms of roots/rocks/logs, steps/ditches/culverts, and branches/foliage. In general, beginner riders were most negative toward these. Experienced riders were more tolerant and positive towards encountering such obstructions. It would seem that with increasing experience levels, track roughness and obstructions become less of a hindrance, and more of a challenge. It would seem likely that a track managed for a higher degree of roughness and obstruction would discourage some riders, particularly those of lesser experience.

Other track conditions considered were the wetness of the track, the presence of unconsolidated surfaces (gravel/sand/boulders), and the presence of river crossings. Riders most negative toward wet track conditions were the beginners and the experts. All riders were negative toward unconsolidated surfaces, suggesting that would represent a major barrier to the desirability and enjoyment of riding, if present on large parts of potential riding routes. Most riders appeared tolerant of river-crossings, and these were attractive for many experienced riders. An interesting exception was the 24% of expert riders negative toward river crossings, which may represent concern about the effect of the water on their generally more expensive bikes.

Table 4.8: Setting attribute preferences - Track condition

SETTING ATTRIBUTES - Track condition	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential	NOTES
* Smooth/benched/open/clear						Beginners were most positive, but this decreased for more experienced riders. Most riders were tolerant of this some of the time.
- Beginner	3	3	39	47	7	
- Moderate experience	3	9	53	31	3	
- Much experience	1	7	64	24	4	
- Expert experience	0	8	64	22	7	
* Rough/uneven/tight/narrow						Beginners were most negative, but once some experience was gained riders were much more positive. This increased further with experience.
- Beginner	10	40	44	2	3	
- Moderate experience	2	9	47	30	11	
- Much experience	0	2	37	49	12	
- Expert experience	0	2	21	60	18	
* Rock/root/log obstructions						Beginners very negative, but

- Beginner	16	51	30	3	0	once some experience was
- Moderate experience	3	27	45	18	5	gained, riders became more
- Much experience	1	23	53	18	5	tolerant and positive. Experts
- Expert experience	0	11	47	33	9	were more positive.
* Step/ditch/culvert obstructions						Beginners were very negative,
- Beginner	25	53	17	2	3	but once some experience was
- Moderate experience	6	37	41	12	3	gained, riders became more
- Much experience	3	31	47	14	4	tolerant and positive. Experts
- Expert experience	2	20	52	21	6	were a little more positive.
* Branch/foliage obstructions						Most riders were tolerant or
- Beginner	16	28	52	2	2	negative towards this. This was
- Moderate experience	4	32	53	6	5	largely consistent across
- Much experience	3	26	56	3	2	experience groups.
- Expert experience	5	26	51	14	4	
* Mud/bog/wet conditions						Both beginners and experts were
- Beginner	16	24	47	9	3	most negative towards this,
- Moderate experience	5	16	52	18	9	possibly for different reasons.
- Much experience	4	27	50	13	6	Riders between these were more
- Expert experience	11	38	36	13	2	tolerant.
* River/stream/creek crossings						Most riders were tolerant
- Beginner	7	14	74	2	3	towards this. Experienced riders
- Moderate experience	1	13	53	23	10	were a little more positive.
- Much experience	0	11	59	26	4	Experts and beginners were the
- Expert experience	2	22	49	22	6	most negative.
* Loose gravel/sand boulders						Most riders were negative
- Beginner	12	58	21	2	0	towards this, particularly the
- Moderate experience	7	47	36	8	2	beginners. Other riders tended to
- Much experience	5	43	46	6	0	be less strongly negative, being
- Expert experience	9	44	40	7	0	more often tolerant.
* Carrying/pushing the bike						Beginners were most negative
- Beginner	18	41	41	0	0	towards this. Other riders were
- Moderate experience	1	32	65	2	0	more tolerant. This pattern was
- Much experience	1	30	66	2	1	consistent for experienced riders.
- Expert experience	2	33	60	3	2	

The combined effect of these track attributes on mountain biking is often represented by the amount of time spent having to push or carry the bike. When asked to rate their degree of preference for experiencing this (Table 4.8), most riders were tolerant of it, but would generally prefer not to. Beginners were most negative toward this, while other riders were considerably more tolerant of the possibility. This all suggests that for most riders, there is some acceptance of pushing/carrying as an inevitable attribute of their trips. Just how much of this they would be prepared to tolerate was addressed by a separate question, the results of which are presented in Table 4.9.

Table 4.9: Tolerance for carrying the bike on rides

CARRYING THE BIKE (% of ride that carrying tolerated)	TOTAL %	Beginner (combined)	Moderately experienced	Have much experience	Expert/very experienced
No carrying at all-	2	14	0	0	1
Upto 5% of the trip-	13	24	12	13	10
10% of the trip -	28	27	27	25	37
15% of the trip -	18	12	16	21	16
20% of the trip -	15	10	18	18	9
25% of the trip -	14	8	18	13	15

30-50% of the trip- Over 50% of the trip-	7 3	5 0	5 3	7 3	8 5

Almost all riders were prepared to carry their bike at some point on their rides. Few were unwilling to do so, and of these almost all were beginners. For more experienced riders, the tolerable proportion of carrying preference was similar, with most prepared to carry bikes for between 5 - 25% of a ride. Where this carrying takes place is likely to vary for different riders. More experienced riders will be riding where others may have to carry, but they in turn may be attempting more challenging rides themselves, and may carry just as often. Despite this skill difference, the proportions of time riders are prepared to carry appear relatively constant across experience classes (beginners being the exception).

The implication for management is that rider numbers will be minimal on those rides where experienced riders indicate that carrying is likely over 25% of the time. Maintenance of riding conditions that require this level of carrying/pushing of bikes may represent a management option for limiting mountain bikes to acceptable levels rather than banning them. This would also filter out the less experienced riders, leaving those more experienced and committed riders. These riders tend to have higher involvement in clubs and races, with both these characteristics providing convenient mechanisms for accessing the riders to improve rider education and responsibility. These also provide some rider infrastructure for promoting their own self-regulation.

4.2.4 Preferences for Downhill Sections

The downhill sections of rides are an important component of the riding experience, as they often fulfil the desire many riders have for speed and excitement (Section 4.1). They are also an important consideration for managers due to the potential hazards from rider speed, and track damage potential from hard braking. Riders preferences for attributes of downhill sections are presented in Table 4.10.

Table 4.10: Downhill Section Preferences

SETTING ATTRIBUTES - Downhill sections	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential
* Slower/gentle/easy	11	21	47	17	3
* Fast/smooth/open/clear	1	1	22	46	30
* Fast/rough/tight	2	10	28	36	23
* Slower/steep/technical	3	10	33	35	19

Riders were generally most negative toward slow/gentle/easy downhills, and most positive toward downhills which were fast/smooth/open/clear. However there were major variations in these preferences across experience levels (Table 4.11).

Table 4.11: Downhill Sections Preferences (by experience levels)

SETTING ATTRIBUTES - Downhill sections	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential	NOTES
* Slower/gentle/easy						Preference was highest for beginners. It was consistently lower for more experienced riders, who were more tolerant or negative.
- Beginner	3	9	37	42	9	
- Moderate experience	7	17	55	18	2	
- Much experience	12	27	48	10	3	
- Expert experience	18	22	43	17	1	
* Fast/smooth/open/clear						All were strongly positive towards this, although beginners were distinctly less so. This was consistent for the more experienced riders.
- Beginner	5	2	44	39	10	
- Moderate experience	0	1	12	50	31	
- Much experience	0	1	22	42	35	
- Expert experience	0	0	14	54	32	
* Fast/rough/tight						Beginners were the most negative and least positive. Experienced riders were much more positive, and this increased with experience.
- Beginner	16	47	28	7	3	
- Moderate experience	2	8	35	36	17	
- Much experience	0	4	30	41	25	
- Expert experience	0	3	17	43	37	
* Slower/steep/technical						Preference for this increased with experience, being much higher amongst the more experienced riders, and the experts in particular.
- Beginner	17	37	32	14	0	
- Moderate experience	2	12	49	29	9	
- Much experience	1	6	36	36	21	
- Expert experience	0	2	9	52	36	

Preference for slow/gentle/easy downhills was highest amongst beginners (51%). While the more experienced riders were tolerant of these easy downhills, many also felt more negative toward them, including 40% of experts. Descents which had downhill attributes representing reduced potential for speed and/or challenge were not favoured by the more experienced riders.

Almost all (75%) riders were positive toward downhills which were fast/smooth/open/clear. However, this represented only 49% of beginners compared with 86% of experts. This suggests the more experienced riders preferred the types of downhills which would allow a lot of relatively safe and controlled speed, while beginners appeared more cautious.

The differences between riders were even greater for the more challenging downhill attributes. Beginners were very negative toward downhills which were fast/rough/tight, while the other riders were more positive towards these with increased experience. This pattern was repeated for downhills which were slower/steep/technical. The main difference arising was the even more positive preference for these types of highly technical downhill attribute amongst expert riders (88%) compared with beginners (14%).

4.2.5. Preferences for Uphill Sections

Uphill sections are important as their challenge and difficulty can determine how attractive and achievable different routes may be to different riders. Uphills are also important considerations for managers, as how rideable the uphills are may determine the type of riding and rider on the track, and how many there are. Table 4.12 presents the overall responses of the riders to different types of uphill sections.

Table 4.12: Uphill Section Preferences

SETTING ATTRIBUTES - Uphill sections	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential
* Gradual/easy/relaxed climbs	3	9	46	34	8
* Short/hard/steep sections	2	7	40	40	12
* Long/hard/steep climbs	5	15	44	26	10

Riders did not favour the easy uphill sections any more than the harder sections. In most cases, riders indicated that uphills of any description were acceptable some of the time. Many riders indicated that hard uphills were preferable components of their riding settings. However, this response did vary across different experience levels (Table 4.13).

Table 4.13: Uphill Section Preferences

SETTING ATTRIBUTES - Uphill sections	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential	NOTES
* Gradual/easy/relaxed climbs						Preference was highest amongst beginners, and decreased with experience. Here, most riders became more tolerant rather than more negative.
- Beginner	2	3	39	53	3	
- Moderate experience	5	9	38	37	11	
- Much experience	1	10	50	30	8	
- Expert experience	7	9	50	28	6	
* Short/hard/steep sections						Beginners were most negative by far. Preference amongst experienced riders was much higher, and particularly amongst the experts.
- Beginner	10	30	44	12	3	
- Moderate experience	2	6	47	40	6	
- Much experience	0	4	42	40	14	
- Expert experience	0	3	24	54	19	
* Long/hard/steep climbs						Beginners were the most negative by far. Preference increased with experience, and was much higher amongst the experts.
- Beginner	23	36	37	4	0	
- Moderate experience	6	21	50	18	5	
- Much experience	1	13	49	25	12	
- Expert experience	2	3	29	48	18	

When considering easy uphill sections, most riders indicated that climbs which were gradual/easy/relaxed were acceptable at least some of the time (46%). A further 42% considered these types of uphills were an important part of their riding. Most of these were the beginners, 56% of whom were positive about these. More experienced riders were progressively less so positive, with only 34% of experts considering these types of uphills important. However, very few indicated they would avoid these easy ascents if they could. It appears that most riders accept these uphills if they are present, but that their importance for enjoyable riding experiences decreases amongst the more experienced riders.

When considering the harder uphill sections, beginners were negative towards both types, while the remaining riders were more positive with increasing experience. Climbs that were long/hard/steep were preferred most positively by the expert riders (66%). Less experienced riders tended to favour the short hard ascents relatively more. These results further emphasise the preference for challenge amongst the more experienced riders.

4.2.6 Social Encounter Preferences

Rider preferences for the types of social encounters they may experience during rides are particularly important. Social encounters largely determine the degree of recreation conflict, based upon the types of users met, their numbers, and how they behave. The attributes listed here include the types of users met, and rider preferences for experiencing speed and excitement (Table 4.14). Speed is the main source of riding hazard, and of the conflict perceived by others (hence its inclusion here).

Table 4.14: Social Encounter Preferences

SETTING ATTRIBUTES - Social encounters	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential
* Meeting motorised vehicles	45	37	16	1	0
* Meeting walkers	13	38	47	1	0
* Meeting other riders	1	7	61	26	6
* Speed/action/excitement/risk	1	2	21	30	46

Riders were most negative toward encounters with motorised vehicles. Most did not want such encounters (45%), or would avoid them if possible (37%). Only 16% accepted such encunters were OK some of the time. Perception of encounters with walkers were also negative, although to a lesser extent with 13% not wanting to encounter walkers at all, and 38% of all riders avoiding them if possible. While this left 47% who accepted walker encounters as OK some of the time, these results do indicate some perception of conflict with walkers, although the reasons were not directly addressed in this research. By contrast, most riders were tolerant (61%) or positive (32%) toward encounters with other riders.

Almost all riders preferred to experience speed/action/excitement/risk attributes in their riding, with 46% indicating it was an essential component of their riding enjoyment.

These responses did not show much variation across experience levels, as demonstrated in Table 4.15.

Table 4.15: Social Encounter Preferences (by experience level)

SETTING ATTRIBUTES - Social encounters	I don't want this	I avoid if possible	OK some times	I usually prefer this	Always essential	NOTES
* Meeting motorised vehicles						Most riders were strongly negative towards this. This pattern was consistent across experience levels.
- Beginner	37	44	16	3	0	
- Moderate experience	52	31	17	1	0	
- Much experience	46	38	16	0	0	
- Expert experience	41	40	17	3	0	
* Meeting walkers						Riders were negative or tolerant

- Beginner	14	39	46	2	0	towards this in generally equal
- Moderate experience	17	42	38	2	0	proportions. This was
- Much experience	11	39	50	0	1	consistent across experience
- Expert experience	12	32	52	3	1	levels.
* Meeting other riders						Most riders were tolerant of this
- Beginner	3	12	63	16	5	some of the time. Preference for
- Moderate experience	1	9	62	18	10	this was generally lower, but
- Much experience	1	4	64	26	4	did increase with experience.
- Expert experience	0	6	52	39	3	
* Speed/action/excitement/risk						Beginners were the least
- Beginner	7	5	47	36	14	positive by far. All other riders
- Moderate experience	1	2	20	31	47	were strongly positive, and this
- Much experience	0	1	17	32	51	was consistent across the higher
- Expert experience	0	2	15	28	55	experience levels.

Rider dislike of meeting motorised vehicles was relatively consistent across experience levels. However, there was some indication of an interesting change between beginners and moderately experienced riders. Beginners were least inclined to oppose these encounters (37%), while the moderately experienced riders were most opposed (52%). A possible explanation is that beginners may be doing less off-road riding and have less experience of such encounters. Those who progress to having moderate experience may have had some such encounters, be riding more often in the types of tracks where such encounters are likely, but not yet have confidence in coping with these situations. This may represent a similar situation faced by walkers first encountering mountian bikes, where they have not yet become familiar with the new activity.

When considering encounters with walkers, the response pattern was again relatively consistent across experience levels. This suggests that as riders gain experience, their encounters with walkers do not lead to a major change in any perceptions of conflict with them.

When meeting other riders, the positive preference was stronger for the more experienced riders , and experts in particular (42%). Beginners by contrast were the least positive (21%). The reasons for this are not addressed in these results, but it may be that the novice riders are as intimidated by the presence of bikes as non-riders often seem to be.

The importance of experiencing speed and excitment was strong amongst experienced riders, but was considerably less for beginners. However, beginners were not negative towards this, with 47% considering it was acceptable some of the time, and a further 36% preferring to experience it if possible. These results suggest that as riders become more experienced, the desire for excitement in their riding, although not initially strong, develops quickly to become a consistently important component of riding experiences. This is an important point for managers, as this rider preference does imply a potential hazard and conflict source. Not addressed in these results is the degree to which riders may exercise good judgement and responsible riding to minimise these potential problems in some settings, and what managers may also do to ensure this.

4.3 Statements of Favourite Riding Conditions

Complementing the preference scores results in Section 4.2 was an open-ended question where riders described their favourite riding conditions. Over 50 codes were designed to represent the descriptions used by riders, and up to six of these codes could be used to categorise the responses of each rider. Responses were then combined and tabulated, with the % figures representing the proportion of riders who included the condition in their overall response. Table 4.16 presents the main attributes included in rider statements of their favourite conditions. The top five conditions from each experience level group are in bold.

Table 4.16: Summary of favourite riding conditions (open-ended)[10]

TYPES OF RIDING CONDITIONS PREFERRED BY MOUNTAIN BIKERS	Total % stating this	Beginners	Moderate experience	Have much experience	Expert/very experienced
Some technical difficulty/challenge	**37**	18	**31**	**41**	**41**
Downhills which are fast/smooth/open	**31**	24	**42**	**28**	24
An undulating route/mixture of ups and downs	**30**	**26**	**24**	**35**	**28**
Downhills which are fast/technical/tight	**29**	2	18	**34**	**41**
Riding in a forest setting (specifically native)	**28**	**28**	**30**	**28**	**28**
Single-track which is tight/narrow/winding	26	2	14	**29**	**47**
Riding in a forest setting (not type-specific)	21	22	23	20	22
Ride duration between 2-3 hours	20	18	18	22	21
Track surface which is smooth/fast/open	20	13	23	21	19
Good scenery and viewpoints	19	24	22	14	25
Rides going through a variety of terrain/settings	17	4	10	23	18
Rides including a variety of track surfaces	17	7	15	22	13
Uphills which are long/steep/smooth	17	2	11	21	26
Single-track and other (farm track/4WD)	16	4	13	25	23
Few obstructions on track/not too difficult	16	**50**	**29**	7	2
Track surface which is dry/hard (not rocky)	15	11	12	18	26
Uphills which are gradual/gentle/easy	14	**48**	23	9	5
Ride duration of between 3-4 hours	14	4	15	18	9
Track surface which is rough/technical/fast	14	2	12	14	23
Uphills with short steep/technical sections	13	0	15	11	14
Track surface which is smooth/easy/open	11	**42**	17	4	0
Ride duration of between 1-2 hours	10	**26**	11	7	7
Single-track which is smooth/open/clear	9	7	18	6	4
Farm tracks/4WD on farms	7	15	8	6	2
Uphills which are long/steep/rough/technical	6	0	1	8	13
Forestry tracks/4WD in exotic forests	6	9	11	4	2
Track surface which is wet/muddy/slippery	6	7	10	6	2
Experiencing some speed/action/excitement	6	2	7	7	3
Others (all individually < 5%)	< 5	31	45	43	52

Many conditions were preferred relatively evenly by all the experience groups. These represented the conditions important to all riders. The most prominent of these included:

[10] Appendix 8 summarises the top ten conditions specified by the riders, and includes the respective results for each experience level group in their order of priority.

- An undulating route/mixture of ups and downs
- Riding in a forest setting (specifically native)
- Riding in a forest setting (not type-specific)
- Ride duration between 2-3 hours
- Track surface which is smooth/fast/open
- Good scenery and viewpoints

There were also clear changes in preferences for some conditions with increased experience. Some not popular or apparent for beginners became more important for the more experienced riders. Others were more important for the beginners, but became less so amongst the more experienced riders.

Those conditions which became more popular with greater experience included:

- Single-track which is tight/narrow/winding
- Some technical difficulty/challenge
- Downhills which are fast/technical/tight
- Uphills which are long/steep/smooth
- Single-track and other (farm track/4WD)
- Track surface which is rough/technical/fast
- Uphills which are long/steep/rough/technical

Those conditions which became less popular with increased experience included:

- Few obstructions/track not too difficult
- Uphills which are gradual/gentle/easy
- Track surface which is smooth/easy/open
- Ride duration between 1-2 hours

The main themes apparent from the descriptions given by riders overall emphasised preference for experiences which were challenging and interesting for their level of riding abilities, and preferably undertaken in a natural environment. Variety in settings and experiences was a common theme. When combined, the three conditions referring to variety in Table 4.16, represented 64% of all riders. Similarly, preference forest settings was stated by 53% of riders (comprising 28% stating native forest areas specifically, 21% stating forests in general, and 4% stating plantation forests).

5. RESULTS - Attitudes to Opinion Statements

SUMMARY: Riders accepted that some limits to access were necessary, but considered that social and physical impacts of mountain bikes were exaggerated. They considered self-regulation to be the most appropriate form of access and behaviour management. These attitudes generally grew stronger with greater rider experience.

- Riders indicated that they considered riding should be acceptable on most walking tracks, but that exceptions on impact-sensitive tracks and busy walker tracks were inevitable and would require some management controls. However they considered that impacts and hazards to walkers from mountain biking were over-estimated, and that a combination of irresponsible riders and some un-informed walkers exaggerated the conflict potential.

- Riders indicated that views, scenery and nature experiences were important to their riding enjoyment. They also indicated that experiencing speed, action and excitement were important, and this preference increased with experience.

- Riders acknowledged that some limitations to riding access would be necessary They considered self-regulation through voluntary codes of behaviour and information provision would reduce conflicts. Having specified times of access was seen as being a more effective mangement option than zoning different areas for different uses. There were some riders opposed to both.

5.1 Overall Attitude Responses

Riders were asked to indicate the degree to which they agreed or disagreed with a number of `opinion' statements on management issues. Table 5.1 summarises the overall agreement of all riders with the statements listed.

Table 5.1: Rider responses to different opinion statements

OPINION STATEMENTS (read % across)	Strongly Disagree	Tend to Disagree	Neutral	Tend to Agree	Strongly Agree
CONFLICT OPINIONS					
Mountain bikes should be allowed anywhere they can be ridden	14	32	19	23	11
Mountain bikes should not be allowed on walking tracks	16	42	20	17	4
Mountain-biking is compatible with walking on tracks	3	16	22	43	16
Some walking tracks are unsuitable for riding - many walkers	3	9	8	50	30
Danger to walkers from Mountain-bikes is over-estimated	2	12	23	44	19
A few irresponsible riders cause most problems	0	2	8	42	48
A few un-informed walkers imagine most problems	0	5	30	45	20
IMPACT OPINIONS					
Some walking tracks are unsuitable for riding - easily damaged	4	12	17	44	24
Environmental damage by Mountain-bikes is over-estimated	1	8	22	38	31
EXPERIENCE OPINIONS					
Views/scenery/nature are not essential for my riding enjoyment	46	32	10	10	3
Speed/action/excitement are not essential for my riding enjoyment	46	33	8	10	3

MANAGEMENT OPINIONS					
Information on other places to ride would reduce conflicts	0	5	9	47	39
Responsible riding and good attitude would reduce conflicts	0	1	5	44	50
Riders must have voluntary codes of behaviour (safety/impact)	0	2	8	33	57
Access to some riding areas will sometimes need to be limited	5	13	24	43	14
Access should be sometimes limited to specified days/seasons	13	16	15	42	14
Zoning different areas for riding and walking would work	6	23	28	33	9
If biking tracks were designated, riders would stick to them	6	35	24	29	6

Rider responses indicate a general desire to use walking tracks for riding. They considered this was a compatible activity, but they did acknowledge that there were some places where riding would be unsuitable due to potential physical impacts. While indicating this, they also considered that the impacts of bikes were generally over-estimated. The negative social perceptions of mountain biking often expressed by other track users were attributed to a combination of an uninformed view of the activity, and the actions of a few irresponsible riders.

A strong preference for carrying out riding in attractive natural settings was indicated. And a requirement for exciting and challenging experiences in riding was also emphasised. This suggests that limiting riding experiences to peripheral or sub-standard natural areas would be in conflict with the reality of rider demands. Also, that providing access to routes which do not provide some opportunities for speed and challenge would also be inadequate.

Preferences for the management of riding emphasised reliance on a high degree of self-discipline and good sense. While self-regulation was considered the most preferable approach, riders did generally acknowledge that some limits were required. Opinions on seasonal and spatial zoning options were split, and a considerable number of riders considered that regulations, if imposed, would not always be adhered to. It could be presumed that this non-compliance with controls would be at sites where such controls were considered un-reasonable.

5.2 Changes in Attitude Responses with Experience

These opinion responses were not always consistent for riders of different experience levels. Table 5.2 presents those statements where differences were apparent, and these differences are described below.

(i) *Mountain bikes should not be allowed on walking tracks*

Few riders agreed with being kept off walking tracks (Table 5.1), and disagreement increased with rider experience (52% for beginners to 75% for experts).

(ii) *Mountain biking is compatible with walking on tracks*

Most riders agreed that riding was compatible with walking, and this opinion of riding compatibility increased with greater experience levels (44% for beginners to 64% for experts). This included 2% of beginners, and 30% experts who strongly agreed that riding was compatible. Between 20-30% considered riding incompatible with walking, with much of the remaining response being neutral.

(iii) ***Danger to walkers from mountain bikes is over-estimated***

Many riders amongst beginners were neutral on this statement (39%), although rider agreement did increase with greater experience (42% for beginners to 72% for experts). This suggested that more experienced riders felt that their levels of responsibility and riding control were higher than non-riders believed. The more uncertain opinions of beginner riders may reflect their experience of mountain biking being little different from that of non-riders. This suggests that greater experience in riding, which represents greater familiarity with actual riding skills, conditions and encounters, results in increasing perceptions by riders that they do not represent a real hazard.

(iv) ***A few irresponsible riders cause most problems***

Most riders agreed with this statement, and the agreement was stronger amongst the more experienced riders. This suggests that riders are aware that they have an `image-problem', and that they attribute it to inappropriate behaviour by some riders. This also suggests that riders are aware that there are some aspects of riding behaviour which are not acceptable. There would appear to be considerable potential to encourage self-regulation in rider behaviour.

(v) ***Environmental damage by mountain bikes is over-estimated***

Most riders agreed that environmental damage from riding was exaggerated (Table 5.1), and this opinion became stronger with experience (43% for beginners to 83% experts). Few riders disagreed, with the most of the remaining response being neutral (44% for beginners). These results suggest that although riders acknowledge that some areas are susceptible to damage by bikes, this is not the case for all areas. Rider responses suggest that they would generally consider riding limitations imposed on the basis of physical impacts to be unjustified in many cases.

(vi) ***Views/scenery/nature are not essential to my riding enjoyment***

The majority of riders disagreed strongly with the statement that scenery and nature were not important for their riding (Table 5.1). This disagreement did decline with experience (91% of beginners to 68% of experts), but the overall desire for scenery and nature was still very high. This decline may reflect the race-entry origin of the sample, where some expert riders may be concentrating more upon the competitive aspects of their riding. However, the overall preference for riding in natural settings is emphasised here.

(vii) ***Speed/action/excitement are not essential for my riding enjoyment***

Few riders agreed that experiencing speed and excitement was not essential for their riding enjoyment (Table 5.1). Notable agreement with this statement was only apparent amongst beginners (36% compared with 10% for experts). It does appear that these speed/action/excitement experiences are a requirement of satisfying riding experiences for most riders. This represents a problem, as it is the non-rider perception of hazard by speeding bikes which is a common source of conflict. More investigation on the role played by speed-related demands in riding experiences is necessary.

(viii) ***Access to some riding areas will sometimes need to be limited***

This statement was included to determine rider acknowledgement that some limits to access would be needed. The results showed that most riders accepted that some limits were necessary, or were at least neutral on the issue. Only 18% overall indicated they did not agree with the need for some access limits (Table 5.1). There was some variation across experience levels (Table 5.2), with beginners most positive toward some regulation (71% compared with 56% of experts). Disagreement increased with greater experience (7% for beginners to 24% for experts). Overall however, results indicate rider acknowledgement that some limitations will be required.

Table 5.2: Differences in Responses for Different Experience Levels (read % across)

OPINION STATEMENTS	Strongly Disagree	Tend to Disagree	Neutral	Tend to Agree	Strongly Agree	NOTES
* Not allowed on walking tracks						Most riders disagreed, this increased with experience. Many were neutral or agreed, but were a minority.
- Beginner	7	45	24	20	4	
- Moderately experienced	12	38	25	21	4	
- Have much experience	16	43	18	18	5	
- Expert/very experienced	25	43	18	11	2	
* Biking is compatible with walking						Riders agreed more with experience.
- Beginner	0	25	31	42	2	
- Moderately experienced	6	15	26	44	9	
- Have much experience	2	17	19	46	16	
- Expert/very experienced	4	17	21	34	30	
* Bike danger to walkers is over-estimated						Riders agreed more with experience.
- Beginner	0	18	39	35	7	
- Moderately experienced	2	16	24	44	14	
- Have much experience	2	9	22	47	20	
- Expert/very experienced	1	11	16	42	30	
* Irresponsible riders cause most problems						Most riders agreed. Little variation with experience.
- Beginner	0	4	6	65	26	
- Moderately experienced	0	3	10	43	44	
- Have much experience	1	2	7	37	53	
- Expert/very experienced	0	2	9	37	52	
* Damage by bikes is over-estimated						Riders agreed more with experience
- Beginner	0	13	44	37	6	
- Moderately experienced	0	7	31	39	23	
- Have much experience	1	9	17	38	35	
- Expert/very experienced	1	5	11	36	47	
* Views/scenery/nature not essential						Riders disagreed less with experience. Beginners disagreed much more than experts.
- Beginner	58	33	4	3	2	
- Moderately experienced	47	32	11	7	3	
- Have much experience	45	32	9	11	2	
- Expert/very experienced	37	31	14	14	4	
* Speed/action/excitement not essential						Most riders disagreed with this. Experienced riders disagreed more strongly than beginners, who included a many that agreed with this.
- Beginner	25	27	11	25	11	
- Moderately experienced	50	32	9	7	2	
- Have much experience	47	37	5	8	2	
- Expert/very experienced	48	29	13	9	1	
* Some access limits will be needed						Most riders agreed, but this agreement was lower amongst the experienced riders.
- Beginner	2	5	20	55	18	
- Moderately experienced	3	15	30	41	10	
- Have much experience	5	13	25	43	14	
- Expert/very experienced	10	14	20	40	16	

6. DISCUSSION OF KEY FINDINGS

This section discusses the key findings which can be drawn from this study, and makes recommendations for management attention and research needs. These discussions are organised according to the original objectives of this study, which were to:

- provide a profile of mountain bike rider characteristics;
- describe their preferences for recreation settings and experiences; and
- determine their attitudes towards key management issues.

The key findings (*in bold italics*) are generalised conclusions from the research results, and are presented with the expectation that they may be tested by future research. They are presented in no particular order of importance, and are accompanied by discussion of any implications for management or research.[11] The main recommendations for management and research are presented in Section 7.

6.1 Profile of Rider Characteristics

- ***At present, off-road mountain bike riders display age, gender, and occupation features which are characteristic of `active' outdoor recreationists, in contrast to the more `passive' types of recreationists they are most likely to encounter in those settings where most riding takes place.***

Riders in this study included a high proportion of males, of ages between 20 and 40, and of `professional' occupations. Other samples of mountain bike riders have displayed similar characteristics (e.g., Ruff and Mellors 1991; Coughlan 1994; Horn 1994). In general, these types of features are more characteristic of `active' outdoor recreationists[12] (e.g., backcountry trampers, climbers, hunters), than they are of the more `passive' recreationists they are most likely to encounter (e.g., casual walkers, sightseers).[13] These different `types' of recreation groups are usually well seperated as a result of the different settings that they use. In many sites where mountain biking takes place, riders may represent `active' users of predominantly `passive' settings. This could underlie many of the conflict perceptions which arise. Development of more `passive' styles of riding appearance and behaviour may reduce such

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11 Where required, some reference is made to additional material included in the Appendices.

12 This has been a common finding in recreation research, as summarised in reviews such as (Manning 1986)

13 Riders did most riding on tracks near their homes (see Appendix 3). In the same way, the more `passive' types of recreationists (e.g., casual walkers) are also likely to use such tracks. In such shared-track contexts, the visible and associated perceived differences in rider characteristics can exacerbate any pre-existing perceptions of conflict.

perceptions. Managers may find it useful to consult with riders and other users to determine what these `passive' features may be.

In a study of scenic urban cycleways (Gobster 1993), the distinctive rider characteristics as found in this study were less pronounced. This was also the case for the beginner riders in this study. These types of less experienced riders, and those using the more `developed' types of riding settings (e.g., cycleways), were more similar in profile characteristics and activity preferences to the types of walkers most likely to be encountered. It is possible that in these situations, the greater apparent similarities may reduce conflict perceptions. Walkers may view a family group of cyclists differently from a group comprising fit young riders.

Identification of how walkers form their perceptions of mountain biking will be useful. This may only require a targeted review of conflict research and participant consultation, rather than further specific field research. With such information, managers would be better able to advise and regulate riders to minimise any key `impact' features, and would also be able to better define those more `impact-susceptible' users. Better knowledge in this area may be the key to decisions on whether mountain biking at physically capable sites will also be socially acceptable or not.

- ***Women represented only 15 percent of the overall sample, but a high degree of womans' interest in riding is indicated by them comprising 42% of beginner riders in this study.***

While representing only 7 percent of expert riders, women did comprise 42 percent of beginner riders. This difference may indicate that women riders generally drop out of the activity more often, rather than continuing to higher experience levels. Or, it could indicate that women are getting involved in this recently available activity, but have been doing so more gradually than the men. Whatever option is considered, the high proportion of beginner women does suggest a high degree of interest in riding.

Some support for the latter interpretation is apparent from the experience characteristics of women (Appendix 2). A higher proportion of women had less than one year of riding experience, suggesting more recent recruitment to the activity. However, the overall pattern of experience, in years, was otherwise similar to that of the men. If women were dropping out, the proportions with many years experience could be expected to be much lower than that of the men. This represents an obvious area for research. Should the very low proportion of women riders grow, the increase in overall numbers of riders would be great. This has implications for managers when considering the current levels of mountain biking use. Managers should assume that current mountain biking use-levels will increase, and that a considerable part of any increase will represent a gradual growth in the proportions of women participating. This is likely to be most pronounced in areas currently more popular with less experienced riders.

- ***Mountain biking is a very recent addition to the range of outdoor recreation opportunities, and it is unlikely that the rider characteristics and preferences will remain in the patterns they currently display.***

Only 10 percent of riders had been active in off-road riding for more than 5 years. It is possible that with time, the activity will `mature' and stabilise into different patterns of use and user than are described in this study. For example, the proportion of women may increase, current riders may continue their involvement into older age-groups, more `passive' styles of riding may develop, and more children and family involvement may occur. The advent of mountain biking has presented an `socially acceptable' (trendy) and more physically practical means by which the high level of involvement by young people in cycling[14] can be continued. Research into the current use-patterns and aspirations of women, and the developing patterns of current riders as they age, would be useful in the long term.

The very recent advent of mountain biking thus suggests the possibility that the participant characteristics, attitudes and behaviour may be evolving as the activity becomes more established. In a similar fashion, the attitudes and behaviour of other users in relation to mountain biking may also be evolving. Riders gaining more experience of riding and of encounters with other users may change in their attitudes and behaviour toward safer and more responsible riding (e.g., voluntary codes of behaviour). This process may also apply to the other users, who, upon gaining more experience and familiarity with encountering mountain bikes, may also change their attitudes and behaviour towards them. Some suggestion of this type of process was made in Banister et. al. (1992), where the negative attitudes of other users towards cyclists on canal towpaths did not appear to increase over time, despite large increases in rider numbers. Greater familiarity may result in reduced conflict perception.

Managers should recognise that these types of changes are likely to occur, and that it may result in future resource demands for riding, and patterns of conflict perception, which differ from those evident in this study. Clearly these areas represent important topics for longitudinal monitoring and research.

6.2 Recreation Setting and Experience Preferences

- ***Some features of settings and experiences are consistently important to mountain bike riders of all experience levels, and would thus appear to be essential components of any mountain biking opportunities which may be provided or allowed for.***

The riding features considered equally important by most ridrs included the opportunities for exploring new areas; appreciation of scenery, views and nature; experiencing some speed, excitement and risk; and socialising with others. Specific setting preferences included native

[14] Research has indicated about 30% of New Zealanders had participated recently in cycling (all types), but that this decreased sharply with age (from over 50% of those aged 15-18) (Hillary Commission 1990).

forest settings, undulating routes, ride durations of between 2-3 hours, and good scenery. These results indicate that these features represent the basis of most satisfying riding experiences.

Should managers be considering a variety of tracks for potential mountain biking opportunities, those including most or all of these features should be given greater weight in allocation decisions. However, other results indicate that the relative importance of these, and other rider preferences does vary with experience. Managers may also need to consider the types of riders they wish to provide opportunities for in each case.

- ***As riders become more experienced, the balance of their setting and experience preferences shifts from an emphasis on more generalised passive types of riding experiences, toward more active types of features, which are more specific to the mountain biking activity.***

Beginner riders tended to emphasise more `passive' features of riding experiences, characteristic of preference for easier riding conditions (e.g., socialising; appreciating scenery, views and nature; easier and relaxed riding; few obstructions on the track/track not too difficult; uphills which were gradual/gentle/easy; track surface which was smooth/easy/open; ride duration of between 1-2 hours; downhills which were slow/gentle/easy; and riding on sealed roads).

By contrast, more experienced riders emphasised preferences for more `active' features characteristic of difficulty and challenge in riding (e.g., technical and physical challenge; speed and excitement; racing; single-track which is tight/narrow/winding; some technical difficulty/challenge; downhills which are fast/technical/tight; uphills which are long/steep/smooth; track surface which is dry/hard; track surface which is rough/technical/fast; and rides which include a mixture of single-track and other route types).

These changes in rider setting and experience preferences as experience levels develop suggest that the principles of the Recreation Opportunity Spectrum (ROS)[15] should be applied to mountain biking opportunities. Managers using the ROS to aid decision-making on allocations of recreation opportunities, can assess each of the opportunity classes they are using to identify what different opportunities may exist for mountain biking. For example, riding optins in opportunity classes associated with `wilderness' would be unlikely given the lack of tracks. However, in `remote experience' classes, options for expert riders may be possible on the rough tracks predominating in this opportunity class. In more `developed' opportunity classes such as `backcountry drive-in', riding routes accessible to less experienced riders would become more available. This type of process would encourage provision for a

[15] The ROS defines of a spectrum of recreation opportunity classes based upon natural and managed differences in the environmental, social and managerial features of settings. The basis of this zoning and management system is to provide a range of recreation opportunities to cater for the diversity of recreation needs. The ROS is described fully in Department of Conservation Guidelines (Department of Conservation, 1993), and also in the recreation review by Manning (1986).

range of mountain biking preferences, and would also provide a means for limiting the access of mountain bikes to some areas. Any such process for provision of riding access would remain subject to other management requirements such as physical and social impact concerns, as well as any statutory limitations that apply to mountain bikes.

- ***Rider preference for route types shifts strongly toward riding on single-track with experience.***

Beginner riders showed greater preference for riding on more developed routes such as sealed and gravel roads, and 4WD tracks. But preference for single-track riding increased with experience to become the most preferred route type (e.g., narrow walking-type tracks). This suggests that provision of mountain biking opportunities would have to include access to some walking-type tracks if mountain bike rider demand was to be best satisfied. Provision of access to formed roads or retired road tracks may only cater for the less experienced riders. These riders may be unrepresentative of those rider types actually present in most off-road track settings. Provision of opportunities for single-track riding routes should be considered a priority where possible.

Rider preference for single-track riding raises the potential for conflict perceptions from other users of such tracks, particularly walkers. While most riders consider that these uses are compatible, other research indicates that many walkers would disagree.

- ***With increasing experience, riders have greater preference for tight and rough tracks, and have greater preference and tolerance for various types of track difficulties and obstructions.***

Associated with their preference for single-track riding, the more experienced riders also had greater preference for riding challenges in general, and greater tolerance for track difficulties and obstructions (e.g., roots; rocks; steps; culverts; overhanging branches and foliage; wet muddy areas; and river crossings). The main exception to this was the strong aversion by all riders to unconsolidated surfaces such as sand and loose rocks.

Some tolerance for track difficulty by all riders was apparent from the proportion prepared to push or carry their bikes over rough sections. This indicated that many riders were prepared to ride up to, and occasionally over, the limits of their riding abilities. Just where this carrying or pushing would occur would vary for different riders, depending on their relative experience. A track where a beginner may push or carry may be easily ridden by an expert. Whatever the level of skill, few riders indicated they were prepared to carry of push their bikes for over 25% of a ride. This does indicate that where more than this percentage of a track is unrideable by most riders, almost none will be present.

Deliberate retention of rough track surfaces and/or location of maintenance features to maintain more difficult riding conditions could provide a `filter' mechanism. Using such specific `managed difficulty' would provide managers with some control of the numbers and types of riders present on different tracks, without the need to otherwise limit or ban

mountain bikes altogether. Less experienced riders will be deterred by the more difficult riding tracks and conditions.[16]

- ***The difficulty and amount of uphill riding required on tracks will provide an additional factor acting to limit riding use.***

Preference and tolerance for riding long and difficult uphill sections increased with experience. This indicates that less experienced riders may be deterred by the degree of uphill difficulty. Experienced riders were more tolerant of difficult uphills, and if forced to push or carry, would be doing so in much rougher conditions than would be the case for less experienced riders.

Management of uphill gradients represents an additional means to reduce rider numbers and filter out the less experienced. If tracks do not require low gradients to meet the specific needs of different types of walkers (e.g., older walkers, families, disabled etc), then steep climbs and associated difficulty may be retained. Such an approach would be important in backcountry situations, as it would result in only the more experienced riders being present in settings. However, in more accessible areas with smoother and easier tracks, gradients are unlikely to be sufficient to provide any deterrent. They may still be important for management, as they present a different array of management issues when considered as downhills.

- ***Experiencing speed and excitement in riding is important to most riders apart from beginners, and increases in importance with experience, although the setting of these experiences changes.***

Most riders indicated a preference for experiencing fast downhills,[17] and most indicated these types of experiences were essential to their riding enjoyment. The proportion desiring this was lowest amongst beginners, and those that did desire this preferred to do so on more smooth and open tracks. With experience, the preference for speed and excitement increased, and the settings preferred for this emphasised rougher and more challenging tracks. Rider preference to mix speed with challenge was most pronounced amongst the experts, some of whom indicated preference for slow technical downhills. This suggested they were prepared to sacrifice the maximising of speed on downhills for a greater technical challenge.

These results indicate that in many situations, although not necessarily all cases, riders like to go fast at times during their rides. This should be recognised by managers in providing any riding opportunities. If speed-related experiences are inappropriate for sites being considered

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16 The more experienced riders remaining, with their greater commitment to the activity and knowledge of its impacts and requirements, may be more amenable to adopting `low-impact' and `safe' riding practices to minimise impact and retain access. The validity of such an assumption would be a useful research area.

17 Speed and excitment experiences are also possible on level tracks, particularly where smooth surfaces allow faster riding. Also note that for more experienced riders, such experiences can be achieved on rougher tracks, even if actual speeds are quite low.

because of hazard potential (e.g., popular day walking tracks), management actions may be required. Such actions could include both rider education and track maintenance strategies (e.g. strategic location of waterbars, steps and other obstructions to limit speeds on blind corners, `managed' degree of riding difficulty to limit rider numbers). Also, specific efforts to make known the availability of alternative settings for speed-related experiences would help increase rider acceptance of limits to the riding use of some tracks.

- ***Racing is not an important motivating factor for most mountain bike riders, including most of those who have at some time actually entered a race.***

Despite this sample of riders having been drawn from race-entry lists, only 19 percent included racing and race training in their top three preferred riding features. It was the first priority choice for only 9 percent of the riders. An increased preference was apparent with higher experience levels, although this was anticipated due to the greater racing commitment which would be expected of race-entrants at the higher levels. It was apparent that a distinction between `racer' and `non-racer' expert riders was present (refer Appendix 2 for details). This distinction suggested that racing was the means by which `racers' focus the development of their advanced skills and experience, whereas for `non-racers', that focus comes more from applying and challenging their technical abilities. It is likely that managers will be dealing much more with recreational riders rather than those with strong focus on racing, particularly in settings removed from urban areas which would be less amenable to regular training rides. Actual racing on lands managed for conservation would not be permitted without agency consents.

- ***Many experienced riders have some experience of overnight riding trips, suggesting that this aspect of riding behaviour will become more important in some settings and areas.***

Riders indicated a strong interest in multi-day riding opportunities, though these comprised only a small part of their riding effort. Although most previous multi-day rides had been road-based, their interest in future trips appeared to be for off-road riding.

Riders specified a variety of areas they would like to do off-road multi-day trips. Given that mountain biking has only recently developed in New Zealand, it is likely that one of the major factors limiting rider interest in off-road trips has been lack of knowledge. As more riders become experienced, and information exchange increases, it is likely that more sites will be visited, and that some will become distinctly more prominent as preferred locations. This already appears the case with the Heaphy and Queen Charlotte tracks (due to high natural attractiveness, transport connections, rideable with weight and baggage). However, these are remote from the home locations of most riders, and it is unlikely that rider numbers doing such trips will be high. Managers should recognise that these types of riding opportunities in certain key sites will be important to riders on a national basis. This may be an important consideration in decisions on access allocations, particularly if Recreation Opportunity Spectrum (ROS) concepts are applied.

6.3 Rider Attitudes Towards Management Issues

The overall findings summarised in Table 5.1 present a view from riders that the potential social and physical impacts on the environment and other users by mountain biking are not as bad as some may believe. They seem to be suggesting that if riders are responsible, and other users are better informed about the activity through information and increased familiarity, impact perceptions would be reduced and the banning of bikes would be unnecessary. However, they did recognise that in some cases, there would be the need for limitations to their access.

- ***Riders believe that riding should be possible on most walking tracks, but do acknowledge that there will be some exceptions because of possible track damage and conflict with walkers.***

This acknowledgement by riders is useful for managers, as it represents a recognition that use of some tracks would not be appropriate in all situations.[18] However, there was an expectation by riders that these limitations would be the exceptions rather than the rule.

- ***Riders believe that perceptions of damage and safety hazard from mountain biking are over-estimated, and that a combination of some irresponsible riding behaviour, and a lack of knowledge by walkers, contributes to these perceptions.***

While acknowledging that mountain biking may be inappropriate in some situations, mountain bike riders generally considered that the activity was compatible with other use of walking tracks. The implication for managers is that any limitations placed on mountain bikes resulting only from manager response to the perceptions of other users, are likely to be considered by riders to be an over-reaction. Conflict may develop between managers and riders where riders believe limits are being unfairly applied. Given the acknowledgement by riders that some situations will require limitations, it would appear that they would generally accept any reasonable limitations, especially when consultation was undertaken on general access opportunities, and the justifications for the specific management actions were outlined. The same consultation process could also be used for discussions with other users, where management decisions make provision for some riding access.

- ***Self-regulation of riding behaviour and attitude was seen by riders as being an important part of management to reduce any use-conflicts.***

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[18] Whether other users of tracks would be prepared to make similar concessions due to possible physical impacts or other problems has not been researched to date.

Voluntary codes of behaviour such as `low-impact' riding and self-regulation of behaviour were considered more useful management options than were separate times or zones for mountain biking. However, given the high proportion of riders involved in clubs, and the number who have done races, it would appear that convenient mechanisms to promote voluntary self-regulation are available. Any management strategy dealing with mountain bike issues should ideally address this option through consultation with riders and others before any regulatory site management actions are applied. This approach may represent a more long-term process than an immediate management action, and it will depend on the degree to which rider behaviour conforms to the desired states. Some short-term regulatory approaches may be necessary in some situations, although the option for reviewing these should be available if initial conflict and impact problems subside.

Riders were evenly divided on whether most riders would stick to specifically designated mountain biking tracks. This suggests that many riders believe that any tracks designated for riding use will generally not reflect their setting and experience needs, or not be readily accessible.

- ***Riders identified views, scenery and nature experiences as important components in their recreation opportunities.***

In most of the data collected on setting and experience preferences, and from specific questions, a strong expression of rider interest in undertaking rides in attractive natural settings was apparent. Settings in farmland or pine forest environments were accepted as being tolerable, but strongest preference was exhibited for natural forested areas. In a similar way, farm tracks and 4WD tracks were acceptable, but very much secondary in preference to single-tracks in natural forest settings.

This has implications for managers when considering potential tracks which could be used to provide for mountain biking. Tracks with attractive natural settings would appear to be as important to mountain bike riders as they are to other track users. If the Recreation Opportunity Spectrum (ROS) system is applied, ridng opportunities with these features should be provided for.

- ***Speed and excitement are important components of mountain bike riders' recreational opportunities.***

In data collected on rider experience preferences, and from a specific question, a strong expression of rider interest in experiencing some speed, risk and excitement in their riding was apparent. This has implications for management when considering potential tracks which could be used to provide for mountain biking. This rider preference does represent a key area of potential user conflict and hazard if uncontrolled. In many cases, and particularly amongst more experienced riders, pure speed is not the objective. Rather, it is associated with the technical challenge of travelling quickly but in control over rough surfaces and terrain. In these situations, the actual speeds reached may not be high.

Rider education to ride safely, and track design to limit speed where potential hazard does exist are two possible options. Riders do indicate a strong interest in self-regulation, and management actions such as strategically located obstructions (e.g., culverts, steps) have been proposed.

7. RECOMMENDATIONS

Based upon the results of this study, a number of recommendations can be made for management and research consideration. These highlight some of the main findings of this study, and some of the new questions raised. They are not presented in any order of priority.

7.1 Management Recommendations

These management recommendations relate to the type of recreation experiences being sought by mountain bike riders, and the implications for managers for making some provision for mountain biking opportunities. The types of features preferred by riders are well summarised in the executive summary. Specific reference is also made to the Recreation Opportunity Spectrum (ROS).[19]

- When considering options for mountain biking opportunities, managers should ensure that the tracks include some or all of the following `core' features: opportunities for exploring new areas; opportunities for appreciating views, scenery and nature; experiencing some speed, excitment and risk; native forest settings; undulating routes with variety; socialising with others; and rides of between 2-3 hours duration. These were identified as features of high importance to almost all riders.

- Managers also need to apply Recreation Opportunity Spectrum (ROS) concepts as rider preferences vary with experience, and the preferences of the more experienced riders broaden the range of areas in which mountain biking interest occurs. As riders gain experience, they prefer more challenge and difficulty in their riding, and more access to single-track types of routes. The more common road and 4WD options (e.g., `back-country drive-in' zones) are not the preferred options of experienced riders, whose preferences may need to be considered in areas where only foot access occurs (e.g., `remote experience' zones).

- Management focus on mountain biking opportunities and issues should focus upon front-country rather than back-country areas. Most riding will be on day-trips under five hours, and managers can consider the proximity of tracks to residential areas, holiday locations, and easy road access to better determine the likely levels of riding use and conflict which may occur. While most riders would only be riding on these, others may be using them to access more remote riding areas. Such distinctions in use patterns may influence how managers plan the use of these tracks by mountain bikes. Provision of access `corridors' may be an option.

- Regulation and prohibition of rider access to more remote and difficult tracks may be unecessary, due to the low numbers of riders likely to use them. Small numbers may

[19] Those unfamiliar with this planning system should consult Department of Conservation (1993) as a first reference.

be tolerable in these circumstances. Managers could expect that any riders on more remote, long and difficult tracks (e.g., rough and/or steep) would be of higher experience and commitment to riding, but that their numbers would be low (particularly if overnight stays on the tracks were required).

- Managers should consider the national and regional role of backcountry multi-day routes when addressing the Recreation Opportunity Spectrum features of the areas under their management. Considerable interest in multi-day riding opportunities is apparent from rider responses. Interest in these routes is likely to increase as rider knowledge and skill levels increase, and more variety in experiences is sought. This does not mean all tracks should be considered, as many are too difficult, or may be subject to general overuse already.

- Track maintenance features such as waterbars, steps, culverts, and ditches could be deliberately located in a way to minimise rider speeds at potentially hazardous points along the track. If required, this type of `managed difficulty' could also be taken further to create sufficient track obstructions to deter less committed riders. In the same way, many natural obstructions such as roots, rocks, logs, stream-crossings and vegetation could be left in-situ to maintain high riding difficulty. Actions which smooth track surfaces may encourage more inexperienced riders, and allow greater riding speeds. While this approach may represent additional maintenance costs, the process could be incorporated over time into the overall schedule of track maintenance, and concentrated first upon the most relevant tracks (e.g., high use tracks with greater hazard and conflict potential). This approach may be unacceptable where it compromises easy foot access on tracks provided for less able walkers.

- It can be accepted from rider preferences that there will always be a proportion of riders in any setting who will be riding at excessive speeds. This proportion may be only small, but does represent a potential hazard. Application of a `managed difficulty' approach and/or rider education to self-regulate behaviour would be appropriate courses to consider before major riding limits or prohibitions are imposed. If regulations are imposed, they should be specific to problem sites, and backed up by rigourous enforcement if ignored. Rider responses suggest they would accept such controls where justified.

- Consultation with any concerned groups (mountain biking and other user groups) should be undertaken at an early stage when managers are considering issues of riding access on potentially controversial tracks. Many conflict situations may be prevented or reduced in this way. Where problems are occurring or anticipated, the option for allowing rider self-regulation should be considered first. Most riders in the study accepted the need for some controls, but felt that self-regulation was the best means to deal with potential problems. If limitations or prohibitions are being considered, reasons will need to be clearly specified to ensure rider acceptance. Riders perceive that impacts from riding are exaggerated, and are unlikely to support those they may perceive as not clearly justified.

7.2 Research Recommendations

A number of general research topics are suggested here. These will provide complementary results to those presented in this study, and address some of the additional questions it raises.

- Research on other samples of mountain bike riders asking similar questions to those used here should be undertaken. This would provide complementary data to that gathered in this study, and would assist definition of a spectrum of different riders and their preferences. Although the analysis of rider responses according to their experience level has proved useful in this study, more work is required to identify criteria that may better define different types of riders. Further analysis of data from this study may be undertaken to address this need.

- More research on how walkers perceive mountain biking is important, particularly on how these perceptions vary according to different rider types, different encounter settings, and according to the different types of walkers. The walker types most susceptible to impacts from mountain biking may be better identified. This information would allow managers to minimise conflict potentials, by designating greater limits to rider access on those tracks with high proportions of `bike-sensitive' users.

- Research investigating how attitudes towards mountain biking may change over time as walkers become more familiar with bike encounters is important. If perceived impacts from mountain biking are largely due to the `new and different' status of the activity in off-road settings, these negative attitudes may moderate over time as the activity becomes more familiar. This would require a longitudinal project using a consistent methodology.

- Research is required to determine whether the behaviour of more experienced and committed riders is safer and more responsible than that of novice riders. This is necessary as the assumption of such a process is the basis of any successful self-regulation of riding behaviour. In addition, identification of any particular `problem' types of riders may aid management targeting of education initiatives, or focus rider efforts to self-regulate. With this information, managers may also consider the proportion of riders in the settings who may be `problem' riders, and manage the riding use of the sites accordingly. Where any such proportions are low, major management action may not be required.

- Given the `new' status of the activity, research on the evolution of riding behaviours, preferences and participation patterns will aid prediction of future demands for riding opportunities. Since women are very under-represented in off-road mountain biking, research on their riding involvement, aspirations and barriers will be important. Evolution of greater off-road riding interest amongst women, and reduction of any barriers, could result in major increases in mountain bike numbers.

- Further research to identify the off-road tracks and routes most highly preferred for multi-day riding trips would be useful to assist managers deciding on the implications

of riding access relative to the national value of the tracks. Research here should also provide some indication of use-level implications of riding access to such tracks.

- Research dealing with the behavioural response of riders to `managed difficulty' strategies will clarify if this is a feasible mainstream strategy, or simply another tool for managers in localised situations. How rider behaviour on downhill sections changes as a result of obstacle location is an example of the sort of work which may be done. How much difficulty riders may tolerate before they give up on certain tracks is another. There is much scope for small scale trial and observation research in this area.

- Specific physical impact research addressing how the real impacts of mountain bikes compare with those of other users (e.g., walkers) will help resolve some perceived conflicts between user groups, and between managers and user groups.

- Perception of hazard from mountain bikes appeared to be a major source of social impacts perceived by other track users. Research to identify what the actual hazard potential may be, and how this may vary in different setting circumstances is an important topic. While mountain bike riders may accept considerable risk to themselves from their activity, other track users may not accept the risks they perceive this represents to them. Resolving the differences theat exist between actual and perceived risks may allow managers to take action to minimise the social impact conflicts related to perceived hazard.

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