

Australian Mountain Bike Trail Guidelines



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Note:

Mountain Bike Australia became part of AusCycling in November 2020. Where appropriate, references in this document to Mountain Bike Australia or MTBA have been replaced with references to AusCycling.





Foreword

Australians love to ride mountain bikes. There are now nearly half a million Australian mountain bike riders, and trails wind all across our landscape. No longer a fringe sport, mountain biking has become one of the nation's most popular recreational activities.

With growing popularity comes a growing demand for great, safe places to ride. Governments around the country are investing in new trail networks, and existing trails are seeing more use than ever. This level of interest is welcome, but also brings challenges, including the need to ensure that the trails we have are well-built and sustainable.

The Australian Mountain Bike Trail Guidelines were developed and released by Mountain Bike Australia, and are the result of a collaboration between riders, governments, professional and volunteer trail builders, and land managers.

Their purpose was to create a set of standards for the construction and maintenance of mountain bike trails that is suited to Australian conditions. As a testament to their importance, the first edition of the Guidelines, released in 2020, sold out.

In 2023, the need for these Guidelines is greater than ever. The job of maintaining the places we ride is getting bigger – there are more trails, more people riding them and more extreme weather accelerating wear and tear.

AusCycling's first step to meeting this challenge is to reissue the Guidelines and get them in the hands of more land managers, more trail builders and more mountain bike clubs.

We look forward to working with the Australian mountain bike community to support more and better places for all of us to ride.

Marne Fehner

CEO

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Contents

Chapter 1 Introduction	5	Chapter 8 Sustainability	34
• Background	5	• Trail Location and Alignment	35
• Purpose	6	• Drainage	36
• Vision	6	• Minimising Soil Disturbance	36
Chapter 2 What is Mountain Biking	7	• Sustainable Trail Building Techniques	38
• User Types	7	Chapter 9 Incorporating Technical Features	50
• Trail Types	9	• Flow and Technical Trails	50
• Other Trail Users	10	Chapter 10 Trail Difficulty Rating Systems	62
Chapter 3 Strategic & Legislative Context	11	• General Difficulty Rating Requirements	62
• Land Tenure & Purpose	13	• Symbols and Descriptions	64
Chapter 4 Partnerships	16	• Trail Classification Matrix	65
Chapter 5 Funding	17	• Adaptive Mountain Bike Classification	72
• Applying for Funding	17	Chapter 11 Signage	73
• Funding Trail Maintenance	18	Chapter 12 Trail Development Process	77
Chapter 6 Events	19	• Stage 1: Project Proposal	79
• Events Proposed on Parks and Wildlife Land	20	• Stage 2: Project Framework	80
• The Assessment Process	21	• Stage 3: Site Assessment	85
• The Approvals Process	21	• Stage 4: Concept Plan	89
• Holding Events	21	• Stage 5: Corridor Evaluation	91
Chapter 7 General Trail Planning, Design and Construction Principles	22	• Stage 6: Detailed Design	92
• Significance Hierarchy and Trail Models	22	• Stage 7: Construction	94
• Trail Models & Systems	26	• Stage 8: Management	96
• Single and Dual Direction	30	Glossary of Terms	100
• Single and Shared Use Trails	31		
• Preferred Use Trails	33		
• Adaptive Mountain Bike Trails	33		



The Australian Mountain Bike Trail Guidelines were developed in response to a growing need to establish and implement an Australian specific trail development process that guides mountain bike trail planning from proposal to implementation.

The Australian Mountain Bike Trail Guidelines will be an important tool for land managers, trail professionals and mountain bike groups by providing guidance to ensure a consistent approach to planning, designing, constructing and managing sustainable mountain bike trails.

These guidelines aim to ensure that mountain bike trails are developed to align with landholder expectations, to meet the needs of riders, to minimise environmental impacts and to provide opportunities for the public to connect with the environment.

Background

The Australian Mountain Bike Trail Guidelines combines best practice trail development and management from around the world with local experience and knowledge, to guide the sustainable development and management of mountain bike trails in Australia.

Western Australian Guidelines

Much of the information provided in these guidelines has been derived from the Draft Western Australian Mountain Bike Management Guidelines, the International Mountain Bicycling Association (IMBA), and consultation with internationally renowned trail developer Dafydd Davis.

IMBA provides a strong platform for advocacy and continues to assist mountain bike clubs and land managers to work together worldwide. IMBA provides best practice guides for sustainable trail development and solutions to help both land managers and mountain bike clubs develop and manage their trails. IMBA's trail solutions books are referred to in the guidelines and are recommended further reading.

In 2012 Dafydd Davis was engaged by the Departments of Sport and Recreation and Parks and Wildlife (Western Australia) to develop a sustainability framework for trail development in Western Australia.

Following the development of this framework, a Mountain Bike Working Group was established to review and expand Davis' work into an overarching management context for Western Australian. The development of the Draft Western Australian Mountain Bike Management Guidelines was led by the Department of Sport and Recreation and Parks and Wildlife (Western Australia).

AusCycling recognises the contribution of the Western Australian Mountain Bike Working Group and the Western Australian Department of Sport and Recreation for the development of the Draft Western Australian Guideline document which forms the basis of these guidelines.

Mountain Bike Australia Trail and Advocacy Management Commission

At the 2014 Australian Mountain Bike Summit, the idea of developing an Australian specific mountain bike standard or guideline was raised.

At the 2015 summit, a working group was established to investigate the options and methodology to develop and implement national mountain bike trail standards and to establish a professional trail builder's certification framework. The working group subsequently developed options papers for the development of a national standard, the development of a mountain bike trail building curriculum and the establishment of a peak body for trail builders. These options papers, together with the findings of a national survey of land managers and the wider mountain bike community were presented at the 2016 Australian Mountain Bike Summit.

Stakeholder feedback indicated that a national guideline was the preferred method of documenting trail planning and development requirements.



In September 2017, the Trails and Advocacy Management Advisory Commission (TAMAC) was established to develop this national guideline along with the suite of technical drawings and other supporting tools and resources.

What these guidelines are not:

The guidelines are not a new national standard or regulation and they have not been developed as a means to close or limit access to areas for mountain bike use or to remove the 'artistic' nature of mountain bike trail building. The guidelines provide a broad framework for the sustainable development and operation of mountain bike facilities.

Purpose

The purpose of the Australian Mountain Bike Trail Guidelines is to provide an overarching, standardised framework for the planning, development and management of mountain bike trails across Australia.

The guidelines have been developed to:

- Provide land managers, trail builders, trail users and clubs and groups with practical information and tools to effectively develop and manage mountain bike trail networks
- Complement existing information and tools.

The guidelines are aligned with the following documents:

- Trail Solutions: IMBA's Guide to Providing Sweet Singletrack (2004)
- Managing Mountain Biking: IMBA's Guide to Providing Great Riding (2007)
- Australian Adaptive Mountain Bike Guidelines (2017)
- IMBA Guidelines for a Quality Trail Experience (2017).

Vision

The vision of the Australian Mountain Bike Trail Guidelines is to provide information and resources to assist in the sustainable development and management of high quality mountain bike trails for the right users, in the right areas for the right reasons backed by strong partnerships and community ownership.

Objectives

- Provide a consistent approach to mountain bike trail development and management across Australia.
- Provide an understanding of various styles of mountain biking and the differing user types and their needs.
- Trails are developed using principles of sustainable planning, design, and construction techniques.
- Trails are planned and developed in accordance with a consistent trail development process.



What is Mountain Biking

Mountain biking is an activity with increasing participation rates worldwide. Mountain biking encompasses a broad spectrum of activities ranging from international level competition and extreme events to school sport programs and recreational riding.

Mountain biking can be performed almost anywhere from a backyard to a gravel road, however it is essentially about riding specialised bikes on dedicated off-road trails.

Historically mountain bikers have preferred to ride singletrack trails as this type of trail offers intimate experiences of their setting and enable riders to experience relatively high levels of technical challenge. The narrow nature of the trails also provides a better connection between the rider and the environment they are in.

Recently there has been a shift in rider preference toward flow and gravity trails that provide increased levels of speed and technical features. The increase in development of these types of trails is partly due to an increase in the capabilities of the bikes being ridden (i.e. more suspension, improved frame geometry and design) along with an increase in rider skill and capabilities.

The challenge for land managers is to cater for all user groups in an equitable and sustainable manner.

The varying difficulty and skill levels required to safely ride different mountain bike trails is communicated to riders using a trail difficulty classification (refer to Chapter 10 for additional information).

Different users will ultimately seek the level of trail difficulty that aligns with their skills and abilities and to meet the riding experience that they are seeking, for example, technical progression to a more difficult trail type, appreciating nature and descending fast.

User Types

Mountain biking is a diverse activity and for the purpose of these guidelines, mountain bikers have been divided into five user types, which are defined by their differing trail expectations and ride experiences.

Although the five user types have differing requirements, there is often a significant amount of cross-over between types. Different user types also have different barriers to mountain biking and require varying levels of trail facilities. (Davis, 2012)

Understanding user types helps land managers to define the rider group being targeted and why the trails are being developed. Historically, trail development has often been reactive and based on user demands or to legitimise existing trail networks.

Understanding the target market enables land managers to adopt a proactive approach to trail development that ensures the right trails are developed in the right area, for the right users.



Table 1. Mountain Biking User Types

Type	Description	Classification Sought	Potential Market
Leisure	Includes general cyclists of all ages and abilities and is potentially the largest market. Typically, they ride infrequently, often have limited skills and require very accessible trails. They are not members of clubs and they are more likely to use highly accessible routes close to home or make the journey to trail facilities with amenities and services such as bike hire, cafés and toilets.	This group will generally seek white (easiest) and green (easy) classification trail. As they progress, will start to ride blue (moderate) classification trails.	Significant
Enthusiast	Enthusiasts are purely recreational mountain bikers with moderate skills and variable fitness, and ride weekly. They are typically aged 29-49 and form the majority of mountain bike riders. They typically don't compete in events and they possess limited outdoors experience. They prefer trails with good trail signage and seek technical but not too challenging trails. Enthusiast Mountain Bikers are the most likely to take short breaks to different areas.	Mostly green (easy) and blue (moderate) classification trails. As they progress will start to ride black (difficult) classification trails and has the potential to move into another user type (sport and/or gravity).	Significant
Sport	Competitive mountain bikers, who ride regular routes multiple times a week and are members of mountain bike clubs, they are a small but influential market. They are willing to seek less accessible trails, have a high fitness level and are technically proficient but may have limited outdoor skills. They ride a very wide variety of trails.	Green – Double Black (extreme).	Small but influential
Independent	Skilled outdoor enthusiasts who ride once a week and are technically proficient with good level of fitness. Generally, they are a small market. Often involved in other outdoor activities, they are capable of planning their own rides and ride a very wide variety of trail classifications. The adventurous aspect is more important than the technical challenge and they seek more remote trails.	White to Black	Small
Gravity	Highly skilled technical riders who seek very challenging trails, typically ride at least once a week and are often members of clubs. They represent a small market that requires purpose built trails, which are repeatedly used in a concentrated manner. Gravity riders seek specific trails with the highest classifications.	Blue – Double Black	Small but growing rapidly

While all trail types need to be developed and catered for, trail development should generally focus on a specific target market that is identified in the objectives of each project.



Trail Types

There are several trail types, usually defined by the riding style of the trail, the terrain the trail passes through and the number and type of features on the trail. Trail types have evolved over the last 30 years and will continue to evolve due to the improvement in bicycle technology, rider skill levels and the adventurous nature of the activity.

Trail types define the style of trail and its typical attributes. Different trail types suit different styles of riding and typically each trail type will have a specific kind of mountain bike designed to suit.

Land managers need to understand trail types as the type of trails selected and built in an area will ultimately provide the basis for what the development is known for and the demographic of riders that the trail development will attract.

Table 2. Mountain Bike Trail Types

Type	Description
Cross Country (XC)	Primarily single-track orientated with a combination of climbing and descending, and natural trail features of varying technicality. Cross Country trails appeal to the majority market and can cater for timed competitive events. Typically, bikes are lightweight with shorter travel dual suspension or have no rear suspension.
Flow (FL)	Flow trails typically contain features like banked turns, rolling terrain, various types of jumps, and consistent and predictable surfaces. Flow trails do not contain abrupt corners or unforeseen obstacles. Bikes are typically light-medium weight with medium-travel dual suspension.
All Mountain (AM)	Similar to Cross Country and primarily singletrack orientated, with greater emphasis on technical descents, with non-technical climbs. All Mountain trails can cater for timed competitive events. Bikes are typically light-medium weight with medium-travel dual suspension.
Gravity / Enduro (GE)	Similar to All Mountain with greater emphasis on steep, fast, technical descents. Gravity / Enduro trails can cater for timed competitive events. Gravity / Enduro trails appeal to more experienced riders who enjoy technical descents but are still happy to ride back to the top of the trail. Bikes are typically medium to long-travel dual suspension and are built for strength.
Downhill (DH)	Purely descent only trails with emphasis on speed and technical challenge and focus on skill development. These trails can cater for timed Downhill competitive racing. Downhill trails typically appeal to the more experienced market, however green (easy) downhill trails are emerging to cater for all experience levels. Downhill trails usually require uplift to the trailhead via chairlift or vehicle shuttling. Bikes are designed for descending and are typically long-travel dual suspension and built for strength over weight.
Freeride (FR)	Typically, descent focused trails with emphasis solely on technical challenge and skill development. Trails feature both built and natural terrain technical features with a focus on drops and jumps. Appeals to the more experienced market and caters for competitions judging manoeuvres and skills only. Bikes are typically medium to long-travel dual suspension and are built for strength.
Park (PK)	Built feature environment with emphasis on manoeuvres, skill development and progression. Appeals to wide market including youth and can cater for competitions judging aerial manoeuvres. Can include Jump and Pump Tracks and Skills Parks. Typically, dirt surfaced but can include hardened surfaces. Bikes are typically built for strength, with short travel suspension.
Touring (TO)	Typically, long distance riding on reasonably uniform surface conditions and lower grades. Touring trails are dual direction linear trails or long-distance circuits with a focus on reaching a destination. Touring trails can include rail trails, access/fire roads and single track. While there is a limited market for long distance mountain biking, touring trails can be ridden in sections making them accessible to all. If carrying panniers bikes are usually robust with limited suspension, however, for short sections or day trips most mountain bikes are suitable.



Other Trail Users

While these guidelines have been developed specifically for mountain bike trails, other trail users must be considered when planning and developing mountain bike trail networks.

Generally, the recreation objectives set for an area will guide the recreation activities and user groups that can be accommodated for through the provision of infrastructure.

Understanding where different user groups will interact in an area is important to minimise user conflict and provide safe and enjoyable experiences for both shared use and mountain bike only trails.

Other trail users that should be considered when developing mountain bike trails include:

Hikers – more focused on setting and destination, most mobile users, capable of cross-country travel.

Horse Riders – less affected by tread condition, prefer loops, greatly prefer water access, require longer distances than hikers for a valued experience.

Trail Runners – most similar in movement to mountain bikers (speed, distance, preferred trail conditions) where the trail itself is an important factor along with exercise.



Strategic and Legislative Context (Public Lands)

Chapter 3

State and local governments are responsible for the development and implementation of a wide range of legislation and policy which impacts the development of new trails and the management of existing trails on public lands. Legislation can significantly influence the location, construction, ownership and ongoing maintenance of mountain bike trails and associated infrastructure.

Trails cannot be developed in isolation; they must 'fit' within a strategic and legislative context. It is essential that careful consideration is given to all relevant legislation, policies and strategies when planning a new trail or reviewing an existing one.

The Trail Development Process outlined in Chapter 12, includes a structured process for identifying and reviewing relevant legislation, policies and strategies during the proposal and site assessment stages of a project.

A well researched project proposal supported by relevant policies and strategies will be more likely to attract funding and other forms of support.

The following sections outline specific planning and development strategies, policies and guidelines relevant to mountain biking.

Specific planning and legislative requirements for each state and territory are defined in information sheets which are available on the AusCycling website.

State and Territory Strategies

State and territory governments and peak industry organisations develop recreation strategies that outline the vision for recreation and guide the development of recreational infrastructure across specific locations and regions.

Many states and territories now have mountain bike specific strategies.

Regional Trail / Activity Master Plans and Strategies

Regional master plans assess the region or area and provide recommendations and priorities for the development of trails. Examples of regional master plans/strategies include the South West Mountain Bike Master Plan in Western Australia and the Tropical Queensland Regional Mountain Bike Strategy.

Policies and Guidelines

State and territory governments and some local governments have policies and guidelines that outline the underlying principles, administrative controls and, where appropriate, operational guidelines and procedures relating to land management, access arrangements and visitor services.

These documents provide the basis for planning and management for recreation, tourism and associated visitor activities on land and water managed by the respective organisation.

Local Trail Master Plans

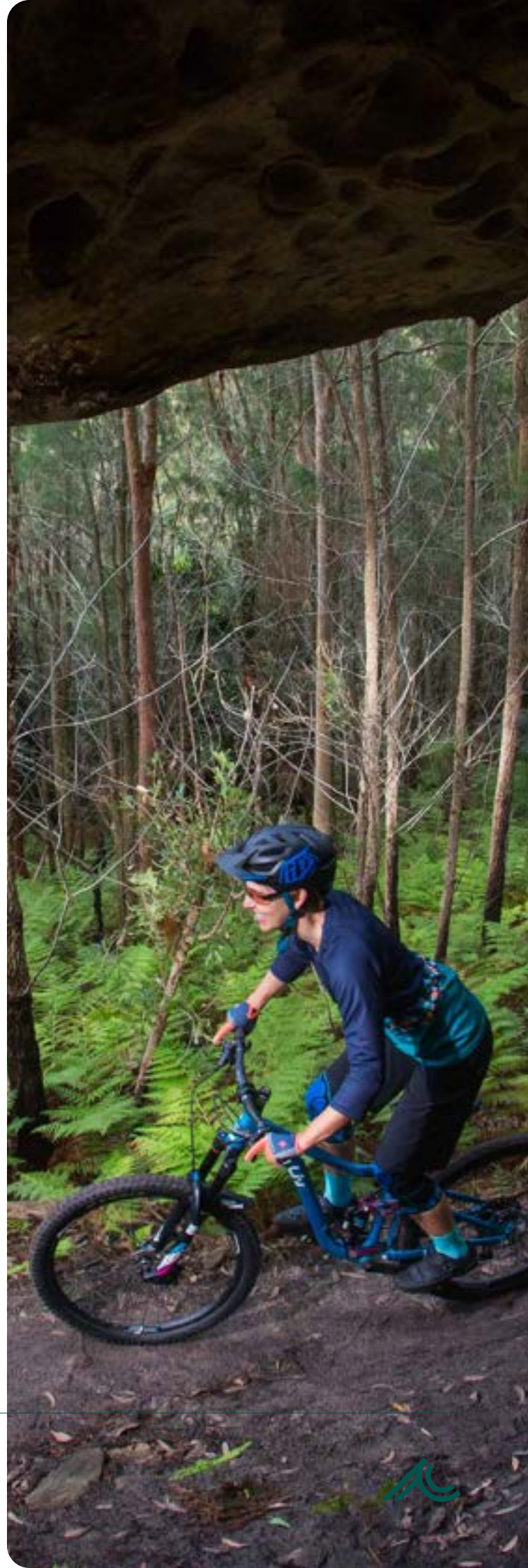
Trail master plans are typically undertaken by landowners and/or by local mountain bike clubs. These local plans provide a framework to guide the planning of individual trail networks to ensure the trails are planned correctly, achieve the goals of the master plan or state strategy and are managed, resourced, promoted, and maintained.



Tenure Compatibility (Parks and Wildlife Managed Land)

Each state and territory has a different approach to mountain bike trails and its compatibility with land tenure and purpose. Proponents wishing to see a new mountain bike trail developed on state/ territory government land should liaise with the relevant land owner to confirm compatibility of the proposed trail type/s with the purpose of the land tenure.

The following section Land Tenure and Purpose and the Compatibility Table relate to Parks and Wildlife managed land which has been cross referenced against the potential suitability for recreational mountain bike trails. This information should be used as a guide only.



Land Tenure and Purpose

National Parks

National parks are areas that have national significance for scenic, cultural or biological values, and can accommodate recreation that is consistent with maintaining these values.

National parks are managed to conserve wildlife and the landscape, for scientific study and to preserve features of archaeological, historical or scientific interest and to allow forms of recreation that do not adversely affect their ecosystems or landscapes.

Conservation Parks

Conservation parks have the same purpose as national parks, but they have regional or local, rather than national significance.

Conservation parks are managed to conserve wildlife and the landscape, for scientific study and to preserve features of archaeological, historical or scientific interest and to allow forms of recreation that do not adversely affect their ecosystems or landscapes.

Nature Reserves

Nature reserves are terrestrial areas set aside for the conservation of flora and fauna. They are managed to maintain and restore the natural environment, and to protect, care for and promote the study and appreciation of indigenous flora and fauna. Recreation that has no impact on the conservation values of the reserve may be allowed.

Nature reserves have high conservation value because they represent natural ecosystems and because they contain or provide habitat for particular species of plants or animals.

State Forests and Timber Reserves

State forest containing indigenous vegetation is managed for purposes that include recreation and nature conservation, the protection of water catchments, and the production of a sustainable harvest of timber. These areas also provide for commercial activities such as beekeeping and the harvesting of flora.

Timber reserves are managed identically to State forest. Some timber reserves outside the main forest areas are progressively being evaluated and may be cancelled or amended, or have their purpose changed, by an order of the Governor published in the Gazette.

Regional Parks

Regional parks are open spaces identified as having regionally significant value for conservation, landscape and recreation. Regional parks protect a range of areas, including foreshores, ocean beaches and wetlands.

Regional parks may comprise lands with a variety of tenures. These may include Crown land vested in Commonwealth or State bodies or local government authorities, as well as private (freehold) lands where the agreement of the landowner is obtained. They may also include unmanaged reserves or unallocated Crown land. This land management system provides the opportunity for a coordinated planning and management approach by the tenure owner and land management agencies.



Table 3 outlines a 'generalised' compatibility guide of potential mountain bike trail development on Parks and Wildlife managed land.

Table 3: General Compatibility Evaluation

	National Parks	Conservation Parks	Nature Reserves	State Forest and Timber Reserves	Regional Parks	Other Reserves
Cross Country	Green	Green	Red	Green	Green	Orange
All Mountain/ Gravity/ Enduro	Green	Green	Red	Green	Green	Orange
Downhill	Red	Orange	Red	Green	Orange	Orange
Freeride	Red	Orange	Red	Green	Orange	Orange
Park	Orange	Orange	Red	Green	Orange	Orange
Touring	Green	Green	Orange	Green	Green	Orange

Generally Compatible

Generally compatible with the purpose of the land tenure however still requires Parks and Wildlife confirmation.

Conditionally Compatible

May be acceptable if the trail type, design and alignment have little to no impact on the area's conservation, heritage or social values and/or where there are no conflicts with other recreation activities.

Not Compatible

Not compatible with the purpose of the tenure.

Note:

Proponents of new MTB trail developments must liaise with individual land owners to confirm the compatibility of the proposed trail type/s with the purpose of the land tenure.



Local Government Managed Lands

Local government managed lands are also set aside for specific purposes, such as conservation or recreation.

Local Planning Schemes divide local government districts into zones to identify areas for particular uses and identify land reserved for public purposes. Most importantly, Planning Schemes control the types of uses and development allowed in different zones.

The Schemes also establish the requirements for planning approval, enforcement of the Scheme provisions and non-conforming uses.

Typically, land is zoned Residential, Commercial, Industry, Tourist or Rural but can have various additional use classes. Also, public and private recreation are identified as community uses and may be permitted subject to the local government granting planning approval after advertising the development.

Private recreation defines premises used for indoor or outdoor leisure, recreation or sport, which are not usually open to the public without charge. Public is of a similar meaning but without charge.

Specific planning requirements will apply to most mountain bike trail developments proposed on local government areas.

Proponents of new mountain bike trail developments on local government land should liaise with their relevant local government authority or engage the services of a town planner to determine local planning requirements.

Developments on Privately Owned Land

There is an increasing trend for landholders to develop mountain bike trail networks on private land. Landholders should review the classification of their land during the planning phase to determine if a material change of use is required to build the trail network on their land, especially if the network will be used for commercial gain.

Landholders should liaise with their relevant local government authority or engage the services of a town planner to determine land classification and material change of use requirements.

Landholders should also consider access, operational, public safety and rider safety issues when planning a mountain bike trail network.



The development and management of mountain bike trails often requires partnerships between multiple groups to achieve optimum project outcomes.

The size and complexity of the project, land tenure, funding arrangements and volunteer groups all influence who project partners will be and how they will interact.

Partnerships may be formed between two or more of the following stakeholders:

- the land owner/manager
- state and local government agencies
- mountain bike clubs and groups
- funding providers
- sponsors
- other interest groups.

Well structured, strong partnerships are an invaluable tool to leverage effort and achieve favourable project outcomes.

Before trails are built, it is crucial to establish and document the roles and responsibilities of all partners involved in the trail development. Establishing and documenting roles and responsibilities at the commencement of a project is essential to build solid, long-term partnerships.

One of the most important partnerships for ongoing trail management and maintenance is the clarification of the 'trail owner' and the 'trail operator'.

The **trail owner** is the entity that owns the physical structure of the trails and is usually the owner or manager of the land that the trails are built on. The owner carries the liability for the health and safety of all trail users.

The **trail operator** is the entity that maintains the trails to the agreed standards of the owner.

Wise Words from International Mountain Bike Association (IMBA)

Before you move any dirt, you must gain legal access and ensure all your partners are on the same page.

Understand before you seek to be understood - read the Trail Development Process (Chapter 12) prior to approaching a land manager to gain an understanding of what may be required.

Be professional and patient – educate yourself about priorities and constraints facing land managers.

Find common ground – how can your group and project assist with other issues facing the land.

Trail Adoption

A trail adoption agreement is a great tool that can be used to formalise a partnership between a land manager and a club or group.

By defining and acting in accordance with the terms of a trail adoption agreement, both parties build a trusting relationship, which allows trail groups to take responsibility and work more autonomously.

Resources:

The following resources are available on the AusCycling website:

- *Engaging Project Partners Template*
- *Trail Adoption Agreement Template*



Some government agencies view favourable trail projects that cater to a broader range of users including mountain bikers, hikers, trail runners and horse riders.

Sourcing adequate funding for trail development and ongoing management is essential for sustainable trail networks. While some land management agencies contribute funds to developing and maintaining trails, a significant proportion of funding for new work has to be secured from external sources.

When seeking funding, it is important to look beyond the traditional grants available from the sport and recreation sector. Trails often have a close link to the natural environment. Projects that can demonstrate environmental protection or rehabilitation outcomes, or an ability to connect the wider community with the environment may be eligible for local, state and federal grants from environmental agencies.

Trails and other recreational infrastructure provide significant health and community benefits that are often difficult to quantify, however these benefits are often critical to gaining buy in from governments and other providers of funding. In addition, many community grant programs provide funding for projects with a demonstrated community benefit.

Ecotourism and adventure tourism and the economic benefits that flow into local economies from increased visitation is also a significant driver for governments and businesses to invest in mountain bike infrastructure. Where possible, proponents of new trail developments should undertake some economic modelling to quantify the long-term economic benefits of the development to the local, regional and state economies.

Other sources of funding for trail developments include crowdsourced funding and trail 'karma' contributions through mountain bike related websites and forums.

Applying for Funding

When preparing funding applications, it is important that appropriate time and effort is given to preparing the application to ensure the best chance of success. The size and complexity of the proposed trail development, together with the amount of funding being requested, will guide the amount of effort and information required for a successful funding application.

It is critical to consider and address the strategic objectives of the agency or funding body who is being asked to provide funding for a development. Applications that align with the goals of the agency or funding body, and link to any relevant strategic plans have a far greater chance of success.

For most funding submissions, the following should be incorporated into a Business Case:

- An outline of the proponent's eligibility for the available funding (where required)
- An outline of the scope of the proposed development
- Detailed costings for all aspects of the development (including approvals, cultural heritage assessments, etc.)
- The timing and a program of work
- Consultation undertaken with landholders and stakeholders
- How the development will help the agency meet their strategic objectives
- Statistics to support the development
- A cost benefit analysis of the development to demonstrate the economic benefits of the development



- Letters of support from local officials, businesses, etc.
- Suggestions on how ongoing maintenance will be funded
- Suggested management/ governance models.

Note:

Most funding providers will require a letter of support from the landholder supporting the development and acknowledging that the proposed work has been approved. Proof of tenure is usually also required.

Consideration should be given to how funding is staged over the duration of a development. Rather than seeking funding for an entire development, dividing the overall project into smaller individual packages may open more funding opportunities.

Following the Trail Development Process outlined in Chapter 12 will generate a significant amount of information and documentation that will be very useful reference material that can be included in funding applications.

Funding Trail Maintenance

Funding for general trail maintenance is often more difficult to source as the outcomes are more difficult to quantify and are not seen as being as 'appealing' as new developments.

As highlighted earlier in this Chapter, methods for funding trail maintenance must be considered in the early stages of planning a new trail development to ensure that the development does not become a burden on the land manager who is unable to maintain the trails adequately.

When sourcing funds for ongoing trail maintenance, the following options should be considered:

- Club membership fees
- Merchandise, for example, club apparel, trail apps
- Events
 - Event Fees
 - Requesting event organisers to donate a percentage of each entry fee to trail maintenance.
- Fundraising activities
 - Raffles
 - Crowdfunding
- Sponsorship (where permitted by the land owner)
 - Seek sponsors for your trail or sections of the trail network
- Charging visitors a permit fee to access the trails for the duration of their stay
- Donation boxes located at partners of the trails such as bike shops, outdoor adventure tour operators.

Funding Example:

In 2014 the Department of Parks and Wildlife (Western Australia) worked with the Kalamunda Mountain Bike Collective (KMBC) to gain sponsorship for the maintenance of trails within the Kalamunda Circuit. This has proved a great success with the KMBC attracting sponsorship to the majority of their trails and raising approximately \$30,000 in the first 12 months.

Resources

A Business Case Template and Blue Derby Case Study are available on the AusCycling website.



The increase in popularity of mountain biking as a sport has fuelled significant growth in the number of mountain bike events taking place with corresponding increases in participation levels. Mountain biking events are diverse and enjoyed by people of all ages and abilities. Events may have a competitive or recreational focus, depending on the target market and demographic of participants.

Recreational events are typically about riding in a social, non-competitive environment. They can include regular rides led by local mountain bike groups, longer endurance rides and bike skills clinics run by clubs, accredited individual operators or commercial entities.

Competitive events may include international, national, state or local competitions for cross-country, downhill and gravity enduro, stage races or endurance/marathon events. Examples include the Flight Centre Epic in Queensland or the four-day Cape to Cape stage race in Western Australia.

The broad range of ages, skill and fitness levels of those who compete in mountain bike events demonstrate the popularity amongst competitive and recreational riders. Many of these races are important for the competitive

riders, but for the rest of the field, it is the social aspect, as much as the participation and “have a go” attitude promoted by these events that appeals to the recreational rider.

AusCycling has developed a Guide to Mountain Bike Event Management, which provides information and guidance for people who are planning to hold a mountain bike event. The Guide is available on the AusCycling website.

The information provided in this section is general in nature. People wishing to hold a mountain bike event should liaise with landholders or relevant government departments to seek approval and confirm specific event management requirements.

Events Proposed on Parks and Wildlife Managed Land

The rugged and diverse landscapes of Australia's protected areas are a popular setting for mountain bike events.

Legislation governing the management of public land requires the consent of the land manager to conduct events on public lands. The way the consent or authority is issued depends on the land manager, the nature and size of the event, and if the event is being held for commercial purposes.

Generally, event proponents must obtain approval from the relevant state/territory department to conduct the event before commencing any advertising and/or marketing for the event. Neglecting to do so may affect the chances of obtaining approval from the department and may even result in penalties such as a fine or prosecution.

To assist landowners in assessing an application to hold an event, the following should be considered and may form part of the application/ approval process:

Applicants should provide as much detail as possible with their application, including:

- An event management plan including areas such as medical/ first aid, communication procedures.
- Maps indicating the proposed routes, spectator points and where applicable, camping sites, any gathering, changeover or transition points, and emergency access points.
- Detailed layout of each gathering, changeover or transition points indicating possible vehicle overflow areas for the maximum expected numbers.
- Detailed itineraries and proposed advertising material.
- A safety/emergency response plan and an environmental policy for their organisation.
- Risk management plan.
- Details of any insurances held.
- Traffic management plan (where required).
- Details of the representative in the organising team who will be the contact person for the event to ensure any issues can be addressed as soon as possible.



Note:

Applicants should be prepared to negotiate on any of the before-mentioned points.



The Assessment Process

All applications for events, commercial and non-commercial, must undergo a more detailed assessment than other activities due to their unique impacts and management requirements.

Land managers/owners have a duty of care to all visitors, including spectators, and must manage any potential environmental impacts from events in a sustainable manner.

Some of the issues that land managers/ owners may take into consideration when assessing an application to conduct an event are:

- The appropriateness of the event to the reserves' values and purpose and if the proposed activities are in line with the area's management plan.
- The risks and likelihood of spreading diseases (for example eucalypt dieback) and weeds between reserves and management options to reduce the risk.
- Waste collection and removal including litter and toilet waste.
- Impacts on threatened species and ecological communities and management options to reduce impacts.
- Participant, spectator and support crew vehicle management and impacts on both the event site and surrounding environment and/or neighbourhood.
- Whether departmental operations such as prescribed burning, could significantly impact on or cause the cancellation of an approved event.
- The likelihood that the event could endanger or otherwise significantly impact on or disadvantage other user groups.
- Whether the activity or event could result in a significant or unacceptable level of environmental damage if not properly managed/controlled.
- Whether the marketing and promotional material is appropriate.

If the land manager/ owner considers an application acceptable, the application will then progress through the approvals process. If the land manager/owner considers an event unacceptable, detailed feedback should be provided.

The Approvals Process

Once assessment of the application is complete and the proposed event route is satisfactory to all parties, the application will then undergo a process for approval. The length of time for the approvals process depends on the type and complexity of the event and the land manager.

Holding Events

Event Managers are responsible for identifying all event management requirements before applying to hold an event.

Events must be held and managed in accordance with the requirements of all conditions imposed by the approving body in addition to technical regulations and other requirements of Mountain Bike Australia. This includes appointing an appropriately qualified commissaire to manage the event and ensuring that appropriate insurances are in place before the event is held.

It is also critical that event venues are cleaned following events, including the removal of all course marking signs and tape.

Event proponents should research their relevant state and local legislative requirements for holding events together with specific landholder event management requirements.

Note:

The nature of mountain bike events may require the event proponent to 'make good' any damage to trails or other infrastructure that was incurred as a result of holding the event.

While most land managers will impose a 'fair wear and tear' approach to assessing damage to trails, holding an event in wet weather when there is a high likelihood of significant trail damage would likely result in the land manager directing the event manager to repair the damage or charging the event manager to have the damage repaired.

Resources:

AusCycling Guide to Mountain Bike Event Management – available on the AusCycling website.



General Trail Planning, Design and Construction Principles

Chapter 7

This chapter provides the general principles of trail planning, design and construction. The content should be used as a reference when working through the Trail Development Process outlined in Chapter 12.

Significance Hierarchy and Trail Models

Significance Hierarchy

Establishing the scope and scale of a trail network is essential to new development and ongoing management of trail systems. It ensures that trail systems of the right type, size, scale and extent are established in the right locations.

The trail significance hierarchy, which was developed by D. Davis, 2010, gives a quantitative justification for identifying the size of a trail network.

The level of trail significance should be established when developing the Trail Framework (Stage 2 of the Trail Development Process) as detailed in Chapter 12.

The following questions should be used to establish the appropriate level of trail hierarchy:

- What is the significance of the trail development to the local and wider communities in terms of both economic and social impacts?
- What is the significance of the trail development in terms of wider recreation and access issues?
- Will the development have impacts that are felt nationally, regionally, or locally (community level)?
- How many people and communities is the development likely to affect?

Much of the information in this section has been derived from the International Mountain Bike Association (IMBA) and Natureshape. The following publications expand on the material provided here and are recommended as further reading.

Trail Solutions. IMBA's Guide to Building Sweet Single Track. (IMBA)

Managing Mountain Biking. IMBA's Guide to Providing Great Riding. (IMBA)

Natural Surface Trails by Design. Troy Scott Parker (Natureshape).

These books can be found at the following websites:

International Mountain Bike Association – www.imba.com
Naturescape – www.naturescape.com

The significance hierarchy is comprised of three levels: National, Regional and Local. Each of these levels is defined in the following tables.



National Significance

A mountain bike facility designed for a large population centre and/or a tourism resource that caters for at least a week of unique riding opportunities.

Table 4. Criteria for a trail network of national significance

Criteria	Metric	Minimum Infrastructure Required
Length of trails	> 80km	Trail Hub or Trail Centre with high quality user facilities including: <ul style="list-style-type: none"> • Car park • Toilets • Trail head signage • Trail markers • Accommodation • Bike hire • Cafe • Event hosting capabilities
Number of loops	4+	
Proportion of single track	> 50%	
Minimum area of site	> 1500ha	
Location	< 180km from airport/major transport links	
Road access	< 20km from major highways	
Exclusion Zones	90km from another national scale centre	
Other	Must be within 1km of a national or state road	
Trail classification range	Mixture of trail classifications. Green, blue and black diamond required as minimum.	

Recommended trail classification percentage breakdown:				
White	Green	Blue	Black	Double Black
-10%	-30%	-40%	-15%	-5%



Regional Significance

A mountain bike facility for a small population centre or large community and/or a tourism resource that caters for short breaks or weekend trips.

Table 5. Criteria for a trail network of regional significance

Criteria	Metric	Minimum Infrastructure Required
Length of trails	20km – 80km	<ul style="list-style-type: none"> • Car park • Toilets* • Trail head signage • Trail markers
Number of loops	2+	
Proportion of single track	> 50%	
Minimum area of site	> 500ha	
Location	< 40km from 15,000 population	
Road access	< 10km from highways and primary roads	
Exclusion Zones	45km from another national or regional centre	
Other	Must be within 1km of a national or state road	
Trail classification range	Mixture of trail classifications. Green and Blue required as minimum.	* 50 – 80km trail network

Recommended trail classification percentage breakdown:

White	Green	Blue	Black	Double Black
-10%	-30%	-40%	-15%	-5%



Local Significance

A mountain bike facility for a small community and/or a tourism resource that caters for day trips.

Table 6. Criteria for a trail network of local significance

Criteria	Metric	Minimum Infrastructure Required
Length of trails	Up to 20km	<ul style="list-style-type: none">• Car park• Toilets*• Trail head signage• Trail markers <p>* Desirable</p>
Number of loops	2+	
Proportion of single track	> 80%	
Minimum area of site	> 250ha	
Location	Selected areas	
Road access	Must have clear public road access	
Trail classification range	Green Circle – Double Black Diamond.	

Locally significant trail systems may only include one trail classification and or one trail type. This detail would be captured in the development of a trail framework which is outlined in stage two of the trail development process in Chapter 12.

For example:

- a small 10km green trail in suburbia to provide a recreational resource to the local community
- a 5km double black diamond trail situated relatively remotely
- a 20km network with a range of trail classifications.



Trail Models

A trail model defines how a mountain bike facility can be developed and applied to a population centre or an individual site. Trail models heavily influence all parts of the trail planning, design and delivery process.

Four types of trail model exist:

Trail Town or Hub

A population centre that offers a large range of high quality trails, trail user related services, facilities, trail related businesses, strong branding and supportive governance.

Trail Network

A collection of linked trails, often of the same type and typically accessed via a trail head. A trail network may be stand-alone within a population centre or individual location and can form part of a trail town/hub.

Trail Centre

A trail or trail network supported by high quality dedicated on site trail related services and facilities. A trail centre is stand alone in an individual location and can be located within a trail town/hub.

Individual Trails

Individual linear or looped trail. Small individual trails typically form part of an alternate development model or may be standalone individual trail in a community setting. Long distance trails can link trail models and can also be the precursor to developing a tourism destination.

The following table defines the scope and extent of each type of trail model.

Table 7. Types of trail models

	Trail Town / Hub	Trail Centre	Trail Network	Individual Trails
Population centre-based user services/facilities	✓	✗	✗	✗
Site-based user services/facilities	✓	✓	✗	✗
Associated infrastructure	✓	✓	✓	✓
Multiple trails	✓	✓	✓	✗
One trail	✗	✗	✗	✓

A trail model should be applied to all mountain bike facilities. The type of trail model should be established at an early stage and must be appropriate to the scope, scale and goals of the development.

The type of trail model should also be appropriate to the national, regional or local significance of the mountain bike facility in accordance with the following table.



Table 8. Trail model and Trail Network Significance

	Trail Town / Hub	Trail Centre	Trail Network	Individual Trails
National Significance	✓	✗	Only if part of a trail hub/centre	Only if part of a trail hub/centre
Regional Significance	✓	✓	✗	Only if part of a trail hub/centre
Local Significance	✓	✓	✓	✓

Trail Systems

Trails can stand-alone or be part of a trail system that links several linear or loop trails, or other facilities together.

The layout and design of a trail system is dependent on the location's characteristics and attributes:

- The location of the trailhead
- Topography and environmental conditions
- Land ownership.

Linear Trails

Linear trails are point-to-point routes that start and finish in different places. Linear trails may have trailheads at both ends and /or at common entry points along the route. Linear trails can be used to link destinations, points of interest or other trails.

Linear trails may be appropriate when factors such as landscape or land ownership may not accommodate loop trails.

Long-distance linear trails can enable an uninterrupted trail experience over a significant distance.

Loop Trails

Loop or circular trails are trails that start and finish in the same place. Loop trails may have a single trailhead.

Loops can be stacked on top of each other. They can enable trail users to ride shorter or longer sections and vary the route they take.

Loop trails are an efficient design that allow for longer trail lengths within the available space.

Trail Networks

Trail networks can make the optimal use of available space by linking several trails together from a trailhead. Larger trail networks may require more than one trailhead.

Trail networks enable the provision of trails of one trail type or classification, or a variety of trail lengths, classifications and trail types in an available space. This variety gives trail users options regarding distances, and choices regarding experiences during the same or subsequent trips.

Trail networks can also include facilities such as pump tracks, skills parks and dirt jumps.

Trail networks often include loop trails. The loop trails may be interconnected with each other or linked together by linear trails. This enables trail users to travel down one trail and return to the same point via another route.

It is preferable to design the main trailhead location at the bottom of hills. Where practicable, trail networks should limit access to one entry and egress area.

It is important to design emergency and maintenance access points into all trail networks.

Dependent on the design of the trailhead, trail systems could include a core trail. The core trail could lead from the trailhead and provide access to the rest of the network. As the core trail will receive the most use, it should be able to accommodate the widest variety of trail users.

The remainder of the trail network could be designed out from the core trail or trailhead.



Depending on the style of trails within the network, trails can become longer and more technically challenging as the distance from the core trail or trailhead increases, as trail users seeking difficult or remote experiences are usually willing to travel further. This design is generally suited to cross-country and all-mountain trail types.

It may be more appropriate to design downhill trails within a trail network closer to the core trail or trailhead, as trail users seeking these styles typically do not want to ride long distances or climb uphill too much due to the style of bike they are riding (for example: heavy, long travel, highly geared).

When designing downhill trails, vehicle access should be considered to enable shuttling from the bottom to the top and for emergency services access.



Prevalent trail network designs include:

Stacked Loop

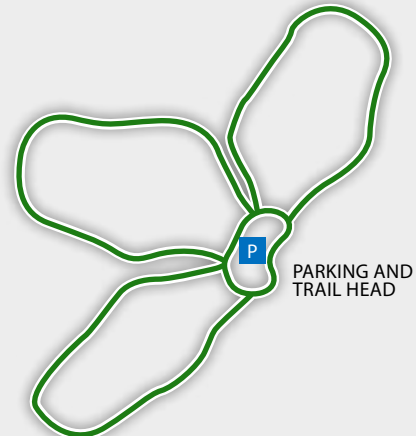
Stacked loop designs are a series of loop trails that radiate concentrically from a trailhead and core trail, usually in a single direction. This means that there are loops inside other loops. Linear trails can link loops together, meaning the trails can be used in any combination.



Cloverleaf

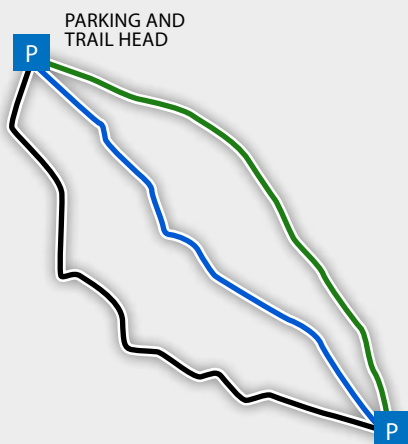
Cloverleaf designs are a series of loop trails that radiate from a central trailhead and core trail.

Linear trails can link loops together meaning the trails can be used in any combination.



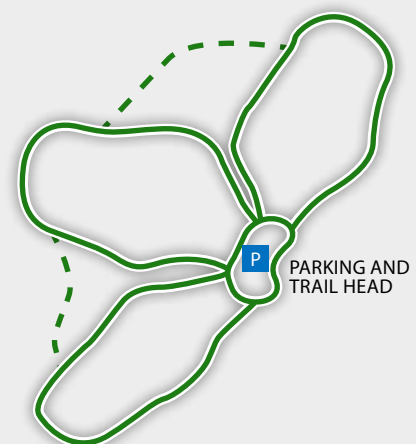
Trail Finger

Trail fingers fan out from the core trail or trailhead at various points giving riders a simple choice of options, trails could be loops or linear.



Linked Loop

Similar to the cloverleaf design, with linkages between trails to enable trail users to try a different trail without having to ride back to the trailhead.



Trail networks may include a combination of trail styles, difficulty levels and designs, depending on the location's characteristics and attributes.



Single and Dual Direction

Single Direction Trails

As the name suggests, single direction trails are designated for use in a single direction.

Single direction trails:

- Provide a more predictable trail experience by eliminating encounters and the risk of collisions with trail users travelling in the opposite direction
- Help to alleviate congestion and overcrowding on busy trails
- Enable the development of more advanced technical trails with tight turns and corners, short and obstructed sightlines, single direction features and obstacles (for example: large drop-offs and jumps), and extreme descents.

However, single direction trails may limit trail user experience as travelling in opposite directions on the same trail can provide diverse experiences through differing levels of technical difficulty, views etc.

The direction of travel along single direction trails must be clearly and consistently communicated via trailhead signage, at all access points, along the trail and in other media.

Dual Direction Trails

Dual direction trails are designated for use in both directions. Dual direction trails take better advantage of the available space by doubling the length of trail available within a trail corridor.

Dual direction trails can provide varied experiences to trail users travelling in opposite directions through differing levels of technical difficulty, views etc. However, dual direction trails can increase encounters and the risk of collisions between trail users travelling in different directions.

Trail design can be used to control how dual direction trails are used. Consider appropriate design measures, including:

- Long and clear sightlines
- Passing opportunities
- Slowing points prior to turns, technical trail features (TTFs) and intersections
- Appropriate warning signage prior to turns, TTFs and intersections.

Whilst it is not ideal to convert single direction trail to dual direction trail, it may be possible if appropriate design measures can be fitted retrospectively. It is possible to design technical dual direction trails if appropriate design measures are used.

As a general rule, most mountain bike trails are dual direction unless otherwise signposted. This practice should be clearly communicated on trailhead signage, at all access points, along the trail and in other media. Single direction trails should be clearly marked with 'no entry' signs at the exit points, or wherever appropriate.

A code of conduct, or rules of the trail, should include information about rider responsibilities when using dual direction trails.

Give Way Code of Conduct

Historically the code of conduct for riders stipulated that descending riders were responsible for giving way to ascending riders. In some locations this 'rule' has been reversed and ascending riders are responsible for giving way to descending riders.

Trail owner / operator must ensure that trail signage clearly defines the expected give way rules in place for their mountain bike facility.

Resources:

A Mountain Bikers Code of Conduct is available on the AusCycling website. Any code of conduct should align with the specific requirements of the trail owner / operator.



Single and Shared Use Trails

Single Use Trails

Single use trails or facilities are designed, constructed, sanctioned, managed and used solely by a single user group, for example mountain bikers.

Single use can:

- Enable construction of mountain bike trails and TTFs challenges that are not suitable for other user types
- Be desirable in order to eliminate/avoid conflict with other user groups, for example in high use areas to alleviate congestion on very technically difficult and/or high-speed sections of trail
- Provide more predictable experiences as riders are unlikely to encounter other user groups.

Single use trails may create the following issues:

- Monitoring and enforcing single use can be challenging
- Can perpetuate assertions/assumptions that a particular user group is incompatible with other user groups due to safety, behaviour, operation etc
- Can create hostility amongst different user groups, for example through perceived or actual rivalry and territorialism
- Can increase demands for single use trails for other user groups. This can result in increased environmental impact, increased maintenance requirements and can be less cost effective
- Can concentrate users, which can result in overcrowding/capacity issues.

Single use trails must be clearly communicated at all access points, and via trail signage, maps and other media. An appropriate filter should be used at the beginning of the trail to discourage use by other user groups. (Refer to Trail Filters in Chapter 9 for examples)

Single use trails are appropriate for advanced cross-country, all-mountain, downhill and free riding trails, skills parks and dirt jumps as these activities are generally incompatible with other non-mountain bike trail users due to the nature of the trail, and the speed and actions of the riders.

User experiences on single use trails

Since use and terrain conditions can vary greatly, there are cases where single use trails may be the best solution:

- **Trails:** Popular recreation areas with crowded trail systems can benefit by providing access to both shared and single use routes, helping to ensure that visitors can avoid traffic jams if they simply want to hit the trails seeking relaxation and a connection with nature.
- **Trailheads:** Trail systems can avoid crowding at trailheads by providing separate access points to accommodate specific users. For instance, one entrance can be designated for equestrians and include horse-trailer parking, while another parking area can be designated for hikers and mountain bikers.
- **Targeted Experiences:** The experience of riding a narrow rollercoaster trail with a rocking rhythm of twists and turns is a highly valued prize. These are the trails that envelope riders in a zone of exhilaration and successfully provide that desired result when they are specifically designed for mountain bikers.
- **High-Speed Trails:** Trails designated for speed can allow riders to race and train at higher speeds without affecting other visitors. They are designed to separate visitors by skill level and the experience sought.
- **Skills Areas:** Skills facilities at trailheads or within developed parks can incorporate a practice area with a variety of challenging obstacles, from easy to progressively difficult. Skills clinics can also be conducted in these specialised areas.

Shared Use Trails

Shared use trails or facilities are designed, constructed, sanctioned, managed and used/ shared by more than one user group - such as mountain bikers, bushwalkers, trail runners, horse riders, and off-road vehicles.

Shared use trails are advocated by IMBA. IMBA advises responsible mountain biking is compatible with most other types of trail users.



Shared use trails can:

- Take advantage of the available space
- Reduce maintenance costs compared with providing a single use trail for each activity
- More effectively service destinations/ points of interest or transport corridors, for example through many users travelling in the same direction
- Help to build relationships and cooperation between different user groups, for example through encounters on the trail and mutual interest in maintaining a shared resource
- Be more attractive to funding bodies than single use trails or facilities.

However, shared use trails can limit the provision of difficult Technical Trail Features (TTF's), or necessitate alternative routes. If not promoted and communicated effectively, shared use trails can provide a less predictable experience than single use trails as the risk of conflict or accidents with other trail users is increased.

When designing shared use trails, the following should be considered:

- Optimum trail speed is achieved through the flow of the trail
- Trail anchors and demarcation (Refer to Chapter 9) are included (below shoulder height to maximise sightlines) to control speed and keep users on the trail
- Inclusion of singletrack as it slows users without affecting experience
- The use of slow points and chicanes to control speed
- Turns and corners are placed appropriately to ensure sightlines are maintained and speed is controlled
- Passing opportunities are included in the design
- Clear sightlines are included in the design
- Safe intersections are designed by slowing users at these points. This can be done by using slow points, chicanes, signage, and planning intersections at high points where some speed has washed off.

Shared use trails do not need to be wide straight trails providing that they are carefully designed to reduce the risk of collisions between users. Shared use trails can include single track and some TTFs.

Communication and managing expectations is imperative to the success of a shared use trail. Generally, if trail users expect to encounter another activity and other users on the trail, they are more likely to be positive and pass in a considerate manner. As with single use trail, a shared use trail should be communicated to all users via appropriate signage at the trailhead, all access points, along the trail and in other media.

A code of conduct or rules of the trail should include information about rider responsibility when riding shared use trails.

User experiences on shared use trails

Shared use trails allow two or more distinct user groups to access a trail, and have a number of advantages that have made them popular among trail manager and users:

- Shared use trails best accommodate the needs of the broadest array of users, whereas single or restricted use trails tend to concentrate users, sometimes creating negative social impacts due to crowding.
- Sharing helps build a trail community. Visitors are encouraged to cooperate in order to preserve and protect a common resource and encountering other types of users on a trail helps to establish mutual respect and encourage courtesy.
- Shared use trails take better advantage of available space and trail mileage. Quite simply, they provide more trail for everyone to enjoy.
- Systems with shared use trails require fewer miles than would be necessary to accommodate trails for individual user groups, and therefore have less impact on the surrounding ecosystem.
- Shared use trails support the most visitors. Trails that lead to specific major destinations, such as waterfalls and scenic vistas, should be considered for shared use, since most visitors will be drawn to the point of interest regardless of the mode of use to get there. Likewise, trails that serve as major travel corridors can be more efficient when shared.



Preferred Use Trails

While preferred use trails allow two or more user types to access a trail, they are designed to primarily accommodate the experience of only one of the users. Used as a management tool, preferred use trails can combine the benefits of both multi-use and single use trails, but due to user preference of the design elements they may become de facto single use trails.

Bike Optimised Features

Bike optimised features are those that are developed specifically to enhance the mountain biking experience. They can be located on shared use, single use, adaptive or preferred use trails.

Bike Optimised Features not Appropriate for Shared/Preferred Use:

Features that are not appropriate for shared/preferred use trails include:

- high speed features
- jumps
- large drops
- elevated structures
- gravity trails
- any other feature where a rider cannot safely yield
- where rider experience is the primary function of the trail and the use of the trail by other users would significantly diminish the riders experience (including riders traveling in opposite direction).

Appropriate for Shared/Preferred Use:

Bike optimised features can be appropriate for shared or preferred use trails depending on their frequency of use. A small feature placed strategically within the trail corridor would be enjoyed by riders but could go unnoticed by other trail users.

Features that are appropriate for shared/preferred use trails include:

- Rollers
- Small berms
- Rock gardens
- Slow speed technical features
- Clear sightlines on faster trail sections

Walker/Trail Runner Optimised Features

Walker or trail runner optimised features are developed to enhance alternate use of the trail network while also protecting the environment.

Adaptive Mountain Bike Trails

Adaptive Mountain Biking encompasses a broad range of events and riders who typically cannot ride a standard mountain bike and require adapted equipment and trails to suit their physical, intellectual, neurological and sensory abilities.

Adaptive riders have specific requirements for trails to allow their bikes to navigate the trails, these include:

- Minimum trail widths
- Minimum turning radius
- Limits on technical trail features
- Maximum trail gradients
- Maximum trail camber.

Resources:

Break the Boundary Inc. has developed the Australian Adaptive Mountain Bike Guidelines and resources for use by associate members, clubs, charities, associations and government agencies around Australia.

The Guidelines address many challenges with adaptive mountain biking and provide solutions such as the Adaptive Trail Rating (ATR) system.

The guidelines and trail rating system can be purchased from the Break the Boundary website.



Sustainable trails align with user's needs, provide social and economic benefits, minimise environmental impact and require less maintenance.

To achieve sustainable trails, land managers must develop the right trail, in the right area, the right way and for the right reasons. For mountain bike trail development, the word sustainable refers to different things for different groups, for example:



Trail Users

Trail user sustainability is about designing and constructing trails for the intended target market and the appropriate demand. Trail development should not devalue landscapes or places and should positively impact individuals and communities. Trail development should not negatively impact the cultural heritage of any community or group.



Social

Social sustainability should be a primary goal of any trail network. However social sustainability is complex and often difficult to address correctly. Each trail user seeks a specific experience from a trail network, and while this seems simple to achieve, varying requirements and expectations of users may create tension within and between user groups who each believe the trail network should be delivering a different experience.

Engaging user groups during the planning phase, and before any major changes are made, will assist to identify the social expectations for a trail.

Failure to address social sustainability issues often results in overcrowded trails, trails with little use, trail users who feel 'pushed out' by other users and the creation of unauthorised trails.



Economic

Economic sustainability of a trail or trail network involves the assessment of inputs (eg. trail construction, trail maintenance, user management) against positive outputs (eg. bike purchases, travel and accommodation, local business growth, improved community health and wellbeing) and negative outputs (eg. damage to the environment, impacts on amenity, unauthorised trail development).

Identifying all inputs and outputs during the planning phase of a development will help to determine the economic sustainability of a trail or trail network.

Failure to address economic sustainability will result in greater ongoing costs to manage trail users and maintain existing and unauthorised trails.



Environment

Trail development must be planned, designed and constructed with the highest environmental standards. Trails should be appropriate to the landscape, sense of place, and add value to the area.

Trails should not destabilise soils or slopes. Vegetation should not be cleared or damaged beyond the bounds of the required trail footprint. Trails should be used to manage recreation on wildlife and habitats in a positive way. Trails should be designed and constructed in way that minimises the potential spread of pathogens, diseases and weeds.



Trails and Infrastructure

Trail development must be consistent with the sustainable provision of resources to manage the trail and associated infrastructure. Design and construct of trails should minimise maintenance requirements and ongoing costs.



Land Use

In some areas, trails may coexist with other land uses such as recreation, land management or commercial enterprises. Trails need to be planned in a way that does not adversely affect the existing land use and ensures that the land use does not impact other trail users negatively.

Trail Location and Alignment

Topography plays an important role in aligning trails that are fun and sustainable. It is very important that trails and their infrastructure such as TTFs, are designed to fit into the environment and add value to an area. Trail location and alignment also plays a part in reducing erosion and minimising the spread of pathogens, diseases and weeds.

Erosion is the biggest threat to trail surface sustainability. Erosion is accelerated by water, trail users and gravity. However, poor trail design is usually the biggest culprit. Location, soil type, drainage features, alignment and grade are the most important factors affecting erosion (IMBA, 2007).

How to locate a sustainable trail alignment:

- Design trails across the side slope along the contour, perpendicular to the fall line. It is much easier to drain water away from a trail located on a slope.
- Avoid the fall line – Fall line trails follow the shortest route up or down a hill. Fall line trails become gullies,

- funnelling water which strips the trail of its tread and creates deep ruts that are almost impossible to maintain.
- Avoid flat terrain. The trail will become compacted and will start to collect water and create puddles and muddy sections.
- Sometimes a flat area will be unavoidable, if this is the case, use trail construction techniques such as boardwalks, sustainable crowning, armouring etc.
- Trails can negatively impact water quality. To address this issue the following should be considered:
 - Avoid wetlands and minimise the number of stream crossings.
 - Where a crossing is unavoidable build above the water using bridges or boardwalks or rock armour the crossing.
- Control points are places that influence where the trail will go. The beginning and end of the trail are basic control points. Other control points include parking areas, structures, slopes for turns, road or water crossings and other trails.



Positive control points are places riders may want to visit such as:

- Scenic views
- Native forest
- Large trees
- Certain slope aspects
- Rocky outcrops
- Interesting boulders or ledges
- Appealing sounds
- Gentle side slopes
- Sustainable turning platforms
- Sustainable drainage/water crossings
- Existing road, rail or water crossings.

Negative control points or constraints are places you want the trail to avoid such as:

- Historic, cultural and archaeological sites
- Private property
- Unpleasant views
- Wetlands
- Flat ground
- Extremely steep side slopes
- Sensitive wildlife habitat
- Sensitive plant communities.

Drainage

Frequent drainage features are essential to ensure any water captured on the trail sheds off the trail as quickly as possible. Grade reversals and outslope should be planned as part of new trail design. Other drainage features such as rolling grade dips and knicks can be added to existing trails. However, retrofitting drainage features is a poor substitute for proper planning and design (IMBA 2007, p.122).

Construct drainage features in way that blends into the environment – use a rake/hoe to blend where construction finishes, and the natural vegetation begins. When drainage is designed and constructed well, trail users won't notice it.

Note:

If an existing trail has severe erosion or water pooling problems, it may be better to realign the trail than try to fix the problem.

Understanding Soil Type

Soil type plays an important role and should be considered throughout the trail development process. Understanding soil texture assists in predicting how trail tread will behave (Scott Parker 2004, p45). Refer to Table 9 for information about drainage intervals for different types of soils.

Every landscape, hillside, valley and vegetation complex will have a different soil type and structure. In fact, soils can change several times in as little as 20m of trail and with each soil change comes slight differences in trail construction and drainage requirements.

Initial trail planning and design can only make broad assumptions on the soil type of a proposed alignment, but it will determine areas that may require special attention or areas that need to be avoided (seasonally inundated areas may need to be avoided or hardened).

Scott Parker (2004) describes the textures and behaviours of common trail tread materials. This is an important study that has credibility through years of trail building research and describes general soil characteristics that can easily be put into practice.

The designer of a trail must be aware that different soil types will:

- Vary in their ability to maintain large volumes of traffic (compaction and displacement)
- Resist water erosion and have varying performances when wet (muddy or well drained)
- Have suitably smooth surfaces for specific trail use and speeds (walking, cycling, equestrian).
- Maintain tread stability in varying trail gradient.

Table 9 provides the relationship between soil type, grades and maximum length between drainage features.

This table is hypothetical and only to be used as a guide – conditions and results will vary. It includes the following assumptions:

- Most tread watershed drains down the tread and through the dip at the lower end (for example: sunken tread with little side drainage)
- Erosion will still occur even within these values (especially in extreme weather events) the tread length values are designed to require minimal tread maintenance and minimise tread shape through erosion



- Tread is well compacted and about 750mm wide
- Trail has moderate use with moderate displacement
- Tread watershed has moderate runoff potential
- Downpours are likely only 1-3 times per year

(climates with more extreme rain events should use shorter tread watersheds)

- No water sources exist beside rain and runoff
- Your conditions and results will vary

Table 9. Soil Types and Drainage Intervals

	0%**	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%
Clay loam with high quantity of gravels, cobbles and stones.	65m	50m	35m	25m	20m	15m	10m	7m	5m	3m	1.5m
Gravelly clay	55m	40m	30m	21m	15m	10m	7m	4m	2.5m	1m	
Loam with high quantity of gravel and stones	50m	35m	25m	17m	11m	8m	5m	3m	2m	1m	
Clay***	45m	30m	22m	15m	10m	7m	4m	2m	1m		
Loam	40m	27m	17m	11m	7m	4m	2.5m	1m			
Crushed granite or limestone, angular particles	38m	23m	15m	9m	5m	3m	1.5m				
Organic soil	33m	20m	11m	7m	4m	2m					
Sand	30m	15m	9m	5m	2.5m	1m					

** No tread should have 0% grade. The 0% figures are listed as an upper drainage spacing limit for grades above 0% and below 2%

*** Although compacted pure clay can be cohesive even on steep grades, it is generally too slippery when wet to be practical.



The Half Rule

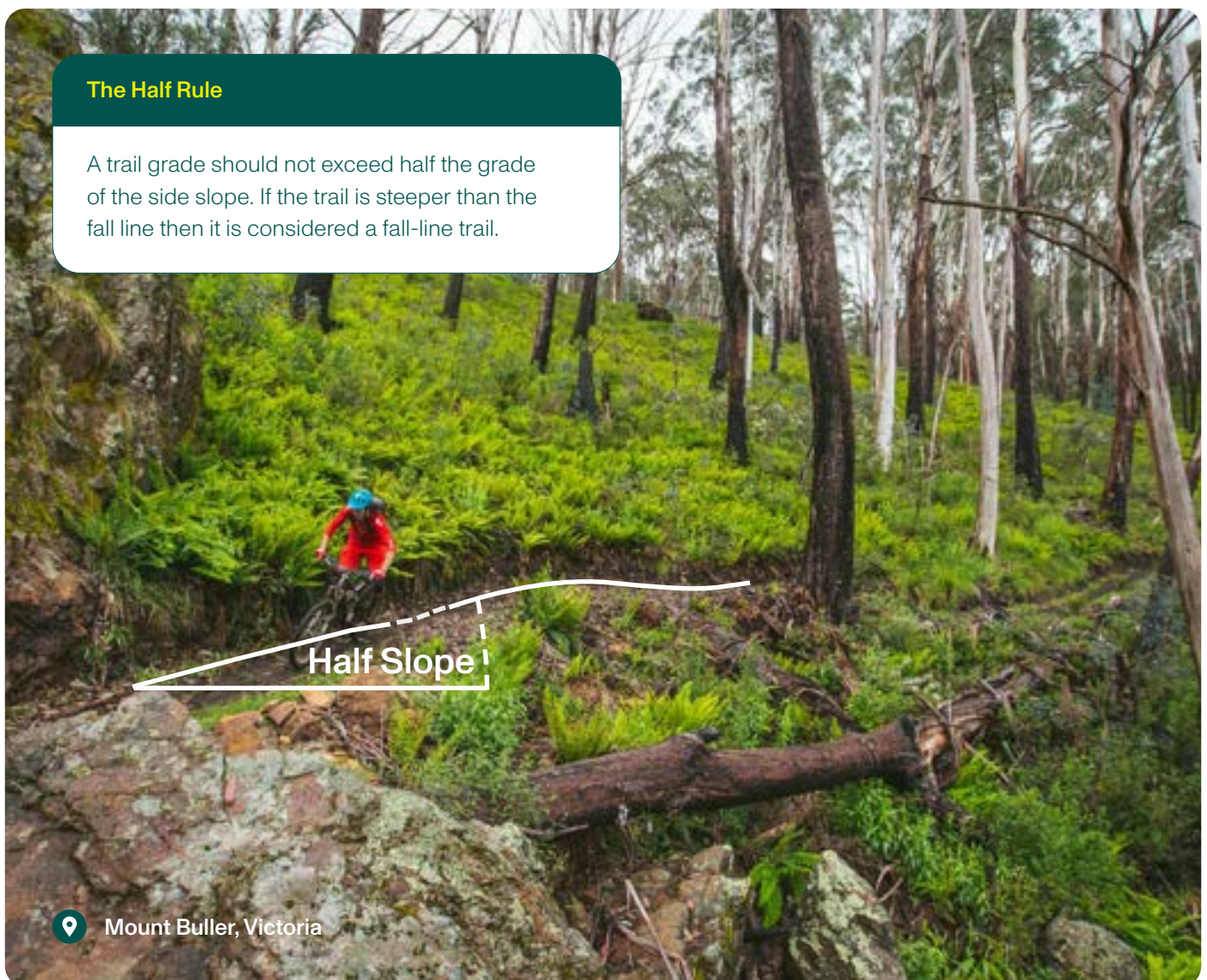
The half rule is based on the premise that a trail's grade should never exceed half the grade of the side slope it is located on. If the trail grade is more than half of the side slope grade, water will not be able to sheet off the trail and will flow down the trail causing erosion. (IMBA, 2007, p 118).

The half rule is especially important to remember when working with gentle slopes, as it may be assumed that gentle slopes are less susceptible to erosion – this assumption is incorrect.

The following are specific exceptions to the half rule:

- Except in rare situations trail grade should never exceed 15 percent, even if a steeper trail would meet the half rule.

- Be careful in erosion prone soils. The maximum sustainable grade may be just four or five percent, often less than half of the grade of the side slope.
- There is a maximum sustainable grade for each trail location and soil type irrespective of the side slope grade. See Table 9 Soil types and drainage intervals.
- Some trail types (for example downhill) may require a steeper grade. To be sustainable these trails should be carefully designed to include a higher frequency of drainage features and may require tread armouring.



Sustainable Grade - The 10 Percent Rule

The 10 percent rule is based on experience and industry best practise which has shown a grade of less than 10 percent is most sustainable:

- It applies to most soil types
- Minimises user caused erosion
- Allows for design flexibility
- Accommodates undulations
- Allows for realignments above or below features.

To calculate average trail grade, divide the total elevation gain or fall by the total length of the uphill or downhill section and then multiply by 100.

Elevation difference/length x 100 = average grade.

For example, if a trail falls 50m over a 650m section the trail grade would be $50/650 \times 100 = 7.7\%$ grade.

When applying the 10% rule consideration should be given to undulations and pinches around natural features which can increase the grade to above 10%. This can impact on user experience and accelerate trail wear and maintenance.

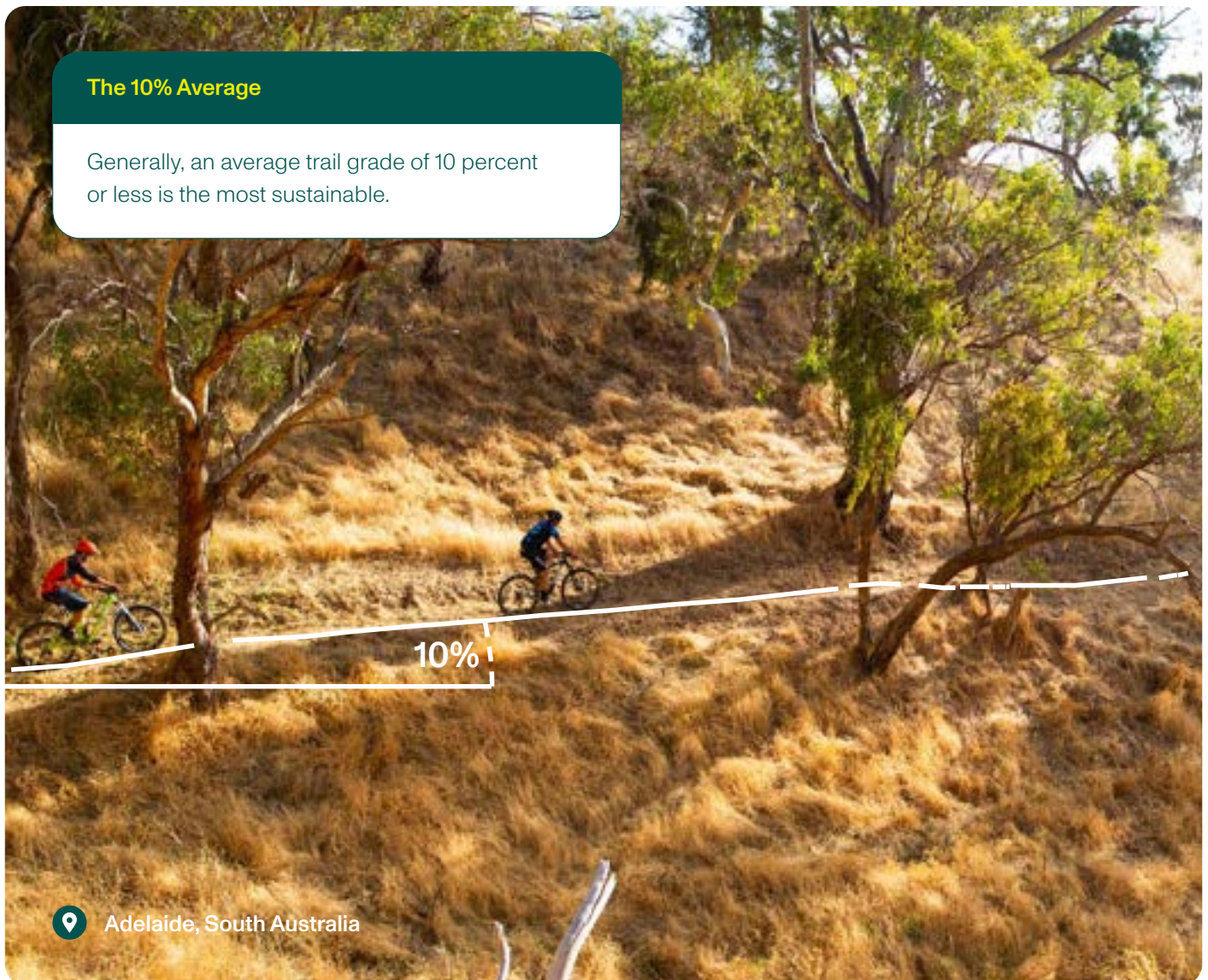
Never guess the grade, no matter how experienced you are, always use a clinometer to take an accurate measurement.

Resources:

An information sheet explaining how to use a clinometer is available on the AusCycling website.

The 10% Average

Generally, an average trail grade of 10 percent or less is the most sustainable.

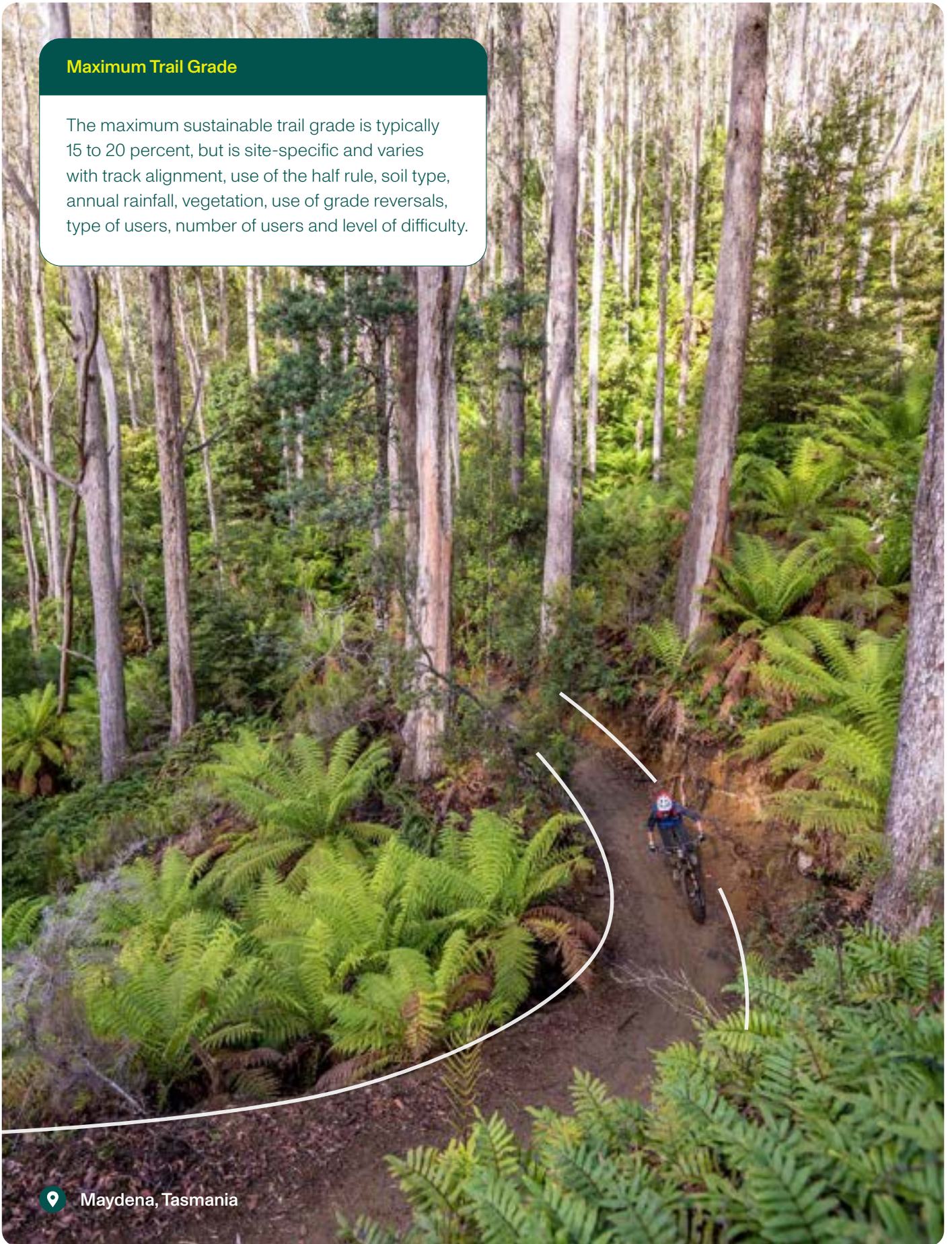


📍 Adelaide, South Australia



Maximum Trail Grade

The maximum sustainable trail grade is typically 15 to 20 percent, but is site-specific and varies with track alignment, use of the half rule, soil type, annual rainfall, vegetation, use of grade reversals, type of users, number of users and level of difficulty.



Maydena, Tasmania



Knicks

A knick is a shaved down section of trail, semicircular in shape and about three metres in diameter, with the centre of the knick outsloped at about 15 percent to draw the water off the trail. There must be lower ground next to the trail for the knick to be effective.

Rolling Grade Knicks

A knick is a semi-circular, shaved down section of the trail, that is canted to the outside (and lower slope) to draw water off the trail.



Thredbo, New South Wales



Rolling Grade Dips

Rolling grade dips build on the knick feature. The knick is built and followed by a long gentle soil ramp. The knick should be about three metres in diameter and the soil excavated from the knick is used to create the ramp that reinforces the knick. The ramp should be three to six metres and outsloped at five percent.

Correct placement of a rolling grade dip is essential – look for a natural roll or change in the trail grade to be accentuated. Don't place rolling grade dips in turns.

Although minimal maintenance is needed, knicks and rolling grade dips will still collect leaves and silt that will need to be cleared each season and after heavy rain events. Both designs will fill up over time if left unattended and become ineffective.

Grade reversals

Grade reversals should be planned and built into all new trails. Grade reversals make trails more enjoyable and provide excellent drainage solutions. A grade reversal is the change in trail tread grade from up to down as the trail moves across the side slope.

Grade reversals allow water to leave the trail at the low point of the grade reversal, before it can gain enough speed and volume to cause erosion. Grade reversals divide the trail into continuous small watersheds - this means the drainage feature of one part of the trail won't affect another section, reducing erosion while also minimising the effect the trail might have on the area's overall hydrology.

Frequent grade reversals are critical (and often overlooked) to sustainable trail design. It is much easier to build grade reversals into new trails, than to retrofit drainage features into a poorly designed trail.

Grade Dips & Reversals

A reverse in the trail grade, usually a short dip followed by a rise, creating a small watershed and forcing the water off the trail.

 Falls Creek, High Country VIC



Outslope


Creating outslope on a trail involves finishing the trail so the tread tilts slightly down and away from the high side encouraging water to sheet across and off the trail, instead of funnelling down the centre of the trail and causing erosion. IMBA recommends most trail treads should be built with a five percent outslope.

It is not always possible to outslope all sections of trail, and it is particularly hard to maintain outslope on loose soils like pea gravel. Bermed turns will be absent from outslope, which are intentionally insloped to provide a banked turn. Where outslope is not possible, it is especially important to design trails with frequent grade reversals.

Outslope

A method of tread construction that leaves the outside edge of a hillside lower than the inside, in order to shed water in sheet flow.



 Hobart, Tasmania



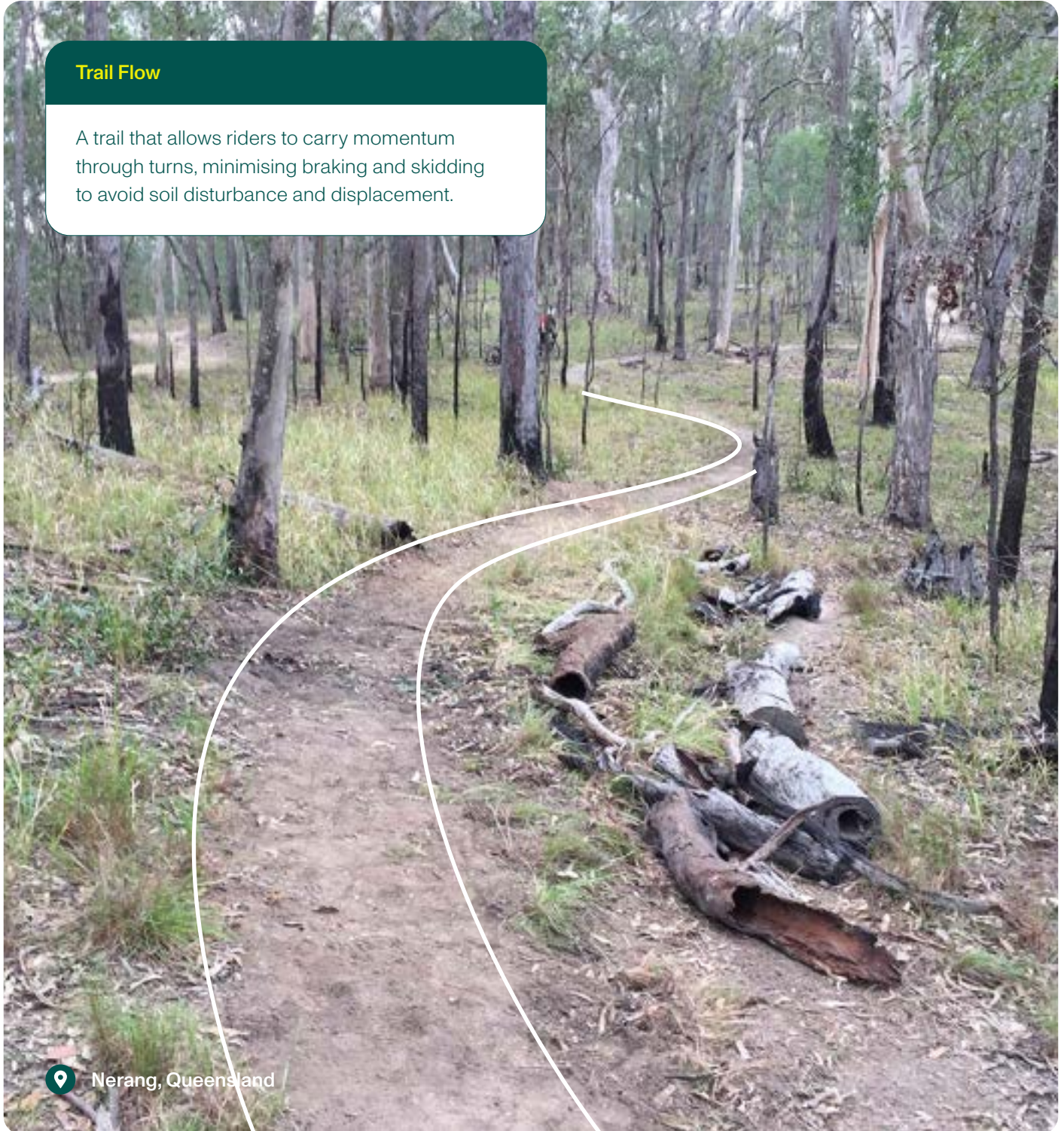
Trail Flow

Flow manages the trail user's speed and momentum through trail design. Consistent flow can minimise user soil disturbance and displacement by reducing the need for users to exert more downwards or sideways force to stay on the trail.

The goal of this element of trail design is to avoid abrupt changes and corners that are likely to make riders brake excessively or skid, which can result in braking bumps and trail widening.

Trail Flow

A trail that allows riders to carry momentum through turns, minimising braking and skidding to avoid soil disturbance and displacement.



📍 Nerang, Queensland



Berms or Insloped Turns

Berms are fun to ride, improve trail flow and reduce soil movement on corners. Berms help riders maintain speed without sliding out of the turn.

It is difficult to achieve correct drainage on a bermed turn. Building this type of structure requires a high level of experience and understanding of water flow across the landscape and the use of effective grade reversals.

Berms that face upslope will often have drainage issues and may retain water and become a major maintenance issue. Where this occurs, alternate draining methods may be employed, for example, drainage pipes under the trail tread, soakage pits to the side of the trail tread to collect water that will soak away over time, etc.

Bermed Corner

A bermed corner has a banked outer edge that runs the entire length of the corner, allowing the rider to maintain a faster speed.



Tread Armouring

In some instances, the only way to ensure sustainability of a trail is to armour or harden the surface with gravel, rock, boardwalks or synthetic materials.

Armouring can be used to elevate the trail out of very soft or wet areas where no alternate route is available. It can also be used to reduce user created erosion. Armouring generally involves the use of rock to harden

the trail tread, however other materials such as flagging stone, paving or plastic soil reinforcing materials may be used.

Although armouring hardens the trail tread, all the principles of sustainable trail design still apply as it is essential that water is prevented from following down or under that section of trail.

Tread Armouring

Armouring is a method of using large rocks to pave a trail and prevent erosion.



Rolling Crown Switchback

A sustainable turn on a hillside engineered for drainage. The upper approach is insloped and the lower approach is outsloped.



📍 Mount Buller, Victoria



Climbing Turns

A climbing turn should be used on shallow slopes that are free flowing and gentle. Grade reversals before the turn to help divert water away and avoid erosion.




Derby, Tasmania



Trail Corridor

The full dimensions of the trail, including the area on either side of the tread and the space overhead that needs to be cleared of bush and obstacles.



 Margaret River, Western Australia

Mountain bikers like a challenge and technical trail features (TTF) are often used to provide that challenge. TTFs do not always need to be built structures such as tabletops and ladders. - they can be created by the environment the trail is in, for example, rock gardens, a fallen log, or boulders that creates a drop.

It is critical to design trails that fit into the landscape and look like they are meant to be there. Trails and TTFs shouldn't stand out or look like a scar on the natural landscape.

When deciding the type of trail features to include, consider the following:

- The tenure and significance of the site/ landscape. What is appropriate for a particular landscape considering conservation and other values, for example:
 - It may not be appropriate to incorporate built structures in sites which have high conservation, cultural or other values.
 - Degraded sites such as rehabilitated mine sites or areas that have been harvested may lend themselves to built structures and TTFs, or more significant earthworks.
 - Urban/ built environments may cater for built structures and TTFs.
- Trail difficulty classification (Refer to Chapter 10)
- Target market (Refer to Chapter 2)
- The experience that the trail is aiming to provide
- The purpose of the trail, for example:
 - To link to another trail or site
 - Provide a range of riders a fun 'flowy' ride through the bush
 - Provide experienced riders with a technical trail aimed at progression.
- Other user groups in the area (wanted and unwanted).

Flow and Technical Trails

Flow and technical mountain bike trails provide different riding experiences. Both styles of trail test the ability of riders to choose the best line and then ride that line smoothly.

Trails can be all flow, all technical or include both flow and technical sections. The style of trail developed will depend on:

- Location
- Topography and environmental conditions
- The type of riding experience sought (the demand)
- If the trail will accommodate other trail users such as hikers, trail runners, horse riders and/ or off-road vehicles.

Flow Trails

Flow mountain bike trails enable riders to develop a rhythm – or 'flow' - by maintaining momentum with minimal pedalling or braking. This type of trail typically contains features like berms, rolling terrain, various types of jumps, and consistent and predictable surfaces (IMBA).

Flow trails can be designed to be used by riders of different abilities - with beginners and less skilled riders able to travel at slower speeds and roll over or bypass features and obstacles, and more advanced riders able to travel at higher speeds and ride over or jump features and obstacles.



Flow is created and maintained using:

- Rolling terrain
- Sweeping turns and corners
- Berms
- Consistent and predictable surfaces
- Generally insloped
- Jumps and drops and other TTFs that are relative to the trail's difficulty classification and are built with a smooth transition.

Flow trails should **not** include:

- Long climbs, the descents should instead assist the ascents
- Short and obstructed sightlines
- Tight turns or corners
- Uneven and unpredictable surfaces
- Unexpected or unavoidable TTFs or obstacles.

Technical Trails

Technical mountain bike trails test the bike handling skills and balance of riders.

The difficulty of technical trails can vary. Advanced technical mountain bike trails are usually incompatible with other trail users due to the nature of the trail and the speed and actions of the riders.

Technical trails typically include:

- Tight turns and corners
- Short and obstructed sightlines
- Uneven and unpredictable surfaces
- Generally slower rider speeds
- Challenging, and sometimes unavoidable, TTFs or obstacles.

Trails that include both flow and technical sections must be designed to ensure smooth transitions between different sections. The use of slow points, chicanes, and corners directly before a technical section will gradually slow riders, reduce skidding, and improve the transition.

Locating a descent directly after a technical section will enable riders to accelerate quickly and easily and develop flow.

Note:

Please note that the technical drawings have not been developed for use as construction drawings, local considerations (terrain, soil type, etc.) together with specific trail user experience outcomes need to be incorporated into 'For Construction' drawings.

Resources:

A suite of technical drawings has been developed to support these guidelines and are located on the AusCycling website.

These drawings provide additional detail to guide trail design and construction requirements and have been developed to assist land managers and trail builders gain a uniform understanding of minimum design requirements and trail construction outcomes.



Trail Demarcation or Anchors

Trail users will often cut corners through turns or around TTFs. This can negatively affect the sustainability of a trail. Demarcation or anchors are a subtle way of keeping riders on the intended line.

This can be done by placing natural elements such as rocks and logs, or planting vegetation to set a boundary around the trail – the trick is to do this in a way that riders don't notice.

The level of demarcation or anchor required will be dependent on the site, the following techniques may be considered:

- using natural landforms and on-site material
- existing vegetation
- planting
- using imported material that reflects the landscape

If demarcation is not designed and constructed properly it can be visually obtrusive. If done well it will blend into the environment and trail users will not notice it. However, it is important that the demarcation or anchor does not blend in so much so that it becomes unnoticeable and catches riders unaware. Strategically selected and placed demarcations or anchors can offer a more advanced TTF for the more experienced riders.



Trail Filters

A filter is the first technical trail feature riders will encounter on a trail. The filter should be visible at the start of the trail and be designed and constructed in a way that riders cannot avoid it.

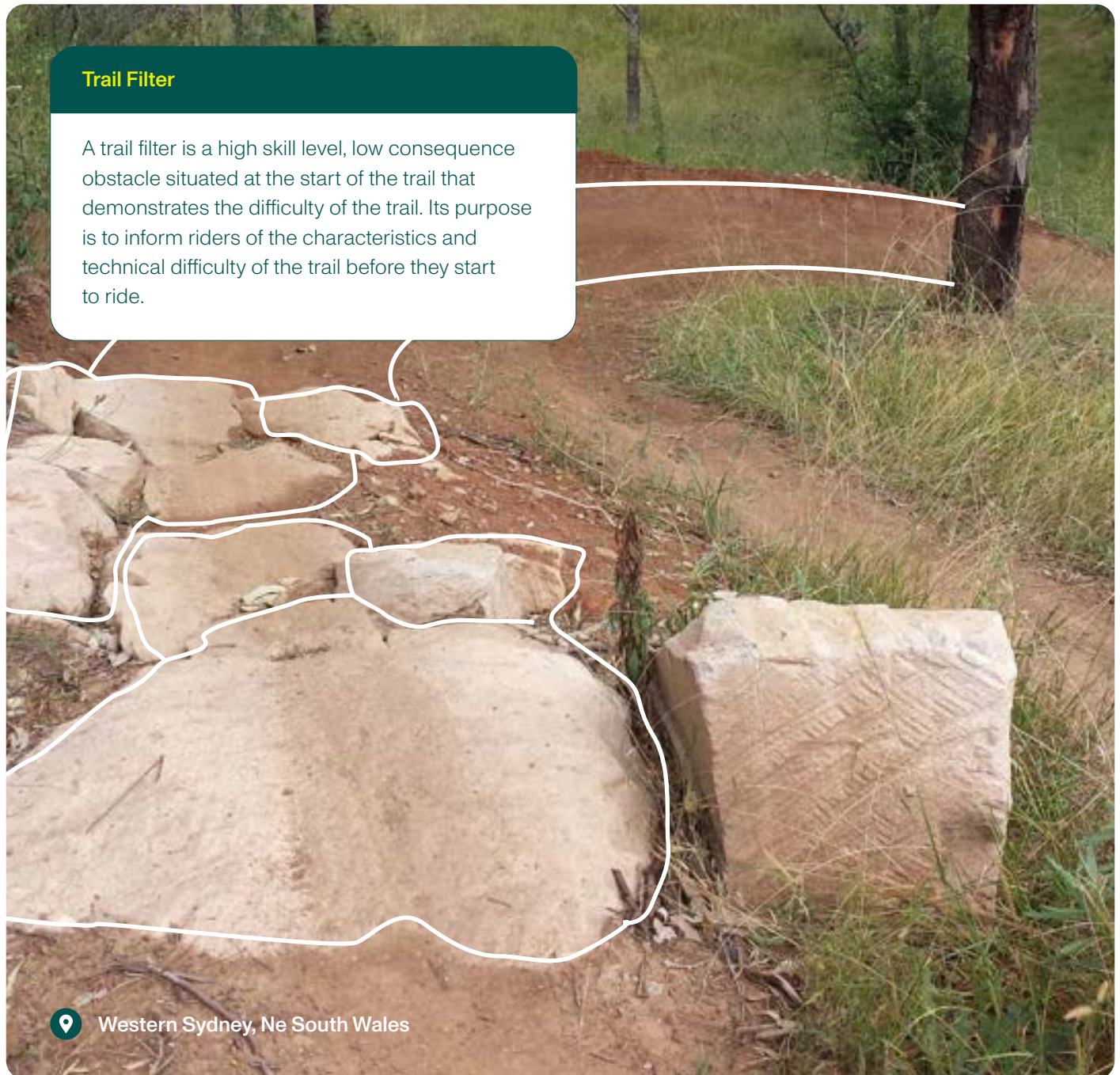
The filter should be equally difficult as the most difficult trail feature on the main line of the trail. The intention of the filter is to clearly inform riders of the characteristics and technical difficulty of that trail before they start riding it.

Filters should be difficult but with lower consequences than TTFs on the rest of the trail. They should require the same skill as the features on the trail and reflect the character of the trail.

All trails from green (easy) classification up should incorporate a filter at the start of the trail.

Trail Filter

A trail filter is a high skill level, low consequence obstacle situated at the start of the trail that demonstrates the difficulty of the trail. Its purpose is to inform riders of the characteristics and technical difficulty of the trail before they start to ride.



Western Sydney, Ne South Wales



Alternative Lines

Alternative lines are optional routes or obstacles within one trail, usually designed to either allow a more difficult route to be taken, allow for an easier option around a TTF or provide an alternative option of the same classification to provide a diverse experience.

- Alternative lines:
 - Allow different levels of riders to ride together
 - Can aid progression
 - Require careful design and sign plans
- When designing alternative lines, the planned/ sign posted trail grade should always be the main trail.

The rider should have to make a conscious decision to ride a line that is more difficult than the main trail classification.

- If designing more difficult lines into a trail, the classification should not exceed more than one level higher than the classification of the main trail. Alternative lines of the same classification may be designed to offer riders a more diverse trail experience.

The inclusion of alternative lines should be discussed during the Stage 2 of the Trail Development Process (Refer to Chapter 12). If a trail will include alternative lines, these should be designed into the trail to ensure trail flow and appropriate decision points.

These guidelines are focused on recreational mountain bike trails. However, it is acknowledged that race events may require alternative lines where the fastest line is the more difficult line.



Fall Zones

A fall zone is an area where there is a higher probability of a rider falling off their bike. Such as:

- The area around or next to a TTF
- Bottom of descents
- Outside of corners that a rider may deviate into.

Fall zones should reduce the risk and level of injury. Hazard mitigation efforts can include:

- Cutting or digging out any sharp objects
- Trimming tree branches to branch shoulder
- Dulling sharp points or edges of logs and rocks.


Note:

The fall zone does not need to be cleared of all vegetation. Moss, grasses, herbaceous and small shrubs should be left to avoid soil erosion and to deter riders from enlarging the trail into the fall zone.

Fall zones should be considered and included in the Detailed Design phase of the Trail Development Process (Refer to Chapter 12).

The Fall Zone

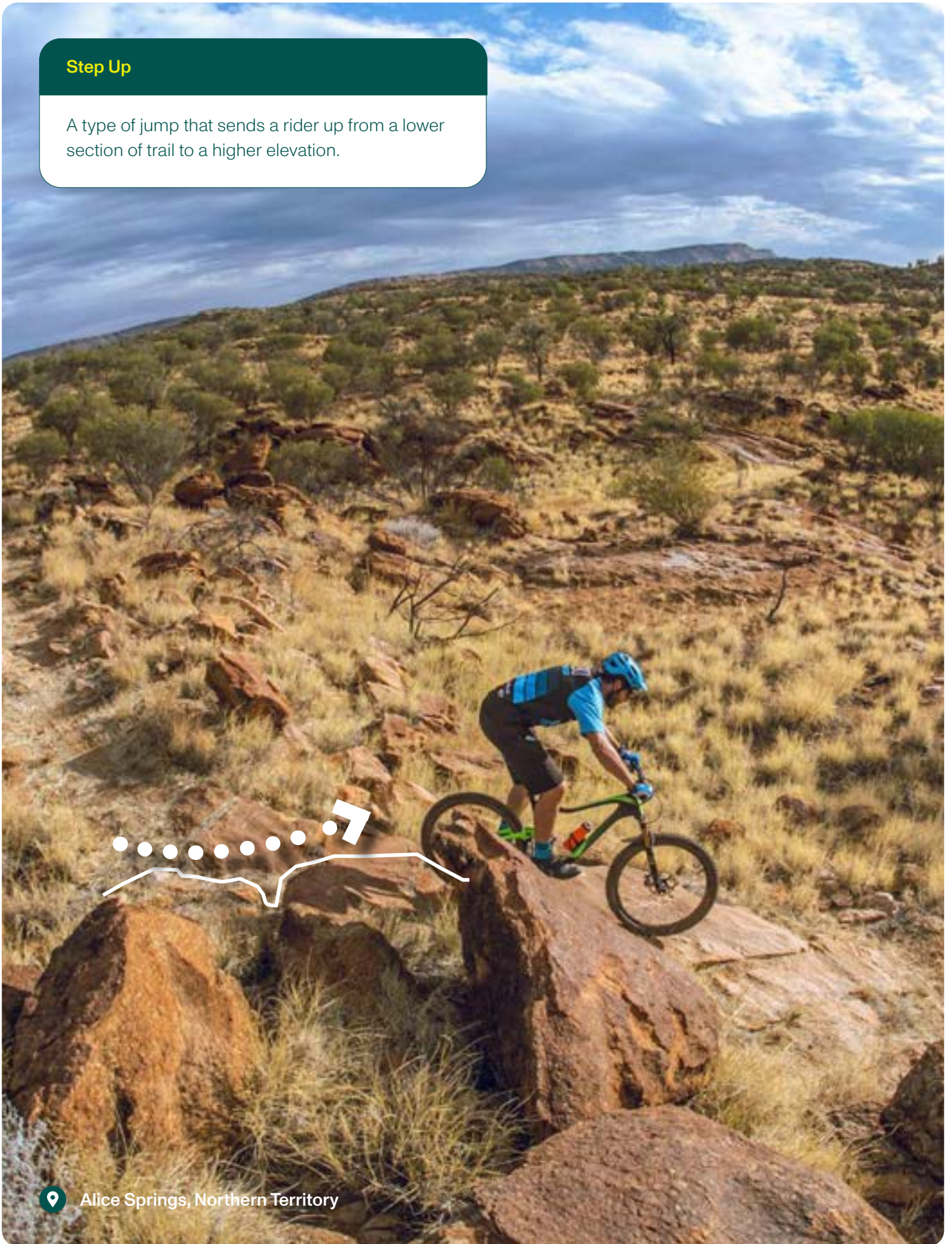
The area on either side of or below a technical trail feature that provides a clear landing for a rider who has failed to negotiate the obstacle.


 Cairns, Queensland



Step Up

A type of jump that sends a rider up from a lower section of trail to a higher elevation.

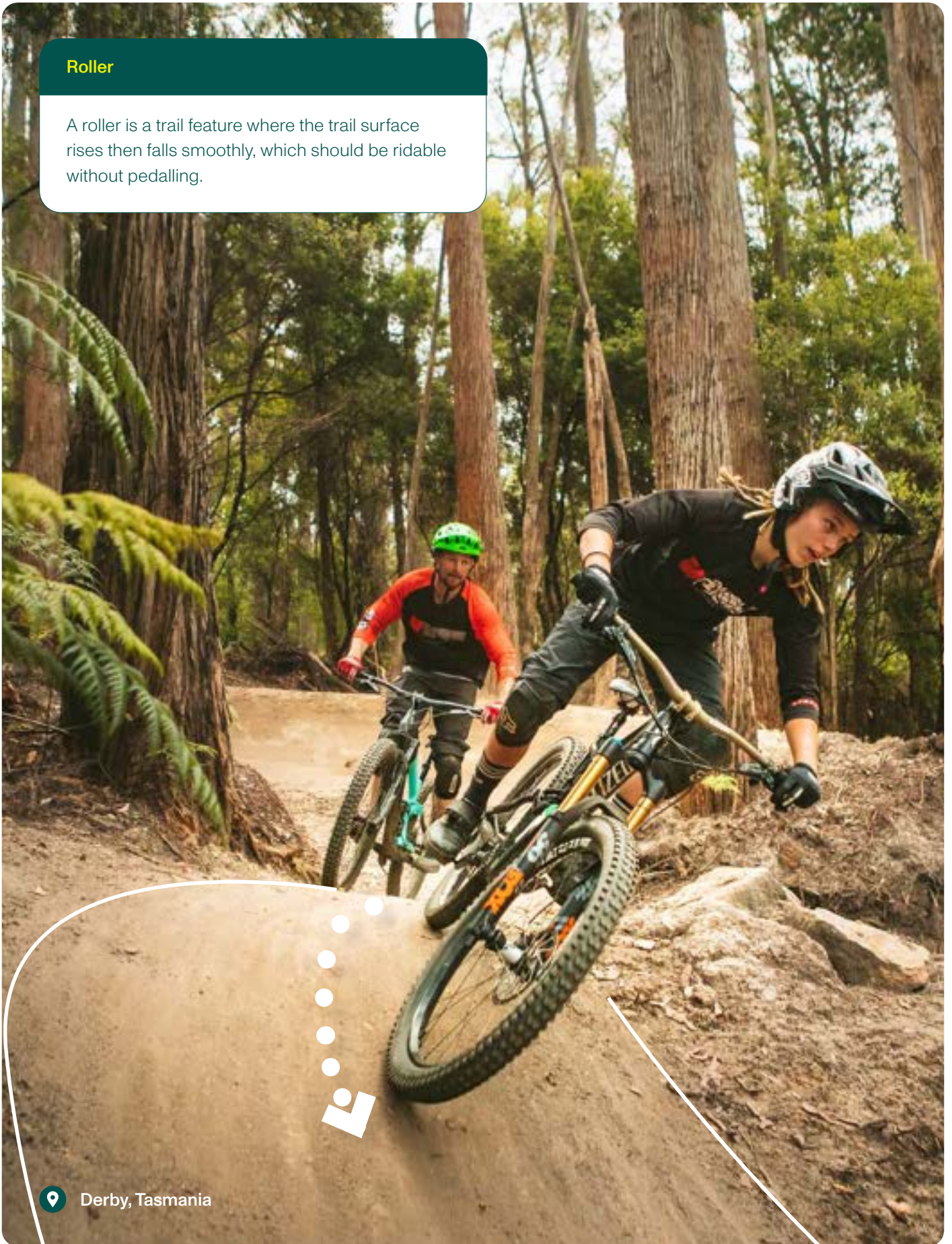



 Alice Springs, Northern Territory



Roller

A roller is a trail feature where the trail surface rises then falls smoothly, which should be rideable without pedalling.

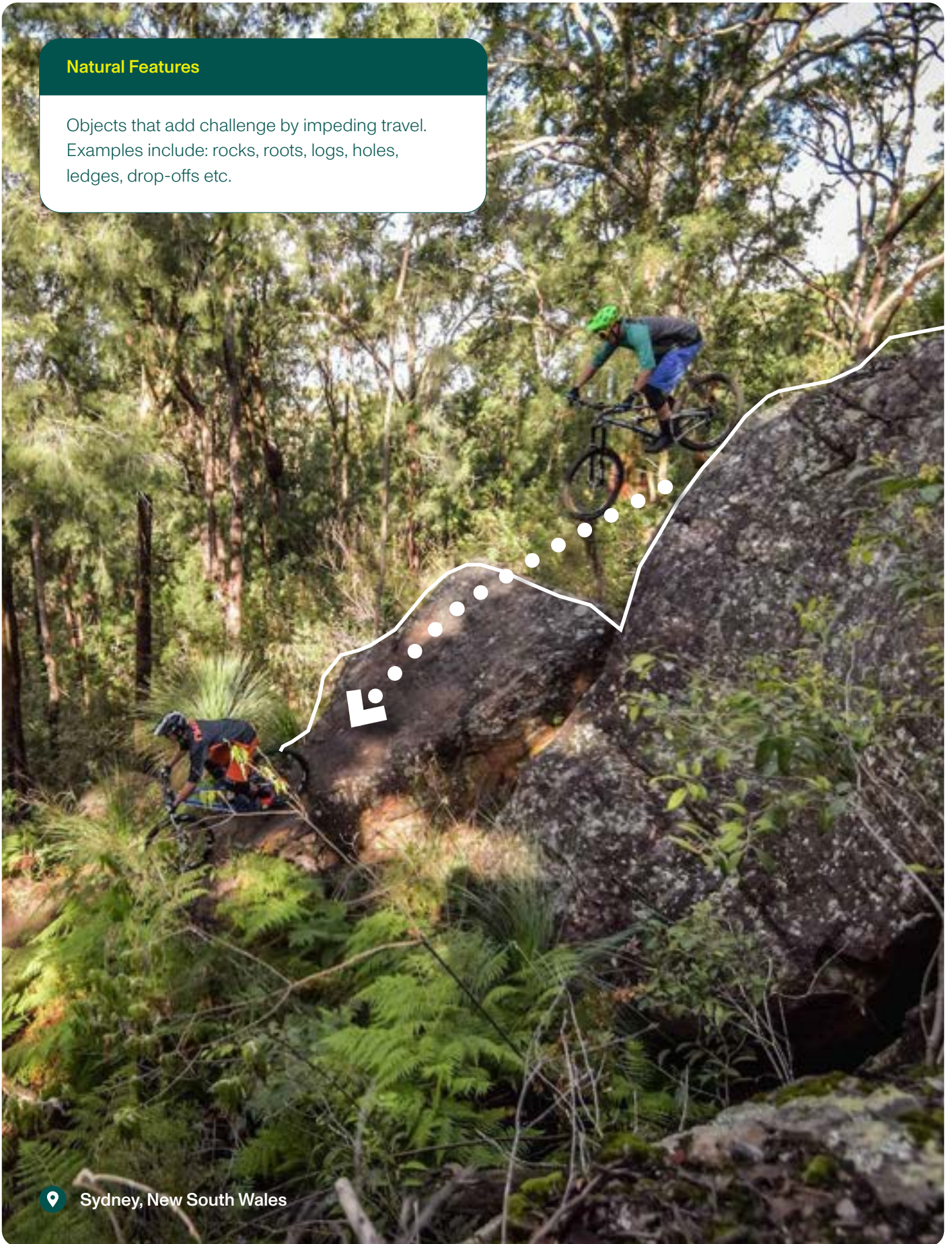


 Derby, Tasmania



Natural Features

Objects that add challenge by impeding travel. Examples include: rocks, roots, logs, holes, ledges, drop-offs etc.



 Sydney, New South Wales



Gap Jumps

A type of jump on a trail in which there is a break between the takeoff and the landing. The priority when building jumps is to create smooth flow through the approach, take-off, air and landing.



Tabletop

A tabletop is a jump feature with a flat top which separates the take-off ramp from the downslope. The advantage with this feature is that the jump can be rolled over at any stage.



📍 Stromlo, ACT



Drop Off

A drop off is a feature on the trail where the rider will undertake a step down from a high level to a lower, defined by losing vertical height of the trail edge.



📍 Rockhampton, Queensland



General Difficulty Rating Requirements

As highlighted in the Sustainability Chapter, mountain bike riders seek a range of experiences, difficulty levels and challenges to satisfy their own specific riding expectations.

To cater for this variety of expectations, trail features and trail difficulty can be increased or decreased to meet the desired rider experience. As a result, not all trails will be suited to the experience and skills of all riders

A trail difficulty rating system allows trails to be graded according to their relative technical difficulty.

Trail are classified based on the physical attributes presented and the technical challenge of the trail, not the exertion and fitness that may be required by the user.

The classification of a trail must reflect the most difficult section of that trail for visitor risk management purposes.

It is important to provide information to:

- Help riders make informed decisions
- Encourage riders to use trails that match their skill level
- Manage risk and minimise injuries
- Aid in the planning and design of trails.

Trail classifications allow trail designers, builders and land managers to develop trails appropriate for the anticipated users, based on objective criteria.

Strategies that can be used to minimise and transfer risk regarding mountain bike trails include:

- Communicating the risk through classifications and signage; this reduces the probability of a rider attempting a trail above their ability.
- Installing a trail filter at the beginning of a trail to let the rider know what type of features to expect and give the option to turn back if they decide the trail will be too difficult for them.
- Construct a skills park near the trail head that incorporates features similar to those encountered in the trail network but located in a controlled environment (high reward and low risk for the rider).
- Providing similar features within a trail network from green to black to give riders the opportunity to practice to aid with skill progression.

The International Trail Marking System is used universally on ski fields, and has been adapted by the International Mountain Bicycling Association (IMBA) for classifying the difficulty of mountain bike trails.

These guidelines have adopted the IMBA system with the following additions and interpretations:

- The addition of two new trail difficulty classifications – one new classification between green and blue and one new classification between blue and black
- Making the following difficulty assessment criteria 'guiding criteria only':
 - Trail width
 - Trail surface
 - Trail gradient
 - Quality of signs
- Making the following difficulty assessment criteria 'risk assessable criteria':
 - Trail exposure
 - Natural and technical trail features.



Optional Lines or Alternate Trail Features

Trails sometimes have optional lines or alternate trail features along the length of the trail that exceed the difficulty rating for the rest of the trail.

For example a Blue rated trail may have a number of rock drops or jump features that exceed the blue rating for the trail, however there are clear lines to bypass the difficult features and riders need to make a deliberate decision to ride the difficult features.

In these instances, the trail can maintain the lower difficulty classification, provided clear lines are available to bypass the difficult features and appropriate warning signage is installed to highlight the more difficult line.



Symbols and Descriptions

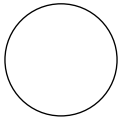






The Trail Difficulty Rating System (TDRS) outlined below provides seven levels of difficulty for mountain bike trails. The TDRS enables visitors to understand the nature of the trail before beginning their ride and allows them to plan their ride for enjoyment, appropriate level of challenge and safety.

Trail ratings can be communicated in several ways. Pre-visit information may include a more detailed description of the ratings, while a shorter description is required for trailhead signage and maps. Rating colours should be used on all on trail directional signage.

Mountain bike TDRS short trail descriptors should be used at trail signage, on brochures and maps or similar applications.

The use of the bike in the centre of each symbol is optional and will likely depend if the trail network consists of multi-use & shared use trails or single use.


Table 10. Mountain bike TDRS short descriptors

Difficulty Symbol	Short Description
	<p>Very easy</p> <p>Wide trail with a gentle gradient smooth surface and no obstacles Suitable for beginner cyclists with basic bike skills, and most bikes</p>
	<p>Easy</p> <p>Wide trail with a gentle gradient smooth surface Some obstacles such as roots, logs and rocks Suitable for beginner cyclists with basic mountain bike skills, and off-road bikes</p>
	<p>Easy with Intermediate Sections</p> <p>Likely to be single track with a moderate gradient, variable surface and some obstacles Some obstacles such as roots, logs and rocks Suitable for mountain bikers with mountain bikes</p>
	<p>Intermediate</p> <p>Single trail with moderate gradients, variable surface and obstacles May include steep sections Suitable for skilled mountain bikers with mountain bikes</p>
	<p>Intermediate with Difficult Sections</p> <p>Suitable for competent mountain bikers, used to physically demanding routes Expect large and unavoidable obstacles and features Challenging and variable with some steep climbs or descents and loose surfaces</p>
	<p>Difficult</p> <p>Suitable for experienced mountain bikers, used to physically demanding routes Navigation and personal survival skills are highly desirable Expect large, dangerous and unavoidable obstacles and features Challenging and variable with long steep climbs or descents and loose surfaces Some sections will be easier to walk</p>
	<p>Extreme</p> <p>Suitable for highly experienced mountain bikers, used to physically demanding routes Navigation and personal survival skills are highly desirable Severe constructed trails and/ or natural features, all sections are challenging Includes extreme levels of exposure and / or risk Expect large and unavoidable obstacles and features Some sections will be easier to walk</p>

Trail Classification Matrix


The Trail Classification Matrix incorporates the Trail Difficulty Rating System and provides detailed information to use when planning, designing, constructing and maintaining mountain bike trails to ensure a consistent classification standard is applied.

Very Easy Mountain Bike Trail / Fire Trail

		Technical Description (for Land Manager use)	Trail Description (for public information)	Generic Description (for public Information)	Short Classification Key
Grade of trail		Very easy			
Description		Likely to be a fire road, rail trail or wide single track with a gentle gradient, smooth surface and free of obstacles	Likely to be a fire road, rail trail or wide single track with a gentle gradient, smooth surface and free of obstacles	Wide trail with a gentle gradient smooth surface and no obstacles Suitable for beginner cyclists with basic bike skills, and most bikes	Wide trail, gentle gradient smooth surface, no obstacles For beginner cyclists with basic bike skills
Guiding Criteria	Trail Width	2100 mm plus or minus 900 mm	Two riders can ride side by side		
	Trail Surface	Hardened or smooth	Hardened with no challenging features on the trail		
	Trail Gradient	Climbs and descents are mostly shallow Ave. trail grade – 7% or less Max. trail grade – 15%	Climbs and descents are mostly shallow		
	Quality of Markings	Trailhead signs and route markers at intersections	Clearly signposted		
Risk Assessable Criteria	Level of Trail Exposure	Exposure to either side of the trail corridor includes downward slopes of up to 30%	Minimal exposure on either side of the trail corridor		
	Natural Obstacles and Technical Trail Features (TTFs)	Unavoidable bridges 2100mm or wider	No obstacles		
Experience Required		Suitable for beginner / novice cyclists with basic bike riding skills Suitable for most bikes	Suitable for beginner / novice cyclists with basic bike riding skills. Suitable for most bikes		




Easy Mountain Bike Trail

		Technical Description (for Land Manager use)	Trail Description (for public information)	Generic Description (for public information)	Short Classification Key
Grade of trail		Easy			
Description		Likely to be a combination of fire road or wide single track with a gentle gradient, smooth surface and relatively free of obstacles Short sections may exceed these criteria	Likely to be a combination of fire road or wide single track with a gentle gradient, smooth surface and relatively free of obstacles Short sections may exceed these criteria	Wide trail with a gentle gradient smooth surface Some obstacles such as roots, logs and rocks Suitable for beginner cyclists with basic mountain bike skills, and off-road bikes	Wide trail, gentle gradient, some obstacles For beginner mountain bikers with basic mountain bike skills
Guiding Criteria	Trail Width	900 mm plus or minus 300 mm	Handlebar width or greater		
	Trail Surface	Mostly firm and stable	Mostly firm and stable		
	Trail Gradient	Climbs and descents are mostly shallow, but trail may include some moderately steep sections Ave. trail grade – 7% or less Max. trail grade – 15%	Climbs and descents are mostly shallow, but trail may include some moderately steep sections		
	Quality of Markings	Trailhead signs and route markers at intersections	Clearly signposted		
Risk Assessable Criteria	Level of Trail Exposure	Exposure to either side of the trail corridor includes downward slopes of up to 30%	Minimal exposure on either side of the trail corridor		
	Natural Obstacles and Technical Trail Features (TTFs)	Unavoidable obstacles to 100mm high, such as logs, roots and rocks Avoidable, rollable obstacles or jumps may be present Unavoidable bridges 900mm or wider Short sections may exceed these criteria	Trail may have obstacles such as logs, roots, rocks and jumps		
Experience Required		Suitable for beginner / novice mountain bikers with basic mountain bike skills Suitable for off-road bikes	Suitable mountain bikers with basic mountain bike skills Suitable for most bikes		




Easy / Intermediate Mountain Bike Trail

		Technical Description (for Land Manager use)	Trail Description (for public information)	Generic Description (for public Information)	Short Classification Key
Grade of trail		Easy with Intermediate Sections			
Description		Likely to be single track with a moderate gradient, variable surface and some obstacles Short sections may exceed these criteria	Likely to be single track with a moderate gradient, variable surface and some obstacles Short sections may exceed these criteria	Likely to be single track with a moderate gradient, variable surface and some obstacles Some obstacles such as roots, logs and rocks Suitable for mountain bikers with mountain bikes	Single track, moderate gradient and some obstacles For beginner mountain bikers with basic mountain bike skills
Guiding Criteria	Trail Width	750 mm plus or minus 200 mm	Handlebar width		
	Trail Surface	Mostly firm and stable	Mostly firm and stable		
	Trail Gradient	Climbs and descents are mostly shallow, but trail may include some moderately steep sections Ave. trail grade – 7% or less Max. trail grade – 20%	Climbs and descents are mostly shallow, but trail may include some moderately steep sections		
	Quality of Markings	Trailhead signs and route markers at intersections	Clearly signposted		
Risk Assessable Criteria	Level of Trail Exposure	Exposure to either side of the trail corridor includes downward slopes of up to 30%	Minimal exposure on either side of the trail corridor		
	Natural Obstacles and Technical Trail Features (TTFs)	Unavoidable obstacles to 200mm high, such as logs, roots and rocks Avoidable, rollable obstacles and jumps may be present Unavoidable bridges 900mm or wider Short sections may exceed these criteria	Trail may have obstacles such as logs, roots, rocks and jumps		
Experience Required		Suitable for beginner / novice mountain bikers with basic mountain bike skills Suitable for off-road bikes	Suitable mountain bikers with basic mountain bike skills Suitable for most bikes		




Intermediate Mountain Bike Trail

		Technical Description (for Land Manager use)	Trail Description (for public information)	Generic Description (for public information)	Short Classification Key
					
	Grade of trail	Intermediate			
	Description	Single trail with moderate gradients, variable surface and obstacles Dual use or preferred use	Single trail with moderate gradients, variable surface and obstacles	Single trail with moderate gradients, variable surface and obstacles May include steep sections Suitable for skilled mountain bikers with mountain bikes	Single trail, moderate gradients, obstacles and some steep sections For skilled mountain bikers
Guiding Criteria	Trail Width	600 mm plus or minus 300 mm	Handlebar width or greater		
	Trail Surface	Possible sections of rocky or loose tread	Possible sections of rocky or loose tread		
	Trail Gradient	Mostly moderate gradients but may include steep sections Ave. trail grade – 10% or less Max. trail grade – 20% Short sections may exceed these criteria	Mostly moderate gradients but may include steep sections		
	Quality of Markings	Trailhead signs and route markers at intersections	Signposted		
Risk Assessable Criteria	Level of Trail Exposure	Exposure to either side of the trail corridor includes downward slopes of up to 50%	Sections of trail will include moderate exposure on either side of the trail corridor		
	Natural Obstacles and Technical Trail Features (TTFs)	Unavoidable obstacles to 350 mm high, such as logs, roots and rocks Avoidable, obstacles to 600 mm may be present, width of deck is greater than half the height of the obstacle Tabletop jumps to 1500mm high, rollable double jumps and avoidable gap jumps Unavoidable bridges 600mm or wider Short sections may exceed these criteria	Trail will have obstacles such as logs, roots, rocks and jumps		
	Experience Required	Suitable for skilled mountain bikers with basic mountain bike skills Suitable for mountain bikes	Suitable for skilled mountain bikers with basic mountain bike skills Suitable for mountain bikes		




Intermediate / Difficult Mountain Bike Trail

		Technical Description (for Land Manager use)	Trail Description (for public information)	Generic Description (for public information)	Short Classification Key
	Grade of trail	Intermediate with Difficult Sections			
	Description	Likely to be a challenging single trail with moderate gradients, variable surface and obstacles Dual use or preferred use	Likely to be a challenging single trail with moderate gradients, variable surface and obstacles	Suitable for competent mountain bikers, used to physically demanding routes Expect large and unavoidable obstacles and features Challenging and variable with some steep climbs or descents and loose surfaces	For competent mountain bikers Large, unavoidable obstacles and features Some steep climbs or descents and loose surfaces
Guiding Criteria	Trail Width	600 mm plus or minus 300 mm	Handlebar width or greater		
	Trail Surface	Possible sections of rocky or loose tread	Possible sections of rocky or loose tread		
	Trail Gradient	Mostly moderate gradients but may include steep sections Ave. trail grade – 20% or less Max. trail grade – 30% Short sections may exceed these criteria	Mostly moderate gradients but may include steep sections		
	Quality of Markings	Trailhead signs and route markers at intersections	Signposted		
Risk Assessable Criteria	Level of Trail Exposure	Exposure to either side of the trail corridor includes downward slopes of up to 50%	Sections of trail will include moderate exposure on either side of the trail corridor		
	Natural Obstacles and Technical Trail Features (TTFs)	Unavoidable obstacles to 400 mm high, such as logs, roots and rocks Avoidable, obstacles to 1000 mm may be present, width of deck is greater than half the height of the obstacle Tabletop jumps to 2000mm high, rollable double jumps and avoidable gap jumps Unavoidable bridges 600mm or wider Short sections may exceed these criteria	Trail will have obstacles such as logs, roots, rocks and jumps		
	Experience Required	Suitable for competent mountain bikers with good mountain bike skills Suitable for mountain bikes	Suitable for competent mountain bikers with good mountain bike skills Suitable for mountain bikes		



Difficult Mountain Bike Trail

	Technical Description (for Land Manager use)	Trail Description (for public information)	Generic Description (for public Information)	Short Classification Key
Grade of trail	Difficult			
Description	<p>Likely to be a challenging single trail with steep gradients, variable surface and many obstacles</p> <p>Single use and direction Optional lines</p> <p>Suitable for cross country, downhill or trials</p>	<p>Likely to be a challenging single trail with steep gradients, variable surface and many obstacles</p>	<p>Suitable for experienced mountain bikers, used to physically demanding routes</p> <p>Navigation and personal survival skills are highly desirable</p> <p>Expect large, dangerous and unavoidable obstacles and features</p> <p>Challenging and variable with long steep climbs or descents and loose surfaces</p> <p>Some sections will be easier to walk</p>	<p>For experienced mountain bikers</p> <p>Challenging trail</p> <p>Large, unavoidable obstacles and features</p> <p>Long, steep climbs or descents and loose surfaces</p>
Guiding Criteria	Trail Width	300 mm plus or minus 150 mm for tread and bridges	Can be less than handlebar width	
	Trail Surface	Variable and challenging	Variable and challenging	
	Trail Gradient	<p>Contains steep descents and climbs</p> <p>Ave. trail grade – 20% or less</p> <p>Max. trail grade – 30%</p> <p>Short sections may exceed these criteria</p>	Contains steep descents and climbs	
	Quality of Markings	Trailhead signs and route markers may be limited	Limited signs	
Risk Assessable Criteria	Level of Trail Exposure	Exposure to either side of the trail corridor includes steep downward slopes or freefall	Exposure to either side of the trail corridor includes steep downward slopes or freefall	
	Natural Obstacles and Technical Trail Features (TTFs)	<p>Unavoidable obstacles to 500 mm high, such as logs, roots, drop off's or constructed obstacles</p> <p>Avoidable, obstacles to 1200 mm may be present, width of deck is greater than half the height of the obstacle</p> <p>Tabletop jumps to 2500mm high, rollable double jumps and avoidable gap jumps</p> <p>Unavoidable bridges 600mm or wider</p> <p>Short sections may exceed these criteria</p>	Unavoidable obstacles such as logs, roots, drop off's, jumps or constructed obstacles	
Experience Required	<p>Suitable for experienced mountain bikers with good skills, used to physically demanding routes</p> <p>Navigation and personal survival skills are highly desirable</p> <p>Suitable for better quality mountain bikes</p>	<p>Suitable for experienced mountain bikers with good skills, used to physically demanding routes</p> <p>Navigation and personal survival skills are highly desirable</p> <p>Suitable for better quality mountain bikes</p>		



Extreme Mountain Bike Trail

		Technical Description (for Land Manager use)	Trail Description (for public information)	Generic Description (for public Information)	Short Classification Key
	Grade of trail	Extreme			
	Description	Extremely difficult trails incorporating very steep gradients, highly variable surface and unavoidable, severe obstacles Single use and direction Optional lines Cross country, downhill or trials	Likely to be a challenging single trail with steep gradients, variable surface and many obstacles	Suitable for highly experienced mountain bikers, used to physically demanding routes Navigation and personal survival skills are highly desirable Severe constructed trails and/ or natural features, all sections are challenging Includes extreme levels of exposure and / or risk Expect large and unavoidable jumps, obstacles and features Some sections will be easier to walk.	For highly experienced mountain bikers All sections extremely challenging Large, unavoidable jumps, obstacles and severe features
Guiding Criteria	Trail Width	150 mm plus or minus 100 mm for tread and bridges Structures can vary	Can be less than handlebar width		
	Trail Surface	Widely variable and challenging	Widely variable and challenging		
	Trail Gradient	Expect prolonged steep, loose and rocky descents or climbs Average trail grade – 20% Max. trail grade – 40% Short sections may exceed these criteria	Expect prolonged steep, loose and rocky descents or climbs		
	Quality of Markings	Trailhead signs and route markers may be limited	Limited signs		
Risk Assessable Criteria	Level of Trail Exposure	Exposure to either side of the trail corridor includes steep downward slopes or freefall	Exposure to either side of the trail corridor includes steep downward slopes or freefall		
	Natural Obstacles and Technical Trail Features (TTFs)	Unavoidable obstacles over 1000mm Avoidable, obstacles may be present Unavoidable gap jumps and doubles Unavoidable bridges 600mm or narrower Width of bridges is unpredictable Short sections may exceed these criteria	Unavoidable obstacles such as gap jumps, logs, roots, drop off's or constructed obstacles		
	Experience Required	Suitable for highly experienced mountain bikers with excellent skills, used to physically demanding routes Navigation and personal survival skills are highly desirable Suitable for quality mountain bikes	Suitable for highly experienced mountain bikers with excellent skills, used to physically demanding routes Navigation and personal survival skills are highly desirable Suitable for quality mountain bikes		



Adaptive Mountain Bike Classification Requirements

Break the Boundary Inc. with support of AusCycling has developed the Australian Adaptive Mountain Bike Guidelines and resources for download and use by associate members, clubs, charities, departments and associations around Australia.

The Guidelines address many challenges with adaptive mountain biking and includes an Adaptive Trail Rating (ATR) system. The Adaptive Trail Rating System is available from the Break the Boundary website.



The Australian Adaptive Mountain Biking Guidelines



Adaptive Trail Rating signage



Trail signage is an essential element to managing trails. Trail signage is a communication tool that enables a trail user to understand the trail. Signage must communicate clear and consistent messages.

Good trail network signage provides:

- Clear identification of trails
- Easy orientation and directional information for trail users
- Clear definition and explanation of trail difficulty levels
- A method for managing end user risks
- Opportunities to educate riders about environmental impacts
- Clear and effective emergency management information.

Trail network signage is also used to convey messages such as:

- Trail etiquette / mountain biker's code
- Risks or warnings
- Historic or cultural messages.

Please note that trail closure signage and specific risk or hazard management signage is not covered in these guidelines. Refer to the relevant land manager for specific risk and hazard signage used in the relevant area.

Trail signage should be obvious without being obtrusive to the natural environment. Signs should never be attached to trees or other vegetation as the signs and attachments will damage the vegetation as well as creating maintenance issues.

The size of the characters on the sign should be easily read by the target audience. Character size may change depending on the location of the sign on the trail, for example, signs on fast sections will require larger characters so they are easily read while passing quickly.

Signage is just as important as the trail itself and a signage plan must be developed as part of Detailed Design element of the Trail Development Process (Refer to Chapter 12).

The costs of signage must be included in trail budgets and all signage should be installed during the trail construction stage.

Sign planning is a skill and is essential to a mountain bike trail. Locals or regular riders often forget that visitors and beginners won't instinctively know where to go.



When undertaking sign planning it is a good idea to consider:

- How will riders get from the car park to the trailhead sign?
- How will riders get from the trailhead sign to their choice of trail?
- How will riders know which way to go when they reach an intersection?

Land managers / trail owners / operators generally have an established signage system comprising of management, orientation and interpretative signs that are used at all the of their parks and reserves. The system typically allows consistency across managed estate and as a branding and a point of recognition for the public.

Always check with the land manager or owner before developing signs.

Trailhead Signage

Trailhead signage should display the entire trail system and provide key navigation and trail user information. The trail user should be able to easily identify the location of trailhead signage from the access point (eg. the car park). Trailhead signage should include:

- A map of the trail system. The map should clearly show how trails link up. For example, where a single-track trail uses a section of fire road or vehicle track this should be marked as a continuous trail. Maps should always:
- Be orientated logically for the location and include a legend and scale.
- Outline the trail difficulty rating system with a short description. (Refer to Chapter 10)
- A short description of the trails – use standard trail difficulty classification colours. These can be found in Chapter 10.
- Code of conduct/rules of the trail/ trail etiquette
- Any suggested riding loops incorporating multiple trails
- Land manager logo and contact details
- Local group logo and contact details
- Sponsor logos where appropriate (seek land manager permission); and
- Emergency contact details
- Advance notice of opening hours and trail closures (eg. Total fire bans).

Always consult with the land manager when developing trail signage.

Welcome to Bayview Conservation Area

For non-emergency assistance or to report a trail problem, ring Council on 03829 8999 and quote the closest bollard number and trail name

Welcome to Bayview Conservation Area

Trail etiquette
When using track parks on Redlands Coast, be sure to follow some simple trail etiquette:

- stay on the trails – don't cut corners
- use tracks only in dry weather – we may close the park in wet conditions to preserve tracks
- obey all signs
- respect wildlife
- be considerate in protecting our bushland areas and keeping them enjoyable for all – please pick up your horses' droppings and clean hoofs where possible and help stop the spread of weeds.

Shared mountain biking and walking trails

Trail Name	Distance
Garidgee	1900m
Candlestick Boys	900m
Candlestick	330m
Candlestick	330m
Chicken Pump	250m
Chicken Run	900m
Flutter	610m
Grass Tree Link	340m
IO	837m
Kids Loop	230m
Kooljahnobbles	400m
Link Track	40m
Pick Up Sticks	2900m
Sock Puppet East	1344m
Sock Puppet West	2388m
The Maze	2300m
The Maze Extension	400m
To Chicken Run	63m
To Puck Rd	226m
Wool Patch	1900m
Yours Kidding	3358m

Shared horse riding, mountain biking and walking trails (Fire roads)

Trail Name	Distance
Black She-oak	490m
Canemery Road	760m
Crinkle Bush	2600m
Days Road Main Trail	1620m
Fring Platter	960m
GC Mixture Trail	835m
GCR Link	210m
GCR North and South	259m
Kidds Corner Track	1930m
Maples	2920m
Native Dog Rd	2080m
Puck Road	1832m
Snake Rd	2300m
Stair and Chicken	66m
Stone Hut Loop	1668m
Straddle Pump	2000m
Sugarum	244m
Talon Trail	1825m
To Straddle Pump	295m

Walking trail only

Trail Name	Distance
Bankia loop	300m

Common courtesy
Respect for others and common sense go a long way toward everybody having a great experience in Bayview Conservation Area.

Passing with courtesy

- Always give way to horses and their riders
- When cycling, you must also give way to walkers.

Passing a walker

- Great walkers early
- Pass slowly and be prepared to stop.

Passing a cyclist

- Announce to the cyclist that you intend to pass. Use the phrases, 'on your left' or 'on your right' to tell them which side you will pass on.
- If you are being passed on a single trail, stop to the side and lean away from the passing cyclist.

Passing a horse rider

- Stop at least 10m from the horse and rider
- Wait for the rider to give you the go-ahead to pass
- Pass slowly and steadily – sudden movements can spook a horse.

Trailcare volunteers
Trailcare volunteers offer their valuable time to help us maintain the quality of trails and bushland in Bayview Conservation Area. To find out about trailcare, or to become a volunteer please phone Redlands Indig/Scapes Centre on 3824 8611.

For non-emergency assistance or to report a trail problem, ring Council on 03829 8999 and quote the closest bollard number and trail name



Themed Signage

Mountain bike groups often like to add character to their trails through the name of the trails and themed signage. Themed signage often relates to the uniqueness of an area or the features of a trail. Themed signage could be included for trailheads or signage at the entrance of some trails.

Themed signage should be investigated and designed during the sign planning process, in consultation with the land manager. All themed signage must be approved by the land manager.

Trail Marking

Trails signage located at the start of trails and at intersections should include directional signs to direct trail users and keep them on the correct trails.

- Beginning of the trail:
 - The user must clearly be able to see where to go from the trailhead sign to the trail access point. If the entrance to the trail cannot be seen from the trailhead, directional signage may be used to point the way.
- At the beginning of the trail attach a trail difficulty symbol marker to the post along with a directional arrow of the same colour. The trail name may also be attached to this post.
- Intersections:
 - Trail markers should be installed a couple of metres prior to an intersection.
 - A trail marker should be installed 10 – 20 metres after the intersection to confirm the trail user has taken the correct path. Trail users should be able to see this confirmation marker from the intersection.
 - Where a trail has no intersections or other options, trail markers do not need to be installed.
- Location and destinations:
 - For trails that link to other riding destinations or other suburbs / towns, trail signage should identify where the trail will take the rider and the distance to get to the destination.
- Route Signage
 - Trail networks often consist of several trails of the same classification. Riders unfamiliar with an area can easily get disorientated.



- Where a trail meets another trail or multiple trails it may be useful to install directional signs that point to a destination (eg. to the trail head, or to a car park).
- It may be useful to use orientation signs with a map and 'you are here' points at these locations. The map should always be orientated so north is up.
- Another option is to develop trail routes for an area that link up trails with a similar difficulty classification. These routes can be numbered, or colour coded to make it very easy for riders to follow a particular route.
- Single direction trails:
 - Always install 'no entry signage' at intersections that cross single direction trails, or at the exit points of single direction trails.

A Point of Caution

Increasing the amount of signage equates to higher construction and maintenance costs. Often well-planned trail marking may be more effective than more trail signs.

Land managers will generally have specifications for trail signage and trail markers to be used on their land.

A generic trail signage and marker specification has been developed to support these guidelines. This specification should be used when a land manager has not developed a specification of their own.

The trail signage and marker specification can be found on the AusCycling website.



Trail Development Process

It is important to develop the right trails, in the right places, in the right way and for the right reasons. This ensures that trails are sustainable and are an asset to landowners and managers, trail users and the community.

Trails are like any other asset or facility development and as such, are subject to a formal planning and approval process. The processes outlined in this guideline provide landowners and managers, trail developers and trail groups with a structured and holistic approach to trail development and management.

With the increasing demand for trails across Australia, it is important that the standard of trail development is applied in a uniform manner, using current sustainability standards that provide excellent trails while minimising ongoing maintenance costs.

A robust trail development processes achieves these outcomes by moving trail development away from a purely design and construction approach to a more considered and planned approach.

Working within a standardised methodology is especially important in high conservation areas where trail

planning, design and construction needs to be done right the first time. Building rigour into the development process will ensure that project proposals are transformed into professionally built assets.

The process refers to engaging expert knowledge at various stages. It is important to note that a professional trail planner, professional trail designer and a professional trail builder are very different disciplines, and all require a different skill set and knowledge base.

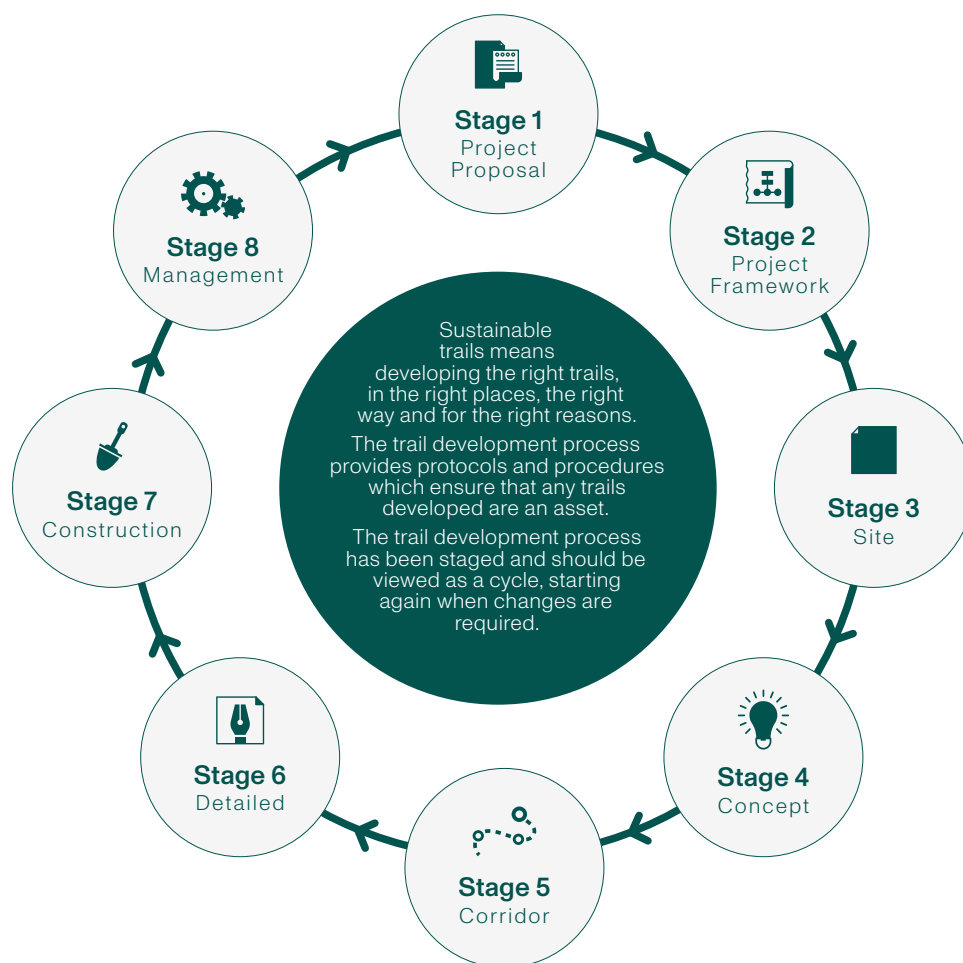
The trail development process outlined in Table 12 and Figure 1 involves eight stages and encompasses a constant evaluation, review and improvement process as trails are being extended or revised.

Each stage must be completed before moving on to the next stage. If trail revitalisation or renewal is required, the whole planning process should be reviewed to determine if the basis for previous decisions have changed.



Table 12. Trail Development Process

Stage	Outcome
1. Proposal	The proposed area is either supported in principle for trail development, or is not supported due to environmental, social or cultural constraints. Or proposal to identify suitable areas.
2. Framework	A project outline, developed by project steering group (stakeholders), including: project objectives, project management model, stakeholder roles, target market, requirements, standards, execution, and ongoing trail management model.
3. Site Assessment	Undertake a broad scale study of the area and identify constraints, soil types, vegetation etc.
4. Concept Planning	Identify opportunities and conceptual trail plan including infrastructure requirements produced. Broad trail corridors are physically flagged in the field.
5. Corridor Evaluation	Detailed assessment of corridor.
6. Detailed Design	Detailed trail design produced and physically flagged in the field, including: trail classifications, technical trail features (TTFs), construction types and specifications.
7. Construction	Trail is constructed in line with the detailed design.
8. Management	Management plan implemented detailing maintenance and monitoring requirements.



Stage 1: Project Proposal

Land management and land use legislation is complex and there is several Federal and State/Territory Acts and Regulations that must be adhered to when developing trails (Refer to Chapter 3 for additional detail). Coupled with any legislative requirements, all existing or proposed land use and management considerations must also be assessed when proposing any activity including trail development.

Undertaking preliminary background investigations and gauging support for a trail project early is vital. A few initial checks can go a long way to help avoid problems and wasted resources later in the process.

Undertaking a structured Project Proposal (Stage 1), a detailed Site Assessment (Stage 3) and Corridor Evaluation (Stage 4), will ensure the following:

- The right area is chosen which supports the proposed trail types.
- Master plans and management plans support the proposed trail development.
- Compliance with legislation. In some cases, there are hefty fines for noncompliance. Be aware that some legislation applies to privately owned land. It always pays to seek advice.
- Longevity and sustainability of the trails. For example, if a trail is built in a commercial forest without consultation with the land manager and lease holder, all the hard work that went into designing and building the trail could be lost when the forest is harvested.

Not all legislation and land constraints preclude the development of trails. However, approvals for trail development will need to be sought.

An Impact Evaluation Checklist (IEC) (Available as a resource on theAusCycling website) has been developed to support the guideline and should be used when undertaking the approvals process to ensure that required approvals are not overlooked.

The IEC process begins in Stage 1: Project Proposal when the landowner or manager perform a desktop search and initial check for major constraints that could potentially prevent trail development within a certain area.

Constraints to the trail development may include:

- The management plan for the proposed area explicitly precludes the proposed activity
- A master plan exists for the activity and the proposed area is not included in the master plan.

During the Site Assessment (Stage 3), the IEC is reviewed and validated to assist in developing the Concept Plan (Stage 4). If required, further detailed assessments or surveys are undertaken if the Concept Plan includes trail development within a sensitive area.

The IEC is then submitted for approval at the relevant level once the Corridor Evaluation (Stage 5) has taken place.

Mountain Bike Groups Proposing a Project

Project proponents must liaise with relevant landowner/s or manager/s regarding and proposed trail developments. The landowner or manager will be able to provide information on current land use and management for the area and check relevant management and master plans to determine if there are any constraints.

Landowners may also be able to identify alternative sites for consideration if the proposed area is not suitable due to major constraints.

If an individual has a proposal, this should first be discussed with the local mountain group or the national body if there is no local group in the area.

If the local group are supportive of the proposal, the land manager may be contacted through the appropriate process.

Landowners and Managers Proposing a Project

Landowners or managers must ensure that any proposed development project is discussed with the local mountain bike group and national body if there is no local group in the area, to ensure they are involved and have input throughout the development process.

A project developed without community involvement and support may not receive the anticipated support and use resulting in wasted time, effort and resources.



Stage 2: Project Framework

Developing a clear framework is essential to the successful and sustainable delivery of every trail project.

The framework informs the planning, design and delivery process and clarifies the key issues, including:

- Steering Group
- Background
- Project Objectives
- Management Model
- Scope and Scale
- User Types and Trail Types
- Trail System and Model
- Agreed Standards
- Funding and Resources
- Project Delivery
- Project Evaluation

A Framework Template has been developed to support this guideline (Available as a resource on the AusCycling website). This template can be used to develop the framework for any project, where possible the template should be adapted to include specific landowner or manager requirements.

Developing the framework can be greatly assisted by the involvement of a specialist trail planner.

Not having a clear framework in place can cause confusion and undermine the delivery and sustainability of a project.

Steering Group (Governance)

Developing a framework can only be done through clear and formal consultation with all relevant stakeholders and partners. It is crucial that all stakeholders and partners understand and buy in to the planning, design and delivery process.

An effective way of developing a framework is to establish a Steering Group to draw together relevant stakeholders and partners. The Steering Group may be made up of some or all the following as appropriate:

- Key landowner and/or land manager staff at the relevant level (commensurate with the scope and scale of the project)

- Other key stakeholders, including:
 - Local mountain bike groups
 - Local community groups
 - Special interest groups
 - and in some instances, National Body
- Other key partners, including:
 - National body where appropriate
 - Department of Sport and Recreation
 - Local Governments
 - Tourism Authorities
- Funding bodies

The framework is documented and formally endorsed by the Steering Group using the Framework Template. Following endorsement critical roles including a project manager is appointed.

Background

Provide a background and purpose statement as to how the project area has been identified and why it is being considered for trail development. Include reference to any supporting documents such as a master plan or management plan.

Detail the tenure and size of the project area and give a broad overview of why the trails are being developed.

Project Objectives

Establishing and agreeing the overarching objectives of a project is essential to ensure successful, sustainable and informed development.

Project objectives define the overall aim and outcomes of the project. The objectives should be broad, high-level and clearly set out what the project is trying to achieve and why.

Examples of project objectives include:

- Risk management issues mitigated
- Reduce illegal trail building
- Participation increased amongst beginners and less-skilled riders
- Trails have the capacity to stage competitive events
- Provides a recreation resource for a small community or suburb
- Provides an economic benefit to the region through MTB tourism.



Project objectives do not detail 'how' the outcomes of the project will be achieved. This will be covered in the next part of the framework by looking at: the scope and scale of the trails, the intended users and trail types, and the trail model and system.

It is essential that the project objectives are clear, measurable and agreed by the Steering Group.

Management Model

All trails must have an agreed management model to ensure long term sustainability. The management model will inform how the trails will be developed, managed and maintained. It will also detail where resources to carry out the management and maintenance of the trails and any associated facilities and infrastructure will come from. The management model should also clearly define roles and responsibilities of those involved in managing the trail.

Establishing the management model requires the Steering Group to agree on the following key issues:

- Who is the trail owner?
- Who is the trail operator?
- How will visitor use be monitored?
- Who will undertake maintenance?

The trail owner is the entity that owns the physical structure of the trails and is usually the owner or manager of the land that the trails are on. The owner carries the liability for the health and safety of all trail users and for the protection of environmental and cultural heritage assets.

The trail operator is the entity that maintains the trails to the agreed standards of the owner.

Owners and operators can be the same entity, but in some cases can be different. For example, Parks and Wildlife may own trails on land they manage, but a local mountain bike group may be responsible for maintaining the trails through an agreement and is therefore the operator.

Scope and Scale

The scope and scale of a project defines its significance and impact. The scope and scale must be appropriate to its location and clearly link back to the project objectives. This ensures that trails of the right type, size and extent are established in the right places.

The following should be considered when establishing the scope and scale of a project:

- What is the proposed level of significance? National, Regional or Local (Refer to Chapter 7 for additional detail on Trail Significance Hierarchy)
- What are the parameters of the project? Include the extent of the trails, proposed trail length and associated infrastructure required (e.g. roads, trail head, toilets, car parks, etc.)
- Is the project development to be delivered as a single package of work or staged across multiple packages?
- What type of use is proposed? Recreational and/or event?
- What impacts/outcomes will the project have? For example: social, community, economic, environmental, recreation, access, etc.
- Will the trail/network have single entry or be permeable?

User Types and Trail Types

It is essential to define the target market for the proposed trails to ensure that they meet the needs and expectations of the intended users, and to allow outcomes to be measured.

Defining the target market involves establishing and agreeing the following:

- The different user types being targeted
- The abilities of targeted users (Refer to Chapter 1 User Types for additional information)
- Which trail classifications will be represented and the percentage of each trail classification (Refer to the Difficulty Rating System in Chapter 10 for additional information)
- The styles of mountain biking that will take place on the trails (Refer to Chapter 7 for additional information)
- The trails that will be single or multi use (Refer to Chapter 7 for additional information)
- The trails that will be single or dual direction (Refer to Chapter 7 for additional information)
- The inclusion of technical features and alternative lines (Refer to Chapter 9 for additional information).

Different types and abilities of riders and different riding styles have different requirements. This has a direct effect on the design, layout and configuration



of trails developed. Different types of riders and riding styles can also raise different management issues and the management model must accord with the target user types.

Trail System and Model

Trail System

Detail the type of trail system, for example: loop, linear, stacked loop, cloverleaf, finger and determine if any of the trails will be dual direction or multi use (Refer to Chapter 7 for additional information).

The trail system heavily influences all parts of the planning, design and delivery process. It defines the design, layout and configuration of the trails as well as the location, nature and extent of associated facilities and infrastructure such as car parking, toilets and trailheads.

Trail Model

Detail the trail model that the project will become, for example a trail hub, centre, network or individual trails (Refer to Chapter 7 for additional information).

The trail model must be appropriate to the location, scope and scale of the project and clearly link back to the project objectives and goals.

Agreed Standards

The project must be underpinned by clear and appropriate standards. These standards must be applied consistently to all aspects of planning, design, construction and maintenance.

Trail planning, design and construction principles together with the trail difficulty rating system should be used as a starting point to identify the standards for a project. In some cases, customised standards may need to be developed to meet specific requirements.

Examples of standards include:

- Planning standards, for example:
 - Following correct approval procedures
 - Undertaking an Impact Evaluation Checklist (IEC)
 - Undertaking consultation throughout the development process

- Design standards, for example:
 - Sustainable design principles outlined in this guideline (Refer to Chapter 8 for additional information) and other resources such as IMBA guidelines.
 - Designing trails to the agreed classification
- Construction standards, for example:
 - Implementing building standards
 - Constructing to the detailed design
 - Following hygiene protocols
 - Ensuring the trail fits into the environment
 - Ensuring appropriate supervision
- Maintenance standards, for example:
 - Development of checklists and frequencies for maintenance
 - Employing sustainable construction standards
 - Following hygiene protocols
 - Maintaining the trail to its original classification (i.e. no new features without approval).

Funding and Resources

It is important to outline how each stage of the process will be funded and who will drive or undertake each stage. For example, a land manager may fund the site assessment, an external grant may be sought for concept planning and detailed design and construction may be undertaken by the land manager and volunteers from a local mountain bike group.

Management and maintenance of the trails may be a combination of land manager resources, volunteer efforts and sponsorship.

Project Delivery

Establishing and agreeing how the project will be delivered is essential to the framework. Failing to clarify how the project will be delivered can lead to resources being wasted and deadlines not being met.

Trail projects can be delivered in several ways:

- Capital projects with the entire project put out to tender
- Capital projects split into phases with each phase put out to tender separately
- Projects partly capital funded with the remainder made up by volunteers or with resources provided by partners
- Projects delivered by partners and volunteers with no capital funding



Confirming the way the project will be delivered, requires the Steering Group to agree on the following key issues:

- Who will deliver the project?
- How will the project be delivered?
- Who will manage the project?
- How will the project be managed?
- Who will monitor the project?
- Who will take responsibility for delivering different aspects of the project?
- Will the project be staged?
- What are the estimated timelines?
- Land manager may require additional approvals and various levels.

Project Evaluation

It is essential to evaluate the project to measure the extent to which its goals have been met.

This enables an understanding of where and how the project has been successful and/or where and how it has

not. Evaluation identifies what worked along with areas for improvement (lessons learned).

The Project Framework must establish a methodology for project evaluation. When establishing the evaluation methodology, the Steering Group must consider the following:

- Evaluation criteria - What is the evaluation process trying to find out? For example:
 - Has the project met its objectives?
 - Have the standards been adhered to?
 - Are the trails being used by the intended target market?
 - Has the predicted usage been reached?
 - Have the trails caused any unforeseen issues or impacts (e.g. maintenance, environmental, economic or social); and
 - Are the users satisfied with the trails?
- Evaluation data – Accurate data is required to ensure effective and appropriate project evaluation. Data is likely to be from both quantitative sources, for example, trail counters, visitor counters and admission fees and qualitative sources, for example, questionnaires, surveys and forums.

The framework should identify arrangements for data collection, record keeping, analysis and interpretation.

- Evaluation timescales – When will evaluation take place? A project is likely to have a mix of shorter and longer-term effects. Some will be evident during delivery or upon completion whilst others may only become evident with the passage of time, for example, after one month, six months, one year, five years etc.

Ongoing monitoring is likely to be required to enable the project to be evaluated in perpetuity.

- Who will evaluate the project? – Evaluation which involves both the Steering Group and the project's users is likely to be the most effective. The framework should establish roles and responsibilities for undertaking data collection, record keeping, analysis and interpretation.

Project evaluation is an ongoing process and should be carried out through the lifetime of the project/the trails. Results from the project evaluation process should be used to make amendments and improvements to the project and future projects.

Project evaluation assists with accountability, especially where funding has been sourced and acquittals are required. Understanding what worked and what did not, build's knowledge which will benefit future projects.

Project Framework Checklist

1. Establish a Steering Group of relevant stakeholders and partners
2. Develop a framework using the framework template
3. Outline the background for the project
4. Define the overall project objectives
5. Agree on the management model
6. Establish the scope and scale
7. Define the target market
8. Agree on the type of trail system and model
9. Set design, planning, construction and maintenance standards
10. Set out funding and resourcing requirements
11. Confirm delivery arrangements
12. Set out evaluation criteria
13. Steering Group formally agree and adopt the framework



Consultation and Approval

The Steering Group must agree and adopt the project framework before the project can proceed to the next stage.

Formal approval of the project framework will confirm that all relevant stakeholders and partners understand and buy in to the planning, design and delivery process. The completed Project Framework document should be signed by all stakeholders involved in the project.



Stage 3: Site Assessment

The purpose of the site assessment stage is to identify positive (opportunities) and negative (constraints) control points within the area chosen for the project.

The site assessment stage builds on the Project Proposal and is vital to ensure the land owner or manager complies with legislative requirements and that the environment is suitable for the proposed trail network.

The site assessment stage informs the Steering Group of the following:

- Potential legislative approvals required
- Opportune landscapes/topography in the project area
- Other land use, activities and management considerations
- Any exclusion zones.

The site assessment coupled with the Project Framework (Stage 2) informs the development of an effective Concept Plan (Stage 4).

Further detailed corridor assessments and approvals will be required during the Corridor Evaluation (Stage 5).

Site assessments are completed by the landowner or manager in liaison with a specialist trail planner and the project coordinator. In some cases, the landowner may engage a specialist trail planner to perform the site assessment.

The site assessment must include a broad scale overview of the area and will require:

- Review of master plans, management plans and other recreation plans
- Review of the Impact Evaluation Checklist (developed in Stage 1)
- Desktop analysis of available information
- Field validation of collated information.
- Provides an economic benefit to the region through MTB tourism.

The findings of the site assessment should be presented formally to the Steering Group. The site assessment will show three types of areas:

- Areas where trail development is permitted
- Areas that preclude trail development

- Areas that may allow trail development dependent on further surveys and potential approvals, for example, Aboriginal heritage sites, poorly represented vegetation, threatened fauna.

Consultation may be required with special interest groups, other recreation users, neighbours and the wider community.

Steering Group Decision

The steering group may need to decide whether they want to undertake concept planning on only the areas where trail development is permitted or whether to include the areas that require further investigation.

The costs and time required to undertake surveys and gain approvals will depend on the type and extent of the constraints and size of areas surveyed.

Alternatively, the decision could be made after reviewing the draft concept plan during the next stage.

Depending upon the outcomes of the site assessment, the chosen site may be unsuitable for trail development. It may therefore be appropriate to abandon the site and assess other areas.

Conducting a preliminary background check during Stage 1 minimises the likelihood of having to abandon an area following site assessment.

If working on public land, involve local district staff from all areas including:

- Parks and visitor services
- Nature conservation
- Fire management
- Aboriginal liaison
- Sustainable forest management

The local knowledge the district staff can provide is invaluable.

Constraints and opportunities can be identified very quickly by consulting relevant staff early in the planning phase.



If significant time has passed after undertaking a site assessment, or corridor evaluation, a cursory check for any new opportunities or constraints should be performed. If any issues are identified, the IEC should be updated and further approvals and/or changes to the concept plan may be required.

The following sections provide an overview of potential impacts that need to be addressed during the Site Assessment (Stage 3) and the Corridor Evaluation (Stage 5). The detail is not exhaustive, with different land tenure and management may require further additional checks.

Location and Access

The location of a site and its proximity to communities and transport links will provide an understanding of current and potential recreation use. Looking at the way the community will access the site will provide a starting point on how access may be managed and where to locate the trailhead(s) and other infrastructure.

Access points, location and size of trail heads and car parks will depend on the nature of access to the site, including:

- How will riders access the site? By bike, public transport or private vehicle?
- How many access points are there to the site?
- Are there any road crossings? How will these be managed?
- Consider emergency access.

Land Use, Tenure and Management Considerations

It is important to determine the tenure of the land, land use priorities and management considerations. Some of these may have been identified as part of the Project Proposal (Stage 1). Understanding land use and management consideration will assist in identifying constraints, and potential opportunities.

It is possible for trails and some land uses to coexist if appropriate planning, consultation and design is undertaken.

Where trails and land use can co-exist, consultation is required with relevant stakeholders to ensure that all stakeholders are aware of the project plan and have the opportunity to influence how the project may affect their operations or interests.

Land use may include:

- Mining
- Forestry
- Utility lines
- Basic raw material
- Commercial activities (e.g. apiarist)
- Water catchment

Management considerations may include:

- Neighbouring land holders and community interests
- Prescribed burning plans
- Informal reserves
- Other considerations as identified in a management plan
- Recreation and tourism

Landscape

Understanding landforms, soil types and landscape is critical to designing sustainable trail networks.

When planning trail networks, the following landscape factors must be considered:

- Topography
- Soil types
- Nature and character of the landscape
- Quality and value of the landscape e.g. vista, scenic areas,
- Ground conditions (vegetation cover, soils, drainage)
- Hydrology (drainage, water courses, crossings, etc.)
- Visual landscape management.

Environmental Protection

Assessing environmental protection issues and ecosystems allows the identification areas to be avoided or managed through trail design and construction strategies that minimise environmental impact. Please refer to the relevant state legislative guideline on the AusCycling website to identify the environmental legislation to the State and Local Government that the project is being delivered.



Specific environmental surveys and assessments may be required dependent on the native flora and fauna within the project area. Consideration should also be given to the spread of soil borne pathogens and diseases. These assessments will determine risk management strategies that need to be implemented to eliminate or minimise the environmental impacts of the project.

Existing Recreation Use

Understanding existing recreation use in an area can assist in managing visitor conflicts, ensure existing infrastructure is not overloaded, and enable effective consultation with the community and user groups.

Depending on the trail system, type and classification, there may be some potential to capitalise on existing facilities and infrastructure to develop dual use trails.

When assessing existing recreation use the following must be considered:

- Potential conflict with other recreation users
- Visitor safety
- Increased demand for facilities and services (rubbish removal, car parking, toilets)
- Commercial tour operators
- Events held in the area

When working on Public land, environmental constraints are viewed at a desktop level initially by relevant staff.

Specialist staff from the relevant Parks and Wildlife district are then sought to give recommendations and conduct field assessments where required.

Environmental protection constraints may include:

- Flora, fauna and ecosystems
- Old growth forest
- Dieback and other plant health issues
- Weeds, pests and feral animals

Heritage Protection

Maintaining heritage values and places is a vital part of the community's sense of place, cultural identity and wellbeing. Trail planning must protect heritage, which may mean avoiding sites, interpreting sites or planning trails with the least disturbance.

In Australia, legislation exists to protect both indigenous and non- indigenous heritage.

Aboriginal Cultural Heritage

Federal and State/Territory legislation protects sites and objects used by, or traditional to, the original inhabitants of Australia. Under these pieces of legislation, it is an offence for anyone to excavate, damage, destroy, conceal or in any way alter an Aboriginal site or object without the relevant Minister's permission.

It is the responsibility of the proponent undertaking the work, or the land owner or manager approving the work to:

- Check relevant registers and other sources of data for areas of Aboriginal Cultural Heritage value
- If there is a registered site within the area, consult with relevant authorities to ascertain the likelihood of the proposed activity affecting that site.
- If impact on sites cannot be avoided:
 - Consider alternative design to avoid impact upon sites
 - Consult with the relevant Aboriginal group (which will generally be the native title group for the area) in relation to the proposed activity
 - Seek approval from the relevant authority to proceed with the project. In some cases, approval can take up to 12 months and there may be costs associated with archaeological and/or ethnographic surveys, reports and potential requirement of Aboriginal monitors.

Native Title

Native title is a form of legal interest in land that recognises rights and interests that Aboriginal people have in land under their traditional laws and customs, within the broader Australian legal system.

The Native Title Act 1993 is a Federal Act which governs how native title rights and interests are recognised and may be validly affected by other land uses.

The landowner or manager must comply with the relevant 'future act' requirements of the Native Title Act, which will differ in accordance with the underlying tenure of the land.



Generally, the following scenarios are encountered:

- Native title has been extinguished on freehold land and no future act provisions apply
- Native title has been extinguished on many parcels of conservation estate that were vested under State legislation
- The construction of trails will generally be consistent with the reserve purpose of a conservation estate, and accordingly will not be a future act on conservation estate validly created in relation to the Native Title Act.

Specialist advice should be sought on a case by case basis, if there is any ambiguity on the underlying native title status and future act requirements.

Aboriginal Cultural Heritage obligations continue, irrespective of the 'future act' obligations, and consultation and engagement on Aboriginal Cultural Heritage issues will generally be with the native title group, as representatives of the traditional owner group with rights to speak on issues of heritage.

European Heritage

European Heritage sites may include buildings, railways and other structures, which may be protected under Federal or State/Territory legislation.

The Impact Evaluation Checklist (IEC) details a list of registers that need to be checked and heritage management plans will need to be followed or put in place.

If a site is found that cannot be avoided, regardless of whether it is registered or not, an assessment by the Australian Heritage Council is required.

Costs associated with the assessment, any follow up works will be an additional cost for the project.

Consultation

The site assessment provides a broad scale overview of where the trails may be positioned, areas to be avoided, opportune landscapes and features to be utilised, and groups to be consulted with.

Depending on the site, vicinity to communities, any pre-determined conflicts, and the value of the area to the community, it may be appropriate to meet with special interest groups, other recreation groups and/or neighbours separately to capture their concerns and communicate the strategies for sustainable development and conflict minimisation.

Locals know their area well and may provide suggestions and inclusions to address issues that had not been identified by the project team. Seeking relevant stakeholder input will ensure they are part of the project and included in the process, which will also assist in securing greater support of the project.

Documenting Site Assessments

The Site Assessment findings must be documented to assist with approvals and to inform the concept planning stage of the project.

In addition, the IEC must be updated with site evaluation outcomes, including the development of maps to show constraints (negative control points) and opportunities (positive control points).

Site Assessment Checklist

1. Desktop search for positive and negative control points (Positive control points may be views, visual landscape qualities, topography etc. Negative control points may be dieback free areas, heritage sites, vegetation complexes etc.).
2. Meet with people who know the land (relevant staff and other key stakeholders)
3. Find out who else uses the land
4. Consultation with relevant stakeholders
5. Document findings and report to Steering Group for approval to move to Stage 4: Concept Plan

Steering Group Decision

Following any special interest group consultation, a wider community consultation should be organised. It is best to involve a professional facilitator who will assist in keeping the consultation on track and may be able to provide a consultation report.

A decision should be made at this point on whether to hold community consultation now or wait until a concept plan (stage 4) has been developed. This will depend on the potential impact of the constraints and opportunities identified.



Stage 4: Concept Plan

The purpose of the concept plan is to illustrate what the trail system may look like, address key strategic priorities and physically flag and digitally record broad corridors in the field.

Concept plans form a crucial consultation tool which can be presented to partners and stakeholders.

Recorded indicative corridors can be utilised in the Corridor Evaluation (Stage 5) to conduct potential surveys.

Concept plans should be developed by specialist trail planners based on the outcomes of the Project Framework (Stage 2) and Site Assessment (Stage 3). Concept plans should illustrate the following:

Propose and identify the location of trail heads

- Existing infrastructure and/or infrastructure to be provided (toilets, car parking, picnic sites, bridges/crossings, trailhead signage) and the nature of these facilities

The configuration of the trail system

- Classification
 - What is the classification of each of the proposed trail corridors?
 - How will this affect the alignment?
 - Proposed types of technical trail features for each trail where required
- Purpose
 - What is the purpose of each trail?
 - How will it be accessed?
 - Is it a linking trail?
 - Does it take riders to positive control points or avoid negative control points?
 - Is it an ascent or descent or both?
 - Is it a shared trail?
- Strategic Value
 - How important is the proposed trail corridor to the integrity of the trail network as a whole?
- Topography
 - What is the nature of the topography within the proposed trail corridor?
 - How might this affect the development of a sustainable trail? Ground conditions
 - What are the prevailing ground conditions within the proposed trail corridor?

- How might these affect the development of a sustainable trail?

Construction Stages

If construction will be phased, the stages should be detailed within the concept plan, including the construction of associated infrastructure where required. The staging should consider appropriate time of year.

Corridor flagging

- Indicative trail corridors flagged physically in the field and recorded digitally at the centre line (corridors may be 20m -150m wide as the corridor will be refined during Corridor Evaluation (Stage 5).

Broad cost estimate

- trail design, construction, signage, maps and ongoing management
- any supporting facilities such as car parks trail heads, toilets etc.

Concept plans should consist of mainly illustrative documents, including maps, and should be broken down into indicative trail corridors.

At this stage indicative trail corridors should be detailed on a topographic map and flagged in the field to allow them to be assessed during the Corridor Evaluation (Stage 5).

Steering Group Decision

During the Concept Planning stage that the configuration and layout of the trails can be changed to meet the needs of landowners or managers and trail providers and to fit with the agreed framework.

If the steering group agreed during Site Assessment to draft a concept plan that includes areas where further investigation may be required, a decision needs to be made whether to continue with surveys and approvals or request the draft concept plan is modified to avoid those areas.



Concept Planning Checklist

1. Refer to the agreed framework and site assessment
2. Illustrate possible infrastructure and trail corridors
3. Detail construction stages where required
4. Present draft concept plan to Steering Group for feedback
5. Present amended concept plan to relevant stakeholders
6. Physically flag trail corridors in the field
7. Provide broad cost estimates for detailed design, construction and including supporting infrastructure
8. Present final concept plan to Steering Group for approval to move to Stage 5: Corridor Evaluation

Consultation

Development of concept plans should include ongoing consultation between specialist trail planners and:

- Project Manager
- Land Owner/Manager
- Key stakeholders
- Native Title Working Party through the land council (where required)
- Other relevant Government Departments (where required)



Stage 5: Corridor Evaluation

The purpose of corridor evaluation is to identify constraints and formally establish and agree on the location of trail corridors with landowners/managers and other stakeholders.

The corridor evaluation should be developed into a report which can be used to seek approvals to proceed with the Detailed Design (Stage 6).

Evaluating each trail corridor is essential in establishing estimated design costs and broadly estimating construction and management costs as well as identifying appropriate ways in which trails can be constructed.

If corridor evaluation is not undertaken, it will be very difficult to accurately estimate trail costs and land owner/manager approval may not be granted.

It is beneficial to engage a specialist trail planner to work in liaison with the project manager and local land manager staff during the corridor evaluation.

Detailed Corridor Assessment

The IEC is used and updated during the corridor assessment, by undertaking detailed checks and surveys within the proposed corridor identified in the concept plan and documenting environmental or heritage protection strategies where required.

Knowing these strategies will assist in estimating costs for design, construction and ongoing maintenance.

Environmental and heritage protection strategies may include:

- Adjusting the trail corridor to move it away from a sensitive site
- Inclusion of boardwalks or raised platforms to minimise impacts to flora or fauna
- Armouring a section of trail where a flat area is unavoidable or where soil or topography are unsuitable.

Refining Trail Corridors

Concept planning allows for corridors that are 20m - 150m as it will be difficult to work around any identified constraints if the initial corridor is too narrow. During Corridor evaluation these proposed corridors are adjusted, based on field validation and the identification of mitigation strategies.

Once the constraints have been assessed and any mitigation strategies documented and approved, the corridor should be refined to be as narrow as possible.

The corridor alignments should be re-flag along the centre of the corridor and maps amended to reflect the new corridor alignment.

This activity is basic broad-scale flagging with the aim of marking the route between each positive control point and avoiding negative control points and will assist with estimating costs and gaining approvals.

Better defined trail corridors also provide better guidance for specialist trail designers to undertake detailed design activities.

Estimate Probable Costs

Corridor evaluation assists in accurately estimating costs for design, construction and ongoing management as well ensuring environmental and heritage protection issues are considered.

Having realistic and accurate probable costs is extremely important when preparing funding submissions.

Approval for the Corridor

Use the IEC, supporting maps, other documentation and estimated costs to form a report to be used to secure approvals or permission to proceed with the Detailed Design (Stage 6).

Depending on the scope and scale of the trails, the land tenure and the constraints that may have been identified, approvals for the corridor may be required from landowners or managers and external stakeholders.

Concept Planning Checklist

1. Undertake detailed constraints assessment of the proposed trail corridors
2. Review and adjust if required
3. Flag and record the broad- scale alignment
4. Estimate probable costs for design, construction and ongoing management
5. Report to the Steering Group for approval
6. Seek approval from the landowner/manager to move to Stage 6: Detailed Design



Stage 6: Detailed Design

Trail design is a professional discipline which requires a detailed understanding of trail sustainability, trail users and types, construction techniques and long-term trail management.

Detailed trail design is essential in ensuring trails are fit for purpose, built correctly and sustainably.

Where possible, a specialist trail designer should be engaged to undertake this work.

The trail designer should:

- Formally establish definitive trail lines flagged in the field every few metres along one edge
- Prepare a draft design plan including schematic construction specifications and drawings related to these for review by the Steering Group.
- Based on comments from the Steering Group prepare a final detail design plan and construction ready specifications and drawings to be formally approved by the Steering Group.

The detailed designs will guide and inform trail construction and provide quality assurance tools to evaluate trail construction outcomes. These plans will also serve as a reference for any future trail maintenance work.

The detailed design process should be applied to every project regardless of how it is to be delivered. This means that the process should be the same for a capital project that is released to tender as the process that is used for a project that is carried out by volunteers.

Trail design should make it possible to accurately identify construction costs, resource and material requirements, and timescales. This information may impact on how trails are constructed and who has the capability to perform the construction activities.

Design Outputs

Detailed design must reflect the Project Framework (Stage 2), including:

- The trail management model and trail system
- Trail classification(s) and intended user groups
- Sustainability standards as outlined in the framework
- Trail construction standards as outlined in the framework

During this stage, it is essential that the trail designer produces:

- Definitive trail lines that are flagged in the field and identified on the plan. This should include the location of:
 - Turns
 - TTFs
 - Built structures
 - Drainage features
 - Hardened surfacing
- Schematic construction plans including specified drawings for:
 - Turns
 - TTFS
 - Built structures
 - Drainage features
 - Trail tread construction cross sections
 - Hardened surfacing
- Details of resources and materials required
- Details of construction type (hand built or machine and size of machine)
- A signage plan
- Estimated probable construction costs

Definitive trail lines and construction specifications enable construction work to be carried out in a way that is consistent with the Project Framework. This enables the application of construction standards which can be monitored and evaluated.

Delivery

To undertake effective trail design, the specialist trail designer must be provided with a detailed brief before commencing this stage. This brief must include:

- The agreed framework with overall project objectives as well as individual trail objectives, purpose and approximate lengths
- Site assessment information (including restrictions and considerations identified in the IEC)
- Corridor evaluation information
- The formally agreed corridors
- Design and construction standards
- Soil types and drainage standards e.g. trail surface must be free draining
- Protection of natural features and any restrictions regarding such as the removal of trees, boulders



- Maximum acceptable disturbance footprint of the trail
- Whether in situ natural features can be utilised for TTFs or not e.g. fallen log to create a log ride
- Timescales for draft and final design

The trail designer should produce a draft design plan for review by the Steering Group. The trail designer should then prepare a final detailed design plan to be formally approved by the Steering Group.

Resources:

A Detailed Design Plan Template is available on the AusCycling Website

Detailed Design Checklist

1. Produce design brief based on the framework
2. Appoint specialist trail designer to produce draft design plan with construction ready schematic plans and specifications and flag the alignment in the field.
3. Draft design prepared and reviewed by the Steering Group
4. Final detailed design plan prepared and formally approved by the Steering Group
5. If the proposed trail is on Parks and Wildlife-managed, the trail design must be approved at the appropriate level.



Stage 7: Construction

Construction is about building the planned and designed trail into the landscape utilising sustainable construction techniques and appropriate construction standards. The Project Framework (Stage 2) detailed the way the project will be delivered.

Construction may be delivered by:

- Tendering for specialist trail construction services
- Volunteers
- Land manager construction crew
- A combination of any of the above.

Project Delivery

The trail builder must be provided with a detailed brief including the following:

- The final detailed design plan and associated documentation
- IEC including hygiene plans and any other restrictions
- Construction ready schematic plans and specifications
- General Trail Principles
- Technical trail feature classification specifications
- Any additional standards required for the area (see below)
- Trail signage standards

A detailed brief enables trail builders to provide an accurate quotation for the work and ensures the project will be delivered in line with client requirements, the approved detailed design and associated standards.

Implementation of Construction Standards

Construction practices must meet the specification and guidelines outlined in the detailed design plan.

Where possible, the trail designer should provide a handover of the design to the trail builder.

The project manager must also provide the trail builder with an induction including the following aspects:

- Site familiarisation including hygiene plans
- Where vehicles can be driven and parked
- Health and safety requirements and protocols
- The desired outcome of the project

- Construction standards (examples below)
- Protocols to be undertaken where the builder wants to make changes to the design or the construction cannot meet these guidelines.

Dependant on the outcome of the Site Assessment (Stage 3) and Corridor Evaluation (Stage 5), specific construction standards or techniques may also be required in order to comply with all design requirements.

These standards may include:

- Visitor Risk Management standards to minimise the risk of visitors using the trail while it is under construction
- Hygiene standards to ensure any machinery or tools are free from contaminated soil, weeds or seeds
- Natural features not to be removed/damaged for example, do not remove trees larger than 100mm
- Aboriginal heritage site stop-work instructions
- Maximum size of machinery to be used
- Materials
 - Will material be provided?
 - Does material have to be sourced from within the area, if so where?
 - If material is being brought in to the area, what standards are in place?
- Trail finish/final completion
 - What standard should the trail be completed to in terms of rehabilitation, clean-up of the area and ensuring the trail fits into the environment?
 - Will this standard be the responsibility of the contractor, volunteers or the land owner/manager?



Construction Supervision

The project manager must ensure adequate supervision is provided for the project. Supervision is always required whether the project employs a specialist trail builder, volunteers or uses land manager construction crews.

Supervision should include:

- Regular inspections to ensure specifications are followed accurately and the project is on schedule:
- Ensure the trail builder is consulting and gaining approval for any modifications required
- Document any modification decisions
- Approve each stage of the work at completion prior to commencing the next stage
- Control project spend / budget

The use of the detailed design and construction brief during supervision activities allows the project manager to ensure the trail builder is meeting client expectations and adhering to required standards.

Approval of the Work

A final inspection must be performed once construction work is complete. This inspection should be undertaken by the project manager and the land owner or manager to ensure the trail and associated features and infrastructure meet client requirements and have been built to the design and relevant standards.

The project manager and the land owner or manager must agree and document the following:

- The trail opening timeframe
- The defects liability period
- Communication protocols for trail users.

Record the Asset

Trails, like any other recreational infrastructure are assets. Recording the trails and their associated infrastructure as an asset on an asset management database is critical and ensures that:

- Asset information is readily accessible
- Financial information is available for the assets for insurance, funding and auditing purposes
- An appropriate ongoing maintenance budget is applied to the asset.

The following should be included when recording the trail in an asset register:

- Land owner or manager
- Contact details
- Park name
- Site name
- Trail length
- Location coordinates
- Total cost (include all planning, design and construction costs)
- Trail surface
- Technical trail feature and built structure location and costs (include specifications, design drawings and materials)
- Signage (trail, directional, road signs etc.)
- Associated infrastructure location and costs

Construction Checklist

1. Who will undertake construction?
2. Contractor, volunteers, land manager construction crew or a combination?
3. Develop a trail construction brief and required standards
4. Have all required approvals been received?
5. Record the trail and associated infrastructure



Stage 8: Management

Trails, like any other facility, require ongoing management and maintenance.

A management plan should be developed and agreed on by the Steering Group.

The management plan must encompass all aspects of managing the trail and be informed by the framework and any broader land management policies.

As a minimum, the plan should consider the following:

- Background information (outlined in the framework)
- The trail system (including GPS plots / drone surveys of the trails)
- The classification of the trails
- Target use
- The amount and type of use
- Clarification of management roles and responsibilities (outlined in the framework)
- Trail adoption if appropriate (refer to Chapter 4 for additional detail)
- Funding and resources
- A record of the infrastructure and costs or link to the appropriate system or asset database
- Maintenance program
 - Roles and responsibilities
 - Audits
 - Frequency of maintenance
 - Standards (e.g. construction, hygiene, signage)
 - Works program
 - Funding and resources
 - Tools and equipment
- Hazard inspection and reporting procedures
- Visitor statistic recording procedures
- Marketing, maps and information

Resources:

A Trail Management Plan Template is available on the AusCycling website.

Responsibilities, Funding and Resources

Funding for trail management is often overlooked however is important to identify and document how trail maintenance will be funded.

Funding can come from a range of sources including landowner or manager funding, fundraising by a local mountain bike groups, sponsorship of the trails or external grant programs.

A trail management plan should be developed for each trail network outlining:

- Who is responsible for what?
 - Trail maintenance
 - Maintaining the asset database
 - Hazard inspection and reporting
 - Undertaking visitor monitoring activities
- How will each aspect of trail management be funded?
 - Internal funding
 - External funding
 - Sponsorship
 - Fundraising

Trail Maintenance

Trails that are designed well will require less maintenance, however all trails will require some maintenance.

A maintenance program should be developed to provide a strategic and targeted approach to ensuring trails are maintained in the best condition possible, providing the optimum riding experience and reducing costs.

It is important to accept that ad hoc maintenance tasks will be required from time to time due to the natural location of trails, weather events and impacts from use.



A trail maintenance program should consist of the following:

Audit

It is advised to conduct a trail audit for inclusion in the maintenance program. The trail audit should detail any trail surface issues that require maintenance and any drainage problems, vegetation regrowth on the trail, condition of signage and record all TTFs and built structures and their condition. The trail audit gives trail owners and operators a complete picture of the condition of the trail and allows resources and funding to be allocated accordingly.

Resources:

A Trail Audit Template is available on the AusCycling website.

Trails will change over time with use. Trail surface change is acceptable provided:

- The original trail classification is maintained
- No environmental issues have been caused
- All TTFs are of sound construction

Frequency of Maintenance

The frequency of the maintenance required will depend on several factors, including:

- The trail system and classification of the trails
- The amount and type of use
- The type of trail. (For example, downhill trails or any trail with built features, due to their design and the type of riding, may require more frequent checking for safety reasons)
- Soil type, vegetation type (fast growing or prone to dropping limbs and leaves)
- Where the trail is located. For example:
 - Trails located in northern Australia may require substantial maintenance after each wet season
 - Trails that are more accessible may be more prone to vandalism, illegally dumped rubbish etc. than remotely located trails
- Extreme weather events may necessitate unscheduled maintenance and hazard checks.

Standards

Standards may include:

- Trails are maintained to the original classification
- Construction standards
 - No material is moved without prior approval
 - Trail surface standards
 - Drainage standards
 - TTF standards (e.g. existing TTFs are to be maintained to their original design)
 - Hygiene standards
 - Statement regarding the type of machinery and tools permitted and the appropriate or maximum size and relevant qualifications of the operator
 - Final completion standards
- Signage standards
- Visitor Risk Management standards to be put in place e.g. site closures, signage and notification.

Hazard Identification and Reporting

Trails are subject to varying weather conditions, wear and tear and even vandalism. All of which have the potential to create hazards to the user. It is essential that the trail management plan includes hazard identification, reporting criteria and a schedule.

The Trail Framework should detail who will be responsible for managing hazards.

Hazards should be managed in accordance with AS/NZS 31000:2009 Risk Management Standards.

Visitor Statistics

It is important to understand how the trails are being used and how often. This assists trail owners and operators with the following:

- Evaluating the success of the project – for example, did the project meet its objectives? Are the trails being used in the intended ways by the intended users?
- Planning maintenance works
- Supporting external funding applications
- Prioritising resources
- Guiding future trail development

There are several ways to collect information and data collection methods will be dependent on purpose.



Visitor Surveys

Visitor surveys can be used for a range of reasons such as: building a picture of the people who are using the trails, the way in which they ride the trails or determining how much users spend while at the trails.

Before developing a survey, it is important to understand what the information will be used for and this will determine the types of questions to ask. Unnecessary questions can lead to a survey that is too long and potentially cause a low response rate.

Trail Counters

Trail counters are a cost-effective monitoring tool. Trail counters are used to gather data on the number of times trails are ridden and can help identify usage patterns, for example:

- Are trails busier at certain times of the day or are there seasonal, annual or long-term trends?
- Which days of the week are most popular?
- What time of the year is the busiest?

For new trails, it is recommended trail counters are installed as soon as construction is complete.

Knowing the amount of use trails are experiencing and the nature of the use assists with project evaluation, maintenance works programming and gaining funding

Note:

Not all trail counters include date and time stamp, research the best counter to use for your particular reason and purpose for data collection.

Marketing

The scope and scale of a trail or network will guide the level of marketing. Where possible, trail managers should partner with regional tourism and marketing organisations and local governments to develop strategic resources and trail marketing materials.

At a minimum, the following should be developed:

- Ensure trailhead signage and maps are updated
- Upload trail information to relevant websites
- Update park brochures and websites

Trail users may live close to the trail network, or they may travel to the area specifically to use the trail network (or use the trail network as part of a broader tourism experience).

Land managers should consider the following to encourage and promote visitation:

- Develop a promotional brochure, guide or map.
- Ensure trail heads are clearly signposted and marked on maps so that new visitors can easily find them.
- Ensure promotional material is distributed widely to relevant retail outlets and visitor centres in the region.
- Develop a list of all outdoor magazines and local papers and aim to have at least one press release or article per year.
- Organise an annual event or activity that may attract the attention of major newspapers and magazines. Remember, events may require approval by the land manager before promotion.
- Publicise scheduled maintenance activities.
- Form a 'friends of' type of group to undertake maintenance activities, social rides etc.

Promotional material should be professionally prepared and designed, printed in an attractive format, pleasing to the eye yet still simple to read. Generally, the following features should be included:

- Maps are clear and concise with distances, topographical features, scale bar, north point, legend contours, and trail classifications
- Where relevant include trail notes describing key points along the way and relating them to distances and directions
- Background information about the trail and history of the area
- Safety and etiquette information (for example, AusCycling Riders Code of Conduct) and Leave No Trace principles
- Where relevant, interpretive information about culture, history, geography and environmental matters
- Emergency contact details and directions
- Clear indication of routes to and from the trail and parking areas
- Logos or acknowledgement of all partners.



Trail Revitalisation

There are several reasons that trails may require alterations or realignments, including:

- The network may be experiencing a visitation growth or a new user type
- A trail may not be sustainable
- The local mountain bike group may want to change the features on an existing trail to keep the trail relevant for users
- Trail revitalisation should follow the trail development process. However dependent on the scale of the changes, parts of the process may already have been completed during the initial development meaning the timelines may be shorter.

For Example:

A local mountain bike group would like to make some changes to features on an existing trail and intends to keep the original trail classification and work within the already disturbed footprint. The process may be able to begin at Detailed Design (Stage 6) in consultation and with approval from the landowner/manager.

Where a network exists that requires strategic planning and the possibility of additional trails. The trail development process should begin with a Project Proposal (Stage 1).



Glossary of Terms

Cross-Country (XC)	A style of mountain biking that involves a variety of riding experiences, including downhill and uphill trails of varying steepness.
Dirt Jumps (DJ)	Mounds of packed dirt or other material that are designed to lift riders into the air. Riders often perform tricks whilst airborne.
Downhill (DH)	A style of mountain biking that involves descending steep downhill trails as quickly as possible
Endurance/ Marathon	Long distance cross-country mountain bike races. Races are either based on time, typically 6, 12 or 24 hours, or distance.
Freeride	A style of mountain biking that combines speed and technical challenge. Freeride involves taking imaginative riding lines over steep and technical terrain, performing tricks in the air and maintaining speed, control and style.
Gravity Enduro (GE)	A mountain bike race format with timed downhills and untimed uphill. Racing is over a series of stages, with the winner the rider with the fastest combined time over those stages.
IMBA	International Mountain Biking Association. An organisation for trail advocacy.
MTBA	Mountain Bike Australia. The national governing body for mountain biking.
Natural Obstacles	Naturally occurring objects that add technical challenge to a trail.
Off-Road Touring	A style of mountain biking that involves riding long distances off-road, generally over more than one day.
Pump Track	A closed circuit with rollers and berms. Designed to be ridden without pedalling by using weight shifts (pumping) and gravity.
Shuttling	A system where riders and their bikes are transported uphill to the start of a trail. Shuttling can be by vehicle ferrying or lift access.
Singletrack	A narrow trail only wide enough for one rider.
Skills Park	A purpose-built venue with features to build technical skills. Well-designed skills parks allow riders to progress safely from beginner to advanced levels.
Technical Trail Features (TTF)	Objects that have been introduced to a trail to add technical challenge.
Trail Difficulty Rating System (TDRS)	A system used to grade trails with similar levels of technical difficulty. Trails are graded on width, grade (maximum and average), surface, natural obstacles and Technical Trail Features (TTFs). Other factors such as enclosure and exposure can also influence classification.
UCI	Union Cycliste Internationale/International Cycling Union. The world governing body for competitive cycling.



