WESTERN AUSTRALIAN *MOUNTAIN BIKE* MANAGEMENT GUIDELINES

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

Department of **Local Government, Sport and Cultural Industries**

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ACKNOWLEDGMENT

Coordinated by the Parks and Wildlife Service (Department of Biodiversity, Conservation and Attractions) and developed in partnership with:

Department of Local Government, Sport and Cultural Industries;
WestCycle;

West Australian Mountain Bike Association; and
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Photo: Cover
Courtesy Jarrad Lawrence

Photo: Above
Courtesy Danielle Stone

1 INTRODUCTION

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Mountain biking is one of the world's fastest growing recreational, sport and tourism activities and Western Australia is following this global trend (WestCycle, 2015):

- Almost 120,000 mountain bikes are purchased every year in Western Australia
- 19% of Western Australians own a mountain bike
- Mountain bikers are seeking places to ride in increasing numbers
- Over 50 competitive mountain bike events take place in Western Australia each year, with 1200 riders taking part in the Cape to Cape and more than 1000 people riding the 'Dwellingup 100' in 2014

The Western Australian Mountain Bike Strategy (Westcycle, 2015) identified the need to establish and implement a trail development process to guide mountain bike trail planning from proposal to implementation. The Western Australian Mountain Bike Management 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 across the State.

The guidelines will be of particular interest and assistance to:

- Trail managers
- Land managers and land owners
- Clubs and associations groups
- Trail builders
- Trail users

These guidelines aim to ensure mountain bike trails are developed to meet the needs of users, minimise environmental degradation and ensure longevity of trails.

"The right trail, in the right place, built the right way for the right reasons" Dafydd Davis

"Measure twice, build once" Lee McCormack, Pump Track Nation

The guidelines have been structured into 10 sections:

SECTION	DESCRIPTION
1	Provides the introduction, background, vision and objectives.
2	Outlines the key stakeholders involved with mountain bike development and management.
3	Provides a background into mountain biking and the differing user and trail types.
4	Outlines the legislative and policy context and provides an understanding of land tenure.
5	Provides an overview of partnership models in the development and management of mountain bike trails.
6	Outlines potential trail funding opportunities.
7	Gives consideration to mountain bike events.
8	Provides a range of general principles relating to sustainable trail planning, design, and construction.
9	Describes the Mountain Bike Trail Classification System.
10	Outlines the Trail Development Process, an eight-stage process to take a trail proposal through the planning stages to construction and ongoing management.

The information within these guidelines is based on local and international experience and best practice. It has been written so that anyone can use it. However, given the majority of trails within Western Australia are located on Parks and Wildlife-managed land, specific information relating to departmental policies and procedures has been provided and highlighted throughout the document.

Photo:
Courtesy Angus Stuart

1.1 Background

The Western Australian Mountain Bike Management Guidelines combine 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 Western Australia.

Much of the information provided in these guidelines has been derived from the International Mountain Bicycling Association (IMBA), and from consultation with internationally renowned trails consultant Dafydd Davis MBE.

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 listed in the reference section of this guideline and recommended further reading.

Dafydd Davis was responsible for the UK's first purpose built mountain bike trails in Wales. He also developed the 'Welsh Mountain Bike Initiative', the world's first national strategy for mountain bike trails and tourism. Davis has benchmarked strategies for sustainable planning, and methodologies for delivering successful trails and was recognised in 2004 for his services to forest recreation and tourism in Wales.

In 2012, Dafydd Davis was jointly engaged by Department of Local Government, Sport and Cultural Industries (DLGSC) and the Parks and Wildlife Service to develop a sustainability framework for trail development in Western Australia. Davis' trail sustainability framework incorporates and advocates for the sustainability of:

- environment;
- trails and infrastructure;
- trail users; and
- other land use.

This sustainability framework recommended the use of Davis' trail development protocol be expanded and adapted for a Western Australian context.

A Mountain Bike Working Group was set up to review and expand Davis' work into a Western Australian context. The development of the Western Australian Mountain Bike Management Guidelines has been led by the Parks and Wildlife Service, Department of Local Government, Sport and Cultural Industries, WestCycle and West Australian Mountain Bike Association (WAMBA) in conjunction with eight members from the mountain bike community who were selected by the above stakeholders through an expression of interest process.

Photo: Far right
Courtesy Kelly Doye

Photo: This page
Courtesy Danielle Stone

VISION

Sustainably develop and manage 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 an understanding of various styles of mountain biking and the differing user types and their needs.

Develop trails using principles of sustainable planning, design, and construction techniques.

Follow the Trail Development Process for all trails.

Provide a consistent approach to mountain bike trail development and management across Western Australia.

2 STAKEHOLDERS

2 STAKEHOLDERS

Parks and Wildlife Service

The Parks and Wildlife Service, part of the Department of Biodiversity, Conservation and Attractions (DBCA), works with the community to ensure the nature of Western Australia is conserved, for its intrinsic value and to sustain and enrich people's lives.

DBCA manages national parks, marine parks, State forests and other reserves, conserves our world renowned native animals and plants, supports Aboriginal people in protecting their culture and heritage on parks and reserves, and supports access to, managed use and enjoyment of the State's wildlife and natural areas.

Many different forms of recreational activities are undertaken within these areas, with DBCA being the largest provider of outdoor recreation opportunities in Western Australia. Mountain biking is one of the fastest growing recreational and sporting activities catered for on lands managed by the department.

DBCA is committed to working in partnership with the community to actively connect Western Australians with the parks and areas it manages by developing and managing recreational facilities, including mountain bike trails. The department manages a number of mountain bike facilities in partnership with community mountain bike groups, and is a key stakeholder to the following mountain bike initiatives:

- Western Australian Mountain Bike Strategy
- South West Mountain Bike Master Plan
- Perth and Peel Mountain Bike Master Plan
- Western Australian Mountain Bike Management Guidelines

Department of Local Government, Sport and Cultural Industries

The Department of Local Government, Sport and Cultural Industries (DLGSC) develops and implements government policy and initiatives in sport and recreation, while contributing to the healthy lifestyle of Western Australians by increasing physical activity through sport and recreation.

DLGSC has the lead State responsibility for sport and recreation and works closely with other agencies and organisations to deliver community outcomes.

DLGSC is a key stakeholder and contributor to the following mountain bike initiatives:

- Western Australian Mountain Bike Strategy
- South West Mountain Bike Master Plan
- Perth and Peel Mountain Bike Master Plan
- Western Australian Mountain Bike Management Guidelines
- WAMBA organisational development
- Partnering with Lotterywest to deliver funding via the Trails Grant Scheme

Local Government Authorities and private land owners

Local Government Authorities (LGAs) work with local partners (including business, charities, police and other groups) to determine and deliver local priorities. LGAs provide a range of services to the local community, such as infrastructure, health, planning, recreation etc. Local Government largely works within Federal and State legislation.

Some land vested in LGAs may be appropriate for trail development, with many LGAs in Western Australia already providing trail opportunities for their residents and visitors. Refer to Section 4 Strategic and Legislative Context for more information on LGA land use and zoning.

There are numerous examples worldwide where private land owners have developed commercial mountain bike trails and facilities on private property to provide for this growing activity, including the Linga Longa Bike Park near Greenbushes in the south-west of Western Australia.

WestCycle

WestCycle is the peak body for cycling in Western Australia. WestCycle embraces all cycling disciplines and operates at a strategic level to lead and coordinate the growth and development of cycling in the State.

WestCycle's member organisations include State governing cycling bodies and those actively involved in the promotion and development of cycling. WestCycle acts as the interface between the Western Australian cycling community and government.

Photo:
Courtesy Kerry-Anne Deklerk

WestCycle also plays a leading role in mountain bike planning, including the development of the Western Australian Mountain Bike Strategy and regional mountain bike master planning.

West Australian Mountain Bike Association

WAMBA was officially launched in 1996 as a body principally designed to represent the interests of mountain bikers in Western Australia, with a vision of being "run by mountain bikers for all mountain bikers". The Association's mission was to develop and promote mountain biking in Western Australia for the benefit and enjoyment of all mountain bikers, of all disciplines and all levels of ability.

Reformed in 2010, WAMBA's primary role has been in trail advocacy. Initially several projects were completed in the Kalamunda area, including finishing the Kalamunda Circuit and Mount Gunjin trails. Other WAMBA projects included the Skills Park at the Goat Farm, sign posting and maintenance work at Langford Park in Jarrahdale and maintenance and upgrades to Marrinup in Dwellingup.

With the formation of the Kalamunda Mountain Bike Collective, WAMBA moved to a more strategic, State-wide advocacy role, developing strong relationships with land managers and government stakeholders. With the support of the Department of Local Government, Sport and Cultural Industries, the Parks and Wildlife Service, WestCycle and the mountain bike community, WAMBA has evolved to become the peak State representative body for mountain biking in WA.

In July 2019, WAMBA formally merged with WestCycle as the peak body for cycling in Western Australia. WAMBA's previous role in representing mountain biking and undertaking trail advocacy is now undertaken by WestCycle.

Mountain Bike Clubs and Groups

Numerous mountain bike clubs and informal groups from across the State are affiliated with WAMBA. The clubs and groups are made up of volunteers, who are dedicated to the growth of mountain bike trails and the sport. Some clubs have been around for over 20 years and possess a wealth of knowledge, experience and strong roots in trail advocacy.

Clubs and groups are made up of recreational riders, racers, parents, trail builders and others who volunteer their time to support their communities. Clubs and groups have taken on the responsibility for many years to build and maintain trails through sustainable management practices and close relationships with land owners. They also hold races and events to encourage participation and development of the sport and athletes.

Mountain Bike Community

It is acknowledged that many individual mountain bikers are not necessarily associated with a MTB club or group, yet they are potentially the largest user group and one of the hardest to consult with. Based on national and international experience, it is anticipated the continual growth of MTB activities will see sustained growth in participation from this group.

Photo: Right
Courtesy Kelly Doye

Photo: Left
Courtesy Angus Stuart

3 WHAT IS MOUNTAIN BIKING?

3 WHAT IS MOUNTAIN BIKING?

Mountain Biking is an activity with increasing participation rates worldwide. Mountain biking encompasses a broad spectrum of activities ranging from Olympic and Commonwealth Games level cross-country racing, competition downhill and extreme events, to school sport programs and recreational trail riding at levels from novice to experienced.

Mountain biking is a diverse activity that can be performed almost anywhere from a backyard to a gravel road, but is essentially about riding specialised bikes on off-road trails. According to a 2012 survey undertaken for the Western Australian Mountain Bike Strategy, the top three reasons why Western Australians mountain bike are to experience the outdoors, for fitness and to socialise.

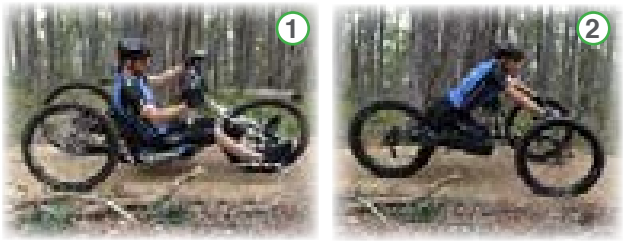
Most riders prefer and seek 'singletrack' trails, which are only wide enough to accommodate a single rider or groups in single file. Singletrack trails offer riders more intimate experiences of their environment, with the narrow nature of the trails providing a closer connection between the rider and the environment.

Well-designed and constructed singletrack trails provide a more sustainable outcome, reducing environmental impacts and costs associated with ongoing maintenance.

Mountain bike trails have varying levels of difficulty and this level of difficulty is communicated through the use of trail classifications (see Section 9). Different users will seek different levels of difficulty depending on their experience and what they are looking for in a trail, for example: technical progression, appreciating nature, endurance etc.

The ongoing development of cycle technology has now been incorporated into adaptive mountain bikes (aMTB) specifically designed for off-road cycling, including –

- Handcycling (for lower body impaired)
- Legcycling (for upper body/balance impaired)
- Tandem (for vision/auditory impaired)
- Modified bikes (for intellectually/other impairments)



① Off-road handcycling ② Kneeling handcycling

This enables people with disabilities to experience the range of mountain bike trails, with aMTB riders seeking the same mountain bike experiences outlined below (Break the Boundary, 2016).

Break the Boundary has produced the Australian Adaptive Mountain Biking Guidelines to help improve the accessibility and inclusion of aMTB in Australia. Copies of the guidelines are available from breaktheboundary.com

3.1 User Types

Mountain biking is a diverse activity. For the purpose of these guidelines mountain bikers have been divided into five user types which are defined by their differing trail requirements and expectations. 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 to define who the trails are for and why the trails are being developed. In the past, trail development has been reactive and based on user demands.

Understanding your target market enables a proactive approach to ensure the right trails are developed in the right area, for the right user.

TYPE	DESCRIPTION	CLASSIFICATIONS SOUGHT	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, cafes and toilets.	This group will generally seek white (easiest) and green (easy) classification trails. As they progress, will start to ride blue (moderate) classification trails.	Large
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 existing market majority (WA MTB Strategy). They typically don't compete in events and they possess limited outdoors experience. They prefer trails with good trail signs 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 have the potential to move into another user type (sport and/or gravity).	Moderate
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 a 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 often with an uplift facility, which are repeatedly used in a concentrated manner. Gravity riders seek specific trails with the highest classifications.	Blue – Double Black	Small

Table 1 Mountain bike user types (based on Davis, 2012 – *Off-road cyclist cohorts*)

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

3.2 Trail Types

There are several trail types, usually defined by terrain. Trail types have evolved over the last 30 years and will continue to evolve due to the improvements in bicycle design and technology, and the adventurous nature of the activity.

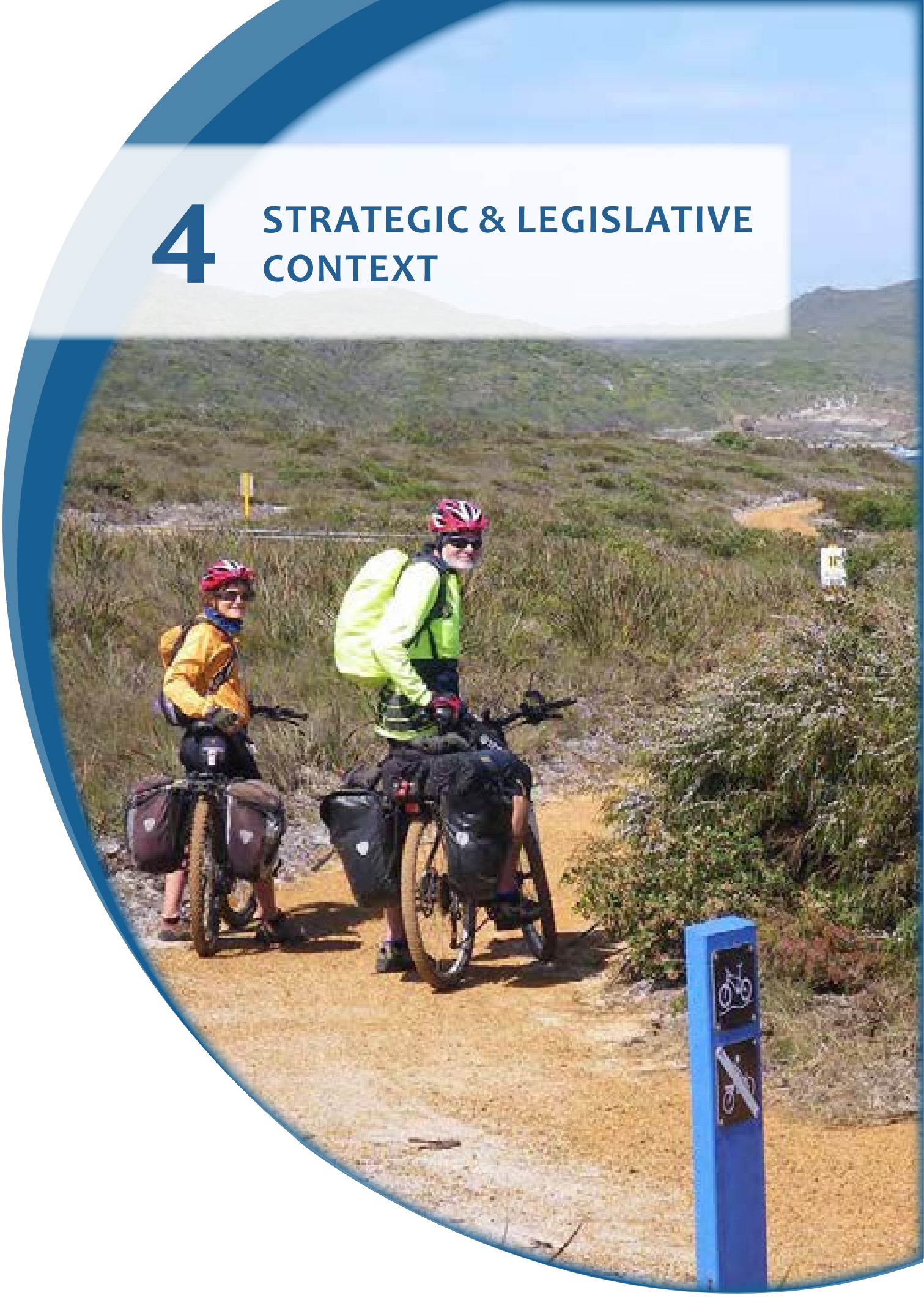
Trail type defines the style of riding and its typical attributes. Different trail types suit different styles of riding and typically each trail type will have a specific mountain bike designed to suit. All trail types can vary in classification.

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.
All Mountain/Enduro (AM/EN)	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 (Enduro). All mountain trails may use uplift to the trailhead where appropriate. Bikes are typically light to medium weight with medium-travel dual suspension.
Downhill (DH)	Purely descent only trails with emphasis on steep gradients for speed and technical challenge with a focus on skill development. These trails can cater for timed 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, built for strength over weight and typically long-travel dual suspension.
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 maneuvers 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 maneuvers, skill development and progression. Appeals to wide market including youth and can cater for competitions judging aerial maneuvers. Can include jump tracks, 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. Bikes may be carrying panniers or towing trailers, and are usually robust with limited suspension, however, for short sections or day trips most mountain bikes are suitable.

Table 2 Trail Types

Photo: Right
Courtesy Leanne Robb

4 STRATEGIC & LEGISLATIVE CONTEXT



4 STRATEGIC AND LEGISLATIVE CONTEXT

State and local governments are responsible for the implementation of a wide range of legislation and policy which impact the development of new trails and the management of existing trails. This legislation has significant influence on the location, construction, ownership and ongoing maintenance of trails.

Trails cannot be developed in isolation; they must be developed within 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 (Section 10) includes processes for checking and reviewing legislation, policies and strategies.

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

Strategies

Western Australian Strategic State Trails Blueprint 2017-2021

The Western Australian Strategic Trails Blueprint 2017-2021 is an overarching guide for consistent and coordinated planning, development and management of quality trails and trail experiences across Western Australia. It provides a vision, guiding principles, strategic directions and actions for consideration across State government, trail managers, landholders, trail support groups, tourism operators and the community.

Western Australian Mountain Bike Strategy

The Western Australia Mountain Bike Strategy provides a high-level framework for coordinating and developing mountain biking across Western Australia. The Strategy assesses identified challenges and desired improvements in order to provide a vision for the future of mountain biking in Western Australia. It details the objectives, strategies and recommendations needed to unlock the opportunities and potential that mountain biking presents.

STATE	REGIONAL	LOCAL
• Western Australian Trails Strategy • State Government strategies and plans • Departmental policy statements • WestCycle and WAMBA strategies and plans	• Regional Developmental Commission plans • Regional Tourism Authority plans • Local government strategies and plans	• Local government strategies and master plans • Land management and business plans • WA Mountain Bike Management Guidelines and Trail Development Process • Clubs and groups strategies and plans
Western Australian Mountain Bike Strategy	**Regional Masterplanning**	**Detailed Trail Planning**

Our Bike Path 2014 – 2020: A Strategic Framework for Cycling in Western Australia

WestCycle's Our Bike Path 2014 – 2020 is a strategic and collaborative approach to the growth of cycling in Western Australia. It map s a vision and framework to guide the future development and growth of cycling in Western Australia. The document aims to provide a framework for all cycling groups and State government agencies and establishes the principal that no single cycling organisation, club, rider, bicycle user group or government agency can grow cycling alone. It establishes the need to grow a cycling culture, create bike-friendly communities, build community capacity, strengthen sporting pathways and develop a cycling economy.

Regional Trail/Activity Master Plans

Regional master plans may be undertaken for an activity or for trails in general. Regional master plans assess the region or area and provide recommendations and priorities for the development of trails, for example the South West and Perth and Peel Mountain Bike Master Plans.

Policy and Guidelines

Parks and Wildlife Service Policy Statement 18 Recreation, Tourism and Visitor Services

Policy Statement 18 outlines the underlying principles, administrative controls and, where appropriate, operational guidelines and procedures relating to parks and visitor service. It provides the basis for planning and management for recreation, tourism and associated visitor activities on lands and waters managed by the Parks and Wildlife Service.

The policy states the Parks and Wildlife Service will ensure a diversity of sustainable nature-based recreation opportunities and high quality visitor experiences are provided on their managed lands and waters. Generally the policy supports recreational activities and development subject to meeting various criteria including aesthetic value, public demand and ability to withstand appropriate levels of use without environmental degradation.

Parks and Wildlife Service Policy Statement 53 Visitor Risk Management

Policy Statement 53 outlines the Parks and Wildlife Service's commitment to the safety of visitors to Parks and Wildlife-managed land and waters, and the strategies the department has adopted to manage visitor risk.

The policy is supported by operational guidelines and a visitor risk management program which comprises identification, analysis and efficient control of exposure to public liability risks. The Policy states the department will aim to manage the potential for injuries and misadventure to visitors is a manner that does not render the environment sterile or unnecessarily diminish visitor use and enjoyment.

Forest Management Plan 2014 – 2023

This plan outlines the Parks and Wildlife Service's approach to forest management in Western Australia's national parks, conservation parks, nature reserves, State forests and timber reserves, which cover a total area of more than 2.5 million hectares. The purpose of this plan is for biodiversity to be conserved; the health, vitality and productive capacity of ecosystems to be sustained; soil and water resources to be protected; and the contribution to global carbon cycles to be sustained. Further, the social, cultural and economic benefits valued by the community are to be produced in a manner taking account of the principles of ecologically sustainable forest management.

Conservation Reserve Management Plans

All national parks, conservation parks and nature reserves in Western Australia are vested in the Conservation and Parks Commission of Western Australia. The Parks and Wildlife Service carries out the management of these reserves and prepares management plans. Management plans contain a statement of the policies or guidelines proposed to be followed and a summary of operations proposed to be undertaken. Once a management plan is in place for a national park, conservation park or nature reserve, Parks and Wildlife must manage the land in accordance with that plan. Where there is no management plan in place only necessary or compatible operations may be undertaken.

Department of Water and Environmental Regulation's Operational policy 13: Recreation within Public Drinking Water Source Areas on Crown Land

Operational policy 13 is the Department of Water and Environmental Regulation's (DWER) policy to ensuring recreational activities in Public Drinking Water Source Areas (PDWSAs) are managed to protect water quality and public health. It identifies that passive land-based recreation activities in PDWSA's are:

- Not supported in reservoir protection zones (RPZ) except on trails designated for bike riding or public roads.
- Supported in outer catchments, wellhead protection zones, and outer catchments of groundwater source areas subject to recreation compatibility requirements noting that recreation events and facilities cannot exceed 2012 approved levels and new or enhanced recreation must be located outside proclaimed PDWSAs.

(Note - At the time of development, Operational Policy 13 was under review by the Department of Water and Environmental Regulation).

Local Planning Schemes

Local Planning Schemes divide the local government district into zones to identify areas for particular uses and identify land reserved for public purposes. Most importantly, the Scheme controls the types of use and development allowed in different zones. The Scheme also sets out the requirements for planning approval, enforcement of the Scheme provisions and non-conforming use. Typically land is zoned Residential, Commercial, Industry, Tourist or Rural but can have various additional use classes. Public and private recreation areas are usually identified for community use and may be permitted subject to the local government granting planning approval, after advertising the development.

Local Trail Master Plans

Trail Master Plans are typically developed by local governments and the key stakeholders, and provide a framework to integrate the planning of individual trails to ensure they are well planned, managed, resourced, promoted and maintained.

Photo: Below
Courtesy Kamila Ambrozewicz

Photo:
Courtesy Kamila Ambrozewicz

PARKS AND WILDLIFE SERVICE

4.1 TENURE COMPATIBILITY (PARKS AND WILDLIFE MANAGED-LAND)

The following sections of 'Land Tenure and Purpose' and the 'Compatibility Table' relate to Parks and Wildlife-managed land and the potential suitability of various tenures for different types of mountain bike trails.

Land Tenure and Purpose

National Parks

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

National parks are managed to conserve wildlife and the landscape, for scientific study, 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, 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, due to their high conservation value and representation of natural ecosystems, and because they contain or provide habitat for particular species of plants or animals.

They are managed so as 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 considered.

State Forest and CALM Act Timber Reserves

State forest is managed for multiple purposes that include sustainable timber production, nature conservation, recreation and the protection of water catchments. It also provides for commercial activities such as beekeeping and the harvesting of flora. State forest containing exotic trees such as pine plantations, are managed predominantly for timber production.

Timber reserves created under the CALM Act are managed identically to State forest.

Forest Conservation Areas (FCA) are primarily managed for biodiversity conservation, hence they will not be available for timber production, but may be available for other uses such as wildflower picking, beekeeping, recreation, craftwood collection and possibly firewood collection.

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, wetlands and the Darling Scarp.

Regional parks may comprise lands with a variety of tenures. These may include Crown land vested in Commonwealth, State or local government authorities, and 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.

Other Reserves managed by the Parks and Wildlife Service, include:

- Reserves under Section 5(1)(g) or 5(1)(h) of the CALM Act. These are reserves vested in or placed under the care, control and management of the Conservation and Parks Commission and managed for a variety of purposes including recreation and conservation (e.g. part of Lane Poole Reserve).

- Land managed under Section 8C of CALM Act. In accordance with Section 8C of the CALM Act the Governor by order may place unallocated Crown land or unmanaged reserves under the management of the DBCA Director General (DG). On the recommendation of the Minister for Land the Governor can specify the functions in relation to management of that land. Generally this management will be consistent with the powers of the DG and in accordance with the CALM Act.

- Land subject to management agreement under Section 8A of CALM Act. Section 8A of the CALM Act allows the DG to enter into an agreement with the owner of freehold land, Crown reserves or pastoral leases for a specific purpose consistent with the CALM Act. The bulk of land managed under Section 16 is for regional parks. Some portions of pastoral leases are managed under Section 16A for conservation purposes.

- Miscellaneous Reserves, Freehold Land and Former Leasehold Land. Miscellaneous reserves and freehold land can be vested in or held in the name of the department. These lands are held for specific operational purposes (e.g. departmental office sites) or pending conversion into a conservation reserve. The majority of pastoral lease land purchased by the department is held as unallocated Crown land, with the pastoral lease cancelled.

Unallocated Crown Land and Unmanaged Reserves

Nearly 40 per cent of Western Australia comprises unallocated Crown land and unmanaged reserves (e.g. not directly administered or managed by a Government agency). The Department of Planning, Lands and Heritage (DPLH) has responsibility for this land. DBCA manage this type of land outside cities and town sites for preparations to control fire and for the control of weeds and pest animals. DPLH are responsible for all other management issues, including recreation.

Local government-managed lands are also set aside for specific purposes, such as conservation or recreation. (Refer to Local Planning Schemes in Section 4: Policy and Guidelines).

Table 3 shows general compatibility of mountain bike trail types on Parks and Wildlife-managed land as outlined in Section 4 Land Tenure and Purpose.

PARKS AND WILDLIFE-MANAGED LAND COMPATIBILITY						
	National Parks	Conservation Parks	Nature Reserves	State Forest and Timber Reserves	Regional Parks	Other reserves
Cross Country						
All Mountain						
Downhill*	***					
Freeride**	***					
Park	***					
Touring			***			

Table 3 Mountain Bike Trail Compatibility Matrix for Parks and Wildlife Managed Land

COMPATIBLE
MTB trail development is generally considered compatible – requires Parks and Wildlife checks and Trail Development Process

CONDITIONALLY COMPATIBLE
MTB trail development may be considered if the trail type, design and alignment have little to no negative impact on the area's conservation, heritage or social values and/or where there are no conflicts with other recreation activities.

NOT COMPATABLE
MTB trail development is not compatible with the purpose of the tenure.

* Downhill trails are generally steeper than cross country and all mountain trails, with evidence showing the steeper a trail grade is, the more impact it will have on the surrounding environment as well as having a higher maintenance cost (IMBA, 2007 pg. 102; Duffy, Basch, & Sharlow, 2012).

** IMBA defines freeriding as a "style of mountain biking that celebrates the challenges and spirt of technical riding and downhilling" These trails are usually either steeper than cross country and all mountain trails, and/or require a higher concentration of built features which may impact on the aesthetic of the environment. (IMBA, 2004).

*** Downhill, freeriding, park and touring trail development in these areas may be considered on a case by case basis where proposed on existing disturbed areas e.g. existing roads, tracks or previously cleared areas.

5 PARTNERSHIPS

Photo: Left
Courtesy Kerry-Anne Deklerk

5 PARTNERSHIPS

The development and management of mountain bike trails often involves partnerships. Partners involved will depend on size of the project and the land tenure. Partnerships may be formed between:

- the land manager/owner;
- State and local government agencies;
- peak bodies such as WestCycle and/or the WAMBA;
- State and local tourism associations
- mountain bike clubs and groups; and/or
- other interest groups.

BEFORE trails are built it is crucial to establish and document the roles and responsibilities required for trail development and management and then set out the roles and responsibilities of each trail partner. This will form the basis for a solid long-term relationship.

Wise words from 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 (Section 10) 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?**

Photo:
Courtesy Danielle Stone

The initial stages of the Trail Development Process outlined in Section 10 provides templates for identifying and engaging key project stakeholders and partners and detailing their roles and responsibilities.

One of the most important partnerships for ongoing trail management and maintenance is clear clarification of who is the **trail owner** and the **trail operator**. A single entity may fulfil both functions in some circumstances, but there is potential for separate entities to fill these functions.

The **trail owner** is the organisation legally responsible for the trails and is usually the land manager or land owner where the trails are built. 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 trail owner.

If the owner and operator are different, a trail adoption or similar management agreement (see Section 10.8.3: Trail Adoptions) is recommended for documenting the terms and conditions of a trail management partnership.

6 FUNDING

6 FUNDING

Funding for a new trail project or ongoing maintenance and management of a trail may come from a variety of sources, include land managers, community groups and grant programs. Securing appropriate levels of funding for trail development and management is essential for long term sustainability.

While this can seem daunting, proper planning of a trail project and breaking it down into its various stages may assist in developing budgets and identifying potential funding sources. For example, the land manager may be able to fund planning components, while the local trails group may apply for a grant to complete design and construction components.

When seeking funding, it is important to look at all potential funding and grant opportunities, including those outside the traditional grants available within the recreation sector. Trails often have a close link to the natural environment and local communities, and potential grant opportunities may exist in these areas:

- Local government community grants
- Natural resource management programs
- Tourism

When preparing funding applications ensure the strategic objectives of the grant program are considered. The application should align to the goals of the agency or funding body and link to any relevant strategic plans.

Both WAMBA and WestCycle may be able to assist with grant applications and/or with looking into other funding options.

Photo: Left
Courtesy Danielle Stone

Funding for trail maintenance is often difficult to source. However, there are a number of options to consider:

- Club membership fees
- Merchandise – MTB club apparel, trail apps
- Events – where event organisers to donate a percentage of each entry fee to trail maintenance
- Fundraising – raffles, crowdfunding
- Sponsorship of trail networks or individual trails

PARKS AND WILDLIFE SERVICE

COMMUNITY TRAIL SPONSORSHIP ON PARKS AND WILDLIFE-MANAGED LAND

In 2014, the Parks and Wildlife Service worked with the Kalamunda Mountain Bike Collective (KMBC) to develop and trialed community sponsorship guidelines. These guidelines enable community trail groups to offer 'on-trail' sponsor recognition, with sponsorship funds to go directly to the trail group to be used for trail maintenance and management activities.

The guidelines enabled the KMBC to seek community 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

For further information, contact the Recreation and Trails Unit on (08) 9219 8265) or recreationandtrails@dbca.wa.gov.au

Photo: Far left
Courtesy Jon Lloyd

7 EVENTS

7 EVENTS

The rise in mountain biking in Western Australia in recent years has fuelled both a huge growth in the number of mountain bike events taking place across the State and also increased participation levels. Mountain biking events are diverse, may be recreational or competitive and enjoyed by people of all ages and abilities.

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

Competitive events may include international, national, State or local competitions, series or championships for cross-country, downhill and gravity enduro or endurance/marathon events, such as long distance single or multi-day staged race events. Examples include the Dwellingup 100 or the four-day Cape to Cape stage race. The WAMBA have developed racing guidelines to assist event managers.

The broad range of ages, skill and fitness levels of those who compete in events such as this demonstrate the popularity amongst both the competitive and recreational rider. 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 draws the recreational rider to take part in these events.

Given the large number of existing mountain bike events in Western Australia, it is recommended proponents for any new mountain bike events liaise with both the WA Mountain Bike Association and Westcycle and the relevant land manager for where the event is planned early in the development of their new event.

Photo: Left
Courtesy Travis Deane

Race lines -
In competitive situations there may be more than one alternative riding line required, with the most difficult line the fastest. If additional riding lines are required for an event, organisers must seek land owner/manager approval for these lines and rehabilitate post-race as or if required.

If a trail is being designed to include racing, the inclusion of alternative lines should be discussed and agreed upon during the development of the Framework (Trail Development Process Stage 2: Section 10.2) and included in the detailed design plan.

7.1 EVENTS PROPOSED ON PARKS AND WILDLIFE MANAGED-LAND

The landscapes of WA's protected areas are a popular setting for mountain bike events. Legislation governing the management of Parks and Wildlife-managed lands requires event organisers to gain the department's approval prior to advertising or conducting an event. The manner in which the approval is issued depends on the nature of the event and if it is run for commercial purposes.

Event organisers must obtain approval from the department to conduct the event **before** commencing any advertising and/or marketing. Neglecting to do so may affect their chances of attaining approval and may even result in penalties such as a fine or prosecution.

To assist the Parks and Wildlife Service in completing the assessment process as soon as possible, the following is recommended when applying for an event:

1. Review the event information available on the Parks and Wildlife website **www.parks.dbca.wa.gov.au** and determine if your proposed event is a **commercial** or **non-commercial** event.

2. Provide as much detail with the relevant application form (either commercial or non-commercial) including:
   - An event management plan.
   - Maps indicating the proposed routes, spectator points and camping sites, and any mustering, changeover or transition points.
   - Detailed layout of each mustering, 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.

3. Identify an individual in the organising team to be the contact person to ensure any issues can be addressed as soon as possible.

The Assessment Process

All applications for events must undergo a more detailed assessment due to their unique impacts and management requirements. Parks and Wildlife has 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 the department may take into consideration when assessing an application to conduct an event are:

- The appropriateness of the event to the reserve's values and purpose and if the proposed activities are in line with the area's management plan.
- The risks and likelihood of spreading pathogens (e.g. Phytophthora Dieback) and weeds and the 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.
- If departmental operations such as prescribed burning could impact or cause the cancellation of an approved event.
- The likelihood that the event could endanger or otherwise impact on or disadvantage other user groups.
- If the activity or event could result in a significant or unacceptable level of environmental damage if not properly managed/controlled.
- If the marketing and promotional material is appropriate.
- If there are other alternatives or more suitable sites outside Parks and Wildlife-managed land.

If the department considers the application acceptable, the application will then proceed through the approvals process. If the department considers an event unacceptable, detailed feedback will be provided.

The Approvals process

Once assessment of the application is complete and the proposed 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.

Commercial Events

All commercial operations licenses granted by the Director General must be referred to the Conservation and Parks Commission for consultation before being submitted to the Minister for the Environment for approval. This process can take up to 6 to 10 weeks to complete and is required for all commercial events.

Non-Commercial Events

Parks and Wildlife district and regional managers have the authority to approve non-commercial events without having to consult vesting bodies or seek approval of the Minister for the Environment. The exceptions to this are significantly large or high impact events where managers should consult the Conservation and Parks Commission before approval is granted.

For further information contact:

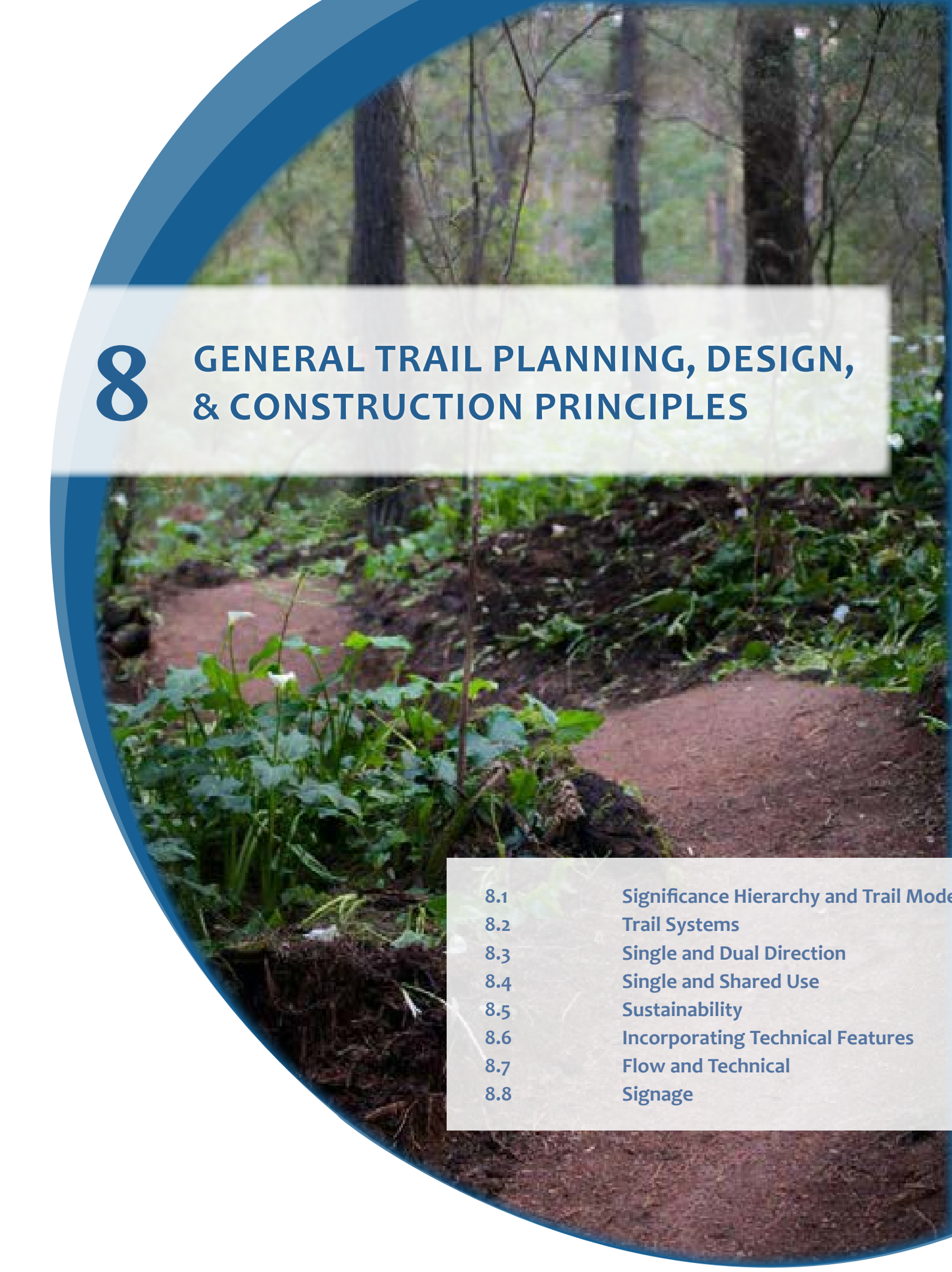
For Commercial Events

The Licensing Officer
Email: licensing@dbca.wa.gov.au

For Non-Commercial Events

The relevant Parks and Wildlife district or regional office in the area the event is proposed.

Photo: Right
Courtesy David Willcox



8 GENERAL TRAIL PLANNING, DESIGN, & CONSTRUCTION PRINCIPLES

8 GENERAL TRAIL PLANNING, DESIGN, AND CONSTRUCTION PRINCIPLES

This section provides some general principles regarding trail planning, design and construction. It can be used as a reference when working through the Trail Development Process (Section 10).

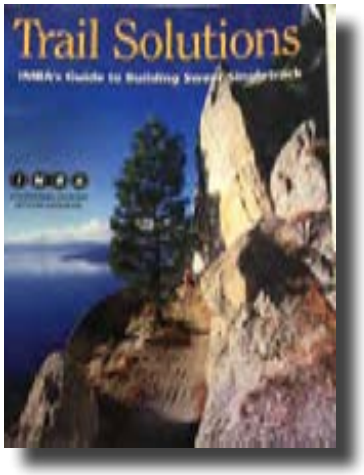
Much of the information has been derived from the International Mountain Bicycling Association and Natureshape. The following publications expand on the material provided here and are recommended reading.

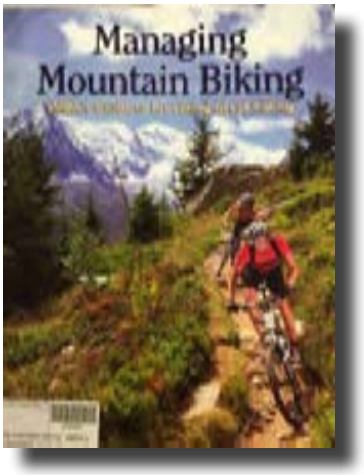
- Trail Solutions. IMBA's Guide to Building Sweet Single Track. (IMBA)
- Managing Mountain Biking. IMBA's Guide to Providing Great Riding. (IMBA)
- Natural Surface Trails by Design. Troy Scott Parker (Natureshape).

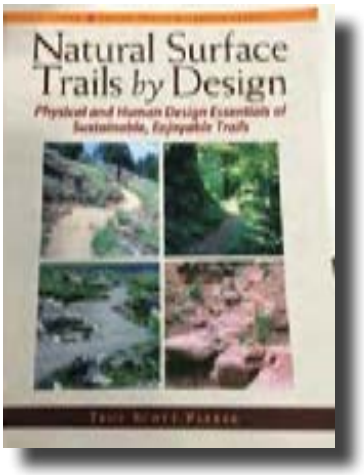
These books can be found at the following websites:

www.imba.com

www.natureshape.com







8.1 SIGNIFICANCE HIERARCHY AND TRAIL MODELS

8.1.1 Significance Hierarchy

Establishing the scope and scale of a new trail system is essential to ensure 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) and adapted for Western Australia, gives a quantitative justification for identifying the size of a trail network.

NATIONAL SIGNIFICANCE	REGIONAL SIGNIFICANCE	LOCAL SIGNIFICANCE
A mountain bike facility for a large population centre and/or a tourism resource that caters for at least a week of unique riding opportunities.	A mountain bike facility for a small population centre or large community and/or a tourism resource that caters fir short breaks or weekend trips.	A mountain bike facility for a small community and/or a tourism resource that caters for day trips.

STATEWIDE NETWORK

The significance hierarchy comprises three levels: National, Regional and Local:

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.

CRITERIA	METRIC	MINIMUM INFRASTRUCTURE REQUIRED
Length of Trails	> 80km	Trail Town or Trail Centre with high quality user facilities including: Car park Toilets Trailhead signs Trail markers Accommodation Bike hire Cafe
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 and Blue required as minimum.	

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.

CRITERIA	METRIC	MINIMUM INFRASTRUCTURE REQUIRED
Length of Trails	20km – 80km	Car park Toilets Trailhead signs Trail markers Accommodation
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 scale 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.	

Local Significance

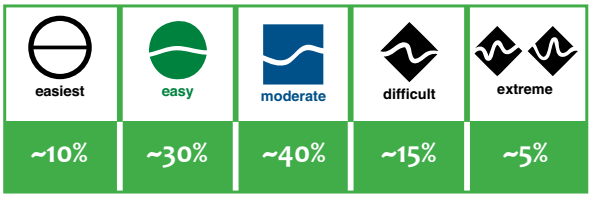
A mountain bike facility for a small community and/or a tourism resource that caters for day trips.

CRITERIA	METRIC	MINIMUM INFRASTRUCTURE REQUIRED
Length of Trails	Up to 20km	Car park Toilets
Number of loops	2+	Trail head signage Trail markers
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.	

An appropriate level of significance for new trail developments must be established in the initial stages of any new trail system planning and the following questions can help to determine the appropriate significance level within the hierarchy:

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

National and regional significant trail systems have the potential to cater for the full spectrum of trail classifications and are based on the indicative percentage breakdown below:



*Percentages based on WA MTB Strategy 2012 survey results

Locally significant trail systems may only include one classification and/or one trail type.

For example:

- **a small 5km green trail within the metropolitan area to provide a recreational resource to the local community; or**
- **a 20km network of cross country trails with a range of trail classifications catered for.**

Photo:
Courtesy Sean Blocksidge

8.1.2 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.

There are five types of trail models:

Trail Precinct

A defined area with a potential mixture of Trail Towns, Trail Centres, Trail Networks and Individual Trails.

Trail Town

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 Centre

A trail or trail network supported by high quality dedicated on site trail related services and facilities. A Trail Centre is typically stand alone in an individual location, but can form part of a larger Trail Town.

Trail Network

A collection of linked trails, often of the same trail type and typically accessed via a trailhead. A Trail Network may be standalone in an individual location and can form part of a larger Trail Town.

Individual Trails

Individual linear or looped trails are typically small individual trails that stand alone in a community setting. Long distance trails can link these trails to another trail model and can also be the precursor to developing a tourism destination.

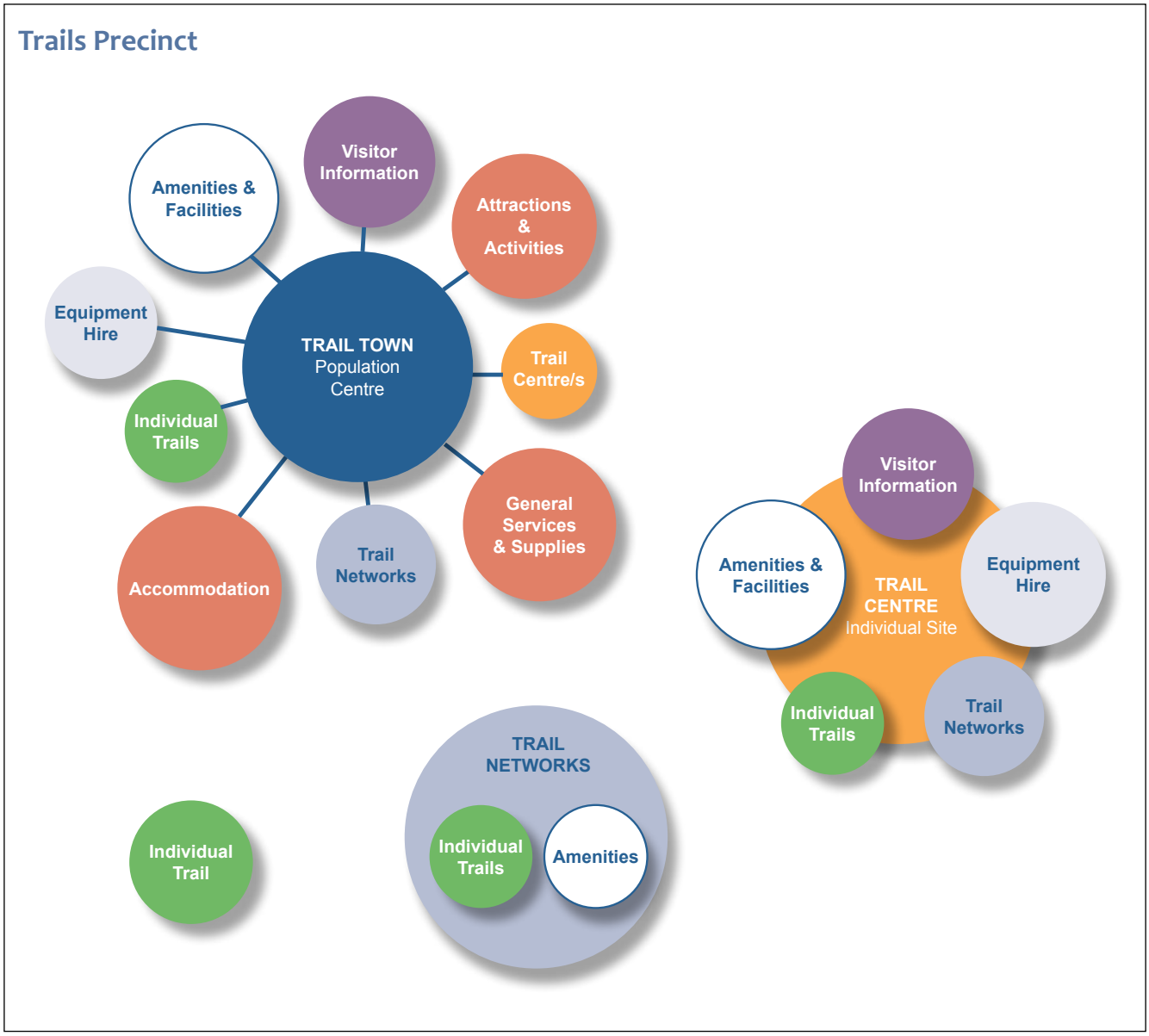


Figure 2 Trail Models (State Trails Blueprint 2017-2021)

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:

	TRAIL TOWN	TRAIL CENTRE	TRAIL NETWORK	INDIVIDUAL TRAILS
National Significance	✓	✓	Only if part of a trail town/ centre	Only if part of a trail town/centre
Regional Significance	✓	✓	✓	Only if part of a trail town/centre
Local Significance	✓	✓	✓	✓

Table 4 Significance hierarchy and appropriate trail models (WA MTB Strategy)

8.2 TRAIL SYSTEMS

Trails can standalone or be part of trail systems that link 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 tenure

8.2.1 Linear Trails

Linear trails are point-to-point alignments starting and finishing in different places. Linear trails may be single direction or dual direction with trailheads at both ends. Due to their point to point design, linear trails may be suited for the provision and use of lift or shuttle services.

Linear trails can be used to link destinations, points of interest or other trails, with long-distance linear trails providing an uninterrupted trail experience over a significant distance.

8.2.2 Loop Trails

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

Loops can be stacked so that they enable trail users to ride shorter or longer sections and vary the route they take. Loop trails may be interconnected with each other or linked together by linear trails to enable trail users to travel one trail and return to the same point via an alternative trail.

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

Photo:
Courtesy Sean Blocksidge

8.2.3 Trail Networks

Different trail systems can make the optimal use of available space by linking several trails together from a trailhead and may include a combination of trail styles, difficulty levels and designs depending on the location's characteristics and attributes.

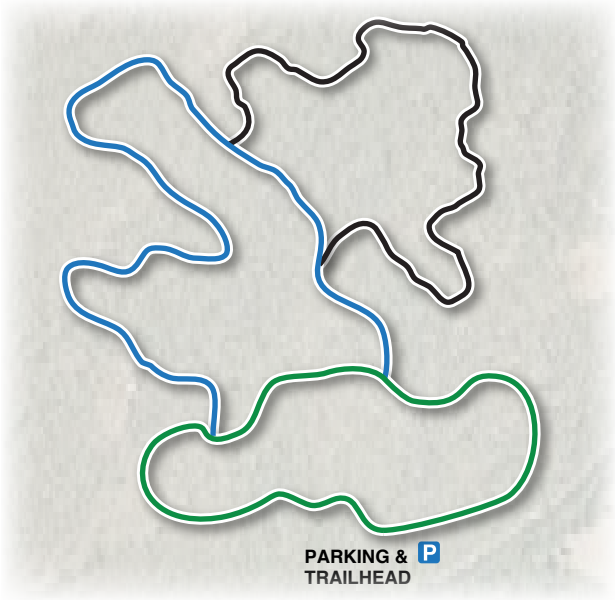
Larger trail networks may require more than one trailhead, however where practicable, trail systems should limit access to one entry and exit area, preferably at the lowest elevation.

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

Key trail system designs:

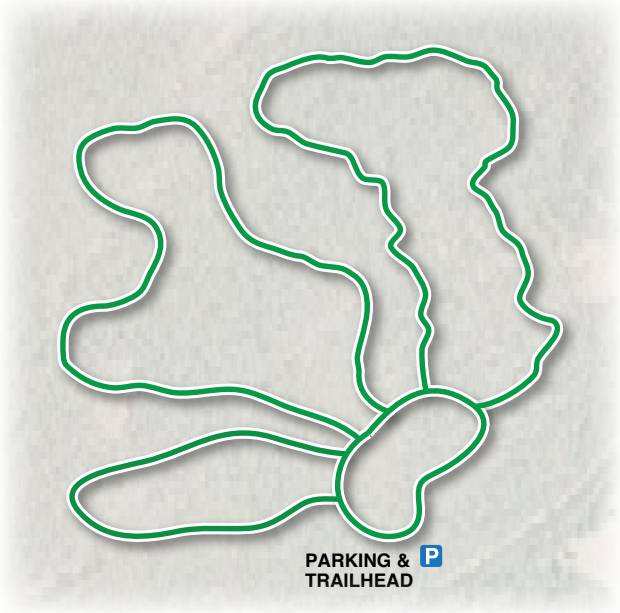
Stacked loop

With stacked loop designs, trail networks can provide a variety of different length experiences, and may become more technically challenging as the distance from the trailhead increases, given trail users seeking difficult or remote experiences are usually willing to travel further.



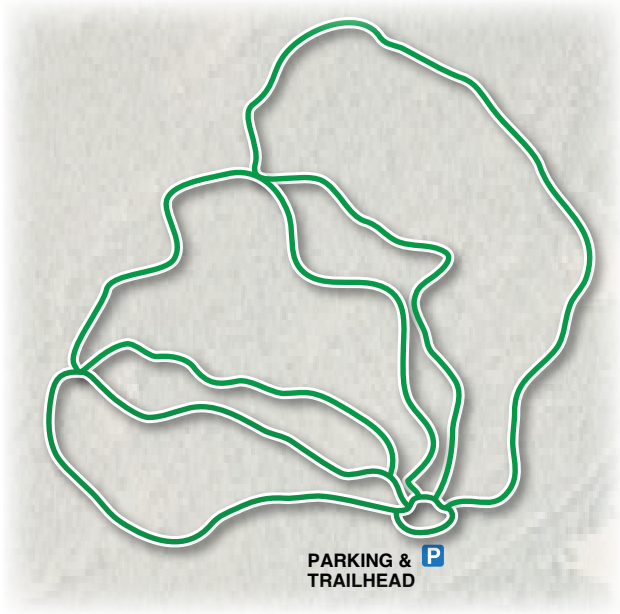
Cloverleaf

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 many combinations.



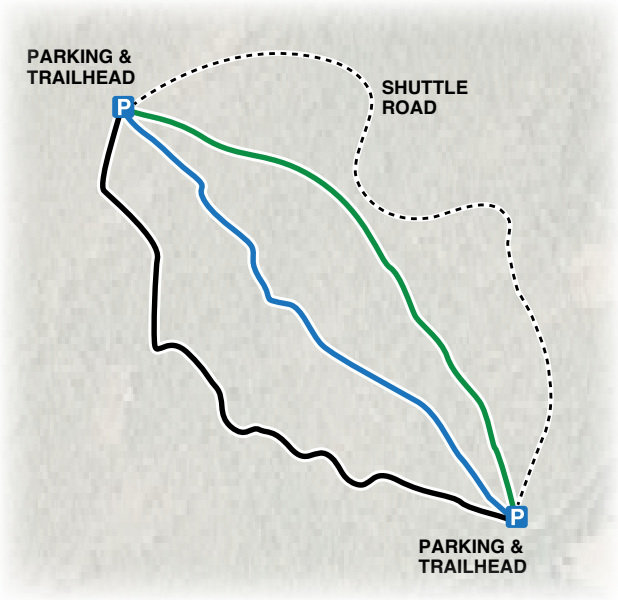
Linked Loop

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 finger

Trail fingers fan out from the core trail or trailhead at various points giving riders a simple choice of options. Trails can be loops or linear. Trail finger design lends itself to uplift facilities such as a lift or shuttle road.



Different trail systems 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 and can also include facilities such as pump tracks, skills parks and dirt jumps. This gives trail users a variety of options during the same or subsequent trips.

When designing downhill trails, it may be more appropriate to design these 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 (e.g. heavy, long travel, highly geared). When designing downhill trails, vehicle access should be considered to enable shuttling from the base to the start of the trails.

It is also important to consider emergency and maintenance access points in the design stages of all trail systems.

8.3 SINGLE AND DUAL DIRECTION

8.3.1 Single Direction Trails

Single direction trails:

- Provide a more predictable trail experience by reducing potential encounters and the risk of collisions with trail users travelling in opposite directions.
- 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 (e.g. 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 and different views etc.

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

8.3.2 Dual Direction Trails

Dual direction trails take better advantage of the available space by doubling the length of trail available within a trail corridor, particularly in areas where there may be limited trail quantities available.

Dual direction trails can provide varied experiences to trail users travelling in opposite directions through differing levels of technical difficulty and different views, however, dual direction trails increase the potential for encounters and the risk of collisions between trails users traveling in opposite directions. This needs to be duly considered in the development of any dual direction trails.

Dual direction trails require appropriate trail design to manage potential risks, including:

- long and clear sightlines;
- passing opportunities;
- slowing points prior to turns, technical trail features (TTFs) and intersections; and
- appropriate warning signs 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 retrospectively built into the existing trail.

In Western Australia, single track mountain bike trails are generally single direction unless otherwise signposted. This should be clearly communicated on trailhead signs 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 wherever appropriate.

A code of conduct, or rules of the trail, should include information about rider responsibilities when using dual direction trails. See Appendix 1 for the Western Australian Mountain Biker's Code.

8.4 SINGLE AND SHARED USE

8.4.1 Single Use

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

Single use can:

- Enable construction of technical mountain bike trails that are not suitable for other trail users.
- 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, to create a more desirable experience for riders.
- Provide more predictable and safer 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. (See Filters Section 8.6.2)

Single use trails are appropriate for advanced cross-country, all-mountain, downhill and free riding trails, and skills 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 riders.

8.4.2 Shared Use

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 where appropriate by IMBA, who suggest responsible mountain biking is compatible with most other types of trail users.

Shared use trails can:

- take advantage of the available space and 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 technically difficult TTFs 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 potential for encounters with other users is increased.

When designing shared use trails, IMBA recommends to ensure:

- Optimum trail speed is achieved through the flow of the trail.
- Trail anchors and demarcation (see Section 8.6.1) 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 through the use of 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 they are carefully designed to reduce the risk of collisions between users.

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. See Appendix 1 for the Western Australian Mountain Biker's Code.

8.5 SUSTAINABILITY

Sustainable trails meet user's needs, reduce environmental impact and require less maintenance. The way to achieve this is to develop the right trail, in the right area, the right way and for the right reasons.

With regard to trail development the word 'sustainable' refers to:

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 that required for the trail footprint. Trails should be used to manage potential recreational impacts on wildlife and habitats in a positive way. Trails should be designed and constructed in way that minimises the potential spread of soil-borne pathogens and weeds.

Trails and Infrastructure

Trail development must consider the ongoing provision of resources to manage the trail and associated infrastructure. Designing and constructing trails to minimise ongoing maintenance requirements and costs, allow staff and volunteer resources to be better used elsewhere.

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.

Other land use

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

8.5.1 Trail location and alignment

Topography plays an important role in building trails that are a 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. 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, alignment and gradient are the most important factors affecting erosion (IMBA, 2007).

Trail location and alignment also plays an important part in minimising the potential spread of soil-borne pathogens such as the water mould (Phytophthora cinnamomi) that causes the plant disease Phytophthora Dieback. Poorly draining trails create a higher risk for transferring Phytophthora Dieback. This pathogen causes root rot in susceptible plants by limiting or stopping the supply of water and nutrients. Over 40% of native Western Australian plants are susceptible to Phytophthora Dieback. It is common in most of southern Australia, particularly in the jarrah forests near Perth and in the south-west of Western Australia. The pathogen is most easily spread by human movements and travel through soil movement. There is currently no practical method of eradication of the pathogen once an area is infected. The potential spread of Phytophthora Dieback can be minimised through free-draining trails, which reduce the incidence of puddles and inundated trails, lessening the amount of dirt that sticks to shoes and tyres. (DWG, 2014)

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 building up and crowning the trail, armouring or boardwalks etc.

Trails can also negatively impact water quality:

- Avoid wetlands and minimise the number of stream crossings.
- Where a crossing is unavoidable, build above the water using bridges or boardwalks, or armour the crossing.
- Watercourses are often Registered Aboriginal Sites. Any construction activities may require consultation and approval. Always check with the land manager. See Section 10.3.6 for more information about Aboriginal sites.

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:

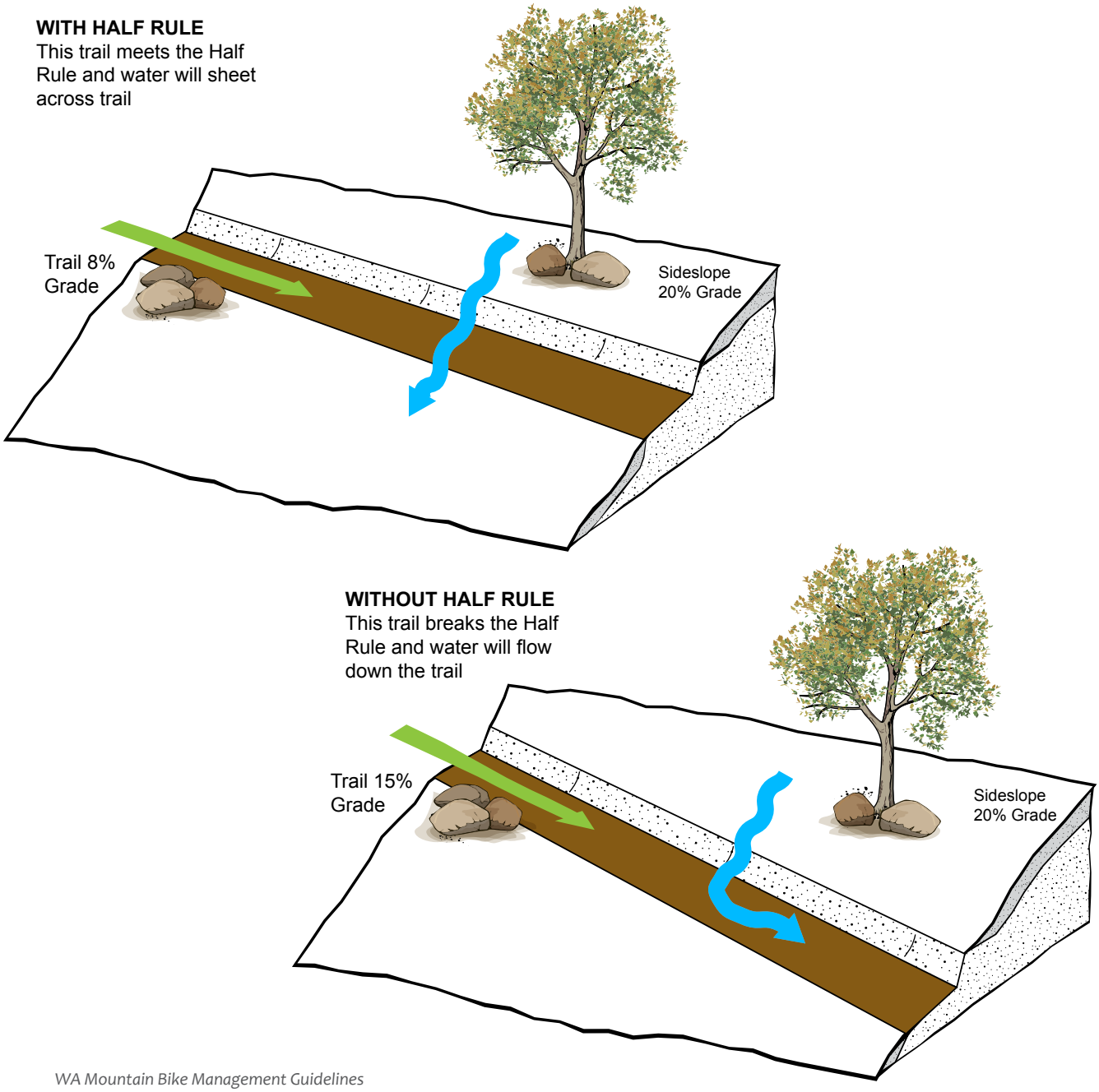
- Historic, cultural and archaeological sites
- Private property
- Unpleasant views
- Wetlands
- Flat ground
- Extremely steep side slopes
- Sensitive wildlife habitat
- Sensitive plant communities

8.5.2 Grade

Half rule:

- 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 is incorrect.
- There are 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 6 - Soil types and drainage intervals.
  - Some trail types (e.g. 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.

HALF RULE



Sustainable grade – the 10% Average Rule:

- The 10 percent rule is based on experience and industry best practice, which has shown an average gradient of 10 percent or less is generally sustainable:
  - It applies to most soil types;
  - minimises user caused erosion;
  - allows for design flexibility;
  - accommodates undulations; and
  - 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/length x 100 = average grade. For example, if a trail falls 50m over a 650m section the trail grade would be 50/650 x 100 = 7.7% grade.

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

See Appendix 2 – How to measure with a clinometer.

8.5.3 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).

Every landscape, hillside, valley and vegetation complex has 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 should assess soil suitability of a proposed alignment and identify areas that may require special attention or areas that need to be avoided (e.g. 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 trail designer 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); and
- maintain tread stability in varying trail gradients (braking, surface movement).

Table 6 provides a guide to the relationship between soil type, grades and maximum length between drainage features, noting the following assumptions:

- Most tread watersheds drain down the trail and through the dip at the lower end (e.g. 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.
- Conditions and results will vary – **this is only a guide.**

* No trail 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

SOIL TYPE	*GRADE*										
	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					

Table 5 Soil types and drainage intervals (Scott Parker, 2004).

8.5.4 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 outsloping 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).

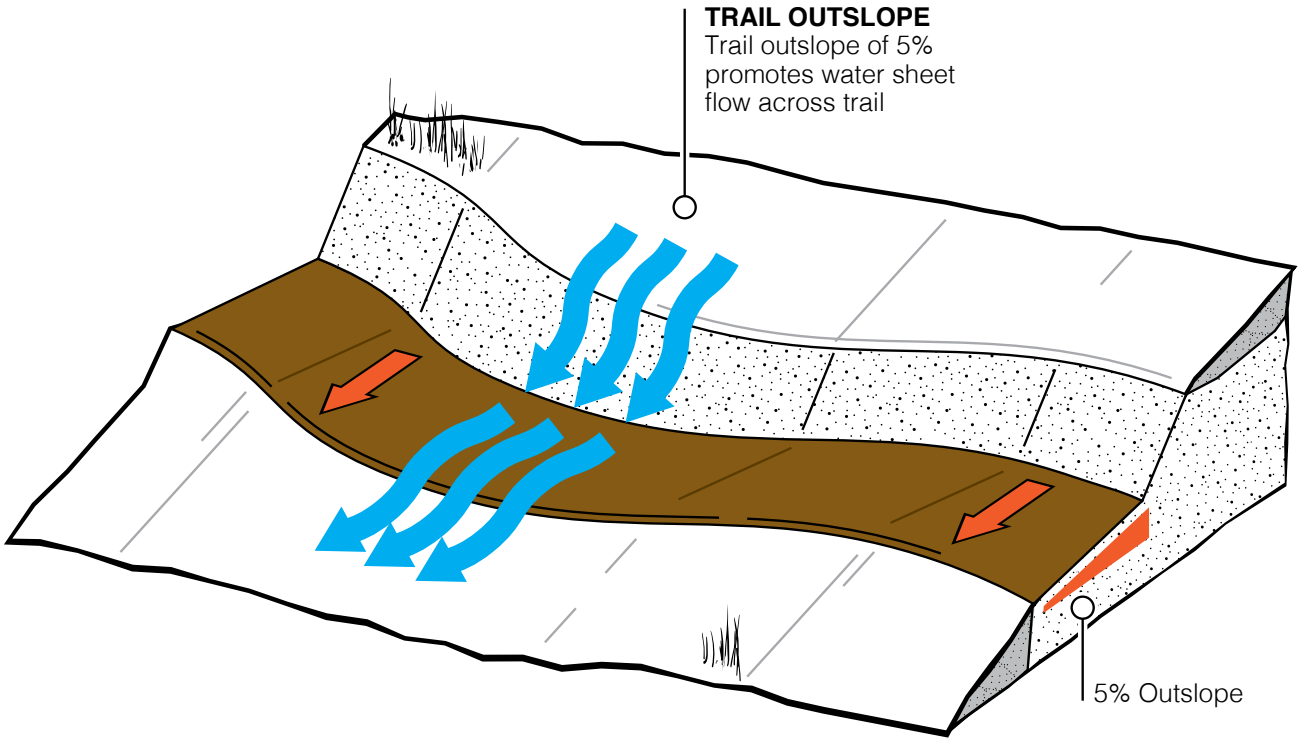
Construct drainage features in way that blends into the environment – use a rake-hoe to blend where construction finishes and the bush begins. When drainage is designed and constructed well, trail users won't notice it.

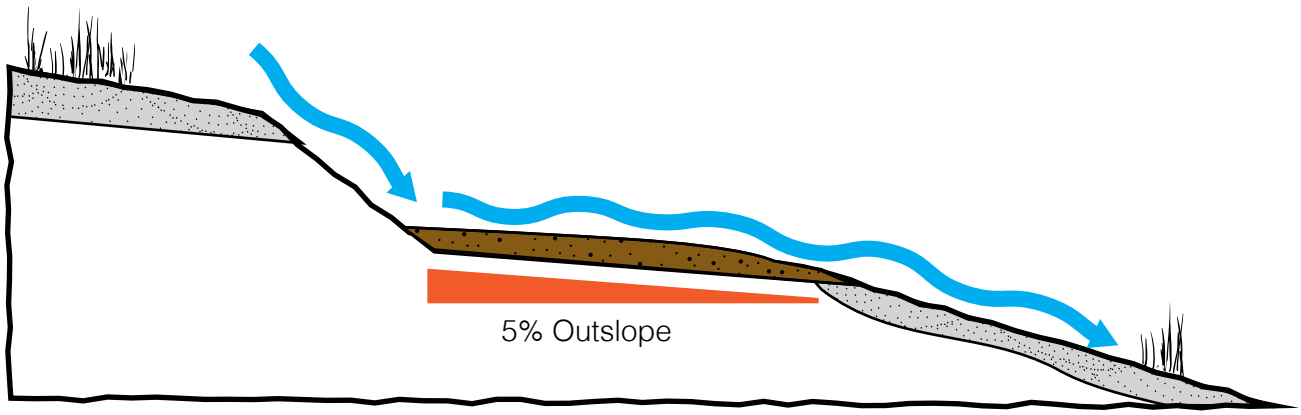
Photo:
Courtesy Kamila Ambrozewicz

OUTSLOPE VS INSLOPE

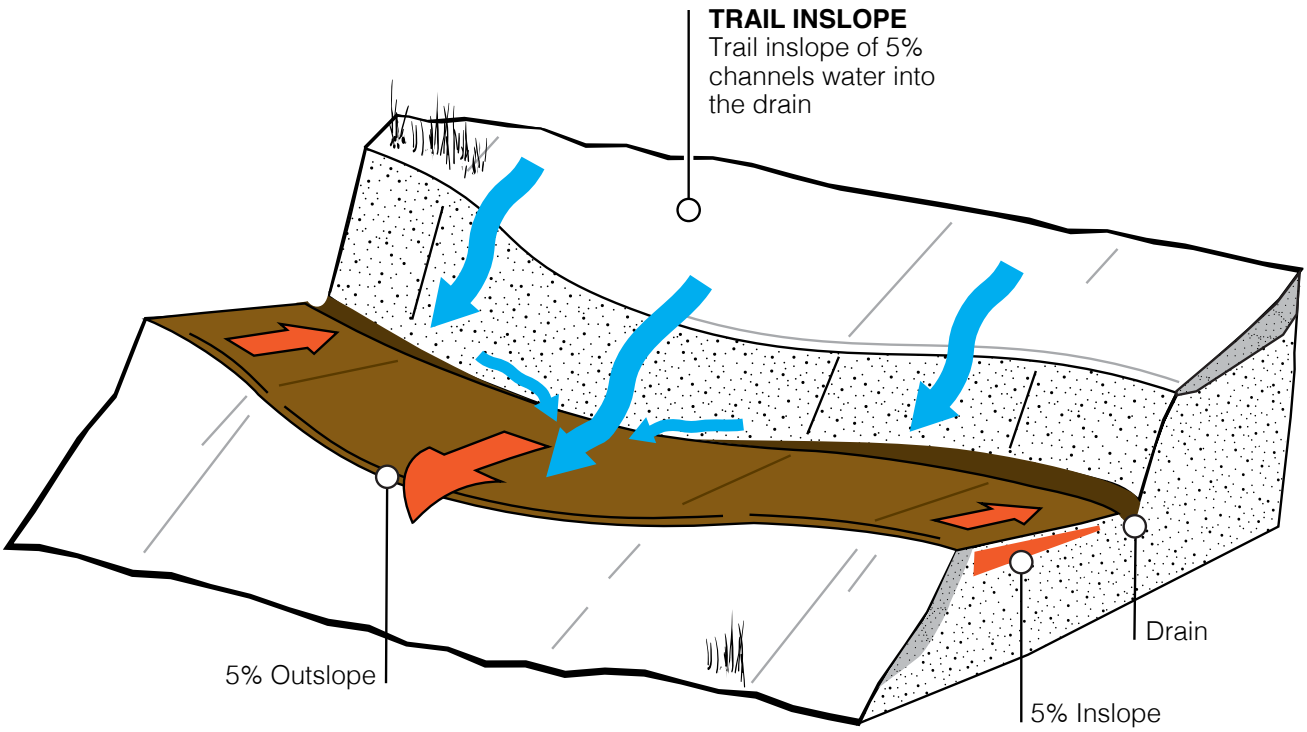
Outsloping trails have a tread that tilts slightly down and away from the high side, encouraging water to sheet across and off the trail, instead of funnelling down the centre of the trail and causing erosion. Where appropriate most trail treads should be built with a five percent outslope.

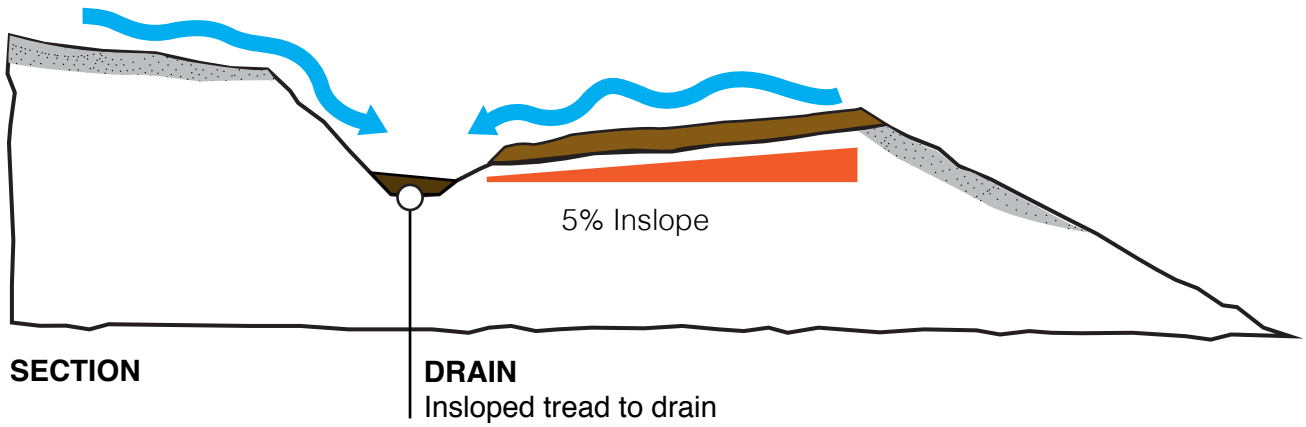
Of course, it is not always possible to outslope all trails, and it is particularly hard to maintain outslope on loose soils like pea gravel. In some situations, trails may be intentionally insloped and combined with other drainage features (such as grade reversals) to shed water from the trail tread, e.g. on bermed turns. Where insloping drainage is used, it is especially important to design trails with frequent drainage features to shed water.





SECTION


TRAIL INSLOPE
Trail inslope of 5% channels water into the drain
5% Outslope
Drain
5% Inslope

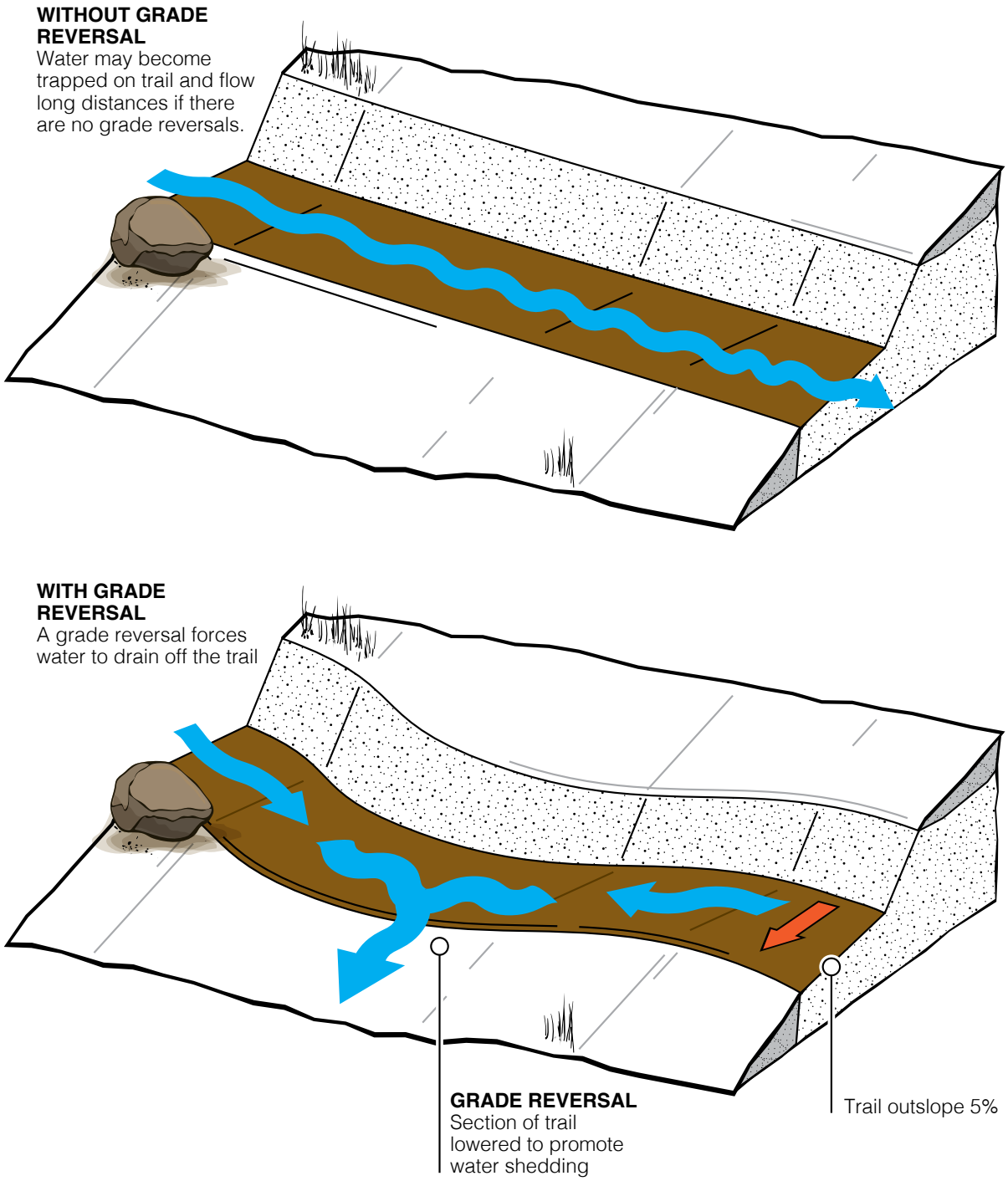

5% Inslope
SECTION
DRAIN
Insloped tread to drain

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 a place where the trail briefly changes elevation, dropping before rising again. This allows water to leave the trail at the low point of the grade reversal, before the water can gain enough velocity to cause water 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. Grade reversals also minimise the effect the trail might have on the area's hydrology, an important factor in Western Australia.

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

If an existing trail has severe erosion or water-pooling problems, it may be better to realign the trail and rehabilitate the existing alignment.



If drainage hasn't been designed into an existing trail, IMBA recommends retrofitting the following drainage features where possible:

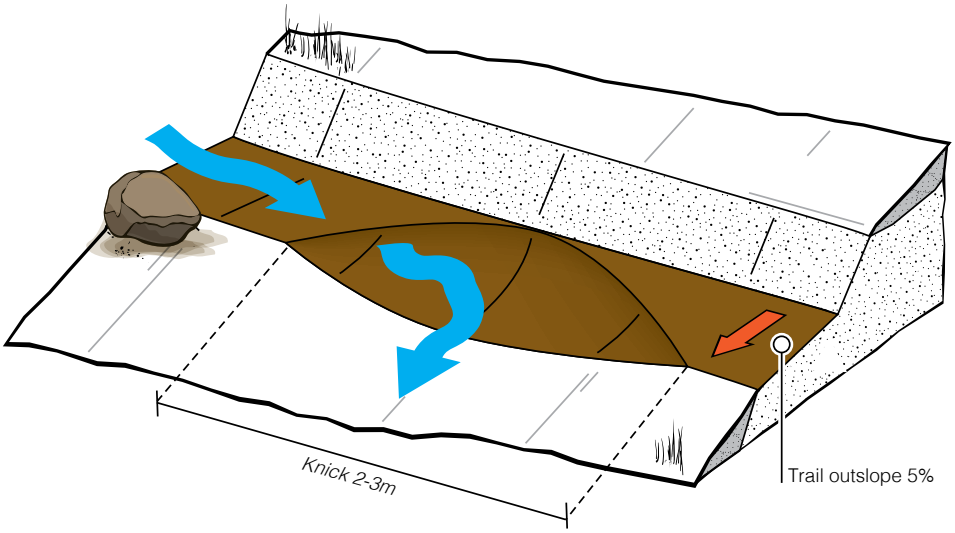
KNICKS

A knick is a shaved down section of trail, semicircular in shape and around two to three metres in length, 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 DIPS

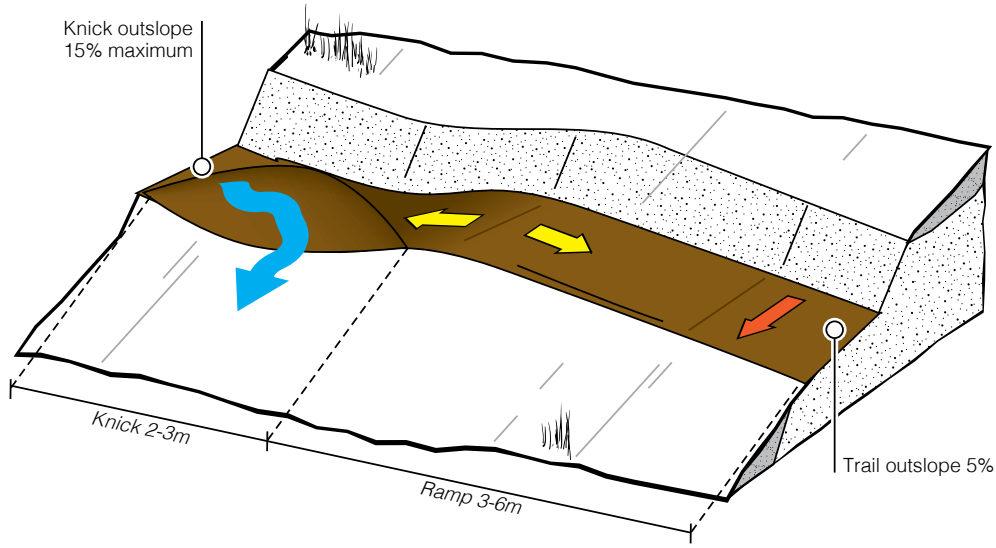
Rolling grade dips build on the knick feature. The knick is built and followed by a long gentle soil ramp. The knick should be about two to three metres in length and the soil excavated from the knick is used to create the ramp that reinforces the knick. The ramp should be three to six metres and outsloped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



KNICKS

ROLLING GRADE DIP



8.5.5 Minimise soil displacement

Flow

Flow manages the trail user's speed and momentum through trail design. Consistent flow can minimise user soil displacement by reducing the need for users to exert more downwards or sideways force to stay on the trail. The goal is to avoid abrupt changes and corners that are likely to make riders hit the brakes or skid, which can result in braking bumps and trail widening.

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.

However, it is difficult to achieve proper drainage on a bermed turn. Building this type of structure requires a high level of experience, and an understanding of water flow and the landscape and effective grade reversals.

Avoid designing or constructing berms facing upslope as they will create a low point where water pools and require the construction of engineered drainage solutions such as culverts, which require regular maintenance.

Tread Armouring

In some instances, the only way to ensure sustainability of a trail is to armour or harden the surface with imported 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. Although armouring hardens the trail tread, all the principles of sustainable trail design still apply as it is essential to prevent water following down sections of trail.

8.6 INCORPORATING TECHNICAL FEATURES

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

It is critical to design trails to 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, and what is appropriate for a particular landscape when 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 classification
- Target user market and access for adaptive cycles where appropriate
- 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

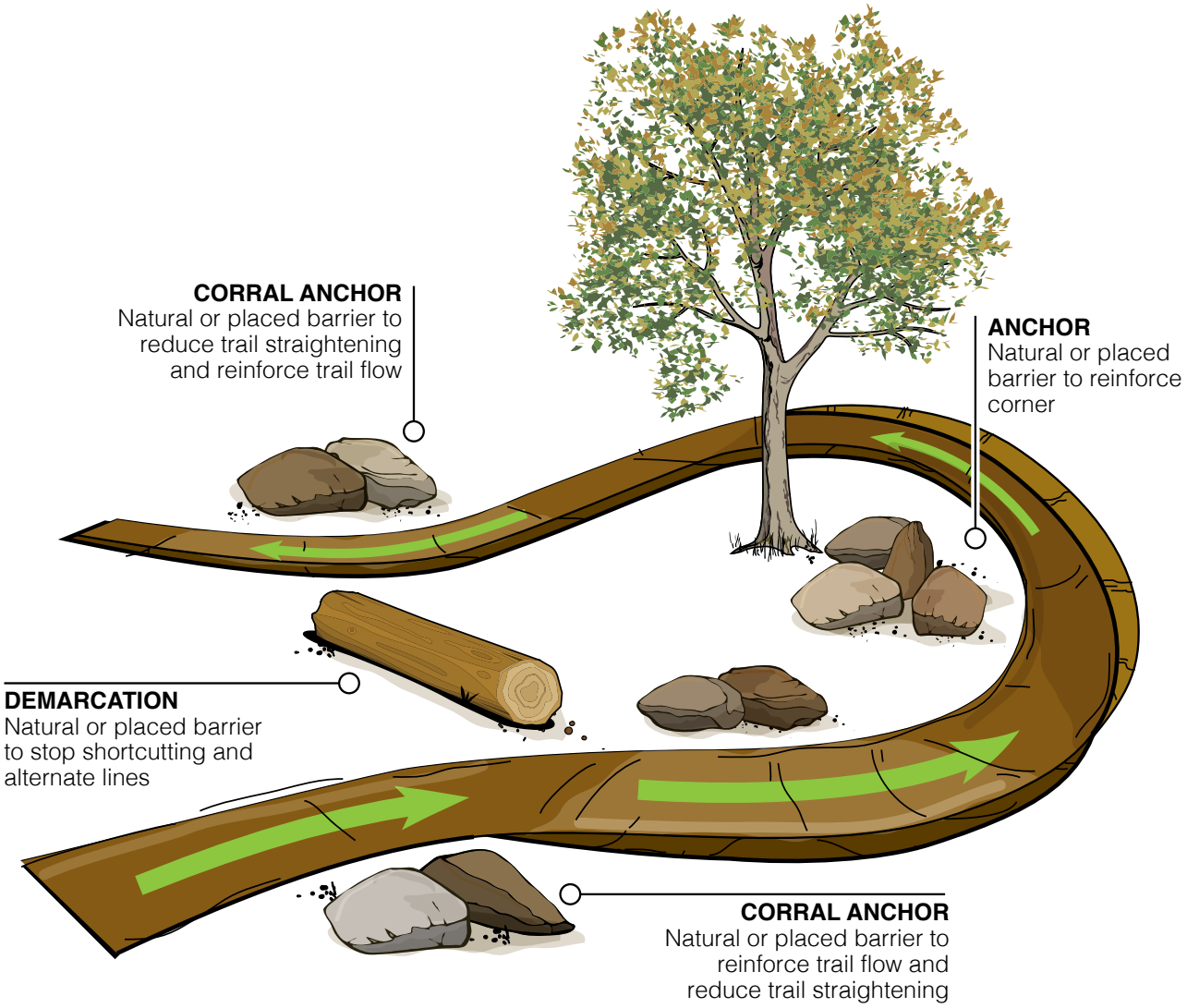
8.6.1 Demarcation

Trail users will often cut corners through turns or around TTFs. This can negatively affect the sustainability of a trail and the environment. Demarcation is 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 required will be dependent on the site. The following techniques may be considered:

- using natural landforms and onsite materials
- 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.



8.6.2 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 as difficult as the most difficult trail feature on 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.

Photo:
Courtesy Jon Lloyd

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

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

Photo:
Courtesy Jon Lloyd

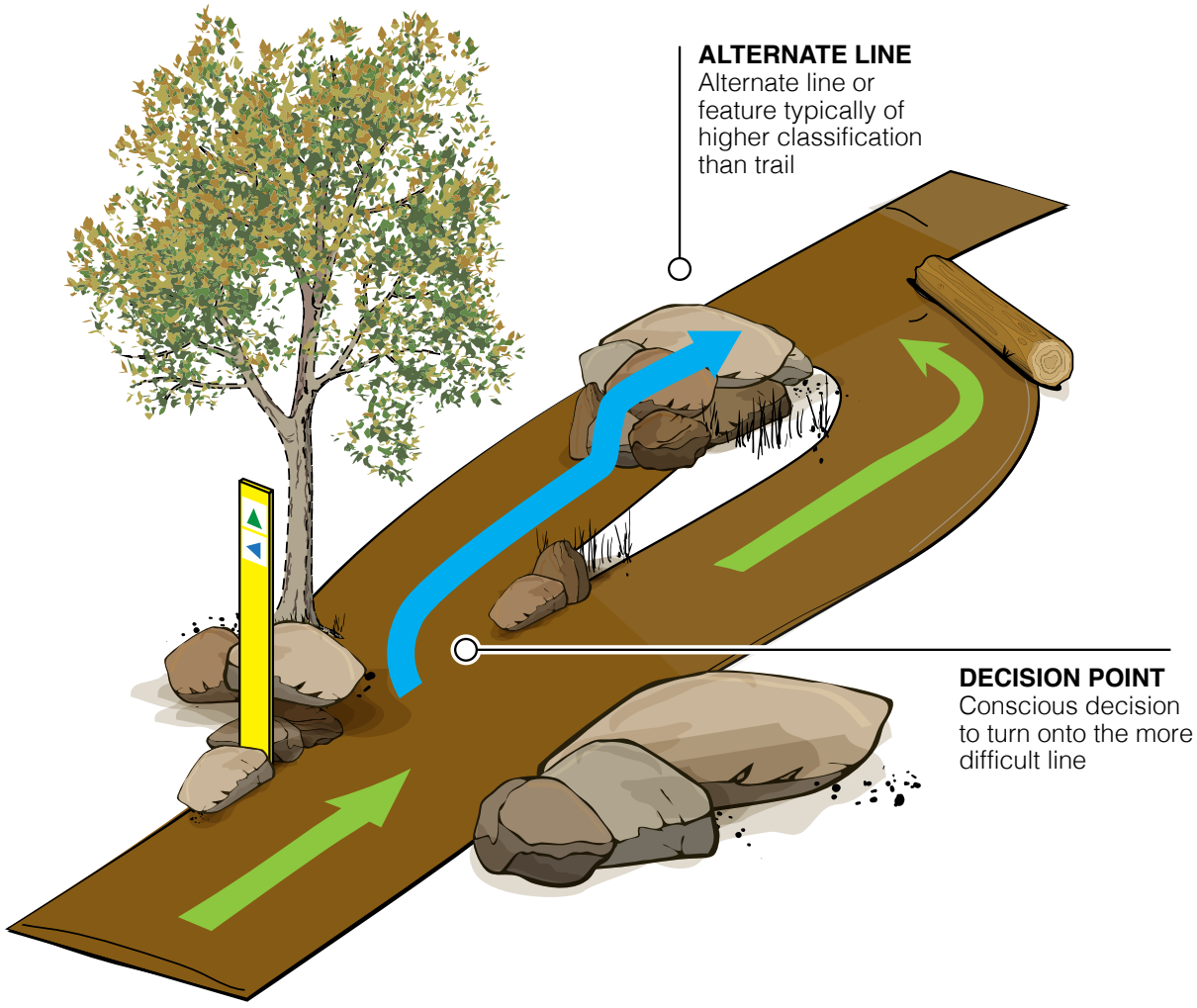
8.6.3 Alternative lines

Alternative lines are optional routes or obstacles within one trail, usually designed to either allow a more difficult route to be taken 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.

While alternative lines may be able to be retro-fitted to existing trails, it is preferable for them to be considered in the initial planning stages to ensure they are appropriately 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 race events may require alternative lines where the fastest line is the more difficult line. In this situation, the trail design could consider using a combination of different types of TTFs with the same classification. Refer to Section 7: Events for more information.



8.6.4 Fall Zones

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

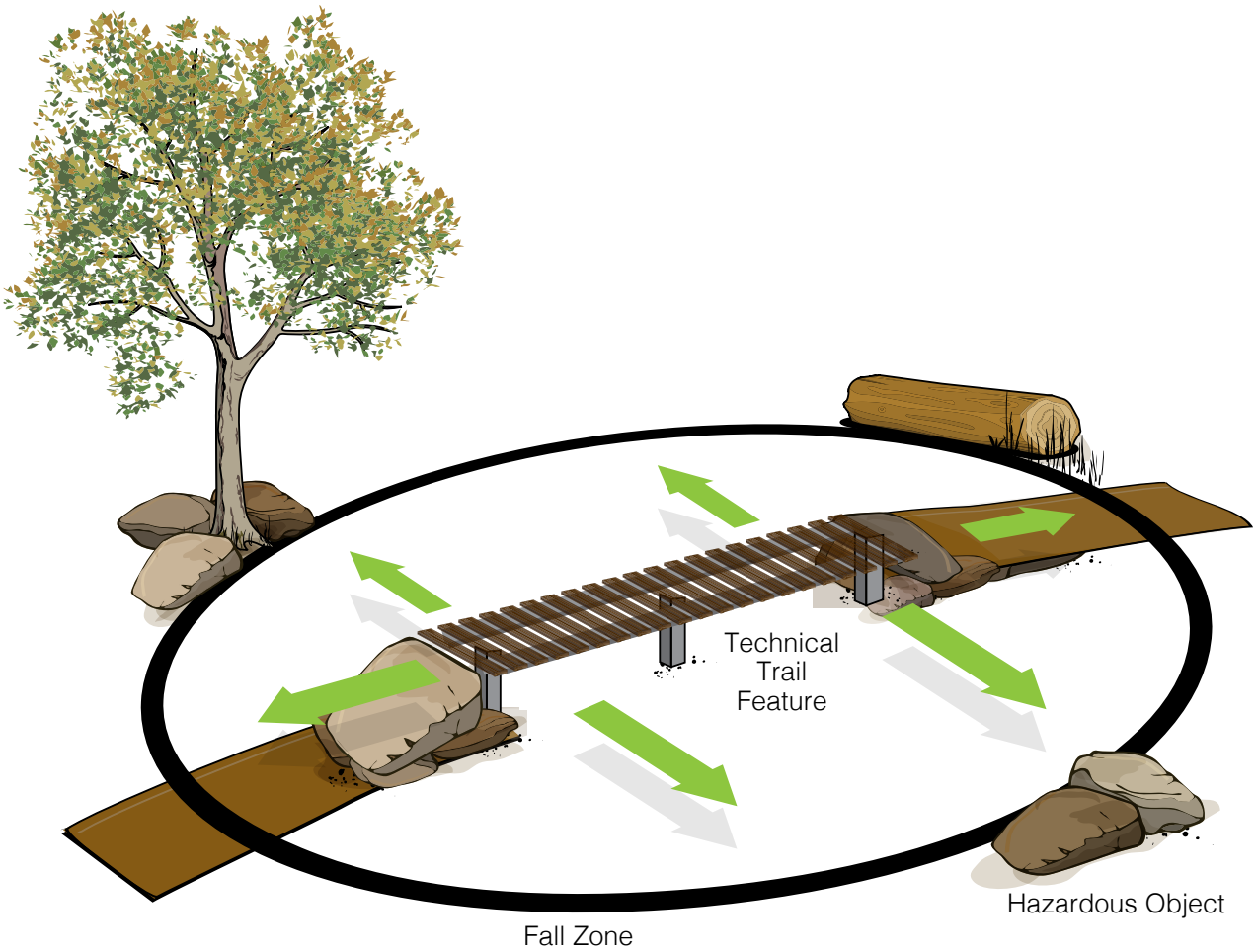
- The area directly adjacent to a TTF
- Bottom of descents
- Outside of corners that a rider may deviate into.

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 as part of the trail design process prior to construction commencing.



8.7 FLOW AND TECHNICAL

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); and
- if the trail will accommodate other trail users such as hikers, trail runners, horse riders and/or off-road vehicles.

8.7.1 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, along with consistent and predictable surfaces (IMBA, 2007).

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.

It is possible to design flow trails to accommodate both mountain bikers and other trail users.

Flow is created and maintained through the use of:

- Rolling terrain
- Sweeping turns and corners
- Berms
- Consistent and predictable surfaces
- 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

8.7.2 Technical Trails

Technical mountain bike trails test the bike handling skills 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
- 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 develop flow.

Photo:
Courtesy Danielle Stone

8.8 SIGNAGE

Trail signage is an essential element in the use and management of trails by providing a key communication tool informing users of a trail's characteristics by providing:

- Identification of trail location and access
- Site orientation and information
- Trail classification and description
- Directional information
- Site-specific management messages
- Risks or warnings

Trail signs must communicate clear and consistent messages.

Signs may also convey messages such as:

- Mountain Biker's Code
- Historic or cultural messages

Closures, risk/hazard signs etc., will not be dealt with in these guidelines. Refer to the land manager for guidance on their policies.

Trail signs should be obvious without being visually obtrusive in the natural environment. Signs should never be attached to trees or other vegetation as not only is it destructive, it also creates ongoing maintenance issues.

Signs are just as important as the trail itself and a sign plan should be developed as an integral part of the trail planning process, with signs and trail marking ready to be installed at the completion of trail construction.

Sign planning is a skill and is essential to successful trail development. Local or regular riders often forget that visitors won't instinctively know where to go and so effective sign planning helps us to decide how and where to use them.

- **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?**

PARKS AND WILDLIFE SERVICE

Parks and Wildlife has an established sign system comprising management, orientation, directional and interpretive signs that are used in all of the department's parks and reserves. The system has been developed to ensure consistent corporate sign standards across Parks and Wildlife-managed estate and a recognised and trusted form of public communication.

If a sign in on Parks and Wildlife-managed estate then it must meet corporate standards and is required to be approved by the department's Visitor Communication Branch. The department's Recreation and Trails Unit and Visitor Communication Branch have experienced staff that can also assist with design for trails and facilities, and sign planning on Parks and Wildlife-managed estate.

Other land managers are likely to have their own sign systems. Always check with the land manager or owner as to requirements before developing signage.

Photo:
Courtesy Kamila Ambrozewicz

The process of sign planning

To review and upgrade signs at an existing location or plan for a completely new location, the following process is recommended:

1. Site visit - description and analysis

Conduct a site visit with key stakeholders to obtain a clear understanding of the project area. Consider natural and built features, natural and cultural heritage values, site issues, constraints and opportunities.

2. Site visit - sign inventory and evaluation

Undertake an inventory and evaluation of existing signs (content and position). Record your observations with photos, drawings and notes and list a recommended action beside each item (i.e. upgrade, update, replace, move, remove or retain the sign).

3. Needs assessment

Identify visitor types (demographics, activities, site use, access, flow and impacts) to build a picture of your visitor profile and how they use the site. Listen to key stakeholders to obtain a good understanding about visitor risks and unsustainable activities or behaviours at the site. List all messages that need to be communicated at the site through the use of signs.

4. Develop a Sign plan

The sign plan is a document that recommends and describes a collection of signs at a location that are designed to meet the needs of users and land managers. It comprises two parts - a sign list and location map.

- The sign list covers all of the identified messages being communicated at the location through signs and includes details of sign types and designs, content, reason for use and any additional notes. TIP: keep the plan simple and visual, including photos of existing signs and drawings of new signs.
- Give each sign a unique code or reference number and plot its location on a map or maps at different scales. If there are many signs at a site, it can be helpful to distinguish between different types of signs in your plan using colours and/or symbols.
- Work with key stakeholders to fine tune the sign plan for land manager/owner approval.

5. Sign budget

Use the approved sign plan to develop a detailed budget.

6. Design and production orders

Convert the sign plan into simple lists or spreadsheets that will assist with design and production orders for the signs and supporting structures.

7. Maintenance and evaluation program

Whilst conducting regular maintenance, you should incorporate a check of all signs at the site. Using the sign plan as a reference, you can record, assess and review the status (e.g. still exists or missing - particularly important for visitor risk signs), condition and effectiveness of the signs installed. Any tasks that are generated by the review can be included in the annual maintenance works program.

Sign planning tips

- Signs create visual impact. A well-designed site or trail can reduce the number of signs required. Effective trail design and sign planning is the key to achieving more with less.
- Effective trail design and sign planning is the result of a collaborative effort between all key stakeholders – users, land managers/owners and peak bodies.
- Think message first. For each site or larger area that you are planning for, there will be key locations where visitors need particular messages ... to get their bearings, find their way, stay safe, be suitably prepared, know how to act in a way that protects site or trail values or in a way that does not impact adversely on other trail users. Put yourself in the trail users shoes and move through a site from a logical starting point to an end point. When you have decided what the messages are and where they need to be, then choose a suitable sign format.

8.8.1 Trailhead signage

Trailhead signs should display the entire trail system and provide key navigation and trail user information. The trail user should be able to locate the trailhead sign from the access point e.g. the car park.

Trailheads should include:

- Map of the trail system. The map should clearly show how trails link up. For example, where a purpose built trail uses a section of fire road or vehicle track this should be marked as a part of the continuous trail. Maps should always be orientated so north is up and include a legend and scale.
- A 'You are here' location so that orientation to the trails is clear.
- The trail classification system with a short description. (See Section 9)
- Short description of the trails – use standard trail classification colours.
- Code of conduct/rules of the trail
- Land manager logo and contact details
- Local group logo and contact details
- Sponsor logos where appropriate. Seek land manger permission.

Always consult with the land manager when developing trail signs to ensure accurate information is communicated.

Photos:
Courtesy Danielle Stone

8.8.2 Themed signage

Mountain bike groups often like to add character to their trails through the name of the trails and themed signs. Themed signs often relate to the unique features of a trail or area, and can be used in entry statements, trailheads and/or the entry to individual trails.

Themed signs should be included in the sign planning process in consultation with the land manger or owner. As with all other signs, themed signs should never be attached to trees or other vegetation.

The Goat Farm
Courtesy Nathan Greenhill

8.8.3 Trail Marking

Directional signs should be attached to posts located at the start of trails and at intersections, 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 signs 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 should also be attached to this post.

Intersections

- Trail markers should be installed a couple of metres prior to an intersection to forewarn the rider.
- 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

Trail networks often consist of a number of trails of the same classification. Riders unfamiliar with an area can easily get disorientated. To assist with wayfinding:

- Where a trail meets another trail or multiple trails it may be useful to install directional signs that point to a destination e.g. to the trailhead or to a car park.
- It may be useful to use orientation signs with a map and 'You are here' at these locations. The map should always be orientated so north is up.
- **Remember -** increasing the amount of signs equates to a higher cost and more maintenance. Often simple, well planned trail marking is sufficient.

Single direction trails

- Always install 'no entry signs' at intersections crossing single direction trails, or at the exit points of single direction trails.

Remember, good trail design requires less signage.

Photo:
Courtesy Stuart Harrison

PARKS AND WILDLIFE SERVICE

8.8.4 TRAIL MARKER AND POST SPECIFICATIONS (PARKS AND WILDLIFE-MANAGED LAND)

Marker specifications

The Parks and Wildlife Service sign standards require mountain bike trails to be marked by a white square with a triangle in the middle. The triangle should be the same colour as the classification of the trail.

Due to the speed mountain bikers are travelling, trail markers and posts should be highly visible.

All trail markers, including trail difficulty symbol markers and directional arrows, should meet the following specifications:

- Minimum size is 95mm x 95mm
- 1.6mm marine grade aluminium
- Coloured directional arrow onto reflective vinyl
- Predrilled Ø5mm holes in each corner (holes optional if using industrial standard double-sided tape)
- Safety cropped corners

All trail markers should be mounted on posts and not attached to trees.

Photo:
Courtesy Danielle Stone

Post specifications

Posts can be crafted from a variety of materials. It is important to note that different materials vary in robustness, for example wood will burn and plastic will melt in a bushfire. Post specifications:

- 1100mm height (above ground level).
- If steel or aluminium it is best to pre-drill the Ø5mm holes for markers (optional if using industrial standard double sided tape).
- Do not attach any more than four trail markers to a post (they have to be comprehended quickly by a rider).

Post and trail marker installation

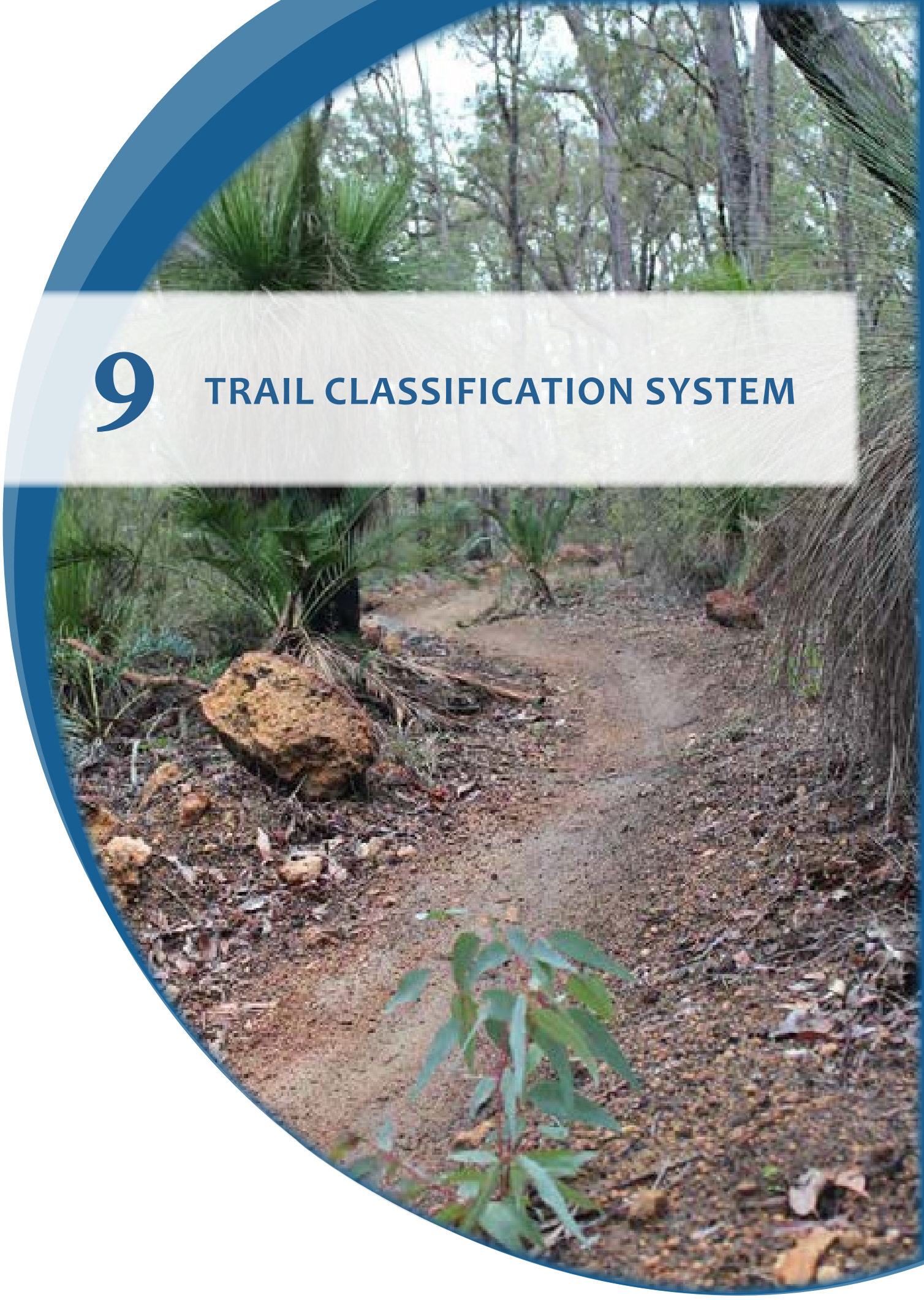
Trail marker posts should be installed in a clearly visible position. This may require minor pruning of vegetation to ensure visibility. If ongoing pruning is required it will be a maintenance issue later on.

Consider the location of marker posts to ensure a hazard is not created, for example never install a post in the middle of a trail or within the fall zone of a TTF.

Install posts vertically into the ground to a depth of 500mm leaving 1100mm above the ground, at 90 degrees to the trail. Securely fix up to four symbol markers to the post starting with the marker at the top, with four rivets or double-sided tape.

If using double sided tape, it should be a high quality, industrial standard double-sided tape, such as 3M 4951 VHB Tape.

Photo:
Courtesy Sean Blocksidge



9 TRAIL CLASSIFICATION SYSTEM

9 TRAIL CLASSIFICATION SYSTEM

Mountain bike riders seek a range of experiences, difficulty levels and challenges. Given this variety it can be expected that not all trails will be suited to all riders' experiences and skill levels.

A classification system allows trails to be graded according to their relative technical difficulty. The International Trail Marking System is used around the world in ski resorts, and has been adapted by the IMBA for mountain biking. Western Australia has adopted the IMBA classification symbols. Trail classifications are 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. See Section 8.6.3 alternative lines.

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.

Photo: Left
Courtesy Danielle Stone

Photo: This page
Courtesy Vanessa Parsons

PARKS AND WILDLIFE SERVICE

The trail classification system is used as part of the Parks and Wildlife Service Visitor Risk Management (VRM) system. Strategies that can be used to minimise and transfer risk in regards to 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 filter (see Section 8.6.2 for more information) at the beginning of a trail to let the rider know what type of technical trail features to expect and give the option to turn back if they decide the trail will be too difficult for them.
- Providing similar features within a trail network from green to black to give riders the opportunity to practice to aid progression.

9.1 CLASSIFICATION SYMBOLS AND DESCRIPTIONS

The Trail Classification System provides a standard five level, colour coded system to indicate the degree of difficulty of mountain bike trails. The classification enables visitors to understand the nature of the trail before beginning their ride and allows them plan their ride for enjoyment, appropriate level of challenge and safety.

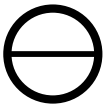
Trail classifications can be communicated in a number of ways. Pre-visit information may include a more detailed description of the classifications, while a shorter description is required for trailhead signs and maps. Classification colours should be used on all on-trail directional signs.

As part of these guidelines a Trail Classification Matrix (Appendix 3) was developed by the Mountain Bike Working Group. This matrix incorporates both IMBA's Trail Difficulty Rating System and Dafydd Davis' mountain bike Trail Classification and Grading System. This matrix gives detailed specifications for trail tread, turns and technical features. The Classification Specification matrix does not include an exhaustive list of TTFs. It should be used as a guide when making decisions about appropriate specifications for new or combination TTFs.

The Classification Specification matrix may be used by land managers, trail designers, trail builders and volunteers involved in planning, designing, constructing and maintaining mountain bike trails in Western Australia to ensure a consistent classification standard. A consistent standard assists in managing trail user's expectations by becoming familiar with each trail classification.

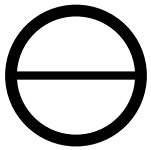
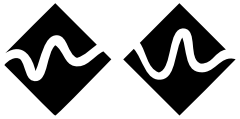
9.1.1 Mountain Bike Trail Short Classification Descriptors

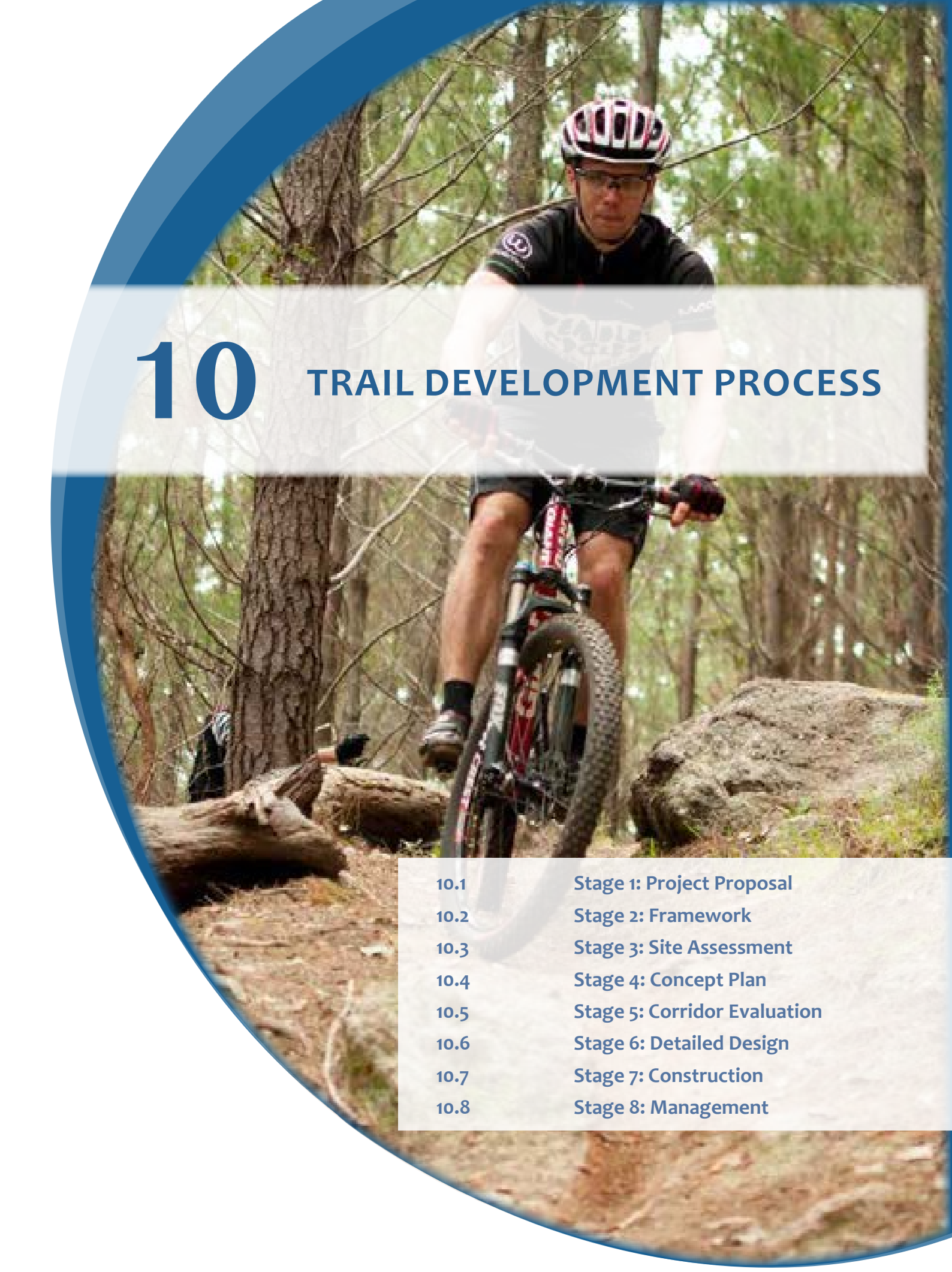
Short trail classification descriptors should be used at trailheads, brochures and maps or similar.

SYMBOL	SHORT DESCRIPTOR
 easiest	This symbol indicates a typically wide trail with smooth terrain and low gradients. Surface may be uneven, loose or muddy at times but free from unavoidable obstacles. Recommended for novice riders.
 easy	This symbol indicates a typically flowing, open trail on firm terrain with gentle gradients. Surface may be uneven, loose or muddy at times. Riders may encounter small rollable obstacles and technical trail features. Recommended for beginner riders.
 moderate	This symbol indicates a typically narrow trail with loose, soft, rocky or slippery sections and hills with short steep sections. Riders will encounter obstacles and technical trail features. Recommended for intermediate riders with some technical mountain biking experience.
 difficult	This symbol indicates a trail with variable surfaces and/or steep gradients. Riders will encounter large obstacles and technical trail features. Recommended for experienced riders with good technical skills.
 extreme	This symbol indicates the trail may contain highly variable surfaces, very challenging terrain and/or very steep sections. Riders will encounter committing and unavoidable obstacles and technical trail features that may not be rollable. Recommended for very experienced riders with high level technical skills.

9.1.2 Mountain Bike Trail Detailed Classification Descriptors

Detailed classification descriptors should be used within documents, websites and similar.

	 easiest	 easy	 moderate	 difficult	 extreme
DESCRIPTION	Likely to be a rail trail, wide purpose built cycle trail or fire road with a gentle gradient and smooth surface and free of obstacles. Frequent encounters are likely with other cyclists, walkers, runners and/or horse riders.	Likely to be a purpose built mountain bike trail or rail trail with gentle gradients, smooth surface and some unavoidable obstacles. May encounter other cyclists, walkers, runners and/or horse riders	Likely to be single track with moderate gradients, variable surface and obstacles.	Likely to be single track with steep gradients, variable surface and many obstacles.	Trails which incorporate very steep gradients, highly variable surface and unavoidable severe obstacles.
RECOMMENDED FOR	Beginner or novice riders with basic bike skills.	Beginner riders with basic mountain bike skills.	Intermediate riders with some technical skills.	Experienced riders with good technical skills.	Very experienced riders with a high level of technical skills.
TRAIL WIDTH	1500mm or wider	900mm or wider	600mm or wider	300mm or wider	150mm or wider
TRAIL SURFACE & OBSTACLES	Hardened with no challenging features on the trail.	Mostly firm and stable. Trail may have rollable technical trail features and/ or obstacles such as logs, roots and rocks.	Possible sections of rocky or loose tread. Trail may have natural obstacles such as rocks, roots and logs and some constructed technical trail features.	Variable and challenging. Unavoidable obstacles such as logs, roots, rocks, drop-offs or constructed technical trail features.	Widely variable and unpredictable. Expect large, committing and unavoidable obstacles.
TRAIL GRADIENT	Climbs and descents are mostly shallow.	Climbs and descents are mostly shallow, but may include some moderately steep sections.	Mostly moderate gradients, but may include steep sections.	Contains steep descents and/or climbs.	Expect steep, loose and rocky descents or climbs.



10 TRAIL DEVELOPMENT PROCESS

10 TRAIL DEVELOPMENT PROCESS

'Ensure you develop the right trails, in the right places, in the right way and for the right reasons.'
Dafydd Davis MBE

Trails are like any other facility development and are subject to an approval process. The Trail Development Process (TDP) provides land owners, land managers, and trail users in Western Australia with a methodology to ensure any trails developed in the state are sustainable and an asset rather than a liability.

With the increasing demand for trails across Western Australia, it is important a high standard of trail development across the State is maintained to ensure trails are developed using current sustainability standards and minimising maintenance costs into the future.

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 trail proposals are transformed into high quality, low maintenance asset on the ground.

The process recommends 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 TDP involves eight stages (Figure 1) and encompasses a constant evaluation, review and improvement process as trails are being maintained, extended or renewed. Where possible, each stage should be completed before moving on to the next stage, although some overlaps may be possible.

STAGE	OUTCOME	
1 TRAIL PROPOSAL	A trail development proposal is either supported in principle by the land manager/owner, or not supported (due to environmental, social, cultural or other constraints). The purpose of a proposal could be to identify potential suitable areas for consideration.	Desktop
2. FRAMEWORK	A project outline developed by the steering group (stakeholders), including: project objectives, project management model, stakeholders, roles, target market, requirements, execution, and ongoing management model.	
3 SITE ASSESSMENT	Broad scale study of the area and identification of opportunities, constraints and characteristics such as soil types, vegetation etc.	
4 CONCEPT PLANNING	Identification of opportunities and conceptual trail plan, including broad trail corridors and infrastructure requirements.	
5 CORRIDOR EVALUATION	Detailed assessment of trail corridors for use in determining the final trail alignment.	Field
6 DETAILED DESIGN	Detailed trail design and alignments physically flagged in the field. Includes detail on the trail classifications, technical trail features (TTFs), construction methods and specifications.	
7 CONSTRUCTION	Trail constructed in line with the Detailed Design.	
8 MANAGEMENT	Management plan implemented detailing maintenance and monitoring requirements.	

Table 7 Trail Development Process Summary

Photo: Left
Courtesy Vanessa Parsons

Figure 1 Eight Stage Trail Development Process

10.1 STAGE 1: TRAIL PROPOSAL

Land management and land use legislation is complex and there are numerous Federal and State Acts and Regulations that must be adhered to when developing trails (See Section 4: Strategic and Legislative Context). Coupled with legislative requirements, 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 time and resources later in the process.

Following the TDP should 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. Be aware that some legislation applies to privately owned land. It always pays to seek advice from relevant local and State government agencies.
- Longevity and sustainability of the trails. For example, if a trail is built in State forest without appropriate consultation with the Parks and Wildlife Service and the Forest Products Commission, all the hard work in 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. The completion of Site Assessments (Stage 3) is recommended as part of the approvals process. The site assessment process really begins at the point of a new trail proposal, where the land owner/manager may conduct a desktop search to check for major constraints that could potentially prevent trail development within a certain area.

Constraints may include:

- The management plan for the proposed area explicitly precludes the proposed trail or activity.
- A master plan exists and the proposed area is not supported by the master plan.
- Restricted areas such as public drinking water catchments or Disease Risk Areas.
- Other significant values which may preclude the proposed activity, such as mining.

Anyone can propose new trails, be they individuals, user groups or land owners or managers. Individuals or user groups should contact the land owner/manager with regards to developing new trails in a particular area, allowing the land owner/manager to provide information on current land use and management, along with checking relevant management and master plans. They may also be able to identify alternative sites for consideration if the proposed area is not deemed suitable.

Individual Proposed Projects

If an individual has a proposal, this should first be discussed with the local mountain bike group, or WAMBA if there is no local group in the area. If the local group and WAMBA are supportive of the proposal, the land manager may be contacted through the appropriate process.

Mountain Bike Group Proposed Project

Mountain bike groups should contact the land owner/manager with regards to developing trails in a particular area. The land owner/manager will be able to provide information on current land use and management for the proposed area and check relevant management and master plans. They may also be able to identify alternative sites for consideration if the proposed area is not suitable due to major constraints.

Land Owner/Manager Proposed Project

Where landowners and/or managers are proposing a project, then they should discuss the project with the local mountain bike group, or WAMBA if there is no local group in the area, and ensure they are involved from the start. A project developed without community involvement and support may not receive the anticipated use and resources could be wasted.

Photo: Left
Courtesy Kelly Doye

10.2 STAGE 2: 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 provided in Appendix 4A, and includes a list of prompting questions for each of the sections above.

PARKS AND WILDLIFE SERVICE

Parks and Wildlife has a project management system that the Framework document can be added to. Consult with the Parks and Visitor Services Capital Works Unit for project management templates and further information.

Developing a descriptive 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.

10.2.1 Steering Group

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.

Photo:
Courtesy Sean Blocksidge

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 of the following as appropriate:

- Land owner/manager staff
- Local recreation groups
- Local community groups
- Local Governments
- Special interest groups
- Other key partners, including:
  - Recreation peak bodies e.g. Westcycle and/or WAMBA
  - Department of Local Government, Sport and Cultural Industries
  - Tourism Authorities
- Funding bodies

The framework should be documented and formally agreed to by the Steering Group and a project manager/coordinator identified.

10.2.2 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.

10.2.3 Project Objectives

Establishing and agreeing on 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:

- Provide a recreational MTB trail network for the local community or Provide a national MTB trail network providing a regional tourism resource
- Increase trail opportunities and participation
- Mitigate visitor risk management issues
- Create trails with the capacity for MTB events

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

Project objectives do not detail 'how' the outcomes of the project will be achieved. This is 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

10.2.4 Management Model

All trails must have an agreed management model to ensure long term sustainability, informing how the trails will be developed, managed and maintained. It will also detail where resources will come from to carry out the management and maintenance of the trails and any associated facilities and infrastructure. 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?
- Who will undertake maintenance?
- How will visitor use be monitored?

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 trail 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.

Owners and operators can be the same entity, but in some cases, can be different. For example, Parks and Wildlife is the trail owner on land they manage, but a local mountain bike group may be responsible for day to day maintenance of the trails through an agreement as the trail operator (see Section 5: Partnerships and Section 10.8 Stage 8: Management for more information).

10.2.5 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.

Establishing the scope and scale:

- What is the proposed level of significance? National, Regional or Local? (See Section 8.1.1: Significance Hierarchy)
- What are the parameters of the proposed project? Include the extent of the trails (area), proposed quantity of trails (length) and associated infrastructure required (roads, trailhead, toilets, car parks).
- Is the project development to be staged?
- What type of use is proposed? Recreational and/or events?
- Will the trail/network have single or multiple entry points?

10.2.6 User Types and Trail Types

It is essential to define the target market of the trails in the framework to ensure that they meet the needs and expectations of the intended users.

Defining the target market includes establishing and agreeing on, such as:

- What user types being targeted and what's their ability?
- What trail classifications are proposed?
- Will be single or multi-use?
- Will be single or dual direction?
- Will the trail be universally accessible?

Note – 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 account for the target user types.

10.2.7 Trail System and Model

Trail Model

Detail the trail model that the project will either be or become a part of - for example, a trail town, trail centre, trail network or individual trails. (See Section 8.1.2: Trail Models)

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

Trail System

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.

Detail the type of trail system, for example: loop, linear, stacked loop, cloverleaf, finger. Define if any of the trails will be dual direction or multi use. (See Section: 8.2 Trail Systems)
Agreed Standards

10.2.8 Agreed Standards

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

- Planning standards:
  - Following correct approval procedures
  - Undertaking site assessments and impact evaluation
  - Undertaking consultation throughout the development process
- Design standards:
  - Sustainable design principles (see Section 8and other resources such as IMBA guidelines)
  - Designing trails to the agreed classification
- Construction standards:
  - Implementing building standards
  - Constructing to the detailed design
  - Following hygiene protocols
  - Ensuring the trail fits into the environment
  - Ensuring appropriate supervision
- Maintenance standards:
  - Development of checklists and frequencies for maintenance
  - Employing sustainable construction standards
  - Following hygiene protocols
  - Maintaining the trail to its original classification (i.e. no construction of new features without appropriate approval)

Section 8: General Trail Planning, Design and Construction Principles and Section 9: Trail Classification System may be used as starting points to identify the standards for any project. In some cases, customised standards may need to be developed to meet specific circumstances.

10.2.9 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 site assessments and an external grant may be sought for concept planning and detailed design, with trail construction 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.

10.2.10 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.

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

- Who will deliver the project? (staff, contractors, volunteers and for which stages of the trail development)
- 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 managers may require additional approvals.
- What are the estimated timelines?
- Land manager may require additional approvals and various levels.

10.2.11 Project Evaluation

It is essential to evaluate the project to measure the extent to which its objectives have been met. This enables an understanding of where and how the project has been successful of not. Evaluation identifies achievements and also areas for improvement.

The framework sets out a methodology for evaluation. The Steering Group agreeing on:

- Evaluation criteria. What is the evaluation process trying to determine? 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 (maintenance, environmental, economic or social)
  - Are the riders 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 (for example: trail counters, visitor counts, and admission fees) and qualitative (for example: questionnaires, surveys, forums) sources. The framework should set out 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 e.g. 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.
- Evaluation roles. 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 set out roles and responsibilities for undertaking data collection, record keeping, analysis and interpretation.

Evaluation assists with accountability, especially where funding has been sourced and acquittals are required. Understanding what worked and what did not, builds knowledge, benefitting future projects.

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

10.2.12 Consultation and Approval

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

Formal approval will confirm that all relevant stakeholders and partners understand and buy in to the planning, design and delivery process. The Framework Template (Appendix 4A) should be signed by all stakeholders.

FRAMEWORK CHECKLIST

- ✓ Establish a Steering Group of relevant stakeholders and partners
- ✓ Develop a framework using the framework template (Appendix 4A)
  - Outline the background for the project
  - Define the overall project objectives
  - Agree the management model
  - Establish the scope and scale
  - Define the target market
  - Agree the type of trail system and model
  - Set design, planning, construction and maintenance standards
  - Set out funding and resourcing requirements
  - Confirm delivery arrangements
  - Set out evaluation criteria
- ✓ Steering Group formally agree and adopt the framework

10.3 STAGE 3: SITE ASSESSMENT

The purpose of the site assessment is to identify positive (opportunities) and negative (constraints) control points within a project area (See Section 8.5.1: Trail Location and Alignment). The site assessment builds on previous stages and is vital to ensure the land owner/manager complies with legislative requirements and to ensure the project area offers the necessary opportunity for the proposed trail.

The site assessment informs the Steering Group of:

- Potential legislative and planning approvals required
- Opportune landscapes/topography/natural features
- Other land use, activities and management considerations
- Any exclusion zones

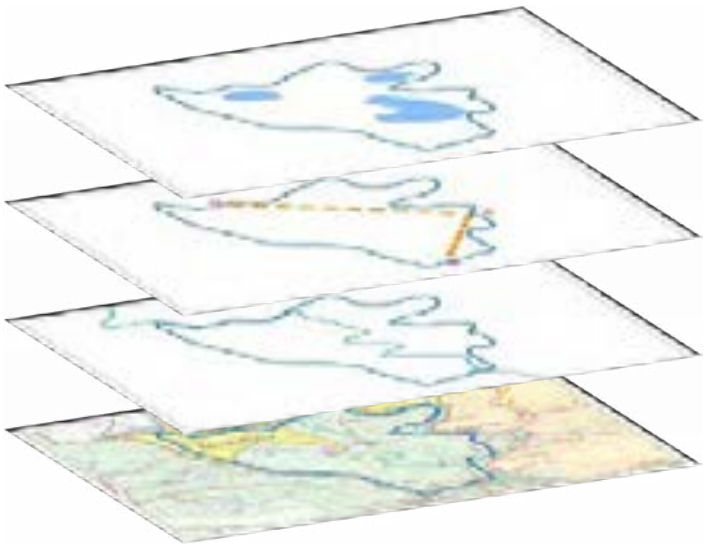
The site assessment coupled with the framework (Stage 2) informs the development of an effective concept plan (Stage 4). Further detailed corridor assessments and approvals will be required during Stage 5: Corridor Evaluation.

Site assessment is generally completed by the land owner/manager in liaison with a specialist trail planner and the project coordinator. It involves a broad scale overview of the area and will require review of master plans, management plans and other recreation plans, desktop analysis and field checks.

Photo:
Courtesy Kerstin Stender

OPPORTUNITIES AND CONSTRAINTS MAP

Opportunities



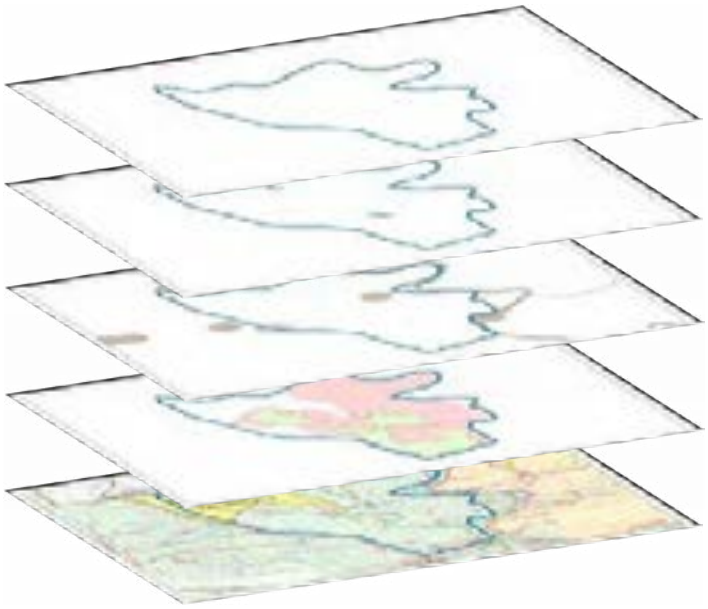
Positive attributes

Existing Rec sites

Existing trails

Base map

Constraints



Other Constraints

Flora/Fauna

Heritage

Hygiene

Base map

The site assessments are generally initiated in Stage 1 to identify any major constraints that may halt the project. Stage 3: Site Assessment requires the impact evaluation to be looked at in more detail. This will be followed by Stage 5: Corridor Evaluation where more specific assessments or approvals may be sought and finalised prior to landowner or land manager approval.

By digitally mapping and overlaying the findings of the site assessments (i.e. the opportunities and constraints), it is easy to identify the following areas for the Steering Group's consideration.

- Areas where trail development is permitted,
- Areas where trail development is not permitted e.g. rare flora, wetlands, Aboriginal heritage sites, etc, and
- Areas where trail development may be permitted subject to further surveys and any necessary approvals. e.g. Aboriginal heritage sites, poorly represented vegetation, threatened fauna.

Depending on what is identified, further 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 make a decision regarding whether they want to undertake concept planning on only the areas where trail development is permitted or whether to include the areas that may be permitted subject to 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 survey areas.

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

Depending upon the results of the site assessment, it may be found that the chosen site is unsuitable for trail development. It may therefore be appropriate to abandon the site and assess other areas. Conducting a preliminary background check as part of Stage 1: Proposal, minimises the likelihood of having to abandon an area during latter stages.

PARKS AND WILDLIFE SERVICE

If working on Parks and Wildlife managed land within the south-west forests, the local district will be required to complete the Planning for Disturbance Activities Checklist (FEM019 form) instead of the Impact Evaluation Checklist (IEC). Whichever checklist is required, approvals must be sought at the relevant level in accordance with Management Guideline 1 and the Approvals Matrix. Both of these documents can be found on the department's intranet.

If working on Parks and Wildlife-managed land, involve local district staff from all areas of the department including:

- Parks and Visitor Services
- Nature Conservation
- Fire management
- Aboriginal Liaison
- Sustainable Forest Management

The local knowledge that district staff can provide is invaluable. Constraints and opportunities can be identified very quickly by consulting relevant staff early in the planning phase.

Remember, things can change. If for some reason a significant amount of time has passed after undertaking the initial site assessment, a cursory check for any new opportunities or constraints may be required. If any issues are identified, the site assessments should be updated and updated approvals sought.

The following is an overview of potential impacts that need to be addressed through the Stage 3: Site Assessment and Stage 5: Corridor Evaluation. The list is not exhaustive, and different land tenure and management may require further additional checks.

10.3.1 Location and Access

The location of the site and its proximity to populations or communities and transport links will give 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 trailheads and car parks will depend on the nature of access to the site:

- 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.

10.3.2 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 during Stage 1: Proposal. Understanding land use and management considerations will assist in identifying some constraints and potential opportunities. It is possible for trails and some land uses to coexist if proper planning, consultation and design takes place. Where trails and land use can co-exist, consultation is required with relevant stakeholders to ensure they are aware of the plan and have input into how it may affect their operations or interests. Consultation is undertaken by the land manager, for example, where trails are proposed within State Forest, Parks and Wildlife will consult with Forest Products Commission.

Land use may include:

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

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

10.3.3 Landscape

Understanding landforms, soil types and landscape features is key to designing sustainable trails. The trail designer needs to be able to understand these to make sustainable-trail design decisions.

The following must be assessed:

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

10.3.4 Environmental Protection

Assessing environmental protection issues and ecosystems allows identified areas to either be avoided or addressed through trail design and construction strategies that minimise environmental impact.

Legislation for the protection of the environment includes:

- Conservation and Land Management Act 1984
- Wildlife Conservation Act 1950
- Environmental Protection Act 1986
- Environmental Protection and Biodiversity Conservation Act 1999 (Federal Act)

Note: The Environmental Protection Act 1986 requires that any person clearing native vegetation must hold a permit, unless the clearing is for an exempt purpose. These laws apply to private and public lands throughout Western Australia.

It is recommended that flora and hygiene assessments be considered early in site assessments, to determine whether field surveys are required. Often flora surveys can only be undertaken at certain times of the year (primarily in spring), and if the appropriate season is missed, the project may be delayed up to a 12 months.

In order to mitigate the potential impact of hygiene constraints on trail development in the south west, it is recommended that operational scale disease distribution information is required to inform the trail planning process. This information is developed by undertaking Phytophthora Dieback surveys which include mapping and classification of the disease status of the vegetation, identification and mapping of protectable and un-protectable areas and the collection of soil and tissue samples to verify assessment results.

This enables a clear picture of the area to inform risk mitigation strategies for the spread of Phytophthora Dieback. Linear Dieback surveys are generally not recommended for trail networks as they may not provide enough information to inform the placement of trail corridors.

10.3.5 Existing Recreation Use

Understanding existing recreation use in the area can assist in managing visitor conflicts, ensure associated infrastructure is not overloaded, and enable consultation with the community. Depending on the trail system and classification and type, there may be scope to capitalise on existing facilities to share infrastructure and develop dual use trails.

The following must be considered:

- Existing recreation users and potential conflict
- Visitor safety
- Increased demand for facilities and services (rubbish removal, car parking, toilets)
- Commercial operations e.g. tour operators
- Events held in the area

PARKS AND WILDLIFE SERVICE

When working on Parks and Wildlife-managed land, environmental constraints are initially assessed at a desktop level and dependant on what is identified, specialist staff/contractors may be engaged as required

Environmental protection constraints may include:

- Flora, fauna and threatened communities/ecosystems
- Old growth forest
- Dieback and other plant health issues
- Weeds, pests and ferals

In planning site assessment surveys, it is important to consider any implications from planned prescribed burning operations, e.g. a recently burnt area cannot be assessed for dieback disease or rare flora for two to three years after a burn.

10.3.6 Heritage Protection

Maintaining heritage values and places is a vital part of the community's sense of place, cultural identity and wellbeing. Trail planning seeks to protect heritage, which may mean avoiding sites, interpreting sites or planning trails with the least disturbance. In Western Australia, legislation exists to protect both indigenous and non-indigenous heritage.

10.3.6.1 Aboriginal Heritage

The Aboriginal Heritage Act 1972 protects sites and objects used by, or traditional to, the original inhabitants of Australia. Under the Act 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/manager approving the work to:

- Check the Department of Planning, Lands and Heritage (www.dplh.wa.gov.au) Aboriginal Heritage Inquiry System (AHIS) for any registered sites. Avoid planning trails through registered sites where possible.
- Consult the DPLH Cultural Heritage Due Diligence Guidelines (www.dplh.wa.gov.au) to determine actions required.
- If there is a registered site within the area, consult with DPLH 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; and/or
    - Consult with the relevant Aboriginal group in relation to the proposed activity (contact DPLH for advice); and/or
    - Seek approval from the Minister for Aboriginal Affairs via Section 18 of the Act or from the Registrar of Aboriginal Sites under Section 16 of the Act. 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.

10.3.6.2 Native Title

Native title is a form of legal interest in land that recognises the 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.

On crown land, the land 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:

- 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 the Land Act (WA) 1933.
- The construction of trails will generally be consistent with the reserve purpose of 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.

The Aboriginal Heritage Act obligations continue, irrespective of the 'future act' obligations, and consultation and engagement on Aboriginal 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.

10.3.6.3 European Heritage

European Heritage sites may include buildings, railways and other structures, which may be protected by the Heritage of Western Australia Act 1990.

The IEC details a list of registers that need to be checked, and heritage management plans may need to be developed.

If a site is found that cannot be avoided (registered or unregistered), then consultation with the Western Australian State Heritage Office is required and they may request/require further assessment. Costs associated with the heritage assessments and any associated work an additional cost to the project.

10.3.7 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 of neighbours, 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 garner their concerns and communicate the strategies for sustainable development and conflict minimisation.

Locals know their area well and may have good suggestions for inclusion in the project. Seeking their input will ensure they are included in the process, and will assist with securing greater support for the project.

10.3.8 Documenting Site Assessment

The Site Assessment findings are now documented to assist with approvals and to inform the concept planning stage. In Stage 1: Trail Proposal it was recommended an Impact Evaluation Checklist (IEC) be used to commence documenting assessments and approvals. (Appendix 4B) during the Site Assessment stage the IEC is populated and maps are created to show constraints (negative control points) and opportunities (positive control points).

Once the Concept Plan is complete, further checks or consultation may be undertaken if required as part of Stage 5: Corridor Evaluation where the IEC is finalised and signed off. The IEC and maps, surveys and any consultation reports will be used to seek approval for detailed design from the land owner or manager.

PARKS AND WILDLIFE SERVICE

Parks and Wildlife has a number of resources available to assist with community consultation:

- Public Participation policy (and accompanying fact sheets)
- Good Neighbour policy
- Media relations policy
- Administrative Instruction No.31 – operational guidelines for public participation in planning, and the management of advisory bodies
- Committee Establishment and Management policy

SITE ASSESSMENT CHECKLIST

- ✓ 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.).
- ✓ Meet with people who know the land (relevant staff and other key stakeholders)
- ✓ Find out who else uses the land
- ✓ Consult with relevant stakeholders
- ✓ Document findings and report to the Steering Group for approval to move to Stage 4: Concept Plan

STEERING GROUP DECISION:

Following any special interest group consultation, a wider community consultation may be organised. Consider engaging a professional facilitator who will assist in keeping the consultation on track and provide a consultation report. A decision should be made at this point on whether to hold community consultation now or wait until Stage 4 - Concept Plan has been completed. This will depend on the potential impact of the constraints and opportunities identified.

10.4 STAGE 4: CONCEPT PLANNING

The purpose of the concept plan is to illustrate what the trail system may look like, address key strategic priorities and identify broad trail corridors in the field. Concept plans form a crucial consultation tool which can be presented to stakeholders, interest groups and community partners.

Concept plans should consist of mainly illustrative documents, including maps. It is recommended concept plans are developed by specialist trail planners based on the outcomes of the framework (Stage 2) and site assessment (Stage 3) and should include the following:

A map or maps detailing the configuration of the trail system including:

- Broad trail corridors
- Control points
- Access and the location of existing infrastructure and/or new infrastructure to be provided (toilets, car parking, picnic sites, bridges/crossings, trailhead signs) and the nature of these facilities

Detailed information about each individual trail including:

- 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?
  - 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 times of the year.

Corridor identification

- At this stage, broad trail corridors should be detailed digitally at the centre line (corridors may be 20m -150m wide) on a topographic map and flagged in the field to allow them to be assessed and refined during Stage 5: Corridor Evaluation.
- Where the site assessment has indicated highly sensitive issues, physical flagging of the corridors may be required.

Broad estimated costs for:

- trail design, construction, signs, maps and ongoing management
- any supporting facilities such as car parks, trailheads, toilets etc.
- A basic concept plan outline is included in Appendix 4C.

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 digitally on a topographic map and flagged in the field to allow them to be assessed during the next stage – Stage 5: Corridor Evaluation.

Photo: Left
Courtesy David Willcox

10.5 STAGE 5: CORRIDOR EVALUATION

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

Evaluating each trail corridor may also assist in establishing estimated design costs and broadly estimating construction and management costs, as well as identifying appropriate ways in which trails can be developed. 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 may be beneficial to engage a specialist trail planner (preferably the same one involved in Stage 3: Site Assessment and Stage 4: Concept Planning) to work in liaison with the project manager and land owne/manager during the corridor evaluation.

10.5.1 Detailed Corridor Assessment

The Impact Evaluation Checklist (IEC) (appendix 4B) was utilised to identify constraints during Stage 3: Site Assessment (See Section 10.3).

The IEC is completed during Corridor Evaluation 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 a boardwalk to minimise impacts to flora
- Armouring a section of trail where a flat area is unavoidable

STEERING GROUP DECISION:

It is during Stage 4: Concept Planning that the configuration and layout of the trails can be changed to meet the needs of land owners/managers and trail providers and to fit with the agreed framework.

If the Steering Group agreed (during Stage 3: 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 additional surveys and approvals (requiring extra planning time) or request the draft concept plan is modified to avoid those areas (allowing the project to progress to Stage 5 – Corridor Evaluation) .

CONCEPT PLANNING CHECKLIST

- ✓ Refer to the agreed framework and site assessment
- ✓ Illustrate possible infrastructure and trail corridors
- ✓ Detail construction stages where required
- ✓ Present draft concept plan to Steering Group for feedback
- ✓ Present amended concept plan to relevant stakeholders
- ✓ Provide broad cost estimates for detailed design and construction, including supporting infrastructure
- ✓ Present final concept plan to Steering Group for approval to move to Stage 5: Corridor Evaluation

10.5.2 Refine Corridors

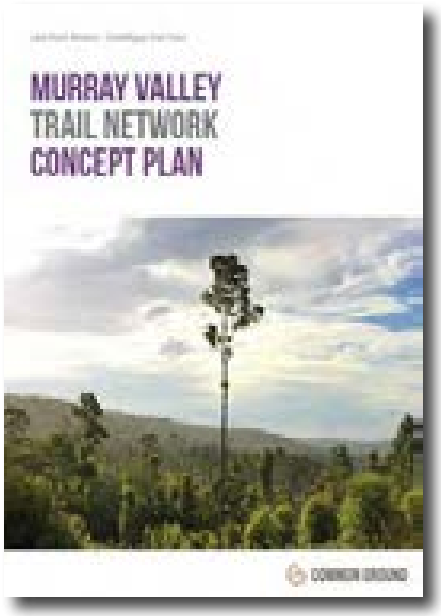
Stage 4: Concept Planning is generally based on broad corridors (20m-150m wide). Through the corridor evaluation, these broad corridors are adjusted and refined based on identified constraints and mitigation strategies.

Once the constraints have been assessed and the corridor refined to as narrow as possible, it is recommended to flag the corridor centreline in the field and digitally capture the alignment. This is basic broad-scale flagging with the aim of aligning the route between each positive control point and avoiding negative control points. This clearly marks out the corridor for the trail designer to undertake the Detailed Design (Stage 6).

10.5.3 Estimate Probable Costs

Corridor evaluation may assist in accurately estimating costs for design, construction and ongoing management, as well ensuring environmental and heritage protection. This is extremely important when preparing funding submissions.

Ensure the design, construction techniques and materials meet the needs, and are appropriate for, the environment in which the trail is to be constructed.



10.5.4 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 Stage 6: Detailed Design.

Depending on the scope and scale of the trails, the land tenure and any constraints identified, different levels of approvals from the land owner/ manager may be required. If working on Parks and Wildlife-managed land refer to the Approvals Matrix (Management Guideline 1) for the required level of approval/s.

CORRIDOR EVALUATION CHECKLIST

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

10.6 STAGE 6: DETAILED DESIGN

Sustainable trail design requires a detailed understanding of trail sustainability principles and designs, the trail users and types, appropriate construction methods and techniques and long term trail management. It is recommended a specialist trail designer be engaged to do this work.

Detailed design ensures high quality and long term sustainable trails that are fit for purpose and low maintenance.

The trail designer should:

- Formally establish definitive trail lines, accurately flagged in the field and digitally captured.
- Prepare draft design plan including construction specifications and drawings for steering group review.
- Prepare final detail design plan and construction-ready specifications/drawings.

These plans will then guide and inform trail construction and serve as a quality assurance system, and as a reference for any future trail maintenance work.

The detailed design process should be applied at an appropriate scale to every project regardless of how it is to be delivered. This means that the process should be the same for a project that is put out to tender and a project that is carried out by volunteers.

Detailed trail design should make it possible to accurately identify construction costs, resource and material requirements, and timescales. This can have a direct bearing on how trails are delivered and by whom.

A basic detailed design outline is included in Appendix 4D.

10.6.1 Design outputs

Detailed design must be informed by the Stage 2 - Framework and Stage 4 - Concept Plan, 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

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

Photo: (left) Courtesy Kelly Doye
Photo: (above) Flagging Courtesy Stuart Harrison

10.6.2 Delivery

In order to undertake effective trail design, the trail designer must be provided with a detailed brief before commencing, including:

- 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 site assessments/IEC)
- Corridor evaluation information
- The 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 such as the removal of trees or boulders
- Maximum acceptable disturbance footprint of the trail
- Whether in situ natural features can be utilised for TTFs or not, e.g. use of a fallen log to create a log ride, or use of in-situ rocks to create a rock garden,
- Timescales for draft and final design

PARKS AND WILDLIFE SERVICE

Built structures and TTFs planned for Parks and Wildlife Service-managed land must comply with the same standards as any other infrastructure built on public lands. The design of TTFs and other built structures may require certification and sign off after construction by an engineer. The engineer or Parks and Wildlife staff may conduct checks during the construction phase.

Parks and Wildlife staff will require a copy of the draft design drawings for review, and must sign off on the final plans and construction specifications and drawings.

DETAILED DESIGN CHECKLIST

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

10.7 STAGE 7: CONSTRUCTION

- Construction is building the designed trail into the landscape utilising sustainable construction techniques and standards. The Framework (Stage 2) detailed the way the project will be delivered. Construction may be delivered by:
- Being put out for tender for specialist trail builder services
- Volunteers
- Land manager construction crews
- A combination of any of the above

10.7.1 Delivery

The contractor, volunteer group or land manager construction crew 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 plans and specifications
- General principles (Section 8)
- Technical trail feature classification specifications (see Appendix 3)
- Any additional standards required for the area (see below)
- Trail sign plan and standards (if it forms part of a construction contract)

If going to contract, a detailed brief enables contractors to provide an accurate quotation for the work and ensures the project will be delivered in line with the design and standards, and provide value for money.

Photo:
Courtesy Kamila Ambrozewicz

10.7.2 Implementation of Standards

No matter who is undertaking the construction phase, construction practises have to meet the specification and guidelines outlined in the detailed design.

Where possible, the trail designer should provide a handover of the detailed design to the trail builder. The project manager must provide the trail builder with a site induction including the following:

- Site familiarisation including hygiene plans/ requirements
- Approved mobilisation/demobilisation areas
- Safety and health protocols and procedures
- Construction standards
- Protocols for where the trail builder encounters problems or issues with the construction works or the design.

Standards may include:

- Visitor Risk Management standards to minimise the risk of visitors using trails while under construction
- Hygiene standards to ensure any machinery or tools are free from contaminated soil, weeds or seeds
- Natural features to be protected e.g. do not remove trees larger than 100mm
- Aboriginal heritage site stop-work instructions if new or suspected sites are found during construction
- Type and size of machinery to be used
- Construction materials
  - Will construction material/s be provided? If so where?
  - 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 and finishing to ensuring the trail beds into the local environment?
  - Will this standard be the responsibility of the contractor, volunteers or the land owner/manager?

10.7.3 Supervision

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

The project manager should:

- Conduct regular inspections to ensure design and construction specifications are followed accurately and the project is on schedule
- Ensure the trail builder is consulting and gaining approval for any required design modifications
- Document any design modification decisions
- Approve each stage of the work at completion prior to commencing
- Monitor and manage the timeline and budget

The application of the detailed design and construction brief allows the project manager to ensure the construction contractor or team is adhering to the required standards.

10.7.4 Approval of the Work

A final check is required once construction work is complete. This should be undertaken by the project manager and the land owner or manager to ensure the trail and associated features and infrastructure has been built to agreed design and standards.

PARKS AND WILDLIFE SERVICE

When working on Parks and Wildlife Service-managed land, the trail cannot be opened until the delegated officer has signed off and approved the work.

Photo:
Courtesy Sam Russell

10.7.8 Record the Asset

Trails, like any other recreational infrastructure are assets. Record the trails and their associated infrastructure on land manager's asset register where appropriate.

As appropriate, the following details should be included when recording the trail:

- 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
- echnical trail feature and built structure location and costs (include specifications, design drawings and materials)
- Signs (trail, directional, road signs etc.)
- Associated infrastructure location and costs

CONSTRUCTION CHECKLIST

- ✓ Decide who will undertake construction. Contractor, volunteers, land manager crew or a combination?
- ✓ Develop a trail construction brief and required standards
- ✓ Check that all required approvals have been received
- ✓ Monitor construction standards and budget
- ✓ Record the trail and associated infrastructure

PARKS AND WILDLIFE SERVICE

Trails built on Parks and Wildlife Service-managed land must be recorded in the department's Recreational Park Infrastructure Asset Register (RecData). RecData is managed by the department's Visitor Research Unit.

RecData is used to:

- provide accessible information for sites and assets;
- assist with planning by providing detailed site information; and
- provide financial information regarding assets for insurance, funding and auditing purposes.

Photo:
Courtesy Kamila Ambrozewicz

10.8 STAGE 8: MANAGEMENT

Trails, like any other facility, require ongoing management and maintenance. The management model, in terms of who is responsible for what, should have been agreed on during the development of the Stage 2: Framework.

A concise trail management plan should be developed and approved by the Steering Group. The management plan should 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 take into account the following:

- Background information (outlined in the framework)
  - The trail system
  - The classification of the trails
  - Target use
  - The amount and type of use
- Clarification of management roles and responsibilities (outlined in the framework)
- Management responsibilities, funding and resources for individual stakeholders
- A record of the infrastructure and costs or link to the appropriate system or asset database
- Maintenance program
  - Audit (for existing trails)
  - Frequency
  - Standards (e.g. construction, hygiene, signs)
  - Works program, and
  - Funding and resources
- Hazard inspection and reporting procedures
- Visitor statistic recording standard and procedures
- Marketing, maps and information

10.8.1 Responsibilities, Funding and Resources

Funding for ongoing trail management and maintenance is often overlooked. It is important to consider how trail management and maintenance will be funded during Stage 2: Framework. Planning and building a trail and then deciding how maintenance will be funded and resourced is not recommended.

Funding can come from a range of sources including: land owner/manager, fundraising by a local mountain bike group, sponsorship of the trails, commercial operations (e.g. café, bike hire, etc) or partnerships, fees for car parking or sometimes, but rarely, external grant programs.

The management plan should outline:

- 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?

10.8.2 Maintenance

Trails do not maintain themselves. Well-designed trails require less maintenance, however all trails will require some ongoing 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 minimising maintenance costs in the future. It is important to accept that unexpected maintenance tasks may be required from time to time fallen trees from storm damage.

A trail maintenance program should consist of the following:

Audit

It is advised to conduct a trail audit prior to developing a maintenance program for existing trails. The trail audit should detail any trail surface issues requiring maintenance and any drainage problems, vegetation regrowth on the trail, and the type, position and condition of trail signage and record all TTFs and built structures and their condition. Refer to Appendix 4E for the trail audit process and template.

The trail audit gives trail owners and operators a complete picture of the condition of their trail and allows resources and funding to be allocated accordingly.

Where a maintenance program is being developed for a new trail the audit information should have been captured at the completion of Stage 7: Construction and recorded on the land owner/managers asset register (see to Section 10.7)

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

- The original planned trail classification is maintained, and
- Trail infrastructure and signage remain safe and serviceable, and
- Technical trail features remain safe and serviceable, and
- No environmental issues have developed e.g. erosion, short cutting, etc

Frequency

When and how often will the trail be maintained? The frequency of the maintenance required will depend on a number of factors:

- The extent of the trail system and classification/s
- The amount and type of use (e.g. recreational vs event use, small vs large event),
- The type of trail. (e.g. coastal trails exposed to potential wind erosion, or downhill mountain bike trails being steeper).
- Soil type, vegetation type (e.g. rapid regeneration of vegetation blocking the trail)
- Where the trail is located. For example:
    - Trails located in northern Western 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

Are standards being maintained? These include:

- Original planned trail classification
- Construction standards
    - No material is moved without prior approval
    - Trail surface standards
    - Drainage standards
    - Hygiene standards
    - TTF standards (e.g. existing TTFs are to be maintained to their original design)
    - Approved machinery and tools
    - Final finishing standards
- Signage standards
- Visitor Risk Management standards to be put in place e.g. site closures, signs and notification.

10.8.3 Trail Adoption

A trail adoption agreement is a great tool that can be used to formalise a partnership between a land owner/manager and a user club/group. A trail adoption should clearing outline the roles and responsibilities of stakeholders, and helps build community ownership of the trails. Through meeting the terms of the trail adoption agreement, both parties build a trusting relationship, which allows trail groups to take responsibility and work more autonomously.

Refer to Appendix 4F for a trail adoption agreement template.

The trail adoption program has been initiated by the Parks and Wildlife Service and enables a formal partnership and agreement between the local Parks and Wildlife District and local mountain bike club/group. The aim of an adoption agreement is:

- Ensure mountain bike trails on Parks and Wildlife-managed land are maintained to a sustainable standard.
- Clarify the highest standards of cooperation and understanding between the Parks and Wildlife District and the mountain bike club/group.
- Define the roles and responsibilities of each party in the agreement.
- Outline a program of works and the resources available to the mountain bike club/group to undertake maintenance and other trail management activities.
- Promote appreciation of the natural environment and interpretation of natural and cultural values to the wider mountain bike community.

Once a club/group and local district have agreed to proceed with an adoption agreement, the following steps should be taken:

1. The Parks and Wildlife District completes a 'Community Involvement Program Project Notification' (DPaW206) and submits this to the Community Involvement Unit to register the volunteer project.
2. The Parks and Wildlife District and the mountain bike club/group complete and sign the adoption agreement.
3. The Parks and Wildlife District and the mountain bike club/group agree on and deliver an annual works program.

10.8.4 Hazard Identification and Reporting

Trails are subject to wear and tear, illegal use and vandalism, and the weather. All of these have the potential to create hazards to trail users. It is essential for the trail management plan to include a hazard inspection process and schedule, reporting criteria to meet the land owner/manager requirements, as the trail owner will carry a duty of care to trail users.

Where trails are not located on Parks and Wildlife-managed estate it is essential to check with the land owner/manager to ascertain their visitor risk management processes.

The Stage 2: Framework should detail who will be responsible for managing hazards, which will generally rest with the trail owner.

The following process should be applied:

1. Identify the hazard
2. Assess the risk
3. Manage the risk (either by accepting the risk, modifying the risk or removing the risk)
4. Review, monitor and record actions

PARKS AND WILDLIFE SERVICE

The Parks and Wildlife Service has developed a Visitor Risk Management (VRM) Policy, which sets out the department's objectives with regards to managing visitor risk. The VRM policy and guidelines provides a framework for identifying hazards, assessing the risk and putting in place management strategies to reduce or remove the risk.

The department's VRM guidelines require annual formal inspections of trails near recreation sites, plus additional maintenance checks throughout the year undertaken by the trail operator or reported by the users. Any hazard identified is recorded on the relevant District's Risk Register.

10.8.5 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
- Prioritising maintenance and resources
- Guiding future trail development
- Supporting external funding applications

There are a number of 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 and designing a survey, it is important to understand what the information will be used for, as 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?
- Which days of the week are most popular?
- What time of the year is the busiest?

Note: not all trail counters include date and time stamp so research the best counter to use for the purpose of the data collection.

For new trails, it is recommended trail counters are purchased and installed as construction is completed and the trails opened. Knowing the level of use trails are experiencing and the nature of the use assists with project evaluation, programming maintenance works and gaining funding.

PARKS AND WILDLIFE SERVICE

If working on Parks and Wildlife-managed land contact the Parks and Wildlife Visitor Research Unit who coordinate the corporate visitor monitoring and visitor survey program.
The unit:

- Coordinates monitoring and defines the number of visits to selected sites within Parks and Wildlife-managed lands and waters.
- Maintains the Visitor Information and Statistics (VISTAT) database.
- Collects public feedback on the level of satisfaction with services and facilities.

10.8.6 Marketing

The scope and scale of a trail or network will guide the level of marketing. At a minimum:

- Ensure trailhead signs and maps are updated
- Upload trail information to the Trails WA website www.trailswa.com.au
- Update park brochures and websites
- Contact Westcycle and WAMBA to assist with promotion

Trail users may be local residents, or may travel to the area specifically to use the trail or use the trail as part of a broader tourism experience.

Consider the following to encourage and promote visitation:

- Develop a promotional brochure, guide or map.
- Ensure trailheads 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 advise them of the new trail/s..
- 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’ group or similar to undertake maintenance activities, social rides etc.

Where possible, promotional material should be professionally prepared and designed, printed in an attractive format and still simple to read. Generally, the following information should be considered for inclusion:

- Maps are clear and concise with distances, topographical contours, provide a scale, north orientation, a legend, and an explanation of the trail classifications.
- Where relevant, include trail notes describing key points.
- Background information about the trail and history of the area.
- Safety and etiquette information (for example, Mountain Bikers Code Appendix XXX) 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.

10.8.7 Trail Renewal

A trail renewal is the process of making significant upgrades and/or changes to an existing trail utilising the existing trail corridor . There are a number of reasons that trails may require alterations or realignments, including:

- Mountain biking is an evolving activity and result in changes to the types and styles of trails currently available.
- An existing trail alignment may not be sustainable.
- The opportunity to provide a new trail experience within an existing footprint,
- The network may be experiencing a visitation growth or a new user type e.g. increasing availability and use of electric mountain bikes.
- The local mountain bike group may wish to build additional features on an existing trail.
- Changes in the trail classification (e.g. changing a blue/Moderate MTB trail into a green/Easy trail)

Trail renewal projects should still follow the trail development process. however if the trail has previously been planned using the trail development process, stages of the planning process may already have been completed during the initial trail development such as previously completed site assessments, thus shortening the timeframes required.

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 Stage 6: Detailed Design with consultation and approval from the landowner/ manager.
- Where a network exists that requires strategic planning and the possibility of additional new trails. The trail development process should begin at Stage 1: Trail Proposal. If a site assessment for the area had been completed previously, Stage 3 timelines may be reduced significantly.

Photo:
Courtesy Sean Blocksidge

10
TRAIL DEVELOPMENT PROCESS

10.8.8 UNSANCTIONED OR ILLEGAL TRAIL

Unsanctioned or illegal trails are trails which have been built without planning or approval from the land manager or owner. With the rapid growth of mountain biking activities, there has been significant development of unsanctioned and illegal mountain bike trails on both Parks and Wildlife and local government managed land.

These unplanned trails can present risks to government, users and environments where they are constructed, and can hamper the development of legal trails, as land manager's resources are drawn away to manage unsanctioned trail development.

The Parks and Wildlife Service has developed the following unsanctioned/illegal trail closure procedure to assist with managing the safety issues and environmental damage that may be caused by unsanctioned trail building.

Confirm trail is un-sanctioned.

↓

Inspect trail for any immediate safety issues (e.g - poorly built structures, gap jumps, packing crate TTFs, etc.) using the VRM Risk Calculator and immediately remove any risk that scores 'substantial' or higher.

The local club/group may be willing and able to assist in removal of any structures and trail closure/rehabilitation.

↓

Install VRM risk sign (see Appendix 5)
Document & photograph

↓

Advise Recreation and Trails Unit (RTU). Include trail location, length, type and any structures. → RTU to advise Westcycle and WAMBA of trail and reasons for closure.

↓

Close and rehabilitate trail. (RTU can advise on methods and options for rehabilitation). Advise RTU on completion and cost. → RTU to advise Westcycle and WAMBA on completion.

GLOSSARY

Adaptive cycles	Adaptive cycles are predominantly used by people with disabilities, special needs, or those who are uncomfortable, or unable to ride standard two-wheeled bikes. As with mountain bikes, there are also a range of off-road adaptive cycles tailored to meet individual needs and the style of riding.
aMTB	Adaptive mountain bike
Cross-country	A style of mountain biking that involves a variety of riding experiences, including downhill and uphill trails of varying steepness.
Dirt jumps	Mounds of packed dirt or other material that are designed to lift riders into the air. Riders often perform tricks whilst airborne.
Downhill	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	A mountain bike race format with timed downhills and untimed uphills. Racing is over a series of stages, with the winner the rider with the fastest combined time over those stages.
IMBA	International Mountain Bicycling 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 pedaling 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 (TTFs)	Objects that have been introduced to a trail to add technical challenge.
Trail classification system	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.
WAMBA	Western Australian Mountain Bike Association. The representative body for mountain biking in Western Australia.
WestCycle	The peak body for cycling in Western Australia.

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APPENDIX

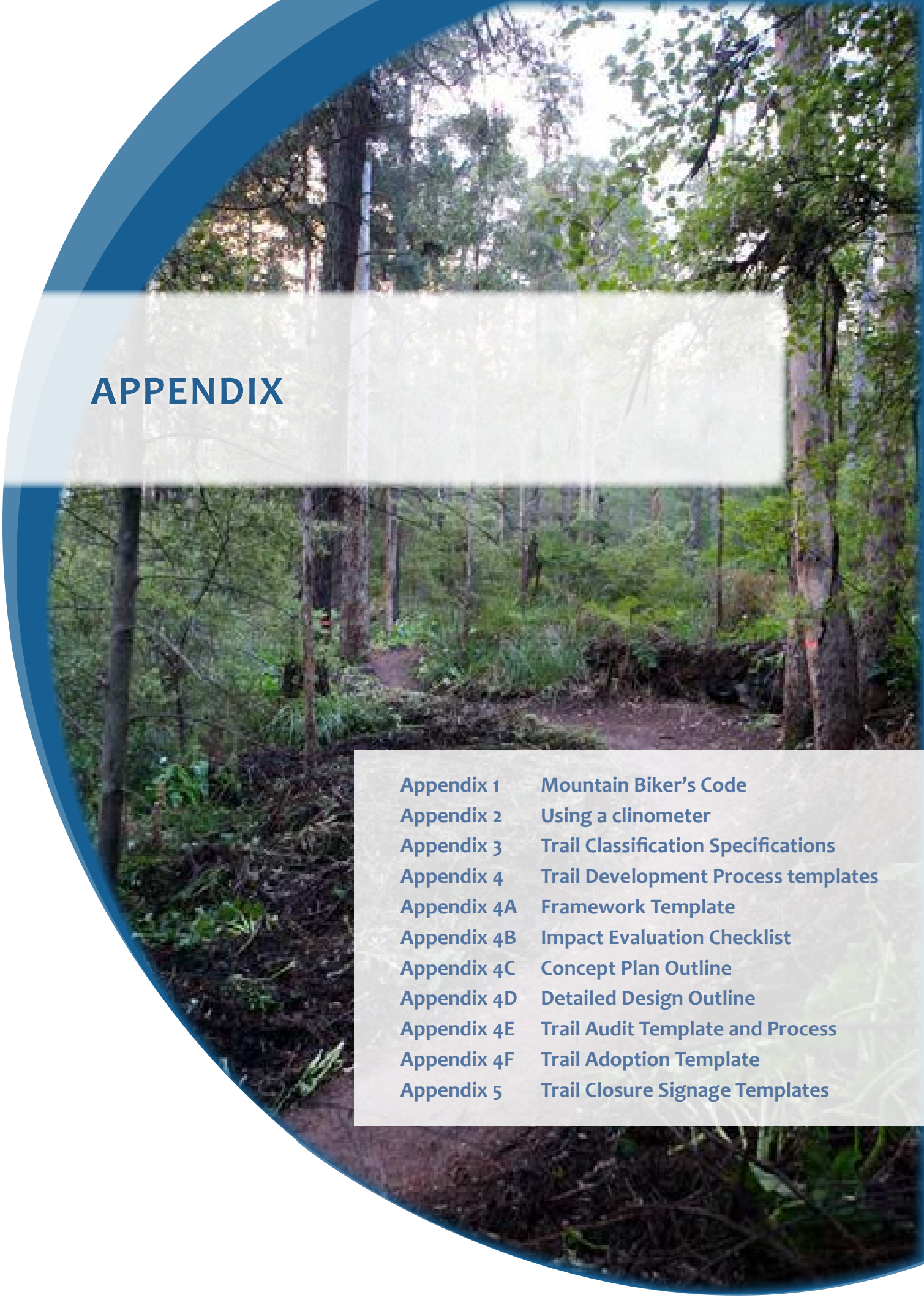


Photo:
Courtesy David Willcox

APPENDIX 1

MOUNTAIN BIKERS CODE

WA Mountain Bikers Code

SAFETY	**Be prepared** **Know yourself, your bike and your trail**	**Check trail conditions, tell someone your plans, take enough food, water, clothes and first aid. Check your bike, helmet and gear, read the trailhead and choose your trail, ride within your skills and abilities.**
ENVIRONMENT	**Respect your trail and the environment**	**Follow signage, stay on track and don't take shortcuts, protect wildlife and plants, take rubbish home, prevent spreading dieback: keep your bike and gear clean.**
ATTITUDE	**Make it a good experience**	**Share the trail, pass safely and courteously, help others out.**

APPENDIX 2

HOW TO MEASURE GRADE WITH A CLINOMETER

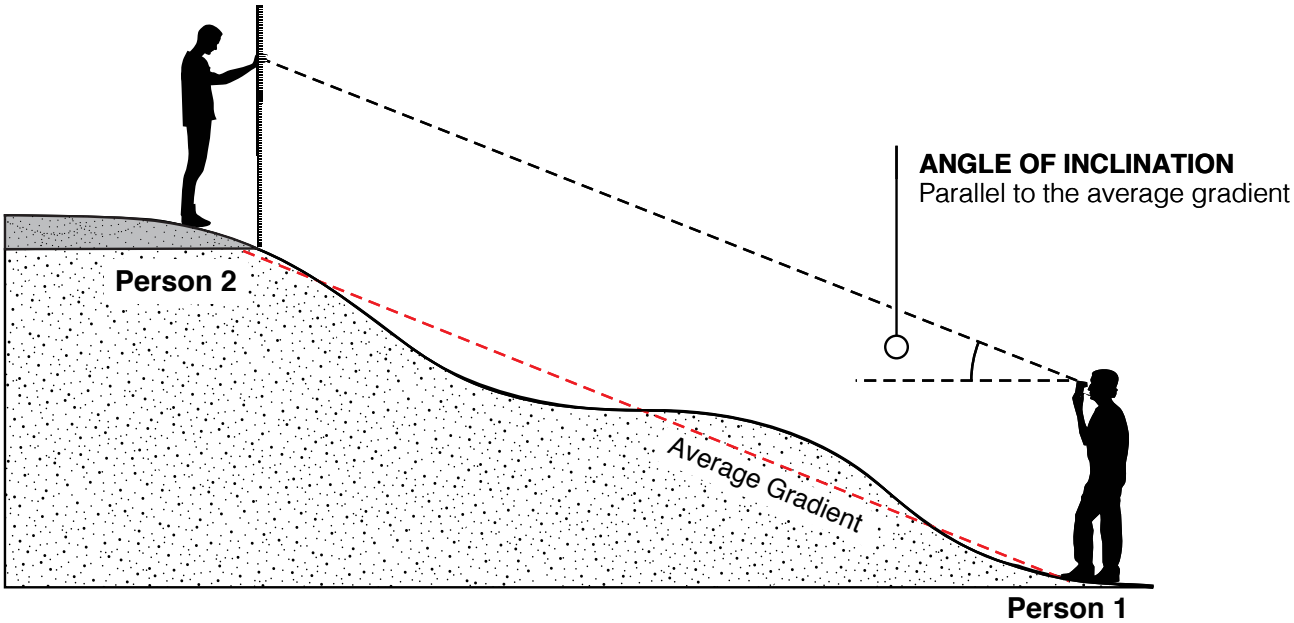
1. Person 2 records the eye level of Person 1 by placing the graduated survey staff (perpendicular) in front of Person 1 and determines their eye height on the staff.

2. Person 2 moves up or down to the other side of the trail section being measured, and puts their finger across the front of the staff at the height of Person 1's eyes.

3. Person 1 sights through the clinometer to their eye height on the survey staff, and reads off the angle of inclination as a percentage (%) and records it.

It is important that both eyes are kept open when using the clinometer. The instrument is held before the reading eye so that the scale can be read through the optics, and the round side-window faces to the left. The instrument is aimed at the object by raising or lowering it until the hairline is sighted against the point to be measured. At the same time the position of the hair line against the scale gives the reading. Owing to an optical illusion the hair line (crosshair) seems to continue outside the frame and is thus easily observed against the terrain or the object.

HOW TO USE A CLINOMETER

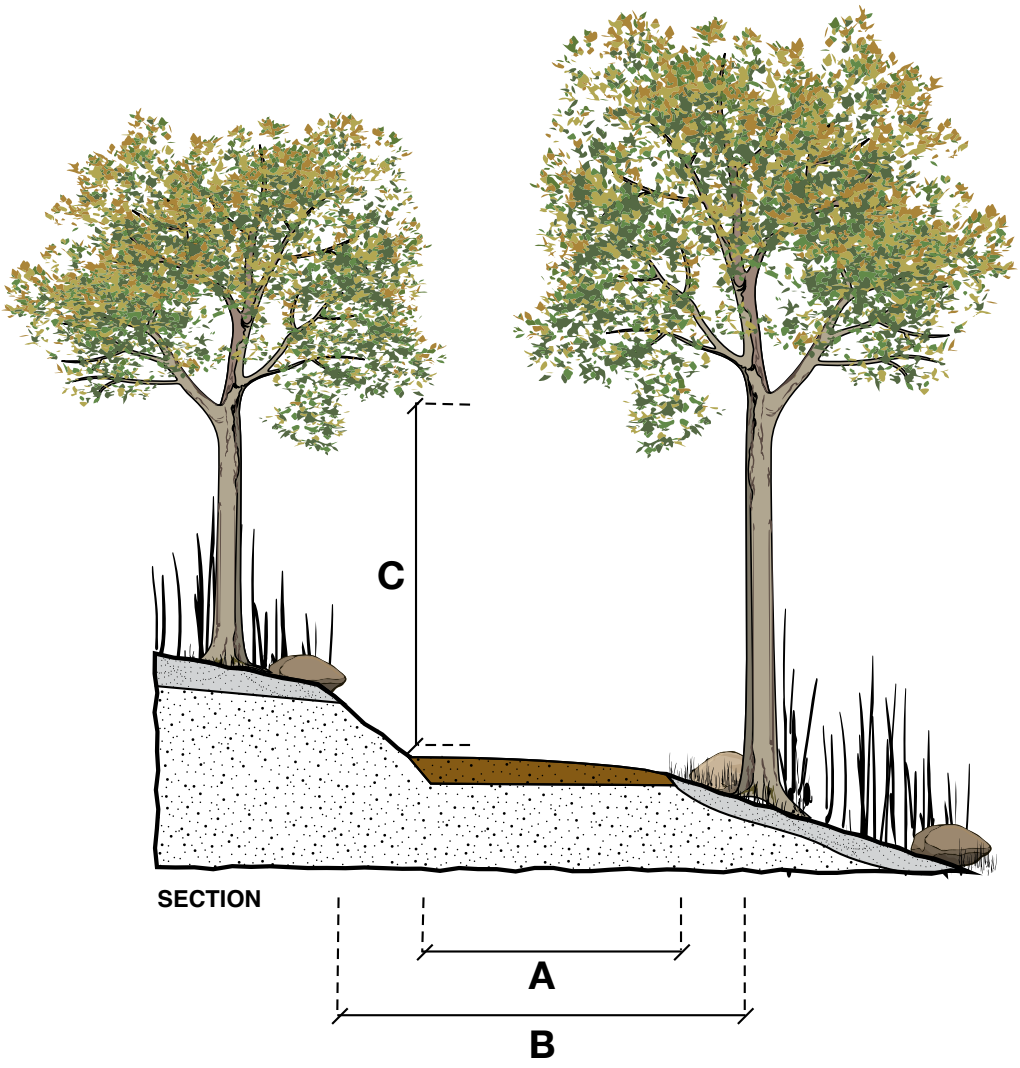


Feature	Description	easiest	easy	moderate	difficult	extreme
Tread Construction						
Minimum width of tread	The width of the trail tread	1.5m	900mm	600mm	300mm	150mm
Surface	Surface material	Stable and smooth surface. Not variable. Loose material <20mm	Mostly stable, can be variable & uneven. Loose material <30mm	Mostly stable, can be variable & uneven. Loose material <50mm	Widely variable, uneven. Loose material <100mm	Extremely variable and unpredictable Loose material <300mm
Gradient (avg/max)	The amount of elevation change between two points over a given distance.	5% or less/8%	7% or less/15% up to 20m	10% or less/20% up to 50m	15% or less/50% up to 10m	20% or less/70% up to 20m
Line of Sight	How far ahead a rider can see the trail	Average 30m Minimum 15m	Average 20m Minimum 10m	Average 15m Minimum 7.5m	Average 15m	Average 10m
Turns	**Turns are one of the most difficult areas of trail design. If turns are not designed and built exactly right they can create major issues to sustainability and lead to ongoing major maintenance requirements. Turns are control points and suitable placement of turns should be identified in Stage 4 Concept Plan. Turns should be linked into the overall design, the alignment leading into and out of a turn must be considered.**					
Climbing turns	A climbing turn does not have a constructed turning platform with the apex of the turn lying directly in the fall line. Therefore these turns should be built on shallow slopes that don't exceed a grade of about 7%. Keep the turn radius as wide as possible ideally 6m. If the grade is steeper than 7% use a well-built switchback.	Min radius 4m	Min radius 3m	Min radius 2.5m	Min radius 2.5m	Min radius 2.5m
Rolling crown switchbacks	A switchback reverses the direction with the help of a level, constructed landing. Switchbacks are more difficult to build than climbing turns but are more durable on steep slopes as they do not force the rider onto the fall line. IMBA recommends the rolling crown switchback where turns occur on a near level platform that is slightly crowned to drain from all sides. Switchbacks shouldn't be built directly above one and other, they should be staggered on a hillside to prevent shortcutting and water accumulation.	Min radius 4m	Min radius 2m	Min radius 2m	Min radius 2m	Min radius 2m
Berms	Bermed or insloped turns are built up and in-sloped at a steep gradient. This helps riders maintain a smooth speed without sliding out of the turn. Side slopes with a grade less than 25% are best. The curve of the berm should be shaped for purpose and fit into the design of trail.	✘	Min radius 3m Max in slope 10% Max height 600mm	Min radius 2m Max in slope 20% Max height 1200mm	Min radius 2m Max in slope 20% Max height 2000mm	Min radius 1.5m Max in slope 40% Max height 2500mm
Vertical change						
Obstacles	Unavoidable obstacles such as logs, roots and rocks.	✘	50mm	150mm	400mm	400mm
Rollers	Rollers are a rollable feature with no sharp edges. Riders do not need to loft their bike over a roller, both wheels can be touching the ground. Rollers have different purposes: they can create a 'pumping' feeling in the trail and are good for encouraging flow, or they can be used as a slowing feature. They should be shaped fit for purpose. Each singular roller should be detailed in design as a chainage point. The spacings should be based upon approach and exit speeds, and the dimensions between rollers may change through the 'set' to suit gradients. The trail designer should space rollers sensibly considering all the conditions.	✘	Maximum height to length ratio 1:8 Max height 400mm Max 2 together Minimum length to spacing ratio 1:2 crown to crown	Maximum height to length ratio 1:7 Max height 600mm Max 3 together Minimum length to spacing ratio 1:1.5 crown to crown	Maximum height to length ratio 1:5 Max height 800mm Max of 4 together Minimum length to spacing ratio 1:1 crown to crown	Maximum height to length ratio 1:3 Max height 1000mm Max of 4 together Minimum length to spacing ratio 1:1 crown to crown
Log rollers	A log that has a ramp on both sides. The ramp may be constructed out of logs, dirt or rock. The ramp must be rollable.	✘	✘	Same as rollers	Same as rollers	Same as rollers

Feature cont.	Description cont	easiest	easy	moderate	difficult	extreme
Vertical change cont.						
Tabletops	Tabletops are in effect rollers with steeper approaches and transitions with longer flatter tops. Tabletops can be used as jumps but it is essential that riders can roll over every part of the feature. Transition should be designed to suit the classification and purpose of the table top.	✘	✘	Max height 1500mm Min length 2000mm	Max height 2000mm Min length 2000mm	Max height 2000mm Min length 2000mm
Step ups	A step up is where the level of the trail changes abruptly, usually with a vertical face between the two levels.	Max height 40mm not less than 20m apart	Max height 50mm not less than 10m apart	Max height 200mm not less than 4m apart	Max height 700mm not less than 2m apart	Max height 1500mm not less than 2m apart
Drop off	A drop off is where the level of the trail changes abruptly with a vertical drop between the two levels.	✘	✘	Max height 500mm not less than 4m apart	Max height 1000mm not less than 4m apart	Max height 2500 not less than 4m apart
Rollable step downs	A rollable step down is similar to a drop off, the trail changes level with a less than vertical steep slope between the upper and lower levels. Riders should be able to roll the bike over the feature rather than having to drop over it as in the case off a drop off.	✘	✘	Max height 1000mm not less than 5m apart	Max height 1500mm not less than 4m apart	Max height 3500mm not less than 4m apart
Gaps	Parks and Wildlife will consider gap jumps being built on double black diamond trails on a case by case basis. A gap is a TTF with no rideable surface between the take-off and landing platform. Gaps can have increased consequences for riders. The perceived air gained from a gap jump can be achieved with a tabletop.	✘	✘	✘	✘	Conditionally. Max height 2000mm Min length 2000mm
Elevated Platforms	**Bridges and boardwalk installed as water crossings are not dealt with in this table.**					
Log rides and Ladders	Log rides are features made up of a log that forms the trail tread. The log should be set into the ground and the top should be shaped to form the running or tread surface. A ladder is a feature that is constructed with stringers and rungs.	✘	Ratio: 1:2 Max height 100mm Min width 200mm Max gradient 0% Ramps can have a gradient 10%	Ratio Height to Width 2:1 Max height 600mm Min width 200mm Max gradient 8% Max inslope/outslope 15% Ramps can have a gradient of 30%	Ratio Height to Width 4:1 Max height 1200mm Min width 150mm Max gradient 20% Ramps may have a gradient of up to 50% for up to 8m Max inslope/outslope 30%	Max height 1500mm Min width 100mm Max gradient 30% Ramps may have a gradient of up to 80% for up to 10m Max inslope/outslope 40%
Other						
Chicane and Choke (speed control)	A chicane is used to slow riders in a controlled manner by creating two tight corners by demarcation. A choke is a slight narrowing of the trail through the use of trees or rocks with the intention of slowing riders in a controlled manner. **Note: Minimum widths are at handlebar height. Objects lower to the ground may be less depending on design and purpose.**	Chicane only: WA Department of transport standards. Min corridor width 1.5m Chokes - NA	Min corridor width 1000m	Min corridor width 900m	Min corridor width 800mm	Min corridor width 800mm
Exposed edges	The outside edge of the trail has an exposed drop. For example bridges, boardwalks or cliffs. Guard rails are not required for TTFs, with appropriate cleared and maintained fall zones.	>600mm drop requires 1280mm high guardrails	>1000mm drop requires 1280mm high guardrails	>1500mm requires 1280mm high guardrails	>2000mm requires 1280mm high guardrails	>2000mm requires 1280mm high guardrails

REFERENCE: D Davis, 2012, IMBA, 2007, L McCormack, 2008, Greater Regional Vancouver District Parks, Resort Municipality of Whistler

TRAIL CORRIDOR

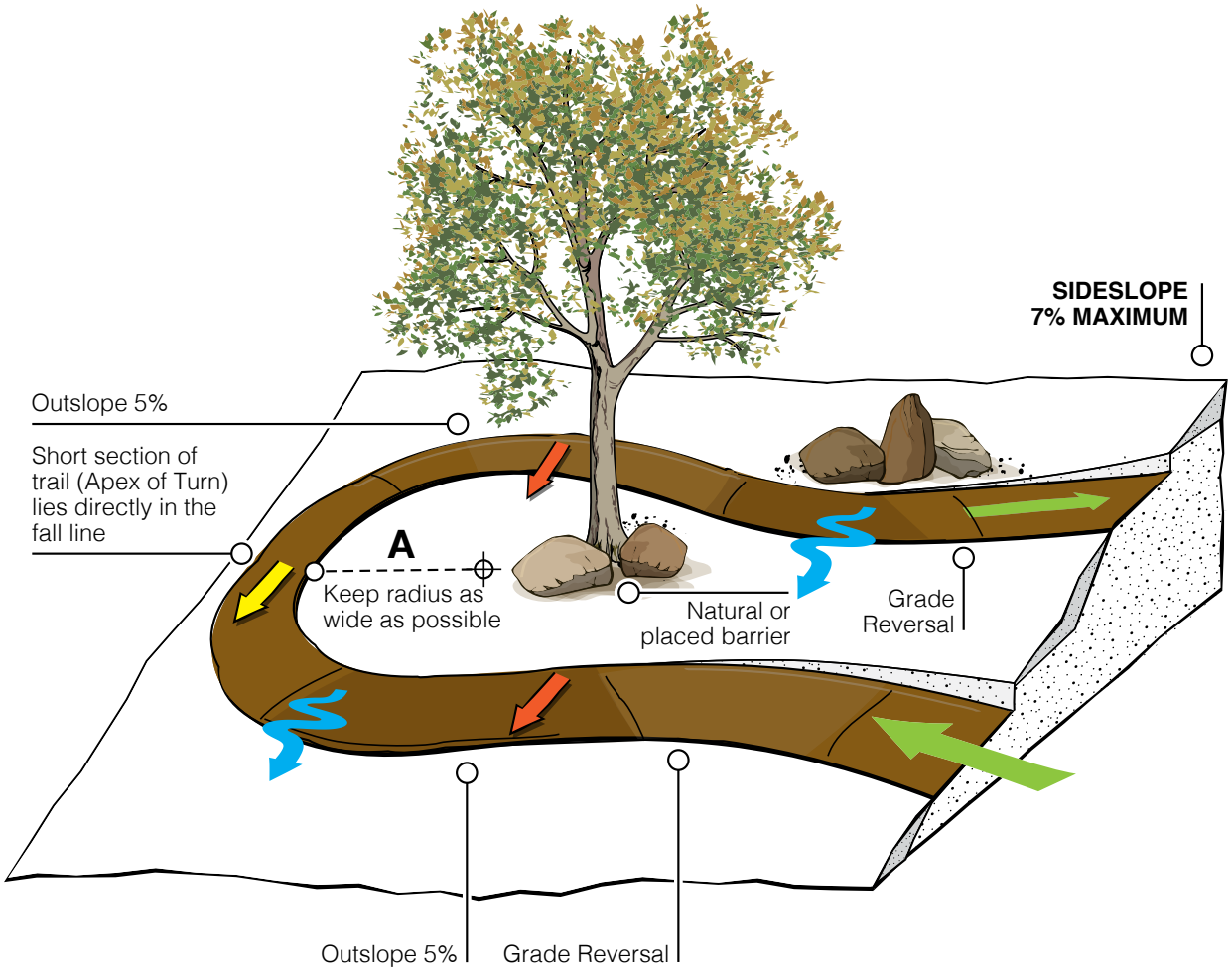


	easiest	easy	moderate	difficult	extreme
A (minimum)	**1500mm**	**900mm**	**600mm**	**300mm**	**150mm**
B (minimum)	**2000mm**	**1000mm**	**900mm**	**800mm**	**800mm**
C (minimum)	**2400mm**	**2200mm**	**2200mm**	**2200mm**	**2200mm**

Notes:

- Assess soil to ensure the most appropriate design and construction techniques and drainage intervals are incorporated for the soil type.
- Consider hardening the area close to the base of trees to reduce root compaction.
- Construct full benched trail where possible as it offers longevity, provides a stable riding surface and improves drainage and water flow off the trail.
- Angle batter sufficiently to reduce erosion and blend with the existing sideslope.
- Use soil removed for trail tread to spread down slope or use for rehabilitation.
- Outslope trail tread to 5% to allow water to shed off the trail.
- Crowned and insloped trail tread may be appropriate in some locations. Ensure appropriate drainage is installed for this type of construction.

CLIMBING TURN

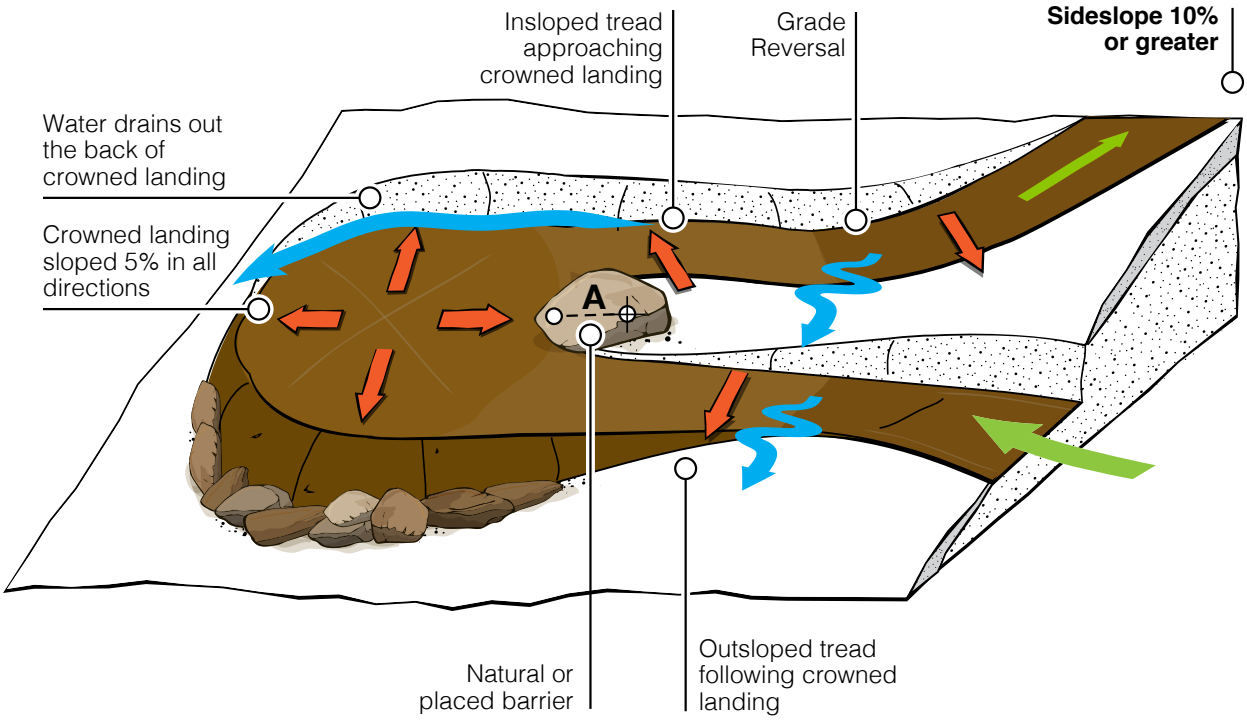


	easiest	easy	moderate	difficult	extreme
A (minimum)	**4m**	**3m**	**2.5m**	**2.5m**	**2.5m**

Notes:

- Anchor the turn around a natural or placed object to reduce short cutting.
- Ensure that the trail is an adequate distance from the base of trees to reduce impact to the root system and future health of the tree. If not possible, protect roots with trail armouring.
- The trail will lie on the fall line of the slope for a short section of the corner. It is important that the sideslope does not exceed 7%.
- The trail must be designed to shed water off the running surface before it reaches the corner. Include a grade reversal in and out of the turn.
- Ensure trail surface is outsloped to 5% to assist in shedding water.

ROLLING CROWN SWITCHBACK



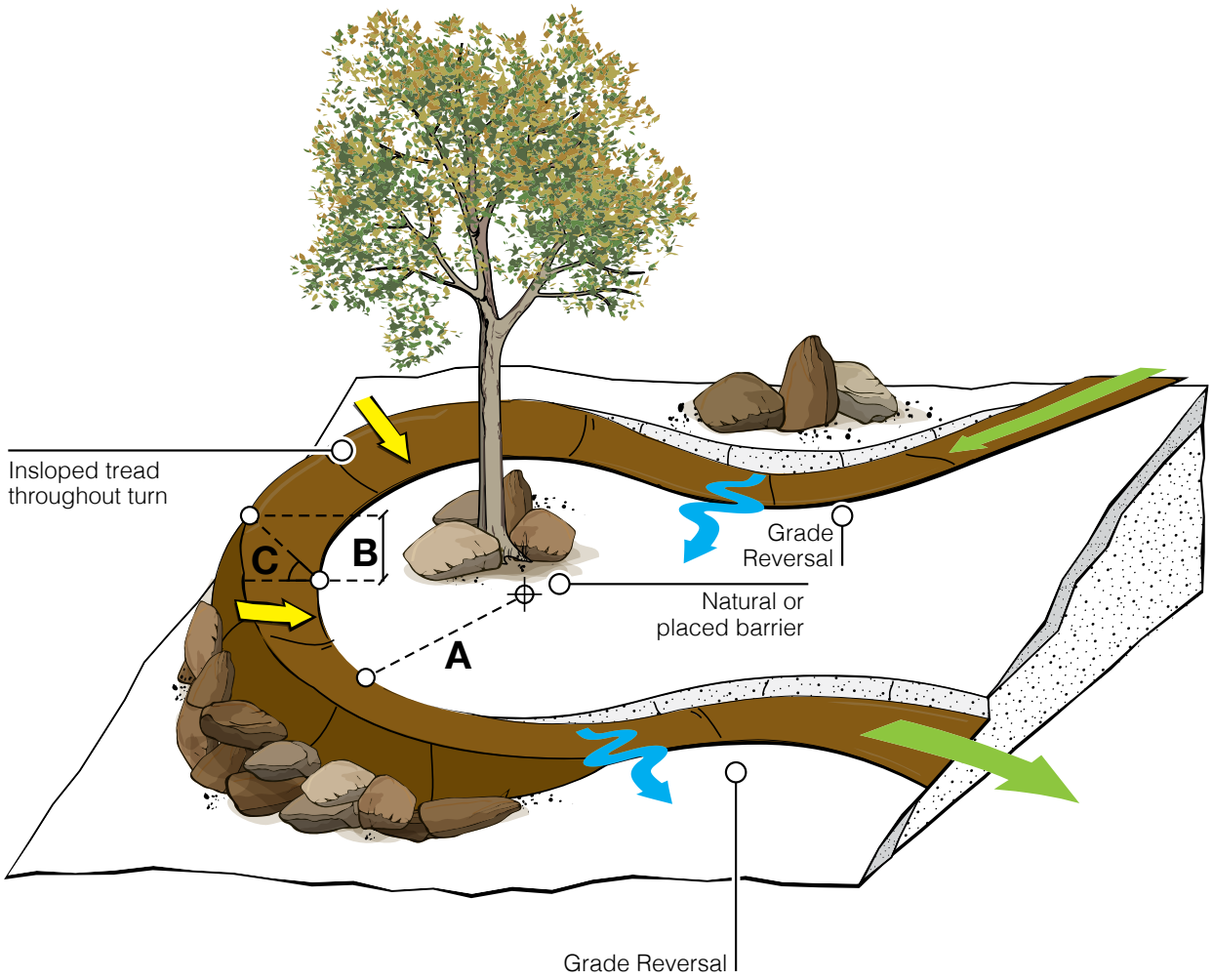
	easiest	easy	moderate	difficult	extreme
A (minimum)	**4m**	**2m**	**2m**	**2m**	**2m**

Typically not suited to high speeds, but to allow a change of direction on steep slopes.

Notes:

- This feature should be used where the sideslope is 10% or greater.
- Anchor the turn around a natural or placed object to reduce short cutting.
- Ensure that the trail is an adequate distance from the base of trees to reduce impact to the root system and future health of the tree. If not possible, protect roots with trail armouring.
- Crown the landing with 5% sloped in all directions.
- The trail must be designed to shed water off the running surface before it reaches the corner. Include a grade reversal in and out of the turn.
- Ensure trail surface is insloped 5% approaching the turn and outsloped 5% following the crowned landed to assist in shedding water.
- Rock retaining wall may be required.

BERMED TURN

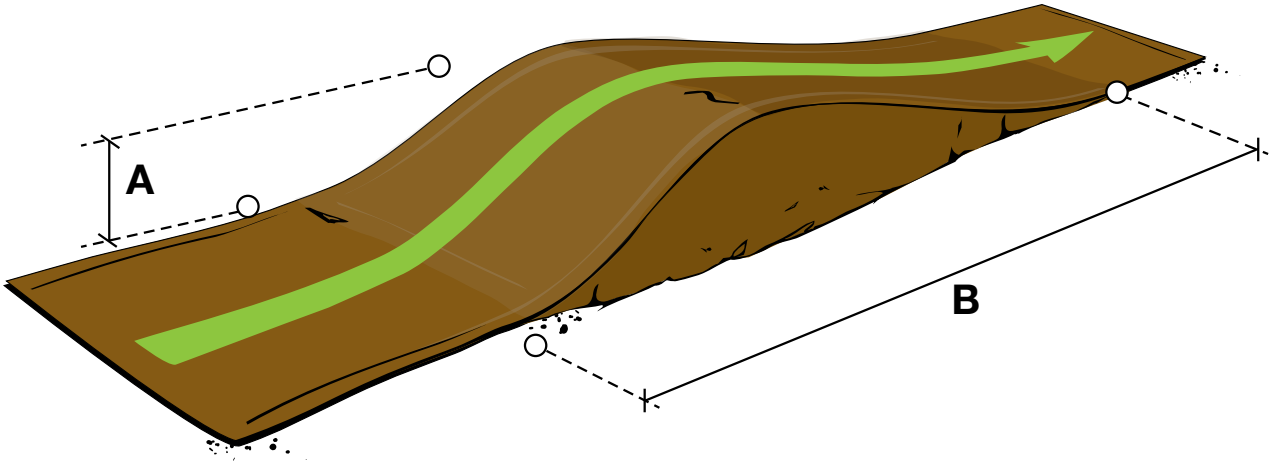


	easiest	easy	moderate	difficult	extreme
A (minimum)	×	**3m**	**2m**	**2m**	**1.5m**
B (maximum)	×	**600mm**	**1200mm**	**2000mm**	**2500mm**
C (maximum)	×	**20%**	**45%**	**45%**	**60%**

Notes:

- Use in situations where a change of direction is required, often at speed.
- Anchor the turn around a natural or placed object to reduce short cutting.
- Ensure that the trail is an adequate distance from the base of trees to reduce impact to the root system and future health of the tree. If not possible, protect roots with trail armouring.
- Ensure the approach and exit angles and the radius of the berm provide smooth transition through the berm and suit the flow and riding characteristics of the trail.
- Use local or imported fill to sculpt the shape of the berm. Utilise large rocks to add stability but avoid materials that will rot or cause injury e.g. stumps, logs, star pickets.
- Replace local topsoil on the back of berm to encourage growth and help stabilise.
- The trail must be designed to shed water off the running surface before it reaches the corner. Include a grade reversal before and after the turn.

ROLLER



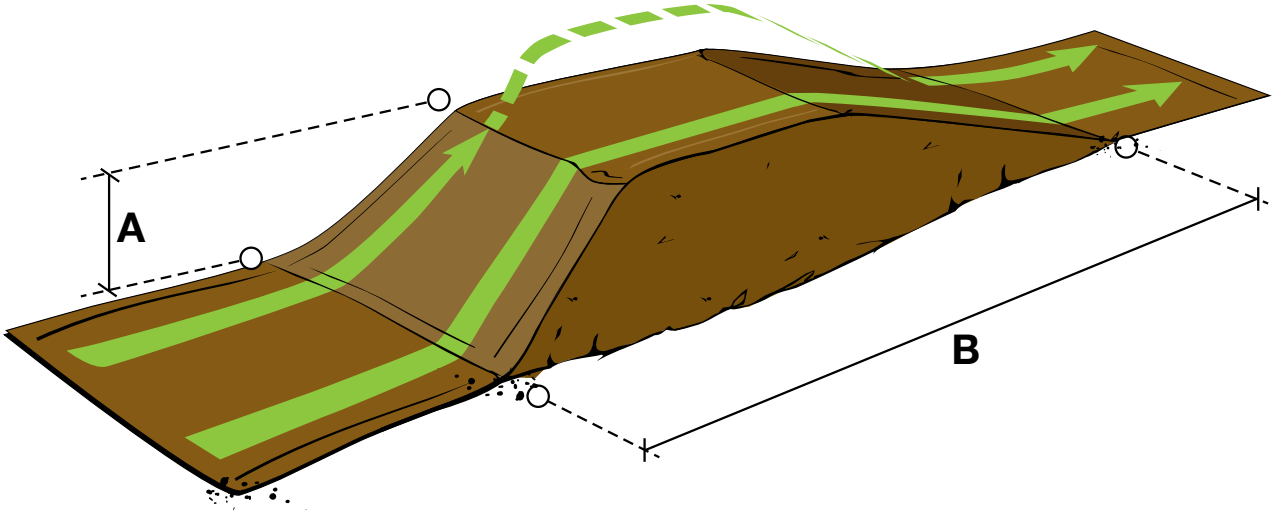
	easiest	easy	moderate	difficult	extreme
A (maximum)	x	**400mm**	**600mm**	**800mm**	**1000mm**
B (L:H Ratio)	x	**1:8**	**1:7**	**1:5**	**1:3**
Maximum together	x	**2**	**3**	**4**	**4**
Min length to spacing ratio (crown to crown)	x	**1:2**	**1:1.5**	**1:1**	**1:1**

A roller is a feature where the trail surface rises and then falls smoothly. Rollers are designed to be rolled over, however experienced riders may use a roller to 'pump' to gain speed or may use a roller to jump.

Notes:

- Rollers may occur singularly or in multiples depending on the trail's classification.
- Ensure appropriate sub-base is used and compaction is adequate to reduce future maintenance requirements.
- Ensure fall zone is clear of hazards.
- Rollers can be built up on flat terrain or use naturally occurring features.

TABLETOP



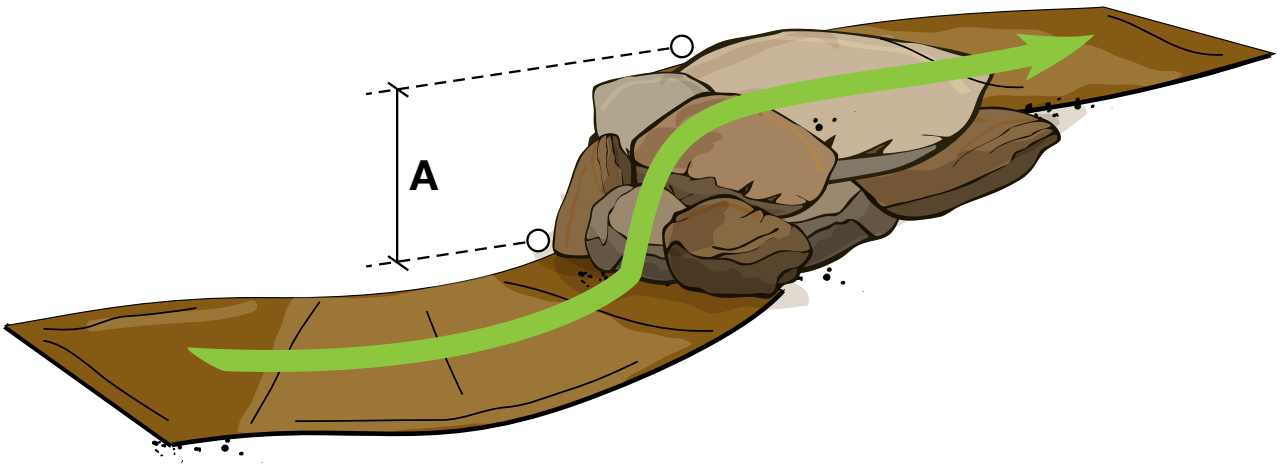
	easiest	easy	moderate	difficult	extreme
A (maximum)	x	x	**1500mm**	**2000mm**	**2000mm**
B (minimum)	x	x	**2000mm**	**2000mm**	**2000mm**

A tabletop allows riders to experience jumps in a safe and controlled manner.

Notes:

- Ensure appropriate sub-base is used and compaction is adequate to reduce future maintenance requirements.
- Side batters should be no more than 45°.
- Consider clay or stone capping to minimise maintenance requirements.
- Ensure fall zone is clear of hazards.
- Table tops can be built up on flat terrain or use naturally occurring features.

STEP UP



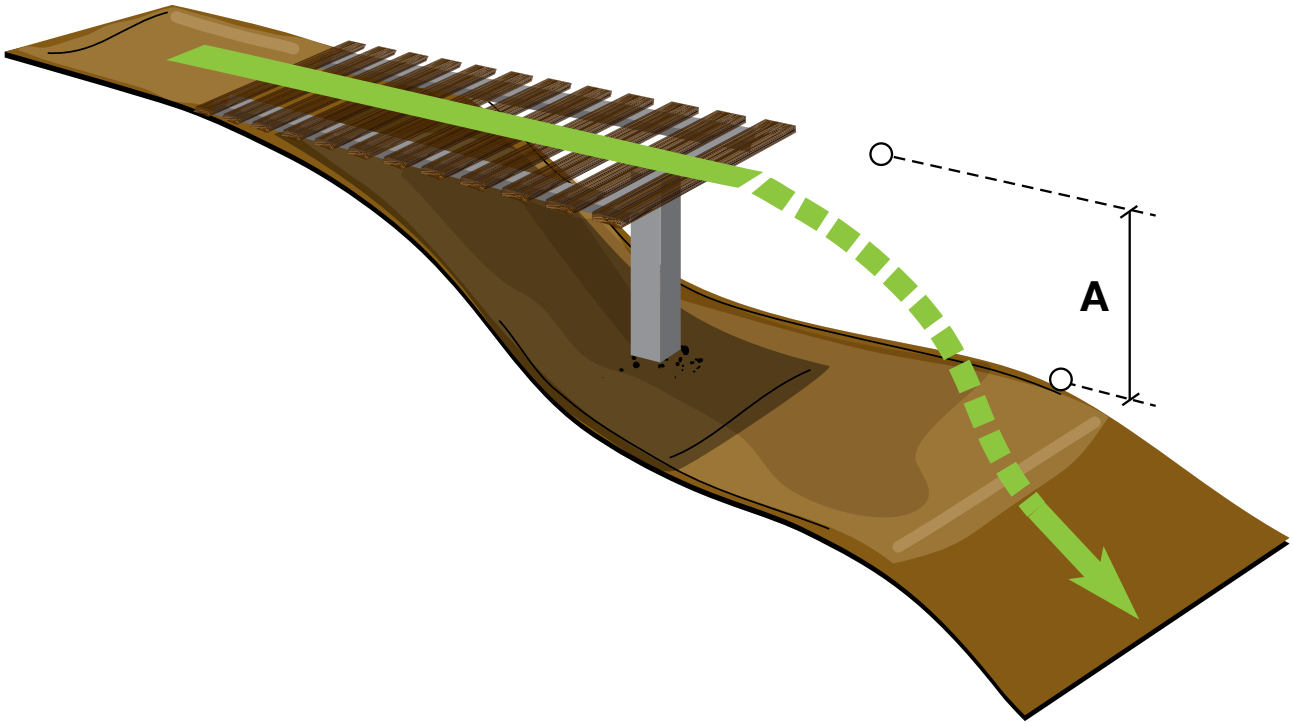
	easiest	easy	moderate	difficult	extreme
A (maximum)	**40mm**	**50mm**	**200mm**	**700mm**	**1500mm**

A step up is where the level of the trail surface changes abruptly, usually with a vertical face between the two levels.

Notes:

- Step ups may be constructed from large rocks or logs. Using rock increases sustainability and reduces maintenance as logs are likely to rot or burn away in a fire.
- Ensure appropriate drainage features (e.g. grade reversal) are installed before and after the step up.
- Ensure fall zone is clear of hazards.

DROP OFF



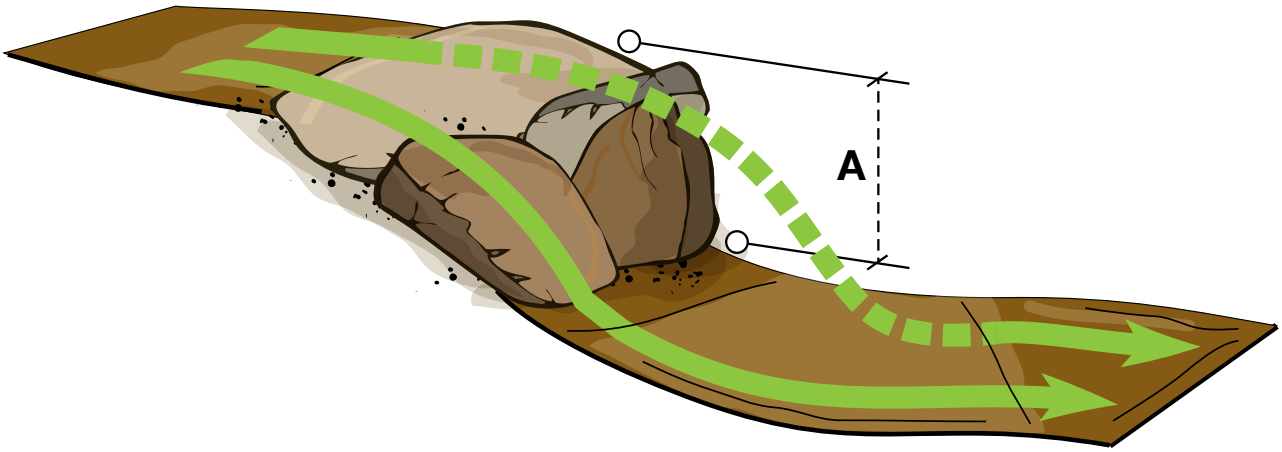
	easiest	easy	moderate	difficult	extreme
A (maximum)	✘	✘	**500mm**	**1000mm**	**2500mm**

A drop off is a feature where the level of the trail surface changes abruptly, usually with a vertical drop between the two levels.

Notes:

- Ensure appropriate drainage feature (e.g. grade reversal) is installed prior to the drop off to divert water away from the feature.
- Drop offs may be constructed from timber/steel, soil or rock. Using rock or soil increases sustainability and reduces maintenance as logs are likely to rot or burn away in a fire.
- Drop offs need to have a suitable landing area designed and constructed as part of the feature. This will minimise erosion.
- Ensure fall zone is clear of hazards.

ROLLABLE STEP DOWN



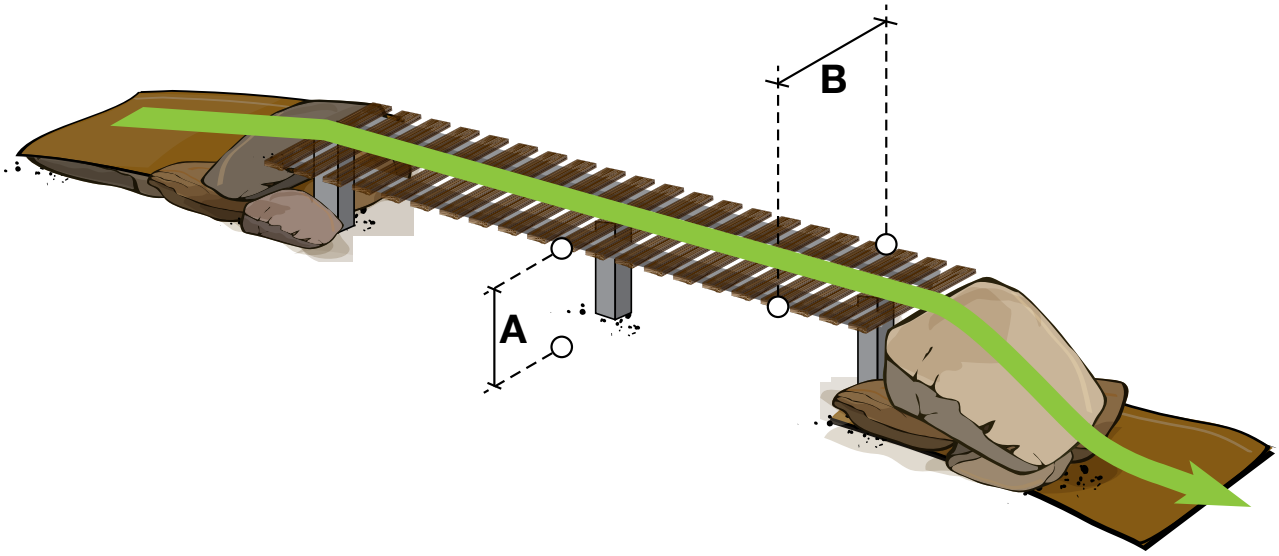
	easiest	easy	moderate	difficult	extreme
A (maximum)	x	x	**1000mm**	**1500mm**	**3500mm**

A rollable step down is similar to a drop off. However where the trail changes levels there is a less than vertical slope. Riders should be able to roll their bike over the feature rather than having to drop/roost over it as with a drop off.

Notes:

- Ensure appropriate drainage feature (e.g. grade reversal) is installed prior to the rollable step down to divert water away from the feature.
- May be constructed from rock, timber or logs. Using rock increases sustainability and reduces maintenance as logs are likely to rot or burn away in a fire.
- Ensure fall zone is clear of hazards.

ELEVATED PLATFORM



	easiest	easy	moderate	difficult	extreme
A (maximum)	x	**100mm**	**600mm**	**1200mm**	**1500mm**
B (minimum)	x	**200mm**	**200mm**	**150mm**	**100mm**
H to W ratio	x	**1:2**	**2:1**	**4:1**	**NA**
Max gradient	x	**0%**	**8%**	**20%**	**Up to 80%**

Elevated platforms include log rides and ladders which are technical features that form part of the trail tread.

Notes:

- Log rides should be set into the ground and the running surface should be shaped to form the tread.
- Remove any sharp edges.
- Ladders should be constructed from durable material and to design specifications. Some land managers may require engineer or builder approval.
- Ensure fall zone is clear of hazards.

CHICANE & CHOKE

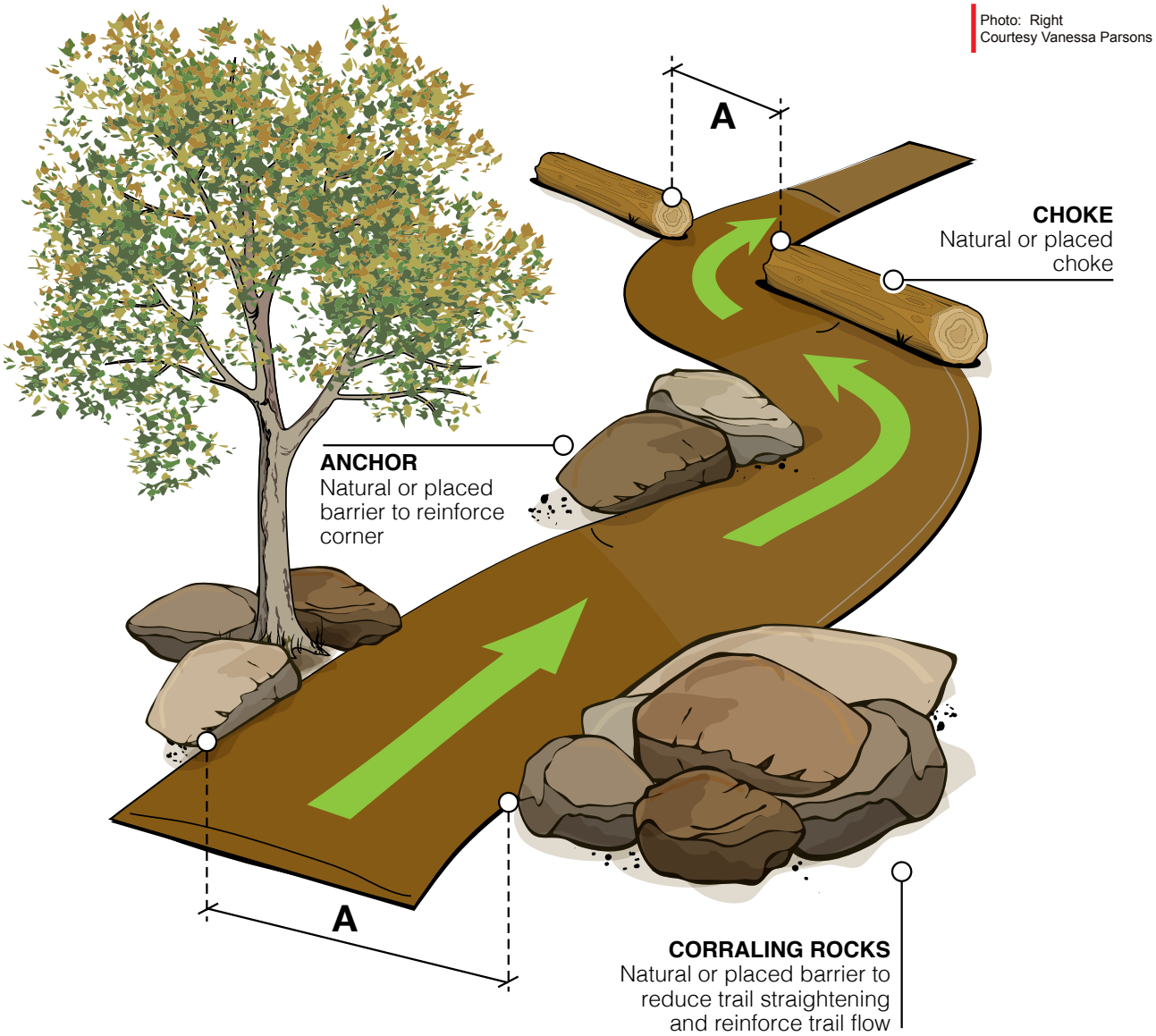


Photo: Right
Courtesy Vanessa Parsons

	easiest	easy	moderate	difficult	extreme
A (minimum)	x	1000mm	900mm	800mm	800mm

A chicane is a feature used to control speed by creating two tight corners with demarcation.

A choke is a slight narrowing of the trail through the use of natural or placed barriers such as trees, logs or rocks with the intention of slowing riders in a controlled manner.

Notes:

- Ensure appropriate sight lines in order to avoid heavy breaking and therefore erosion prior to the chicane/choke.
- Additional demarcation may be required to stop riders from avoiding the chicane.
- If using rock ensure 2/3 of the rock is buried.

APPENDIX 4A

FRAMEWORK TEMPLATE

https://www.dpaw.wa.gov.au/management/trails

Project Name	
Project Location	
Project Area	☐ Plan Attached
Tenure	

Background	
Steering Group	
Objectives	
Meetings	
Management Model	
Scope and Scale	
User Types and Styles	
Trail System/Model	
Agreed Standards	
Funding	
Delivery	
Evaluation	

Signature .....

Name .....

Organisation .....

Date .....

Signature .....

Name .....

Organisation .....

Date .....

APPENDIX 4A

EXPLANATORY NOTES

The development of a framework for proposed trail developments will ensure clarity with all stakeholders working towards agreed objectives and outcomes, along with assisting and informing the trail planning, design, construction and management stages.

The following notes have been provided as a general guide to the development of the framework.

Location	Provide a description of the proposed location.
Project Area	Provide details of the boundaries of the planning area for the proposed trails.
Tenure	Provide details as to the land tenure, or mix of land tenures applicable to the project area.
Background	Provide the background as how the project area has been identified and why it is being considered. • Has it been identified in trail master planning? • Is there community support/demand? • Is it supported by land managers & local government? • What is the rationale of the trail – why is it being proposed?
Steering Group	Developing a framework can only be done through clear and formal consultation with all relevant stakeholders and partners. It is crucial that all key stakeholders and partners are identified, understand and support the planning, design and delivery process. Provide a list the key agencies/groups and persons who will form the steering group, such as other government agencies, local government, local trail groups, recreation clubs, environment groups, etc. If the project is of national significance, you may also wish to include relevant peak bodies, such as the Westcycle or the WA 4WD Association. Include contact details – phone & email as minimum. Consider also listing interested stakeholders (in addition to the steering group) to keep informed on the trail development process.
Meetings	Identify an indicative timeframe of how often and where the Steering Group will meet for the duration of the project.
Objectives	Project objectives should define the overall aim and outcomes of the project, clearly setting out what the project is trying to achieve and **why.** Objectives may include environmental, economic, social and/or community outcomes. All objectives should be high-level and SMART – Specific, Measurable, Achievable, Realistic and Timely.

Explanatory Notes cont.

Management Model	To ensure long term sustainability, it is essential to identify who is the **trail owner** and **trail operator.** (The trail owner is the entity that owns the physical structure of the trail and manager of the land and carries the liability for the health and safety of all users. The operator is generally the entity that maintains the trail to the agreed standards of the owner. It can be the same organisation). • Who is the trail owner? • Who is the trail operator? • How will visitor use be monitored? • Who will undertake the maintenance – owner, operator, volunteers? • If the owner and operator are different, what instrument of agreement is to be used – trail adoption, MOU, etc?
Scope and Scale	The scope and scale clearly identify the significance and size of the project and are closely linked to achieving the project objectives. • What is the proposed trail/networks level of significance – is a nationally, regionally or locally significant trail? • What size is the project? • How many kilometres of trail is planned? • What infrastructure is required? • Is the project development to be staged? • What type of use is proposed – recreational and/or event?
User Types and Styles	It is essential to define the target users of the trails as part of the framework to ensure that they meet the needs and expectations of the intended users. • What are the different types of users being targeted? • What are the abilities of target users? • Is universal access required e.g. wheelchair access on walk trails, or adaptive cycle access on mountain bike trails? • What are the appropriate trail classifications for the targeted users? • What are the different styles of activities that will take place on the trails (if appropriate) e.g. trail running on walking trails, cross country vs downhill for mountain bike trails • Is the trail single use or multi use?
Trail System/Model	Outline the trail system being proposed. • Is it linear or looped trail? • If looped, is it a core trail, stacked loop, cloverleaf, or finger style? • Is it single or dual direction? • Is it a single trail or a network of trails? • Is it part of a trail centre or trail town?

Explanatory Notes cont.

Agreed Standards	These standards must be agreed by the Steering Group and applied consistently to all aspects of: • Design, • Planning, • Construction and • Maintenance.
Funding	Outline how the project will be funded. For larger projects with multiple funding sources, it may be beneficial to outline the sources for the specific stages of trail development e.g. Site Assessments, Concept Plan, Corridor Evaluations, Design, Construction and Management.
Delivery	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 – internal staff or external contracts? • Will stages (e.g. Site Assessments, Concept Plan, Corridor Evaluations, Design, Construction) be addressed separately? • Will volunteers be involved? If so how and at what stage? • Who will manage the project? • How will the project be managed? • Who will take responsibility for delivering different aspects of the project? • Will the project be staged? • What are the proposed timelines?
Evaluation	Evaluation of the project is essential to find out if the project has met its objectives and to improve future trail developments. • How is the steering group planning to evaluate the success of the project? • Has the project met its planned objectives? • Are the trails being used by the intended target market? • Are then any unforeseen issues/impacts (environmental, economic or social)?
Stakeholder Approval	Document the steering group approval of completed and agreed framework.

APPENDIX 4B

IMPACT EVALUATION CHECKLIST TEMPLATE

Note: a word template of the Impact Evaluation checklist can be downloaded from the following link: https://www.dpaw.wa.gov.au/management/trails

A – Land Details	
Land Manager	
Local Government Authority	
Private property/Reserve Name and Location	
Tenure and Primary Management Objective of Lands	

B – Proposed Project
Purpose
Type & Extent of Proposed Project
Alternative Options Considered
Implications of Postponement or 'Do Nothing' Option

C – Impact Evaluation				
Indicate with Y/N in **Acceptable** column if proposed work is acceptable or not with respect to the environmental/ management issue listed. If it's not acceptable, consider acceptability of modified proposal in **Modified** column or the **Do Nothing** column. The Comments column is for detailing action/s required to overcome/minimise adverse impact, or if no information is available to allow a decision.				
Issues	**Acceptable**	**Modified**	**Do Nothing**	**Comments** Indicate action required to overcome/minimise adverse impact, or if no information is available to allow a decision.
1. Management Considerations				
1.1 Does the area have a management plan or strategy?				
1.2 Does the proposal conflict with existing policy or management plan?				

Issues		Acceptable	Modified	Do Nothing	Comments Indicate action required to overcome/minimise adverse impact, or if no information is available to allow a decision.
1.3	How will the proposal affect neighbouring land holders and community interests				
1.4	How will the proposal affect land management considerations e.g:				
	• Fire management				
	• Roads				
	• Other recreation or tourism				
1.5	How will the proposal affect or be affected by existing or planned land use e.g:				
	• Mining and exploration				
	• Basic Raw Material (gravel, rock and borrow pits)				
	• Forestry				
	• Utility lines				
	• Water catchment				
	• Commercial activities (e.g. apiarist)				
1.6	How will the proposal affect or be affected by neighbouring land use?				
1.7	Are there any research plots, scientific study areas and reference sites in the proposed area?				
2.	**Plant Disease, Ferals, and Weeds**				
2.1	Diseases (e.g. dieback, armillaria, cankers etc)				
2.2	Will area require baiting buffers?				
2.3	Declared weeds, or other environmental weeds				
3.	**Flora, Fauna and Ecosystems**				
3.1	Declared Rare Flora or Priority Species, Threatened Communities or restricted, unusual or poorly reserved vegetation associations				
3.2	Declared Rare or Endangered fauna, translocation programs, release sites or restricted habitats.				
3.3	Diverse Ecosystem Zones including rivers, streams, swamps, lakes, gorges, rock outcrops etc.				
3.4	Fauna Habitat Zones				
3.5	Old-growth forest				
4.	**Cultural Heritage**				
4.1	Registered Aboriginal sites				

C – Impact Evaluation cont.					
	Issues	**Acceptable**	**Modified**	**Do Nothing**	**Comments** Indicate action required to overcome/minimise adverse impact, or if no information is available to allow a decision.
4.2	Is the area subject to a Native Title claim? Has DAA or the Aboriginal Land and Sea Council been advised? Have Working Party members been consulted?				
4.3	Does the area adjoin or contain any places on the following lists:				
	• Register of the National Estate				
	• Register of Heritage Places				
	• Municipal inventory for the local council				
	• Land manager heritage database				
5.	**Recreation and Access**				
5.1	How will the area be accessed?				
5.2	Is there a potential conflict with existing recreation use, events and/or commercial tour operators?				
5.3	How will visitor safety be managed?				
5.4	Landscapes, features, wilderness appreciation.				
5.5	Increased demand for facilities and service (rubbish disposal, toilets etc)				
6.	**Geology, Landform and Soils**				
6.1	Caves, fossils, or dunes				
6.2	Soil erosion (water or wind)				
6.3	Soil mixing or soil compaction				
6.4	Soil compatibility				
7.	**Hydrology**				
7.1	Stream or impoundment sedimentation				
7.2	Altered run-off, impeded drainage or water logging				
8.	**Monitoring**				
8.1	How and when will the effects of the proposed operation be monitored?				
8.2	Who is responsible for completing the monitoring?				
8.3	Have resources been made available for monitoring?				
8.4	Who will be provided with the monitoring results, and what is expected to happen with the results?				

D – Level of Approval Required (from Approvals Matrix)

E – Proponent/s			
Signature		Date	
Name/Position			
Signature		Date	
Name/Position			

F – Endorsements/Approvals			
Comments			
Signature		Date	
Name/Position			
APPROVED / NOT APPROVED		Date	

Explanatory Notes

Item	Comment
Section A – Land Details	
Land Manager:	Identify who the land manager is.
LGA:	Identify the Local Government Authority in which the Park / Reserve is located. This will be important in determining whom to contact regarding "Municipal Inventory" information if not the same as the land manager.
Park / Reserve Name and Location:	Identify the gazetted name of the Park / Reserve and any additional information regarding the locality or block name that may be relevant, and provide a map with the Checklist. Identify the project area boundary.
Primary Management Objective of the Park / Reserve:	Clearly identify the primary management objective of the Park / Reserve, and include the identification of any proposed zoning classification that is applied to the Park / Reserve.
Section B – Proposed Works	
Purpose:	Provide a clear description of the purpose of the work proposed for evaluation. The proposed project must be broken down into its component parts, and the location and extent of each of these parts quantified in detail. The proposed location of the project should be mapped at a scale that enables it to be effectively assessed.
Alternative Options Considered:	Briefly outline the other options that were considered, and provide a short justification as to why they were not preferred.
Implications of postponement or 'Do Nothing' option:	Briefly outline the implications of delaying the completion of the proposed work or of doing nothing.
Section C – Impact Evaluation	
1. Management Considerations	
1.1 Does the area have a management plan strategy or master plan?	Outline the management documents available for the area.
1.2 Does the proposal align with existing policy or management plan?	Describe how the proposed project aligns with any existing management documents.
1.3 How will the proposal affect neighbouring land holders and, and community interests	Will the proposed project affect neighbouring land holders? Is the proposal likely to adversely affect local community interests? How will this be managed?

1.4 How will the proposal affect land management considerations e.g:	Outline the management documents available for the area.
• Fire management	Consider how the proposed project may affect prescribed burning activities or bush fire management (additional firebreaks, recreation site protection during prescribed burning, review prescribed burn plan etc)
• Roads	Review the proposed project against strategic roads (existing and future) for potential changes required or conflicts.
• Other recreation or tourism	Review the proposed project against existing recreation and tourism activities in the area for conflicts and opportunities (e.g. shared facilities).
1.5 How will the proposal affect or be affected by existing or planned land use e.g:	
• Mining and exploration	Identify weather there are any mining operations that are likely to impact on the Park/Reserve in the future.
• Basic Raw Material (BRM) e.g. gravel, rock and borrow pits	Identify the quantities of BRM required. Where will this be obtained from and any ongoing commitments from the Park/ Reserve. How will BRM extraction areas be rehabilitated?
• Forestry	Identify whether the area is leased to any forestry organisations or companies. How will consultation with forestry organisation/ companies be undertaken? How will the proposed project be managed around harvesting operations?
• Utility lines	Identify any public utilities within the proposed project areas and whether these will be affected by the project.
• Water catchment/public drinking water source areas (PDSWA)	Identify whether or not the proposed project is within water catchment or PDWSA. Does the proposal conform to any existing or proposed management plans or policy? e.g. Operational policy 13 – Recreation within Public Drinking Water Source Areas on Crown land.
• Commercial activities (e.g. apiarist)	Identify if the proposed project may affect any approved commercial activity on the Park/Reserve.
1.6 How will the proposal affect or be affected by neighbouring land use?	Identify neighbouring land use that is likely to affect the proposal, or where the proposed project is likely to affect the neighbouring land use.
1.7 Are there any research plots, scientific study areas and reference sites in the proposed area?	Identify whether there are any research plots, scientific study or reference sites that may be affected by the proposed project.

2. Plant Disease, Ferals and Pests, Weeds	
2.1 Diseases (e.g. Dieback, *Armillaria*, Cankers etc)	If no dieback report is available for the area, complete a survey and develop a hygiene management plan. Identify the presence of Armillaria and provide proposed operational strategies to manage this. Identify whether the native vegetation in the area exhibits symptoms of cankers.
2.2 Will area require baiting buffers?	Identify whether the area will require a buffer for 1080 baiting.
2.3 Declared weeds, or other environmental weeds	Are there known infestations of weeds in the Park/Reserve? Identify if the proposed project may cause introduction or spread of weeds. What will be the management costs?
3. Flora, Fauna and Ecosystems	
3.1 Declared Rare Flora (DRF) or Priority Species, Threatened Communities or restricted, unusual or poorly reserved vegetation associations	State the presence of DRF, priority species, Threatened or Priority Ecological Community on the Park/Reserve.
3.2 Declared Rare or Endangered fauna, translocation programs, release sites or restricted habitats.	State the presence of Rare and Endangered species in the Park/Reserve. Comment on any translocation programs, release sites or restricted habitats if identified.
3.3 Diverse Ecosystem Zones including rivers, streams, swamps, lakes, gorges, rock outcrops etc.	Comment on the degree to which the natural vegetation is intact.
3.4 Fauna Habitat Zones	State the presence of any fauna habitat zones within the proposed project area.
3.5 Old-growth forest	State whether the proposed project will impact on any areas of Old-growth forest. Higher level approval may be required.
4. Cultural Heritage	
4.1 Registered Aboriginal sites	Report on known Aboriginal Sites located within the proposed project area. Is further surveys or consultation required.
4.2 Is the area subject to a Native Title claim? Has DAA or the Aboriginal Land and Sea Council been advised? Have Working Party members been consulted?	State whether DAA, or the appropriate ALSC has been advised and what the outcome of this is. State when advice or consultation with the Working Party members will occur.

4.3 Does the area adjoin or contain any places on the following lists:	
• Register of the National Estate	Check the register and report on any sites that are within or adjoining the proposed project area. Comment on whether the proposed project will impact on any sites.
• WA Register of Heritage Places	Check the register and report on any sites that are within or adjoining the proposed project area. Comment on whether the proposed project will impact on any sites.
• Municipal inventory for the local council	Check the inventory and report on any sites that are within or adjoining the proposed project area. Comment on whether the proposed project will impact on any sites.
• Land manager heritage database	The land manager may have a database that lists identified cultural heritage places for the proposed project area.
5. Recreation and Access	
5.1 How will the area be accessed?	Identify access routes and entry/egress areas for the proposed project area and activity. Identify any existing access that requires closure or management. Differentiate between access for the public and access for maintenance.
5.2 Is there a potential conflict with existing recreation use, events and/or commercial tour operators?	Identify any existing recreation, events and/or commercial tour operators within the proposed project area. Will the proposed project conflict with this? How will any potential conflict be managed?
5.3 How will visitor safety be managed?	Assess potential visitor risks and identify how visitor safety will be managed.
5.4 Landscapes, features, wilderness appreciation.	Identify whether the proposed project will impact on important scenic areas, and how this can be managed through any future planning and/or construction works.
5.5 Increased demand for facilities and service (rubbish disposal, toilets etc)	How will increased usage be managed? Roading or trail wear/tear, rubbish removal, toilet maintenance, vandalism etc

6. Geology, Landform and Soils	
6.1 Caves, fossils, or dunes	Assess and identify areas that are sensitive to disturbance and may be affected by the proposed project now or in the future.
6.2 Soil erosion (water or wind)	Assess and identify appropriate trail design and construction techniques and standards to minimise soil erosion.
6.3 Soil mixing or soil compaction	Assess and identify appropriate trail design, construction techniques and standards to minimise soil profile damage.
6.4 Soil compatibility	Is the soil type compatible with the proposed project? What management strategies will be in place e.g. surfacing, armouring etc.
7. Hydrology	
7.1 Stream or impoundment sedimentation	Identify whether the proposed project is likely to affect water quality in the rivers and streams or where there is the potential to affect a catchment. This may include major dams, or dams used by neighbouring land holders.
7.2 Altered run-off, impeded drainage or water logging	Assess and identify areas that may be affected by a changed water flow regime.
8. Monitoring	
8.1 How and when will the effects of the proposed project be monitored?	Provide a task list for monitoring the proposed project.
8.2 Who is responsible for completing the monitoring?	Detail the person or organisation responsible for the monitoring of the proposed project.
8.3 Have resources been made available for monitoring?	Detail the commitment and resources that have been made available for the life of the monitoring period.
8.4 Who will be provided with the monitoring results, and what is expected to happen with the results?	Identify who will receive the reports and what is expected to happen as a result of monitoring. This may include review of procedures, cessation of the project, rehabilitation etc.
Section D – Level of Approval Required	
The person who prepared the Impact Evaluation should seek guidance from the land manager regarding level of approval required.	
Section E - Proposer	
The person who prepared the Impact Evaluation should sign the document.	
Section F – Endorsement/Approval	
The “Impact Evaluation Checklist” should signed by the land manager at the appropriate approval level (Section D above).	

APPENDIX 4C

CONCEPT PLAN OUTLINE

Suggested minimum content

1. Project Area Overview/Summary:
    - Description of project area
    - Project objectives
    - Scope and scale
    - Opportunities & Constraints within project area (based on site assessments, e.g. access, vegetation, soils, topography, environmental constraints, interpretative opportunities)
    - Proposed target market and user types
    - Proposed trail system

Note : much of the above should be available from the agreed Framework.

2. Trail Network Concept Description:
    - Plan of overall trail network concept (indicative alignment based on ~25-50m wide trail corridors)
    - Individual trail summaries (including but not limited to; trail description, length, gradient, classification, type, style, recommended technical trail features (TTF) & filters, recommended construction method & materials, etc)
    - Proposed infrastructure requirements and locations (including but not limited to; carparks, toilets, facility capacities, etc)
    - Sign plan (including but not limited to; proposed location for major and minor trailheads, interpretative opportunities, etc)

3. Proposed Development Process
    - Proposed development staging, priority and construction sequencing
    - Trail construction estimates and estimated Bill of Quantities.

APPENDIX 4D

DETAILED DESIGN OUTLINE

Written Specification (suggested content)

- Trail network summary, including (but not limited to) –
- Project background
- Written Specification (recommended minimum content)Project site summary
- Written Specification (recommended minimum content)Breakdown of trail types, styles and classifications
- Topographic plan of all individual trail alignments (GPSed alignments)

Individual trail summaries:
A trail summary should be provided for each individual trail and include (but not limited to) –

- Individual trail classification
- Individual trail type and style
- Identified direction and purpose (e.g. ascend/descending, single/dual-purpose/multi-purpose)
- Distance
- Breakdown of existing, upgrade or new trail construction required
- Individual topographic plan for each individual trail, including GPSed trail alignment
- If upgrading existing trail alignments, redundant trail requiring rehabilitation
- Individual trail assessment, including (but not limited to) the following:
  - Assessment of natural features, soil type and geology, including any vegetation disturbance/removal, any required trail tread, treatments (e.g. surfacing, armouring, etc) and treatment specification (e.g. start/finish, dimensions (length x width x depth), materials requirements, etc)
  - Assessment of gradients (trail and side slope), proposed drainage features, position and specification
  - Any constructed trail tread or elements (e.g. switchbacks, climbing turns, demarcation, etc) and specification
  - Any natural or constructed technical trail features (TTF) and specification (e.g. type of feature, dimensions (length x width x depth), construction materials, fall zone dimensions and treatments, etc)
  - Proposed trail element or feature construction material source (e.g. type of material, local or imported, etc)
  - Proposed filters and decision points, Construction access points.

Recommended trail construction techniques, including:

- Vegetation clearing techniques, clearances, disposal and equipment requirements
- Specifications of required machinery for trail construction.

Detailed drawings/specifications/construction notes for any proposed:

- Trail tread treatments
- Drainage features
- Constructed trail elements
- Constructed TTF's.

Summary of required materials and quantities for trail construction, itemised by individual trail.

Note: The completed detailed design should allow construction stages to be separated into individual trails as/if required.

APPENDIX 4D

DETAILED DESIGN OUTLINE (CONTINUED)

Field Outputs (recommended minimum requirements)

Trail centrelines flagged in the field at specified intervals (suggested 5-10 metres) and include marked chainage.

In addition to the centreline/chainage flagging, the following points must be identified in the field, and linked with the written specification above –

- Changes in any trail tread treatments (e.g. use of onsite vs imported materials, changes from insloped to outsloped trail, etc)
- Locations of trail drainage features (e.g. grade reversals, drains, etc)
- Location of constructed trail elements (e.g. anchors, armouring, corrals, etc),
- Location of constructed technical trail features (TTF) (e.g. berms, tabletops, rollers, etc).

APPENDIX 4E

Department of **Biodiversity, Conservation and Attractions**

GOVERNMENT OF WESTERN AUSTRALIA

PARKS AND WILDLIFE SERVICE

Mountain Bike Trail Audit Template

Page ___ of ___

Trail Assessed by: ..... **Assessment Date** .....

Feat#	WP or GPS Coordinates	Photo (tick)	Feature/Issue Type	Feature/Maintenance Issue Description and Measurements	Class (Main Trail)	Class (Alternate Line)
Example	*WP 205 or 50 394604E 6459558N*	*001*	*Steep section or Log ride*	*Gradient of 20% for 30m or Alternate route/feature - log ride in good condition length 3m, height 1m, width 300mm.*	*3 or NA*	*NA or 4*
				Overall Trail Classification		

Notes
1. GPS used in recoding waypoints need to be -
   - Set to UTM coordinates, GDA94 Datum
   - Downloadable
2. Gradients are to be measured using a clinometer, and not estimated by eye. Always measure gradient as a percentage.
3. Feature includes: TTFs, built structures, turns, slowing points, steep sections, change in trail surface etc
4. Issue includes: erosion, drainage required/not working, safety issue, trail damage, TTF damage, signage

Classification	○	●	■	◆	◆◆
Number	1	2	3	4	5

Mountain Bike Trail Audit Template v1-0
Parks and Wildlife Service

APPENDIX 4F
TRAIL ADOPTION AGREEMENT

MOUNTAIN BIKE TRAIL
ADOPTION AGREEMENT

between the

Parks and Wildlife Service

[Name of Organisation]

[Date]

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

PARKS AND WILDLIFE SERVICE

[INSERT MTB GROUP LOGO HERE]

1. Introduction

This Mountain Bike Trail Adoption Agreement is a document to formalise a partnership between [name of organisation] and the Parks and Wildlife Service (within the Department of Biodiversity, Conservation and Attractions).

2. Name and Location of Adoption

NAME AND LOCATION OF ADOPTION	
Adoption Name	
Organisation Name	
District	
Volunteer Project No.	
Reserve Name(s	
Land Tenure(s)	

3. Term

TERM	
Start date	
Term	X years
Finish Date	

4. Contact Details

MOUNTAIN BIKE CLUB/GROUP		
Organisation		
Contact/s		
Position		
Phone	Mobile	Email

LAND MANAGER		
Parks and Wildlife District		
Contact/s		
Position		
Phone	Mobile	Email

Copies of the completed adoption are to be sent to:

- Parks and Wildlife Service Recreation and Trails Unit: recreationandtrails@dbca.wa.gov.au
- WAMBA: info@wamba.org.au
- WestCycle: info@westcycle.org.au

5. Adoption Objectives

- Define the roles and responsibilities of each party.
- Foster the highest levels of cooperation between [Parks and Wildlife District] and [Mountain Bike group] to ensure the sustainable management of [insert name] trail(s).
- Maintain and improve the [insert name] trail(s), to standards agreed and required by Parks and Wildlife and other relevant authorities, with regard to;
- Rider health and safety
- Environmental protection
- Promotion of the activity and user satisfaction
- Shared use (where applicable)
- Promote the partnership between [Parks and Wildlife District] and [Mountain Bike group].
- Promote an active lifestyle and an appreciation of the natural environment.
- Reduce the incidence of unsanctioned/unauthorised trail building.

[insert any extra objectives]

6. Communication & Reporting

[Parks and Wildlife District] will:

- Nominate a specific staff member to be the 'Adoption Liaison Officer' between Parks and Wildlife and the [mountain bike group].
- Ensure agreed maintenance works are approved and included in the local works schedule.
- Approve the group's maintenance plan or provide feedback within a reasonable timeframe.
- Establish and maintain two-way communications and ensure that the [mountain bike group] are advised of any changes that are likely to impact on the adoption activities.
- Provide maintenance standards, technical advice, guidance and inspection as may be required during the adoption.
- Promote the work of the [mountain bike group] in departmental publications, visitor information and interpretive materials, media press releases and through the department's website as appropriate.

[insert further agreed communication and reporting standards/conditions as required]

[Mountain bike group] will:

- Nominate a member to be the 'Adoption Liaison Officer' between [Parks and Wildlife District] and the [mountain bike group].
- Complete all necessary documentation and obtain approval from the [Parks and Wildlife District] 'Adoption Liaison Officer' prior to implementation of any works on Parks and Wildlife-managed lands.
- Provide the Parks and Wildlife 'Adoption Liaison Officer' with a maintenance plan for approval before the beginning of each maintenance season.
- Advise the Parks and Wildlife 'Adoption Liaison Officer' or their nominated representative 14 days in advance of any planned trail maintenance.
- Provide a report to Parks and Wildlife 'Adoption Liaison Officer' at the end of each period of works.
- Notify the Parks and Wildlife 'Adoption Liaison Officer' of any incidents or complaints received from general members of the public.
- Encourage safe and courteous public use; actively promote Leave No Trace minimal impact use of Parks and Wildlife-managed land.

6. Communication & Reporting (continued)

- Serve as ambassadors for the [mountain bike group] and encourage cooperation with all other recreation groups and users.
- Promote sustainable trail development and trail riding practises.

[insert further agreed communication and reporting standards/conditions as required]

Both parties will:

- Ensure all communication will be between the nominated 'Adoption Liaison Officers' provided in Section 4.
- Work together to develop an annual maintenance plan, seek funding and facilitate the works on [insert name] trail(s).
- Notify the other party should their 'Adoption Liaison Officer' be unavailable for more than two weeks, and provide the other party with interim contact details.
- Ensure the nominated representatives (Section 4) will meet at least four (4) times per year to plan and review agreed maintenance and improvement works.
- The dispute resolution: Any disputes that arise will be dealt with constructively and in the spirit of this Agreement. If the dispute cannot be resolved at a local level within 14 days then it shall be referred to the respective Chair/President of the [Mountain bike group] and the relevant Parks and Wildlife District Manager for resolution.
- In the unlikely event that a dispute cannot be resolved, then any of the affected parties may withdraw from the Adoption Agreement in writing.
- Review their Adoption agreement prior to its completion.

[insert further agreed communication and reporting structure as required]

7. Health and Safety

[Parks and Wildlife District] will:

- Complete a 'Community Involvement Program Project Notification' (DPaW206 form) for adoption/s and submit to the Community Involvement Unit (CIU) for processing.
- Provide a copy of the Parks and Wildlife code of conduct and relevant volunteer hours forms.
- Provide departmental volunteer orientation and safety induction to the [Mountain Bike Group] and its members that reflect the nature of the volunteer activities prior to any works commencing.
- Provide appropriate policy, guidelines, regulations and forms pertaining to volunteering on Parks and Wildlife-managed lands.
- Ensure that completed 'Volunteer Registration' forms (DPaW205 form) are submitted to CIU.
- Submit (as required) completed 'District Quarterly Volunteer Return' forms (Parks and Wildlife209) to CIU.

[insert any further Health and Safety standards/conditions]

[Mountain Bike Group] will:

7. Health and Safety (continued)

- Officially register participating [Mountain bike group] members as volunteers under the department's Community Involvement Program.
- Ensure all volunteers have read and adhere to the department's code of conduct.
- Ensure that completed 'Volunteer Registration' forms (DPaW205 form) are submitted to the 'Adoption Liaison Officer'.
- On a regular basis submit completed Parks and Wildlife 'District Quarterly Volunteer Return' forms (DPaW209 form) to the District.
- Carry out only agreed works as documented in accordance with the Adoption Agreement and associated plans.
- Immediately notify the relevant Parks and Wildlife districts 'Adoption Liaison Officer' or their nominated representative of any injuries, accidents or near misses that occur during any maintenance work.
- Abide by all safety inductions and directions as part of the adoption. Volunteer workers are covered by the Occupational Safety and Health Act 1984 and the Occupational Safety and Health Regulations 1996.
- Abide by any special conditions, terms, policies or regulations that have been set by the department for the adoption (e.g. Emergency closures, trail or area closures - dieback risk, fires, floods etc) and operational hazards (harvesting, prescribed burning etc).
- Encourage all volunteers to have formalised first aid training and carry a comprehensive first aid kit.
- Comply with the Western Australian Road Traffic (Vehicle Standards) Regulations 1977 with regard to all vehicles used on Parks and Wildlife managed land. All drivers will comply with relevant provisions of the Road Traffic Act 1974.

[insert any further Health and Safety standards/conditions]

8. General Conditions

[Parks and Wildlife District] will:

- Provide a list of approved maintenance works that the Mountain Bike group can undertake without approval.
- Provide maintenance standards
- Provide the department's Community Trail Sponsorship guidelines

[Mountain Bike Group] will:

- Not undertake any unapproved trail work.
- Not expect financial reimbursement for expenses occurred during track maintenance work.
- Not attempt to enforce any laws while on Parks and Wildlife-managed lands, unless duly authorised. However may report details on perceived incidents.
- Follow the department's event application process prior to holding or promoting any potential events.
- Follow the department's sponsorship guidelines and submit their prospectus for review prior to advertising for sponsors.

All parties will:

- Adhere to the Western Australian Mountain Bike Guidelines.

8. General Conditions (continued)

- Where appropriate jointly seek funding for project resources and training opportunities.
- Follow the agreed Parks and Wildlife Incident or Risk Management procedures.(Attachment X) (District to provide)
- Bear their own costs of administration and management of activities undertaken in support of the Adoption Agreement, but may identify and implement those projects that the parties have agreed to jointly fund.
- Agree that the adoptee will not have exclusive use of any land or facility and will not represent themselves as an agent of Parks and Wildlife or in any way purport to act on or behalf of the department.

Endorsement

This agreement is endorsed by the President of the [insert mountain bike group name] and the Parks and Wildlife [insert District] District Officer overseeing the adoption.

_____
[insert Organisation name]
President of the [MTB group]

_____
Date:

_____
[insert name]
[insert role], Parks and Wildlife [insert district]

_____
Date:

Trail Map

[insert name] Trail(s)

[insert map or trail/network]

Maintenance standards

All trail work must adhere to the WA Mountain Bike Management Guidelines specifications and dimensions.

Definitions:
Maintenance is work to repair existing trail surface, technical trail features (TTFs), and drainage to its original dimensions and specifications.

New work is work that modifies the trail surface or alignment, technical trail features or drainage features beyond the original dimensions and specifications.

APPROVED MAINTENANCE ACTIVITIES	*LAND MANAGER APPROVAL REQUIRED*
Clearing and/or repairing drains to original specification	New work (defined above)
Repairing TTFs to original specification	Any work that requires powered tools or machinery
Repairing trail surface to original specification	Trail head and orientation signage modifications and installation
Installing trail marker signage	
Updating notices within trail head sign	

Trail Maintenace Inspection schedule								
Maintenance	Frequency					Notes	Who?	
	Monthly	Quarterly	Annually	After Storm	Other		Trail Manager	Trail Operator
Infrastructure								
Car Park								
Road surface and drainage			✓			Is the road free from drainage problems e.g. pot holes?	✓	
Signage			✓			Is the signage in good condition?	✓	✓
General rubbish removal					**As required**	Is there litter in the area?	✓	✓
Toilet								
Is it in good working order		✓				Does the toilet require pumping? If applicable - does flush work?	✓	✓
Check paper supply	✓					Is paper supplied?	✓	✓
Inspect condition of structure		✓				Is the structure free from damage?	✓	✓
Trail head sign								
Inspect condition			✓			Is the structure sound? Is the sign in good condition?	✓	✓
Check notices/maps	✓					Are trail notices up to date? Is the map accurate?	✓	✓
Picnic tables/shelter								
Inspect condition			✓			Is the structure sound? Is oiling or painting required?	✓	
Roads (e.g. shuttle or connector roads)								
Road surface and drainage			✓	✓		Is the road free from drainage problems e.g. pot holes? Does the road require grading?	✓	
Other (list as appropriate)								
Trail								
Signage								
Inspect condition and location			✓			Are the signs in good condition? Are the markers approrpriate to the trail classification? Are the signs coherent at intersections?		✓
Tread								
Surface			✓			Are there signs of erosion? Is water pooling on the tread? Is there debris to remove? Is extra drainage required?		✓
Drainage								
Check condition of drains		✓		✓		Are drains full of leaf litter or silt? Are culverts clogged?		✓
Technical Trail Features								
Inspect condition		✓				Is the feature structurally stable? Is it maintained to original specifications? Have alternative lines been created?		✓
Fall zones		✓				Are fall zones clear of hazards e.g. sharp rocks or logs?		✓
Vegetation overgrown?								
Check sight lines			✓			Does vegetation need to be cleared from trail corridor to maintain sightlines?		✓
Check intersections			✓			Are intersections and signage visible?		✓
Check trail corridor and overhead			✓			Is the trail corridor clear of vegetation appropriate to its classification?		✓
Check signs		✓				Is signage visible?	✓	

TRAIL RISK AREA

DO NOT USE THIS TRAIL OR FEATURES as they are poorly constructed and pose significant risk of injury.

This trail and features have been built without Departmental approval.

This trail will be closed and rehabilitated.

For information regarding the reasons for the removal please contact the Department of Biodiversity, Conservation and Attractions.

District: _____

Officer: _____ Phone: _____

Department of Biodiversity, Conservation and Attractions

PARKS AND WILDLIFE SERVICE