Western Australian Hiking Trail Management Guidelines

Trails Development Series

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Biodiversity, Conservation and Attractions**

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

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The authors of the Western Australian (WA) Hiking Trail Management Guidelines acknowledge and value the heritage, culture and spiritual connection of Aboriginal people with the lands and waterways through which trails pass. We acknowledge Aboriginal people as the Traditional Custodians and pay our respects to Elders past, present and emerging.

Illustrations: Common Ground Trails and Magic Dirt Trailworx.

Cover image: Cape to Cape Explorer Tours, Leeuwin Naturaliste National Park. Photo: Tourism WA.

These guidelines draw extensively from:

DBCA and DLGSC, 2019. *Trails Development Series*, s.l.: State of Western Australia.

DBCA, DLGSC & Westcycle, 2019. *Western Australian Mountain Bike Management Guidelines*.

DLGSC, DBCA and Common Ground, June 2020. *WA Hiking Strategy, Bushwalking and trail running in Western Australia 2020-2030*.

International Mountain Bicycle Association (2001) *Building Better Trails: Designing, Constructing and Maintaining Outstanding Trails.*

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1. Introduction

Hiking continues to grow in popularity across Australia. It has minimal start-up costs for participants and caters for a range of abilities. Hiking includes a range of activities such as short-day walks, overnight bushwalks or trail running marathons.

The WA Hiking Strategy 2020-2030[1] identified the need to maximise participation outcomes, grow the visitor economy, facilitate sustainable trail development and maintenance and deliver effective governance and advocacy. Achieving this will ensure the delivery of high quality and consistent trail experiences across the State.

In 2019, the Trails Development Series[2] was published to provide best practice guidance on the Trail Development Process, community consultation, multi-criteria decision analysis, partnerships, funding, trail models and signage.

The series includes checklists and templates to assist with planning and evaluation of the various stages of trail projects.

A suite of activity specific trail guidelines for the range of trail related activities will complement the series.

In 2019, the Western Australian Mountain Bike Management Guidelines[3] was launched as the first set of activity-specific guidelines.

These WA Hiking Trail Management Guidelines should be read in conjunction with the Trails Development Series.

1 Department of Local Government, Sport and Cultural Industries (DLGSC), *WA Hiking Strategy 2020-2030*, 2020

2 Department of Biodiversity, Conservation and Attractions (DBCA) and the Department of Local Government, Sport and Cultural Industries (DLGSC), *Trails Development Series*, 2019

3 DBCA, DLGSC & WestCycle, *Western Australian Mountain Bike Management Guidelines*, 2019

Karijini National Park. Photo: Tourism WA.

1.1 Vision and objectives

Hiking trails across WA are sustainably designed and developed for the right users, in the right areas, for the right reasons.

High quality trails will enhance awareness and protection of cultural, natural and heritage values, underpinned by strong partnerships and community ownership.

The objectives are to:

- Provide an understanding of various styles of hiking and the differing user types and their needs.
- Support trail development using principles of sustainable planning, design and construction techniques.
- Provide a consistent approach to hiking trail classifications, development, maintenance and management across WA.
- Ensure consistent use of the Trail Development Process for all trails.

Margaret River Rail Trail. Photo: Tourism WA.

These guidelines will be of value to:

- Trail planners, designers, builders and maintenance teams.
- Land managers and landowners.
- Trail clubs, associations and 'friends of' groups.
- State trails and outdoor recreation bodies and organisations.
- Training providers for trail design, construction and maintenance.

They aim to ensure hiking trails are developed to meet the needs of users, manage degradation of natural and cultural values and meet high sustainability standards.

These guidelines provide general principles and advice. Every trail will be different and given the variety of situations and locations, each trail project needs to be considered on its own merits.

Trails in WA are located on various land tenures. Most trails however are on local government-managed land or Department of Biodiversity, Conservation and Attractions (DBCA) Parks and Wildlife Service-managed land.

Policies and information pertaining to lands managed by local governments and Parks and Wildlife Service are provided for general information.

1.2 How this fits in the Trail Development Process

These guidelines complement the Trails Development Series and provide direction on developing and managing sustainable hiking trails.

Table 1 shows how the principles and advice in these guidelines align with each stage of the Trail Development Process.

Table 1: Alignment with Trail Development Process

Stage	Key guidance provided in this document
1. Trail proposal	Understanding hiking, strategic and legislative considerations and stakeholders.
2. Framework	Agreement on trail significance, design objectives, management models, user types, required facilities and structures, walking trail classification, building standards and relevant stakeholders, partners and collaboration.
3. Site assessment	Principles on location of control points, facilities, trail alignment, understanding landforms, topography, habitats, soil types and landscape features, environmental and heritage values and protection.
4. Concept plan	Principles on trail design and alignment corridor, water management, structures, visitor communication, interpretation and signs.
5. Corridor evaluation	Confirm location of facilities and trail alignment using control points and design elements.
6. Detailed design	Principles on design and building methodology and standards, protection of natural features and restrictions, water management, disturbance footprint and structures.
7. Construction	Principles for developing construction techniques, standards and construction ready plans and specifications, trail sign plans and standards.
8. Management	Principles on governance, business models, trail management plans, events, design and building for sustainability.

2. Understanding hiking

The WA Hiking Strategy 2020-2030 defines bushwalking and trail running as hiking. The strategy supports the shared interests of all people exploring trails and landscapes on foot, including with mobility support.

This document will refer to bushwalking and trail running as hiking.

Bushwalkers and trail runners seek experiences in natural environments and access to diverse landscapes. Depending on personal abilities and type of experience sought, users require a range of trail classifications and have varying trail needs.

Motivators are as varied as individuals and linked to a person's stage of life, interests, needs and preferences. They may include connecting to nature, seeking a challenge and experience, escapism, health benefits, social engagement and being inspired by others.

Hiking trails are the primary infrastructure to providing these experiences.

Hiking = bushwalking + trail running

Bushwalking can include everything from short walks on well-formed tracks, social recreational nature walks, supported experiences and multi-day expeditions for the fit, experienced and skilled. The skills and experience of the user will determine the type of bushwalking trail sought.

Trail running is a type of running that takes place in bush settings. Trail running can be undertaken for recreation, health, fitness and competition. The activity requires concentration and attention and is growing in popularity in WA.

The Hike Collective, Perth Hills. Photo: Tourism Australia.

2.1 Hiking experiences

Short hikes are some of the most popular trails in parks located throughout the State and in parks close to Perth.

Most are short, linear trails which offer hikes at the easier end of the trail classification system, explained in Section 11, but not always.

These trails are often supported by facilities and are important local trails loved by residents and visitors alike.

Day hikes require more stamina, fitness and hiking skills. Walkers travel 15-20kms and trail runners 15-40kms per day. Existing day hikes are located throughout the State, close to the urban areas as well as in more remote places.

Long distance hikes attract visitors from all over the State, interstate and overseas. They are multi-day experiences that can also be walked or run in short sections.

Whilst they are often linear in WA, the large number of access points allows trail users to create their own itineraries.

Long distance trails pass through a variety of landscapes, rural and natural and connect to towns for services and support[4].

Bibbulmun Track, Peaceful Bay. Photo: Bron Anderson.

4 Department of Local Government, Sport and Cultural Industries (DLGSC), *WA Hiking Strategy 2020-2030*, 2020

The Hike Collective, Perth Hills. Photo: Tourism Australia.

2.2 Participation

National

In Australia, about 2.2 million or 10% of Australian adults (15+) participated in bushwalking in 2022-23[5]. Current data can be obtained from Sport Australia AusPlay data.

Although there is little published research on trail running participation, event data provides one indicator of its popularity. The International Trail Running Association (ITRA) has reported that the sport experienced significant growth since 2020 with an estimated 20 million trail runners worldwide and 12 per cent growth per annum since 2010.

ITRA states that there are nearly 10,000 trail running events around the globe. It reports that although trail runners are mostly men (77%), there has been a 45 per cent increase in the number of women competing since 2015. The average age is 40 years old and dropping, with 90 per cent aged 25 – 55 years[6].

There are approximately 300 trail running events hosted across Australia annually, with some events attracting up to 6,000 competitors[7].

State

For Western Australians, walking (recreational) and running are two of the top five physical activities undertaken in the State.

In 2022-23, it was estimated that about 211,000 Western Australians participated in bushwalking activities, representing a 41.6% increase in participation since 2021-22[8].

- Easy walks (Class 1 and 2) are used most frequently by Western Australian bushwalkers.
- More difficult trails (Class 3 and 4) are used several times a year.
- More women than men participate in bushwalking.
- Most bushwalkers are 25 –54 years old[9].

About 341,300 Western Australians participated in running or athletics in 2022[10].

A 2018 survey of West Australians found that there were equal numbers of men and women, and that 23 per cent of trail runners were aged 45 – 54[11].

In WA, more than 35 trail, off-road and adventure running events are held each year. Most of these events attract more than 400 participants[12].

5 Sports Australia, *AusPlay results*, 2023
6 International Trail Running Association, *Trail Running & ITRA Report,* 2021
7 *Trail running. The value of Australia's trail running event sector*. A short report collated by Tour de Trails, 2022
8 HikeWest, Hiking Participation: AusPlay results to June 2023
9 Sports Australia, 2022
10 Sports Australia, 2022
11 DLGSC and DBCA (2018) *Exploring WA's Bush on Foot* survey report
12 Tour de Trails, 2022

Bibbulmun Track. Photo: Chris Tate.

2.3 User types and tourism markets

Understanding user types and visitor markets enables a proactive approach to ensure the right trails are developed in the right area, for the right users.

Participation spectrum

The WA Hiking Strategy 2020-2030 outlines the participation spectrum in line with the More People More Active Outdoors Framework participation spectrum.

- **Outdoor Aware** – on-screen viewing, spending time in green spaces near home and outdoor play.
- **Outdoor Active** – participation in managed outdoor and adventure recreation and outdoor immersion.
- **Outdoor Adventure** – wilderness experiences and extreme adventure.

Tourism demand

Adventure tourism is a niche but growing sector of the tourism industry characterised by outdoor physical or leisure activities in nature that contain some element of perceived risk or may be outside of the participant's comfort zone.

Adventure tourism in Australia was valued at $22.4 million in 2021 and estimated to grow to $33.5 million by 2027. Soft adventure tourism (such as hiking) is the biggest contributor to the sector, accounting for two thirds of all adventure tourism[13].

Data on pre-COVID visitation to Western Australia reveals an interest in hiking amongst both domestic and international visitors. In 2019, 3.137 million visitors undertook a bushwalk while in Western Australia[14].

Some of the benefits associated with hiking tourism include:

- Dispersion of population.
- Visitors stay longer and spend more.
- Overcoming seasonality of destinations.

International hiking

Recent market research commissioned by Tourism Australia – The Future of Demand[15] – reveals that one third of international travellers are interested in hiking or walking experiences.

The United Kingdom is Western Australia's top international market for bushwalkers, averaging around 33,000 per year or 19 per cent of the state's international bushwalkers. This aligns with the UK being WA's top international market, partly driven by the Visiting Friends and Family segment.

Although smaller in total numbers, German visitors are most likely to go bushwalking during their trip, with more than half (54.3%) of all German visitors to WA participating in bushwalking[16].

The Future of Demand report reveals that just over ten per cent of international travellers are interested in trail running experiences. A niche experience, this interest is strongest amongst young travellers, particularly men in the market segments of Luxury travellers (15%), Long stay travellers (14%) and Working holiday makers (21%)[17]. Although a niche experience, trail running would therefore be reasonably lucrative and a good economic driver in terms of the visitor spend.

13 Allied Market Research, 2021
14 Concept 2 Strategy for Tourism WA, *South West Edge Trail Tourism Experience Opportunities*, November 2023
15 Tourism Australia, *The Future of Demand: Experience Fact Sheets*, November 2022
16 Concept 2 Strategy for Tourism WA, November 2023
17 Tourism Australia, November 2022

The Hike Collective on Yaberoo Budjara Heritage Trail. Photo: City of Wanneroo.

Domestic hiking

Nationally, Western Australia has the second highest percentage of domestic bushwalking visitors (14.4%), behind Tasmania (25.6%). The percentage of domestic visitors who bushwalk while on holiday is steadily increasing and represented 16.7 per cent of overnight visitors to WA in 2020. Australia's South West tourism region currently receives most of the state's domestic bushwalking visitors[18].

WA has the highest percentage of hiking day trippers in Australia (8.3%) and 10% of all Australian bushwalking day trips happen in WA[19].

WA hiking visitor markets

Market research undertaken in 2021[20] identified two distinct trail visitor markets. Destination Trail Users and Trails Users While On Holidays.

Destination Trail Users are experienced trail users who regularly travel with trails as a primary motivator.

They are outdoor enthusiasts who plan their trips to include the use of trails and have likely visited other Australian or international trail destinations. They seek high quality trails with good supporting infrastructure in scenic or natural locations[21].

They have moderately large market potential and are a primary intrastate, interstate and international market for WA's hiking trail offering. They comprise:

- **Active Lifestyle Hiker** represents the largest segment within the Destination Trail User market. Experiences targeted at this group have the potential to become destination drivers by encouraging interstate and international visitors to choose WA for their next hiking trip; and/or extend length of stay and spend of travellers who are already motivated to visit WA.
- **Luxury Walkers** (High Yielding Travellers) represent a small, high yield segment of the Destination Trail User market. Experiences targeted at this group play an important role in destination and brand awareness by elevating domestic and international awareness of iconic trails.
- **Independent Hikers** represent a small, low-yield segment of the Destination Trail User market.

Trail Users While On Holidays are typically less experienced and whose primary motivator for travel is not trails.

- **Holiday Walkers** are walkers who seek out accessible trails for use with family and friends. They enjoy outdoor activities on holiday for socialising, fun, to experience something new and to be immersed in nature.

18 Trail Futures, *Western Australian Trails Market Research*, report prepared for Tourism Western Australia, 2021

19 WA Trails Marketing Report – Appendix B, 2021

20 Trail Futures, *Western Australian Trails Market Research*, report prepared for Tourism Western Australia, 2021

21 Concept 2 Strategy for Tourism WA, November 2023

Beedelup National Park. Photo: Tourism WA.

Combined user types and market segments

Table 2 combines user descriptions developed through industry consultation using working groups, based on the People More Active Outdoors Framework participation spectrum, with Tourism WA hiking visitor segments.

Some assumptions have been made to align these user types with Tourism WA hiking visitor segments.

Table 2: Description of trail users and market segments

Type and market	Participation	Context	Trail class	Market size
Outdoor Aware **+** **Holiday Walkers**	Interested but not necessarily experienced in the outdoor environment, may be first time hikers. Low to moderate fitness level. Suits young families, mature travellers, persons travelling with disability or reduced mobility, visitors with minimal hiking experience, and residents wanting daily exercise, maybe with a dog. Seek out trails whilst on holidays as something to do in between other activities. Want experiences that are immersive, relaxing, discover new things, sociable, safe and accessible.	High quality short nature walks with facilities, easy to access, well maintained, clear trail, markers, signs, trail interpretation and safety information, parking and amenities. Coastal walks, urban trails in parks, heritage walks, short walks in nature-based and national parks and likely to start at or close to a major hub or visitor site. Low risk environment catering for self-guided hikes, with access to amenities and support if needed. Seeking interesting features, points of interest, attractions and improvement of outdoor skills.	Class 1 and 2 trails. This group seeks short to medium length, less than 10km, non-technical and not overly physically challenging.	Large. Primary intrastate market. Holiday walkers represent largest group who take a bushwalk in WA.
Outdoor Active **+** **Active Lifestyle Hikers**	Moderately experienced in outdoor activities, progressing towards outdoor adventure. Moderate or above fitness level. May undertake an overnight trail experience for a more challenging and remote experience as a guided, unguided or club experience. Seeking high quality trails with good infrastructure in scenic or natural locations. Visits and travel are planned to include hiking and hikers will have appropriate skills and equipment to participate.	More adventurous nature trails to suit ability, likely to be more experienced in bushwalking. Longer day walk in significant location such as a national park. Less facilities, however, will still need good pre-visit and trailhead information, adequate signs and wayfinding. Seeking interesting features, best views, attractions and a sense of challenge and solitude.	Class 3 and 4 trails. Happy to hike or walk up to 20km or 40kms for runners on a full day, or further on an overnight experience.	Large. Growing user type with more people keen for experiences. Primary market in Destination trail users. Potential to become destination drivers by encouraging interstate and international visitors.

Type and market	Participation	Context	Trail class	Market size
Outdoor Adventure **+** **Independent Hikers**	Advanced level of competency and self-sufficiency. Enjoy the logistics of planning for safety and self-sufficiency. More challenging trail experiences where increased risk and physical endurance is part of the attraction, including trail running. May participate in trail running type competitions or events. Adventurers who love being outdoors and consider it a very important part of their life.	Multi-day, difficult grading, long distances and highly technical terrain. Prefers remote locations and will to travel to a trail destination for an experience. May hike solo or with bushwalking groups or clubs. Seeking transformative experiences in nature.	Class 4 and 5 trails. Does not necessarily require facilities or wayfinding, has advanced navigation skills and is well equipped.	Small but influential. Small, low-yield segment of the Destination trail user market.
Luxury Walkers	Luxury walkers are seeking unique, exclusive, luxury experiences in areas of exceptional beauty. The exclusivity of the experience is a key motivator.	Average level of fitness and enjoy spending time in the natural environment. Quality of accommodation, food and beverages, and other services are critical when choosing a trail experience. Time spent on trails is 1-3 days, with a mix of half to full-day hikes. Other activities, including time for personal reflection/leisure, may be packaged into the trip. Preference is for trails that are not too strenuous so that walkers can socialise at the end of the day.		Small but High Yielding Travellers (HYT).

2.4 Data collection

Data collection is paramount for progressing experiences suited to the needs and demand of trail users.

To understand the demand for bushwalking and trail running, several data sources are available.

- National surveys of physical activity participation
  - Sport Australia AusPlay data with data visualisation by state, activity, demographics, age and health.
  - Stakeholders including HikeWest, Outdoors WA, DLGSC and DBCA can be consulted to ascertain recent participation reports and strategies.
- Tourism data including Tourism Research Australia's National Visitor Survey (NVS) and International Visitor Survey (IVS) which monitor visitors, nights and spend.

These surveys and reports form the basis of the factsheets published on Tourism WA's corporate website.

Up-to-date and detailed data for both residents and visitors can be obtained through:

- Fact sheets at a regional and local level at Destination insights - Tourism Western Australia that provide insights into an area's visitation breakdown such as intrastate/interstate and international breakdowns, visitor spend, number of nights and purpose of travel. This sort of information can be useful for trails stakeholders to understand their areas current visitation profile. They are updated yearly with significant latency.
- Information on visitor experience and expectations and Aboriginal tourism snapshots can be found at WA Aboriginal tourism snapshot - Tourism Western Australia.
- Insights into the Australian domestic market and Tourism WA's 11 key international markets at Market insights - Tourism Western Australia.
- Information on trail opportunities can be found at South West Edge Trail Tourism Experience Opportunities.

Trail design and management can be assisted by using data that has been gathered on the trail or through stakeholder engagement.

Data collection strategies include:

- Motion / trail counters.
- Physical counting.
- Satisfaction surveys (online or in person) – requires approval from Visitor and Social Research Unit if on DBCA managed trails.
- Scientific assessment of trail surface changes, including photographic monitoring.
- Event participation numbers and details.

Other sources of information may include:

- Department of Biodiversity Conservation and Attractions annual reports.
- Australian Bureau of Statistics.
- Google Trends provides anecdotal insight.
- Trails WA website and social media channels provide detailed information on trail users and demographic profiles of online users using web traffic analysis.
- Trail apps and websites such as Strava and Trailforks, which can provide heat maps of activity.
- Trail user log books or registers.
- Organisations and volunteers involved in trail management and maintenance.

3. Aboriginal collaboration

WA is rich with ancient trails traversing every type of landscape. Aboriginal communities and Traditional Owners across WA are responsible for these trails, as a means of connecting and caring for Country.

The Aboriginal Empowerment Strategy 2021-2029 (AES) seeks to contribute to better outcomes for Aboriginal people, built around genuine partnerships and engagement with Aboriginal stakeholders, strong accountability, and culturally responsive ways of working.

The WA Government Closing the Gap Implementation Plan (CTGIP) addresses the socioeconomic targets and priority reforms outlined in the National Agreement on Closing the Gap.

The AES and the CTGIP are complementary and mutually reinforcing, as they both seek to empower Aboriginal people to have greater control over their lives and futures, and to ensure that government policies and services are responsive, respectful and effective.

Joint management and cooperative management of the conservation estate in WA allows Aboriginal people to have an active role in the management of lands and waters to which they have a traditional connection.

Joint management arrangements are set to expand under the WA Government's Plan for Our Parks initiative and offer a significant opportunity to work alongside Aboriginal communities in land management and trail development.

Trail development can be a very positive activity, strengthen reconciliation and add enormous value to the experience of trail users. Trail projects also provide opportunities for Aboriginal people to access jobs and develop businesses.

Co-design with Aboriginal people through meaningful consultation, engagement and leadership strengthens partnerships and provides significant benefits to trail planning and the trail user experience.

Ngurrangga Tours, near Karratha. Photo: Tourism WA.

Heritage and approvals

Aboriginal heritage holds significant value to Aboriginal people for their social, spiritual, historical, scientific or aesthetic importance within Aboriginal traditions and provides an essential link for Aboriginal people to their past, present and future.

The *Aboriginal Heritage Act 1972* is the legislation that manages Aboriginal heritage in Western Australia. The laws require approval for activities that may impact or harm Aboriginal heritage.

The Aboriginal Heritage Act 1972 Guidelines provide practical guidance to assist landowners on the Act and in particular the requirement for a section 18 consent. More information is available at Aboriginal Heritage Approvals.

The *Conservation and Land Management Act 1984* (CALM Act) provides the legal framework for Traditional Owners to have a formal role in the management of Western Australia's conservation estate and recognises the intrinsic connection that Aboriginal people have with the land and sea.

Under the CALM Act, DBCA has a legislative responsibility to ensure that the management of all CALM Act lands and waters protects and conserves the value of the land to the culture and heritage of Aboriginal people, particularly from material adverse effect.

Joint and cooperative management partnerships

Management partnerships are in place across the State between Aboriginal people and the DBCA. Through the State Government's Plan for Our Parks initiative and other agreements, DBCA is working with Traditional Owners to create and jointly manage additions to the conservation estate.

Traditional Owners and DBCA make decisions and set goals together in formal joint management partnerships. DBCA staff and Aboriginal Rangers are responsible for day-to-day work in jointly managed parks.

Cooperative management arrangements are being set up to provide a voice for Noongar Traditional Owners in how CALM Act lands and waters are managed in the south-west of the State.

Working on Country

Country is the term often used by Aboriginal people to describe the lands, waterways and seas to which they are connected. The term contains complex ideas about law, place, custom, language, spiritual belief, cultural practice, material sustenance, family and identity.

These guidelines support the protection and celebration of Country, embodied in principles of working with nature, landscape, topography and vegetation as well as ensuring cultural and environmental values are protected by following the Trails Development Series.

Cultural protocols

There are many Aboriginal groups within Australia and each have a different way of living.

Different Aboriginal clan groups have different languages, customs and laws so what is relevant to one group may not be the same in another part of the State.

Aboriginal people have their own governance and decision-making processes. Aboriginal people are responsible for their own aspects of culture and do not speak for all Aboriginal business. Some Aboriginal community representatives can't decide immediately and need to return and discuss with their group.

Appropriate cultural protocols need to be recognised for relevant communities involved in trails projects. It may be advantageous for a trail project team to undertake cultural awareness training, which may be offered by the local community or someone recommended by them.

Community engagement

Building relationships and partnerships require continuous engagement and is most successful when consultation is positive, open and transparent.

Traditional Owners are the authority on Aboriginal cultural heritage. Engagement with Traditional Owners and Aboriginal communities needs to be front and centre when planning and designing trails.

Traditional Owners and local Aboriginal communities should be engaged early in the Trail Development Process. This enables them to be part of the decision-making process, ensuring appropriate planning and design solutions are chosen and mitigates impacts on Aboriginal cultural heritage.

Aboriginal design elements should be lead or co-lead by appropriate community members and must be approved by consulted Aboriginal Elders. If approval is not given, the knowledge should not be used in the project.

Indigenous knowledge protocols

Indigenous knowledge refers to the range of knowledge held and continually developed by Aboriginal people. It includes traditional cultural expressions, such as stories, dance and art as well as traditional knowledge relating to a range of areas such as science, ecology, agriculture and medicine.

Aboriginal people's knowledge of their cultural and spiritual values must be respected as being sensitive information that may be confidential and involve intellectual property rights.

Trail projects need to ensure that Indigenous knowledge that is gathered, stored and used is managed respectfully and appropriately.

Cultural recognition and respect

Trails provide an excellent way to value, celebrate and promote Aboriginal culture, languages, relationships to Country, knowledge and heritage.

Visitors to WA are eager to immerse themselves in Aboriginal cultural experience tied to the land and its people[22].

By involving Aboriginal people, their cultural knowledge and values can be acknowledged and incorporated into the design and interpretation of the trails. This can enhance the cultural identity and pride of Aboriginal people, as well as educate and raise awareness among non-Aboriginal visitors about the history and significance of the land.

Trail projects can incorporate Aboriginal culture, with permission, through visitor interpretation including signs, structures and displays at trailheads and along the trail at important cultural sites. Sites for immersive activities such as yarning spaces can also be incorporated as appropriate.

The aim of visitor interpretation is to enhance understanding and reveal a site's meaning and significance to Aboriginal people in ways which are respectful, memorable and engaging[23].

Aboriginal languages can be kept alive through using language names for places, plants, animals or other elements along trails.

The Bungle Bungle Range, Purnululu National Park. Photo: Tourism WA.

22 Tourism WA, *Jina: Western Australian Aboriginal Tourism Action Plan 2021-2025*

23 DBCA, *Corporate Guideline 45 – Protect and Conserve Aboriginal Cultural Heritage*, December 2023

Tourism

Jina: Western Australian Aboriginal Tourism Action Plan 2021-2025 incorporates recommendations relating to trails as a means of enriching the lives of Aboriginal people.

Aboriginal tourism services can be encouraged and supported in trail projects to create immersive and on-Country experiences. This gives Aboriginal people the opportunity to care for Country through tourism, while sharing the world's oldest living culture with visitors.

The Western Australian Indigenous Tourism Operators Council (WAITOC) is the peak representative body for Aboriginal tours and experiences in Western Australia, where authentic cultural experiences at a state, national and international level are promoted.

WAITOC's interactive digital map showcases more than 100 Aboriginal cultural experiences including ancient stories, art, festivals and a range of activities from bushwalks, foraging, fishing, 4WD adventure and camping through to stargazing with the world's oldest living culture.

DBCA's Culture in the Parks program encourages Aboriginal people and organisations who would like to conduct Aboriginal cultural events in WA's national parks and other conservation reserves to apply to become local tourism operators. Tourism opportunities may include bush tucker tasting, sharing language and stories, art and culture, boat tours and hiking tours, among others.

Information on visitor experience and expectations and Aboriginal tourism snapshots can be found at WA Aboriginal tourism snapshot - Tourism Western Australia.

Kurrah Mia, Denmark. Photo: Tourism Australia.

Employment and trail management

Involvement of Aboriginal people in trail planning, design, construction and on-going management ensures a continual and wholistic interaction between trail projects and the community.

Aboriginal people can benefit from the economic opportunities that arise, including direct employment in planning, design, construction, maintenance, guiding, hospitality and other services. There are also indirect benefits from increased income and spending in local communities. This can lead to the development of Aboriginal-owned and operated businesses and social enterprises that can provide culturally appropriate and sustainable services for trail users.

Aboriginal people being involved in trails can assist in their obligations to care for Country.

Identifying roles, responsibilities and opportunities for local Aboriginal communities occurs in the Trail Development Process.

4. Stakeholders

Like any other facility, a trail needs to be well-planned and may be subject to many approval requirements.

An appropriate consultative approach will ensure that those with an interest in a trail project receive information about the project and can provide input and feedback.

If appropriate consultation and approval processes are undertaken, projects are more likely to be successful, receive funding support and avoid lengthy delays.

The Trails Development Series provides guidance on consultation, collaboration and approvals when developing a trail.

Part B: A Guide to Community Consultation outlines various approaches to community consultation and where it fits within each stage of the Trail Development Process. The guide also provides lists of potential Government and community stakeholders.

Stakeholders specific to hiking trails are as listed below.

Department of Local Government, Sport and Cultural Industries

The Department of Local Government, Sport and Cultural Industries (DLGSC) purpose is to foster a cohesive, prosperous, vibrant and healthy Western Australian community. Its vision is that Western Australia is celebrated as the best place to live in Australia.

The DLGSC's strategic priorities of 'Prosperous industries and sectors', 'Healthy living' and 'Connected communities' are closely aligned to the intent of the WA Hiking Strategy which aims to enable access and encourage participation.

With active outdoor recreation a growing trend, DLGSC plays a significant role in trails. It coordinates the Trails Reference Group, convenes WA Trails Forums statewide, provides funding and is the lead agency responsible for the coordination and oversight of the WA Strategic Trails Blueprint 2022-2027. The Department works closely with other agencies and organisations to deliver community outcomes.

Cape to Cape Track. Photo: Tourism WA.

The DLGSC develops and implements government policy and initiatives in sport and recreation, while promoting participation and achievement to support a healthy lifestyle for all Western Australians through physical activity.

Department of Biodiversity, Conservation and Attractions

The DBCA's Parks and Wildlife Service promotes biodiversity and conservation to enrich people's lives through sustainable management of Western Australia's species, ecosystems, lands and the attractions in its care.

The Parks and Wildlife Service 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 Parks and Wildlife Service being the largest provider of outdoor recreation opportunities in WA. They also manage hiking trails in partnership with community groups.

Department of Planning, Lands and Heritage

The Department of Planning, Lands and Heritage (DPLH) are responsible for state level land use planning and management, and oversight of Aboriginal cultural heritage and built heritage matters. The department supports four ministers and administers a wide range of legislation.

The DPLH are responsible for the registration of protected Aboriginal cultural heritage sites and issuing approvals relating to possible impacts on these. They also are responsible for management of unallocated Crown land.

Department of Water and Environmental Regulation

The Department of Water and Environmental Regulation (DWER) supports Western Australia's community, economy and environment by managing and regulating the state's environment and water resources.

The DWER plays a key role in proposals for trail development within public drinking water source areas (PDWSA) and assessing native vegetation clearing applications as well as permitting trail impacts to bed and banks in Rights in Water and Irrigation areas.

Local government

Local governments provide a range of services to the local community such as infrastructure, public health, planning and recreation. They work with businesses, service providers, charities, police and other groups to determine and deliver local priorities.

Local government works largely within Federal and State legislation. Land vested in local government may be appropriate for trail development and many local governments in WA provide trail opportunities for their residents, community and visitors.

Private landowners

There are numerous examples worldwide where commercial trail experiences and facilities have been developed on private or leasehold property. As an example, El Questro in the Kimberley, offers both independent and guided hiking, horse and 4WD trail experiences together with a broad range of complementary activities, accommodation and dining, establishing this leasehold property as a visitor destination.

Trails WA

Trails WA is an independent for purpose organisation that exists to facilitate advocacy for and the marketing of a high-quality trails network across WA. Through the Trails WA website and array of social media channels, WA residents and visitors can find information about trails across the State. Trails WA acts as the central source of accurate and sanctioned trail related information, with the ability for trail managers, local governments and visitor centres to upload details on their well-managed trails to attract visitation. The organisation has developed a Trails WA accreditation program for Trail Towns with assessment criteria developed in partnership with DLGSC and DBCA's Parks and Wildlife Service. Additionally, Trails WA also formulates and promotes a list of Top Trails for the State and supports a Trail Friendly Business program for local business.

HikeWest

HikeWest is a not-for-profit association committed to encouraging the community to participate in safe and responsible bushwalking. HikeWest's mission is to encourage and support more people to pursue health and happiness by hiking in nature.

HikeWest is WA's key representative body for hiking. The organisation advocates in the interests of anyone who hikes or walks in nature in the state and actively works for the conservation and effective management of the natural environment that the hiking community enjoys. Most of WA's bushwalking clubs are members of HikeWest.

Talyuberup Walk Trail, Stirling Range National Park. Photo: Sarah Clay, First Hike Project.

Mighty Jarrah Trail Run, Dwellingup. Photo: Daniela Tommasi Photography.

Representative organisations, clubs and volunteers

Organisations and clubs across WA support hiking experiences as users, event coordinators, trail managers, trail planners, through promotions and advocacy, trail construction and maintenance.

The Bibbulmun Track Foundation and Friends of the Cape to Cape Track are prominent. These organisations and clubs are mostly volunteers, passionate and dedicated to sustainable, enjoyable and high-quality trail experiences. Many are experts in their preferred trail category, with a wealth of knowledge and experience about hiking, trail projects, management and maintenance. They are more than willing to provide support and advocacy.

Trails Reference Group (TRG)

The Trails Reference Group oversees the implementation of the WA Hiking Strategy 2020 – 2030 along with the WA Strategic Trails Blueprint 2022-2027. Membership includes representatives from State and local government agencies and community organisations.

Outdoors WA

Outdoors WA is the peak body for the outdoor sector in Western Australia, including recreation, education and adventure tourism. It exists to provide advocacy, leadership and support to the WA outdoor sector. Outdoors WA's vision is to see and support an empowered community actively engaged in the outdoors.

Members of Outdoors WA include outdoor education teachers, outdoor recreation leaders and adventure tourism operators as well as clubs, outdoor event organisers, retailers and professional associations.

Outdoors WA encourages the development of professional practice in Outdoor Education/ Recreation in WA, is in regular contact with the Department of Education and is part of the Outdoor Education Curriculum Advisory Group for the School Curriculum and Advisory Standards Authority.

Break the Boundary

Break the Boundary provide nature-based opportunities for people with disability to break their physical, mental and social boundaries to engage with the outdoors and the wider community.

Break the Boundary helps people connect with the outdoors and experience places thought to be inaccessible by people with disability. Break the Boundary specialises in Adaptive Mountain Biking and Adaptive Trail Hiking. A range of adaptive mountain bikes are available for people to trial and hire.

Adaptive Trail Hiking is accessible to people with trained adaptive hiking leaders using adaptive hiking equipment to get people off flat surfaces and out into the WA bush.

Tourism

Tourism WA's goal is to grow tourism by marketing WA as an incredible holiday and business events destination, attracting and promoting world-class sporting, cultural and arts events, and improving access, accommodation and tourism experiences.

Tourism Council WA is the peak body representing tourism businesses, industries and regions in WA. Tourism WA provide funding to TCWA to deliver several industry capacity-building programs.

WA Indigenous Tourism Operators Council is the peak representative for Aboriginal tours and experiences in Western Australia and promotes authentic cultural experiences at a state, national and international level.

WA is divided into five tourism regions, each with its own Regional Tourism Organisation (RTOs), which is the peak marketing and management body for that particular region. The RTOs are an important link into the local industry. They build strong relationships with local tourism organisations and local governments to achieve better tourism outcomes and make the most of marketing activities.

Local tourism bodies such as local government authorities, local tourism organisations and visitor centres help strengthen local tourism in the region and support local tourism businesses.

Cape Range National Park. Photo: Australia's Coral Coast.

Commercial operators

Hiking trails provide a range of commercial opportunities such as events, guided experiences, shuttle services, accommodation, food and beverage, training and lessons, education and community services for school groups, scouts, girl guides and disability support.

Linking with existing businesses and supporting the establishment of commercial ventures provides an opportunity for local communities to benefit from trail visitors while also providing additional reasons for visitors to travel for a trail experience.

Communities

Communities should be at the heart of trail development and management.

Trails can deliver flow-on business development opportunities from trail visitors, encourage local volunteers and advocates and provide trail experiences and health benefits for local communities.

Trails can be a supplier of local employment through trail construction and maintenance, which provide job opportunities for youth and others to remain in regional areas.

Community members will be invested for the long term if engaged throughout trail planning processes, resulting in a trail they own, have pride in, receive multiple benefits from and may volunteer to help maintain and manage.

Adjoining landowners

Neighbours and landowners that border or are close to trail developments are significant stakeholders that may be impacted by or benefit from trail developments.

5. Strategic and legislative context

State and local governments are responsible for the implementation of a wide range of laws and policy which impact new trail development and trail management. These laws and policy can have a significant influence on the location, construction, ownership and ongoing management of trails.

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

Table 3 outlines the range of State, regional and local strategies and plans.

The Trails Development Series includes processes for checking and reviewing legislation, policies, plans and strategies. Compliance with relevant legislation is an important part of developing the Trail Proposal (Stage 1) of the Trail Development Process to ensure the project is viable.

A well-researched trail proposal aligned to relevant policies, plans and strategies will be more likely to attract funding and wider support.

Table 3: Relevant strategies and plans

State	Regional	Local
• WA Strategic Trails Blueprint 2022-27 • State Government strategies and plans • Departmental policies and policy statements • State-wide trail strategies and plans • Trails Development Series • WA Hiking Trail Management Guidelines	• Regional development commission plans • Regional tourism organisation plans	• Local Government strategies and master plans • Land and water management and business plans • Club and group strategies and plans
WA Hiking Strategy	**Regional master planning**	**Detailed trail planning**

Bungle Bungles, Purnululu National Park. Photo: Tourism WA.

5.1 Strategies

Western Australian Strategic Trails Blueprint

The WA Strategic Trails Blueprint 2022 - 2027 is an overarching guide for consistent and coordinated planning, development and management of quality trails and trail experiences across WA. 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. Implementation of the Strategic Trails Blueprint is overseen by the Trails Reference Group.

WA Hiking Strategy 2020 – 2030

The WA Hiking Strategy 2020-2030 provides a strategic direction for hiking in WA. It identifies the potential social, cultural, economic, environmental, health and wellbeing outcomes for the State, and articulates a direction for realising these. It seeks to maximise the opportunity for all Western Australians and visitors to benefit from access to an appropriate range of hiking experiences and will guide the sustainable development of hiking activities and associated trails infrastructure.

Jina: WA Aboriginal Tourism Action Plan 2021 -2025

Tourism WA's Jina: Western Australian Aboriginal Tourism Action Plan 2021-2025 sets the direction for government and the tourism industry to deliver transformational change for Aboriginal Tourism through job creation, establishing new innovative cultural experiences and positioning Western Australia as an aspirational cultural holiday destination.

The plan incorporates actions that support Aboriginal employment and economic development through trails projects.

Mt Matilda Walk Trail, Shire of Wongan Ballidu.
Photo: Samantha Cornthwaite.

5.2 Legislation

Aboriginal Heritage Act 1972

The amended version of the *Aboriginal Heritage Act 1972* has been passed[24]. All landowners, be they freehold, leasehold, licensee, invitee or citizen, at large have one simple obligation: that is to not knowingly damage an Aboriginal cultural heritage site, which has been the law since 1972. Landowners can make applications for a section 18 consent and other approvals through ACHknowledge – a dedicated Aboriginal cultural heritage portal.

Conservation and Land Management Act 1984

The *Conservation and Land Management Act 1984* (CALM Act) makes "better provision for the use, protection and management of certain public lands and waters and the flora and fauna thereof, to establish the Conservation and Parks Commission, to confer functions relating to the conservation, protection and management of biodiversity and biodiversity components, and for incidental or connected purposes".

The CALM Act applies to State forest, timber reserves, national and conservation parks, nature reserves, marine parks, management areas and other lands defined in the Act.

Clearing of native vegetation

Under the *Environmental Protection Act 1986* (EP Act) the clearing of native vegetation is an offence, unless done under a clearing permit, or done after a person has received notice under section 51DA(5) of the EP Act that a clearing permit is not required, or the clearing is for an exempt purpose.

Where clearing is proposed in a clearing control catchment, as defined under the *Country Areas Water Supply (CAWS) Act 1947*, a CAWS Act Licence to Clear may also be required.

Rights in Water and Irrigation Act

The *Rights in Water and Irrigation Act 1914* provides for the protection of water resources.

A permit may be required for an activity that has the potential to damage, obstruct or interfere with water flow or the beds and banks of a watercourse or wetland, such as installing a crossing, culvert or viewing platform. A flowchart has been developed to enable a self-assessment of whether a permit may be required, see Do I need a permit?

A water licence may be required to take surface water or groundwater for construction of trails or facilities, see Do I need a water licence or permit?

Public drinking water source area legislation

The Department of Water and Environmental Regulation legally defines public drinking water source areas to protect water quality and public health. Public drinking water source areas are constituted under the *Country Areas Water Supply Act 1947* and *Metropolitan Water Supply, Sewerage, and Drainage Act 1909* and by-laws apply in these areas. The *Water Services Act 2012* and its regulations also applies to protecting water service works and water quality within public drinking water source areas.

Road Traffic Act

According to the *Road Traffic Act 1974* and the Road Traffic Code 2000 pedestrians, including trail runners and walkers, are NOT permitted to travel on carriageways where footpaths or nature strips are available. Where carriageways cannot be avoided, pedestrians must walk single file and on the side of the carriageway used by vehicles travelling in the opposite direction, keeping as far to the right side as possible.

24 Accessed from https://www.wa.gov.au/organisation/department-of-planning-lands-and-heritage/aboriginal-heritage-laws

Other legislation

Other legislation and requirements needing consideration includes:

- *Biodiversity Conservation Act 2016*
- *Environmental Protection Act 1986*
- *Environmental Protection and Biodiversity Conservation Act 1999 (Federal*).
- International agreements and treaties e.g. EPBC Act, Ramsar wetlands, World Heritage and National Heritage
- *Disability Discrimination Act 1992*
- *Occupier's Liability Act of 1985*
- *Civil Liabilities Act 2002*
- Health (Treatment of Sewage and Disposal of Effluent and Liquid Waste) Regulations 1974.

Mt Cooke, Bibbulmun Track. Photo: Chris Tate.

5.3 Policies and guidelines

Local government

Depending on land tenure, local governments may have their own policies and regulations to be adhered to when planning trails.

The WA Local Government Directory provides a complete listing of all of WA's local government authorities.

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

Policy Statement 18 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.

Corporate Guidelines 32 provides guidance to the department in the provision of world-class recreation and tourism opportunities, services and facilities for visitors to the lands and waters managed by the department.

DBCA's 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 in a manner that does not render the environment sterile or unnecessarily diminish visitor use and enjoyment.

Aboriginal Heritage Act 1972 Guidelines

The Aboriginal Heritage Act 1972 Guidelines provide practical guidance to assist landowners on the Act and in particular the requirement for a section 18 consent.

The purpose of these guidelines is to assist landowners to determine whether a consent from the Minister for Aboriginal Affairs is required to undertake a proposed land use that may impact Aboriginal heritage and avoid committing an offence under the *Aboriginal Heritage Act 1972*.

State Planning Policy 2.0 Environment and natural resources policy

The Department of Planning, Lands and Heritage (DPLH) State Planning Policy 2.0 - Environment and natural resources policy defines the principles and considerations that represent good and responsible planning in terms of environment and natural resource issues within the framework of the State Planning Strategy.

Public drinking water source area policy (PDWSA)

The Department of Water and Environmental Regulation (DWER) Strategic policy - Protecting public drinking water source areas in WA, provides for the continued implementation of WA's existing integrated land use planning and PDWSA protection program.

DWER's Policy: Land use compatibility in public drinking water source areas maximises the protection of water quality and public health, by having a presumption against intensifying land uses. This policy is implemented through Water quality protection note (WQPN) 25: Land use compatibility tables for public drinking water source areas.

DWER Operational Policy 13: Recreation within public drinking water source areas on crown land aims to protect drinking water quality and public health by managing recreation in PDWSAs on crown land.

For the process of assessing events or facilities within public drinking water source areas on Crown Land, see Operational Policy 13, Table 4 and Figures 1 and 2, and Water Quality information sheet 34 application form, Recreation proposals within public drinking water source areas on crown land. This process can take up to two months from the submission of all required information.

The Public drinking water source areas (PDWSA) online mapping tool, is publicly available and provides the location of public drinking water source areas and protection zones.

PlanWA is a public mapping tool that provides access to planning, schemes, land and heritage data across Western Australia.

Castle Rock Walk Trail, Porongurup National Park. Photo: DBCA.

5.4 Tenure compatibility (Parks and Wildlife-managed land)

The following section provides guidance on potential suitability of various tenures for different types of hiking trails on Parks and Wildlife-managed land.

National parks

National parks are areas of national significance for scenic, cultural, biological and recreational value 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 and are managed to conserve the same elements as national parks, but they have regional or local, rather than national significance.

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 species of plants or animals. They are managed to maintain and restore the natural environment and to protect, care for and promote the study and appreciation of Indigenous flora and fauna. Recreation that has minimal impact on the conservation values of the reserve may be considered.

State forest and 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 forests 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 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, craft wood 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

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, for example 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 can be vested in or held in the name of the DBCA. These lands are held for specific operational purposes (e.g., departmental office sites) or pending conversion into a conservation reserve.

Unallocated Crown land and unmanaged reserves

Nearly 40 per cent of WA is unallocated Crown land (UCL) or unmanaged reserves, administered by the DPLH.

A memorandum of understanding between Parks and Wildlife and DPLH relates to such lands outside town sites and the Perth Metropolitan region, where Parks and Wildlife is responsible for fire management preparedness and control of weeds and pest animals. DPLH are responsible for all other management issues, including recreation.

The coordination and control of bushfires on these lands, however, remains the responsibility of the Department of Fire and Emergency Services and local government authorities.

Swarbrick Art Loop, Mt Frankland National Park. Photo: Michael Hemmings.

6. Developing sustainable trails

Western Australia is experiencing an unprecedented investment in new trails due to rising demand.

A high standard of trail development is important to ensure trails meet best practice sustainability principles.

This section outlines principles for sustainable trail development, the significance hierarchy, trail models and systems, visitor communications, user safety, accessibility and protecting environmental values.

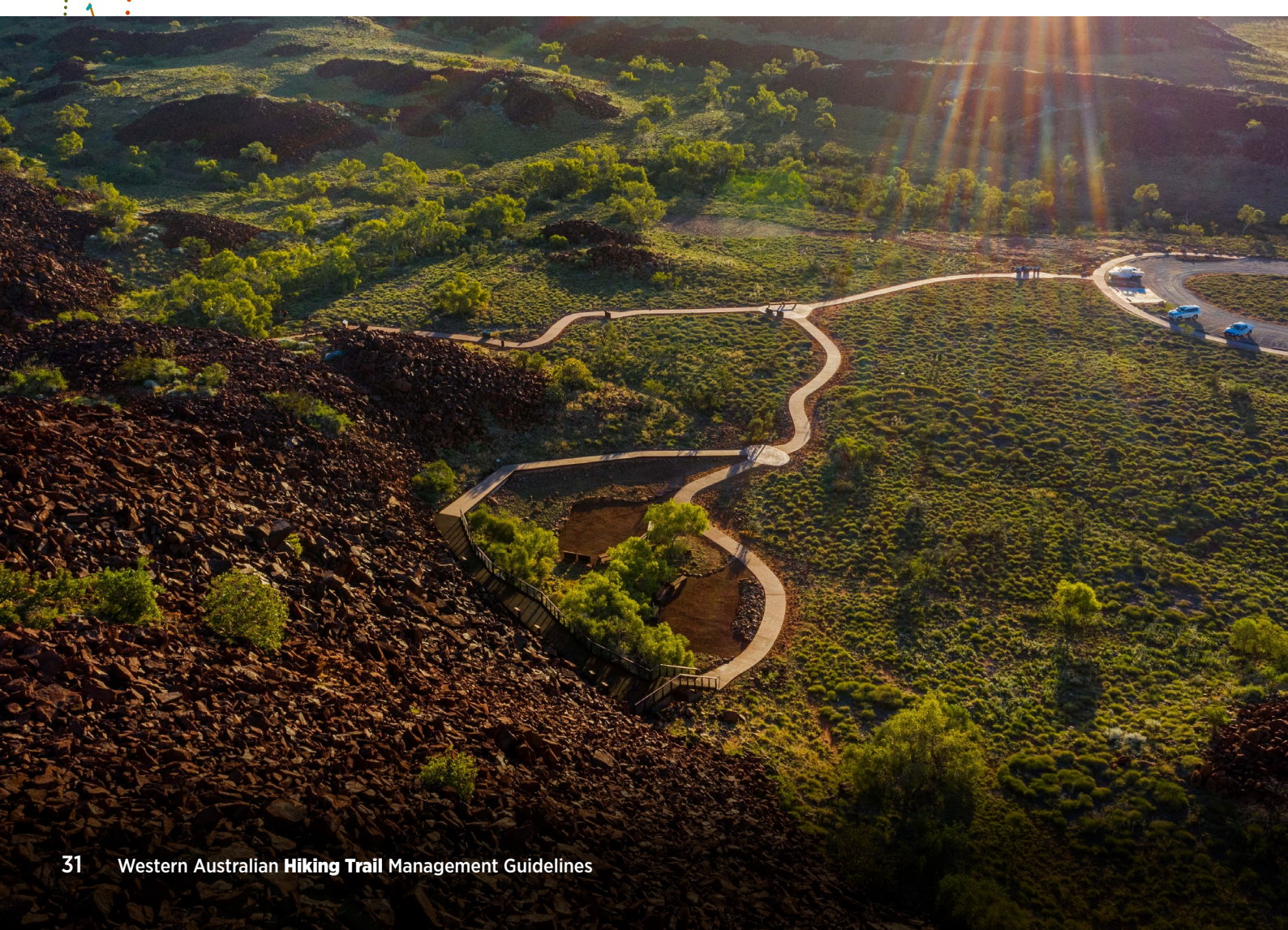
Developing trails using the Trails Development Series will ensure they are a sustainable asset, rather than a liability.

This section applies to all stages of the Trail Development Process, from Trail Proposal (Stage 1) to Management (Stage 8).

Appendix A lists Australian standards, other standards and supporting guidelines that will assist in trail projects.

> Sustainable trails means developing the right trails, in the right places, the right way and for the right reasons.

Ngajarli Rock Art Boardwalk, Murujuga National Park. Photo: Fuzz Digital.



Cape to Cape Track. Photo: Tourism WA and Walk Into Luxury.

6.1 Sustainability

Sustainable trails provide a high-quality experience for the intended user and develop genuine Aboriginal relationships. They respect the community and environment, are designed for longevity and have a good governance and resourceful business model.

The principles in Table 4 have been developed to guide the development of sustainable trails.

In addition, using the Trails Development Series will ensure that trails are developed and maintained in a consistent and standardised process.

Table 4: Sustainability principles

High quality experience	High quality experiences designed for the target market, considering those who deliver tourism experiences, supported by marketing, promotion and experience development.
Genuine Aboriginal relationships	Genuine partnerships and engagement with Traditional Owners and Aboriginal communities for better outcomes, in culturally responsive ways of working.
Respects community	Positive contribution to communities with appropriate stakeholder and community engagement and partnerships, respecting cultural heritage.
Plan, design and built for longevity	Consistent and effective trail planning, design and construction for longevity, minimal maintenance, fire resilience and ease of management, complying with standards and trails classification system.
Respects environment	Appropriate to the landscape, respecting sense of place, natural and cultural values and reducing impacts on ecosystems, habitat and wildlife.
Good governance	Governance and accountability are clear and simple to initiate and administer over the longer term.
Resourceful business model	A business model that provides ongoing resources including people, equipment and infrastructure to manage the trail, inclusive of user and community groups with the benefits visible to the community.

6.2 Significance

It is essential to establish the scope of new trails to ensure they are in the right locations and of the appropriate type, size, scale and extent. The significance of the trail guides decision-making and processes to ensure the trail proposal is a success.

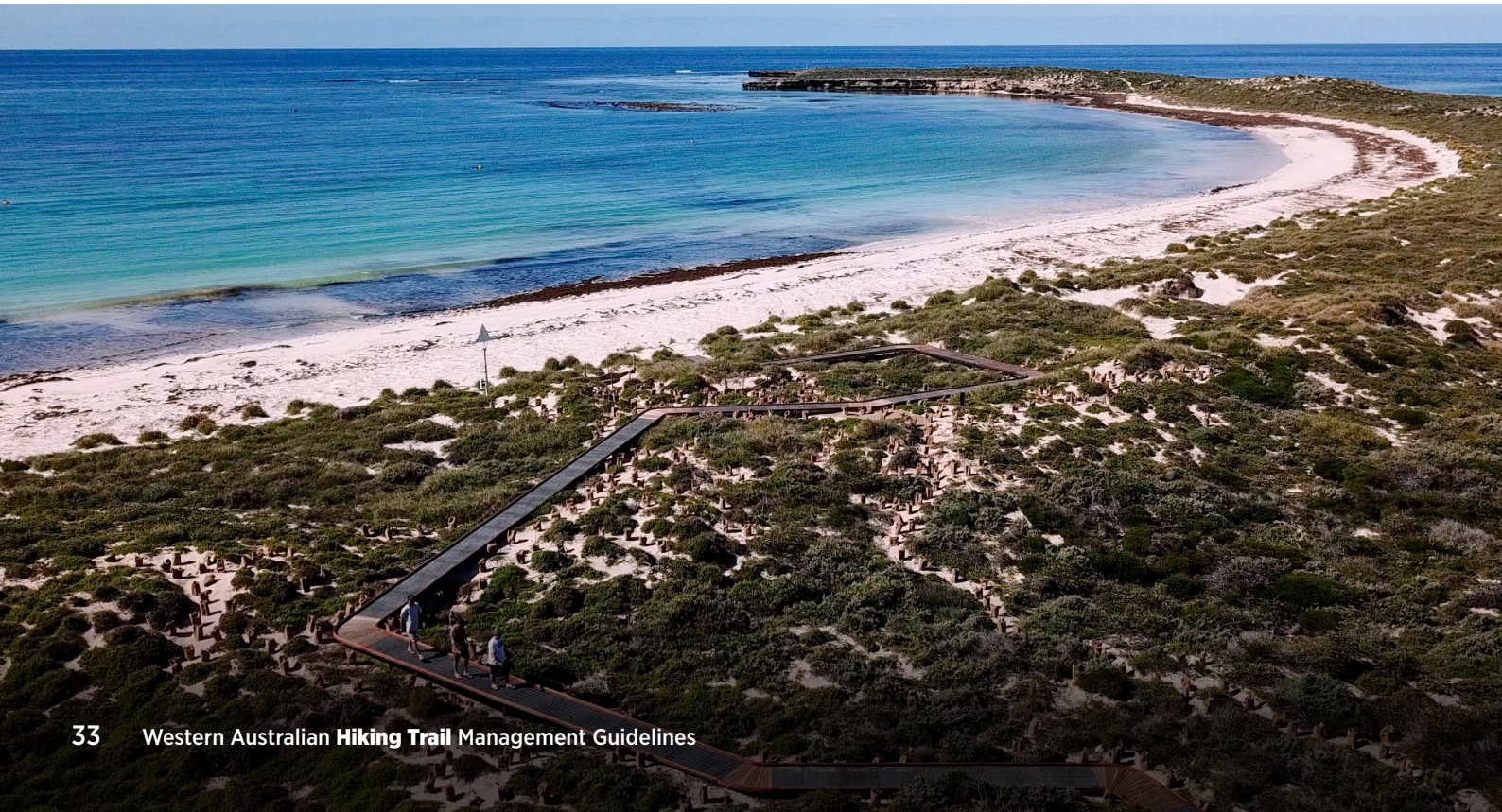
An appropriate level of significance for new trail developments needs to be established in the Trail Proposal (Stage 1) and Framework (Stage 2) of the Trail Development Process.

Tourism WA have developed criteria to assist with identifying the suitability of individual trails for international marketing.

Hiking trails and trail networks are classified into the following significance categories.

State or iconic trails	Regional trails	Local trails
An extended trail or network that is of sufficient quality and with appropriate facilities, products and services to be recognised beyond the State and to attract visitors to Western Australia, such as Bibbulmun Track or the Cape to Cape Track. Iconic trails and networks have the highest marketability, offering and experiences that can align with WA brand positioning. Iconic trails are consistent with Tourism WA's marketing remit to attract interstate and international visitors to the State.	A major trail or trail network that services a population centre or large regional community, with facilities and services of a standard and appeal that could attract visitors from outside the region, such as walk trails in Lesueur National Park, including the Yonga Trail. Regional trails keep visitors in the region longer and align with the focus for regional tourism organisations.	A trail that services the local community and provides facilities suited to local use. Some local trails have potential for development to regional status, such as Lesmurdie Falls Walk Trail. Local trails are more likely to be the focus of local tourism organisation and visitor centres and are not a focus for Tourism WA marketing.

Houtman Abrolhos Islands National Park. Photo: DBCA.



6.3 Trail models

A trail model defines how a trail project can be developed and applied to a population centre or an individual site.

Trail models heavily influence all parts of the Trail Development Process and is determined in Trail Proposal (Stage 1) and Framework (Stage 2).

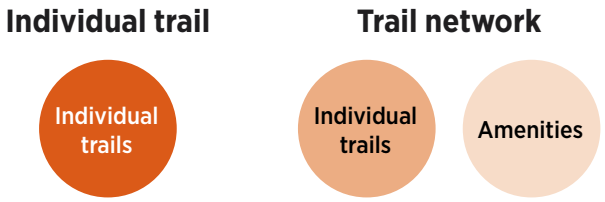
The following describes the models in Western Australia[25].

Trail Town – A population centre which has been assessed and accredited as a destination, offering high-quality trails encouraging extended stays, trail user related services, facilities, trail related businesses, trail branding and signage.

Trail Centre – A managed multiple trail facility with dedicated visitor services, supported by high quality trails, encouraging single day visits, trail user related services and trail branding and signage. A Trail Centre can stand alone in an individual location but may be positioned within a 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 or Trail Centre.

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.



25 Department of Local Government, Sport and Cultural Industries, *WA Strategic Trails Blueprint 2022 -2027*

Trails WA programs

The Trails WA Trail Town Accreditation Program is a tailored, best practice accreditation system designed to help regions and towns build their capacity as a trails destination.

The program has been developed in partnership with DLGSC and DBCA's Parks and Wildlife Service.

The accreditation process includes an application process where critical success factors will be assessed. The accreditation process is a consultative one that requires several in-depth assessments and reviews.

The **Top Trails project** identifies the best trails across the State and promotes them cooperatively to help increase visitation rates to various regions within Western Australia.

Short-listed trails go through an in-depth assessment process to ensure they are suitable, of high quality and provide a memorable or unique experience to the trail user.

Nominated trails are assessed against criteria including appropriate signage, interpretative material and information if appropriate, management and maintenance plans, community support and a promotional brochure.

Trails WA also administer a Trail Friendly Business accreditation program to make businesses that offer trail-specific products and services easily identifiable. The program is designed to direct trail users to businesses that offer a warm welcome, provide local information and allow them to restock, refresh and re-energise.

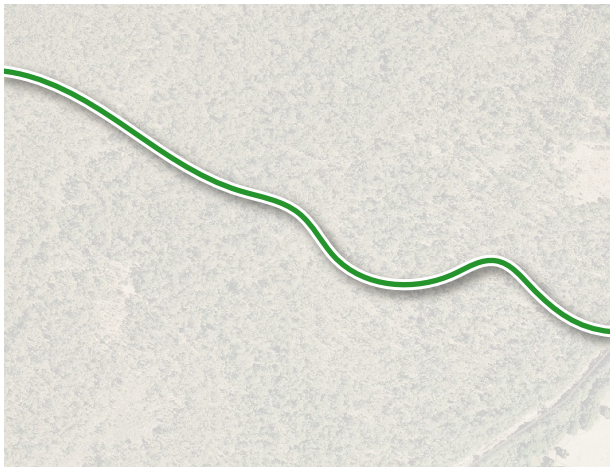
See TrailsWA.com.au for more information.

Walker Friendly Business Program

The Walker Friendly Business Program on the Bibbulmun Track connects walkers with businesses along the Track which provide facilities for walkers to make their stay enjoyable and aid them on their journey.

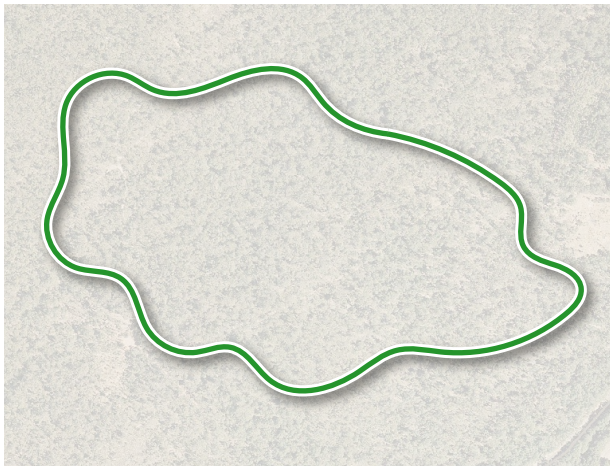
6.4 Trail systems

The trail system is dependent on the location's characteristics, user type and profile and intended user experience. The trail system 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. The system is determined in the Framework (Stage 2) and refined in the Concept plan (Stage 4) of the Trail Development Process.



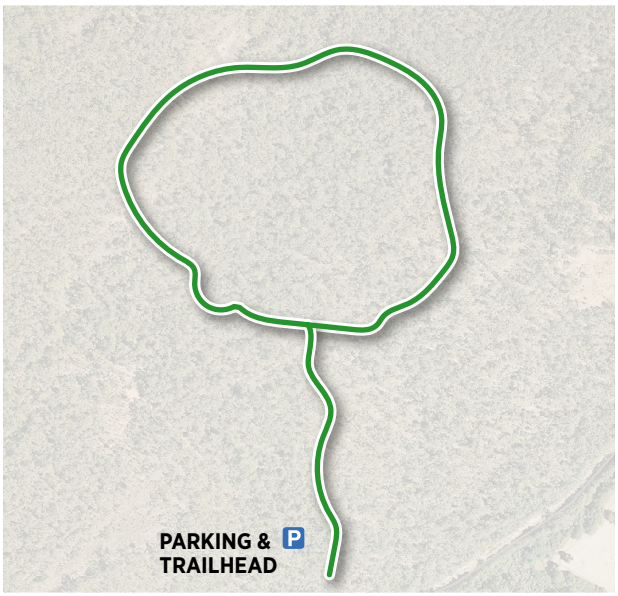
Linear trails

Linear trails are point to point alignments starting and finishing in different places or an out-and-back experience, maybe trailheads at both ends. They can be used to link destinations, points of interest or other trails and may be suited to lift or shuttle services. Long-distance trails like the Bibbulmun Track provide an uninterrupted trail experience over a significant distance.



Loop Trails

Trails that start and finish in the same place with a single trailhead are the preferred system for most users. They allow one-way use which avoids retracing the same route. As the trail brings the user back to the trailhead, they are less likely to get lost. Loop trails are also an efficient design that may allow for longer trail lengths within the available space.



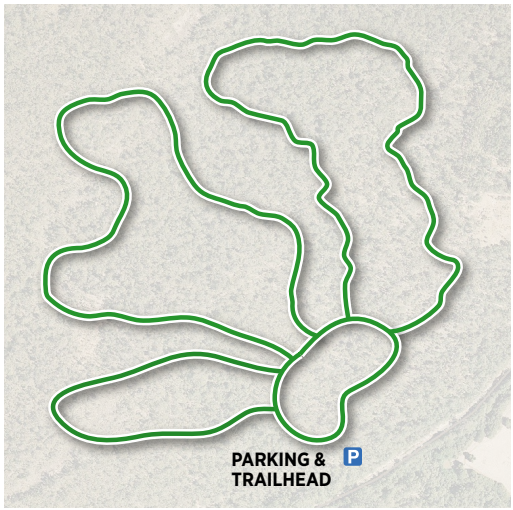
Lollipop

Lollipop trails start with a linear section that connects to a loop, particularly suited to hiking trails and trails designed for users to explore positive attributes and key features of a location. A lollipop trail can be stand alone or a part of a trail network.

Networks

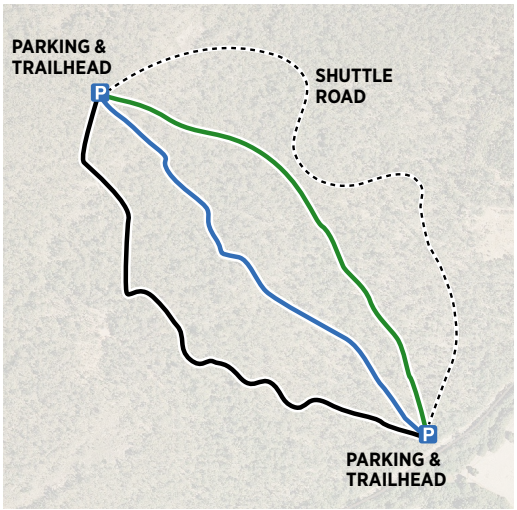
Networks make the optimal use of available space by linking several trails together from a trailhead, combining trail styles, difficulty levels and designs.

It's best to limit trail systems to one central trailhead wherever possible, although larger networks may need more than one trailhead. Trail systems may use a core trail which could lead from the trailhead and provide access to the rest of the system. As the core trail is the most used, it should accommodate a variety of trail users.



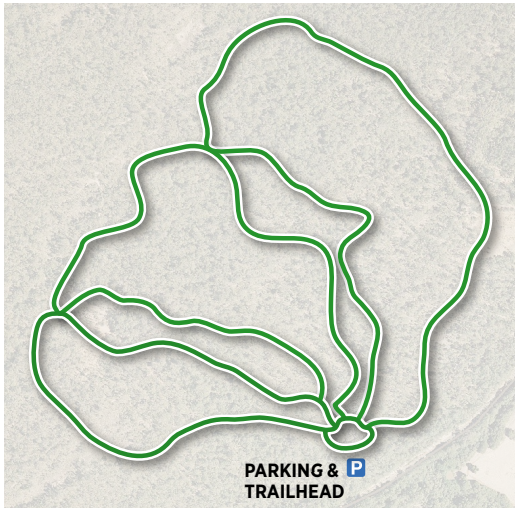
Cloverleaf

Cloverleaf designs are a series of loop trails that radiate from a central trailhead and core trail. Cloverleaf designs can cater for a range of abilities and user types.



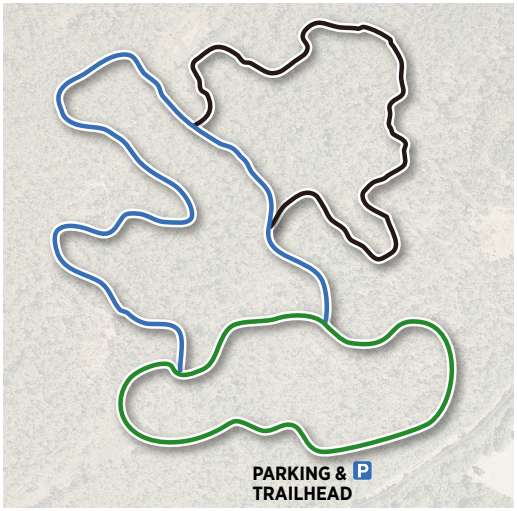
Trail Finger

Trail fingers fan out from the core trail or trailhead giving users a choice of options. Trails can be loops or linear. Trail finger design lends itself to uplift facilities such as a lift or shuttle road which is popular on mountain bike trails.



Linked Loop

Like the cloverleaf design with added linkages between trails to enable trail users to try a different trail without having to return to the trailhead and meaning the trails can be used in many combinations. Linked loop systems can cater for a range of abilities and user experiences.



Stacked Loop

Stacked loops can provide different length experiences. They may become more technically challenging as the distance from the trailhead increases. Stacked loops can also cater for seasonal experiences where certain sections may be closed, such as for flooding or conservation management.

Direction of travel

Single direction of travel on a trail can reduce potential collisions and the perception of overcrowding, however it may limit the user experience.

Dual direction essentially doubles the length of the trail as it provides a different return experience. It can result in trail conflict with users travelling both directions.

For either single or dual direction, it is important the direction is clearly communicated and appropriate safety measures are put in place.

Trail classification

Walking trail classification systems are used throughout Australia and in other countries to categorise trails in a systematic way. They provide standardised, concise information regarding the difficulty and attributes of trails so that users can make informed decisions about whether a trail is suitable for them.

Trail classifications also provide a framework for trail managers to design and maintain trails to suit the desired trail experience and user group.

The Australian Standard *AS 2156.1, Walking Tracks – Part 1: Classification and Signage, 2001* is the 'foundation' that provides land managers with guidance for walking trail classification and signage.

DBCA's Parks and Wildlife Service has adopted a trail classification system that is generally consistent with AS2156.1 and can be used throughout WA. Read Section 11 Walking Trail Classification System for more information.

Shared use

Shared use of trails is a way to encourage greater use by a wider section of the population. It can establish respect and mutually beneficial partnerships between user groups.

Rail trails are a good example of shared trails and the Rail Trails Australia website provides information on rail trails across Australia including WA.

Single use may be more appropriate on trails where a single trail activity is the intent, or where other users impact the intended trail experience.

User conflict on shared trails can occur if they are not well planned and the user groups are not well understood. A combination of good design, signs and codes of conduct will assist in minimising user conflict. Appropriate trail widths, sightlines, separation of paths, trail flow, passing opportunities and safe intersections will also contribute to a more harmonious experience.

Possible conflicts and risks between different users should be identified and addressed in planning and design of trails.

Single or shared use messaging must be clearly communicated at all access points through trail signs, maps and other media.

Leeuwin Naturaliste National Park. Photo: Rapid Ascent.

6.5 Visitor communication

Visitor communication covers pre and post visit information, interpretation, wayfinding and safety messages. This is a very important part of trail planning and management and requires expert advice.

Communicating information about a trail may include on-site signs and displays, publications, digital media including mobile apps, websites and guided activities.

All trails have stories that can be shared and enjoyed by trail users. Interpretation is the process of enriching people's experience of a place by engaging through values-based storytelling.

Wayfinding

Wayfinding is the process of ensuring trail users find and stay on the trail and return safely.

Appropriate safety advice is essential and should consider the risks and requirements of the trail, along with any necessary planning and preparation so that trail users have a safe and enjoyable experience.

Relationship to trail classes

The trail experience and trail classification will help determine the level of communication for key information, messages, safety advice, choice of media and type and number of signs. Class 1 to 3 trails may have more on-site information to communicate and interpret the trail features, whereas Class 4 to 6 may rely more heavily on pre-visit and post-visit information. Read more on Walking Trail Classifications in Section 11.

Systems and standards

The design and style of visitor communication can be a key component when branding, promoting and marketing a trail project. Consistent logos, colours, images and stories are strong elements that can create a better experience and more successful trail. Consistency in materials, structures and visual elements including vocabulary and symbols can be achieved using established systems, templates and standards. This approach helps to elevate the trail experience and make communication clearer.

Cultural information

Working with Aboriginal people to protect and interpret cultural values and stories will greatly enhance a trail project. It will also help build relationships and work towards supporting Aboriginal people's aspirations for better health, employment and wellbeing outcomes.

Where possible and appropriate, traditional Aboriginal language names for places and interpretive elements are to be included. Read more in Section 3 Aboriginal collaboration.

Methods and media

Given the uptake in technology by trail users and increasing coverage of mobile phone networks, providing information about trails using apps, QR codes, augmented reality, GPS triggering and digital downloads may be appropriate. These can be available to assist with pre-visit information and on-site information.

Communication and sign planning

The Trails Development Series provides information about trail signage, developing a sign plan, trailhead signs and trail marking. Read Section 8.2 Trailheads and 8.3 Signs for more information.

Sign planning involves site assessment, consultation and inventory of existing signs. A sign plan can then be developed that recommends what signs are needed and where they are located. Budget and ordering can be developed from the sign plan.

Translation to other languages

It may be appropriate, depending on the user group and target market, to provide visitor communications, and especially safety messages, in other languages.

The 2021 Census shows that 249 languages and dialects are spoken in WA and almost 19% Western Australians speak a language other than English (LOTE) at home including Aboriginal and sign languages. Of the language other than English speakers, 12.1% reported as having low English proficiency[26].

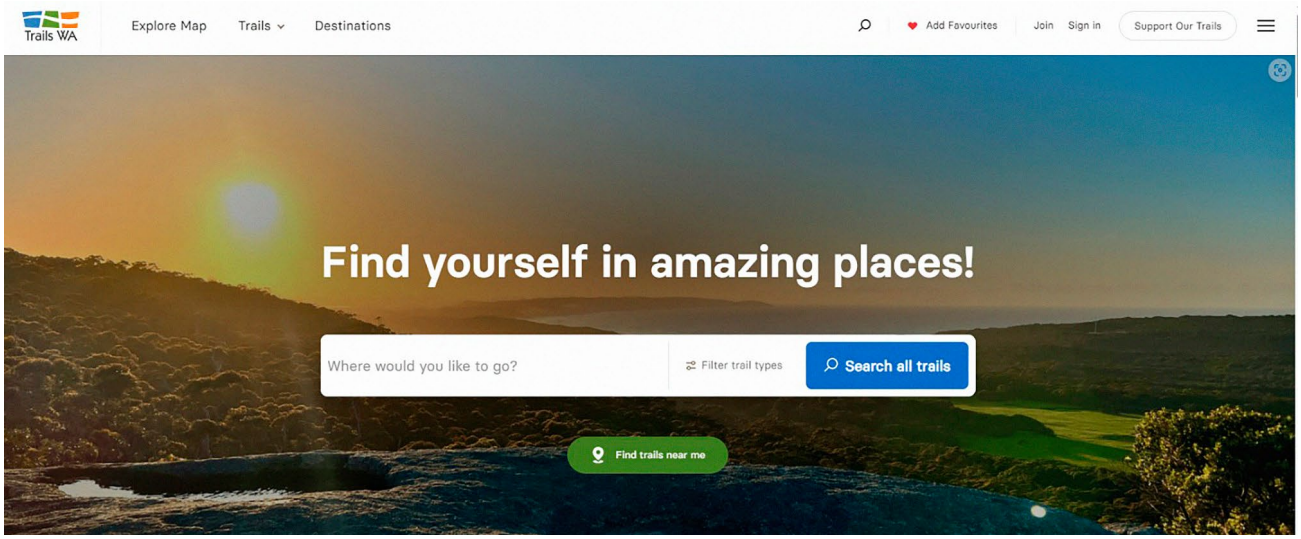
This does not mean multiple languages are needed on signs and interpretative displays on site.

However, if there are opportunities to provide translations, these can be considered through relevant platforms, such as a QR code that leads people to translated material.

Additional attention in pre-visit information, wayfinding and safety messages may be needed to ensure communications capture all visitors.

The Office of Multicultural Interests (OMI) can be contacted for more information on appropriate languages and communication strategies.

Trails WA website



The Trails WA website is the primary source of sanctioned trail information across the State. Trails WA invites local governments, shires, and trail-related organisations to become Trail Managers, giving them the ability to upload trails onto the website and further attract visitors to their regions.

As a central source for all WA trails, the website can be used as an exceptionally useful tool for the industry and trail planners to identify the range and types of trail experiences that exist across the State. Gaps and opportunities for new trails can be observed and where trail experiences may need to be enhanced in response to user reviews and star ratings, which are also published on the website.

In addition, the Trails WA website provides a method of evaluating how an existing or proposed trail compares with other trails and what may be needed to ensure its inclusion in the invaluable promotion provided by Trails WA.

26 Census 2021 WA's Linguistic Diversity

6.6 Trail user safety

Landowners and land managers have a duty of care under the *Occupier's Liability Act 1985* and the *Civil Liabilities Act 2002* to identify potential dangers that may cause injury, death or damage to property and to take steps to eliminate or reduce those dangers to an acceptable level.

The Framework (Stage 2) of the Trail Development Process should detail who will be responsible for managing visitor risk and hazards.

Trail managers need to implement a risk management framework that identifies the risks, determines risk mitigation, outlines safety messages, signs needed, inspection and risk mitigation programs and record keeping.

Key points

- Develop a risk management framework and processes.
- Minimise potential for injuries to trail users.
- Encourage appropriate behaviours through codes of conduct.
- Develop procedures to manage visitor risk.
- Use the Walking Trail Classification System in Section 11 to help manage risk.

The international standard *ISO 31000:2018 Risk Management – Principles and Guidelines* is the relevant standard that directs and informs the risk management process.

Safety messages

Safety messages are a significant component of managing risk. Communication planning should include the key messages and media on risks and safety.

DBCA has developed approved safety messages for trails and other outdoor recreation on DBCA's Parks and Wildlife Service-managed lands and waters. The text on the safety pages of Explore Parks website is consistent with these approved safety messages and can be used as a resource for developing consistent safety messages for other trails.

Safety advice can be delivered on websites, printed publications, apps and on-site signs including trailheads and at relevant risk areas, such as cliffs. It needs to be clear, consistent and include both words and symbols that are easily understood by trail users.

Appropriate advice on what to do in case of emergencies needs to be considered as part of the risk management framework and communicated clearly for trail users.

Emergency WA is the State approved source of emergency alerts and should be promoted where appropriate.

Consider alternative languages depending on target user groups.

Bushfire

Threat of bushfire is a significant risk to trail users and trail infrastructure. Consult qualified experts on fire protection measures to incorporate into risk management procedures and infrastructure planning and design.

Outdoor activities

Providers of outdoor activities with dependant participants should be aware of and understand the Australian Adventure Activity Standard (AAAS) and associated Good Practice Guides (GPG) for guidance on safety and other aspects of responsible activity delivery.

Community reporting

Harnessing the community to report issues on a trail may be an option. Trails WA website has a "report an issue" capacity as does the Bibbulmun Track Foundation website.

6.7 Accessibility

In WA, there are more than 400,000 people with disability. People with disability have abilities, aspirations and contributions to make to their local communities.

A Western Australia for Everyone: State Disability Strategy 2020-2030 sets the foundation for building a more inclusive Western Australia, empowering people with disability to participate meaningfully in all parts of society and to have the resources to do so.

Accessibility for all is about providing opportunities and services for people with a range of impairments, such as mobility and can also include age, mental health, cognitive, visual or hearing impairments.

Accessible trails can cater for a full range of visitor demographics including young families, baby stroller use and people who require even surfaces.

More recent accessibility support options include the use of Adaptive Trail Riders. Break the Boundary offers adaptive hiking and adaptive trail running experiences facilitated by trained Adaptive Hiking Leaders using specialised adaptive hiking equipment.

This is one of the only programs of its kind in Australia and allows for some of WA's most scenic and tranquil walking trails to be enjoyed by people with disability who may have previously considered these locations inaccessible.

Perth Hills. Photo: Break the Boundary.

Continuous path of travel

As a principle of equity, access for people with disability should be considered in all trail projects. This ensures that as people of varying abilities venture into more remote areas, basic facilities such as parking areas, toilets and immediate walking trails are designed to accommodate their needs and provide challenges for those that seek them.

Trail design needs to ensure a continuous accessible path of travel from parking areas and campgrounds to key features and facilities such as toilets.

Trail design should, where appropriate, aim to cater for the widest possible range of abilities. The determination of people to experience trails and WA's natural environment should not be underestimated.

Trail classifications

The Walking Trail Classification System provides clear guidance on levels of accessibility for trails. Trail users can make decisions about their capacity to experience the trail experience based on the trail classification. Read more in Section 11.

It is important that trails are constructed, managed and maintained to their trail classification.

Other considerations

Erosion, fallen trees, poor maintenance and broken facilities impact on all trail users but may be more serious for less able trail users or people with disability.

Local disability providers and groups are a great source of knowledge and experience. Consulting with community, service providers and people with disability is an important part of the Trail Development Process. Read the Trails Development Series Part B: A Guide to Community Consultation for more information.

People with disability often require additional information on accessibility and facilities. Visitor communication, promotional and marketing information should include information to allow trail users to make informed decisions on their ability to attempt a trail.

Providing imagery of people with disability using trails in visitor communications, marketing and promotion reflects all users, is more inclusive and more representative of the activity.

To enhance trail experiences, virtual access could be provided to areas that may not be accessible by everyone through QR codes, video, livestreams, Google Street View, virtual reality and audio.

Leeuwin Naturaliste National Park. Photo: DBCA.

6.8 Protecting environmental values

Environmental values are identified in Site Assessment (Stage 3) of the Trail Development Process and are further assessed during Corridor Evaluation (Stage 5).

Ensuring values are identified early will lessen or avoid any impacts of trail development and will reduce the likelihood of project delays. It will also ensure that the landscape and environment are retained and protected.

Legislation for the protection of the environment includes:

- *Conservation and Land Management Act 1984*
- *Biodiversity Conservation Act 2016*
- *Environmental Protection Act 1986*
- *Environmental Protection and Biodiversity Conservation Act 1999* (Federal).
- *Rights in Water and Irrigation Act 1914*
- *Metropolitan Water Supply, Sewerage and Drainage Act 1909*
- *Country Areas Water Supply Act 1947*
- *Waterways Conservation Act 1976.*

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 both private and public lands throughout Western Australia. Read more about legislation in Section 5.2.

Working through the Impact Evaluation Checklist in the Trails Development Series will assist in ensuring that assessments for relevant plant diseases, ferals, weeds, flora, fauna and ecosystem conservation are considered and where necessary undertaken. For trails proposed on DBCA managed land, the Disturbance Assessment System must be used to consider and assess any disturbance and gain approvals.

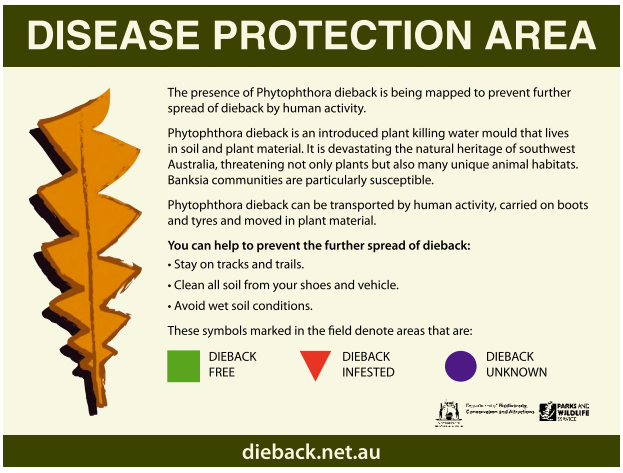
Dieback

Trail location and alignment plays an important part in minimising the potential spread of soil-borne pathogens such as *Phytophthora* (dieback).

In WA's south-west bioregion, more than 40% of native plant species are susceptible to the disease. *Phytophthora* can spread through soil and roots by animals but humans have spread *Phytophthora* further and faster than any other means of spread.

The impacts of dieback are negative, permanent and irreversible and there is currently no practical broadscale method of eradication of the pathogen once an area is infected.

Dieback and where appropriate, other disease management is considered throughout the Trail Development Process. In areas susceptible to dieback disease, the status of the area should be assessed in Site Assessment (Stage 3) and disease boundaries surveyed and demarcated during Corridor Evaluation (Stage 5) of the Trail Development Process.



A dieback management plan needs to be developed and applied during the construction phase to manage the risk of disease spread. Hygiene measures should also be applied to trail maintenance activities. Within DBCA, trail managers follow the Phytophthora Dieback Management Manual.

Important factors in the construction and maintenance of trails in dieback-free areas include the importation of certified clean soil where required and the need for machinery and tools to be free of dieback infected soil prior to work.

The potential spread of *Phytophthora* by trail users can be reduced by creating free-draining trails, which have less puddles and inundated areas. This helps to lessen the amount of dirt that gets moved around.

The potential spread of dieback and other diseases can also be reduced by using signage, from the established suite of Project Dieback signs, at key locations that provide access to trails and on the trails.

Key messages to communicate to trail users include:

- Staying on designated tracks and trails.
- Avoiding puddles or muddy ground and using trails in wet soil conditions.
- Abiding by management signs and not entering restricted areas.
- Cleaning soil from footwear before using a trail and keeping them clean as far as practical while on the trail.

Learn more about dieback on DBCA website at Phytophthora Dieback.

Weeds

Preventing the introduction or spread of weeds is an important consideration in trail development, particularly in areas that are undisturbed and have high conservation value.

Some weeds can also pose a hazard to trail users and increase maintenance requirements.

Weed management in relation to trail development generally involves:

- Identifying and mapping populations of high priority and declared weeds in the vicinity of proposed trails.
- Aligning trails to avoid weed infestations where feasible.
- Ensuring there is no spread of soil or vegetation into un-infested sections during construction where weed infestations occur.
- Ensuring all trail construction materials such as soil and rock are weed free.
- Ensuring all machinery and equipment used in trail construction are clean on entry and are not carrying soil or vegetation prior to entry to the site.
- Undertaking control of weeds along a trail where feasible.

Where trails are proposed in highly disturbed environments, protect good quality remnant vegetation by avoiding those areas.

Weed identification and control requires specialist skills and knowledge, budget and focus. Trail planners should seek weed management advice from specialist staff or consultants.

7. Trail design

Once the trail framework is confirmed, the design of the trail itself can begin.

Memorable and enjoyable trails don't just appear, they come from understanding and working with all the elements that need to be considered.

The book *Natural Surface Trails by Design* explains that natural surface trails are subject to a range of human and natural forces that we cannot fully control. "Each trail both creates and is affected by an entire web of relationships, between its site, visitors, alignment, soils and materials, water, management, and far more."[27]

The skill in creating excellent trails is understanding these basic forces and their relationships, then applying what they mean to the trail design.

This section provides principles on trail alignment, the trail clearance corridor, understanding soil types, trail surface, cross sections and technical aspects of water management and drainage.

This will assist in designing a trail that works for the long term, setting the foundation for trail construction, maintenance and management.

Other core concepts described in *Natural Surface Trails by Design*, such as human perception and feelings, are equally important but are not covered in these guidelines.

The Trail Development Process provides a staged approach to design including site assessment, conceptual planning, corridor evaluation and detailed design.

27 Parker, T.S., *Natural Surface Trails by Design: Physical and Human Design Essentials of Sustainable, Enjoyable Trails,* Natureshape: Boulder Colorado, 2004, p. 11

Torndirrup National Park. Photo: DBCA.

7.1 Alignment

Determining the trail alignment is fundamental to ensuring a great experience, protecting natural and cultural values and having a sustainable trail.

Identifying the values that need to be protected and the elements that most affect trail design will help deliver a sustainable and well-designed trail.

Trail alignment is broadly defined within a corridor in the Concept Plan (Stage 4) and refined to a specific on-ground alignment at Detailed Design (Stage 6).

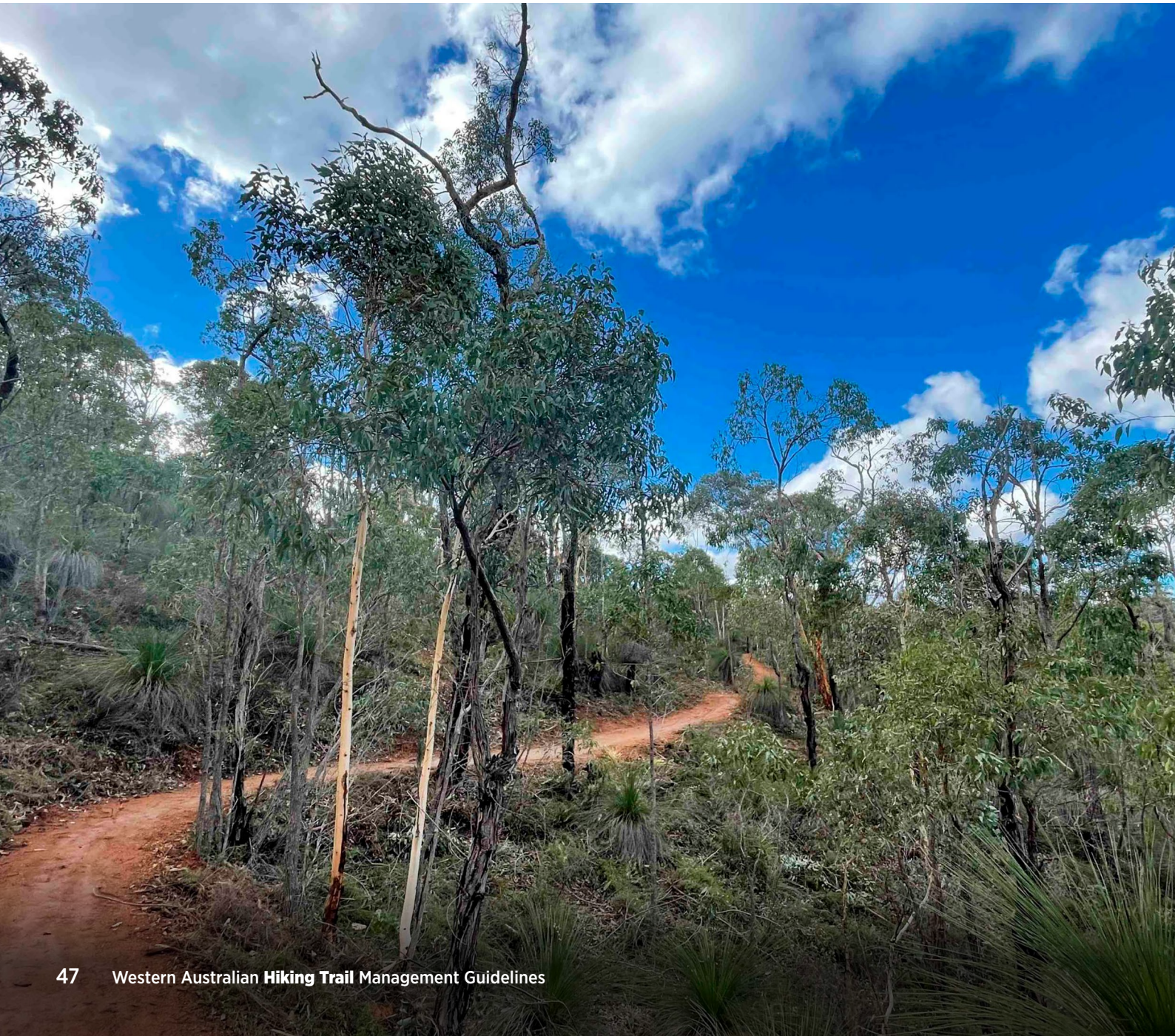
Key elements to consider are:

Topography and gradient are critical as sustainable trails generally follow the landform and work in with the landscape.

Control points keep users on the trail, connect desirable features and avoid undesirable sites or elements.

Demarcation and anchors are a subtle way of keeping trail users on the intended trail route using natural features or placed obstacles.

John Forrest National Park. Photo: DBCA.



Topography

Understanding topography plays an important role in building trails that are enjoyable and sustainable. Topography is the study of the landforms and features, such as hills, valleys and ridges.

Sustainable trails generally follow the landform, running across the slope rather than straight up and down a slope. This is critical to reduce the potential for erosion, one of the main causes of trail deterioration.

Contour trails or rolling contour trails, run at a slight angle to the contour incorporating frequent undulations, called grade reversals, and an outsloped trail tread, while maintaining the trail gradient to an average below 10% (1 in 10). A contour, in this instance, is a line of equal height that represent the landform and topography.

This ensures a smooth trail experience and plays a vital role in managing water flow and erosion, as illustrated in Figure 1. Alignment and design work with the slope where possible and keep long flat stretches to a minimum. Read more about gradient below and grade reversals in Section 7.5 Water management and drainage.

When a trail is seeking to reach a summit, or traversing steeper slopes, switchbacks may be needed. See Switchbacks in Section 7.1.

The topography is analysed using appropriate mapping tools in Site Assessment (Stage 3) of the Trail Development Process. The Concept Plan (Stage 4) and Corridor Evaluation (Stage 5) use this information to determine the trail alignment and design. Decisions made in these stages will influence detailed design and construction.

It's much easier to alter the alignment early in the process to avoid constructing significant infrastructure in unsuitable locations to manage grades and water flow.

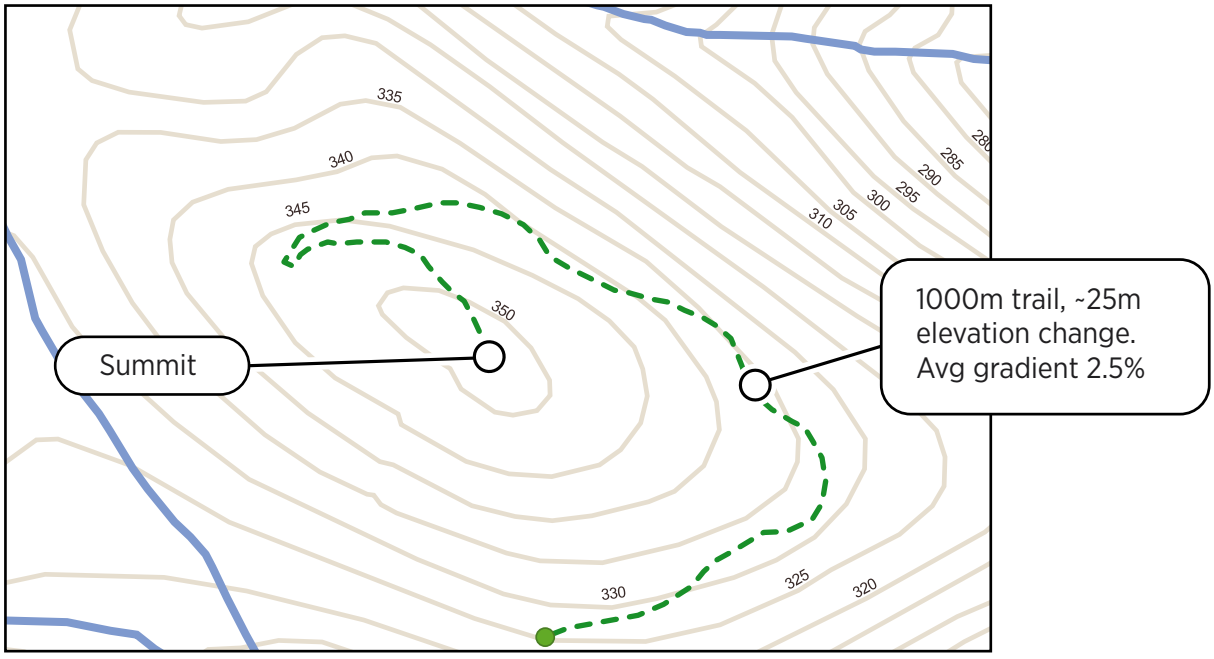


Figure 1: Rolling contour trail

Gradient

In these guidelines, gradient refers to the slope of the land or trail measured from one point to another.

The most sustainable trails are those that have an average gradient less than 10% (1 in 10). This ensures water sheets across and not along the trail, especially when combined with an outslope or cross fall, and regular grade reversals or undulations.

When calculating the average gradient of the trail, exclude height changes on steps or ladders. These do not contribute to the average gradient.

Read more in Section 7.5 Water management and drainage for explanations of soil types and drainage features, outslope and grade reversals[28].

Trail classification

The gradient of a trail is a key attribute that defines the trail classification, explained in Section 11.

Class 1 and 2 trails will have gentle gradients, Class 3 trails may have short sections of steeper gradients, whilst Class 4 and 5 may have long, steep or arduous sections. Table 6 (page 122) provides the acceptable grades for each trail classification.

Suitable gradients are identified in Site Assessment (Stage 3). The trail alignment is determined in the Concept Plan (Stage 4) and refined in Corridor Evaluation stage (Stage 5) and Detailed Design (Stage 6) of the Trail Development Process working through options to manage the trail gradient.

The Hike Collective on Yaberoo Budjara Heritage Trail. Photo: City of Wanneroo.

Principles

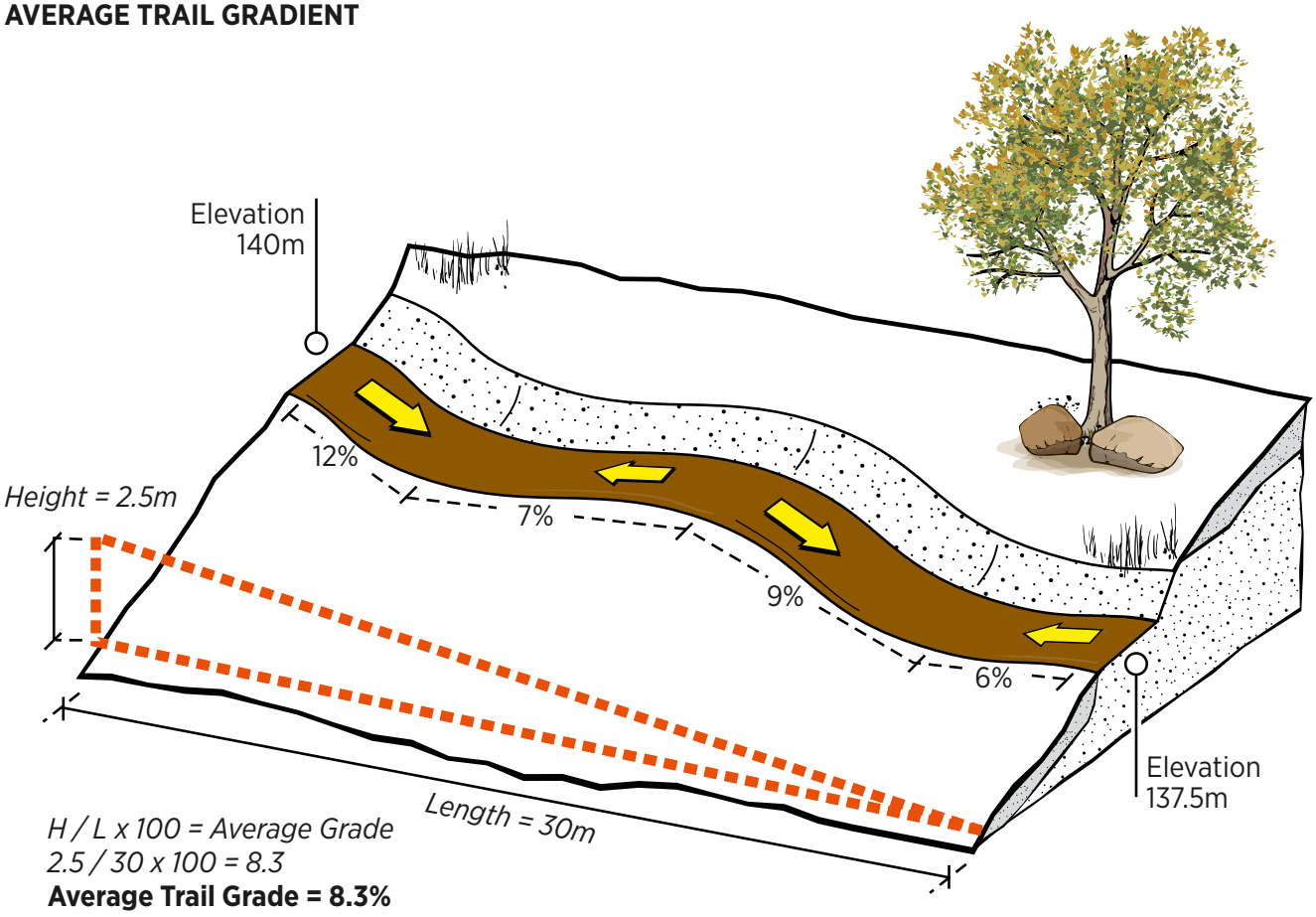
- Work to an average trail gradient less than 10% (1 in 10), to minimise the potential for water erosion.
- Avoid aligning the trail on or near the fall line, by following the 'half rule' – the trail gradient should be no more than half the gradient of the side slope. This ensures water is easily drained off the trail tread and does not accumulate along the trail causing erosion, explained in Section 7.5.
- Avoid flat terrain where possible as the trail surface will become compacted, collect water and create puddles and muddy sections.
- If flat areas are unavoidable use trail construction techniques such as building up and crowning the trail surface, armouring or boardwalks.

Figure 2 shows how to calculate the average trail gradient, by dividing the change of elevation by the total length of the section, then multiplying by 100.

A clinometer is a device used to measure gradient, explained in Appendix D – How to measure with a clinometer.

28 This section draws heavily on Recreation SA, *Guidelines for the planning, design, construction and maintenance of recreational trails in South Australia,* Revised 2016

AVERAGE TRAIL GRADIENT



SIDE SLOPE

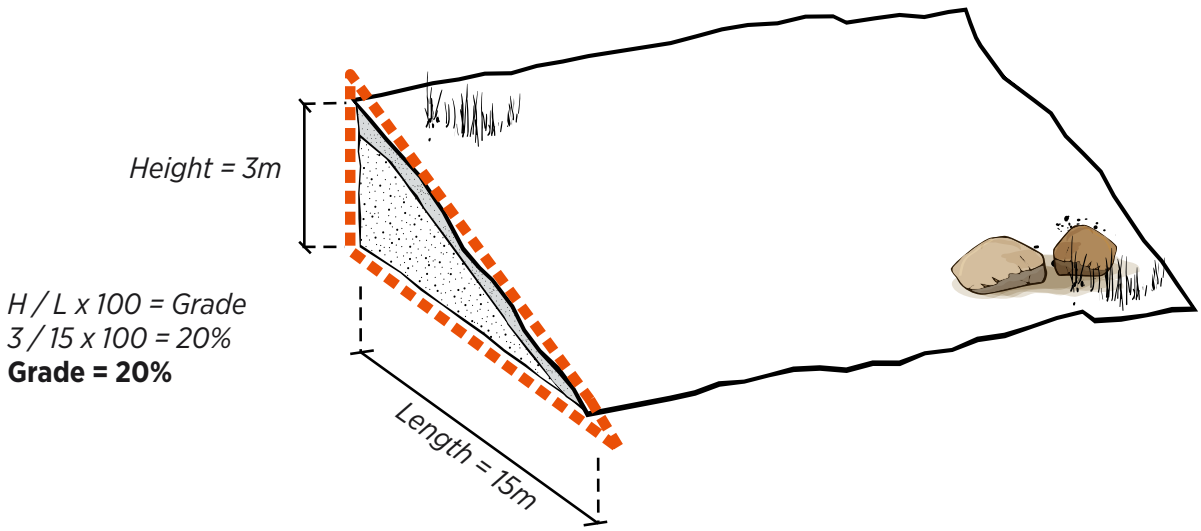


Figure 2: Determining average trail gradient

Control points

Control points influence where the trail should go and not go. Good design connects the positive and avoids the negative control points.

Positive control points heighten the trail experience and keep users on track, which reduces the likelihood of shortcuts.

Control points are identified at a broad scale in Site Assessment (Stage 3) of the Trail Development Process and used to inform the trail alignment. Plotting control points helps define the trail route, start and finish, location of parking areas, structures, slopes for turns or switchbacks and crossings. Control points are also used to control the gradient of the trail.

Refinement of the trail is then undertaken in Corridor Evaluation (Stage 5) where the corridor centreline is flagged connecting each positive control points and avoiding negative control points. This clearly defines the corridor for Detailed Design (Stage 6) and Construction (Stage 7). During Detailed Design, localised features such as large trees, boulders are identified and may be used as control points.

Examples of positive control points are:

- Scenic views.
- Waterfalls, rivers, streams and water features.
- Attractive landscape settings, native forest, large trees, features and anchors such as rock outcrops.
- Places with historical, cultural or interpretive opportunity.
- Appealing scents and sounds.
- Built structures such as bridges.

Negative control points are places that users should avoid as they need protecting or are inappropriate or undesirable along the trail. Examples of negative control points are:

- Unpleasant views.
- Road or rail crossings.
- Private property.
- Wetlands, riparian zones and sensitive wildlife habitat and plant communities.
- Sensitive historical, cultural or archaeological sites.
- Extremely steep cross slopes or cliffs, safety hazards and unstable soils.
- Known weed infested or disease areas.

The Ancient Empire Trail, Walpole Nornalup National Park. Photo: DBCA.

Demarcation and anchors

The trail alignment should be the path of least resistance, even in difficult terrain. When trail users cut corners, it has a negative impact on the environment and sustainability of the trail.

Demarcation is a subtle way of keeping users on the intended trail route. This can be done by retaining vegetation or using elements such as trees, rocks and logs to anchor the trail and to set the boundary around the trail.

Anchors are distinct features that attract and hold the trail user's attention such as large rocks and trees. They create physical or visual demarcations and make the trail more enjoyable.

The amount of demarcation required will depend on the site and include natural landforms, onsite materials, vegetation or supplement planting or other material that complements the landscape.

Designed and constructed properly, demarcation techniques will blend in and trail users will not notice. Where objects such as rocks or logs are placed to provide demarcation, they should be made to look as natural as possible. If not, it can be visually obtrusive and disruptive to the experience.

Figure 3 illustrates these elements. Anchors and demarcation methods are identified in Site Assessment (Stage 3) and refined in the Detailed Design (Stage 6) of the Trail Development Process.

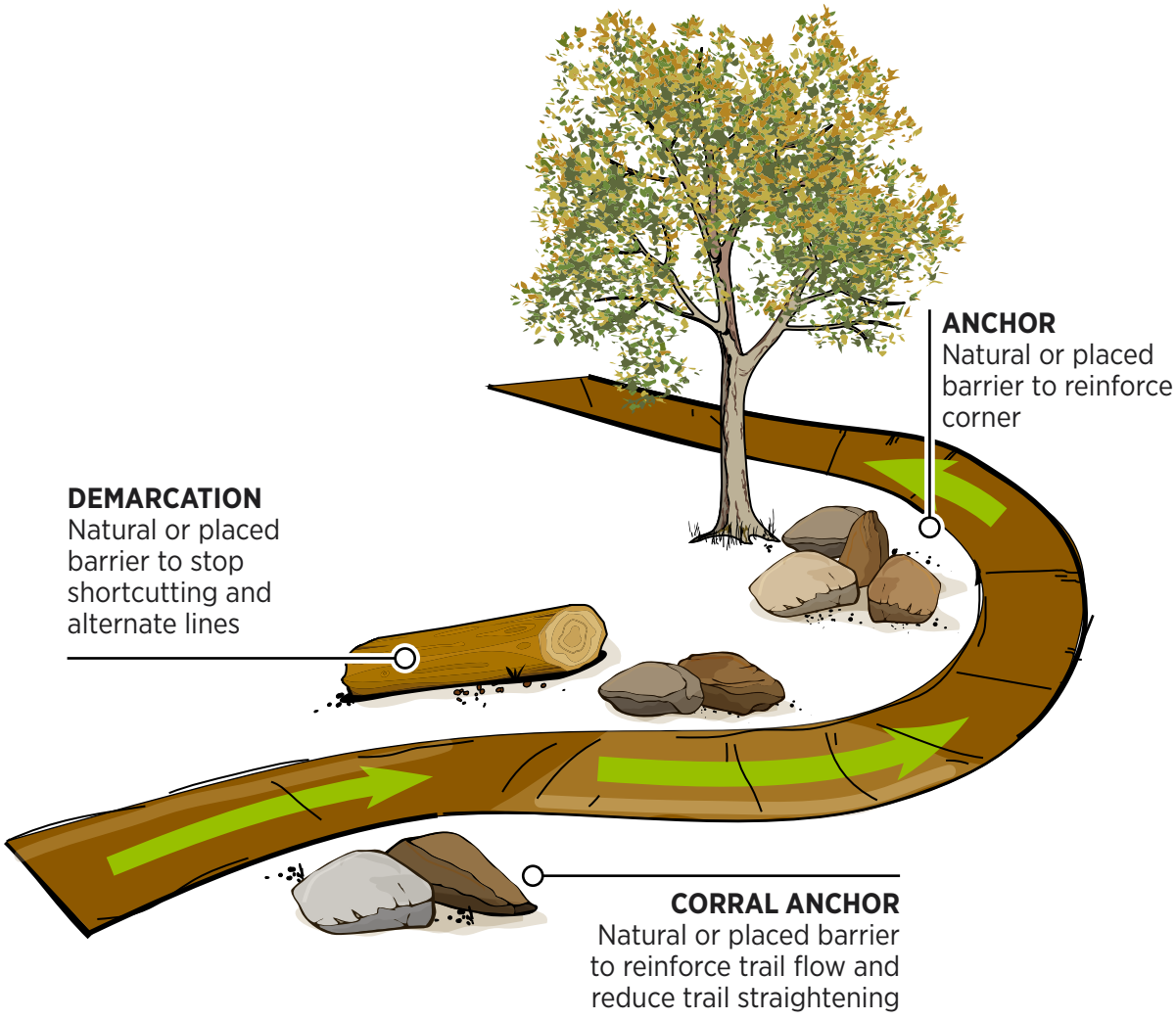


Figure 3: Demarcation and anchors

Switchbacks

Switchback turns are where a trail running along a slope reverses direction and continues in roughly the opposite direction to achieve ascent or descent of the slope.

They can vary in design and construction, depending on the trail classification, landscape and topography. The landing area (turn surface) of the switchback may be very small and no wider than the trail itself.

The best place to locate a switchback turn is on a naturally level area where the least earthwork and soil movement is required. This increases trail sustainability and reduces the amount of construction required.

Switchbacks should be built so that water from the upper leg drains freely off the corner of the landing or turn.

Retaining walls may be needed to support the trail legs or turns if trees and rocks are not available or the strength and durability of the soil is not adequate. Incorporating natural anchors such as trees, large logs or rocks into the corner of the turn is ideal, as illustrated in Figure 4.

Natural Surface Trails by Design[29] is an excellent reference to understand the feelings and perceptions of trail users generated by different switchback design elements.

Locations for switchback turns are identified and used as control points in the Concept Plan (Stage 4) and refined in the Detailed Design (Stage 6) of the Trail Development Process.

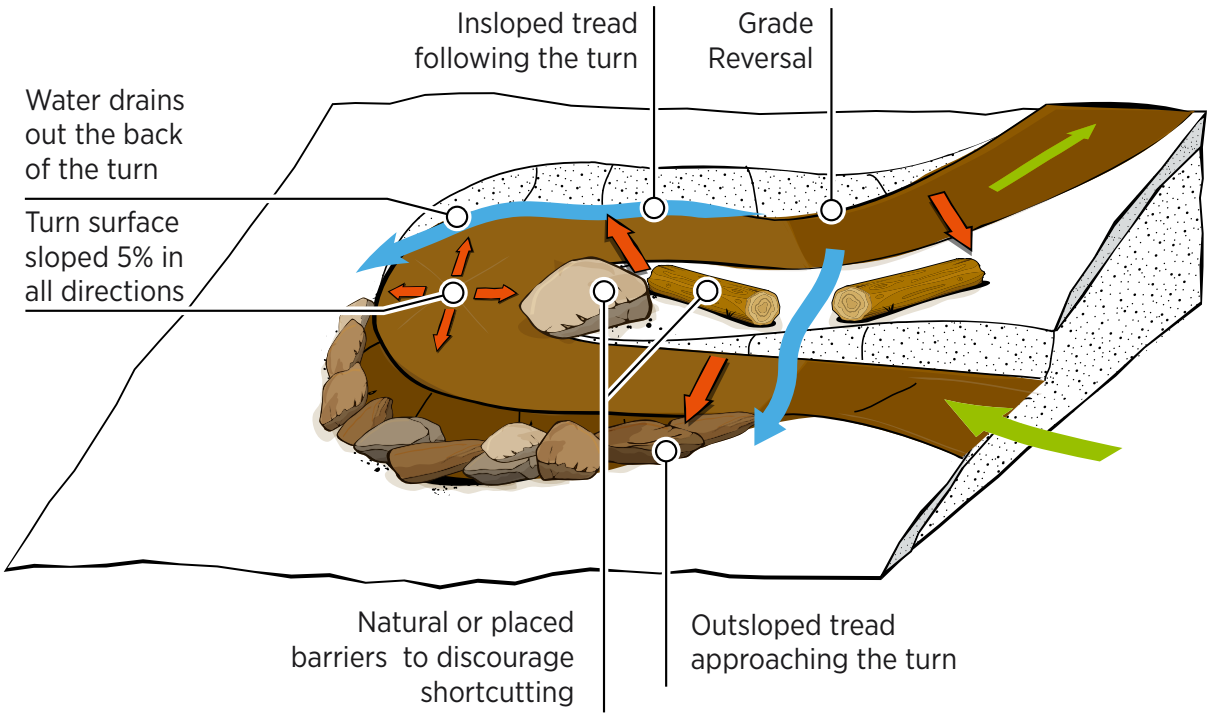


Figure 4: Switchback turn

29 Parker, 2004

Ramps

When meeting accessibility standards, ramps have design requirements for gradient, landings, changes of direction, handrails and kerbs.

A ramp is an inclined surface on a continuous accessible path of travel between two landings with a gradient steeper than 5% (1 in 20) but not steeper than 7% (1 in 14)[30]. Read more on continuous accessible path of travel in section 6.7 Accessibility.

Ramps are more likely on class 1 and 2 trails and are guided by the trail experience, intended user group and trail classification. Class 1 trails should reference AS1428.1 to ensure accessibility standards are met.

The following principles are relevant where the requirements of AS1428 are not able to be applied.

Principles

- Avoid excessive or tight switchbacks when using ramps to navigate slopes in natural areas, read more on switchbacks above.
- Keep steep sections as short as possible with a maximum gradient less than 50% of the fall line gradient, known as the half rule.
- Use steps down the centre of a switchback ramp to avoid short cutting on the corners.

Consider handrails on one or both sides or ideally, down the middle of the ramp where appropriate so that visitors can choose their preferred side.

Sightlines

Sightlines are important so that oncoming trail users are clearly visible when a trail is shared use and dual directional to avoid conflict and possible collision.

When approaching the crest of a hill, a trail user should be able to see the head of other users over the hill, before reaching the crest.

When approaching a corner, a trail user should be able to see an oncoming user through the vegetation. Sharp corners should be avoided for this reason.

Appropriately sized laybys and areas that enable faster trail users to pass are useful on trails with a high volume of users.

Cape to Cape Track, Margaret River. Photo: Tourism WA.

30 According to AS1428.1 – 2001

7.2 Trail clearance corridor

The trail clearance corridor is the cleared space created along the trail to provide safe and enjoyable passage for trail users. The corridor has three main dimensions A: tread width, B: corridor width and C: ceiling or corridor height, illustrated in Figure 5.

A well designed and crafted trail clearance corridor will enhance the trail experience, ensuring the area looks as natural as possible with a good sense of space, enclosure and views.

Dimensions for the clearance corridor will vary according to the trail design, classification and intended users. Read Appendix C for suggested dimensions in line with trail classifications.

Principles

- Keep the corridor as narrow as possible, consistent with the trail classification and intended trail users.
- Vary the width of clearing where appropriate to create an enjoyable experience.
- Provide widening along the trail for rest and scenic views where necessary.
- Provide a larger or more open corridor to allow for passing and visibility for trails with high traffic or shared use when needed.
- Consider a wider clearing in vegetation types such as karri forest where the undergrowth will fall in and reduce the available corridor.

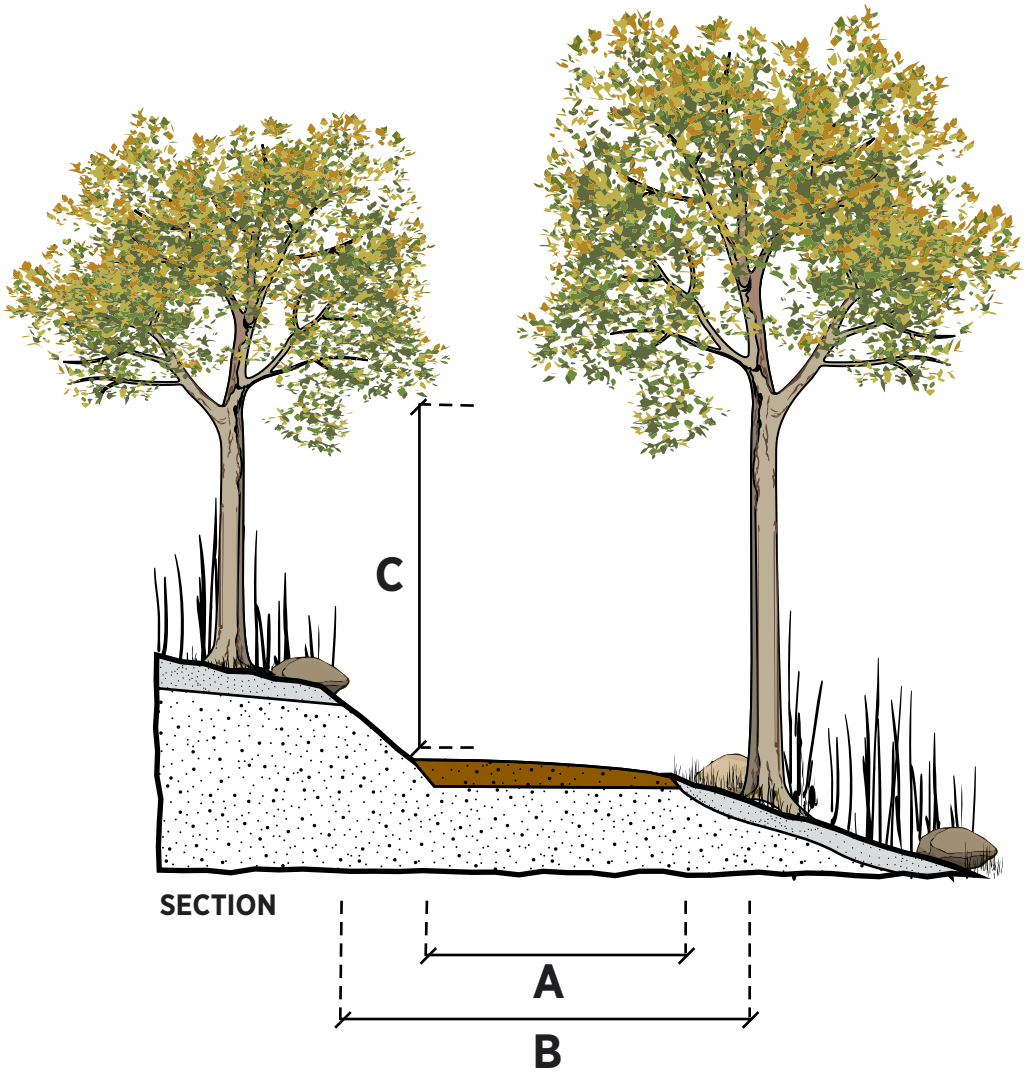


Figure 5: Trail clearance corridor

Clearing the trail corridor

The first step in constructing a new trail is to clear the agreed trail corridor of vegetation and obstacles.

It is critical that approvals and permits to clear vegetation and disturb the ground have been obtained before work commences.

Straight line pruning along the corridor boundary, known as hedging, is a common mistake in clearing the corridor. A more natural look can be achieved by pruning branches back to joints or removing whole plants.

Clearing can be done by hand or machine and depends on the scale of project, logistics, budget and type of landscape and vegetation.

Open grasslands, coastal heath and woodlands will require very different techniques to dense forests with heavy understorey and canopy.

Clearing techniques need to be considered in Site Assessment (Stage 3) and Corridor Evaluation (Stage 5) of the Trail Development Process.

Once the vegetation and topography are assessed for the alignment, determine the clearing techniques in Detailed Design (Stage 6) and specify in Construction (Stage 7) documentation.

Appendix E has tips on clearing vegetation from the corridor.

John Forrest National Park. Photo: DBCA.

7.3 Trail surface

Trail surface, or tread, needs to be durable, cost effective, suit the purpose and users of the trail, easy to maintain and blend in with surroundings.

Erosion, displacement and compaction are some of the most important forces impacting trail surfaces and need to be understood and managed. They are discussed in detail in *Natural Surface Trails by Design*[31].

It is preferable to plan the trail alignment to take advantage of suitable natural soil types as far as practical, but alternative trail surfacing or tread treatments may be required.

Trails that do not have imported or alternative materials are referred to as natural surface trails[32].

Choice of surface material will be influenced by the gradient, soil types, drainage needs and trail experience and trail classification.

Class 1 trails require hard-surfaced tread suitable for wheelchairs. Class 2 and 3 trails will likely have modified surfaces but if the soil type can sustain the anticipated design and use, then alternative materials may not be needed. Class 4 and 5 trails are focused on minimal modifications so favour natural earth surfaces.

Read Table 6 for an explanation of quality of tread for walking trail classification.

Understanding soils

Soil type and structure varies across landscapes, hillsides, valleys and vegetation complexes. In fact, soils can change frequently along the trail and with each soil change comes differences in trail construction and drainage requirements.

Ideally, the trail surface, or tread material, would be the natural soil especially for long distances. This reduces impacts on budget, environment and means the trail better fits into the landscape.

In general, the soils along the alignment will be clay, silt, sand, loam or a combination. Each type performs very differently so it's important to know how they will behave as a trail surface.

Different soil types will:

- Vary in their ability to maintain large volumes of traffic through compaction and displacement.
- Resist water erosion and have varying performances when wet i.e. muddy or well drained.
- Have suitably smooth surfaces for specific trail use.
- Maintain tread stability in varying trail gradients.

Soil suitability of the proposed alignment needs to be assessed and areas identified that require special attention or need to be avoided, such as seasonally inundated areas, in the Site Assessment (Stage 3) of the Trail Development Process. Responses to soil types will be determined in the following stages of the process.

Natural Surface Trails by Design describes the textures and behaviours of common trail tread materials. This important study describes general soil characteristics that can easily be put into practice.

31 Parker, 2004

32 Parker, 2004

Monkey Rock Trail, Denmark. Photo: Frances Andrijich.

Surface materials

Surface or tread materials can include:

- Asphalt, bitumen, paving or concrete for high volume walking trails.
- Compacted crushed rock such as gravel, road base or crushed limestone, with or without soil stabilisers.
- Duck boarding.
- Surface stabilisation systems, such as trackpads.
- Organic material such as sawdust, woodchips or even seagrass when use levels and soil types are appropriate.
- Natural earth and rock when use levels and soil types are appropriate.

Duck boarding involves laying timber planks or equivalent materials directly onto the trail surface, providing a stable surface over soft or unstable soils. They need to be constructed of materials that are suitable to the site and don't deteriorate or rot. They will require ongoing maintenance.

Surface stabilisation systems or modular plastic cell systems may be installed on the surface or buried to stabilise the trail depending on the product. There are numerous products available, generally consisting of plastic grids of various forms. Plastics can become brittle and fragment over time so their use requires careful consideration. They are expensive and should be trialled in situ before committing to large areas.

Natural rock that is flat and stable is very durable. It can be left in place as a feature or to assist with tread stability. Ensure rocks that users will go around are removed, especially if they are sharp or loose.

Rock armouring can be used to harden a trail in very soft or wet areas where no alternative route is available. It can also be used to reduce user-created erosion and soil displacement.

Soil stabilisers are liquid or powder products that bond or add structure to soils, to create a trail surface that is less prone to wind and water erosion or displacement. Cement can be used as stabiliser and there are several synthetic products available, generally polymer based. They can be expensive with a short life span and should be trialled in situ before committing to large areas.

7.4 Trail cross section

Trail cross section or profile will be determined by gradient, surfacing and construction logistics.

The main choices are:

1. Ground level
2. Crowned surface
3. Bench cut

Ground level

A ground level cross section is possible where the soil type is suitable for the user volume, the trail cross fall is at or less than 5% (1 in 20) and drainage is managed in other ways.

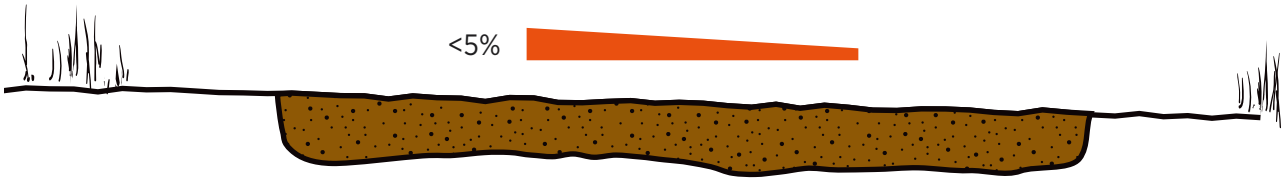
This cross section can be formed using the natural earth through clearing of vegetation, requiring no excavation. If an imported surface material is required, the trail area needs to be excavated and material laid to surface level, illustrated in Figure 6. Depth and width will vary and depend on trail design, soil, material and construction.

Crowned trail surface

Crowning the trail provides adequate drainage on trails that are located on flat topography, illustrated in Figure 7.

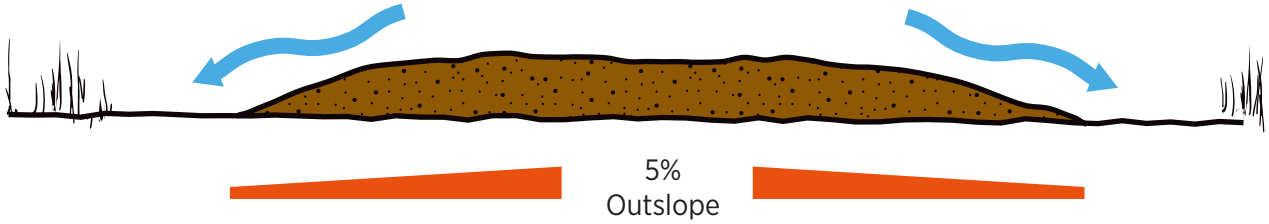
The tread material used to crown the trail is either imported or sourced from the trail corridor. Imported material needs to be from a sustainably managed source and clean of weeds and disease.

Where required, rock armouring can be used to elevate trail out of very soft or wet areas.



If natural earth tread not suitable,
box and fill to adjacent ground level

Figure 6: Ground level trail



Tread material is either imported or sourced from the trail corridor

Figure 7: Crowned trail

Bench cut

Cutting the trail across the side of a hill, or on the contour, is called a bench cut.

The trail tread should have an outslope of 5% (1 in 30 to 1 in 20), which is critical to enable water to drain across the trail.

For bench cut trails, the organic matter and vegetation covering mineral soil should be removed before further excavation. Any surplus top soil should be dispersed where it will not impede drainage.

The uphill side is referred to as the back-cut, back-slope or batter. This area needs to be blended into the gradient of the hill to minimise visual impact and prevent erosion.

A maximum gradient of 50% (1 in 2) is generally recommended for the batter.

A **full bench trail** involves excavating the hillside and puts the entire tread on mineral soil, maximising stability and minimising ongoing maintenance, illustrated in Figure 8.

This technique results in a firm and stable tread with minimal maintenance, however there is more soil disturbance than a partial-bench construction. A significant volume of excavated soil will need to be removed off-site or dispersed downslope and this may not be appropriate or feasible.

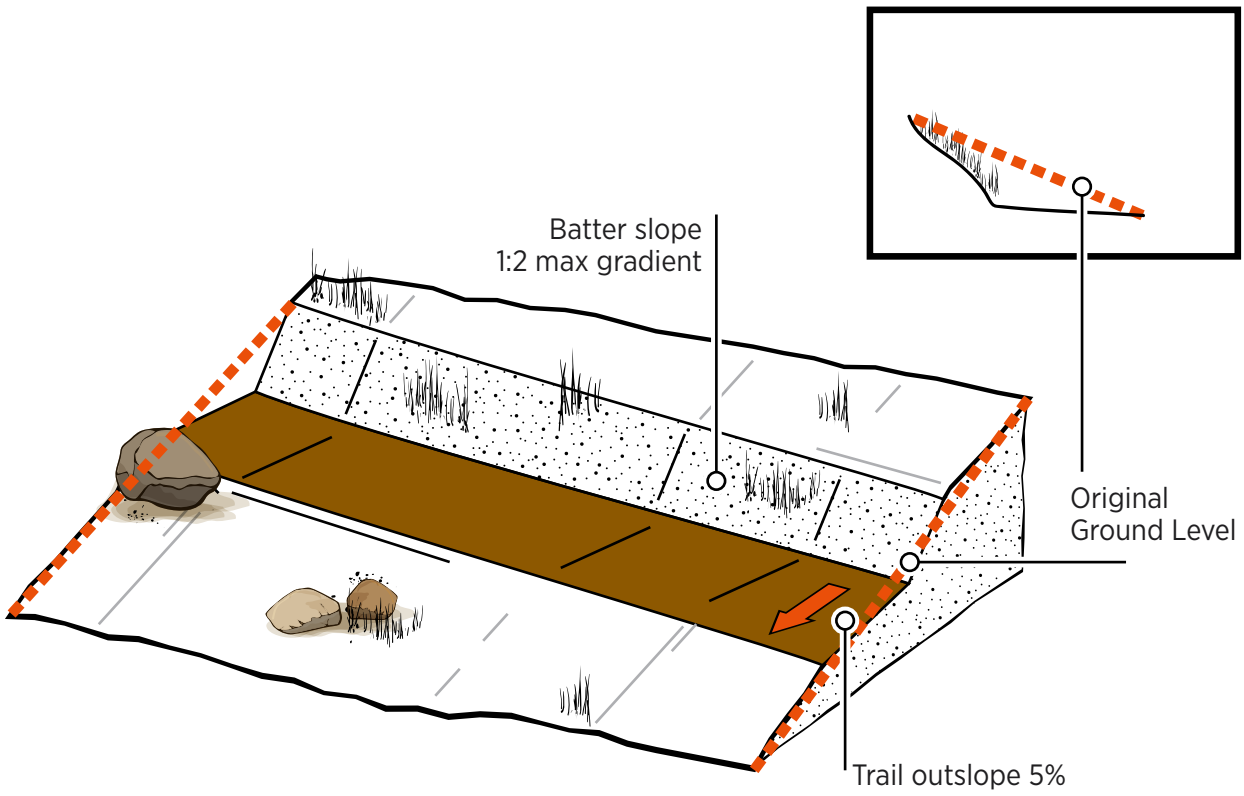


Figure 8: Full bench cut

On a **partial bench trail**, a part of the hill is cut away and the removed soil is placed at the lower edge of the trail to establish the desired width, balancing cut and fill as illustrated in Figure 9. A partial bench requires less ground disturbance due to the shallower cut and is a good solution when roots or impenetrable rock make full bench construction difficult.

However, it may not be as stable as a full bench cut trail. The fill section needs to be compacted consistently so fill-soil doesn't slip or settle and allow a berm, or ridge, to form on the lower edge of the trail and obstruct drainage. Achieving good compaction of the fill may be difficult in some soil types.

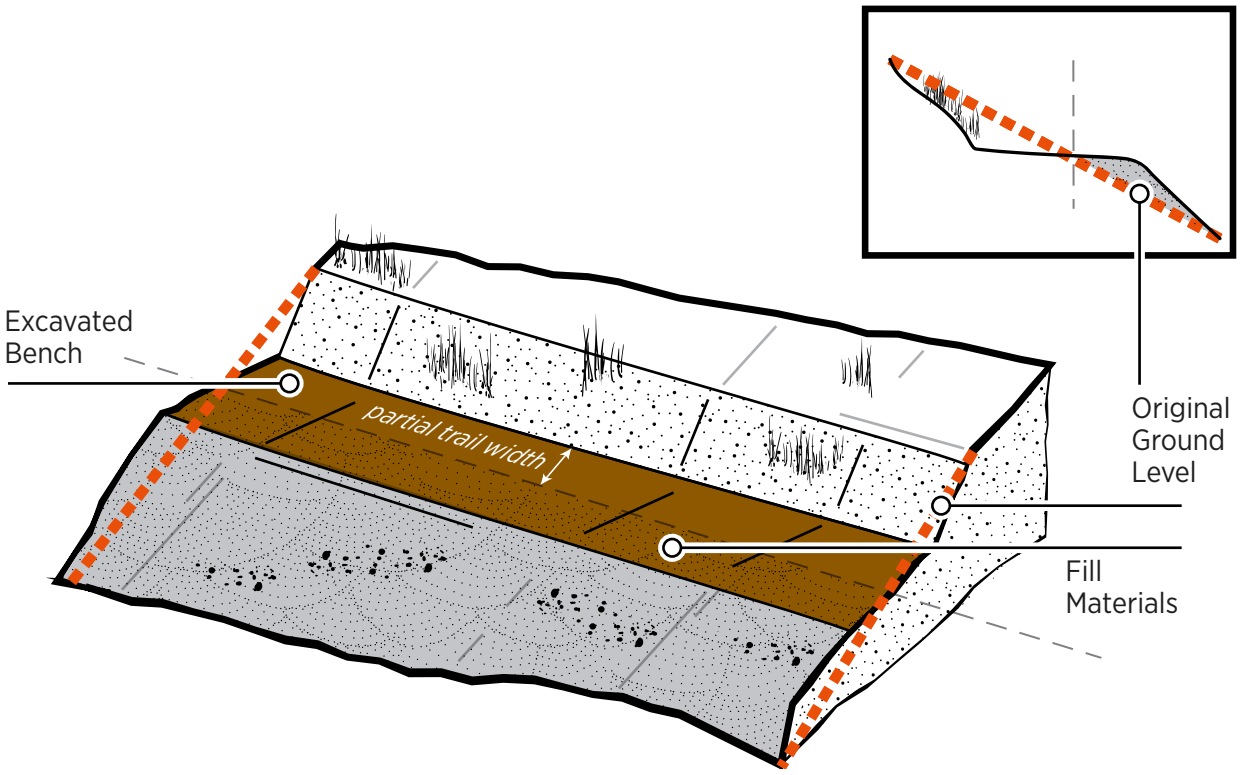


Figure 9: Partial bench cut

A **partial bench trail with retaining wall** may improve the sustainability of the technique, illustrated in Figure 10, but will add significantly to cost and timeframe.

The wall holds the fill soil in place and is installed a fraction lower than the tread so that water can still sheet off the trail.

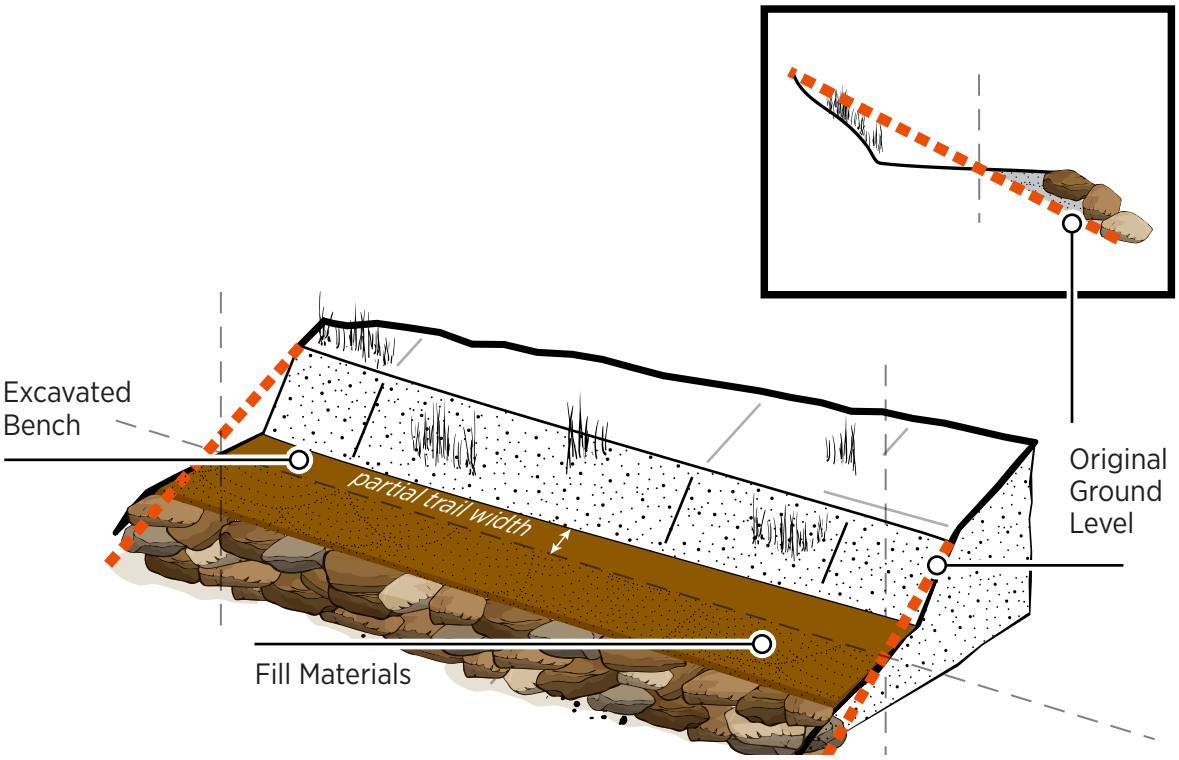


Figure 10: Partial bench cut with retaining wall

7.5 Water management and drainage

Understanding and managing rainfall and water is one of the most important factors in creating and managing sustainable trails.

Trail alignment, gradient, cross section and surface material all play a part in how water will behave on a trail and will dictate how it needs to be managed.

Erosion is a physical force that needs to be managed. Simply put, the steeper the grade and more unstable the trail surface, the more likely it is to erode.

Drainage features for hiking trails include:

Grade reversals divide the trail into continuous water sheds by changing the trail gradient briefly, dropping before rising again.

Outsloping trails have a section of trail that tilts slightly down and away from the high side, promoting water to flow off the trail.

Knicks are a shaved down section of trail that intercepts water and directs it off the trail.

Rolling grade dips build on a knick by adding a gentle ramp, reinforcing the knick.

Water bars are raised barriers constructed at an angle across a sloping trail, directing water running off the trail before it gains momentum.

Principles

- Research rainfall patterns and conditions and understand how normal and extreme events will impact trail design.
- Understand how surface water moves along and around the trail, where it's coming from and where it is going or if it's not going anywhere if the trail is too flat.
- Shed water off the trail before it can gather speed and create erosion or before it can pool and create puddles.
- Use grade reversals as the primary method of water management and supplement this with other drainage features as needed.
- Apply approximately 5% (1 in 20) outslope in most situations.
- Use other drainage features such as, knicks, rolling grade dips or water bars as needed.
- Drain water off flat trail sections by building up and crowning the trail surface.
- Build drainage features in ways that blend into the landscape and if done well, trail users won't notice them.
- Ensure there is an appropriate maintenance program to keep drainage features working properly.
- Monitor trail over time and build additional drainage features as needed.

Drainage intervals

The intervals for drainage features are important to consider in managing water and erosion. The combination of surface material and gradient influence the distance between features.

Natural Surface Trails by Design[33] is an important source of information on the maximum length between drainage features on common trail surface materials, according to gradient.

These drainage intervals are hypothetical as absolute numbers are not possible, especially in extreme weather events.

Therefore, the values in Table 5 are only a guide. Conditions and results on individual trail projects will vary and need to be adapted to suit.

33 Parker, 2004

Table 5: Drainage intervals on common surfaces

Surface tread	Trail gradient										
	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					

This table is derived from *Natural Surface Trails by* Design and converted to metric.

* Unless it is sustainably pitched to drain to the side, no tread should have 0% gradient. The 0% figures are listed as an upper drainage spacing limit for gradients 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.

Karratha. Photo: Pilbara Trailblazers.

The half rule

The half rule states that a trail gradient should never exceed half the gradient of the side slope.

If the trail gradient is more than half the side slope gradient, water is more likely to run down the trail and not sheet off, causing erosion. It is very difficult to implement effective drainage on trails that do not fit the half rule.

The half rule is especially important when working with gentle slopes. It may be assumed that gentle slopes are less susceptible to erosion, which is not always the case.

The half rule is illustrated in Figure 11 and 12.

There are exceptions to the half rule:

- Erosion-prone soils may have a maximum sustainable gradient of just 4% or 5% (1 in 25 or 1 in 20), which can be much less than half of the gradient of the side slope.
- Soil type influences the maximum sustainable gradient for each trail location, irrespective of the side slope.
- Very steep grades will need a higher frequency of drainage features and may require surface treatments that protect the trail surface, such as armouring.

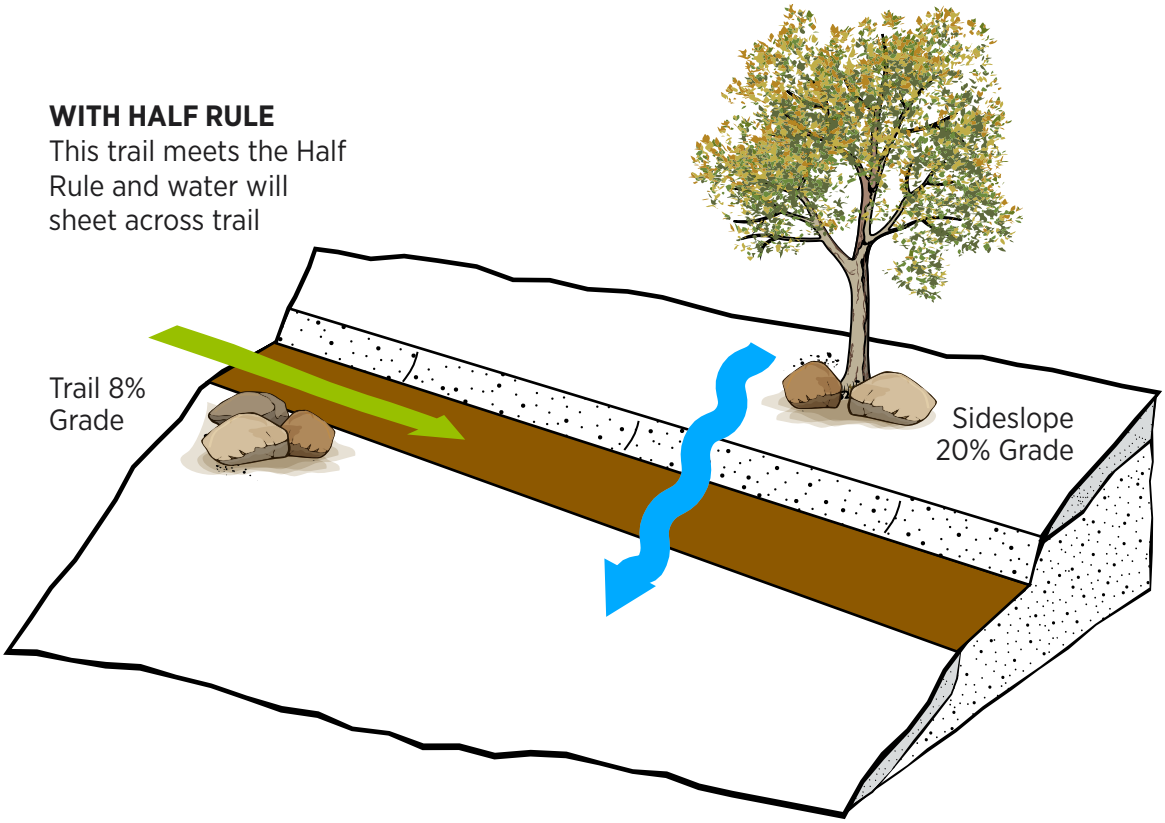


Figure 11: Half rule

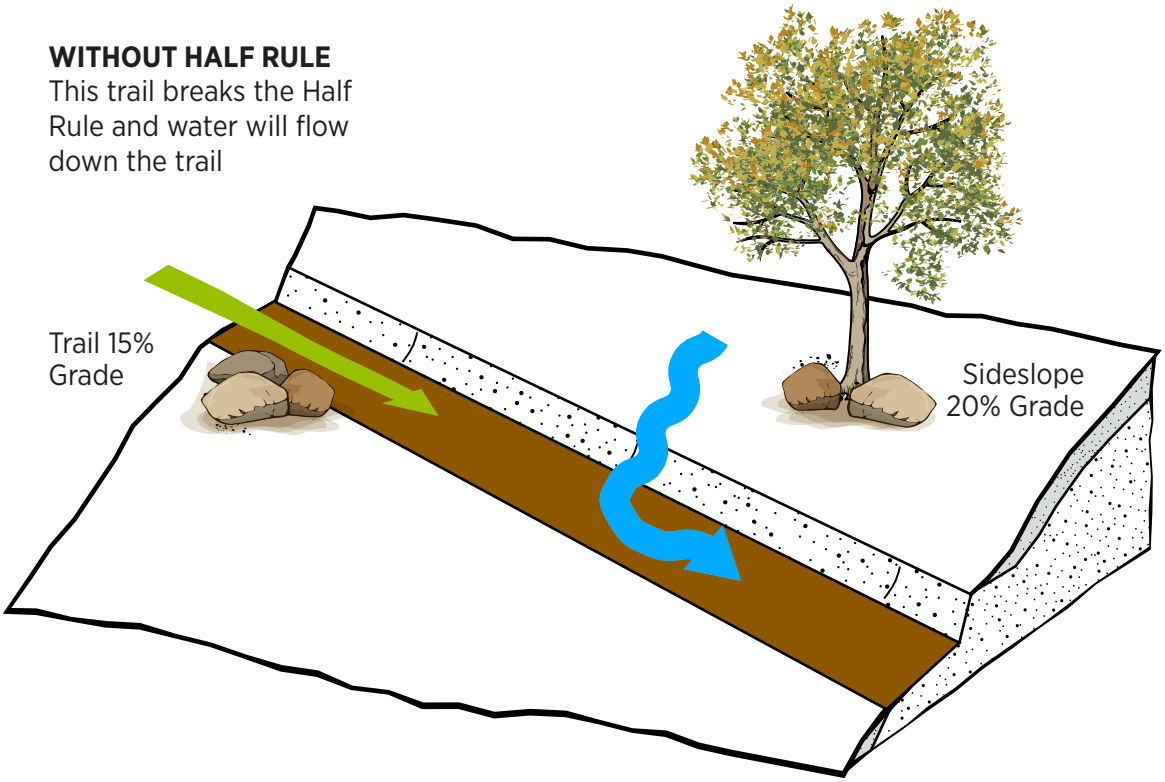


Figure 12: Without half rule

Grade reversals

Grade reversals should be planned and built into all new trails and can be added to existing trails where needed. They make trails more sustainable, provide excellent drainage solutions and should be used as the primary method of trail drainage.

A grade reversal is a place where the tread changes from descending to rising, illustrated in Figure 13. This forces 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. Drainage on one part of the trail won't affect another part. Grade reversals also reduce the effect the trail might have on the hydrology of the area.

Frequent grade reversals are critical and should be created primarily by designing an alignment with regular, subtle undulations. It is then important to ensure the trail is not levelled out during construction.

It is much easier to build grade reversals into new trails than to retrofit them into a poorly designed trail. In some cases, it may be better to realign a trail with severe erosion or water-pooling problems and rehabilitate the existing alignment.

It is important to ensure that at the low point or dip of each grade reversal there is adequate outslope and unobstructed drainage off the tread. This means there is no pooling of water adjacent to the trail.

Although maintenance is usually minimal, grade reversals will collect leaves and silt that need to be cleared out each season and after heavy rain events. They will fill up over time if not maintained and become ineffective.

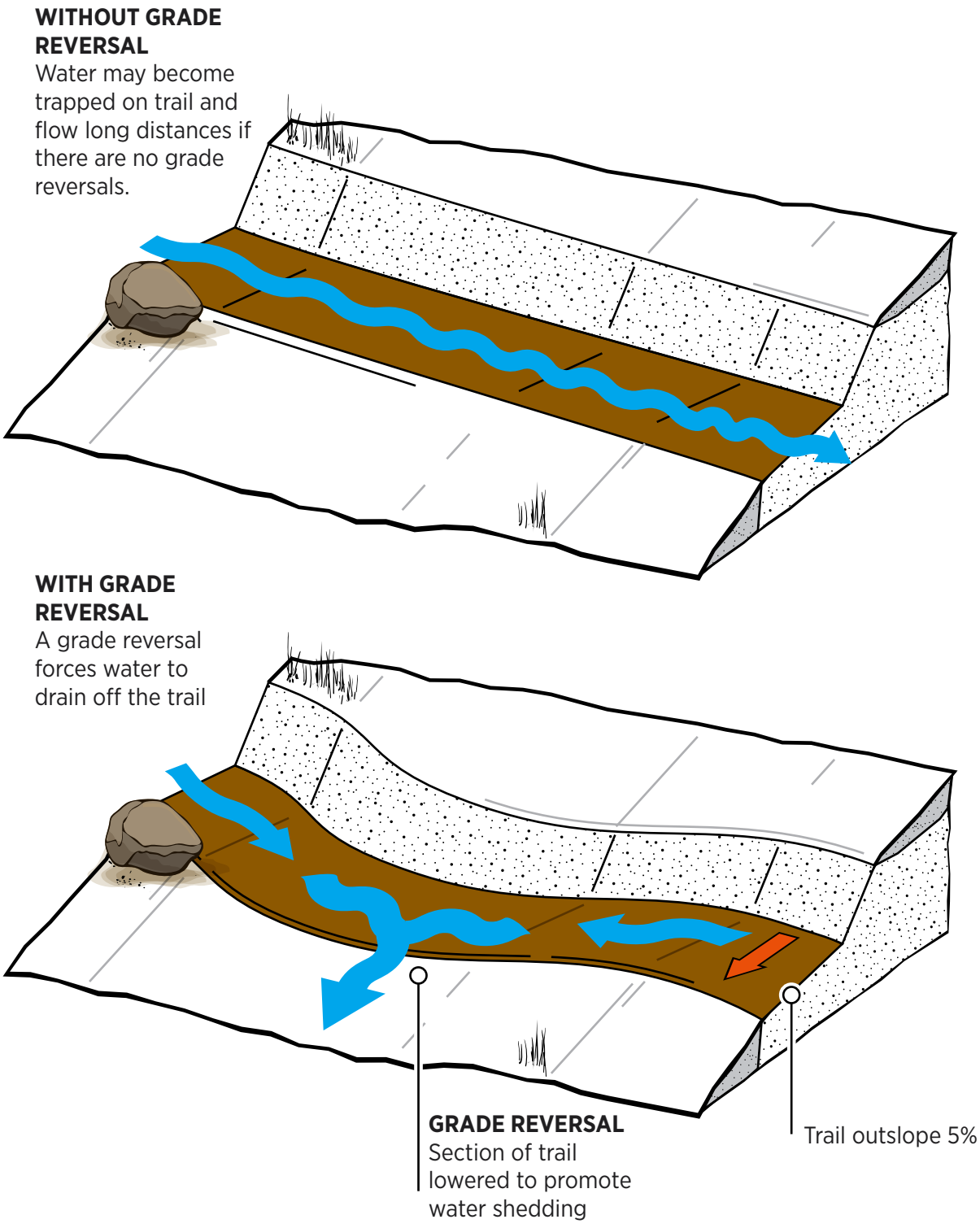


Figure 13: Grade reversal

Outslope vs inslope

Outsloping trails have a tread that tilts slightly down and away from the high side, or sideways from high to low, as illustrated in Figure 14.

This encourages water to sheet across and off the trail instead of running down the centre and causing erosion. Trail treads should be built with a 5% (1 in 20) outslope unless there is a specific need for insloped or level tread.

In loose soils like sands or pea gravel, the trail tread may require regular maintenance to maintain the outslope, as the tread will tend to 'cup' due to soil displacement.

In some situations, trails may be intentionally built with an inslope and combined with other drainage features, such as grade reversals, to shed water from the tread, as illustrated in Figure 15.

Inslope can be useful on the upslope side of switchback turns to direct drainage away from the trail below, as illustrated in Figure 3. It is also useful on wet slopes with significant surface flow or seepage, to intercept drainage and direct it to specific drainage points rather than letting it flow across the whole tread.

Where inslope is used, it is important to use regular drainage points to shed water back across the trail and downslope. Rock armouring or culvert pipes may be required.

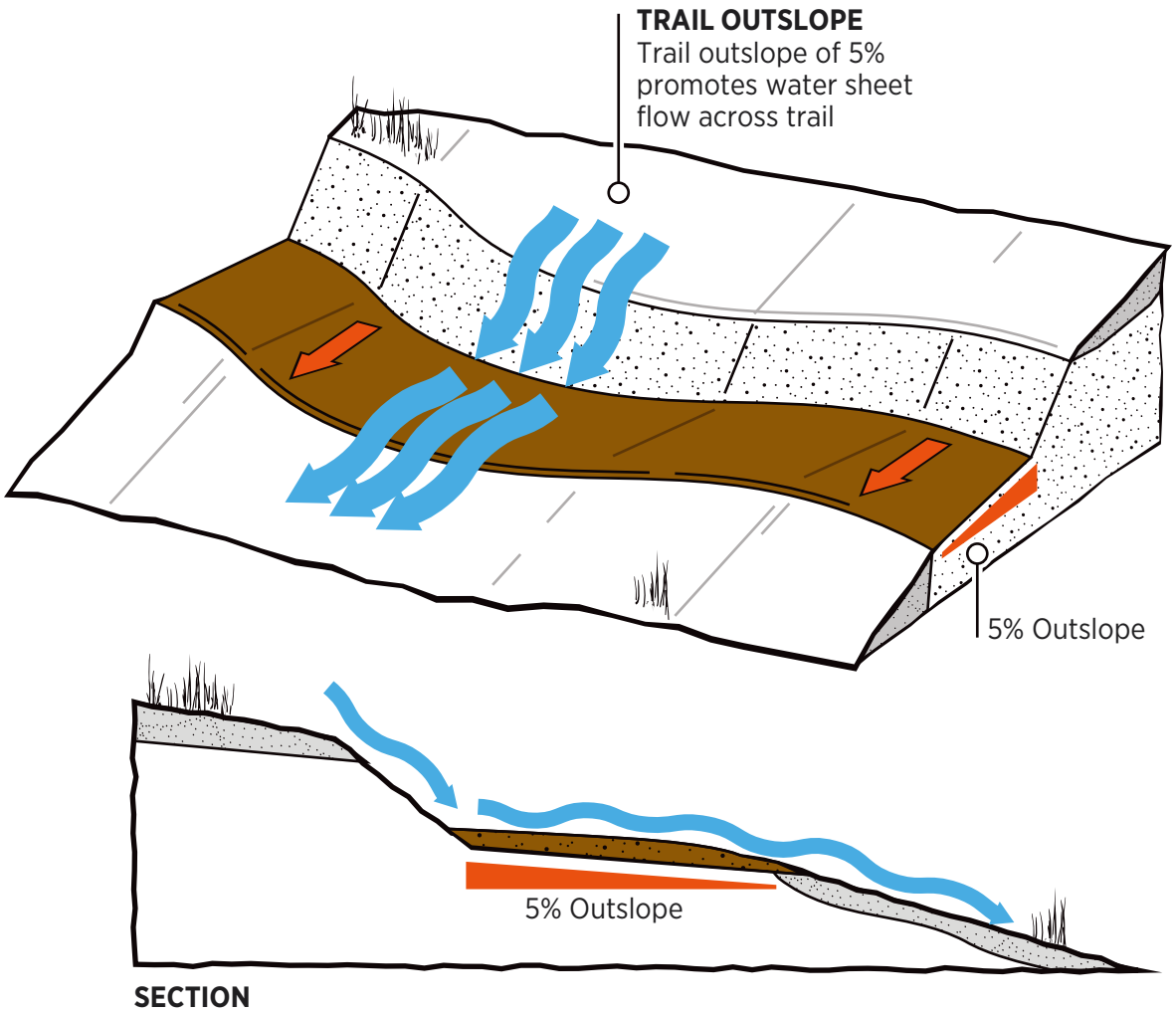


Figure 14: Outslope

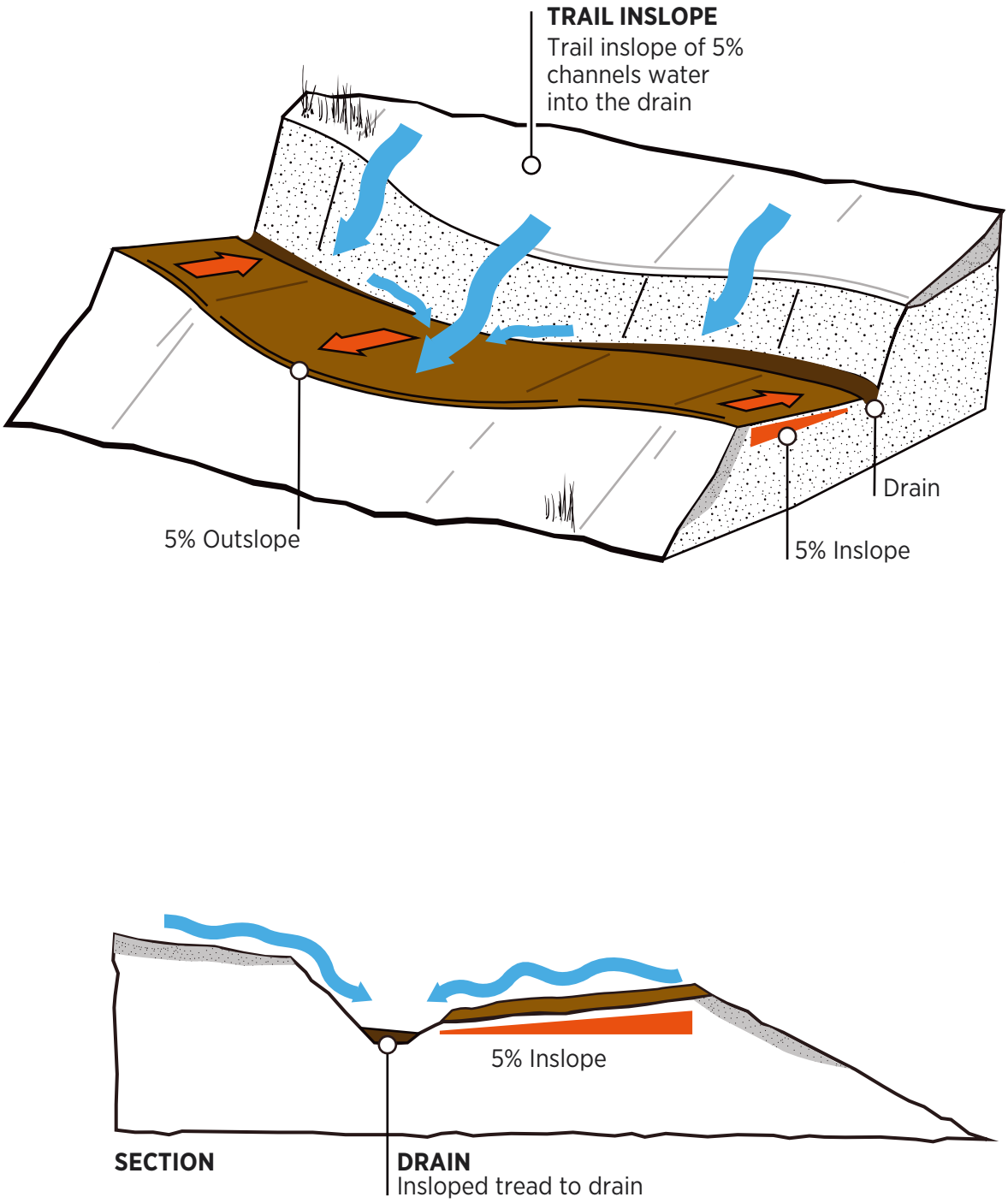


Figure 15: Inslope

Knicks

A knick is a shaved down section of trail that intercepts water running down the tread and directs it downslope. It is roughly semicircular in shape with a length of up to double the tread width, at a minimum 1.5m, as illustrated in Figure 16.

The centre of the knick is outsloped at 15% (1 in 6) to draw the water off the tread.

There must be lower ground immediately adjacent to the knick and generally the same gradient as the knick to ensure free drainage downslope.

The ground adjacent to the knick needs to be kept clear of vegetation, taking advantage of natural depressions and clear areas adjacent to the trail tread.

Knicks that are too small will block up with leaves, silt and other surface debris after the first rain of the season.

Although maintenance is minimal, knicks will need to be cleared out each season and after heavy rain events to clear leaves and silt. They will fill up over time if not maintained and become ineffective.

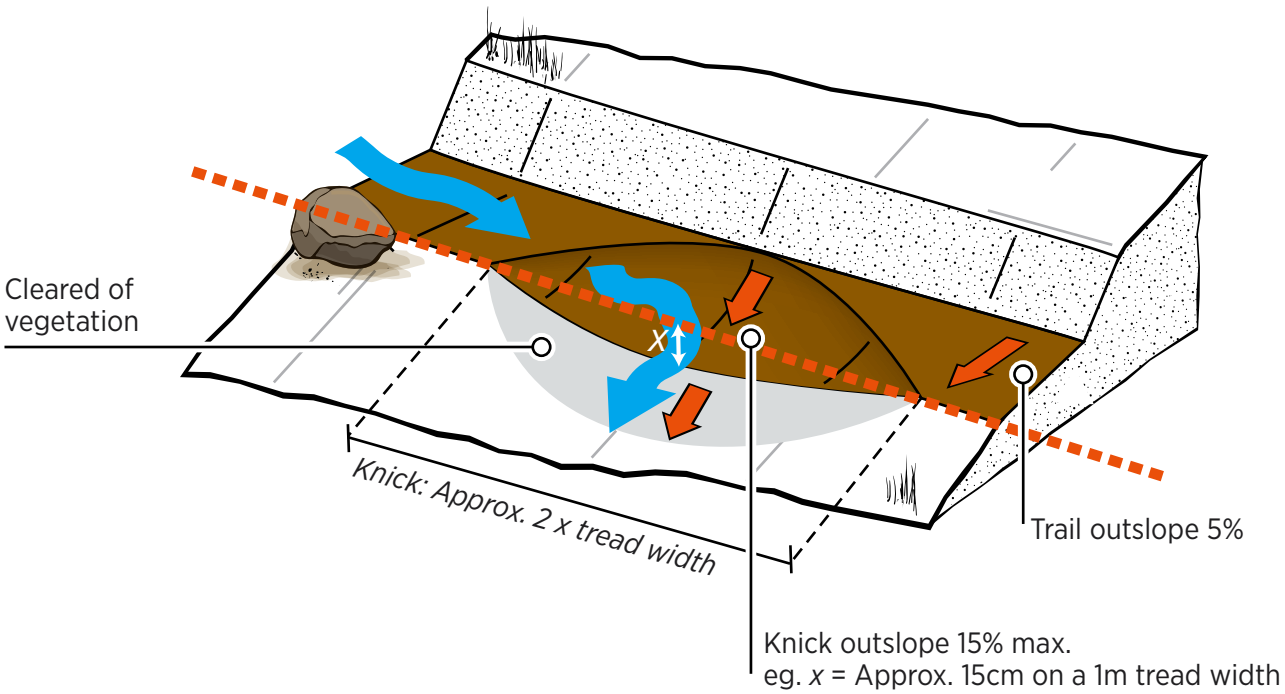


Figure 16: Knicks

Rolling grade dips

Rolling grade dips build on the knick feature, illustrated in Figure 17. The knick is built and followed by a long gentle ramp. The material excavated from the knick is used to create the ramp that reinforces the knick.

The ramp length should be approximately three times the tread width.

Proper placement of a rolling grade dip is essential. A natural roll or change in the trail gradient to be accentuated is the best place and avoid placing rolling grade dips in turns.

Although maintenance is minimal, rolling grade dips need to be cleared out each season and after heavy rain events to clear leaves and silt. They will fill up over time if not maintained and become ineffective.

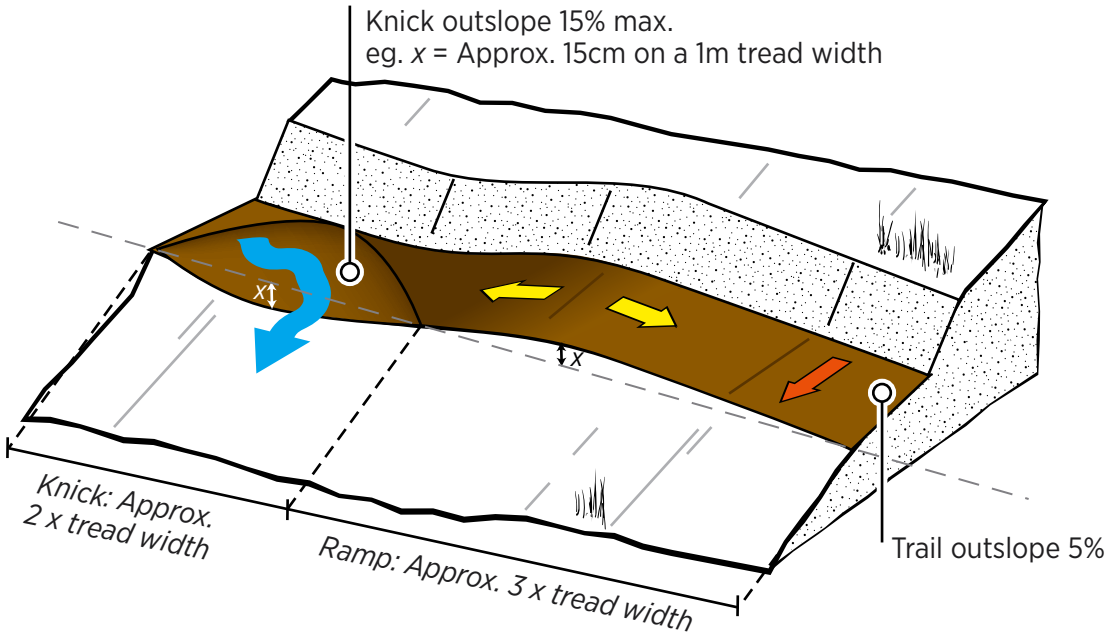


Figure 17: Rolling grade dips

Water bars

A water bar is a raised barrier constructed at an angle across a sloping trail. It catches water running down the trail before it gains momentum, as illustrated in Figure 18.

Only use water bars where other drainage options are not possible as they require frequent maintenance. They can also become a safety hazard, causing a trip or slip. They add cost to the project and timber water bars may be lost in a bushfire.

Water bars can be avoided by re-routing the trail to shallow trail gradients or installing rolling grade dips and knicks.

Water bars may be required where the soil type is very loose or mobile and won't hold rolling grade dips and knicks such as sandy soils or where other treatments are not practical.

Principles

- Assess the space needed for a series of water bars using Table 5 as a guide.
- Choose suitable materials that suit the trail experience such as in-situ material, logs, timber board or stone.
- Angle bars at 30 to 45 degrees across the trail for most situations but this will vary based on slope and soil erodibility.
- Cut the trail tread upslope of the water bar so the water is guided into the drain.
- Extend the water bar beyond the edge of the trail to disperse the water on the downhill side and discourage trail users from going around it.
- Take advantage of existing depressions beside the trail to ensure water sheds freely downslope.
- Ensure a flat surface on top of water bar wherever possible to reduce trip hazards.

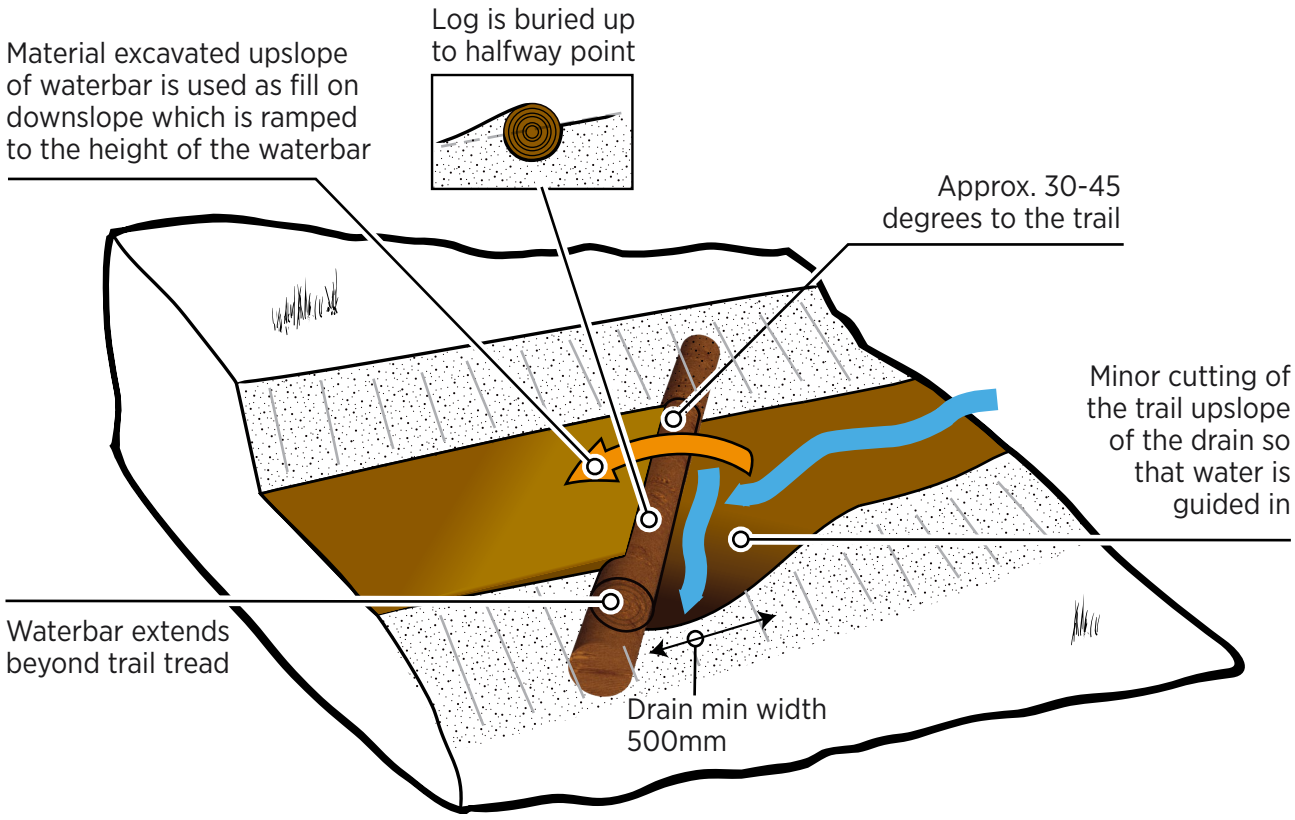


Figure 18: Water bar

Armouring natural drainage lines

Seasonal water courses and drainage lines are common in WA. Rock armouring is one means of preserving the trail tread where sufficient rock is available locally. It also allows trail users to pass through water and wet areas, as illustrated in Figure 19.

Armouring can be applied on the trail in the drainage line, along with the approach and exit. Failing to make the armouring wide enough on the approach and exit is a common mistake.

Stones that will not dislodge are best, framed with larger shoulder rocks and hand-fit tightly together. Aggregate material needs to be packed into the gaps to tighten the formation.

In some soil types, it may be necessary to underlay stones with a base course or geotextile.

A rock spillway downhill of the trail can provide further stability and scour protection where required.

The level of peak seasonal flows and scour potential need to be assessed to determine the armouring dimensions and if a rock-lined spillway is necessary.

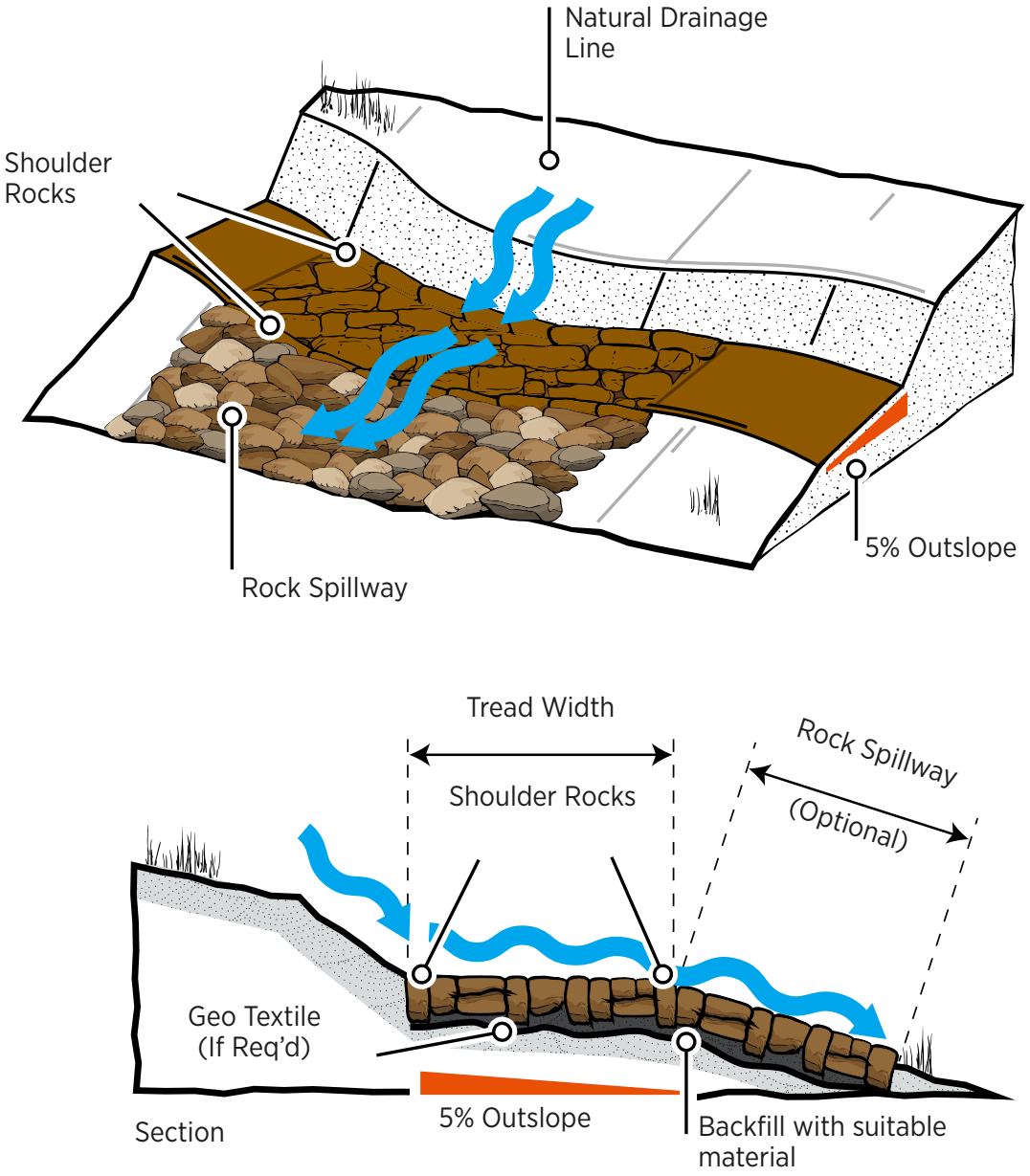


Figure 19: Armouring drainage lines

8. Facilities and structures

Trail experiences generally require more than just the trail itself and are supported by a range of facilities and structures. These are usually needed to keep users safe, reduce impact on values or provide amenity. They can be costly, increase maintenance and have a visual impact.

This section provides principles about the key facilities and structures that might be needed when developing trails, such as overnight accommodation, trailheads, signs, bridges and crossings, stairways, boardwalks, lookouts, small buildings and furniture.

Developing trails using the Trails Development Series will ensure that trails are sustainable and an asset, rather than a liability.

The principles outlined below apply to all stages of the Trail Development Process, from Trail Proposal (Stage 1) to Management (Stage 8).

Appendix A lists Australian standards, other standards and supporting guidelines that will assist in trail projects.

Lane Poole Reserve, Visit Dwellingup. Photo: Sarah Coote.

8.1 Overnight accommodation

Depending on the intended trail experience, accommodating trail users overnight may be an important consideration. Trails that are part of a Trail Town will have access to accommodation.

When planning overnight stays on long distance trails, consider how far hikers will walk or run in a day and the facilities that match the trail experience.

Based on existing long-distance walks across Australia and overseas, independent walkers travel 10-20 kms per day. Supported walkers on guided experiences are generally seeking 10-16 kms per day. Trail runners will cover 15-40 kms per day.

Trails may link to existing accommodation on-route or require new facilities.

Overnight stays should be identified in the Trail Proposal (Stage 1) of the Trail Development Process. If new accommodation sites are needed, their location, design, construction and management will be part of the Trail Development Process.

Independent hikers are often seeking a bush camping experience, away from other campers. They mostly self-cater with tent and cooking facilities.

Depending on the terrain and climate, camp shelters may also be provided to protect users from the elements. Shelters may include bunk beds, cooking facilities and possibly toilets and showers.

Booking systems can be used to ensure there is certainty for trail users and they are not overcrowded. Some long-distance walks have fee systems in place with funds returning to trail management. Online itinerary builders allow users to not only book but calculate distances on longer hikes, such as the Grampians Peaks Trail.

Supported hikers will generally travel with a commercial tour operator or tour guide. They may use facilities provided on the trail or stay at accommodation near the trail. At the high end of the market, operators offer exclusive, luxury accommodation on the trail through an agreement with the landowner or manager, or at accommodation nearby.

Purnululu National Park. Photo: DBCA.

Campgrounds

Existing campgrounds or camp shelters may be linked to a new trail or new facilities may be developed.

Existing or potential sites will be identified in Site Assessment (Stage 3) and refined in the Concept plan (Stage 4) of the Trail Development Process. Further design and construction follow in Stages 6 and 7.

Basic campgrounds with essential facilities may include:

- Tent pads or sites
- Camping platforms
- Fire pits and camp stoves
- Toilet facilities
- Water supply

Depending on the terrain and climate, shelters may also be provided to protect trail users from the elements.

Principles

- Determine the experience, location, size and design features of each campground.
- Determine the level of accessibility required according to the trail experience and trail classification. Campground facilities should be accessible by people with disability wherever possible.
- Consider future growth and means of expansion or managing use.
- Consider the logistics, equipment, materials and skills required for construction.
- Consider mobile phone reception or provision of Wi-Fi at campgrounds where appropriate, for user safety, connectivity and amenity.
- Consider the threat of wildfire and discuss fire protection measures with experts and incorporate into site plan.
- Consider future management responsibilities, maintenance costs and vehicle access, particularly for pumping toilets and filling water tanks.

See Section 8.9 for more information on shelters.

Yonga Walk Trail, Lesueur National Park. Photo: DBCA.

8.2 Trailheads

Trailheads provide a range of functions, as a welcome and starting point of a trail, a gathering space for groups, a point of orientation and trail information and interpretation. Often trailheads will incorporate other facilities such as access to parking, shelter, picnic areas and amenities.

The location, type of trail, user type and volume will determine what is provided at a trailhead. A remote bushwalk trailhead may have a basic orientation sign and toilet. The trailhead for a highly popular day walk may have a parking area, orientation shelter, interpretive displays, toilets, picnic and other facilities.

Trailheads can also be a pivotal site for sharing stories about the landscape, heritage, culture and other interesting aspects of the site. Interpretation is the process of enriching people's experience of a place through storytelling.

Stirling Range National Park. Photo: First Hike Project.

A visitor communication plan or interpretation plan should outline the role of the trailhead.

If events are an important part of a trail project, the site may need to accommodate additional temporary facilities such as staging areas, start-finish areas, portable toilets and first aid posts. Read more in Section 10.2 Planning trail events.

Suitable locations for trailheads are identified in Site Assessment (Stage 3) of the Trail Development Process, and the design determined in the following stages.

Principles

- Locate the trail head so it's easily accessible from roads, park entries and public transport where possible.
- Design the site to meet the needs of the trail experience, including people with disability, considering all functions and ensure they work together.
- Ensure there is adequate parking for intended use and future growth if needed.
- Consider potential impacts on neighbouring residents and businesses, especially traffic and overflow parking in peak times or events.
- Consider security of trail users, vehicles and equipment and improve existing facilities as needed.
- Ensure trails are accessible to trail users, without unnecessary barriers restricting wheelchairs or mobility aids.
- Design appropriate sign structures with relevant information and interpretation, including orientation, safety advice, what to expect, what to take and what not to do.
- Consider the need for shelter, particularly if there are groups of people using the trail.
- Ensure an accessible toilet is located conveniently for visitors.
- Consider the needs, equipment and layout of facilities for events, read more in Section 10 Events.

8.3 Signs

Signs are a necessary part of most trail experiences and are used for:

- Orientation and wayfinding
- Safety and risk
- Management
- Interpretation

Wayfinding is the process of ensuring trail users find the trail, stay on the trail and return safely.

Signs also play a significant role in promotion, marketing and branding. Well-designed signs at trail heads and other significant places provide photo opportunities. These make great memories and help promote trails when used in social media.

Landowners and managers may have established sign systems that are used on lands they manage. Consider this in the Concept Plan (Stage 4) of the Trail Development Process.

Signs on lands managed by DBCA's Parks and Wildlife Service must meet corporate standards and be endorsed by the department's Visitor Communication Unit.

Ngajarli Rock Art Boardwalk, Murujuga National Park. Photo: Fuzz Digital.

Principles

- Align and design the trail to reduce the number of signs and their visual impact. Effective trail design and sign planning are the key to achieving more with less.
- Ensure all key stakeholders — users, landowners, managers and peak bodies are engaged in sign planning.
- Think message first. For each site or larger area that you are planning for, there will be key locations where visitors need messages to get their bearings, find their way, stay safe, be suitably prepared, know how to act in a way that protects the 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 and decide what the messages are and where they need to be.
- Consider international symbology to convey messages.
- Ensure the needs of trail running are considered where appropriate, particularly information about elevation.
- Choose materials for signs that are compatible with the rest of the trail design and are considered as a package, not in isolation.
- Choose materials and fixings for longevity, skills available for construction, fire resistance and maintenance requirements.
- Consider these factors in choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.
- Ensure built materials do not shed or emit damaging chemicals, fibres or other elements into the surrounding environment.

Read Section 6.5 for more on visitor communication.

8.4 Water crossings

Crossings over creeks, rivers and wetlands are control points and a critical element of trail design. The type of crossing that may be required will be influenced by the trail experience and trail classification, user demand and environment.

Water crossings may make the trail exciting for trail users. However, they can be challenging, costly to build, negatively impact natural and cultural values and add to the cost of maintenance.

Use of stepping stones, fords, culverts or bridges depends on the scale of the crossing and trail experience being developed.

Waterways have important cultural significance for Aboriginal people so ensure that appropriate engagement is undertaken.

Creating a safe and sustainable crossing is best undertaken with professional advice and engagement with engineers, landscape architects, architectural designers and trail builders.

Principles

- Design crossings that fit the character and trail classification of the trail, do not alter the flow of the water course, are cost effective but have longevity and require minimal maintenance.
- Ensure that seasonal water levels and flood events are understood and crossings are planned accordingly without impeding water flow.
- Consider a rest area off the trail and outside the floodway if the water course is impressive and the trail is busy, reducing the risk of environmental damage to banks.
- Keep crossings as low as possible to reduce engineering and structural intervention, fall heights, need for handrails and visual impact.
- Carefully choose the crossing location and design the approaches to ensure appropriate management of water, preventing erosion and sedimentation.
- Align crossings perpendicular to the stream or road where possible.
- Descend and climb out of the crossing at no more than 8% (1 in 12) gradient and be guided by the trail experience and trail classification.
- If the trail enters and exits the crossing on a fall line, it may dump water and debris into the stream or onto the road.
- Grade reversals should be designed on both sides of the stream crossing approach. This will prevent large volumes of water and sediment from flowing down the trail into the stream.
- Reduce the speed of the trail user when nearing the crossing, particularly on shared trails, by corralling or creating corners.
- Confirm the approvals process and jurisdiction for crossing significant water courses, such as rivers.
- Obtain relevant permits and approvals prior to construction activities adjacent to or within waterways and foreshore areas.

Location of crossings need to be considered in Site Assessment (Stage 3) and Corridor Evaluation (Stage 5) of the Trail Development Process.

Once the alignment is determined, details on how the crossings are to be developed will be further considered in Detailed Design (Stage 6) and specified in Construction (Stage 7).

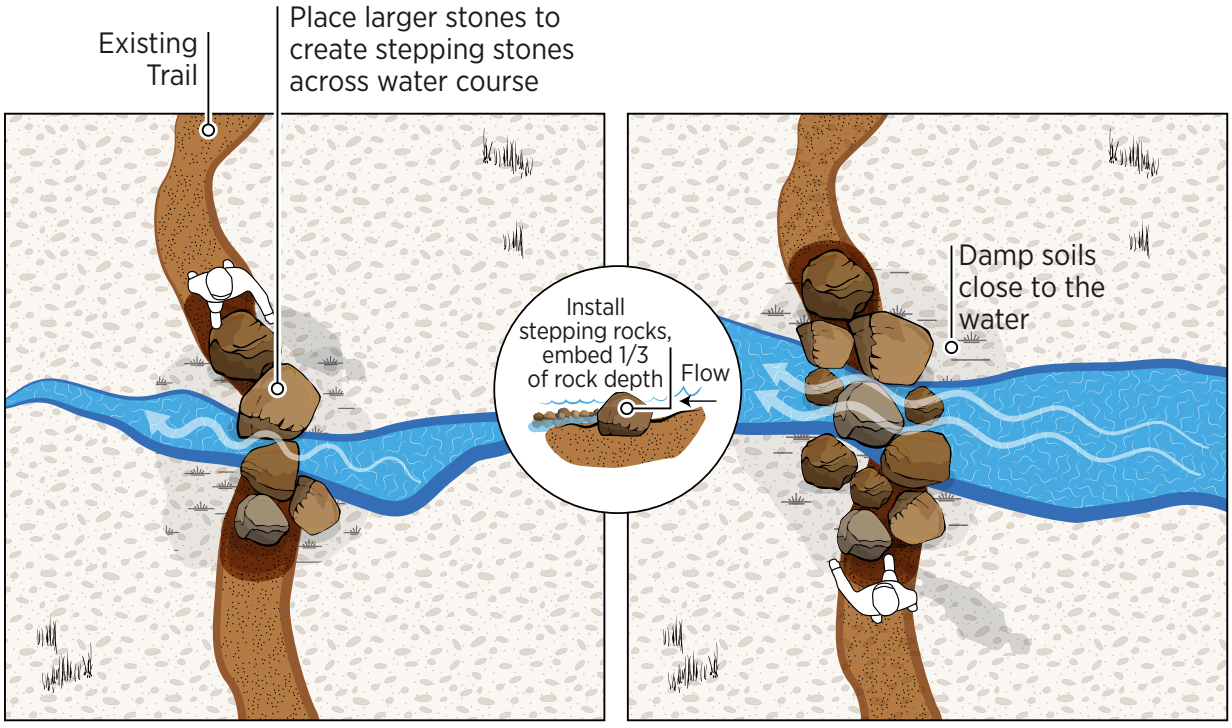
Stepping stones

Stepping stones may be a robust solution in the right location, as illustrated in Figure 20. They can provide a relatively natural experience particularly if stones from the surrounding area can be used.

Stepping stones needs to be consistent with the trail experience and trail classification and will not be suitable for Class 1 or 2 trails. Read Section 11 for explanation of walking trail classifications.

Principles

- Install on rivers and creeks that are shallow in depth, slow flowing and not prone to flooding.
- Allow water to move freely around stones without obstruction.
- Tie the crossing back to the trail by providing additional stones at either edge of the water to help avoid erosion.
- Embed one third of the stepping stones into the ground or creek bed.
- Ensure environmental or cultural values are not compromised by moving stones or impeding water flow.



Typical smaller stone water crossing

Typical larger stone water crossing

Figure 20: Stepping stones

(Source: adapted from Grampians Peaks Trail, Infrastructure Design Manual, 2012)

Fords

Fords are generally suitable for slow water velocity and across shallow sections of a stream. Low stable banks and streambed are also important.

To create a ford, stones are sunk at grade to make both the stream bed and the approaches more durable, as illustrated in Figure 21.

They can be long-lasting, maintaining a natural look and minimising interference with water movement, sediment and aquatic life.

On the downside, trail users get wet and there are risks of slips, trips and falls. They may adversely affect the water quality if poorly constructed or used in areas with a high-level trail volume. Disturbance to the substrate may impact macroinvertebrates and other wildlife.

Fords need to be consistent with the trail experience and trail classification and will not be suitable for Class 1 or 2 trails. Read Section 11 for explanation of walking trail classifications.

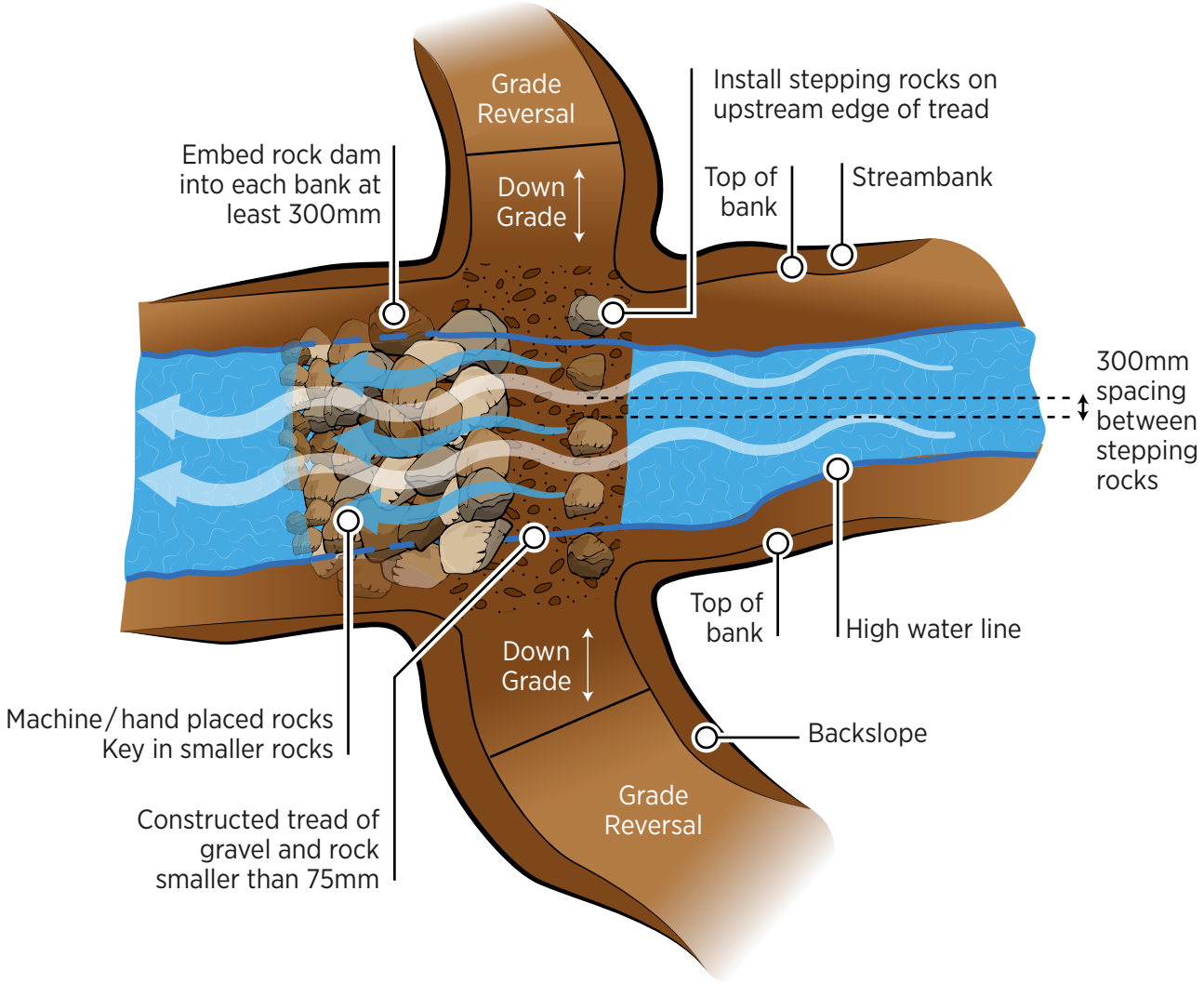
Principles

- Armour both entry and exit of the crossing to protect water quality and harden banks against erosion.
- Ensure the armouring on shared trails with mountain bikes is extended at least one bike length on both sides of the ford.
- Use stones that won't dislodge and underlay with gravel, cobble or geotextile to stabilise where needed[34].

34 Trail Solutions, *IMBA's Guide to Building Sweet Singletrack,* 2004

Cronan Creek Falls Trail, Mt Barney National Park. Photo: Adventurous Women.

PLAN VIEW



SECTION VIEW

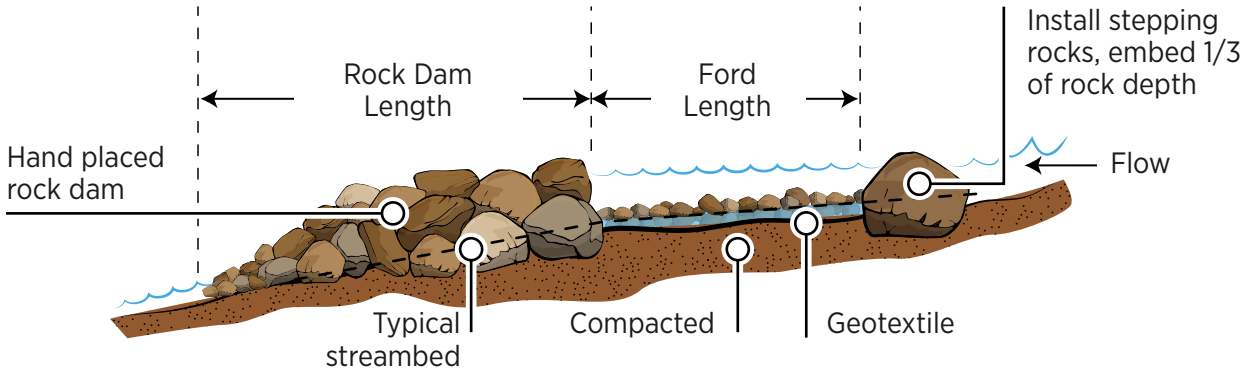


Figure 21: Fords

Culverts

Culverts are ideal for crossing small waterways with minimal flow volumes and small, predictable flood peaks, as illustrated in Figure 22.

They are low cost, robust, not prone to fire damage and easy to install. Lightweight pipes can be carried in for remote trail locations.

On the downside, they require ongoing maintenance to keep them free flowing and free of debris. Poor construction or lack of maintenance can lead to washout in high flows.

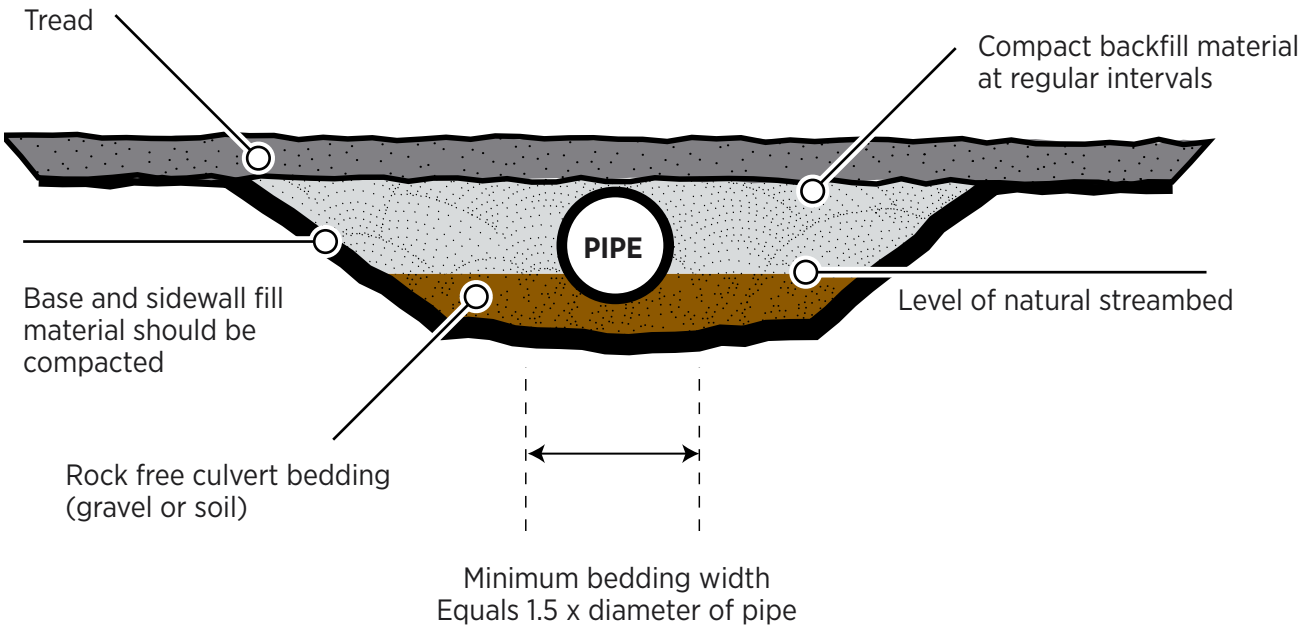
Culverts may be the most cost effective and durable option where the trail shares a crossing with a vehicle track.

In selecting the gauge of the pipe, consider who will be keeping it clear and what tools they will have. A culvert is going to be much easier to maintain if the pipe is of an appropriate diameter that you can get a shovel into it.

Principles

- Choose concrete or metal pipes where loss from bushfire is possible.
- Size culverts and pipes according to the catchment area and rainfall.
- Seek expert advice if vehicles are crossing the culvert.
- Locate the pipe at a depth to collect the water with sumps on the upstream side to collect sediment and armoured on the downside to prevent scouring.
- Armour the culvert headwall with large rock for additional protection if needed.
- The sediment sump depth should be greater than or equal to the diameter of the pipe.
- Establish ongoing inspection and maintenance program and responsibilities.

SECTION VIEW



ELEVATION VIEW

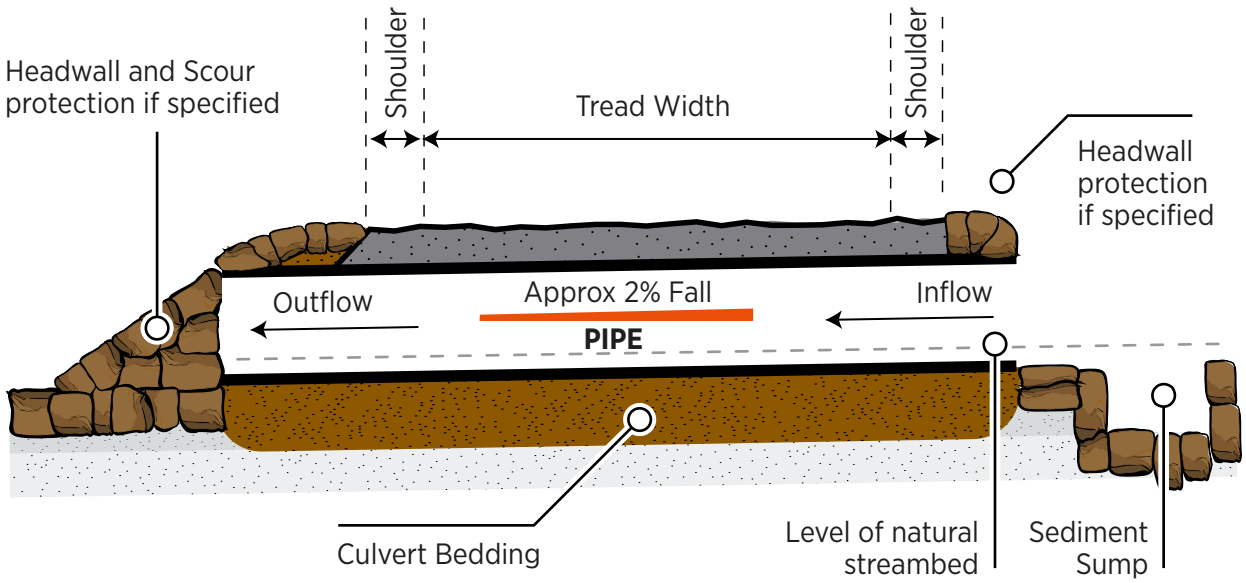


Figure 22: Culverts

Bridges

The trail alignment should avoid crossing major waterways wherever possible, but if this is unavoidable, bridges provide a solution.

Bridges are an exciting addition to a trail experience however they are expensive to install and maintain and can result in significant landscape, environmental and cultural impacts.

The trail experience and trail classification will direct the design and construction when a bridge is required.

If more than one bridge is required on a trail, consider developing a modular design that can be modified to suit.

DBCA's Parks and Wildlife Service has developed engineer-certified modular cycle and pedestrian bridges and boardwalks that assist in reducing construction timeframes and costs.

Specialist advice should be engaged, including architectural designers, structural engineers and landscape architects, to ensure compliance with relevant standards and building codes.

Principles

- Design bridges that fit the trail experience and trail classification.
- Ensure the structure is cost effective, built for longevity, fire resistance and minimal maintenance.
- Locate the crossing where there will be least disturbance to natural and cultural values.
- Ensure the structure does not alter or impede the flow of the water course.
- Understand flood events and design structures for future changes in flow.
- Consider construction logistics when designing structures.
- Secure appropriate funding given the high initial outlay and ongoing maintenance costs.

Noolbenger Trail, John Forrest National Park. Photo: DBCA.

8.5 Road crossings

Road crossings should be avoided wherever possible but may be unavoidable. They create a source of conflict between users but can also be a point of access for users, maintenance and emergency services.

On determining that a road crossing is needed, it's important to identify the correct road manager and consult early in the process.

Road speed and traffic volume will dictate the crossing design, sight lines and signs required for the crossing point.

Specialist advice should be engaged, including engineers and designers, to ensure compliance with relevant standards and approvals processes.

Principles

- Carefully choose the crossing location and design the approaches to ensure appropriate sightlines.
- Cross roads at a point that allows both trail and road users a clear view and clearly signpost the crossing for both road and trail users.
- Align crossings perpendicular to the road where possible.
- Descend and climb out of the crossing at no more than 8% (1 in 12) gradient and be guided by the trail experience and trail classification.
- If the trail enters and exits the crossing on a fall line, it may dump water and debris onto the road.
- Grade reversals should be designed on both sides of the crossing approach to prevent large volumes of water and sediment from flowing down the trail onto the road.
- Reduce the speed of the trail user when nearing the crossing, particularly on shared trails, by corralling or creating corners.

Location of road crossings need to be considered in Site Assessment (Stage 3) and Corridor Evaluation (Stage 5) of the Trail Development Process.

Once the alignment is determined, details on how the crossings are to be developed will be further considered in Detailed Design (Stage 6) and specified in Construction (Stage 7).

8.6 Steps, stairways and ladders

Trail alignments that follow natural landforms are more sustainable and minimise the need for complex structures.

Steps and stairways are used where the trail alignment needs to traverse gradients that are too steep to meet the average trail gradient less than 10% (1 in 10), as explained in Section 7.1. Ladders are only used where a trail needs to be aligned in almost vertical locations.

These structures add to project timelines, construction costs and ongoing maintenance expense as well as create visual impact. Steps are also problematic for Adaptive Trail Riders and other wheeled devices for people with disability.

A **step** consists of a riser and a tread and creates a surface on which to place one's foot when moving from one level to another. The vertical is called the riser and the horizontal part is called the tread.

A **stairway** has more than one step, with or without landings, that provides access from one level to another.

Stairway structures are elevated above the ground to provide access and minimise impacts.

Construction of steps and stairways may require approvals and permits when adjacent to waterways, wetlands and foreshore areas.

The trail experience and trail classification will influence the design and construction of these structures.

Appendix F provides more detail about steps and stairways.

Design principles

- Maintain uniformity over a site, especially in riser heights and tread widths, and consistency along the trail where possible.
- Determine number of steps in a flight as well as location and size of landings in line with the trail classification.
- Maintain riser heights between 150-250mm.
- Avoid a single step. Build at least two or three steps as the level change is more easily seen.
- Choose suitable in situ or imported material that is readily available, easy to maintain and suits the landscape.
- Ensure that steps are wide enough and tied into the banks on each side where possible, reducing wear on the sides.
- Add handrails if appropriate down one or both sides or in some cases, down the middle of the stairway so that visitors can choose their preferred side.
- Consider a colour contrast or nosing treatment on stairways to ensure each step is obvious.
- Locate seats on the landings of long stairways.
- Choose materials and fixings for longevity, skills available for construction, fire resistance and maintenance requirements.
- Consider these factors in choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.
- Ensure built materials do not shed or emit damaging chemicals, fibres or other elements into the surrounding environment.

Beam steps

Beam steps use a beam as the riser, or step front, and surface material as the tread as illustrated in Figure 23.

They work well when the gradient allows a longer tread width. They are easy to align around curves and fit in well with the landscape when designed and built well.

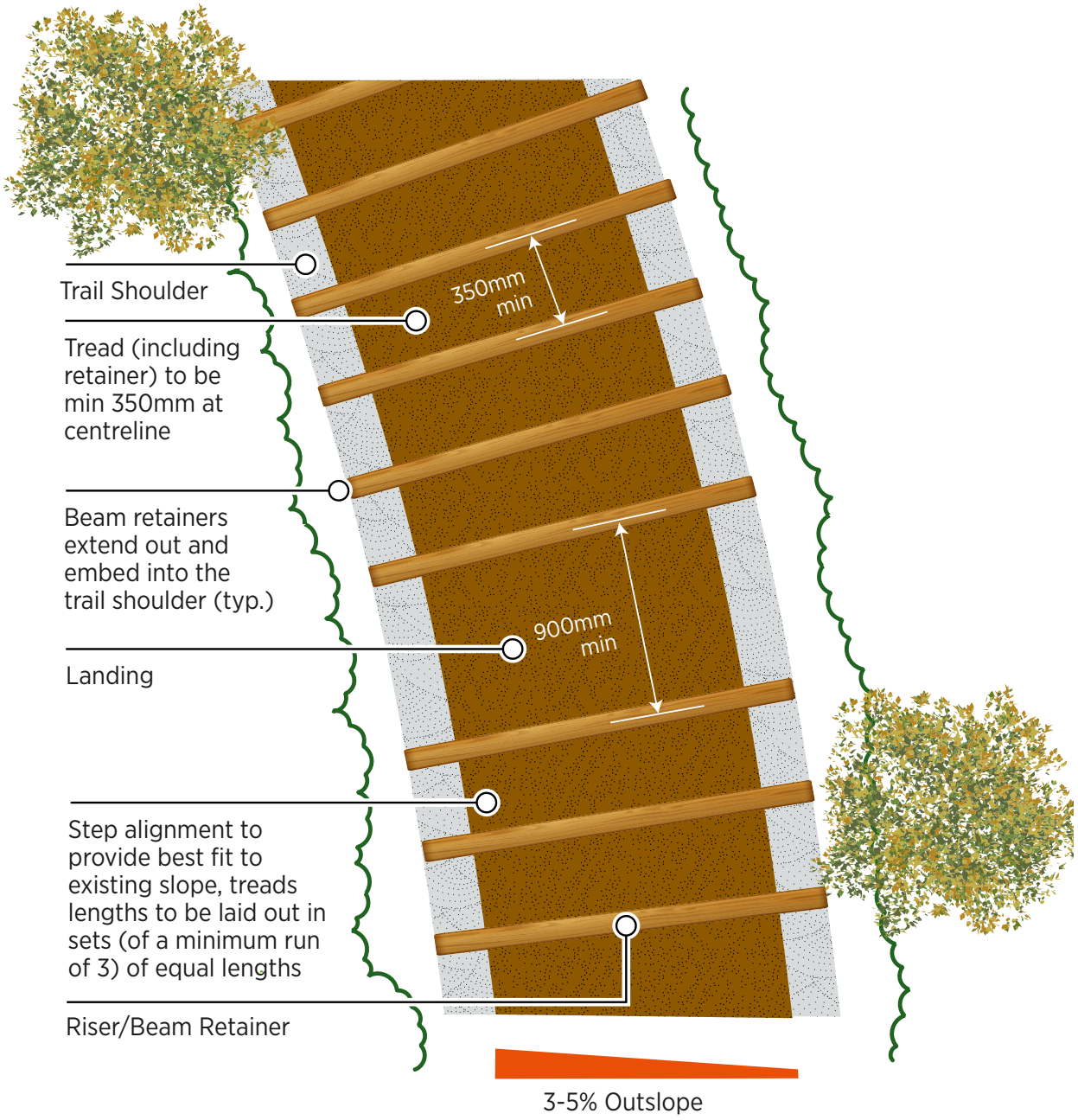
Beam steps are not always easy to get right as they require attention on the shoulders to ensure the beams are buried properly or anchored with a hard edge.

Principles

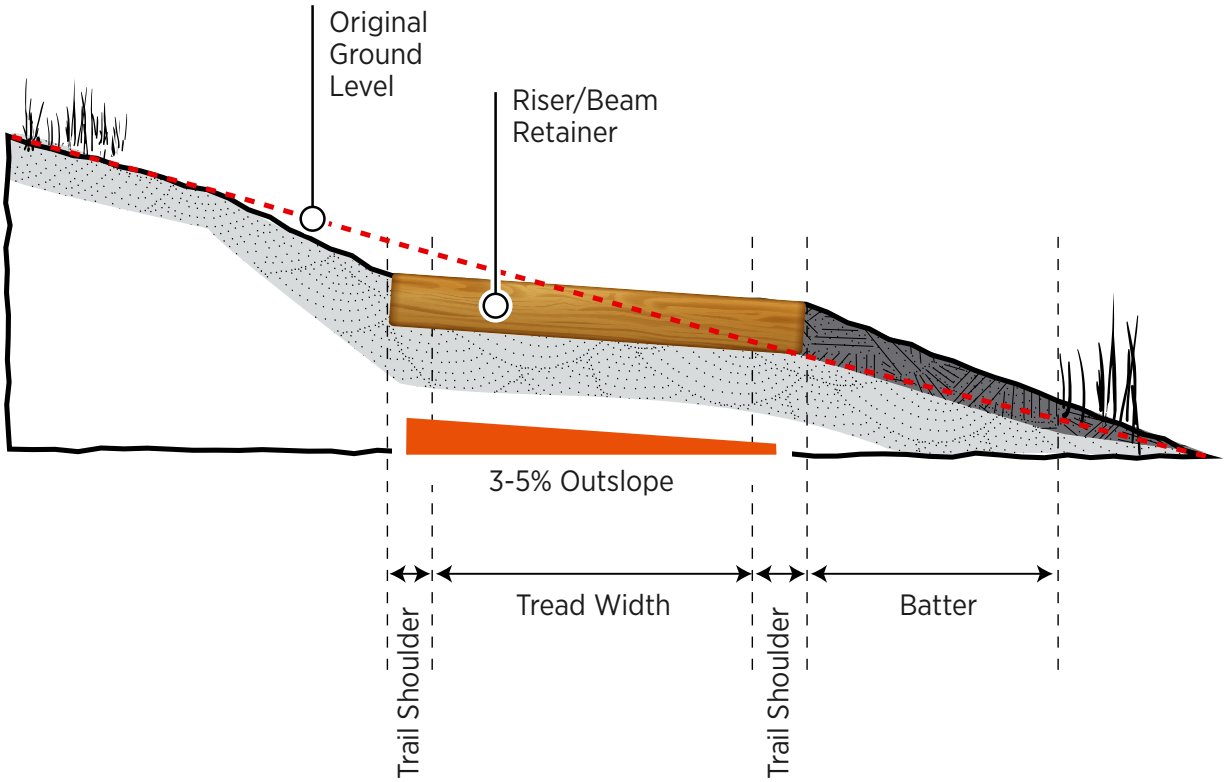
- Design to allow the user to negotiate each step with alternate legs, keeping a good rhythm.
- Carefully consider surface material to ensure it is durable, meets user volume and does not create a slip hazard.
- Extend the riser beyond the trail width and bury in the shoulder of the trail, or anchor with a hard edge to reduce erosion and wear-away.
- Stabilise the shoulder and batter to reduce erosion and create a finished appearance.
- Secure the beam with a bar or rod, as illustrated in Figure 23 cross section, or from behind for safety and aesthetics.
- Outslope treads 3% to 5% (1 in 33 to 1 in 20) to shed water, reducing potential for ponding and erosion.
- Consider track pad to infill the tread to reduce erosion and compaction if appropriate.

Jarrahdene Campground, Leeuwin Naturaliste National Park. Photo: DBCA.

TYPICAL PLAN



TYPICAL SECTION



DETAIL SECTION

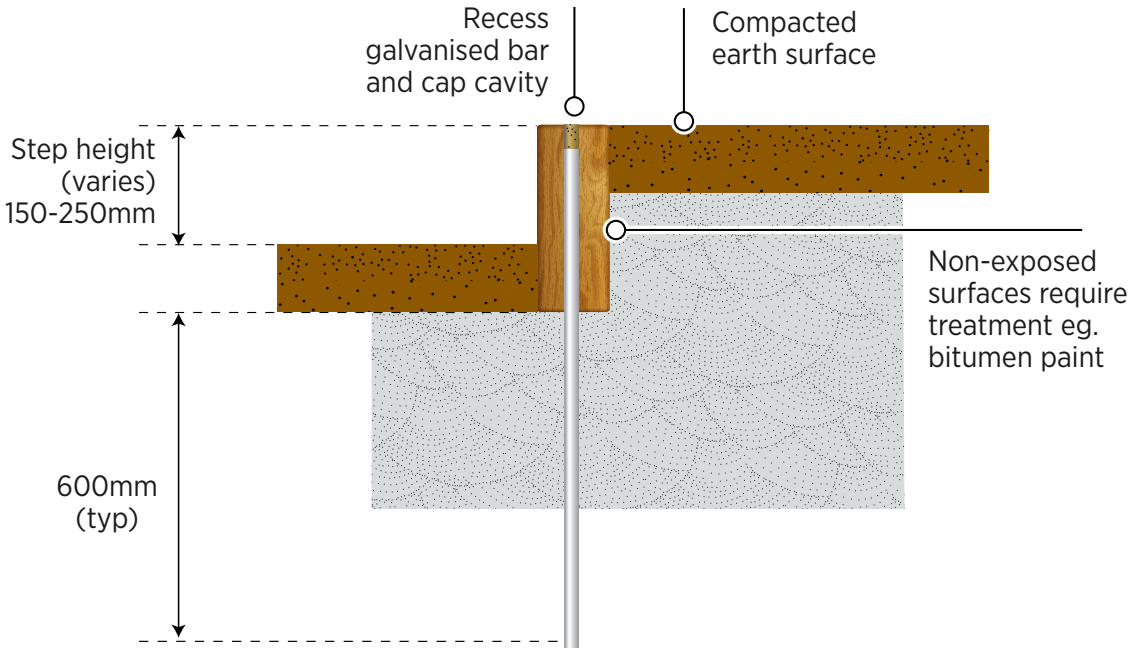


Figure 23: Beam steps

Box steps

Box steps are an enclosed step structure that contains soil or imported fill and sits partly above the surrounding ground level, as illustrated in Figure 24.

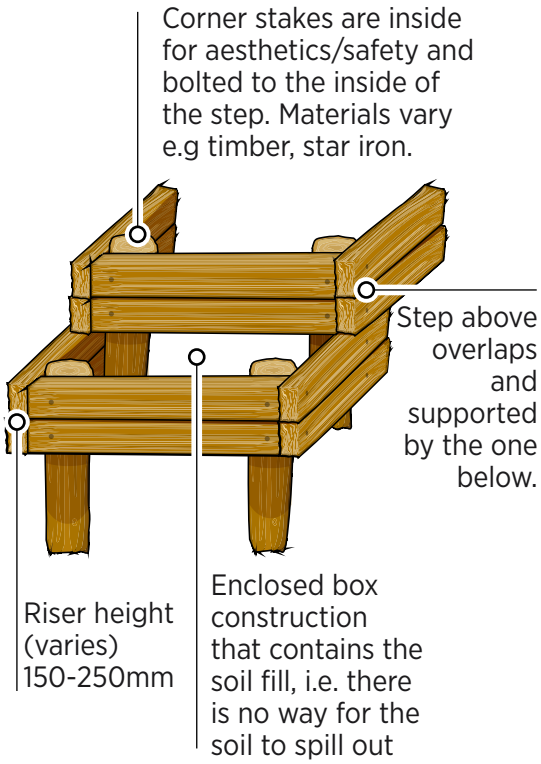
Box steps ensure the tread soil is contained within the box and does not spill or erode out the sides. They also allow drainage to be effectively redirected across the steps and downslope so it does not run down the steps and accumulate.

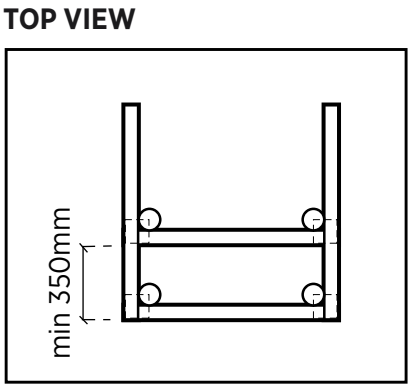
Box steps are used when it is impractical to set the riser into the surrounding soil, or where the soil or imported fill cannot be contained in beam steps.

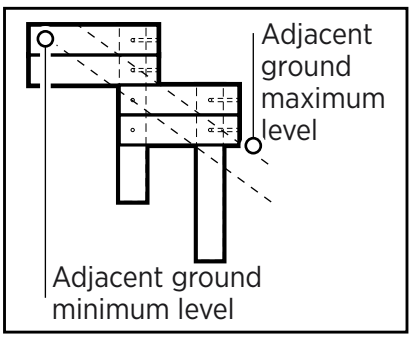
This type of structure can have significant visual impact so be mindful of alignment, material choice, finishing off and grooming the surrounds.

Principles

- Work with the grades to determine tread length parameters, with a minimum of 350mm and a consistent riser height no higher than 250mm.
- Apply a slight outslope to the step treads, or crown if the steps follow the fall line.
- Design them to allow the user to negotiate each step with alternate legs, keeping a good rhythm.
- Carefully consider surface and fill material to ensure they are durable, meet user volume and do not create a slip hazard.
- Site the structure so the fill cannot leak out of the box and relates to the adjacent ground level, illustrated in the side view in Figure 24.
- Hide fixings internally for safety and aesthetics.
- Consider using soil stabilisers or tread treatment to improve durability if using unstable soil or fill.
- Add stone, rock, timber or hard material at the base of steps to prevent compaction and erosion.







Dimensions vary depending on the site & materials used

Figure 24: Box steps

Stone steps

Well designed and built stone steps are very attractive, extremely durable and expensive to install. This is a specialty skill that is well worth the effort, in the right location.

The aim is to create a very natural feel as the stone wraps around existing rocks and vegetation anchoring the trail into the landscape, as illustrated in Figure 25.

Trail builders may use a variety of techniques depending on the materials available.

Local stone sourced on-site is the most appropriate if it is environmentally and culturally acceptable, ensuring the work fits in to the landscape.

The trail experience and trail classification will influence the design and construction of stone steps.

Principles

- Create steps from solid stone, using minimal mortar where needed.
- Determine tread length based on the grades.
- Vary step height as needed, aiming to be in the range 150-250mm, as consistent as possible and aligned with the trail classification. Cut steps into the slope wherever possible, rather than having them protrude above the original landform.
- Slope treads at 2% to 4% (1 in 50 to 1 in 25) to prevent water pooling on the tread reducing potential for erosion.
- Take advantage of natural cross-slope and angle steps diagonally to the slope to ensure sufficient crossfall on all step treads and watershed across the trail.

Castle Rock Walk Trail, Porongurup National Park. Photo: DBCA.

Nancy Peak Trail, Porongurup National Park. Photo: DBCA.

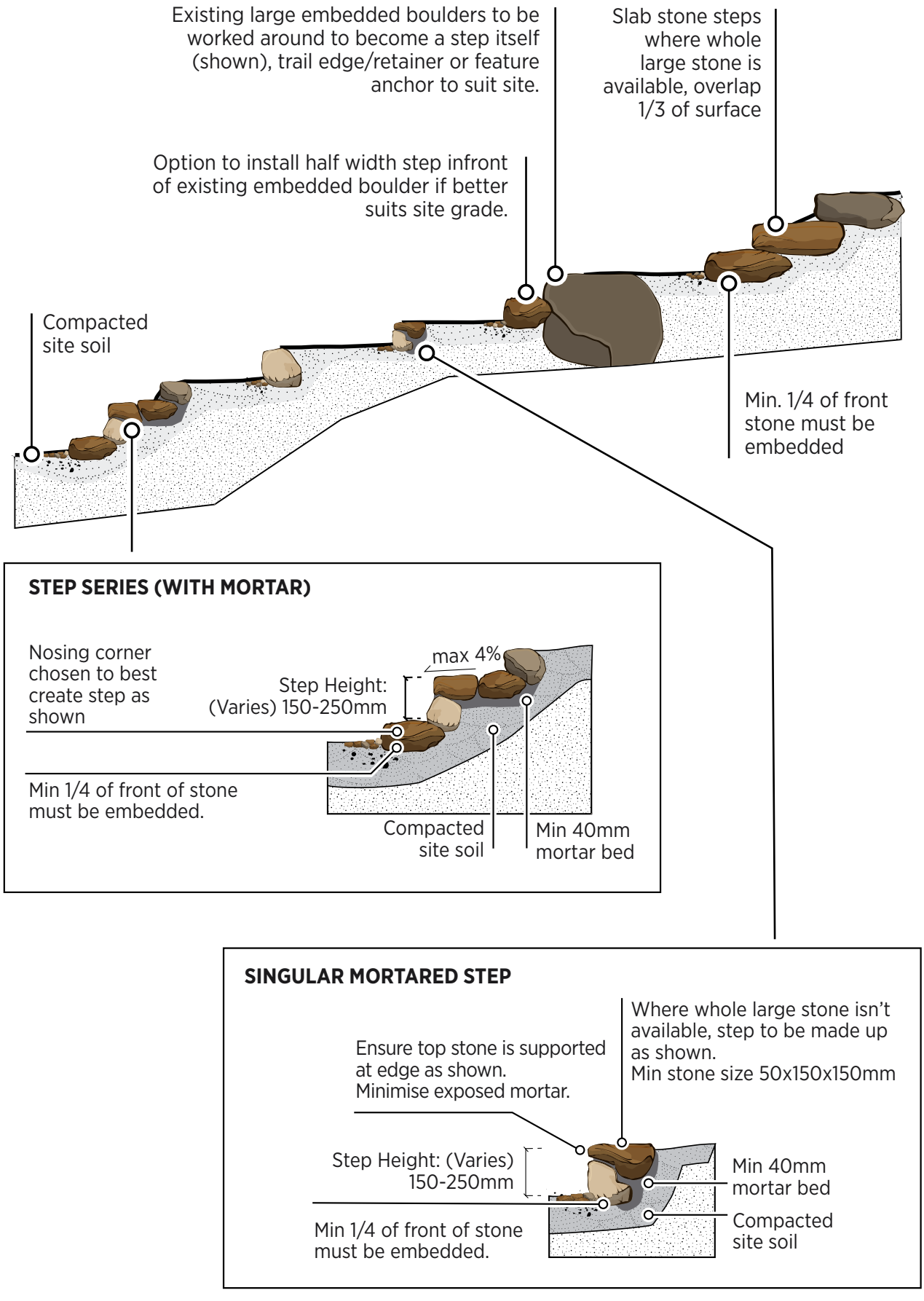


Figure 25: Stone steps

Stiles

Stiles may be a suitable means for crossing fences where a gate is not appropriate or possible. An example may be a situation where it's important gates are not left open.

They are mostly suitable on trail Class 3, 4 and 5, given accessibility needs.

Specialist advice needs to be engaged to ensure stiles meet appropriate standards.

Ladders

Ladders are appropriate in the right situation. The trail experience will determine the appropriateness and suitable design as they do not fit neatly into the trail classification. They are not suited for Class 1, 2 or 3 trails.

They are expensive to install and maintain and can result in increased risks to visitor safety if not used as intended. The structure is also likely to require regular inspection by certified engineers.

Specialist advice needs to be engaged, including landscape architects, architectural designers, geotechnical and structural engineers, to ensure the design, specifications and construction meet appropriate standards and building codes.

Hancock Gorge, Karijini National Park. Photo: Amanda Smith.

Stairway structures

Stairway structures are elevated above the ground to provide access and minimise impacts.

Stairway structures are most appropriate in the following situations:

- High impact or hazardous areas, special interest or focal points.
- Fragile terrain, erodible soils, river banks, steep slopes or dunes.
- Areas of high cultural or heritage values.
- Areas with sensitive or threatened flora or fauna such as rare species, root zones and wildlife corridors.

They are expensive to install and maintain and the visual impact can be significant.

When designing and building a stairway structure, consider water, wind, tidal action, changing sea behaviour and rain to ensure that the structure does not cause erosion under and around itself.

The choice of material will depend on many factors, including durability, maintenance, appearance, trail experience and trail classification. They can be built from a variety of materials including timber, steel, recycled plastic, fibre-reinforced plastic (FRP) or a combination.

Sacrificial ends can be designed on structures at beaches or fast flowing rivers prone to flooding. This allows the end to be taken in storms and surges with less damage to the whole structure.

Specialist advice needs to be engaged, including architectural designers, geotechnical and structural engineers and landscape architects, to ensure compliance with relevant standards and building codes.

Principles in Section 8.6 Introduction and Sections 8.7 and 8.8 for boardwalks, lookout and viewing platforms are relevant for stairway structures.

Salmon Holes, Torndirrup National Park. Photo: DBCA.

Lane Poole Reserve, Dwellingup. Photo: DBCA.

8.7 Boardwalks

Boardwalks are elevated structures used to minimise impacts on environmental, cultural or other values.

They are most appropriate for:

- Marshy or boggy areas or wetlands.
- Fragile terrain or soils, erodible soils, steep slopes or dunes.
- Sensitive flora or fauna, rare species, root zones and animal passage.
- High impact or hazardous areas, special interest or focal points.
- Crossing creeks and gullies where a bridge is not required.
- Where uniform gradient is required and the landform does not allow it.

The trail experience and trail classification will also direct the decision on providing a boardwalk to maintain gradients or accessibility.

Although boardwalks are an exciting addition to a trail experience, they are expensive to install and maintain and can have serious impacts if poorly planned and constructed.

In all instances, consider first if a boardwalk can be avoided if the trail was re-aligned or another surface material chosen.

Specialist advice needs to be engaged, such as landscape architects, architectural designers, geotechnical and structural engineers, to ensure compliance with relevant standards and building codes.

Lake Thetis, Nambung National Park. Photo: Jeremy Flynn.

Location and alignment principles

- Design alignments that fit into the natural landform and landscape characteristics, keeping the structure subordinate to the natural surroundings.
- Avoid long straight sections combined with lots of curves and corners on a boardwalk with no rails, as people can walk off the edge.
- Design and locate structures as part of an overall plan to integrate with the site and not be designed in isolation.
- Consider the ease of access to build and maintain when choosing design and construction techniques and materials.
- Check if boardwalks require approvals and permits when adjacent to waterways, wetlands and foreshore areas.

Design principles

- Keep the structure as low to the ground as possible to avoid having to install handrails.
- Determine need for kick kerbs and rails based on height above ground, fall assessment and trail classification.
- Determine width based on user group, numbers of visitors, landscape character and specific site conditions. Wider structures tend to feel safer for visitors.
- Ensure a smooth transition from the trail onto the boardwalk, without a step or lip to trip people or limit access.
- Consider seats on long sections of boardwalks or as an additional feature to encourage visitors to stop and enjoy the surrounds.
- Assess risks and hazards that could potentially damage the structure, such as vandalism, falling rocks or trees, storm surges or floods.
- Evaluate fire risks and recovery of the structure in event of wildfire.
- Ensure that maintenance needs are kept as low as possible, accepting that this may involve a higher capital construction cost.

Materials and fixtures principles

- Consider the variety of available materials such as timber, recycled plastic, fibre-reinforced plastic (FRP), galvanised and stainless steel.
- Choose materials that are compatible with the rest of the trail design and considered as a package, not in isolation.
- Choose materials and fixings for longevity, skills available for construction, fire resistance and maintenance requirements.
- Consider these factors in choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.
- Ensure built materials do not shed or emit damaging chemicals, fibres or other elements into the surrounding environment.
- Explore alternative materials and surface treatments for slipping, including mould inhibitors, painting and preservative treatments if needed.
- Check for acid sulphate soils, particularly in wetland areas and ensure materials and fixings are appropriate.

8.8 Lookouts and viewing platforms

Lookouts and viewing platforms provide a safe place for people to enjoy the views, rest and take photos. These are designated safe areas to protect visitors, the environment and other values whilst allowing the best viewing opportunities.

Managing visitor risk is of prime consideration. If a trail user cannot capture the best view, they may put themselves in an unsafe position increasing their risk of injury or death.

Lookouts are often a highlight of a trail user's experience. They can be as simple as a handrail on the trail designating a place to stop. They can also be more complex with retaining walls, handrails, terracing or platforms, with cantilevers over an edge.

It is preferable to build lookouts on and into the natural ground wherever possible. This reduces construction and maintenance costs and limits landscape and other impacts.

Building above the ground is appropriate in the following situations:

- High impact or hazardous areas, special interest or focal points.
- Fragile terrain or soils, erodible soils, steep slopes, dunes, cliff edges and riverbanks.
- Sensitive flora or fauna, rare species, root zones and wildlife corridors.
- Where a lookout cannot be built into the landform without unacceptable impacts.

Built structures are expensive to install and maintain and can have significant impacts on landscape, environmental and cultural values.

However, they are an important management tool to ensure trail users gain an enjoyable experience without undue safety risk or damage to values.

Specialist advice needs to be engaged, such as architectural designers, landscape architects and geotechnical and structural engineers, to ensure compliance with standards and building codes.

Z Bend Lookout, Kalbarri National Park. Photo: Tourism WA.

Principles

- Consider the intended trail experience and trail classification to manage visitor risk including the need for railings.
- Determine the capacity required for the expected visitor use, numbers and size of groups, including the space needed for wheelchair users.
- Make sure the location and design allow people to see to the desired view point, such as where the waves crash on the shore or cliff. Without this, people may put themselves in danger to see to the desired viewing points.
- Provide seats to encourage stopping and staying for some time if it's appropriate and doesn't cause congestion and conflict with other users.
- Consider split level surfaces, an accessible raised area, or wider areas to allow people in wheelchairs and those of short stature to see over railings.
- Consider the average eye height for someone in a wheelchair is 1220mm compared with the average eye height of a standing person which is 1550mm.
- Consider construction logistics if working at height or on fragile ground.
- Carefully consider the surface material of a lookout and if appropriate use natural rock or earth if available and appropriate.
- Choose materials and fixings for longevity, skills available for construction, fire resistance and maintenance requirements.
- Consider these factors in choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.
- Ensure built materials do not shed or emit damaging chemicals, fibres or other elements into the surrounding environment.
- Determine geotechnical assessment requirements if located on the edge of cliffs or other geological feature that requires assessment.

Beedelup National Park. Photo: Frances Andrijich.

8.9 Small buildings and furniture

Hiking trails may require small buildings and furniture to support them. These are an integral part of the trail experience and need to be designed as part of the trail planning process, not as an afterthought.

They can be expensive with a significant visual impact – so it's important to get them right.

They may include tables and seats, handrails, barriers and fences, toilets and ablutions, shelters, camp kitchens, camping or tent platforms and water tanks.

Principles

- Ensure furniture and small buildings are designed and located as part of an overall plan to integrate with the trail design and trail classification.
- Design all structural elements to be integrated and complementary in design, form, line, colour and materials.
- Determine the level of accessibility that is required according to the trail experience and trail classification to guide design decisions.
- Design small buildings and furniture to accommodate people with disability to ensure all trails are inclusive.
- Consider the measures needed to ensure user safety, security and deal with vandalism if prevalent.
- Ensure that maintenance and service needs are appropriate to the site and considered in the trail management plan.
- Consider choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.

All small buildings should be designed by qualified professionals such as architects, engineers and landscape architects who can ensure the design and construction conform with appropriate standards and building codes.

Lake Muir Nature Reserve. Photo: DBCA.

Furniture

Type and style of furniture will be influenced by the trail experience, classification, significance hierarchy, user groups and volume, landscape character, maintenance, budget and site conditions.

Trails may need tables, seats, benches or rubbish bins. Multi-functional structures, such as a seating wall that assists water management, helps reduce potential clutter on the trail.

Incorporating furniture into other structures like boardwalks or lookouts where appropriate, reduces clutter and expense. Furniture can also incorporate artwork, visitor messaging or interpretation.

Existing site features can be used for informal seating and resting, such as larger rocks and rock shelves, where it meets the trail classification.

Seats provide excellent opportunities for a rest and somewhere to enjoy the landscape, view and features. They are also an important part of accessibility needs and will be influenced by the trail classification.

Enclosed landscapes, with diverse vegetation patterns, will generally absorb built structures with minimum visual impact. Exposed and horizontal landscapes with little vegetation require significantly greater attention to design and detail to ensure they do not create visual or other impacts.

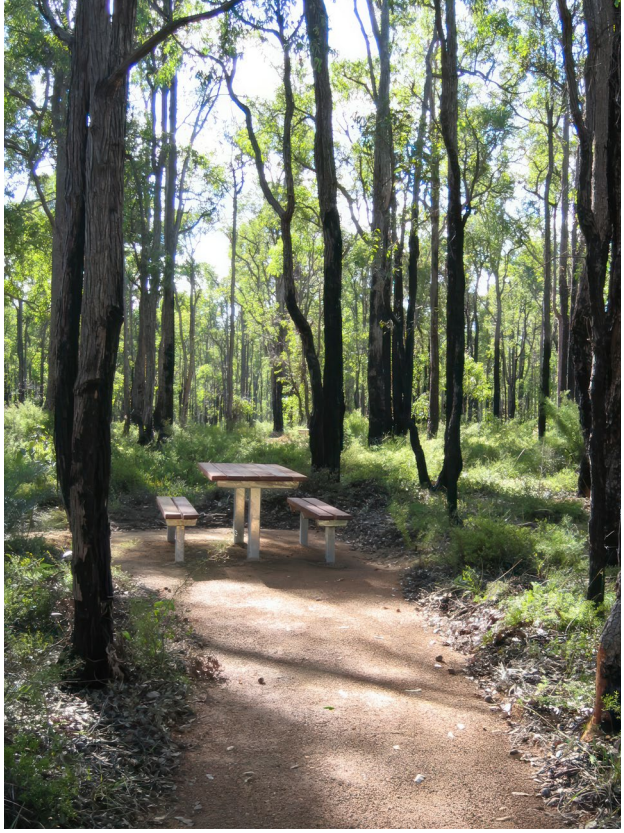
Walpole Nornalup National Park. Photo: DBCA.

Location and alignment principles

- Ensure furniture is designed and located as part of an overall plan to integrate with the trail design and trail classification.
- Locate furniture with shade, shelter and attractive outlooks where it attracts maximum use and a reason for trail users to want to stop.
- Keep furniture out of the direct path of travel, so it is not an obstacle.
- Place seats at least 600mm back from the trail edge to allow legroom and leave a distance of at least 900mm space between seats and at the end of seats to accommodate wheelchairs and prams.

Design principles

- Ensure tables allow wheelchair access at various points around the table, including some tables with no seats at sites with high levels of use by people in wheelchairs so they can sit at the table in a group.
- Consider whether tables will be fixed or moveable including need for surface treatment and theft prevention.
- Consider the potential of low walls to be used as seats. They need to be between 450 and 520mm high and at least 300mm wide for best comfort and ideally have a 100mm overhang to assist standing.
- Assess risks and hazards that could potentially damage furniture such as vandalism, falling rocks and trees, storm surges or floods.



Beelu National Park. Photo: DBCA.

Materials and fixtures

- Choose materials that are compatible with the rest of the trail design and considered as a package, not in isolation.
- Choose designs and materials that are hard wearing and resilient to damage by weather conditions, termites, vandalism and bushfire while still complementing the natural environment.
- Ensure maintenance needs are kept as low as possible, accepting that this may involve a higher capital cost.
- Evaluate fire risks and recovery of the structure in event of wildfire.
- Consider these factors in choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.
- Ensure built materials do not shed or emit damaging chemicals, fibres or other elements into the surrounding environment.
- Ensure all materials are non-abrasive and non-splintering with all corners rounded off and no protruding elements.
- Make sure materials that are to be touched do not get too hot or too cold.

Barriers and fences

Good trail alignment and design avoids areas that pose hazards or need protecting. However, barriers and fences may be needed to manage impacts of trail users on natural and cultural values.

Barriers and fences are used to:

- Prevent damage to natural and or cultural values, such as significant vegetation or special cultural sites.
- Keep traffic off an area whilst the vegetation is rehabilitating.
- Guide, direct or restrict trail users to a certain area or away from safety hazards.

The trail experience and trail classification will set the type and style of barriers or fences. Types include:

- Natural elements such as rocks, logs that are naturally located or introduced.
- Changed landforms such as mounds, swales or gullies and ditches.
- Bollards on their own or with wire, rope, or chain.
- Post and rail.
- Walls – free-standing or retaining.
- Post and wire or mesh fences.

They may be permanent or temporary. Permanent barriers should have a longer life and lower maintenance cost.

If a trail requires a significant amount of fencing or barriers, consider re-alignment as it may not be in the right place or be the right design.

Design principles

- Determine type and style of barriers based on numbers of users, specific site conditions and trail classification.
- Borrow from surrounding landscape characteristics to decide on design and materials and keep them subordinate to the natural landscape.
- Make use of natural barriers such as clumps of trees, rocks, embankments, logs and drainage lines or introduce them when not available. Use the most appropriate for the landscape character of the site.
- Take care when introducing natural elements making sure that they are sited appropriately and are buried, by at least a third their volume, so they look natural and not ‘forced’.
- Assess risks and hazards that could potentially damage barriers and fences, such as vandalism, falling rocks, storm surges or floods.
- Beware of too much barrier or fencing so as not to create a sheep run effect.
- Consider the impact of fences and barriers on fauna movement in and through the site.

Materials and fixtures principles

- Choose materials that are compatible with the rest of the trail design and considered as a package, not in isolation.
- Consider the variety of available materials – timber, recycled plastic, fibre-reinforced plastic (FRP), untreated, galvanised and stainless steel or concrete.
- Choose materials and fixings for longevity, skills available for construction, fire resistance and maintenance requirements.
- Consider these factors in choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.
- Ensure built materials do not shed or emit damaging chemicals, fibres or other elements into the surrounding environment.
- Ensure all materials that are close to people are non-abrasive and non-splintering with all corners rounded off and no protruding elements. If they can be touched, ensure they do not get too hot or too cold.

Purnululu National Park. Photo: DBCA.

Handrails

Handrails serve a variety of purposes. They provide a sense of safety from falling, can help with balance and assist users to move more easily along a trail or on ascents or descents.

They also serve as a protection barrier, preventing trail users from impacting on areas with significant natural, cultural or heritage values.

Handrails can be inappropriate and visually intrusive if not well designed. Their use and design should be directed by the intended trail experience and trail classification.

Mid rails and balustrades, which are vertical bars between top and bottom rails, can be used as additional means of protection.

Principles

- Use consistent handrail design along the trail.
- Consider where views will be obstructed by handrails, particularly at lookouts, and find other design solutions if possible. One solution is to create terraces, lowering the drop height and reducing need for a rail.
- Do not locate seats or structures near handrails that are protecting a fall zone in case children or others use them to climb over rails and barriers.
- Ensure that material choice is consistent with the rest of the trail design elements.
- Follow AS1428 for handrail design and grip dimensions when on Class 1 and 2 trails or when the facility is catering specifically for people with disability.
- Ensure mid-rails are not installed where they can be a climbing hazard.
- Choose materials and fixings for longevity, skills available for construction, fire resistance and maintenance requirements.
- Consider these factors in choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.
- Ensure built materials do not shed or emit damaging chemicals, fibres or other elements into the surrounding environment.
- Read barriers and fences principles above for more guidance.

Access grids

In some circumstance, a fence opening with a grid at ground level may be used to facilitate trail access. These structures are also referred to as cattle grids, stock grids or farm grids. Like stiles, trail users can pass through without being responsible for gates.

Principles

- Allow trail user access while preventing stock moving from one section of land to another.
- Requires excavation of a pit in the ground and surrounding wings and fencing.
- Seek out variety of sizes and designs that are commercially available for both concrete and steel grids.
- Consider the grid profile, a round top is disliked more by stock, whereas a flat top is more vehicle friendly.
- Ensure maintenance includes periodically emptying the box under the grid. Removable box options are available.
- Consider installing drainage to prevent water and moisture build up in the box under the grid and undesirable plant growth within the grid.

Toilets and ablutions

Toilets are a necessity for most trails and may be the first thing a trail user will look for on arrival, particularly if it's taken some time to travel to the trail. They may already be provided if the trail is starting from or close to other amenities.

Providing toilets can be expensive with a significant maintenance and visual impact.

Ablutions are buildings that include both toilet and shower facilities, occasionally a laundry, and are more appropriate to campgrounds.

Constraints and buffers may be required on the design and location of toilets and ablutions to protect sensitive environments such as wetlands, waterways and reservoirs. Approvals or support from Department of Water and Environmental Regulation and Department of Health may be required.

If facilities are not being connected to reticulated sewerage, alternative treatments systems need to consider many factors. They should be approved for use by the Department of Health and installed and maintained according to manufacturer instructions.

Most visitor toilets on DBCA's Parks and Wildlife Service-managed lands are gender neutral where possible and are designed for access by wheelchairs in accordance with AS1428, including those on trails.

There are many factors to consider and it is best to engage specialist advice, such as architectural designers, landscape architects and engineers to ensure compliance with standards and building codes.

Location principles

- Locate toilets at trail heads close to parking areas for convenience, ensuring compliance, assisting with maintenance and security and reducing antisocial behaviour.
- Determine type and style of toilet based on numbers of users, specific site conditions and trail classification.
- Ensure a continuous path of travel for people with disability from the parking area, trail and campground to the toilet.
- Consider visual impact of building and other infrastructure.
- Consider location and type of sewerage system and effluent disposal fields in relation to:
  - Ability of the soil type to accommodate excavation and beware of rocky sites and those with underlying rock.
  - Protecting natural and cultural values from potential nutrients and pathogens.
  - Buffers for water resources such as reservoirs and bores.
- Ensure appropriate approvals are obtained prior to the construction and operation of toilets and ablutions.

Leeuwin Naturaliste National Park. Photo: DBCA.

Design principles

- Determine the capacity by considering visitor numbers and use patterns, as well as capacity of the sewerage system to match the user numbers. Consider future visitor increases and expansion needs.
- Ensure toilets are accessible by people with disability and meet standards and building codes.
- Ensure there are no steps or barriers from the outside to the building, and where necessary, install ramps to standard for access by people in wheelchairs.
- Consider gender neutral toilets to cater for diversity and disperse use in busy times.
- Consider additional facilities such as change tables and sanitary bins based on location and intended users.
- Consider security in the building design, ensuring that there are no 'hiding places' or places where people can be 'bailed up' outside the cubicles.
- Ensure there is suitable access for servicing and maintenance, understanding the costs and frequency of services as well as the size of vehicles that need access.

Materials and fixtures principles

- Choose materials that are non-porous and corrosion resistant wherever possible to extend lifespan and reduce maintenance.
- Choose materials and fixings for longevity, skills available for construction, fire resistance and maintenance requirements.
- Consider these factors in choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.
- Ensure built materials do not shed or emit damaging chemicals, fibres or other elements into the surrounding environment.
- Provide roof lights, skylights or translucent sheeting to improve lighting in sites with no power.

Shelters

Shelters protect visitors from the elements and have a range of flexible uses including:

- Shade and shelter from the weather.
- Interpretation and information.
- Overnight use and accommodation.
- A combination of any of above.

Often, a structure is designed to accommodate more than one function and can be flexible in its use.

The purpose, materials and size of a shelter will vary depending on the trail experience, trail classification and weather conditions.

Engage specialist advice including architectural designers, engineers and landscape architects to ensure compliance with relevant standards and building codes.

Location principles

- Consider prevailing wind and weather to ensure the shelter offers protection.
- Ensure the design is integrated into the trail experience, including the visual impact of the structure.
- Ensure the design and orientation, particularly when holding interpretation and information panels, is matched to the site that has been nominated.
- Deal with edge treatments and ground surfaces, ensuring the building floor is at grade, with no steps or barriers, to the surrounding area.
- Ensure a continuous path of travel for people with disability, such as from the parking area to the shelter at a trailhead.

Building design principles

- Design the size required for anticipated user numbers and proposed activities and ensure the proportions of the structure suit the site, other associated structures and landscape.
- Make the structure as accessible as possible being guided by trail experience and trail classification.
- Ensure furniture that will be installed in the structure, such as tables and seats, will fit and have enough circulation space.
- Consider sun angles throughout the seasons and ensure that protection is offered when and where it is needed.
- Consider security and reducing antisocial behaviour when locating and designing shelters.
- Accommodate the roof water drainage and ensure erosion is managed.

Materials and fixtures principles

- Choose materials and fixings for longevity, skills available for construction, fire resistance and maintenance requirements.
- Consider these factors in choice of materials: local, embodied energy, recycled, plantation or renewable, modern alternatives and non-traditional solutions.
- Ensure built materials do not shed or emit damaging chemicals, fibres or other elements into the surrounding environment.
- Choose suitable floor treatment, such as concrete slab, pavers or hardened earth and ensure that it is suited to the purpose, use levels and maintenance.

Camp shelters are usually rustic shelters, designed for sleeping for a group of people and usually open on one side.

Depending on the design brief, camp shelters may have areas for eating, cooking and sitting.

Additional principles

- Design to the group dynamic and how people will interact in the space.
- Choose materials that allow easy cleaning of surfaces and appliances.
- Consider security and privacy between sleeping and eating areas, giving sleeping areas privacy but open enough to feel secure.
- Consider changing rooms that have lockable doors, depending on the trail experience.
- Include a shower room if appropriate, where visitors hang their own water bag on a simple concrete floor with floor waste to grey water treatment.
- Consider user friendly features that make the stay more convenient, such as hanging hooks, rails, clothes line and shelves.
- Provide a water source and grey water treatment if appropriate.
- Suppress dust and consider pest control in locating and designing camp shelters.
- Consider prevailing weather and wall side treatments.
- Install signs with the trail code of conduct for use of camp shelter.

Grimwade Hut, Bibbulmun Track. Photo: DBCA.

9. Management

As projects move from development to operation, there are a range of roles and functions that need to be fulfilled by trail operators to ensure the new trails are fully activated and operating optimally.

These include trail and facility management, maintenance, marketing, activation and the ongoing development of the trails.

Good trail conditions also need to be maintained so that visitors continue having an excellent experience on high quality trails.

Management of trails encompasses governance, responsibilities, funding, resources, maintenance and trail adoption.

Read Management (Stage 8) of the Trails Development Series for more information.

Coalseam Conservation Park. Photo: Tourism WA.

9.1 Governance

Whether a trail project is a small local trail or major network at a destination, it's important to be clear about who owns the trails, who's managing them and how its condition and success will be monitored.

The Governance Institute of Australia defines governance as –

> *"... the system by which an organisation is controlled and operates, and the mechanisms by which it, and its people, are held to account. Ethics, risk management, compliance and administration are all elements of governance."*

In the trail context, it relates to who will manage and how we manage and maintain the trails and infrastructure. Sustainable governance and funding models may involve new or alternative funding streams or partnering with others to sustainably manage and maintain the trails.

The Framework (Stage 2) of the Trail Development Process determines the governance of the trail through a management model. The responsibilities, funding and resources needed are identified in Management (Stage 8).

Murujuga National Park - Murujuga Aboriginal Corporation, Pilbara. Photo: Tourism WA.

Options

There are a range of options used in Western Australia and around the world. Each trail or destination will have different requirements. There is no one size fits all. Western Australia has looked to other trail destinations around the world and around Australia to see what works, how and why.

Trails in WA also have some great trail management success stories with the Bibbulmun Track and Munda Biddi Trail Foundations and a range of other trail organisations and volunteer groups.

Community and volunteer groups provide support, guidance, management, marketing, fundraising and maintenance for local, regional and national level trail assets. These activities are often undertaken in partnership with the land manager.

TRC Tourism[35] outlined a range of possible models that fall into three categories:

- Public delivery and operation – government builds and operates trails.
- Public delivery and community operation – government build trails and a community organisation or other entity operates them.
- Public delivery and private operation – government builds trails and a private company or organisation operates them, possibly via a lease.

They concluded there is no one-size-fits-all and the suitable model depends on a range of circumstances and operating environment. Therefore, each project needs to develop arrangements fit for purpose for that project and community.

Kurrah Mia, Denmark. Photo: Tourism Australia.

Successful governance

TRC Tourism outlined what they considered the critical factors for successful trail governance and management.

They are:

- A clear, committed, and skilled governance entity.
- Effective trail planning.
- Clear coordination function.
- People dedicated to management and maintenance.
- Adequate resources for trail operations.
- Ongoing funding.
- Stakeholder and community partnerships.
- Supportive government environment.
- Marketing, promotion, and experience development.

35 TRC, *Tourism for the governance and sustainability of Warburton Mountain Bike Destination*, 2017

9.2 Sustainable business models

In addition to having a clear and effective governance model, each trail project needs a sustainable business or funding model. This ensures resources are available for their management, maintenance and promotion.

The business model may include direct funding or revenue and in-kind labour or support such as through volunteers. This equally applies to small local trails and large networks and destinations to ensure the trails do not fall into disrepair.

It is also vital that trails continue to evolve and be promoted with new products and experiences to encourage people to keep returning so that the investment reaches its potential.

The range of funding or income and support options may include:

- Budget and resource allocation from land manager.
- Entry, facility, parking or attraction fees.
- Leases, licences and permits.
- Merchandise.
- Sponsorship and donations.
- Members, volunteers and supporters.
- Partnerships, including trail adoption.
- Events.

Large trail networks and trail destinations may also consider advocating for targeted taxes on points in the market chain related to tourism and earmark the proceeds for conservation or trail management.

Dwellingup Trails Visitor Centre. Photo: Visit Dwellingup.

9.3 Trail management plan

Trails need maintaining like any other facility. The management model, in terms of who is responsible for what, should be established in the Framework (Stage 2) of the Trail Development Process.

A concise trail management plan needs to be developed and approved by the project steering group. The management plan will 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 include:

- Background information from the framework including trail system, trail classification, target users, expected amount and type of use.
- Clarification of management roles and responsibilities (from 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 including: inspection frequency, infrastructure logs, standards to be maintained, works program, funding and resources.
- Hazard inspection and reporting procedures.
- Visitor statistic recording standard and procedures.
- Marketing, maps and information.

A sample template is provided in Appendix G that can be modified to suit trail projects as needed.

Read more on developing a maintenance program and trail adoption in Management (Stage 8) of the Trails Development Series.

Yardie Creek, Ningaloo. Photo: Tourism WA.

9.4 Codes of conduct

A code of conduct is a set of rules that guide behaviour. For trails, they assist in keeping people safe, create more socially harmonious trail use and protect natural and cultural values.

To be effective, the code needs to be relevant, clearly communicated and understood by trail users.

Key messages can be included on signs, publications, maps and digital media including websites.

The WA Hiking Trail Management Guidelines Stakeholder Reference Group has developed core principles that should be included in any trail code of conduct. They are:

- Be safe – prepare and plan.
- Show respect – to others, the trail and environment.
- Leave no trace.
- Enjoy your hike.

Individual trails may have their own principles, policies and values adapted to suit the trail experience, user groups and landscape.

Figure 26: Code of conduct on East Mt Barren sign

10. Events

Trail-based events for trail running and bushwalking are becoming increasingly popular.

Events can provide an economic boost to communities through tourism and retail expenditure, generating greater regional awareness and growing visitation.

Events can also generate interest in trails, bring new users to trails and have mental and physical health benefits. They can also create concerns for local land managers and communities if not managed properly.

The Margaret River Ultra Marathon held in 2021 sold out with 1,500 participants. Entry figures have more than doubled since. Event organisers reported a $5 million direct economic impact from event weekend attendance and 11,914 bed nights.

The requirement and facilities for events on a trail or trail network need to be identified at the beginning of the Trail Development Process and accommodated throughout.

Key factors when considering events on a trail or network is whether the general location and environment can accommodate events and event infrastructure. Also, if needed, that suitable lodging options are available at the destination.

Dwellingup. Photo: Clip Media.

10.1 Developing trails for events

Events can have a significant impact on a trail and users if not considered in the Trail Development Process.

When developing or upgrading trails, consider the type and scale of events that are appropriate in the Framework (Stage 2) of the Trail Development Process. This will ensure that requirements for running events are provided in the trail design and development.

During the Concept Plan (Stage 4), ensure that suitable locations are identified for the event facilities. The trail and network design needs to consider the event type, scale and appropriate course design, particularly for long-distance events. Links between existing trails can also be identified and added if required.

Considerations specific to events are:

- Easy access, parking space and good traffic flow that meets the needs of the planned event.
- Available space for event facilities including check-in, start and finish lines, temporary toilets, first aid facilities, food vendors and stalls.
- Power and water supply at the event hub.
- Emergency access to the event course.
- Suitable locations and access for first aid, water and food stations along the course.
- Rubbish and waste management.
- Well located and designed spectator areas on the event course.

If possible, consider locating event villages in nearby town ovals or parks, suitable commercial properties or businesses to support local communities. Links to the trails or trail networks can be activated for events.

Dwellingup. Photo: Break the Boundary.

10.2 Planning trail events

Trail events can be small or large, commercial or non-commercial.

Prior to planning any event, proponents need to liaise with land owners or managers to assess suitability, permissions, licences, permits, impact assessments, emergency and traffic management and liability.

Considerations for planning events:

- Is the landscape quality, variety and points of interest attractive to walkers or trail runners?
- What is the extent, distance and connectivity of trails?
- Is there access to singletrack trails?
- Can the trail network host different distances for events so there are a range of distance options for participants, with a common start and finish location?
- Is it a loop route or point to point trail and does it suit the event?
- Are trails well maintained, especially after weather events or heavy use?
- Is there good waymarking of trails?
- Is there good connectivity to towns or is the event focused on remoteness as a key attraction?
- Are there appropriate overnight accommodation options for participants if needed?
- Can routes be planned that have limited, if any, interaction with roads and crossings?
- Can traffic management requirements be minimised to reduce cost and risk?
- Is there a suitable staging area – space for event expo, start, finish?
- Is there enough parking at event HQ or can transport be provided?
- Are key services available at the event staging area including toilets, rubbish bins, drinking water and power?
- Is there emergency access for management and aid vehicles and sites for first aid stations?
- What is the available support, financial and otherwise, for the event?
- Will there be community support for hosting the event?
- What is the permit process and does the event need multiple permits from land managers?
- Are there positive relations with and support from the land manager?
- What are the sensitive, no-go areas that need to be avoided and protected?

Events proposed on DBCA-managed lands and waters

The landscapes of WA's protected areas are a popular setting for trail events. Legislation governing lands and waters managed under the *Conservation and Land Management Act 1984* (CALM Act land) requires the consent of DBCA for access to conduct an event.

Information on conducting events on DBCA-managed lands and waters is available online at Conducting an event in a park | Explore Parks WA.

The way consent or authority is granted depends on the nature of the event and if it is run for commercial purposes.

To determine if an event is commercial, answer the following questions:

- Will participants or spectators be charged for attending or participating?
- Will the revenue exceed cost recovery of running the event?
- Will there be profits collected for charity, fundraising or a not-for-profit organisation?
- Will there be profits collected for a club account?

If the answer is yes to any of these questions, it may be a commercial event and require a commercial operations licence. Applications can be submitted online at Commercial events | Department of Biodiversity, Conservation and Attractions.

If the answers are no to all of these questions, it may be a non-commercial event, which requires lawful authority from the relevant local DBCA district or regional office.

Applications are submitted through the non-commercial event application form, available online from Conducting an event in a park | Explore Parks WA.

Event organisers must obtain approval from DBCA before commencing any advertising or marketing, in accordance with the Conservation and Land Management Regulations 2002.

Yellagonga Regional Park. Photo: Marco Noé.

Other resources

The Australian Adventure Activity Standard Good Practice Guide: Bushwalking provides detailed advice on maximum numbers to supervision ratios, management of risk, environmental management, equipment needs, planning and coordination.

The Core Australian Adventure Activity Standard Good Practice Guide provides overarching principles to ensure effective, responsible, sustainable and safe delivery and management of adventure activities to dependent participants.

Events or facilities within public drinking water source areas on Crown land require assessment under Operational policy 13: Recreation within public drinking water source areas on crown land.

Assessment requires the submission of a WQIS 34 - Application form for recreation proposals within public drinking water source areas on Crown land.

11. Walking Trail Classification System

				
Easiest	**Easy**	**Moderate**	**Difficult**	**Extreme**

DBCA's Parks and Wildlife Service has adopted a walking trail classification system to categorise trails in a systematic way.

The system provides standardised, concise information regarding the difficulty and characteristics of trails so that users can make informed decisions about whether a trail suits them. The system also provides a framework for trail managers to design and maintain trails to suit the trail experience and user group.

The system is generally consistent with the *AS 2156.1, Walking Tracks – Part 1: Classification and Signage, 2001* and closely aligns with the Australian Walking Track Grading System.

Other land managers are encouraged to adopt this system for consistency across WA.

The two key components of the Parks and Wildlife Service system are:

Walking Trail Assessment Matrix is used to assess a trail and determine the appropriate classification, or to guide the design of a trail to a pre-determined classification. See Table 6.

Walking Trail Classification Descriptors provide a framework for consistent communication of trail characteristics for each classification. See Table 7.

Key features of the system are:

- Using the term 'class' not 'grade'.
- Colour scheme for the classification symbols, consistent with other trail types.
- One-word descriptors for each class.
- Trail distance and weather are not an attribute used to determine classification.
- Rock hopping and rock scrambling affect classification.
- Inclusion of assisted wheelchair use for certain Class 2 trails.

Walking Trail Assessment Matrix

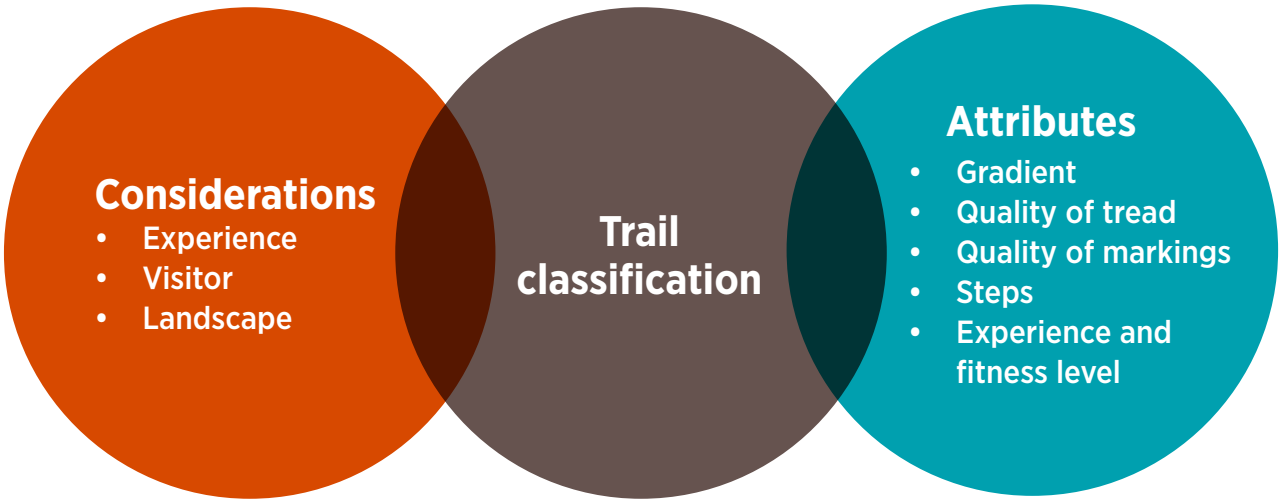
Trail classifications should be based on the desired trail experience, current or desired visitor profile and landscape characteristics.

Key considerations are:

- **Trail experience:** What is the primary attraction and purpose of the trail? What is the trail type and style?
- **Visitor profile:** Who are the visitors? What are they seeking and what are their likely abilities? Are they residents or tourists? Are they destination trail users, visiting specifically for the trail experience, or opportunistic users, integrating trail activities into a visit for other purposes?
- **Landscape:** How rugged or steep is the terrain? What types and scale of trails are possible? Can the trail be built to the desired trail classification? Consider sensitive site constraints and opportunities such as accessibility, visitor risk, Aboriginal and other heritage, flora, fauna and disease.

These factors should be considered in the early planning of a new trail or trail network, with the classification usually determined in the Framework (Stage 2) of the Trail Development Process.

For existing trails, these factors may change over time, particularly visitor profile, which could warrant a review of the classification and subsequent modification of the trail.



Applying the matrix

The physical attributes of the trail, that is the gradient, quality of tread, quality of markings and steps are assessed in accordance with Table 6.

Experience and fitness level are not assessed but are a consequence of the other trail attributes. The assessment should be undertaken by someone trained and experienced in using the Walking Trail Classification System.

The trail classification is determined by the most difficult section of the trail and the most difficult attribute in the assessment, not by 'averaging out' attributes recorded in the assessment.

This means that a trail may have some attributes that apply to a lower classification, but it must not have any attributes applicable to a higher classification. For example, trail managers may opt to provide route markers on a Class 5 trail if the trail is likely to attract less skilled and experienced users. Or they may build well-formed stairs with even tread on a Class 4 trail. However, Class 1 or 2 trails must not involve any rock hopping, and a trail of Class 4 or lower classification must not involve any rock scrambling.

Once a trail has been assessed and classified, the experience and fitness level for that class needs to be considered to ensure it fits with the desired trail experience and visitor profile.

The degree of management intervention and facilities provided should align with the planned trail classification, generally with a decrease in management and facilities as the classification increases. This applies to facilities such as toilets, drinking water supply, seating, shelters and interpretive signs.

A trail should be maintained to the classification and should be periodically reviewed to ensure the classification is still appropriate.

Classifying an existing trail

An existing trail can be assessed and assigned a class.

If the classification does not meet the intended trail experience, consider modifications to achieve the desired classification. For example, the quality of markings could be improved, steps could be installed to avoid rock scrambling or a bridge built to avoid rock hopping.

Building a new trail

For new trails, the intended trail class is determined early in the planning, normally in the Framework (Stage 2) of the Trail Development Process. Gradient limits should be considered in Concept Planning (Stage 4) and quality of tread, steps and sign marking in Detailed Design (Stage 6).

Table 6: Walking trail assessment matrix

	 Class 1	 Class 2	 Class 3	 Class 4	 Class 5
Difficulty	**Easiest**	**Easy**	**Moderate**	**Difficult**	**Extreme**
Gradient	Maximum slope/gradient of 1:14 (7.1% or 4.1 deg) with flat rest stops every 9m	Generally no steeper than 1:10 (10% or 5.7 deg). May be suitable for assisted wheelchairs if ramps are provided at steps	May exceed 1:10 (10% or 5.7 deg) for short sections but generally no steeper than 1:10	May include long, arduous steep sections exceeding 1:10	May include very arduous climbs and long, steep sections exceeding 1:10
Quality of Tread	Broad, hard-surfaced trail suitable for wheelchair use. Well maintained and defined with minimal intrusions. Width 1200mm or more.	Generally modified or hardened surface. Well maintained and defined with minimal intrusions. Width 900mm or more.	Formed trail, generally a modified surface, mostly clear of intrusions and obstacles. May include short sections of rock hopping with wide foot placement surfaces and narrow gaps – no more than 3 sections of up to 20m/km, minor creek crossings. Width variable, generally less than 1200mm.	Generally distinct without major modification to the ground. Fallen debris and other obstacles likely. May have extensive rock hopping, which may include narrow foot placement surfaces with varying gaps. May have natural obstacles (e.g. tides, creek crossings subject to flash floods).	Limited modification of the natural environment. May include arduous rock hopping with narrow foot placement surfaces with varying gaps for long distances (more than 3 hours of total walk time). May also include rock scrambling (where hands are required to traverse a steep climb).
Quality of Markings	Route markers at intersections.	Route markers at intersections.	Route markers at intersections & where trail is indistinct.	Minimal route markers.	Route markers generally not provided.
Steps	Steps only with alternate ramp access suitable for wheelchairs and prams.	Occasional steps no more than 5 steps in a staircase. Steps well formed, even tread heights and no greater than 200mm. No more than 20 steps per km.	Steps may be common. Short flights of well-formed stairs or staircases, generally even tread size. No more than 3 staircases of up to 20 steps/km.	Uneven steps with varying tread sizes, continuous and frequent over long distances.	Steps do not influence this classification.
Experience & Fitness Level	No previous experience required. Suitable for all fitness levels.	No previous experience required. Suitable for all fitness levels.	Some bushwalking experience and minimal navigation skills. Moderate level of fitness required.	Experienced bushwalkers and moderate navigation skills. May require navigation equipment. Self-reliant in emergency first aid and weather hazards. Good level of fitness required.	Very experienced bushwalkers only. High level of navigation skills with navigation equipment. Self-reliant in emergency first aid and weather hazards. High level of fitness required.

11.1 Communicating walking trail classes

Standardised, consistent terminology to describe a trail's classification, attributes and level of difficulty helps trail users make well informed decisions about whether a trail suits their needs and abilities.

Table 7 provides a framework for consistent communication of trail classification.

The classification symbols and the single-word descriptors – Easiest, Easy, Moderate, Difficult, Extreme – should be the primary communication tool.

Written trail descriptions are developed by selecting phrases from the descriptors in Table 7 that are applicable and most relevant.

Attributes that are **not** present can also be described as this may be helpful to trail users. For example, adding 'no steps' can be important for users of Class 1 or 2 trails.

Trail descriptions can be further customised to describe specific features or obstacles relevant to trail class, without replacing the phrases in the descriptors. Appendix H provides examples of trail descriptions.

The preferred terms and definitions when communicating trail use in relation to trail classification are listed below.

Important information will need to be included in more detailed communication about the trail. For example, trail distance does not form part of the classification system but is essential information. The estimated time to complete a trail can also be helpful.

Other important information, particularly safety messages, should also be provided. This could include warnings regarding weather or remoteness, seasonal closures or restrictions, or exposure to heights, such as cliff tops or ledges.

Describing the trail experience and points of interest can be woven in, however the descriptors relating to trail classification should remain clear, prominent, and consistent with those provided in Table 7.

Preferred terms for walking trail classification

Hike	Preferred for more difficult trails and can include trail running. Trail running could be specifically mentioned if it's a target activity.
Walk	Appropriate for relatively short trails with easier classifications (Easiest, Easy, Moderate).
Backpacking	A hike that involves camping/accommodation overnight.
Trail	Rather than track.
Rock hopping	Involves jumping or stepping from rock to rock, or logs, and requires good balance and agility.
Rock scrambling	An average person will need to use their hands for balance and leverage to traverse difficult, rocky and generally steep terrain and requires good balance and agility. This may expose users to falls of significant height and consequence. If there is rock scrambling, then it is a Class 5 trail. The trail description should mention rock scrambling and the rock scrambling risk symbol is used.

Table 7: Walking trail classification descriptors

	 Class 1	 Class 2	 Class 3	 Class 4	 Class 5
Difficulty	**Easiest**	**Easy**	**Moderate**	**Difficult**	**Extreme**
Gradient	Flat	Gentle hills	Short, steep hills	Very steep	Very steep and difficult
Quality of Tread	Well-formed hardened trail	Formed trail	Formed trail, some obstacles and/or some rock hopping	Rough trail, many obstacles and/or extensive rock hopping	Rough unformed trail, and/or arduous rock hopping and/or rock scrambling
Quality of Markings	Clear directional signage	Clear directional signage	Directional signage	Limited directional signage	Limited or no directional signage
Steps	No steps	Occasional steps or no steps	Many steps	Many steep flights of stairs or many steep uneven sized steps.	N/A
Experience & Fitness Level	No experience required. Suitable for all levels of fitness.	No experience required. Suitable for all levels of fitness.	Some bushwalking experience and moderate level of fitness required.	Experienced bushwalkers and good level of fitness required.	Very experienced bushwalkers and high level of fitness required.
General class descrition	All abilities access, flat, even, hardened surface with no steps or steep sections. Suitable for unassisted wheelchair users and prams. Clear directional signage. No bushwalking experience required.	Easy trail with modified or hardened surface, gentle hills and occasional steps. Clear directional signage. No bushwalking experience required. May be suitable for assisted wheelchair users (if ramps are provided at steps).	Moderate trail with short steep hills, rough surface, many steps and some rock hopping. Directional signage. Some bushwalking experience and moderate fitness required.	Difficult trail with rough surface, very steep and extensive rock hopping. Directional signage may be limited. Bushwalking experience, navigation and emergency first aid skills, and good fitness required.	Extreme trail with very rough surface, very steep. Arduous rock hopping and/or scrambling. Limited or no directional signage. For very experienced bushwalkers with navigation and emergency first aid skills, and high level of fitness.

General description for Class 6

The Australian Standard for walking trails AS2156.1 states the following for Class 6 trails:

- **Signage:** Signage is generally not provided.
- **Track information:** Track details will not normally be provided by the managing authority.
- **Publicity:** Will not be marked on maps or brochures produced by the managing authority.

Therefore, Class 6 is not included in the walking trail classification descriptors in Table 7.

The following description may assist trail users and managers understand Class 6.

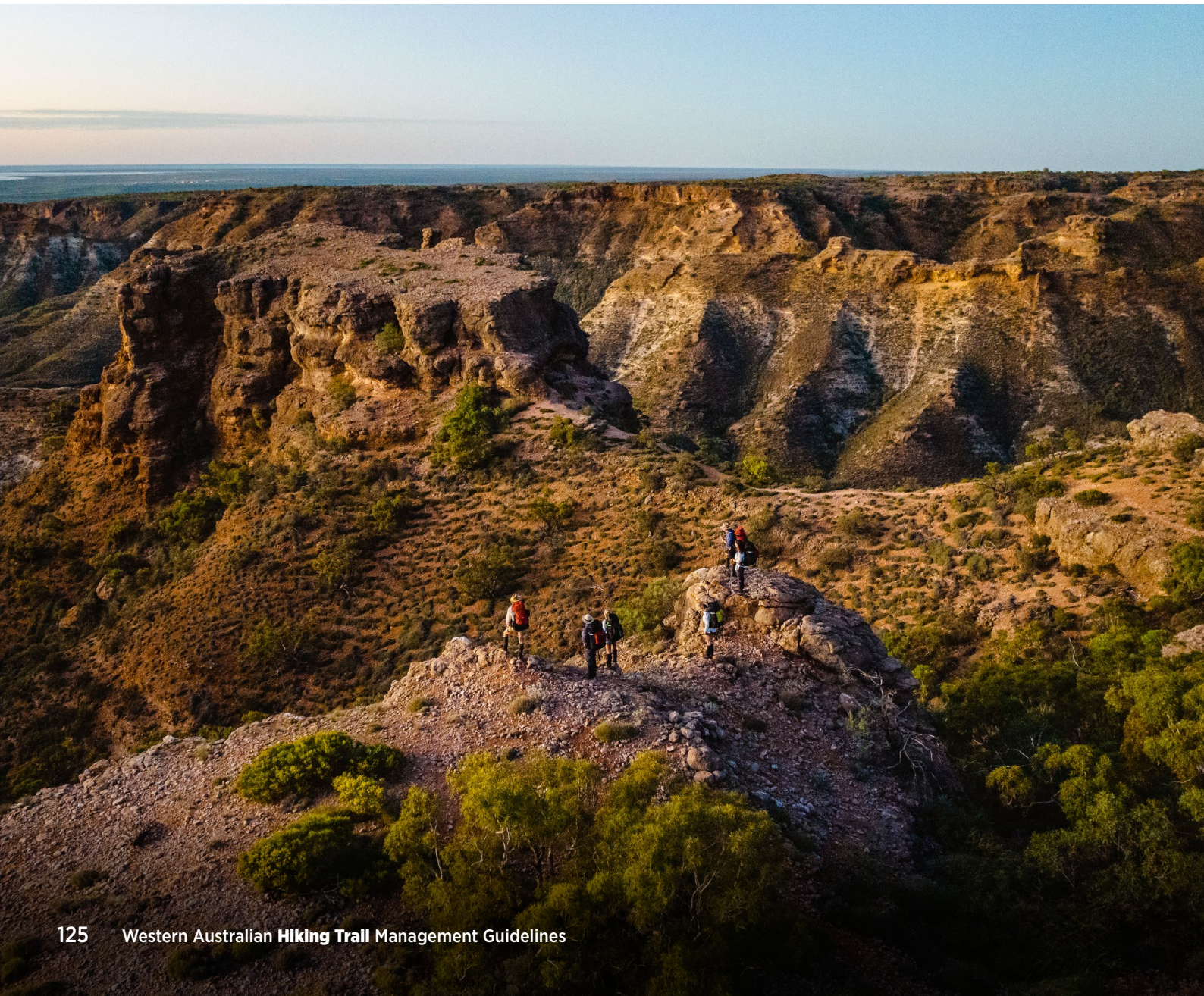
"Class 6 trails provide an opportunity for highly experienced hikers with specialised outdoors skills to navigate off-trail in challenging natural and wilderness areas.

There is no defined trail and no infrastructure is provided, including route marking. For management or safety purposes a trailhead sign may be provided.

Maps and navigation aids are always required, and natural hazards should be expected.

Safety and navigation could be affected by storms and flooding, extreme weather or aridity and vegetation density."

Trek Ningaloo, Ningaloo. Photo: Tourism WA.



12. Appendices

Njaki Njaki Aboriginal Cultural Tours, Merredin. Photo: Tourism Australia.

Appendix A – Relevant standards and guides

Australian Standards

AS 2156.1-2001 [current]

Walking tracks, Part 1: Classification and signage

Provides managing authorities with guidance for walking track classification and signage to provide consistency of information to users of walking tracks. This is intended to minimise risk, preserve natural features and enhance recreation opportunities associated with the use of walking tracks.

AS 2156.2-2001 [withdrawn]

Walking tracks, Part 2: Infrastructure design

Specifies design methods and loads for use in the structural design of walking tracks. It covers boardwalks, galleries, pedestrian bridges (including wire crossings), platforms (for viewing), ladders, stairways, stiles and barriers.

AS 1428.1:2021 [current]

Design for access and mobility, Part 1: General requirements for access — New building work

Specifies the design requirements for new building work to provide building designers and users (architects, property owners and regulators) with the minimum design requirements for new building work to enable access for people with disabilities.

AS 1428.2-1992 [current]

Design for access and mobility, Part 2: Enhanced and additional requirements — Buildings and facilities

Sets out requirements for the design of buildings and facilities for access for people with disabilities. Where appropriate, these requirements are additional to the minimum requirements of AS 1428.1. Also covers requirements for buildings and facilities which are not covered in Part 1.

AS 1428.4.2:2018 [current]

Design for access and mobility, Part 4.2: Means to assist the orientation of people with vision impairment — Wayfinding signs

The objective of this standard is to assist in the provision of a built environment that is legible to all people with particular attention to people who are blind or have low vision, through the provision of tactile signs. Other forms of complementary wayfinding including new technologies are not addressed.

AS ISO 31000:2018 [current]

Risk management – Guidelines

AS ISO 31000 2018 specifies guidelines on managing risk faced by organisations with the application of these guidelines able to be customised to any organisation. As one of the risk management standards, this standard provides a common approach to managing any type of risk and is not industry or sector specific.

AS 4373-2007 [current]

Pruning of Amenity Trees

Specifies methods for pruning of trees and provides guidance on correct and uniform practices intended for use on amenity trees.

Other standards and guides

Australian Adventure Activity Standard

The Australian Adventure Activity Standard (AAAS) and related Good Practice Guides (GPGs) provide a voluntary good-practice framework for safe and responsible planning and delivery of led outdoor adventure activities with dependent participants. GPGs are available for bushwalking and camping.

Guide to Road Design Part 6A: Paths for Walking and Cycling

Guide to Road Design Part 6A: Paths for Walking and Cycling provides guidance for designers and other practitioners on the design of paths for safe and efficient walking and cycling, both within the road corridor and outside the road corridor.

Practice Note 10.6: Trails, Tracks and Paths – Institute of Public Works Engineering Australasia

Practice Note 10.6 is designed to provide subject specific management advice and guidance that addresses all aspects of trail management from planning, through to development, asset management, operations and maintenance.

Practice Note 10.1: Parks Management: Inventories, Condition & Performance Grading – Institute of Public Works Engineering Australasia

Practice Note 10.1 includes an update and replacement of the original "PRAMS" condition grading guideline, providing specific descriptions of how to assess a range of common park assets.

Rail Trails Establishment Guidelines, Rail Trails Australia

This guide provides an overview to what may be required to establish and maintain a rail trail.

Appendix B – References

Web links

Organisation	Weblink
Australian Bureau of Statistics	https://www.abs.gov.au/
Bibbulmun Track Foundation	https://www.bibbulmuntrack.org.au/
Break the Boundary	https://breaktheboundary.com.au/
Department of Biodiversity, Conservation and Attractions (DBCA)	https://www.dbca.wa.gov.au/
DBCA's Parks and Wildlife Service	https://www.dbca.wa.gov.au/parks-and-wildlife-service
Department of Local Government, Sport and Cultural Industries (DLGSC)	https://www.dlgsc.wa.gov.au/
Department of Planning, Lands and Heritage (DPLH)	https://www.wa.gov.au/organisation/department-of-planning-lands-and-heritage
Department of Water and Environmental Regulation (DWER)	https://www.wa.gov.au/organisation/department-of-water-and-environmental-regulation
Friends of the Cape to Cape Track	http://www.capetocapetrack.com.au/
Google Trends	https://trends.google.com/trends/
Governance Institute of Australia	https://www.governanceinstitute.com.au/
Local tourism bodies	https://www.tourism.wa.gov.au/industry-support-and-events/resources-for-businesses-and-operators/whos-who-in-tourism/Pages/Local.aspx#/
HikeWest	https://www.hikewest.org.au/
Office of Multicultural Interests	https://www.omi.wa.gov.au/
Outdoors WA	https://www.outdoorswa.org.au/
Project Dieback	https://dieback.net.au/
Regional Tourism Organisation	https://www.tourism.wa.gov.au/industry-support-and-events/resources-for-businesses-and-operators/whos-who-in-tourism/Pages/Regional.aspx#/
Rails Trails Australia	https://www.railtrails.org.au/
Tourism WA	https://www.tourism.wa.gov.au/Pages/welcome_to_tourism_western_australia.aspx#
Trails WA website	http://www.trailswa.com.au/
Tourism Council WA	https://www.tourismcouncilwa.com.au/
WA Indigenous Tourism Operators Council (WAITOC)	https://www.waitoc.com/
ACHknowledge	https://www.wa.gov.au/government/document-collections/achknowledge-portal

Documents and references	Weblinks
A Western Australia for Everyone: State Disability Strategy 2020-2030	https://www.wa.gov.au/government/document-collections/state-disability-strategy-2020-2030
Aboriginal Empowerment Strategy 2021-2029 (AES)	https://www.wa.gov.au/organisation/department-of-the-premier-and-cabinet/aboriginal-empowerment-strategy-western-australia-2021-2029
Aboriginal Heritage Act 1972	https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_a3.html
Aboriginal Heritage Act 1972 Guidelines	https://www.wa.gov.au/system/files/2023-11/aboriginal_heritage_act_1972_guidelines.pdf
Aboriginal Heritage Approvals	https://www.wa.gov.au/government/document-collections/aboriginal-heritage-approvals#policy-and-guidelines
AusPlay data portal	https://app.powerbi.comview?r=eyJrIjoiZGU1YWFhZDgtMmRhZi00YTgyLThhMzItYjc2ODk5NTg0MTg1IiwidCI6IjhkMmUwZjRjLTU1ZjItNGNiMS04ZWU3LWRhNWRkM2ZmMzYwMCJ9
Australian Adventure Activity Standard (AAAS) and associated Good Practice Guides	https://www.outdoorcouncilaustralia.com/aaas/b3f7a711-d304-41bd-ae61-2f3d426a42f3
Census 2021 WA's Linguistic Diversity	was-linguistic-diversity708970098a51485ea4fb0e120029c649.pdf (omi.wa.gov.au)
Core Australian Adventure Activity Standard Good Practice Guide	https://australianaas.org.au/wp-content/uploads/Core-GPG-v1.0.pdf
Closing the Gap	https://www.wa.gov.au/organisation/department-of-the-premier-and-cabinet/closing-the-gap
Conservation and Land Management Act 1984	https://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_193_homepage.html
Country Areas Water Supply Act 1947	https://www.legislation.wa.gov.au/legislation/statutes.nsf/RedirectURL?OpenAgent&query=mrdoc_25434.pdf
DBCA Annual reports	https://www.dbca.wa.gov.au/about-us/annual-reports
DBCA Commercial events	https://www.dbca.wa.gov.au/licences-and-permits/commercial-activities/commercial-events
DBCA Conducting an event in a park	https://exploreparks.dbca.wa.gov.au/conducting-event-park
DBCA Policy Statement 18	https://www.dbca.wa.gov.au/about-us/legislation/corporate-policies
DBCA Phytophthora Dieback	https://www.dbca.wa.gov.au/management/threat-management/plant-diseases/phytophthora-dieback
DCBA Social research	https://www.dbca.wa.gov.au/management/parks/social-research
DPLH State Planning Policy 2.0 – Environment and natural resources policy	https://www.wa.gov.au/government/publications/state-planning-policy-20-environment-and-natural-resources-policy

Documents and references	Weblinks
DWER Strategic policy – Protecting public drinking water source areas in WA	https://www.wa.gov.au/government/publications/strategic-policy-protecting-public-drinking-water-source-areas-wa
DWER Operational Policy 13: Recreation within public drinking water source areas on crown land	https://www.wa.gov.au/government/publications/operational-policy-13-recreation-public-drinking-water-source-areas-crown-land
DWER Policy: Land use compatibility in public drinking water source areas	https://www.wa.gov.au/government/publications/policy-land-use-compatibility-public-drinking-water-source-areas
DWER WQIS 34 – Application form for recreation proposals within public drinking water source areas on Crown land	https://www.wa.gov.au/government/publications/wqis-34-application-form-recreation-proposals-within-public-drinking-water-source-areas-crown-land
DWER Water quality protection note (WQPN) 25: Land use compatibility tables for public drinking water source areas.	https://www.wa.gov.au/government/publications/wqpn-25-land-use-compatibility-tables-public-drinking-water-source-areas
Destination insights – Tourism Western Australia	https://www.tourism.wa.gov.au/Markets-and-research/Destination-insights/Pages/Destination-insights.aspx#/
Do I need a permit?	https://www.wa.gov.au/service/building-utilities-and-essential-services/integrated-essential-services/checklist-do-i-need-water-permit
Do I need a water licence or permit?	https://www.wa.gov.au/service/building-utilities-and-essential-services/integrated-essential-services/do-i-need-water-licence-or-permit
Emergency WA	https://www.emergency.wa.gov.au/
Environmental Protection Act 1986	https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_a252.html
Explore Parks website safety page	https://exploreparks.dbca.wa.gov.au/safety
Hiking Participation: AusPlay results to June 2023	https://www.hikewest.org.au/hiking-participation-ausplay-results-to-june-2023/
Metropolitan Water Supply, Sewerage, and Drainage Act 1909	https://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_588_homepage.html
More people more active outdoors	https://www.dlgsc.wa.gov.au/department/publications/publication/more-people-more-active-outdoors
Public drinking water source areas (PDWSA) online mapping tool,	https://www.wa.gov.au/service/natural-resources/water-resources/public-drinking-water-source-area-mapping-tool
Rights in Water and Irrigation Act 1914	https://legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_844_homepage.html
Road Traffic Act 1974	https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_a703.html
Road Traffic Code 2000	https://www.legislation.wa.gov.au/legislation/statutes.nsf/law_s257.html

Documents and references	Weblinks
Plan for Our Parks	https://www.dbca.wa.gov.au/management/parks/plan-our-parks
PlanWA	https://www.wa.gov.au/service/natural-resources/land-use-management/view-planning-data-planwa
South West Edge Trail Tourism Experience Opportunities	https://www.tourism.wa.gov.au/Markets-and-research/Specialised-Research-Reports/Pages/South-West-Edge-Trail-Tourism-Experience-Opportunities.aspx#/
Trails Development Series, 2019	https://www.dbca.wa.gov.au/parks-and-wildlife-service/trails
Trail Friendly Business	https://trailswa.com.au/about-trails-wa/trail-friendly-business-membership
Trail Town Accreditation Program	https://trailswa.com.au/about-trails-wa/accreditation
TRC Tourism for the governance and sustainability of Warburton Mountain Bike Destination, 2017	https://www.rideyarraranges.com.au/warburton-mtb-destination/
U.S. Forest Service. Standard Trail Plans and Specifications	https://www.fs.usda.gov/managing-land/trails/trail-management-tools/trailplans
U.S. Forest Service (2000) Trail Construction and Maintenance Notebook	https://www.fs.usda.gov/eng/pubs/htmlpubs/htm00232839/index.htm
Walker Friendly Business Program	https://www.bibbulmuntrack.org.au/get-involved/become-a-member/walker-friendly-business-program
Water Services Act 2012	https://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_12961_homepage.html
WA Aboriginal Tourism Snapshot	https://www.tourism.wa.gov.au/Markets-and-research/Specialised-Research-Reports/Pages/WA-Aboriginal-tourism-snapshot.aspx#/
WAITOC Aboriginal experiences interactive map	https://www.waitoc.com/fast-find/digital-map
WA Hiking Strategy 2020-2030	https://www.dlgsc.wa.gov.au/docs/default-source/sport-and-recreation/wa-hiking-strategy-bushwalking-and-trail-running-in-wa-2020-2030_web.pdf
WA Mountain Bike Management Guidelines, 2019	https://www.dbca.wa.gov.au/media/618/download
Tourism WA, Jina: Western Australian Aboriginal Tourism Action Plan 2023-2025	https://www.tourism.wa.gov.au/About-us/Strategies-plans-reports/Pages/Jina-WA-Aboriginal-Tourism-Action-Plan-2021-2025.aspx#
Walk and Off-Road Cycle Trails Strategy Margaret River 2021-2025	https://yoursay.amrshire.wa.gov.au/margaret-river-precinct-and-trails
WA Local Government Directory	https://walga.asn.au/about-local-government/online-local-government-directory.aspx
WA Strategic Trails Blueprint	https://www.dlgsc.wa.gov.au/department/publications/publication/wa-strategic-trails-blueprint-2022-2027

Publications

DBCA and DLGSC, 2019. *Trails Development Series,* s.l.: State of Western Australia

DBCA, DLGSC & WestCycle, 2019. *Western Australian Mountain Bike Guidelines,* s.l.: s.n.

DLGSC, DBCA and Common Ground, June 2020. *WA Hiking Strategy, Bushwalking and trail running in Western Australia 2020-2030,* s.l.: Department of Local Government, Sport and Cultural Industries

DLGSC, DBCA and Common Ground Trails, 2022. *WA Strategic Trails Blueprint 2022-2027*

International Mountain Bicycle Association (2001) *Building Better Trails: Designing, Constructing and Maintaining Outstanding Trails*

International Mountain Bicycle Association (2004) *Trail Solutions: IMBA's Guide to Building Sweet Singletrack*

Parker, TS (2004) *Natural Surface Trails by Design, Physical and Human Design Essentials of Sustainable, Enjoyable Trails*

Trails South Australia (2016) *Guidelines for the Planning, Design and Maintenance of Trails in South Australia*

Department of Water, Government of Western Australia (2008) Crossing Creeks, Stream crossings on farms. (www.wa.gov.au)

U.S. Forest Service. Standard Trail Plans and Specifications, US Forest Service

U.S. Forest Service (2000) Trail Construction and Maintenance Notebook

Useful websites

Break the Boundary Break the Boundary Inc – Go beyond flat surfaces and into the great outdoors

DBCA Phytophthora Dieback Phytophthora Dieback | Department of Biodiversity, Conservation and Attractions (dbca.wa.gov.au)

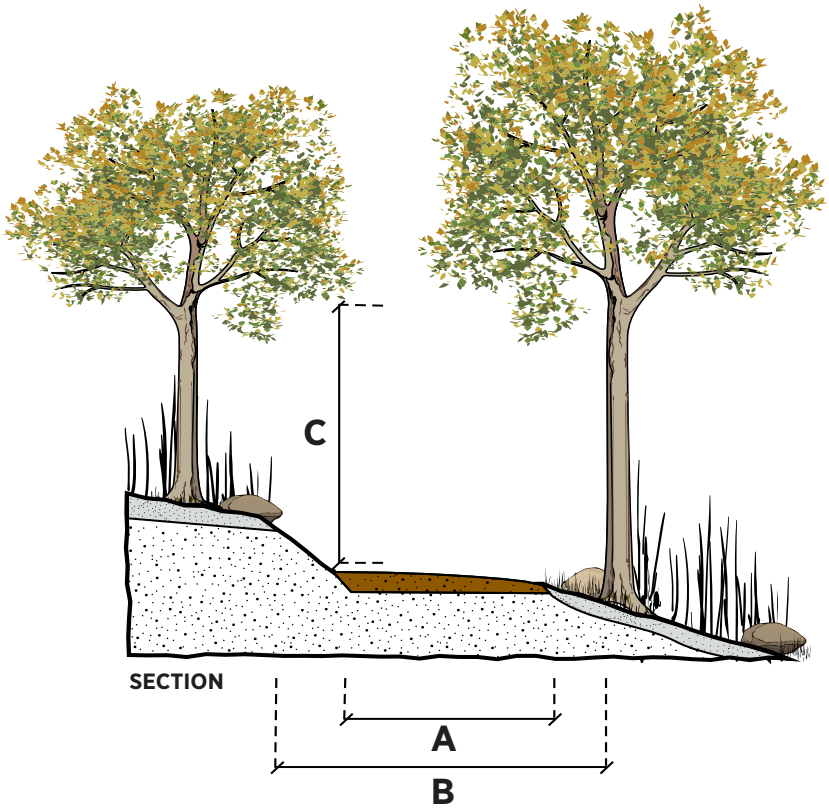
International Mountain Biking Association Mountain Biking | IMBA

Natureshape: Shaping Trails by Design Natureshape LLC

Project Dieback Phytophthora Dieback | Department of Biodiversity, Conservation and Attractions (https://dieback.net.au/)

WALGA Local Government Directory https://walga.asn.au/about-local-government/online-local-government-directory.aspx

Appendix C – Trail corridor



	Class 1	Class 2	Class 3	Class 4	Class 5
A Tread	Min 1200mm	Min 900mm	Variable, less than 1200mm	Variable	Variable with minimal modification to the natural environment
B Corridor (minimum)	2000mm	Variable (see notes below)			
C Ceiling (minimum)	2400mm	2200mm	2200mm	2200mm*	

* Some obstacles below the 2200mm ceiling height may occasionally be present on Class 4 trails.

Notes

- Corridor pruning and scrub rolling is generally 400-500mm either side of the tread. This may vary depending on environment and expected vegetation regrowth. Sloping terrain requires more focus on the upslope side for corridor management.
- Ceiling pruning heights need to consider expected vegetation regrowth and that when vegetation is wet, it may hang down further.
- Where a hike trail will have shared use, consult with recommended trail corridor specifications for the other activities, such as WA Mountain Bike Management Guidelines.

Appendix D – How to measure gradient 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.

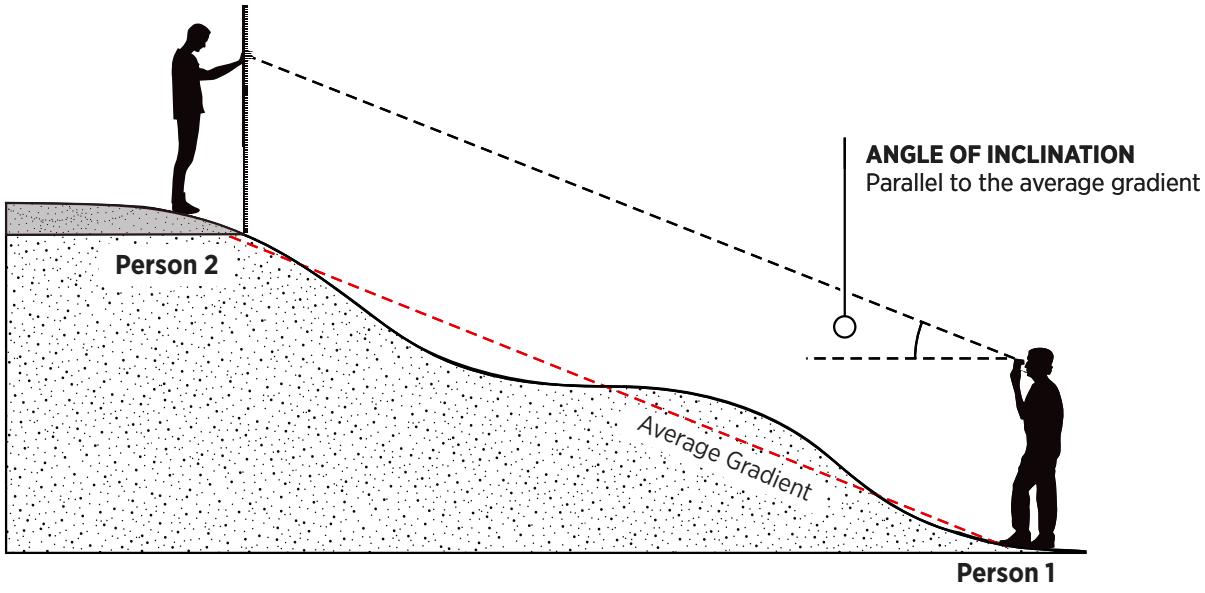
The instrument is aimed at the object by raising or lowering it until the hairline is sighted against the point to be measured. At the same time the position of the hair line against the scale gives the reading.

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.

An alternative to the survey staff is a length of pipe or conduit. Person 1's eye level can be marked with highly visible insulation tape. Person 2 doesn't need to put their finger across the staff.

There are many online instruction videos on how to use a clinometer.

HOW TO USE A CLINOMETER



Appendix E – Tips on clearing vegetation

Ensure relevant vegetation clearing permits, work standards, job safety assessments and operating procedures are prepared before work commences and comply with those required by the land manager.

Cut and clear the trail corridor of projecting limbs and debris that poses a safety hazard. Try to avoid hedge-style pruning to blend in with the surrounding vegetation.

Consider vegetation type and anticipated speed of regrowth when pruning and clearing. Also consider the habit of understory in vegetation types like karri forest that falls in naturally and reduces the available corridor.

Ensure tools are well maintained and clean. Tools and equipment should be thoroughly cleaned, such as with methylated spirits, to reduce the potential for the spread of plant disease.

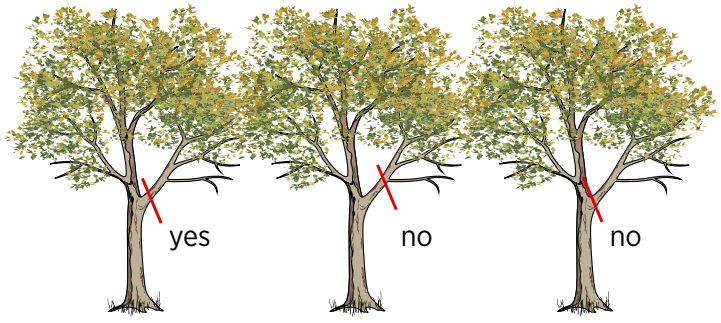
Removing root matter from small trees, shrubs and stumps growing in the tread area will vary. Sometimes root matter is critical in holding soil together. On a hand-cleared trail, it may not be critical to remove all roots. Be aware though, where vegetation is cut off at ground level, it can become a hazard when the tread later compacts, leaving a protruding stump or spike. For this reason, on trails shared by mountain bikes or horses, vegetation is best removed from the tread roots and all.

Cutting vegetation off at waist level first provides a handle to make it easier to lever and remove the root ball. Filling and compacting the resulting hole to match the tread ensures that a puddle doesn't form where it was removed.

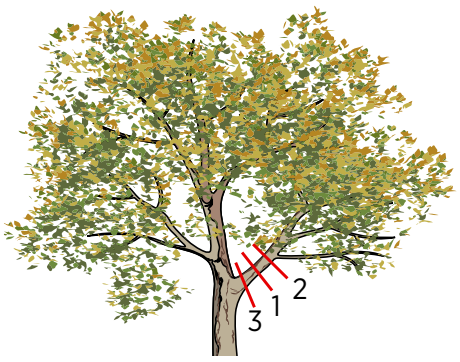
Prune limbs back towards the trunk, leaving the collar. Try not to prune flush with the main stem as it can rip the bark and increase the risk of fungal infection to the plant. Pruning to the collar enables the tree or bush to heal quickly.

Mulch and use prunings and vegetation off-cuts to cover areas of disturbance. Avoid throwing large amounts of cuttings off the trail as they will have a visual impact, so plan for these to be removed from site.

Retain leaf litter and other organic matter raked from the tread construction area and use to finish the disturbance post-construction.



PRUNING TO THE COLLAR



THREE CUT METHOD

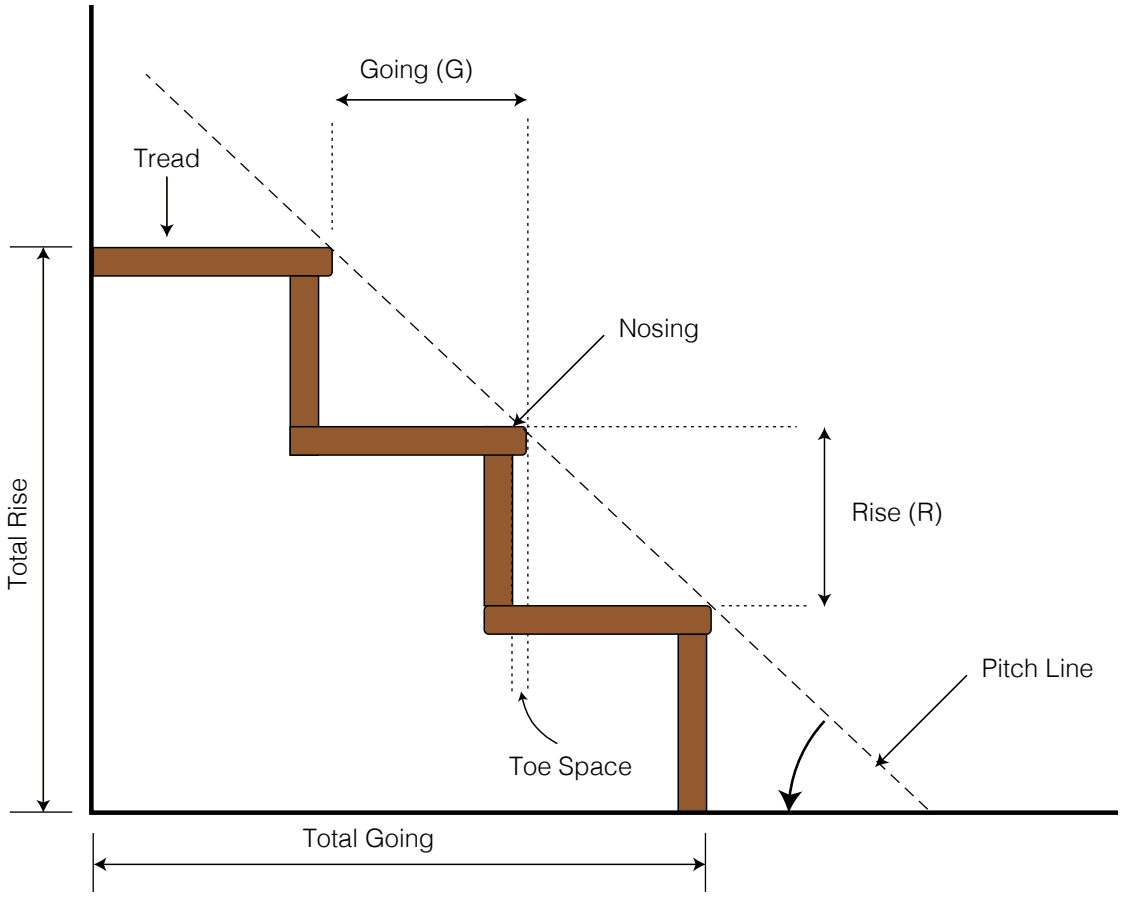
When cutting larger limbs, use the three-cut method:

1. Undercut 20-30cm from the trunk.
2. Remove limb 10cm past the undercut.
3. The final cut will be as close as possible to the branch collar.

Appendix F – Understanding steps

Terminology

Step	Consists of a riser and a tread and creates a surface on which to place one's foot when moving from one level to another. You may see this referred to as stairs.
Riser	The vertical part of the step and provides the rise or height gain.
Tread	The horizontal surface of the step.
Stairway	A structure with a series of steps, with or without landings, that provides pedestrian access from one level to another. Sometimes referred to as a staircase.
Ladder	A structure with treads or rungs and may be with or without handrails or side-rails.
Landing	An intermediate level in a system of stairways, ramps or ladders.
Nosing	The name given to the very edge of the tread. Sometimes a nosing strip or treatment is added to make the edge of the tread more visible or to increase slip resistance.
Toe space	The distance that the treads overlap.



Step formula

Steps must conform to set standards. Riser/ tread ratio should comply with the formulae:

1. 2 x riser + tread = 600mm approx.
2. Riser + tread = 460 mm approx.

For example:
Riser = 165 and Tread = 300

1. 2 x 165 + 300 = 630
2. 165 + 300 = 465

Step planning

1. Measure the total rise – for example 1820mm.
2. Determine appropriate step riser height – for example 165mm.
3. Divide total rise by step rise – 1820 / 165 = 11.04 – say 11 risers.
4. Determine tread width to meet standard formula – 300mm. Calculate total going 300 x number of treads. Remember number of treads = risers + 1 (include the tread at the base of the first riser).

   This example 11 + 1 = 12
   12 x 300 = 3600
5. Plot top and bottom of flight of steps. Where space is limited tread distance may be adjusted within the standard formula, for example, by reducing the tread size from 300 down to 290 will save 120mm on a flight of 12 steps.

Once a step ratio has been selected, use it as a standard along the trail wherever possible.

Appendix G – Template for trail management plan

This template can be used as a basis for a trail management plan and modified to suit the trail project.

Trail Management Plan

[Organisation/Agency Name] [Trail Name] [Location]

Table of Contents

Appendix H – Examples of trail descriptions

Here are examples of trail descriptors applied for each class. Generally, trailhead signs require brief, concise descriptions whereas other media, such as brochures or websites, may allow for a fuller description of the trail experience.

Trailhead	Brochure/website/other
Class 1	
Valley View Trail **Class 1 – Easiest** 900m return, allow 30 minutes. This well-formed, hardened walk trail is flat with no steps and leads to an impressive lookout offering uninterrupted views across the valley. It is suitable for all levels of experience and fitness.	**Valley View Trail** **Class 1 – Easiest** 900m return, allow 30 minutes. This well-formed, hardened walk trail is flat with no steps and leads to an impressive lookout offering uninterrupted views across the valley. The view takes in vast expanses of both forest and tree-less heathland, as well as prominent granite peaks in the distance. In spring, wildflowers are abundant along this trail. It is suitable for unassisted wheelchair users and all levels of experience and fitness.
Class 2	
Gentle Brook Trail **Class 2 – Easy** 2km return, allow 45 minutes. Take an easy walk along Gentle Brook to the waterfall and back. The trail is well formed with gentle slopes and no steps, making it suitable for assisted wheelchair use. It is suitable for all levels of experience and fitness.	**Gentle Brook Trail** **Class 2 – Easy** 2km return, allow 45 minutes. This trail provides an easy walk that closely follows Gentle Brook to the viewing platform at the base of the waterfall. It is best enjoyed in winter and spring when the brook is in full flow and wildflowers are blooming. The trail is a wide, well-formed gravel surface with gentle slopes ascending to the waterfall. It has no steps and is suitable for assisted wheelchair use and walkers of any experience or fitness level. The trail features several interpretive signs that provide insights into the natural and cultural values of the area.

Trailhead	Brochure/website/other
Class 3	
Granite Base Trail **Class 3 – Moderate** 4.5km loop, allow 1.5 hours This moderate difficulty hike circumnavigates the base of the granite dome, passing through shady karri forest. It has short steep sections and steps, and a shallow creek crossing that requires rock hopping. Some bushwalking experience and a moderate level of fitness is recommended.	**Granite Base Trail** **Class 3 – Moderate** 4.5km loop, allow 1.5 hours The Granite Base trail circumnavigates the massive granite dome that rises prominently above the surrounding karri forest. The moderate difficulty trail generally has a well-formed surface and features some steep sections with frequent steps. Around the half-way point there is a creek crossing that requires rock hopping when the creek is flowing (generally during winter and spring). The area features an abundance of birdlife, and lizards are often seen on the granite rocks. Some bushwalking experience and a moderate level of fitness is recommended for this trail.
Class 4	
Little Peak Trail **Class 4 – Difficult** 9km return, allow 4 hours. This is a long and difficult trail with rough, unformed and very steep sections. It runs along Little Gully, with rock hopping at several creek crossings, then ascends to Little Peak with numerous natural rock steps. There are occasional trail markers. Bushwalking experience and good fitness are recommended.	**Little Peak Trail** **Class 4 – Difficult** 9km return, allow 4 hours. This is a difficult half-day hike that includes some rough, unformed and very steep sections. The first 1.5km of the trail features a relatively gentle climb as it winds along Little Gully. There are four creek crossings that require short sections of rock hopping when the creek is flowing. The trail then turns westward and ascends steeply up the slopes of Little Peak, with numerous steps built with the local rock to negotiate. Be prepared for a rapid drop in temperature as you ascend towards the exposed summit. The trail has occasional trail markers featuring the Little Peak symbol to keep you on track. Bushwalking experience and a good fitness level are recommended.

Trailhead	Brochure/website/other
Class 5	
Big Peak Trail **Class 5 – Extreme** 5km return, allow 2 hours. This extremely difficult hike takes you to the highest peak of the Rugged Ranges. The trail has very steep sections with unmodified natural surfaces and rock scrambling is required. The trail has limited marking and is poorly defined towards the summit. Bushwalking experience, navigation skills and a high level of fitness are required.	**Big Peak Trail** **Class 5 – Extreme** 5km return, allow 2 hours. Hikers need to be well prepared to take on this extremely difficult trail that leads to the summit of the highest peak in the Rugged Ranges. The trail is very steep, with a total altitude gain of 290m and traverses rugged terrain with loose rocky surfaces. Towards the summit the trail follows the exposed ridgeline, where rock scrambling is required. The trail has limited marking, so navigation aids and good navigation skills are recommended. This trail is suited to experienced hikers with a high level of fitness. The effort required to reach the summit is rewarded with spectacular 360-degree views over the surrounding ranges.

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The Bibbulmun Track Trailhead, Kalamunda. Photo: Chris Tate.

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