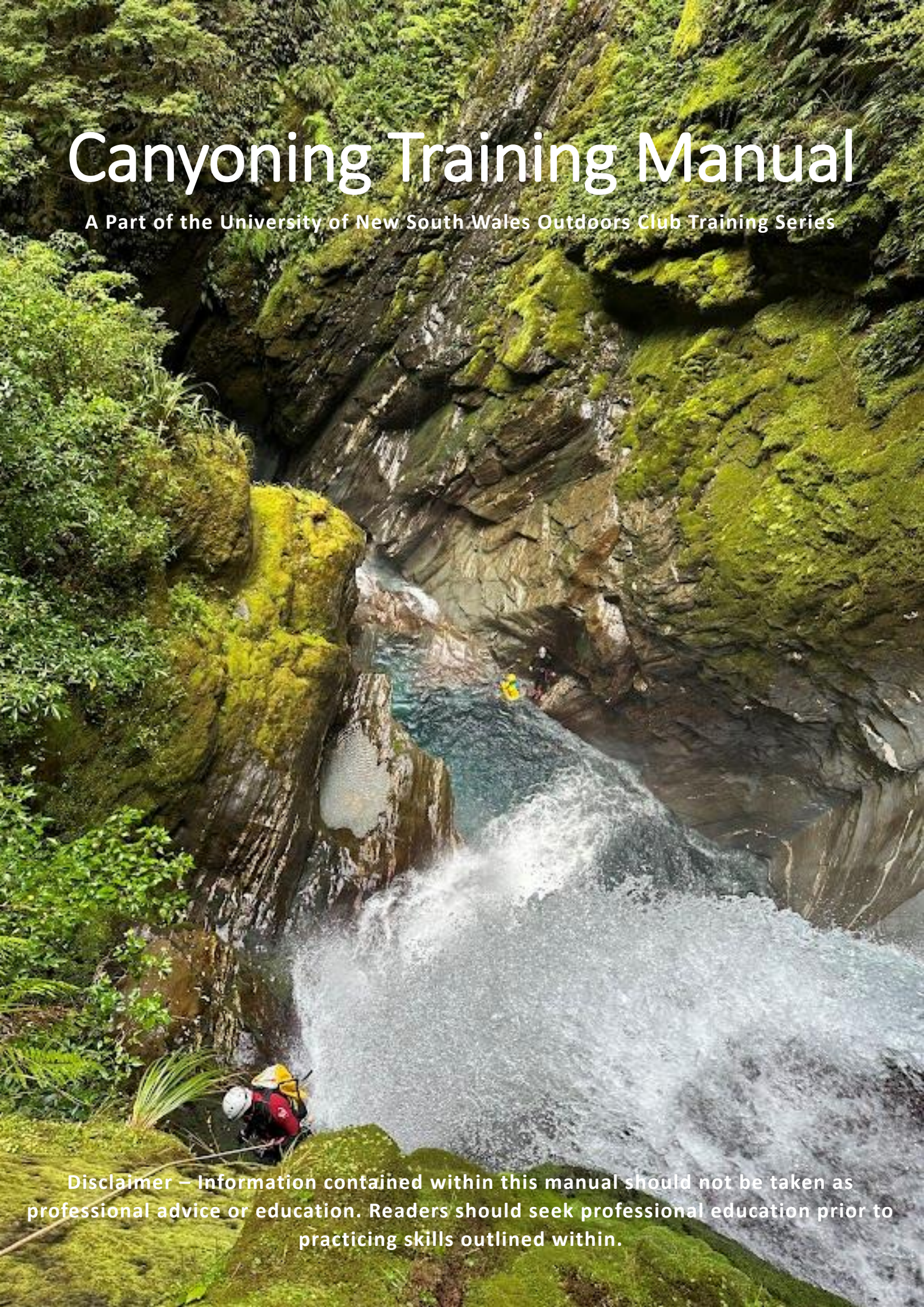


# Canyoning Training Manual

A Part of the University of New South Wales Outdoors Club Training Series



**Disclaimer – Information contained within this manual should not be taken as professional advice or education. Readers should seek professional education prior to practicing skills outlined within.**



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## 0. About This Training Manual

Welcome to the UNSW Outdoors Club Canyoning Training Manual.

This resource has been made to serve as a reference for individuals undergoing canyoning training with the UNSW Outdoors Club. While it offers insights and guidance, it is important to note that this manual does not replace the crucial hands-on training and experiences provided in our training sessions.

Canyoning is a rewarding outdoor activity that requires a unique set of skills and knowledge to navigate safely through rugged terrain and water-filled gorges. Whether you're new to canyoning or seeking to enhance your existing abilities, this manual is designed to support your learning journey and help consolidate essential skills.

Inside, you'll find detailed instructions, techniques, safety protocols, and best practices curated by experienced canyoners.

As you undertake canyoning training with us, remember that safety is paramount. Always prioritize your well-being and the well-being of your fellow canyoners. Take the time to absorb the knowledge presented in this manual, but always practice skills in a safe environment first, under the supervision of an experienced guide. Never hesitate to seek guidance from our trip leaders or other trusted sources.

We hope this manual serves as a valuable companion on your canyoning journey.

Happy canyoning,

- 2023/24 Exec Team

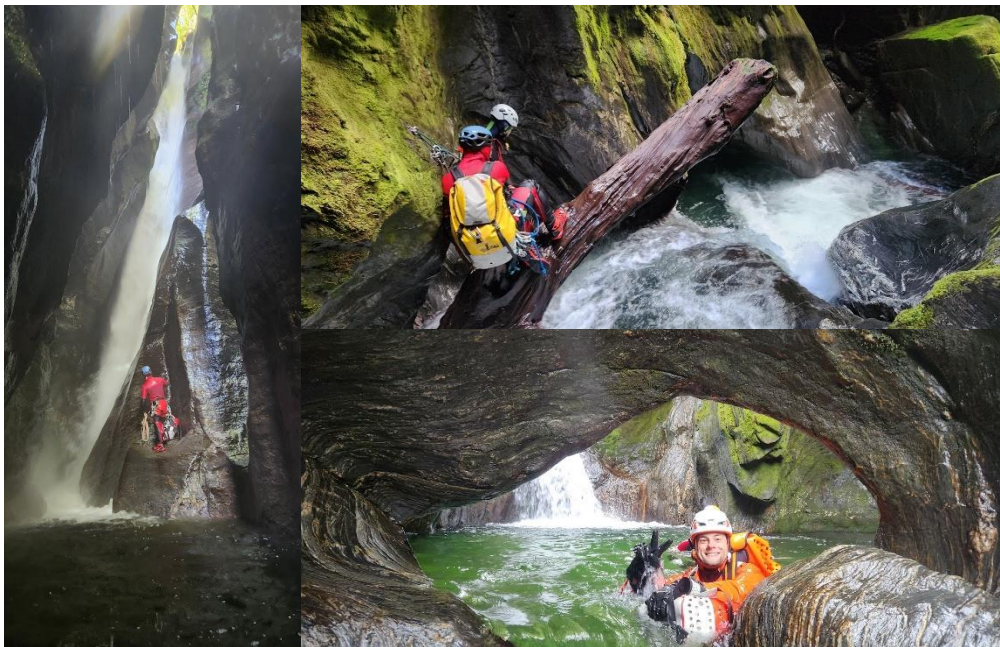


Figure 1 2024 UNSWOC Beanie Grant, NZ Canyon Festival. (Photo Credit Nadav Cohen)

## 1. Introduction

### 1.1 What is Canyoning?

Canyoning is the sport of traversing narrow slots carved into rock by ancient rivers. These environments are often wet and dark and require special skills to navigate obstacles such as waterfalls, slides, jumps and swims.

### 1.2 Where Can You Canyon?

Canyoning is a worldwide sport, ranging from Utah's deserts to New Zealand's fiords. In Australia there are numerous regions and isolated canyons, each with their own unique characteristics. Key regions include:

- North West Tasmania
- Victorian Alps
- Blue Mountains
- Northern NSW

UNSWOC's trips will mostly occur in the Blue Mountains region, primarily due to its proximity and lack of aquatic hazards, however more experienced members of the club will travel further afield to experience more aquatic styles of canyoning.

Information about canyons can be found through the following sources:

- [RopeWiki](#)
- [OzUltimate](#)
- Rick Jamiesons' book 'Canyoning Near Sydney'
- Robert Springer and Sam Thompson's book 'Canyoning around Victoria'

### 1.3 Canyoning Grades

Canyoning in Australia commonly uses two grading systems to classify canyons. These are the Tom Brennan grading system and the standardised French grading system, with the latter being slowly adopted, particularly in areas with significant aquatic hazards.

#### Tom Brennan Grade

Tom Brennan's system is a subjective grade of Easy, Medium or Hard, used to describe the difficulty of canyons in the Blue Mountains area and can be found through his website [OzUltimate](#).

#### French grading system

The French grading system is a four-component string of numbers, letters, and characters to describe 4 factors:

- Vertical Difficulty
- Aquatic Difficulty
- Commitment
- Quality

More details about this grading system can be found on the [New Zealand Canyoning Website](#).

### 1.4 Canyoning Gear

Here is a minimum standard list of canyoning gear for club trips, it is not an exhaustive list.

#### Participant gear

- Canyoning Harness
- Helmet
- Wetsuit suitable for temps
- Gloves
- 3x locking carabiners
- 1x prussik cord (Used as a third hand)
- 1x figure 8 or other canyoning descender
- 1x safety tether or PAS
- 1x large drybag or keg
- Emergency blanket
- Pealess whistle (Fox40 etc)
- Headtorch and spare batteries
- Canyoning Backpack
- Enclosed shoes with good grip (e.g. old sneakers, canyon specific shoes)
- Dry and sun-safe clothes to hike in/out of the canyon in (Not cotton)
- Thick socks / neoprene socks

- Raincoat or windbreaker
- Swimming shorts (To protect wetsuit)
- Thermal top and bottoms, jumper (e.g. enough clothing to keep warm in a canyon overnight in an emergency)
- Appropriate food and water
- Any personal medicine (asthma puffer, EpiPen etc)
- Optional: swimmers to put under your wetsuit, microfibre towel, Thongs for drive home

#### Additional Trip Leader Gear

- Figure eight (For rigging)
- Compass, map and canyon notes
- Canyoning quickdraw
- Ascending gear (Prussiks or mechanical)
- Canyoning knife
- Assorted carabiners
- Club first aid kit (Or appropriately stocked and maintained personal kit)
- Raising and hauling gear (Tibloc, VT Prussik, Pulleys etc)
- Rope protectors
- Replacement 8mm stainless steel maillons
- Replacement tubular tape
- Small adjustable spanner (For maillons)

#### Group Gear

- Appropriate ropes (total length is at least 3x the longest drop length)
- PLB
- Extra sugar e.g. snakes, jellybeans, etc

## 2. Trip Planning

### 2.1 Weather Forecast

Perhaps the most important factor when planning a canyoning trip is the weather forecast. As canyoning is largely an aquatic sport; past and forecast rain, air and water temperatures, and wind speeds can all influence the decision on which canyon to do, if any.

As a rule, a canyon should not be attempted after or during rain, unless a Trip Leader has previously descended the canyon in similar circumstances, and reliably knows how the canyon reacts after rainfall. This is to avoid the possibility of encountering flash flooding and formation of new aquatic hazards that the party might be unequipped to deal with.

Some canyons in the Kanangra, Victorian Alps and Northern NSW regions have direct or proxy water gauges what can be used to predict the aquatic environment inside the canyon, however these should be used with caution. These water gauges are not a substitute for first-hand experience with the canyon in different weather conditions.

Air temperature and wind speeds are also important factors in determining if a canyon can be safely run. As each person is different, it is best to experiment cautiously with your own comfort in these conditions. An emergency blanket and windbreaker should always be carried when canyoning to act as a last line of defence against these factors.

### 2.2 Canyon Grades

When planning canyons consider the competence and skills of the most inexperienced member of the group. Harder canyons require more experienced canyoners to navigate its obstacles, take your time and work up slowly.

### 2.3 Group Size

The size of your group depends on a couple main factors, local regulations, and the duration of the canyon.

In the Blue Mountains canyons, there is a size limit of eight for recreational canyon groups and ten for commercial groups. Other canyon regions have different rules and regulations.

More canyoners means a longer and colder trip, consider the length of your trip and the size of your group to avoid being benighted.

Many consider 5 to be the optimum canyon size for complex canyons (where all are riggers and have rope). The club has a hard cap of 8 canyoners including trip leaders in all canyons.

### 2.4 Local Regulations

Local regulations also influence how, and which canyons can be run. Some canyons are against the law, such as Spring Creek in Bungonia SCA, Minnamurra Falls and most Southern Highland waterfalls.

Some National Parks, State Conservation Areas, and State Forest also require written consent for canyons or waterfalls to be descended.

Wilderness canyons are also a unique canyoning experience and are defined as unpublished with minimal human interference. Proper care should be taken on these trips to minimise impacts, such as rigging using ghosting techniques, and limiting the spread of information about the location of the canyon.

### 3. Abseiling, Jumping and Swimming

#### 3.1 Descenders

Canyoning descenders have some unique properties compared to other descenders used in other sports, which make them best adapted to aquatic environments.

Some of the properties are as follows:

- Permanent attachment to harness
- Friction adjustability
- Ease of loading rope
- Self-belay capacity
- Ability to quickly tie off

Many of the eight style devices also cause rope twist while abseiling, however in many cases in canyons the rope length is set to the height of the water, so any twist introduced undoes itself.

Whichever device you choose to use, you should be comfortable with its friction settings, and be well practiced in tying off and inspecting the device.

#### Figure Eights

A figure eight is the most basic type of canyoning descender, they are also commonly used as a device for rigging, see 5.3 Releasable Systems.

Figure eights are the cheapest type of descender, simple to use

and load onto the rope, however they have little ability to adjust friction on abseil, and hence are used mostly by beginners where the option for a belay is available.

There are two common ways to rig a figure eight, the classic method and vertaco method.

A video on some ways to rig a figure eight are included [here](#).



Figure 2 Figure 8

#### Modified Eights

Modified eights are the standard for canyoning descenders, as they provide all the required properties for aquatic abseiling including the ability to adjust friction on the fly and lock-off quickly.

Numerous brands and styles exist with the most common being, Imlay Canyon Gear Crittr, BG Gear Squwrel, Kong Oka and Petzl Piranha.

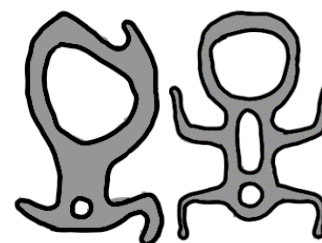


Figure 4 Petzl Piranha

Figure 3 Imlay Crittr

#### Inline Devices

Inline devices are more commonly used in caving than in canyons, except for the Kong Hydrobot. These devices are useful as they do not introduce rope twist, however they can be difficult to load onto rope and have little adjustability of friction.

Devices include the Kong Hydrobot, Rappel Rack, or Conterra Scarab.



Figure 5 Kong Hydrobot

#### Belay Devices

Tubular devices should not be used in canyons for their lack of friction adjustability and the tendency to drop the device when loading on and off rope.

Mechanical belay devices should also not be used for the same reasons, along with the fact that they will become filled with sand and stop working.



## 3.2 Abseiling Technique

### ABCDE Checks

ABCDE checks is a common mnemonic used to check aspects of an individual's setup to ensure they are safe to abseil. Every individual should complete these steps prior to abseiling.

#### Anchor

Check that the anchor is suitable and that the rigging is correct and suitable.

#### Buckles and Belay

Check your harness and helmet buckles are secure and correct. For older styles harnesses this can be particularly important as they must be doubled back to not come undone.

A method of belay has been implemented and checked.

#### Carabiners

Carabiners are all suitable, not cross-loaded and screwed up.

#### Descender

Rope has been properly rigged through the descender with an appropriate amount of friction.

#### Everything else

Gloves are being used on long abseils, hair and loose items are tucked away, helmet.

### Preparing to Abseil

The following simple procedure should always be used when preparing to abseil. This method also ensures that the anchor and rigging is load bearing and that your device is rigged correctly, two of the most common mistakes when abseiling.

- 1) Clip safety when approaching anchor
- 2) Wait for call "Off rope", or whistle equivalent and when ready to abseil

load rope into descender with appropriate friction

- 3) Apply a third hand here if needed.
- 4) Unweight your safety and apply a full load to the abseil line, depending on the angle you may need to give the anchor a little bounce to apply force equivalent to bodyweight.
- 5) Make call "On rope" and wait for call "abseil when ready" if being bottom belayed. Call "abseiling" and unclip your safety, then begin your abseil.
- 6) Once finished abseiling remove your rope from the descender and make call "Off rope"
- 7) If a bottom belay is used, replace the bottom belay.
- 8) Once "On rope" is heard, reply with "On belay" when ready to bottom belay.

### How to Abseil

Abseiling is a technique that is best learnt with practice; however, some general tips can be given.

- Use a device that has a suitable amount of friction. You should not have to grip the rope very much at all to prevent descent, and you should not have to push rope through the device to begin descending.
- Keep your feet a shoulder width apart at all times to stop falling left or right
- Try and maintain feet and legs perpendicular to the wall. This will increase your grip with the wall and prevent sliding front and back into the wall.
- Follow the line that the rope takes. Try not to walk left or right as there become a point you will be pulled off balance and fall, swinging and potentially cutting the rope.
- Never let go of your abseil line, even if you slip or tumble.

- Tend to a third hand with your non dominant hand.
- To go over an overhang you should first place your feet at the edge of the cave and lower your butt below your feet. Once you are as low as you can go, remove the feet, and go into a free hang not touching the wall.
- Never place your hand between your device or rope and the rock. It may get stuck and pinch/abrade your hand.
- Tie back all loose clothing and hair, and always be aware that it can get stuck in your abseil device, especially if the device has been extended.

### 3.3 Communication

Efficient and clear communication when canyoning is crucial. To pass the maximum information clearly it is best to attempt to communicate verbally first, then hand signals and finally by whistles, this particularly helps to avoid passing the wrong information.

Very often the sound of a waterfall, even on short drops, blocks out most sound so verbal communication can be extremely difficult.

#### Calls and Whistles

Common calls are as follows.

Call	Description
"On Rope"	Descender has rope threaded through
"Abseil when ready"	Used to tell an abseiler they have a bottom belay
"Abseiling"	Used to tell people on the bottom of a pitch that you are abseiling
"Off rope"	You are at the bottom of a pitch, and you have come off the rope
"On belay"	Used to tell the abseiler they have a bottom belay
"Lower"	Lower someone on abseil using a releasable system

"Raise"	Convert abseil line to hauling and raise the abseil line
"Stop"	Stop lowering, raising or any other action
"Rock! Rock! Rock!"	Falling object. Don't look up and take cover if possible. Note: always say rock no matter the object.

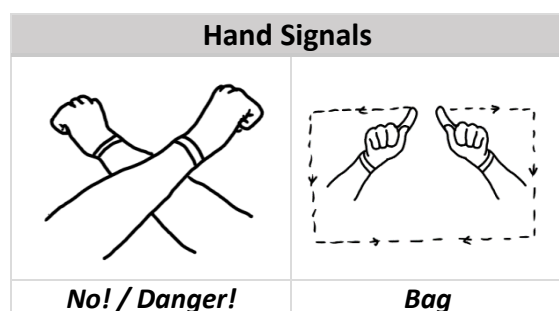
Whistle calls can commonly replace the above calls in situations where it is too noisy for verbal communication. As whistle calls and hand signals are different in different parts of the world, it is best to discuss these before canyoning with a new party.








Call	Description
One whistle	"Stop"
Two whistles	"OK", "Yes"
Three whistles	"Lower"
Four whistles	"Raise"
Continuous whistle blasts	"Emergency"

Two whistles can also be used to replace the abseiling calls such as "Abseiling", "On belay" and "Off rope".

#### Hand Signals

The following signals are used within the club context to communicate. Different groups may use different signals, so before a trip these should be refreshed.



	
<b>Lower</b>	<b>Okay</b>
	
<b>Raise</b>	<b>Release</b>
	
<b>Rope</b>	<b>Sharp Edge</b>
	
<b>Sharp Edge</b>	

### 3.4 Jumping and Swimming Technique

#### Jumping Techniques

While jumping may be one of the most exciting parts of canyoning, it is also the most dangerous. Even the smallest miscalculation of mistake can lead to potentially fatal injuries, and therefore at UNSWOC it is to be taken with upmost caution.

When jumping a person should always check the depth of the water beforehand. The water must be free of submerged obstacles such as rocks, sticks and logs, while also be sufficiently deep to prevent hitting the bottom. The pool

checker should remain at the bottom of the jump to help provide information to the jumper, such as the correct landing position. The checker can also stand n any submerged objects to make clear to the jumper the position of objects beneath the water. Goggles are also a valuable item to check for submerged logs or debris.

Jumping can take many forms, including an L sit (landing with your calves and butt hitting the floor, with an upright body) for shallow jumps, or a upright jump with your knees slightly bent but relaxed, and arms across your chest for a high jump.

It is vital for arms to be crossed, and not to slap the water on landing to prevent shoulder dislocations.

The jump site must also have a solid and easy launch site, otherwise the slightest of slips can become fatal.

Extreme care should be taken on all jumps, and the decision on whether participants an jump should be made by the trip leaders. Always remain on the side of caution about jumps during a club trip to prevent any injuries.

#### Swimming Techniques

Swimming in strong currents should never be done with a bag on. Aggressive freestyle is the preferred approach, keeping your eyesight on your target location.

Swimming in weaker currents can be done with a bag. In canyons with flush overs it is best to swim facing forwards, either breaststroke or resting on your floating bag.

In areas where flush overs aren't a concern, it is okay to swim with your back facing forward.



## 4. Anchors

### 4.1 Types of Anchors

Anchors used for rigging come in variety of types, and each anchor must be assessed on its safety before use.

Some tools used to assess anchors include the EARNEST or SERENE methods, information found [here](#).

#### Suitability Criterion

Factors to check when assessing the safety of an anchor are:

#### Condition of soft and hard gear

If hard gear exhibits any of the following it is unsuitable as anchor material.

- Rust or tarnishing of metal surface
- Any material other than stainless steel or titanium
- Excessive grooves and wear
- Fractures or other faults
- Sharp edges or vertices.

If soft gear exhibits any of the following it is unsuitable as anchor material:

- Discolouration (check sections of webbing not exposed to light to see original colour)
- Cuts, abrasion, burns or melting points
- Any material other than reputable climbing or canyoning brands

#### Condition and type of rock and/or natural feature

If the rock or bolting structure exhibits any of the following it is unsuitable as an anchor:

- Rock has an edge, fractures or fault line or void within 300mm of the bolt.
- There is one bolt or the bolts are too close together.
- The whole rock structure is unstable, on a flake, or the rock is soft (choss).

If natural features exhibit any of the following it is unsuitable as an anchor.

- Tree is less than 30cm in diameter.
- The tree moves when pushed.
- The tree has an unstable root system or unstable soil.
- The tree species is known to be weak or unstable (Xanthorrhoea and Casuarinas are not suitable as they are too weak).



Figure 6 Xanthorrhoea (Grass Trees) and Casuarina

#### Reputable brands

All soft and hard gear must be from a reputable climbing or canyoning brand. Commonly hardware store mallions and tape is used which is unsuitable.

If an anchor does not pass the above requirements a new anchor must be built, suitable to meet the requirements.

#### Slings and mallions

Slings and mallions are the most common anchor in Blue Mountains canyons, where natural protection is plentiful. They limit permanent modification of the environment and are easy to use.

Appropriate mallions must be used for this purpose, hardware store or triangular mallions have been known to catastrophically fail.

Rigging can be done through either the sling

such as in an MMO or by blocking against the mallion in an eight or biner block.

### Log Jams and Chockstones

Log jams and chockstones are also a common natural method of anchor when trees are not available.

These systems must be assessed prior to use based upon the suitability criterion.

### Pitons

Pitons are an outdated method of anchor, however, can still be seen in some of the lesser descended canyons.

Generally, it is best to stay away from these anchors, as they are commonly rusted and unsuitable.

### Bolts

Bolts should also be suitable, reputable brands made of stainless steel or titanium, sufficient length glue ins for sandstone or other soft rock (No expansion bolts or carrots).

Redundancy is also an important factor, anchors should always have two bolts, either linked or unlinked to have redundancy.

### Drilled Threads

Drilled threads are holes drilled through rock with a piece of rope or sling threaded through and a mallion or rappel ring attached. These are used similarly to slings and mallions.

### Meat Anchors

Meat anchors are an advanced technique where the weight and positioning of a person are used as an anchor to abseil or transverse on.

The rope is threaded through their device and locked off, and the person positions themselves in a position sturdy enough to support the required load.

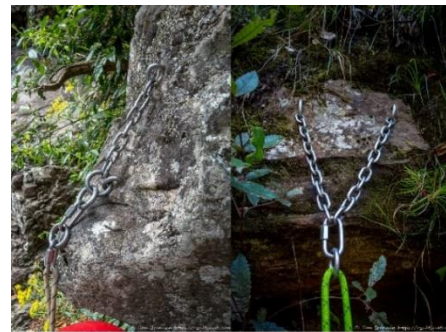


Figure 7 Bolt Examples (Courtesy of Tom Brennan, OzUltimate.com)

This method should first be practiced in a safe environment and used with a high degree of caution.

## 4.2 Replacing Anchors

### Natural Anchors

To replace anchors, you must first remove all other anchor material to avoid clutter.

Check that the anchor you are going to use is suitable.

You can then use a variety of methods such as a [Wrap 3 Pull 2](#), Wrap 2 Pull 1, or Single Wrap using tape or rope to create an anchor. A stainless steel mallion can then be placed on the tape or rope and tightened down with a spanner.



## 5. Pitch Rigging

### 5.1 Trip Leader Gear

#### Rigging Gear

System	Video Link
Eight contingency block	<a href="#">Video demonstration</a>
Munter mule overhand	<a href="#">Video demonstration</a>
Eight mule overhand	<a href="#">Video demonstration</a>
Jester	<a href="#">Video Demonstration</a>
Joker	<a href="#">Video Demonstration</a>

With each rigging method being different this list can vary from leader to leader, however, below is a recommend list that can be used to rig a variety of abseils.

- Assorted biners (Large HMS are good)
- Figure eight (Such as Petzl Huit)
- Grivel Vlad
- Canyon quickdraw (Has locking biners)
- Raising and hauling gear (Tibloc, VT Prussik, Pulleys etc)
- Rope protectors

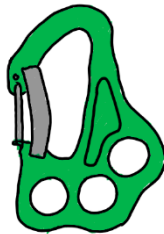


Figure 8 Grivel Vlad

#### Anchor Gear

Gear used to replace and construct anchors should be brought on every trip. Below are some of the items that should be brought.

- Replacement mallions
- Replacement tubular tape
- Small wrench (For mallions)

### 5.2 Classifications of Rigs

An excellent resource by Brent Roth about rigging can be found [here](#), including how to classify rigs based on their utility.

Videos on how to tie some basic abseil rigs and knots can be found [here](#).

### 5.3 Releasable Systems

Releasable systems are quickly becoming the standard practice for canyoning and abseiling due to their ability to allow for rescue quickly and efficiently.

Within UNSWOC it is recommend for all abseils to be rigged with the capacity for rescue, which commonly means rigging releasable systems.

The use of a releasable system also allows for rope to be “bled out” while an abseiler is on rope, reducing the possibility of excessive abrasion or core-shot.

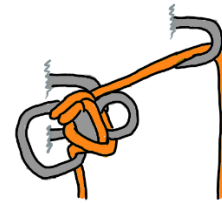


Figure 9 Figure Eight Block

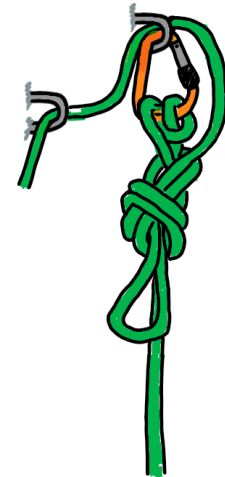


Figure 10 Munter Mule Overhand (Right)

### 5.4 Other Systems

These other methods of rigging can be useful in certain scenarios.

The double stand method is not preferred for abseiling as it has limited options for rescue and is dangerous in aquatic environments due to the amount of loose rope at the bottom of

abseil. It is still commonly seen however as it is easy to rig.

The biner and knot blocks are useful methods to use in combination with other systems (such as traverse lines), or on short drops or hand lines where rescue is unlikely and easy to do without lowering.

The guided rappel is an advanced technique used in highly aquatic whitewater. It is essentially a zip line where participants can avoid aquatic obstacles. Special care and practice should be taken with this technique as it is complicated, requires a bottom anchor, and can make unusually high forces (around 7kN or higher!).

System	Video Link
Double Strand (Throw and go)	<a href="#">Link</a>
Biner Block	<a href="#">Link</a>
Knot Block	<a href="#">Link</a>
Guided Rappel	<a href="#">Link</a>

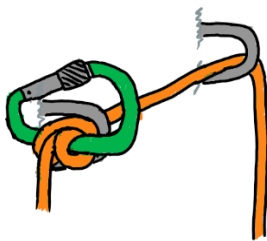


Figure 12 Biner Block

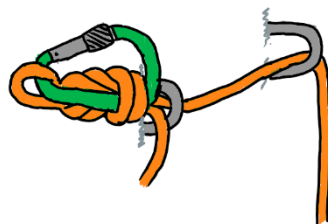


Figure 11 Knot Block

## 6. Belays

Belays are systems used to add redundancy to an abseiler in the case of a fall. Without a belay, the abseiler may slip or fall resulting in injury or death.

All beginner UNSWOC trips should have belays to protect participants, particularly beginners or those not confident in abseiling.

### 5.5 External belay

#### Top Belay

Top belays are an effective and widely applicable method to provide redundancy.

A second rope (or the pull-down strand) can be used to set up this method and requires little more than two carabiners.

[A video on a belay with a munter is found here.](#)

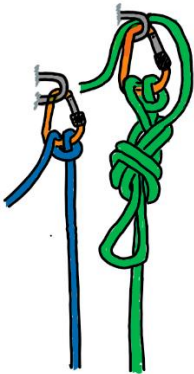


Figure 13 Munter Mule Overhand (Green) with a Munter Top Belay (Blue)

#### Bottom Belay (Fireman's)

Bottom belays are another common method to provide redundancy to an abseiler.

This involves having someone on the ground hold the rope and watch the abseiler as they descend, and in the instance of a loss of control the person on the ground will pull and hold the rope increasing friction in the abseiler's device.

This method, while being easily implemented with no required gear, is unsuitable for the first person, requires the attention of the

ground belayer, and unsuitable in water or aquatic abseils.

[A video on fireman's belay is found here.](#)

### 5.6 Self-Belay

#### Third Hands

Third hands are a useful method of self-belaying and are commonly used by the first abseiler when there is no opportunity for a bottom belay.

Numerous knots exist, with the most common being the [VT \(Valdotain Tresse\)](#), [Autoblock \(or French\)](#), [Klemheist](#), and [Classic prussik](#).

Third hands should never be used in aquatic environments, where there is even the most remote chance of drowning or hypothermia, this is as they tend to get jammed when the rope swells due to water.

You should also ensure an appropriate distance between your third hand and your device. Your third hand can be rendered useless if your device forces it downwards as to not catch when needed. Extend your device if needed.

### 5.7 Specialty Belays

#### Traverse Lines

[Traverse Lines](#) are a useful method to approach anchor or obstacle that is in a dangerous position. These techniques can be dangerous, and as such should be practiced in safe environments first.

The self-belay should only be used when large falls aren't expected, and control of the brake strand can be always kept control of.

An external belay is best when there is any chance of loss of control of the brake strand, however communication is vital between the belayer and the traverser to ensure the correct rope length in aquatic canyons.



## 6. Responsibilities as a Trip Leader

### 5.8 Planning a Trip

Key responsibilities of trip leaders during the planning stages of a trip are listed below.

- A minimum of two trip leaders are required for a trip to run. This includes having either one Level 2 and one Level 1 Trip Leader, or two Level 2 Trip Leaders for the respective sport.
- At least one trip leader must have a first aid certificate, ideally RAFA or WAFA.
- An emergency contact must be delegated and informed on the activity.
- The trip leaders must adequately choose participants for the activity. This includes having a good ratio between beginner and more experienced participants.
- The trip leaders must choose an activity that they are confident can be run safely for the skills of the group. This commonly means running a trip that the trip leaders have already completed.
- Post the trip on the website and ensure participant list is up to date before the commencement of the activity.

### Emergency Contact

The purpose of an emergency contact is to inform emergency services if a trip is overdue and inform the safety officer about an incident or emergency.

Emergency contacts must be easily contactable throughout the duration of the trip.

The emergency contact should also be aware of key details of the trip, such as the number and names of people on the trip, the nature of the trip (canyon, climb, multipitch, bushwalk),

the location of the trip, the expected return time and emergency call time.

If the party cannot be contacted after the emergency call time it is the emergency contacts responsibility to inform both emergency services and the safety officer of the club.

### 5.9 Trip Brief

Before the commencement of a trip a brief of the activity should be done. This is commonly completed at the cars.

The trip brief should include an introduction and icebreaker of the participants and leaders, an acknowledgement of country, a gear check to ensure everyone has suitable gear for the trip, and a brief about that to expect out of the day. This includes outlining what is expected from the participants and explaining expected risks during the day.

Medical conditions of the participants should also be discussed with the trip leaders. The option of discussing this privately should also be provided. Examples include asthma, allergies, history of dislocations or breaks, diabetes, epilepsy etc.

The trip leader should then decide about the suitability of each participant for the trip and decide whether to reject participants due to safety concerns.

### 5.10 During the Trip

Throughout the trip, the trip leaders have a duty of care for their participants. Care should be taken to ensure best practices are exercised, and all unnecessary risks are reduced or eliminated.

Look out for your participants and ensure that they feel safe throughout the trip.

Don't allow yourself or other trip leaders to take unnecessary risks.

### 5.11 After the Trip

After the trip ask participants to return their gear to the gear cupboard after it has been cleaned and dried.

If any gear was damaged during the trip clearly label it and notify the gear officers.

Send any pictures to the gear officer, and if you feel generous with your time write a blog post on the website.

### 5.12 Incidents and Emergencies

During an incident or emergency, the safety of the party is the priority.

During an emergency the following should be followed.

- Apply self-preservation and minimize risks to participants.
- Notify emergency services.
- Provide first aid to your level of training.
- Provide extended patient care if applicable.
- Conclude activity.
- Debrief of party.
- [Fill out the incident report form.](#)
- Talk to other experienced trip leaders, and help each other learn what we can do to avoid similar situations in the future.

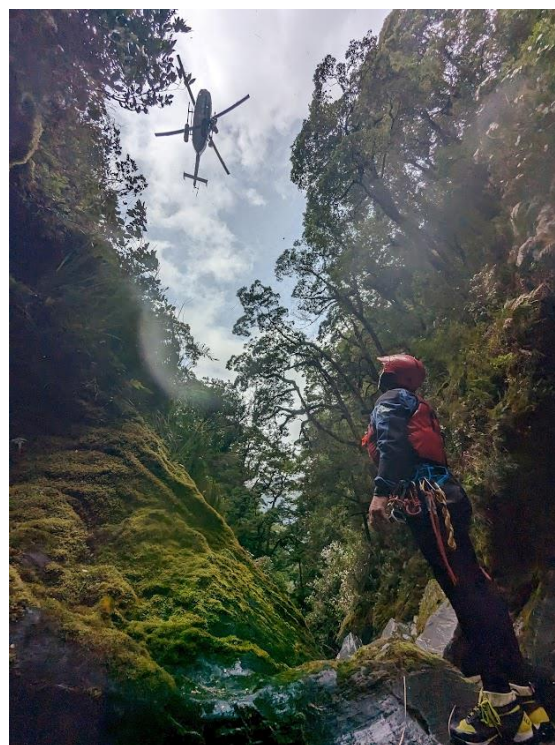


Figure 14 Helicopter Evacuation in Ore Stream, NZ

## 6. Rescue Techniques

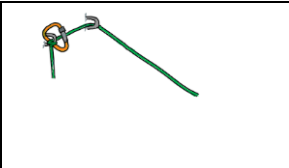
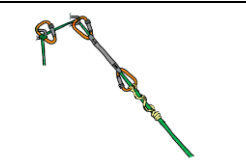

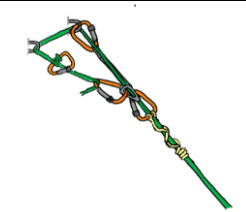
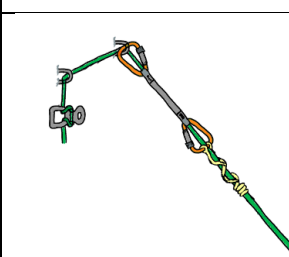
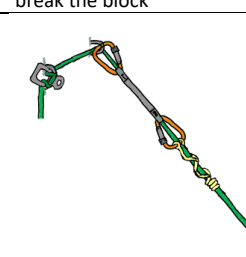
### 6.1 Lowering and Raising

#### Lowering

Lowering on a releasable setup is the preferred method of rescue in most scenarios as it is quick, can be done indirectly, and removes the danger of a person on abseil. Refer to 5.3 Releasable Systems.

Lowering on a biner or knot block is much trickier than lowering on a releasable setup and is used as an emergency technique. It is colloquially called 'breaking a block'.

Firstly, tension must be released from the biner or knot block, then a releasable is installed, and then lowering can begin. While there are numerous methods to achieve this, one method is demonstrated below.

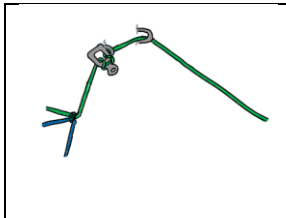
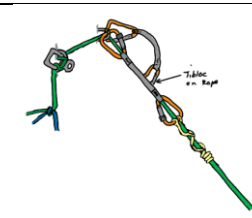
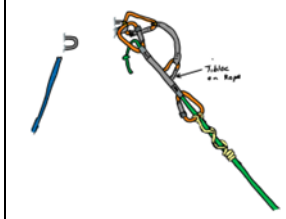
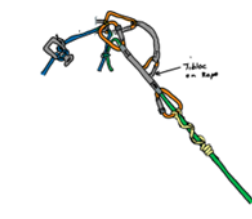
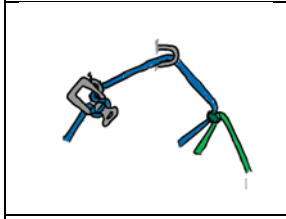
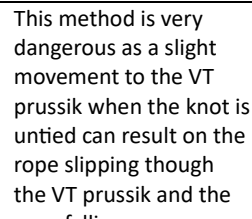
	
Biner Block	Attaching a VT prussik with a canyon quickdraw
	
Making a 3:1 with a tibloc	Hauling on the 3:1 to 'break the block'
	
Replacing the Biner Block with a Figure 8 block	Lowering the VT prussik until the Figure 8 touches the bolt. This is now ready for releasable lower.
Here bolts are shown as unlinked for simplicity. Bolts should temporarily be linked with either a sling, quickdraw or other for redundancy.	

#### Lowering Past Knots

If a lowering past a knot is possible, a MMO is the preferred option as it is the easiest to lower past a knot. Furthermore, if a lower is expected, a Flat Overhand (a.k.a European Death Knot EDK) is the best option for passing through a munter.

A video demonstrating this can be found [here](#).

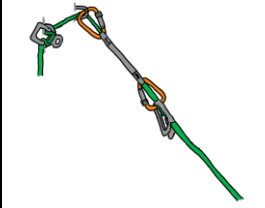
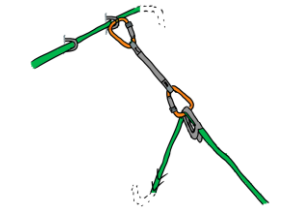
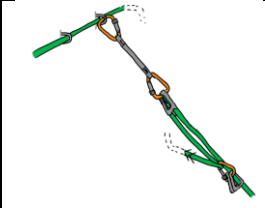

Lowering past a Figure Eight Block is more complicated and dangerous, and as such should be used as a last resort. A method is demonstrated below.

	
Figure Eight lowering past a knot.	A Tibloc and VT prussik are attached to the rope. The tibloc must have engaged teeth otherwise this method is very dangerous.
	
The knot is then untied and the Figure Eight removed.	The second rope is then passed through the bolt and the knot retied on the other side.
	
The excess gear can be removed and lowering can commence.	This method is very dangerous as a slight movement to the VT prussik when the knot is untied can result on the rope slipping though the VT prussik and the rope falling. The Tibloc is placed as a backup in case this occurs, yet it would only work if the teeth are engaged, and if a large shock load was to occur, the rope could de-sheath as it is so close to the end. Hence this method should only be used once all other

	methods have been exhausted.
Here bolts are shown as unlinked for simplicity. Bolts should temporarily be linked with either a sling, quickdraw or other for redundancy.	

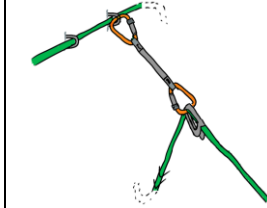
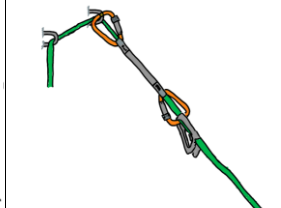
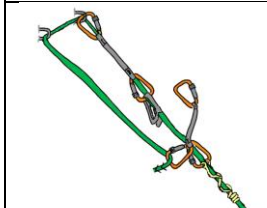
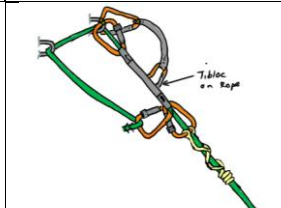
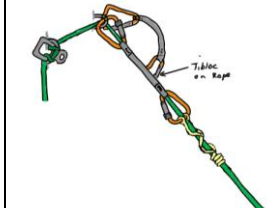
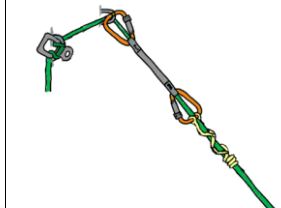
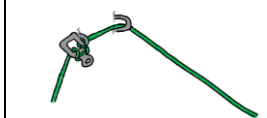
### Raising

The steps for raising are very similar to the initial steps for lowering on a block, with some changes for optimisation.

	
From a Figure Eight block, a quickdraw with Tibloc is attached. The Figure Eight can then be lowered transferring all force onto the Tibloc and quickdraw.	Rope can then be pulled from between the anchor and the tibloc and a Counterweight haul is created. Care must be taken by the hauler in case the abseiler comes off the end of the rope. This can make the hauler fall backwards when the load is removed.
	
A 3:1 haul can be created with additional Tibloc or VT prussik. Attached to the rope below the first tibloc this creates further mechanical advantage.	The addition of a dyneema sling (blue) as shown above can create a 5:1 haul. This is used when previous methods prove too difficult.
Here bolts are shown as unlinked for simplicity. Bolts should temporarily be linked with either a sling, quickdraw or other for redundancy.	

### Converting Raise to Lower

One method of converting between a raise and lower is shown below.

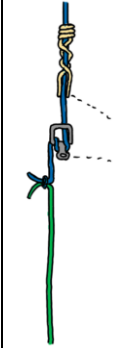
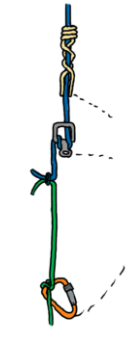
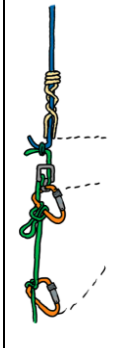
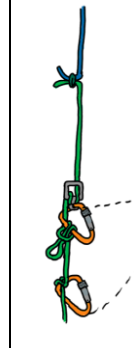
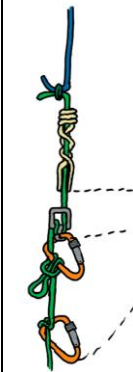
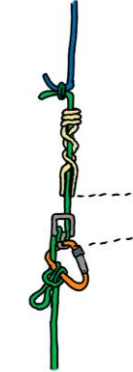
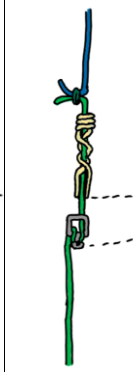
	
Begin with the counterweight haul.	The loose rope between the bolt and tibloc is removed.
	
A VT prussik, quickdraw and biner is spaced on rope as above.	Using the 3:1 created, the rope is hauled until the VT quickdraw be attached to the anchor. The weight on the tibloc is removed at this time.
	
The 3:1 is deconstructed and the eight block is placed on the opposite bolt.	The Tibloc is removed and the VT prussik is released until the eight block bears the weight.
	
The VT prussik is removed and the system can then be lowered as normal.	
Here bolts are shown as unlinked for simplicity. Bolts should temporarily be linked with either a sling, quickdraw or other for redundancy.	



## 6.2 Complex Rescue

### Abseiling Past Knots

Below is a method of descending past a knot with a VT prussik.

			
Begin with a VT prussik above your device and abseil to just above the knot.	While weighting the VT prussik, tie a backup below the entire system, such as a clove on a biner attached to your harness.	Next, remove your abseil device and reattach to below the knot. Tie this off to lock. Next remove weight on the VT prussik and remove it. Qat this time, weight should be on your abseil device.	Next abseil a small distance and tie off your device again. This provides space for reattaching the VT prussik.
			
Reattach the VT prussik.	Remove the backup.	Abseil as normal.	
<p>Here bolts are shown as unlinked for simplicity. Bolts should temporarily be linked with either a sling, quickdraw or other for redundancy.</p> <p>Furthermore, the tying off the device is depicted for simplicity here as a mule knot however it should be done correctly for your respective device, such as a mule overhand for a figure eight.</p>			

### Ascending a Rope

There are many methods of ascend a rope, with common methods including a traditional prussiks, a croll and basic, or foot and hand ascenders.

[Here](#) is a demonstration of ascending using traditional prussiks.

### Ascending Past Knots

Ascending past knots is similar to traditional ascending, yet once the knot is reached, a backup is placed on the rope, and one prussik removed and reattached above the knot. This is repeated for the other prussik and the backup removed. Ascending can then be continued.

## 7. Aquatic Hazards

Aquatic hazards are a constant danger within canyon environments, and while Blue Mountain canyons have relatively few aquatic hazards there have still been numerous deaths over the years.

It is important for all leaders to be able to readily identify hazards and know how to safely traverse these challenges.

### 7.1 Terminology

Whitewater specific terminology has been described here as a basis for the following discussions.

Terminology	Description
River Right (RR)	When facing downstream, the right of the river.
River Left (RL)	When facing downstream, the left of the river.
Flow Rate	The volumetric flow rate in the river, typically in $m^3/s$ or equivalent units (Ml/day)
Boil	White foamy water that has an undulating surface. Typically found when water pushes against an obstacle or when water resurfaces after a drop.
Boil Line	A line that describes where water separates into flow towards and away from the hazard.
Helical Flow	Flow on the edges of a river that forms vortices.
Eddy	Flow that recirculates up river due to an obstacle blocking the flow of water. Circular flow of water.
Eddy Line	The line between main river flow and opposing eddy flow.
Holes	Foamy water that results a loss of buoyancy.
Hydraulics	Water that flows back towards a hazard and causes a dangerous retentive eddy.

Siphon	A constriction that causes an increase in flow rate, such as two rocks.
Strainer	A flow of water underneath an obstacle, such as logs.
Aggressive Swim	Fast freestyle swimming
Defensive Swim	Swimming with you legs forward and looking where you are going.
Pillowing	The boil created when water hits against an object.

### 7.2 Hazards and Features

#### Eddies

Eddies are a recirculation of water behind an obstacle in the path of the water. These can provide an area of relatively calm water in a otherwise fast flowing river.

It is common for canyoneers to aim for these obstacles to break up the traverse down a river or to provide safety in an otherwise dangerous current.

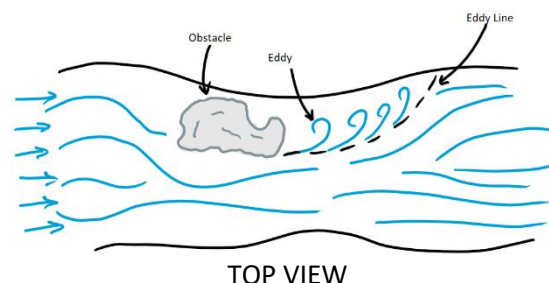


Figure 15 Eddy and Eddy Line

#### Strainers

Strainers are obstacles that block the flow of larger objects in the river but leave the flow largely unimpeded. Examples include fallen trees and their branches or logs.

These can be particularly dangerous as they can hold a larger person against the object, pinning them to the obstacle due to the flow of water upstream.

Avoidance is the best course of action, so if a strainer is seen down river aggressively swim left or right of the obstacle.

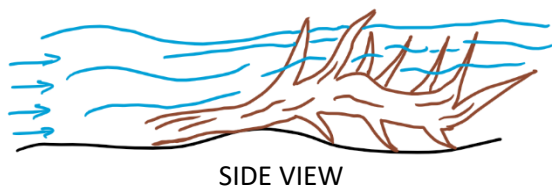


Figure 16 Tree Strainer

### Foot Entrapments

Foot Entrapments are obstacles which can result in a foot being caught, causing a person to be pinned down by the flow of water above stream. These can include fallen logs or rocks underwater.

Avoidance is best achieved by a defensive swimming position to avoid touching the floor of the river.

If a person does become trapped by a foot entrapment, blocking the flow with body positioning or tensioned line hauls are the best methods to free a person.

Information on foot entrapments is found [here](#).

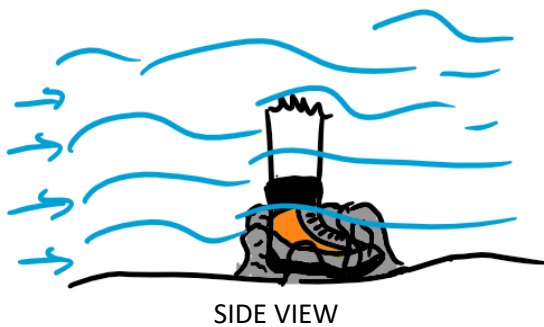


Figure 17 Rock Foot Entrapment

### Recirculation

Recirculation's are any circular flow of water than can cause a person or objects to become stuck in the eddy.

Commonly these form below waterfalls or around objects and can be incredibly strong. Avoidance is best done through early identification, and jumping beyond boil lines

which indicate where the recirculation begins and ends.

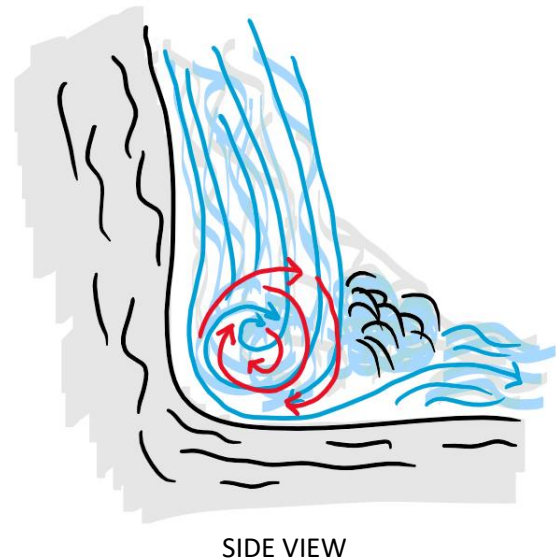


Figure 18 Recirculation

### Undercuts

Undercuts are a dangerous feature where the rock is cut away under the surface if the water. Recirculation can form in these cut aways, pulling and trapping people or objects within.

Undercuts are best avoided by a defensive position, pushing with your legs off the wall, and by the identification and avoidance. Identification can be difficult, but it is often shown by the lack of pillowing as the water pushes against the rock.

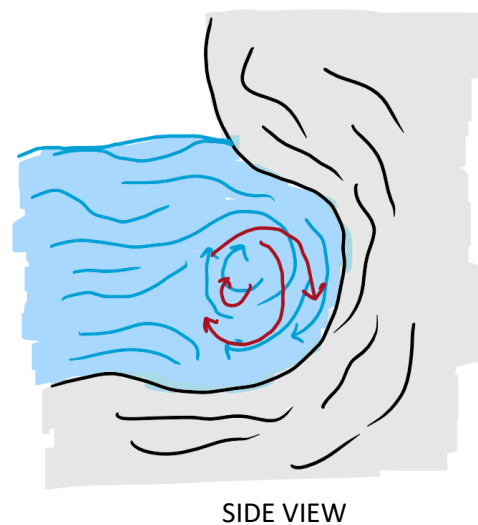
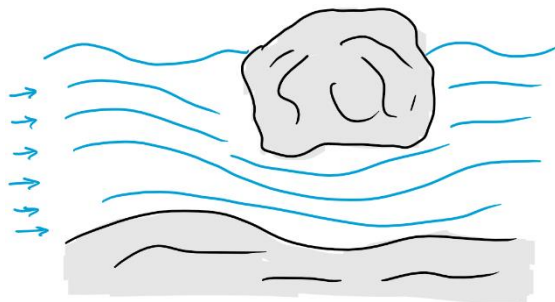


Figure 19 Undercut

## Siphons

Siphons are where the flow of water is impeded by an object, and the water flows below the object, sometimes creating a whirlpool.

These can be difficult to spot and can pin a person under water with little chance of escape. They can sometimes be spotted by a lack of water flowing over an object, and often occur where rocks are built up and impede flow. Avoidance is the best strategy.



SIDE VIEW

Figure 20 Siphon

## Hydraulics

Hydraulics refer to anywhere where strong flows of water can pin a person or object, typically within an eddy. These occur commonly beneath waterfalls. Examples include recirculation.

## 7.3 Rescue Techniques

### Throw Lines

Throw lines are commonly used tools in whitewater canyoning contexts, and many canyoneers also use them.

They can have a variety of uses, from rescuing people from hydraulics and holes, used as a rope for a live bail rescue, or for penduluming people stuck in strong flows to shore.

The basics of throwbags can be found [here](#).

### Live Bail Rescue

Live bail rescue is an advanced technique where a rope is secured to an individual and a 'belayer' hold onto the end loosely.

The individual can then jump into holes and hydraulics after someone and help to retrieve them if they are stuck. This is advanced and very dangerous technique so should be used as a last resort, and where flows are not serious as this can endanger more people's lives than just the initial person.

A video on the basics can be found [here](#).



Figure 21 Live Bail Rescue

### Blocking Flow with Body Positioning

Blocking of flow with body positioning is a useful technique during a foot entrapment or similar scenario where someone is trapped and is having difficulty escaping due to the force of water.

It involves multiple people positioning themselves upstream of a person and diverting water away from the person so that they have less force to overcome, so that breathing and escape is easier.

### Tensioned Line Haul

A tensioned line haul is an advanced technique used to support someone with a foot entrapment. It involves fishing a rope downstream of a person who is stuck, and positioning two people on each bank upstream, while they pull and force someone upstream to remove a stuck foot, or help with breathing.



A video can be found [here](#), which demonstrates this technique, while a similar method, the Y cinch technique is shown [here](#).

### Drogue Anchors

Drogue anchors are an advanced technique where a dedicated water anchor or bag (after the removal of important gear such as ropes, food or first aid), is used as a water anchor and thrown over a successive drop to act as an anchor for a guided rappel.

The guided rappel is used to avoid a potentially dangerous obstacle below an abseil such as an undercut, recirculation or hydraulic.

More bags can also be sent down stream to increase the drag and strength of the bottom anchor.

This method is an advanced technique and should be used with care.

## 7.4 Traverse Techniques

### Tensioned Lines with an Alpine

A tensioned line is an advanced technique used to cross flows in heavy water. It involves tying a bight midway along a rope and connecting a person to this loop. The rope is then thrown across the river to an individual on the other side, and the person can then be dragged across the fast-flowing water.

It is important in this scenario to have to end location downstream and at an oblique angle to the shore to allow for easier crossing.

### Supported Live Crossing

A supported live crossing is a method used to traverse heavy flows with multiple people.

It involves forming a triangle formation with one person on the upstream side. The remaining people push on the persons shoulders upstream from them and the group slowly walks sideways while facing upstream.

This method can help prevent people from being swept away if only one person was to attempt a crossing.

### Eddy Line Rolls

Eddy line rolls are a method of swimming into eddies. It involves rolling along the length of your body at an eddy line and helps to move your body across into an eddy.

General tips to catch an eddy can be found [here](#).

## 8. Other Resources

The Australian Canyoning Association (ACA) has made series of [informative videos](#) demonstrating a range of skills, from beginner to advanced.

Canyoning whitewater identification and knowledge is outlined in this [canyon magazine article](#).

The Rescue 3 International, Water and Flood Rescue Manual is a useful resource on advanced whitewater rescue and survival techniques.

## 9. Appendix

### 10.1 Appendix A – Required Skillsets

#### General Ropework

- Run a trip brief, including acknowledgement of country, asking about medical conditions, gear checks, and expected obstacles and outline of the days activities
- Log trip intentions, assign safety contacts and report safety incidents through the club
- Plan a trip and know when to call off a trip (weather, time, etc.)
- Identify when to prevent a participant from participating due to safety concerns
- Demonstrate navigation skills required for trips (GPS, topos, trip notes)
- Practice and enforce general cliff safety, including being connected to safety within two body lengths distance from the cliff edge, helmet use, and calls such as “rock” and “rope”
- Identify common mistakes in relation to participant harnesses, helmets and knots, including correct sizing of harness and helmets, wrong knots, and not double threading buckles
- Demonstrate and inspect knots including Figure Eight, Figure Eight rethreaded, Figure Eight on a bight
- Demonstrate and inspect a Munter Hitch and Clove Hitch
- Demonstrate and inspect a Stopper Knot and Barrel Knot
- Demonstrate and inspect a Double Fisherman’s Bend, Tape/Water Knot, and European Death Knot
- Demonstrate and inspect an Alpine Butterfly and its use on isolating a section of rope

- Understand the kernmantle construction of a rope
- Identify static and dynamic ropes, and when to use each
- Coil a rope with an alpine and girth finish
- Explain the uses of different rope diameters (Accessory, prussik, climbing, canyoning and caving ropes)
- Identify unsafe/safe ropes with the pinch test, observing excessive sheath abrasion, and by seeing the core
- Practice the maintenance and storage of ropes including not standing on ropes and storing in temperature controlled, dry, dark, and non-chemical environments

#### Level 1 Trip Leader

- Confident and competent in managing participants on trips
- Understand and practice whistle, verbal and hand signals for communication in abseiling and canyoning
- Understand and identify rope materials and their uses (nylon, polyester, dyneema, technora)
- Inspect and assess the safety of anchors, including the replacement of tape anchors (discolouration of tape, stability and strength of trees, abrasion of tape, strength of maillons, cracking and fissures surrounding bolts, replacing tape anchors)
- Inspect the rigging of other trip leaders, participants loading device to abseil, attaching to safety, ABCDE and weighing abseil strand checks
- Demonstrate coiling with a rope bag and helmet biner
- Demonstrate the rigging of double strand techniques for abseils with tape and bolt anchors

- Demonstrate the rigging of single strand techniques including releasable abseils with tape and bolt anchors, and the applications of each (MMO, Eight block, Biner Block)
- Understand the importance of end knots, including appropriate knots and when to use them
- Demonstrate setting rope length as both an anchor manager and first person down
- Practice and inspect loading up on three different descender categories (Eights and Modified Eights, Tubular Devices, Inline Devices)
- Demonstrate adding friction to a variety of abseil and canyoning devices
- Demonstrate tying off a variety of abseiling devices
- Practice with emergency descenders (Super munter, biner brake bar)
- Understand the importance and demonstrate the setting up of belays (top, bottom and third hand)
- Demonstrate three third hand techniques: Klemheist, French, Classic and understand their uses and associated hazards
- Demonstrate and understand the use of a prussik above and below the abseil device, and the use cases of each
- Identify when jumps are appropriate, including identifying appropriate take-off points, depths and heights
- Demonstrate appropriate jumping techniques into water (arms across chest, knees bend, L sits)
- Demonstrate self-rescue and is self-sufficient on a trip

## Level 2 Trip Leader

- Demonstrate ascending ropes using prussiks, ensuring two points of contact with the rope
- Demonstrate ascending ropes using mechanical ascenders, ensuring two points of contact with the rope
- Demonstrate the lowering of appropriate loads on a releasable setups, including how to retie when loaded
- Understand and implement progress capture devices on hauling setups (Microtraxion, tibloc, prussiks)
- Demonstrate the conversion to a haul (using appropriate loads) starting from releasable setup and biner block setup.
- Demonstrate setups for hauling (2:1 (Counterweight), 3:1, 4:1 (Pig Rig Haul), Complex hauling)
- Understand the importance of efficiency on mechanical advantage (Biners vs Pulleys)
- Make decisions about suitability of no belay
- Demonstrate ascending past knots in free-hanging abseil
- Demonstrate abseiling past knots in free-hanging abseil
- Demonstrate lowering past a knot with an MMO and Eight block
- Demonstrate meat anchors and know how to safely use them
- Demonstrate the setup and retrieval of retrievable traverse lines (Self belay and Munter belay)
- Identify aquatic hazards such as boils, hydraulics, siphons, sieves
- Understand the importance of self-preservation in aquatic rescue (Throw bags, Buoyant object rescue)



- Demonstrate rescue and traverse techniques such as tensioned line traverse and supported river crossing