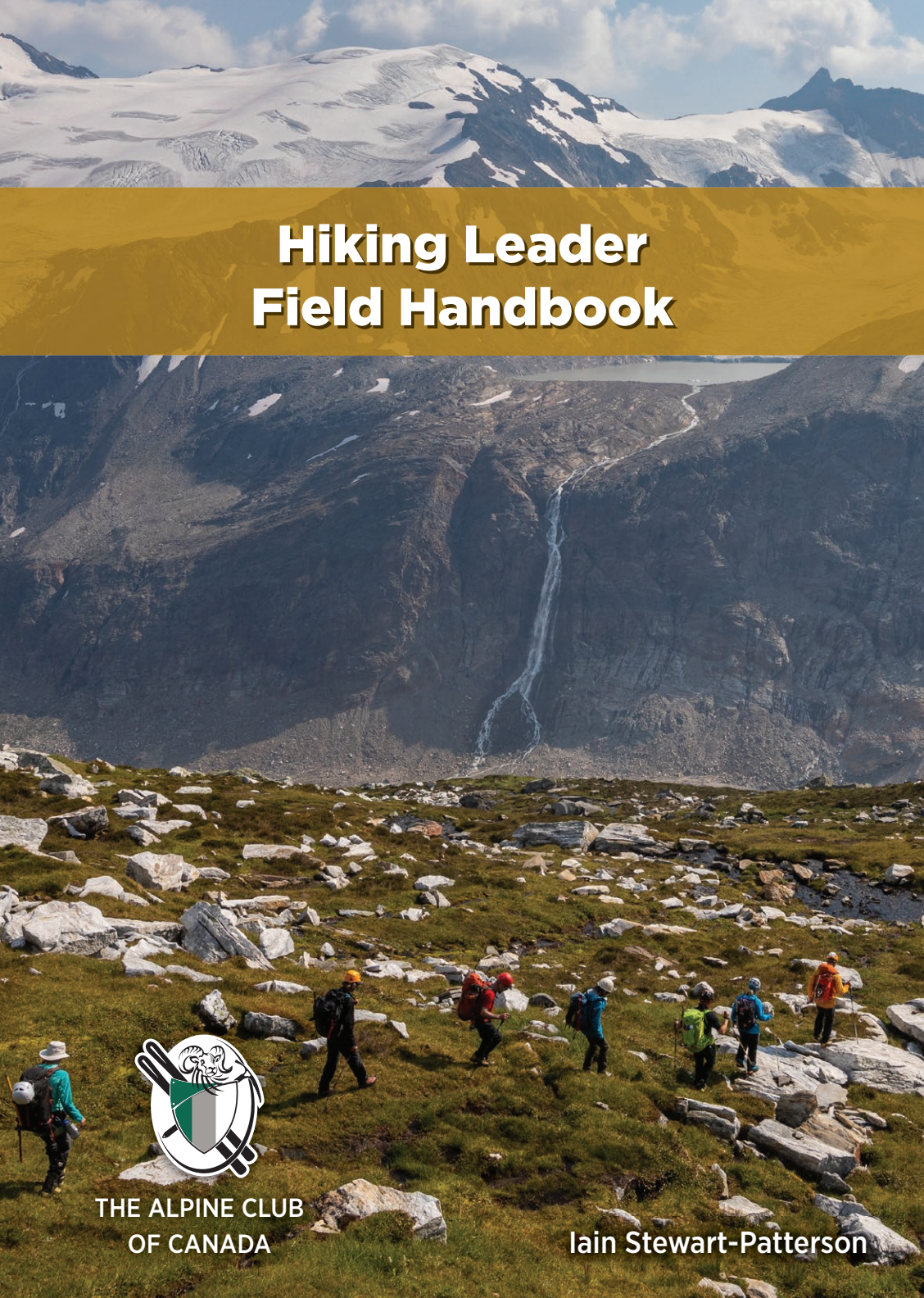
Hiking Leader Field Handbook



THE ALPINE CLUB OF CANADA

Iain Stewart-Patterson

Hiking Leader Field Handbook



Iain Stewart-Patterson

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FOREWORD

The Alpine Club of Canada's (ACC) passionate volunteer leaders have expressed a desire for a nationally-supported training program that recognizes the diversity of ACC trip leaders and their roles in the various types of trips they lead for sections across Canada. The ACC's Section representatives and Board of Directors have expressed concern regarding a lack of a standardized national training curriculum. Over the last four decades previous attempts to provide standardized leader training materials (developed by national panels, mountain professionals or external consultants) were not well received.

The approach taken in developing this field manual (and associated materials) recognizes that past attempts to develop curricula and training materials failed, largely because they were developed using a top-down approach whereby the sections and their volunteer leaders were merely recipients of materials at the end of a process. In 2012 the Leadership Development Committee (LDC) co-chairs proposed the opposite, whereby the sections and their leaders would involved right from the beginning in identifying volunteer leader types, associated competencies and appropriate levels of proficiency for one to be considered a "really excellent leader".

The process proposed by the LDC, and endorsed by Section Council and the Board of Directors, was driven by ACC volunteer leader input and participation. The LDC merely acted as facilitators, coordinating the process and ensuring results met ACC members' expectations. All ACC sections were invited to appoint a volunteer leader to participate in an ACC Competency Profile working group (ACP). ACP reps were active volunteer leaders who were familiar with their section's own leadership needs and current training practices. After establishing an initial list of leader types found nationally, ACP representatives and LDC members met to finalize the list and draft a competency profile for each leader type. Resulting Developing A Curriculum (DACUM) charts list competencies and related learning objectives.

Draft profiles were sent to ACP reps for their review and then shared with other volunteer leaders, for further input. A final set of 15 competency profiles was endorsed by the ACP reps, and by Section Council and Board of Directors.

With section input, ACP reps then prioritized the development of training materials for their top four leader types: Tope Rope Rock Climbing Leader, Winter Backcountry Leader (avalanche), Summer Mountaineering Leader and Ice Climbing Leader. In addition, the ACP reps ranked a list of course goals addressing the competency profiles for each leader type based on their section's view of the highest-priority learning objectives for each competency. Section council then directed the LDC to begin developing a training module for the Top Rope Rock Climbing Leader (completed 2016) followed by the Winter Backcountry Leader (avalanche) (completed 2017), the Summer

Mountaineering Leader (completed 2019), and the Ice Climbing Leader (completed 2020).

Following completion of these first four modules, Section Council and Board of Directors input was sought on prioritization of remaining leader types. This input was combined with an assessment by the LDC of common elements and competencies for DACUMs across remaining leader types in order to deliver training materials for a maximum number core competencies as efficiently as possible. As each leader type module is completed, remaining leader types become more efficient as material for a greater number of common competencies has been developed and can be carried over to subsequent leader modules. When results were considered with the above input from Section Council, this module, the Hiking Leader was prioritized next.

Both the ACP and LDC recognize there are numerous skilled and competent volunteer leaders currently active in ACC sections, and not all of them will have high proficiency in every competency identified in the applicable profile. It is not the intent of the LDC or the ACP reps to define the minimum levels of proficiency in each competency for a given leader type necessary to lead section trips. The relative importance or necessity for proficiency in each competency varies across the country according to the context in which each section operates. It is therefore up to individual sections to decide which competencies are absolutely necessary for the various leader types in their context, and what appropriate minimum levels of proficiency are in each competency relative to their section's needs.

Aspiring volunteer leaders can consider the Competency Profile to represent the ACC's definition of what skills an exceptional volunteer leader would have or aspire to develop. It is possible that volunteer leaders already leading section trips may not have the highest levels of proficiency in all competencies. This should NOT be taken to mean they are no longer qualified to continue leading section trips; rather, the competency profile can be used by these individuals as a road map for continued personal leadership development.

This handbook follows competencies in the Hiking Leader Competency Profile. Together with an accompanying Instructor Agenda, Lesson Plans, Participant Evaluation Form and Competency Vetting Form, it forms a complete module intended to facilitate training of volunteer Hiking Leaders by qualified ACC volunteers, professional outdoor educators, or guides. Individual ACC sections may choose to simply refer to the module to augment existing section training materials, or use it as the basis for their own local volunteer training programs. They may choose to use volunteers from within their own or other sections, or professional instructors, in the delivery of all or some of the materials presented.

TABLE OF CONTENTS

Acknowledgements 2
Foreword 3
Introduction 11
Target audience 11
Limitations 11
Disclaimer 11
Designing a Hiking Outing 13
Terrain Guidelines for Hiking Leaders 14
Pre-trip Planning 17
Establishing Trip Objectives 17
Selecting a Hiking Trip 17
Land Management and Access Issues 18
Terrain 19
Route difficulty 19
Determining Terrain Options 19
Determining Participant Prerequisite Requirements 21
Defining Leader to Participant Ratios 22
Recommended ratios *22*
Group Size *22*
Familiarity *22*
Developing Pre-Trip Communications 23
Equipment list 23
Footwear 23
Clothing 24
Summer Day Trip *24*
Winter Day Trip (add) *24*
Summer Multi-Day Trip (add) *24*
Personal Equipment 24
Group Equipment 25
Summer Day Trip *25*
Winter Day Trip (add) *25*
Summer Multi-Day Trip (add) *25*
Camping Equipment for Multi-day trips 26
Clothing layering 26
Base Layer Characteristics *26*
Mid-Layer Characteristics *27*
Outer Layer Characteristics *27*
Risk Management 27
Emergency Response Plan 27
Waiver Documents 29
Medical Forms 30

Contingency Plans 30
Trips with Minors 30
References and Further Reading 31
Preparing Participants for a Hiking Outing 35
Coordinating and Communicating with Participants 36
Gathering Weather Information 37
Resources for gathering weather information 37
Resources for obtaining a basic weather forecast: *38*
Understanding basic weather patterns 38
Atmospheric pressure *39*
Interpreting clouds 41
Pre-Trip Risk Assessment 43
Conditions monitoring and itinerary adjustment 43
Equipment and Food 44
Organize personal and group equipment 44
Winter day trips *45*
Summer multi-day trips *45*
Stove considerations 45
Fuel considerations *46*
Consumption rates *46*
Ventilation *47*
Pot selection *47*
Package and allocate food 47
Fit and pack a backpack 48
Determine appropriate pack weights 49
References and further reading 50
Delivery of a Hiking Outing 53
Waiver Administration 54
Preferred waiver delivery practices for online waiver administration 54
Preferred waiver delivery practices for in person waiver administration 54
Other waiver delivery considerations 55
Completed waivers 55
Principles of Group Management 56
Communication 56
Expectations 56
Leadership 57
Self-Leadership 57
Diversity and Inclusion 58

Education. 58
Guidance 59
Conflict Resolution 59
Pacing and Transitions 60
Carry out basic equipment repair 62
Track Setting. 63
Risk Management. 64
Risk Analysis. 64
Situational Awareness 65
Hazard Recognition 66
Mitigation 67
Hiking Hazards 67
Terrain 68
Weather 69
Wildlife 70
Other Users 70
Participant-Demonstrated Competence. 71
Wilderness Ethics and Ecology 75
Principles of Low-Impact Travel 76
Summer Travel. 77
Winter Travel 78
Human Waste. 78
Group Size. 79
Wildlife Issues. 80
Interpretive Skills 81
Mountain Morphology 81
Local Flora and Fauna. 82
Winter Flora and Fauna 84
Animal Tracks. 85
The Night Sky. 86
Cultural and Human History. 87
References and Further Reading 88
Basic Navigation Skills 91
Latitude and Longitude. 93
Maps. 94
Topographic Maps 96
Map Accuracy 96
Grid References. 97
Contours 98
Relating Map Features to the Terrain. 100

Relating Terrain Features to the Map *100*
Compass **101**
How Many Norths are There? 102
Compass Unreliability *102*
Bearings and Accuracy 104
The Importance of Accuracy in Compass Bearings *104*
Taking Bearings 105
Transferring a Bearing from the map to the field 106
Resection 106
Altimeter **107**
Off-Trail Navigation **108**
Whiteout/Greenout Navigation 108
The General Principles of Whiteout/Greenout Navigation are: 109
Handrails 109
Aiming Off 110
Route Plans 110
Travel Techniques 111
Walking a Bearing (Whiteout) *111*
Walking a Bearing (Greenout) *112*
Dead Reckoning *112*
Navigating Around Obstacles *112*
Verifying the Route *113*
Time Planning Guidelines 113
Other Considerations 114
Global Positioning Systems (GPS) **114**
Integration of a GPS Unit and a Map 114
Smart Phones 115
Summary **116**
References and Further Reading **117**
Camping in a Summer Backpacking Environment **121**
Camping 122
Shelter Types **122**
Tents - Three-season versus Four-season 122
Single wall versus double wall 123
Size 124
Tarps 124
Sleeping tarps 125
Emergency shelters 125
Bugs 125

Sleeping Systems 125
Campsite Selection and Preparation. 127
Treeline and Alpine considerations 127
Kitchens 127
Meal Preparation for a Summer Environment 128
Meal Preparation 128
Storing Food 128
Water sources 129
Fires 131
Personal Hygiene 131
References and Further Reading 132
Movement Skills 135
On-Trail Movement Skills. 136
Off-trail Movement Skills. 137
Deadfall 137
Boulder fields and talus slopes 137
Scree 138
Track setting 138
Pacing and Breaks 139
Hiking poles 139
Winter Movement Skills 140
Routefinding and Track setting 140
Pacing and Breaks 140
Snowshoe Technique 141
Snowshoe selection 141
Ski Poles. 141
Flat Ground 141
Uphill travel 141
Hard snow 142
Downhill travel 142
Traverses 142
Spikes/Cleats 142
Water Crossings 145
Principles of Water Crossing 146
Hazard Management 146
Decision making and communication. 146
Hazard assessment 147
Water Crossing Techniques 148
Log crossing 148
Assess the Hazard 149

Strategies *149*
Boulder Hopping *149*
In the water 150
Downstream safety 151
Winter Water Crossings **151**
Flowing creeks with open water 151
Flowing Creeks with Ice Bridges and Open Pools *152*
Mostly to Completely Frozen Creeks *152*
Snow-covered Creeks *152*
Lakes *153*
References and further reading **154**
Responding to Emergencies **157**
Performing First Aid **159**
Common medical issues **161**
Feet 161
Sun 163
Prevention *163*
Sun hat *163*
Sunglasses *163*
Treatment *164*
Burns 164
Treatment *164*
Lightning 165
Hypothermia 166
Emergency communications **168**
Communication devices *168*
Helicopters 170
Safety around the helicopter *171*
Selecting a landing zone *171*
Long lines and winches *172*
Emergency survival skills **173**
Emergency shelters 173
Winter emergency survival skills 173
Emergency winter shelters *173*
Fire lighting 174
Group management in emergency situations **175**
References and further reading **176**
Credits **179**

INTRODUCTION

The purpose of this field handbook is to support The Alpine Club of Canada's Hiking Leader training program, as well as to act as an ongoing resource for Hiking Leaders. It is designed to highlight techniques and applications commonly used by Hiking Leaders to assist in the delivery of a successful hiking outing.

TARGET AUDIENCE

The intended audience for this field handbook includes experience recreational hikers, with some prior basic group management experience, who are confident hikers, and who also possess current first aid training. Additionally, it is designed for aspiring leaders who are in the process of increasing their recreational hiking knowledge and abilities, and as a reference resource for Hiking Leaders who have successfully completed higher level (e.g. Hiking Guide) or have been recognized via the Prior Learning and Assessment Recognition process.

LIMITATIONS

This field handbook strives to provide information specific to common, or routine, hiking travel and group management scenarios. However, it is not all-encompassing and cannot account for all potential situations or circumstances. It is therefore expected that in addition to this manual, Hiking Leaders are capable of exercising good judgement and situational awareness.

DISCLAIMER

The information contained in this field handbook has been obtained from equipment manufacturers, industry best practices, applications promoted by the Association of Canadian Mountain Guides, and the policies of The Alpine Club of Canada. Every care has been taken to ensure that the information contained herein is accurate and current. However, the content of this field handbook is subject to change as equipment, techniques and best practices evolve. Therefore, the field handbook should be used as a resource guide only.

The author, publisher, The Alpine Club of Canada, its board, directors and officers, and employees are not responsible for the results of any actions taken by users of the information contained in this book. Hiking outings are an inherently dangerous activity that you pursue at your own risk.

NOTES:



Designing a Hiking Outing

A successful hiking outing starts well before stepping out on the trail. Careful planning and diligent preparation significantly increase the probability of success. In this chapter, we will explore the key aspects specific to the process of designing hiking trips for three levels of leader qualification: the Summer Day Trip, the Winter Day Trip and the Summer Multi-day trip. The process of designing a trip is common to all three leader types, however the complexity of the planning process is greater as one moves from summer to winter and from day trips to multi-day trips. Winter multi-day trips are not covered in this manual. Refer to the Winter Backcountry Leader manual.


Summer day hike terrain

TERRAIN GUIDELINES FOR HIKING LEADERS

The Hiking Leaders are the base level of ACC Leader qualification. There are three Hiking Leader qualifications: the Summer Day Trip Hiking Leader, the Summer Multi-day Trip Hiking Leader and the Winter Day Trip Hiking Leader. There are distinct limits to the terrain used by each level of Hiking Leader. Hiking Leaders can lead groups in up to Class 2 terrain as long as there are no overhead alpine hazards, such as rockfall, cornices, or avalanches AND no significant vertical fall or slip potential that could result in serious injuries.

- Summer Day Trip Hiking Leader
  - Day trips
  - On-trail travel
- Winter Day Trip Hiking Leader
  - Day trips
  - On-trail travel
- Summer Multi-day Trip Hiking Leader
  - Multi-day trips
  - On-trail, or off-trail travel



Winter day hike terrain

The upper limits of terrain for the Summer Hiking Leaders (Day and Multi-day) are the threshold for the Scrambling Leader or the Summer Mountaineering Leader. Scrambling (Class 3 terrain), the use of ropes for security, the need for helmets, the use of crampons, or the use of ice axes would normally require a Scrambling Leader or a Summer Mountaineering Leader.

The upper limits of terrain for the Winter Hiking Leader are the threshold for the Winter Backcountry Leader, the Winter Backcountry Leader (Avalanche), the Ski Mountaineering Leader or the Ice Climbing Leader. The Winter Hiking Leader can travel with groups on foot, snowshoes or with ice cleats. If ice axes, crampons, helmets, ropes or skis are needed or if the trip travels through avalanche terrain, then the leader for the trip would normally be a Winter Backcountry Leader, Winter Backcountry Leader (Avalanche), Ski Mountaineering Leader or Ice Climbing Leader, depending on the requirements of the trip.

Class 1, 2, and 3 Terrain

Summer multi-day hike terrain



Alpine Hiking Grades (Swiss Alpine Club Scale)						
Stage	T1	T2	T3	T4	T5	T6
Definition	**Hike**	**Mountain Hike**	**Demanding Mountain Hike**	**Alpine Hike**	**Demanding Alpine Hike**	**Difficult Alpine Hike**
Trail	Well marked.	Continuous trail.	Trail obscure in places.	Trail missing in places.	Often no trail at all.	Mostly off-trail travel.
Terrain	Flat or gentle slope.	Sometimes steep.	Exposed sections may be equipped with ropes or chains. Hands sometimes required for balance.	Substantial exposure: grassy slopes, steep scree, snowfields and easy glacier crossings not covered by snow. Hands sometimes necessary for progress.	Exposed, demanding steep scree. Glaciers and snowfields. Some sections of easy technical climbing.	Exposed, demanding steep scree. Glaciers and snowfields. Some sections of easy technical climbing.
Dangers	No risk of falls.	Risk of falling.	Some sections exposed, with risk of falling; unmarked route though scree.	Retreat difficult in bad weather.	Risk of sliding.	Heightened risk of sliding.
Requirements	None. No orienteering issues. Possible without a map	Surefooted. Basic orienteering skills.	Very surefooted. Average orienteering skills. Basic mountaineering experience.	Familiarity with exposed terrain. Good orienteering skills and some ability to evaluate terrain. Alpine experience.	Very good navigation skills and a solid ability to evaluate terrain. Good alpine experience.	Excellent orienteering skills. Substantial alpine experience.
Equipment	Possible in sneakers.	Hiking boots recommended.	Hiking boots mandatory.	Rigid hiking boots recommended.	Mountaineering boots. Basic axe and rope techniques.	Comfortable with use of mountaineering equipment.

Swiss Alpine Club hiking scale

Based on the Swiss Alpine Club Scale, the upper limits for an experienced Hiking Leader would likely be the Demanding Mountain Hike, or an Alpine Hike that does not cross a glacier that requires roped travel. The Yosemite Decimal System provides a rating for walking and climbing. Class 1 and 2 fall within the realm of a Hiking Leader. Class 3 and above are considered climbing with fall potential that could be fatal.

Rock terrain is classified from 1 to 6

Classification & Description	
Class 1	Walking.
Class 2	Scrambling, minimal exposure.
Class 3	Scrambling, using hands and feet, some exposure.
Class 4	Using hands and feet, exposed, rope used for beginners.
Class 5	Technical rock climbing. Subdivided from 5.0 to 5.15.
Class 6	Aid climbing.

Yosemite Decimal System Hiking/Climbing Scale

PRE-TRIP PLANNING

The first step in organizing a hiking outing involves basic pre-trip planning. This planning will enable the leader to determine trip suitability for participants of varying abilities, and ensure that the terrain and objectives are appropriate.

ESTABLISHING TRIP OBJECTIVES

Establishing clear trip objectives early in the planning process will enable the hiking leader to choose the most suitable route for the outing. The objectives will determine participant prerequisites, equipment requirements, participant to leader ratios, and overall feasibility. Common hiking trip objectives may include:

- A summer day hike on an established trail
- A summer multi-day hike on established trails
- A summer multi-day hike off-trail
- A winter day hike on an established trail
- Teamwork and trust building
- Natural history – identification and viewing of flora and fauna
- Photography

SELECTING A HIKING TRIP

Trips can be categorized according to their duration, logistics and time of year.

- Summer Day Trips – On-trail travel
  - The difficulty is assessed primarily through distance and elevation gain/loss.
  - Everything needed for the day must be carried. Having a current, detailed weather forecast is crucial. Emergency bivouac equipment should be carried (guide's tarp, lighter and extra food).
- Winter Day Trips – On-trail travel
  - Same as the summer trip, but with the added complexity of more challenging weather conditions (colder temperatures, snow, wind, or poor visibility) and travel on/through snow.
  - Travel and navigation become more difficult if trail breaking through the snow is required.

- Multi-day Trips (Hut–based) – Get detailed information on the current contents of the hut (stove type and availability of fuel, cooking equipment, sleeping accommodation, etc.). Once at the hut, excursions can be treated as day hikes, or if multiple huts are to be linked it becomes more of a traverse-style trip. Huts must be booked and paid for in advance. Communicate with the hut operator as early as possible to confirm space. Some huts can only be booked through a lottery process. It is unacceptable to just show up at a hut and expect to find space.
- Multi-day Trips (Base Camping) – Be clear on who is supplying the base camp contents. Communicate the amenities provided. Once at a base camp, hikes are treated in the same way as day trips. However, accurate daily weather forecasts may be harder to source.
- Multi-day Trips (Traverse style) – It is essential to keep the pack as light and small as possible, while still carrying everything needed. Big, bulky packs make walking harder.
- Multi-day Trips (Off-trail) – A higher degree of fitness and movement skills are typically required. Navigation is more complex. Poor weather may preclude the use of terrain above treeline.

LAND MANAGEMENT AND ACCESS ISSUES

Land management is an increasingly complex topic. It is essential that trip leaders investigate and follow local rules and regulations. The requirements will vary depending on the land manager. Land managers to consult include Indigenous, Crown Lands, Provincial Parks, National Parks, and Municipal Parks. Land use may involve permissions, permits, fees, reservations, limits on group size, restrictions, or closed areas. Many provincial and national parks require user fee permits, for day use and/or overnight use. Prior to offering a hiking outing, a leader must determine what permits are required. They must also determine what, if any, stipulations the permit presents, and who will be responsible for obtaining the permit or permits prior to the outing.

There are a variety of potential access issues that may preclude the use of an area.

- Human/cultural issues – Indigenous land, private property, commercial operations such as logging, etc.
- Wildlife issues – bear in the area, elk rutting, birthing, etc.

- Environmental issues – trail closure/rehabilitation due to fires, floods, etc.

Ultimately, as a hiking leader, you are representing The Alpine Club of Canada and must respect all closures or land access issues, even if other users do not.

Campsites – The Multi-day Hiking Leader will need to identify and potentially reserve backcountry campsites for the trip. More popular areas in national and provincial parks typically only allow camping in designated fee sites. Check the reservation site for the level of amenities provided. This may include toilets, picnic shelters, tent pads and food storage. Sites may be difficult to book at the last minute. Random camping may also be permitted, but typically only in more remote locations.

Parking – Consider how to keep your vehicle and its contents secure while you are hiking. At popular trailheads, the primary concern may be theft, while at more remote backcountry locations the primary concern may be animal damage. Porcupines are known to have a fondness for brake lines and radiator hoses. Placing chicken wire around the vehicle can reduce the likelihood of returning to a disabled vehicle.

TERRAIN

ROUTE DIFFICULTY

Hiking trips can be rated based on objective criteria (difficulty) or subjective criteria (value). Difficulty ratings are anchored by distance and elevation, but may also be influenced by surface conditions (talus, scree, mud, swamp, vegetation, creek crossings, deadfall, etc.). Many surface conditions have the potential to change over the season and from year to year. Subjective value is typically anchored by spectacular views. Long slogs along valley bottoms though thick trees, with minimal views might not be considered worth the effort. On the other hand, trips that start high, follow treeline ridges and provide continuous, panoramic, spectacular views might be considered outstanding.

DETERMINING TERRAIN OPTIONS

Guidebooks provide valuable information on trip difficulty for on-trail travel. Once a primary trip has been selected, the hiking leader



Trails – wide, low angle



Trails – swamp, mud



Trails – deadfall

should also investigate nearby options that can make for a longer or shorter trip.

Off-trail routes can be considerably more difficult. Off-trail trip planning requires more extensive effort. A full trip plan needs to be developed that begins with a measurement of distance and elevation (gain/loss). The roughness of the terrain (e.g. talus and scree) along with the difficulty of the bushwhacking (e.g. deadfall, slide alder, Devil's Club) and the complexity of the river crossings will add to the calculated time required. This is covered in Chapter 5 - Navigation.



Off-trail - bushwhack



Off-trail – above treeline (good visibility)

DETERMINING PARTICIPANT PREREQUISITE REQUIREMENTS

Once the route objectives have been determined, the hiking leader should then determine the skill set that the participants will need. Criteria such as age, experience, and ability should be considered when determining participant requisite requirements. Some trips may not be suitable for certain participant demographics. Multi-day trips involving long sections of rough, off-trail travel may not be appropriate for participants with lower fitness levels. When considering a multi-day trip, the hiking leader should consider the length and difficulty of the trip and the targeted experience level. Participants new to overnight hiking, for example, may be more suited to a shorter trip in simpler terrain where successful skill development can take place without the urgency of a long day, heavier pack, and the need to complete the outing in the prescribed time.

Depending on the outing objectives and the route's technical rating, prerequisite experience may be required. Multi-day trips require a certain level of fitness, movement skills on rough terrain, and previous overnight experience.

DEFINING LEADER TO PARTICIPANT RATIOS

The appropriate ratio between hiking leaders and participants will vary depending on the outing objectives, difficulty of the terrain, number of days, remoteness of the area, physical skills and fitness of the members, and the leader's competence, expertise, and familiarity with the area.

Recommended ratios

Ideal ratios will depend on the participants' skill sets in relation to the technical nature of the terrain. Day trips on trails can have a higher number of participants per leader, whereas a multi-day off-trail trip will necessitate fewer participants per leader.

Small delays, such those caused as a result of blisters, can be more easily managed with a co-leader who can readily communicate the information to the leader, who can then take appropriate group management measures.

Group Size

Many land managers have group size requirements. When travelling in areas frequented by grizzly bears, Parks Canada mandates a minimum group size of four. Maximum group size may also be mandated, but Hiking Leaders should be aware of the potential negative impacts on wildlife and other users of a large organized group. Parks Canada mandates a maximum group size of 10-12, depending on the area.

Familiarity

Whenever possible, hiking leaders should avoid taking participants on trips they are not personally familiar with. In situations where the hiking leader is facilitating an outing that is unfamiliar to them, they should increase their margin of safety with strategies such as earlier turnaround times. Familiarity with a trip allows the hiking leader to anticipate breaks and transitions, and potentially challenging areas for participants. Inexperienced participants may appreciate this knowledge. Familiarity also aids in outing time management, determining whether the trip can be completed as planned, or the selection of a turnaround point to ensure the group returns to the trailhead safely.

DEVELOPING PRE-TRIP COMMUNICATIONS

Initial communication between the hiking leader and participants will begin to build rapport and set the tone for the hiking outing. Participants need to be acutely aware of the trip objectives, the trip and trip rating, access, driving directions, what is expected of them, and what the hiking leader will be responsible for. Early communication with participants also allows the hiking leader to gain information specific to the participants, and modify the objectives slightly to best meet participants' needs.

If the leader is providing food for a multi-day trip, this is also the time to inquire about food allergies.

EQUIPMENT LIST

Participants will be responsible for ensuring that personal gear, such as clothing, pack, food and water and travel equipment (e.g. walking poles, cleats, snowshoes, etc.), are brought. They may also be responsible for group equipment, such as tents and stoves. The equipment will be dependent upon whether the outing is in the summer or winter, a day trip or a multi-day trip. Three sample lists are provided. (Summer day trip, winter day trip, and summer multi-day trip:



Footwear - Summer Day Trip

FOOTWEAR

Properly fitting footwear appropriate for the terrain and the individual's unique characteristics is likely the most important element that contributes to a successful hiking trip. The ideal boot or shoe for a trip: fits perfectly, provides the support needed based on the load carried and the nature of the terrain, and is as light as possible. The environmental conditions also play a considerable role. Cold and snowy, wet and swampy, dry and dusty, steep, loose and rocky – the environmental conditions dictate the level and type of protection needed. Inappropriate footwear may simply add a level of discomfort, but at some point may become a hazard management issue. It does not take long for cold, wet feet to become blistered or frostbitten, and discomfort turns into an evacuation. Winter boots



Footwear - Winter Day Trip



Footwear - Summer Multi-Day Trip

need to be waterproof and insulated, as well as able to fit into snowshoes or have cleats attached.

When preparing participants for a trip, examine their footwear. Make sure that it fits well and is appropriate to the type of terrain you will be travelling in, and the weather conditions. For multi-day, off-trail trips, be prepared to ask a participant to get better boots or reconsider their participation. However, if they upgrade to stiffer boots, they will need time to break those boots in prior to the trip.



Clothing



Personal Equipment



Group Equipment

CLOTHING

Summer Day Trip

- Sun hat
- Toque
- Waterproof breathable shell jacket
- Waterproof breathable shell pants
- Gaiters
- Soft shell or fleece jacket
- Synthetic hiking pants
- Base layer (top)
- Lightweight synthetic or wool gloves
- Synthetic or wool socks
- Insulating jacket (based on weather forecast)

Winter Day Trip *(add)*

- Soft shell or fleece pants
- Base layers (bottom)
- Insulated gloves
- Synthetic or wool sock spares
- Insulating jacket
- Hand warmers
- Neck scarf (i.e. Buff)

Summer Multi-Day Trip *(add)*

- Spare socks and underwear

PERSONAL EQUIPMENT

- Pack (big enough to fit everything inside for the objective)

- Sunglasses
- Small personal first aid kit (moleskin tape etc.)
- Headlamp
- Water bottle
- Knife
- Thermometer (recommended)
- Field book, pencil
- Compass, map and GPS
- Lighter (or alternative fire-starting device)
- Sunscreen, lip balm, bug repellant, ear plugs
- Personal medications
- Personal Hygiene Kit - Wet wipes, toilet paper, hand sanitizer, toothbrush/toothpaste,
- Collapsible ski pole

GROUP EQUIPMENT

Summer Day Trip

- Group first aid kit
- Tarp or emergency shelter(s) able to accommodate all group
- members
- Emergency communication device
- Emergency fire starting kit
- Bear spray
- Bear bangers
- Garbage bags

Winter Day Trip *(add)*

- Thermos
- Backpacking stove and pot (optional)
- (Delete bear spray)

Summer Multi-Day Trip *(add)*

- Repair kit



Camping Equipment for Multi-day trips

CAMPING EQUIPMENT FOR MULTI-DAY TRIPS

- Stove, fuel and repair kit
- Pots (Scrubbie)
- Spare batteries for headlamp
- Eating utensils
- Cup and bowl
- Water treatment
- Candle
- Lighter(s) or alternate fire-starting method (i.e. strike anywhere matches)
- Sleeping pad
- Sleeping bag (rating depends on time of year and trip)
- Toiletry kit
- Camp booties or running shoes
- Three- or four-season tent
- Large pack (50 to 70 litres)
- Food hanging kit (20-30m 5mm rope, 3-4 carabiners)

CLOTHING LAYERING

Appropriate layering ensures leader and participant comfort throughout the day in a multitude of conditions. Appropriate layering will enable participants to stay warm when it is cool, and avoid overheating when it is warm. Layers are commonly separated into three categories: a base layer that sits next to the skin, a mid-layer that traps in heat, and an outer layer that protects from the elements, such as wind, rain, and snow. Multiple thinner layers are preferable to only one or two thick layers, as this allows a greater level of fine tuning to achieve an optimal level of heat retention/dispersion.

Base Layer Characteristics

- Should wick moisture away from the skin
- Should be lightweight
- Should be close fitting
- Should have flat seams to avoid chafing
- Should be constructed using a material that dries quickly and is breathable
- Common base layer fabrics include: synthetics such as polyester or natural materials such as wool

Mid-Layer Characteristics

- Should be lightweight
- Should be air permeable
- Should be compressible and packable
- Should provide insulation and warmth
- Should fit comfortably over a base layer, but still fit close to the body
- Common mid-layer materials include: synthetics like fleece and lofts, and down

Outer Layer Characteristics

- Should block the wind
- Should block precipitation
- Should be breathable
- Should fit comfortably over base and insulating layers
- Should allow freedom of movement
- Common outer layer materials include: breathable hard-shell nylon materials, and soft-shell nylon materials

Cotton clothing should be avoided in climates that are cool and/or damp. This includes cotton base, mid-, and outer layers. That said, on an overnight hut-based trip, a cotton or cotton blend shirt or pants can make one's hut stay more comfortable.

RISK MANAGEMENT

EMERGENCY RESPONSE PLAN

Hiking leaders need to prepare an emergency response plan for their trip. This will facilitate the leader's response to an emergency and accelerate the response rate from outside agencies. The leader carries a copy, and a copy is left with the appropriate club contact person.

An Emergency Response Plan (ERP) should include:

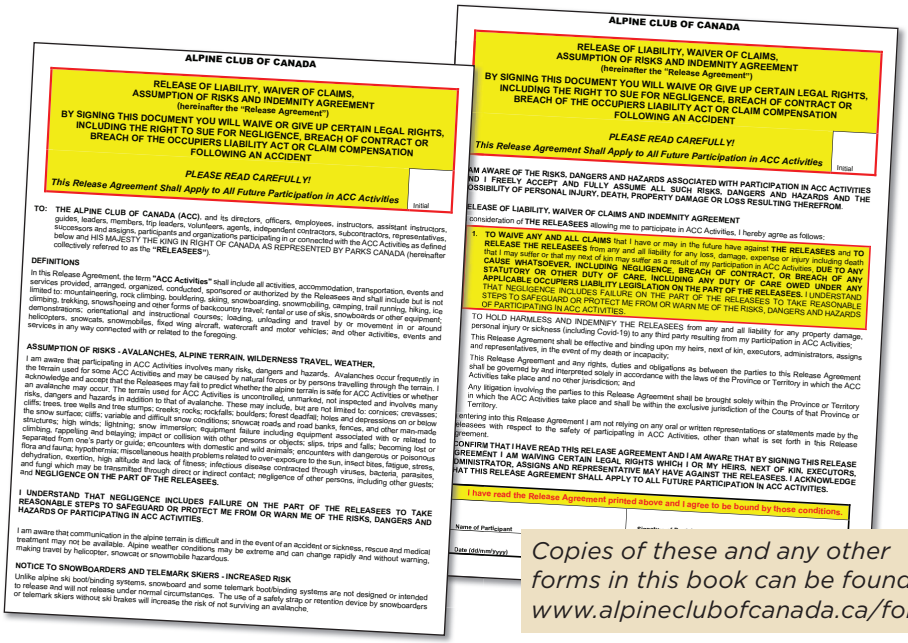
- Emergency Contact Information (name and phone number)
  - Club contact person
  - Local RCMP
  - Local rescue team
  - Provincial Emergency Management personnel
  - Nearest hospital/medical clinic
  - Local helicopter company

- Communication Protocols
  - Document the inter/intra group communication process
    - Call-in times and methods
  - Research and document mobile phone coverage
  - Research and document very high frequency (VHF) radio channels and coverage
    - Ensure that handheld radios have the appropriate frequencies
  - Confirm access to satellite communication (phone, Spot, Garmin, Delorme)
    - Record the sat phone number
- Emergency Incident Levels
  - Level 1 – minor injury, basic first aid
  - Level 2 – Broken bones, traumatic brain injury (TBI), possible evacuation
  - Level 3 – Evacuation and extended medical treatment needed
- Evacuation Protocols
  - Methods
    - Helicopter
    - Ground
- Evacuation routes and trailheads
  - Reasons
    - Motivational evacuation
    - Non-life-threatening medical evacuation
    - Emergency evacuation
  - Costs – payment method
- Backcountry location Information
  - Trailhead
  - Route plan
  - Horizontal distance to be travelled
  - Elevation – gain and loss
  - Campsite locations
- Time plan
  - Departure
  - Turn around
  - Return
- Hazard Analysis and Risk Assessment
  - Hazard analysis
    - Methods of prevention, control and mitigation

- Objective hazards
  - Transportation
  - Environmental
  - Terrain
  - Activity
- Subjective hazards
  - Participants
  - Leaders
  - Other people
- Maps – evacuation routes

WAIVER DOCUMENTS

Waivers are commonly used to transfer responsibility and highlight risks associated with hiking activities that will travel in or through wilderness terrain. It is recommended best practice to clearly explain the risks associated with the outing and to provide participants with waivers before they complete their registration and before taking any money, so they can familiarize themselves with the risks specific to their



ALPINE CLUB OF CANADA

RELEASE OF LIABILITY, WAIVER OF CLAIMS, ASSUMPTION OF RISKS AND INDEMNITY AGREEMENT
(hereinafter the "Release Agreement")

BY SIGNING THIS DOCUMENT YOU WILL WAIVE OR GIVE UP CERTAIN LEGAL RIGHTS, INCLUDING THE RIGHT TO SUE FOR NEGLIGENCE, BREACH OF CONTRACT OR BREACH OF THE OCCUPIERS LIABILITY ACT OR CLAIM COMPENSATION FOLLOWING AN ACCIDENT

PLEASE READ CAREFULLY!

This Release Agreement Shall Apply to All Future Participation in ACC Activities

Initial

TO: THE ALPINE CLUB OF CANADA (ACC), and its directors, officers, employees, instructors, assistant instructors, guides, leaders, members, trip leaders, volunteers, agents, independent contractors, subcontractors, representatives, successors and assigns, participants and organizations participating in or connected with the ACC Activities as defined below and HIS MAJESTY THE KING IN RIGHT OF CANADA AS REPRESENTED BY PARKS CANADA (hereinafter collectively referred to as the "RELEASEES").

DEFINITIONS

In this Release Agreement, the term "ACC Activities" shall include all activities, accommodation, transportation, events and services provided, arranged, organized, conducted, sponsored or authorized by the Releasees and shall include but is not limited to: mountaineering, rock climbing, bouldering, skiing, snowboarding, snowmobiling, camping, trail running, hiking, ice climbing, trekking, snowshoeing and other forms of backcountry travel; rental or use of skis, snowboards or other equipment; helicopters, snowcats, snowmobiles, fixed wing aircraft, watercraft and motor vehicles; and other activities, events and services in any way connected with or related to the foregoing.

ASSUMPTION OF RISKS - AVALANCHES, ALPINE TERRAIN, WILDERNESS TRAVEL, WEATHER,

I am aware that participating in ACC Activities involves many risks, dangers and hazards. Avalanches occur frequently in the terrain used for some ACC Activities and may be caused by natural forces or by persons travelling through the terrain. I acknowledge and accept that the Releasees may fail to predict whether the alpine terrain is safe for ACC Activities or whether an avalanche may occur. The terrain used for ACC Activities is uncontrolled, unmarked, not inspected and involves many risks, dangers and hazards in addition to that of avalanche. These may include, but are not limited to: crevasses; cliffs; trees, tree wells and tree stumps; creeks; rocks; rockfalls; boulders; forest deadfall; holes and depressions on or below the snow surface; cliffs; variable and difficult snow conditions; snowcat roads and road banks, fences, and other man-made structures; high winds; lightning; snow immersion; equipment failure including equipment associated with or related to climbing, rappelling and belaying; impact or collision with other persons or objects; slips, trips and falls; becoming lost or separated from one's party or guide; encounters with domestic and wild animals; encounters with dangerous or poisonous flora and fauna; hypothermia; miscellaneous health problems related to overexposure to the sun, insect bites, fatigue, stress, dehydration, exertion, high altitude and lack of fitness; infectious disease contracted through viruses, bacteria, parasites, and fungi which may be transmitted through direct or indirect contact; negligence of other persons, including other guests; and NEGLIGENCE ON THE PART OF THE RELEASEES.

I UNDERSTAND THAT NEGLIGENCE INCLUDES FAILURE ON THE PART OF THE RELEASEES TO TAKE REASONABLE STEPS TO SAFEGUARD OR PROTECT ME FROM OR WARN ME OF THE RISKS, DANGERS AND HAZARDS OF PARTICIPATING IN ACC ACTIVITIES.

I am aware that communication in the alpine terrain is difficult and in the event of an accident or sickness, rescue and medical treatment may not be available. Alpine weather conditions may be extreme and can change rapidly and without warning, making travel by helicopter, snowcat or snowmobile hazardous.

NOTICE TO SNOWBOARDERS AND TELEMARK SKIERS - INCREASED RISK

Unlike alpine ski boot/binding systems, snowboard and some telemark boot/binding systems are not designed or intended to release and will not release under normal circumstances. The use of a safety strap or retention device by snowboarders or telemark skiers without ski brakes will increase the risk of not surviving an avalanche.

ALPINE CLUB OF CANADA

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PLEASE READ CAREFULLY!

This Release Agreement Shall Apply to All Future Participation in ACC Activities

Initial

AM AWARE OF THE RISKS, DANGERS AND HAZARDS ASSOCIATED WITH PARTICIPATION IN ACC ACTIVITIES AND I FREELY ACCEPT AND FULLY ASSUME ALL SUCH RISKS, DANGERS AND HAZARDS AND THE POSSIBILITY OF PERSONAL INJURY, DEATH, PROPERTY DAMAGE OR LOSS RESULTING THEREFROM.

ELEASE OF LIABILITY, WAIVER OF CLAIMS AND INDEMNITY AGREEMENT

Consideration of THE RELEASEES allowing me to participate in ACC Activities, I hereby agree as follows:

1. TO WAIVE ANY AND ALL CLAIMS that I have or may in the future have against THE RELEASEES and TO RELEASE THE RELEASEES from any and all liability for any loss, damage, expense or injury including death that I may suffer or that my next of kin may suffer as a result of my participation in ACC Activities, DUE TO ANY CAUSE WHATSOEVER, INCLUDING NEGLIGENCE, BREACH OF CONTRACT, OR BREACH OF ANY STATUTORY OR OTHER DUTY OF CARE, INCLUDING ANY DUTY OF CARE OWED UNDER ANY APPLICABLE OCCUPIERS LIABILITY LEGISLATION ON THE PART OF THE RELEASEES. I UNDERSTAND THAT NEGLIGENCE INCLUDES FAILURE ON THE PART OF THE RELEASEES TO TAKE REASONABLE STEPS TO SAFEGUARD OR PROTECT ME FROM OR WARN ME OF THE RISKS, DANGERS AND HAZARDS OF PARTICIPATING IN ACC ACTIVITIES.

TO HOLD HARMLESS AND INDEMNIFY THE RELEASEES from any and all liability for any property damage, personal injury or sickness (including Covid-19) to any third party resulting from my participation in ACC Activities;

This Release Agreement shall be effective and binding upon my heirs, next of kin, executors, administrators, assigns and representatives, in the event of my death or incapacity;

This Release Agreement and any rights, duties and obligations as between the parties to this Release Agreement shall be governed by and interpreted solely in accordance with the laws of the Province or Territory in which the ACC Activities take place and no other jurisdiction; and

Any litigation involving the parties to this Release Agreement shall be brought solely within the Province or Territory in which the ACC Activities take place and shall be within the exclusive jurisdiction of the Courts of that Province or Territory.

entering into this Release Agreement I am not relying on any oral or written representations or statements made by the leasees with respect to the safety or participating in ACC Activities, other than what is set forth in this Release greement.

CONFIRM THAT I HAVE READ THIS RELEASE AGREEMENT AND I AM AWARE THAT BY SIGNING THIS RELEASE GREEMENT I AM WAIVING CERTAIN LEGAL RIGHTS WHICH I OR MY HEIRS, NEXT OF KIN, EXECUTORS, DMINISTRATOR, ASSIGNS AND REPRESENTATIVE MAY HAVE AGAINST THE RELEASEES. I ACKNOWLEDGE HAT THIS RELEASE AGREEMENT SHALL APPLY TO ALL FUTURE PARTICIPATION IN ACC ACTIVITIES.

I have read the Release Agreement printed above and I agree to be bound by those conditions.

Name of Participant

Date (dd/mm/yyyy)

Copies of these and any other forms in this book can be found at www.alpineclubofcanada.ca/forms

participation, and ensure they are comfortable and accepting of those risks. Participant waivers should be signed online ahead of registration or in blue or black ink, in person, at the commencement of the hiking outing. Providing the waivers and clearly explaining the risks associated with the outing as part of the registration process allows participants to review the waiver, seek legal advice, and choose to participate in the activities without any element of duress. Copies of these and any other forms in this book can be found at www.alpineclubofcanada.ca/forms

MEDICAL FORMS

Medical forms enable the hiking leader to familiarize themselves with pre-existing injuries, medical conditions, allergies, and any medications participants may have or require. It is recommended that this information be collected from participants before the outing and reviewed by the leader to ensure the outing is suitable for all group members. If medications are required by participants for allergies or pre-existing medical conditions, this provides the hiking leader with the opportunity to remind participants to bring their medications on the trip. Occasionally a participant may innocently omit disclosing pertinent medical information. For this reason, it is recommended that the hiking leader check in with participants at the trailhead prior to departure as a means to double check if any medical information has not been disclosed, or if conditions have changed since the participant submitted the form.

CONTINGENCY PLANS

Participants should also be informed of any potential contingency plans. The hiking leader should ensure they have all participants' contact information, in the event that last minute communication is needed on the morning of the trip. Participants should also be provided with a phone number, or other means of contacting the trip leader on the day of the outing.

TRIPS WITH MINORS

(Participants under the age of majority)

It is possible an outing may be designed for, include, or attract youth participation (participants under the age of majority). Travelling with minors requires certain and specific procedures. Some of these are

policy within The Alpine Club of Canada (ACC), while other policies have been implemented by external land managers – i.e. national parks. The hiking leader should be familiar with the ACC Policy for persons under the age of majority. A PDF copy can be found on this webpage: www.alpineclubofcanada.ca/forms

This policy describes the process of waiver (assumption of risk administration), information and trip requirements as well as terrain limitations. These may include strategies beyond the typical planning process, such as the following examples from the ACC policy for persons under the age of majority:

- Detailed trip plan forwarded to the parent(s) or guardian
- Permission forms together with the required waiver forms
- Encourage parental participation if practical/possible
- Emergency plans and communications

REFERENCES AND FURTHER READING

Jackson, J., & Heshka, J. (2011). *Managing Risk: Systems Planning for Outdoor Adventure Programs*. Palmer Rapids, ON: Direct Bearing Incorporated.

Priest, S., & Gass, M. (2005). *Effective Leadership in Adventure Programming (Second Ed.)*. Champaign, Il: Human Kinetics.

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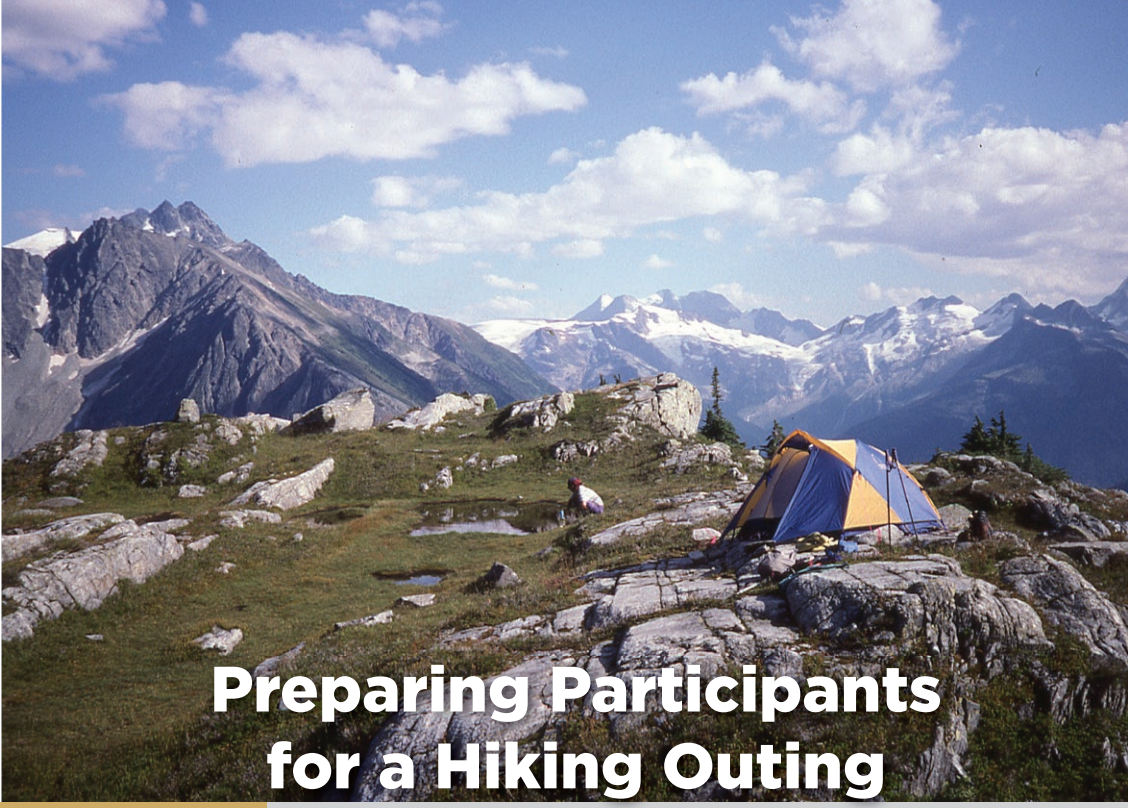
Stremba, B., & Bissoon, C. A. (Eds.). (2009). *Teaching Adventure Education Theory.* Windsor, ON: Human Kinetics.

UIAA (2013), *Alpine Skills Summer: Basic knowledge – Alpine hiking – Climbing – Alpinism*, The Petzl Foundation

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Preparing Participants for a Hiking Outing

Following completion of the pre-trip planning phase, it is important to then communicate with participants and prepare for the hiking route/objective. Participants who possess a clear understanding of the trip's logistics, activities, and expectations will be far better equipped to achieve the outing objectives. In this chapter, we will explore the key information that needs to be conveyed to participants as they prepare for the trip, the requisite weather-related information that the hiking leader should research, and the required decision-making process as to whether or not to proceed with the outing based on that research.

COORDINATING AND COMMUNICATING WITH PARTICIPANTS

Early in the preparation stage, it is important to coordinate and communicate with participants. Bigger objectives may require substantially more lead time. This provides them with sufficient time to ensure the trip is suitable for their skill level, they meet any prerequisite requirements, and they are capable of appropriately equipping themselves for the trip and arranging transportation to the hiking objective trailhead. There are many ways to communicate with participants, however, email is one of the simplest methods to ensure all participants receive consistent and accurate information. Phone calls, a face-to-face meeting, or a video conference provide a richer engagement for all participants during the pre-trip process.

Information that must be communicated to participants includes:

- Meeting time
- Meeting location
  - Parking lot for well-established venues, carpool locations, or restaurant/coffee shop, etc.
- Hiking Leader contact information
  - Cell phone number, email
- Level of risk specific to the activity
  - Route and weather considerations, hiking difficulty, and access concerns
  - Description of the hazards that may be encountered. (e.g. weather, animals, etc.)
- Prerequisite requirements
  - Previous hiking experience, ability to carry a pack for the distance planned, minimum age
- Training trips may be needed to build movement skills, fitness and acclimatization
- Fitness level
  - Participants must be fit enough to maintain the pace needed to achieve the objective in a timely manner
  - Participants may need help in developing and implementing a training plan as they prepare for the trip
  - Altitude acclimatization
  - Participants must be sufficiently acclimatized. Someone who lives at sea level may begin to feel some negative effects of altitude by the time they reach treeline. Sea level dwellers should spend a few days acclimatizing before attempting any major high traverses

- Clothing requirements for the trip
  - Send a clothing list to the participants
  - Follow up to ensure that clothing and footwear is appropriate for the trip
- Equipment requirements for the trip
  - Send an equipment list to the participants
  - Follow up to ensure that packs are of appropriate size and well fitted and camping equipment is appropriate
  - For example – participants may want to use a sleeping bag that is too light for the conditions instead of renting or buying a warmer bag
- Contingency plans for the trip (nearby alternate route selections, trip cancellation)

GATHERING WEATHER INFORMATION

One of the greatest factors in determining the success of a hiking outing, and the level of risk the outing will present, is the weather. Warm, dry, and calm conditions are more conducive to the completion of a successful objective than cold, wet, snowy, and windy conditions, or alternatively, conditions that are very hot and humid, with no wind. Access to a high-quality weather forecast for the duration of the trip will aid the hiking leader. Being able to anticipate weather occurrences and changes enables the leader to adapt the objectives, location, or timing of the outing to increase participant enjoyment and success while also decreasing the level of risk.

RESOURCES FOR GATHERING WEATHER INFORMATION

Current, short-range, and long-range weather forecasts can be quickly accessed online through a variety of sources. During periods of stable and predictable weather, short-range forecasts tend to be quite accurate and highly reliable. However, long-range forecasts and the modelling upon which they are based, particularly during periods of instability or changing weather, become less reliable and the hiking leader may need to complete further research to obtain an accurate depiction of the weather systems that will affect the outing.

The reliability of weather forecasts decreases as the forecast is predicted further into the future. A forecast for the next 24 hours will be more reliable than a seven-day forecast. A professional weather forecast will also provide a confidence rating of low, moderate, or high depending on the quality of the information they are basing their forecast from.

Resources for obtaining a basic weather forecast:

- Environment Canada (radar, satellite, and jet stream mapping): www.weather.gc.ca/
- Avalanche Canada Mountain Weather Forecast: www.avalanche.ca/weather/forecast
- The Weather Network: www.theweathernetwork.com/ca
- AccuWeather: www.accuweather.com
- Televised weather stations; and
- Weather Radio Canada: frequency (MHz) 162.40
- Spot Weather: www.spotwx.com

UNDERSTANDING BASIC WEATHER PATTERNS

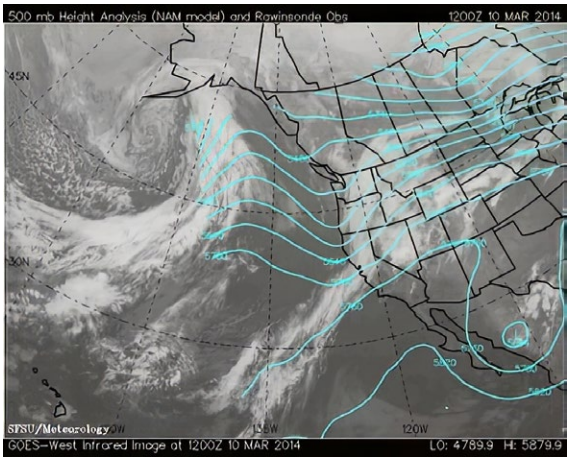
Weather is influenced by global circulation, which includes a combination of: warm air rising, cool air descending, the spin of the earth, atmospheric pressure, atmospheric humidity, air temperature, elevation, and wind. These variables combine to create localized weather systems, widespread weather patterns, and changes in weather conditions. In the context of preparing for a hiking outing, it is crucial that the hiking leader explores the weather forecast and completes further research to obtain a solid understanding of the anticipated weather for the trip. Widespread weather systems are typically easy to predict, however localized mountain weather can at times be more challenging. Understanding if the weather will be poor for an entire day, or just for brief periods during the day, will enable the hiking leader to determine if they should proceed with the trip, reschedule, or implement contingency plans.

Atmospheric pressure

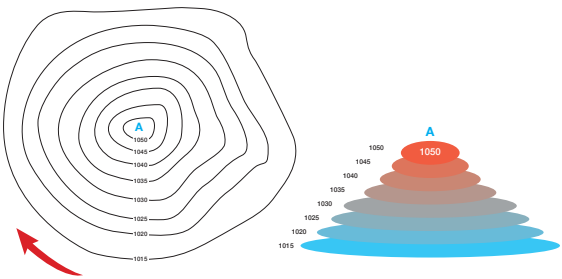
At a basic level, atmospheric pressure is the measurement of air density and is commonly measured in either hectopascals, kilopascals, or millibars. Variation in atmospheric pressure gives an overall sense of the widespread weather systems throughout a region and is commonly viewed on a large-scale pressure map that enables the viewer to identify areas of both high and low pressure.

Jet streams are narrow bands of strong wind high in the upper atmosphere that steer weather systems and transfer heat and moisture around the globe. The jet stream is an upper air westerly flow, generally travelling from west to east. The jet stream constantly moves and changes. Typically, it is found at 9-14 km above sea level, with wind speeds as high as 400 kph. The local weather that we experience is related to high- and low-pressure systems and fronts, however, jet streams high in the atmosphere impact their movement, trajectory and speed. As air warms, it rises and expands, creating lower pressure at the earth's surface. The continual upward movement of the air mass can create strong winds and overall instability of the pressure centre.

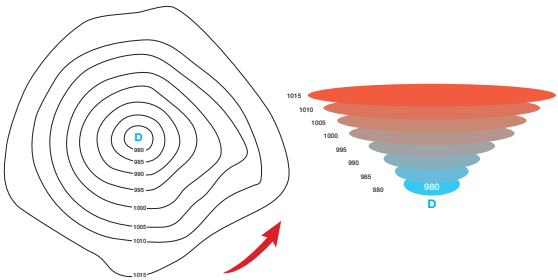
Warm air can retain more



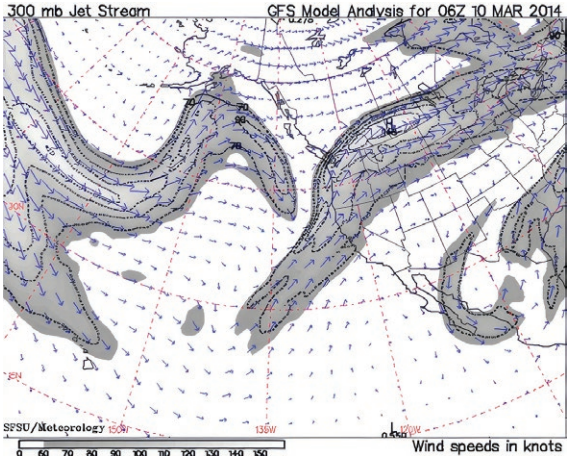
Atmospheric Pressure



High Pressure



Low Pressure



Jetstream

moisture and as it rises and cools, precipitation often develops. The primary means of cooling an air mass is to lift it. There are two major means of lift: orographic lift and frontal lift. Orographic lifting is caused when an air mass is lifted, flowing up and over mountains. The primary weather pattern in Western Canada brings moisture-laden air off the Pacific and sequentially up and over the Coast Ranges, then the Interior Ranges and then the Rocky Mountain Ranges. The orographic lifting and resultant precipitation of the westerly flow of the air masses produces the greatest amount of precipitation over the Coast Range, progressively less over the Interior Ranges, and relatively little once it finally reaches the Rockies.

During the summer months, this precipitation comes in the form of rain and thunderstorms, and in the winter months, it comes in the form of snow. A low-pressure system will show increasing pressure outward when viewed on a large-scale pressure map. As air cools, it contracts, creating higher pressure at the earth's surface. A high-pressure system draws air downwards, often creating calm wind conditions and overall stability of the air mass. Cool air tends to be dry and lack humidity; therefore, a high-pressure system is typically not characterized by notable precipitation. A high-pressure system in the summer usually offers calm, comfortable hiking conditions, whereas in

Orographic lifting

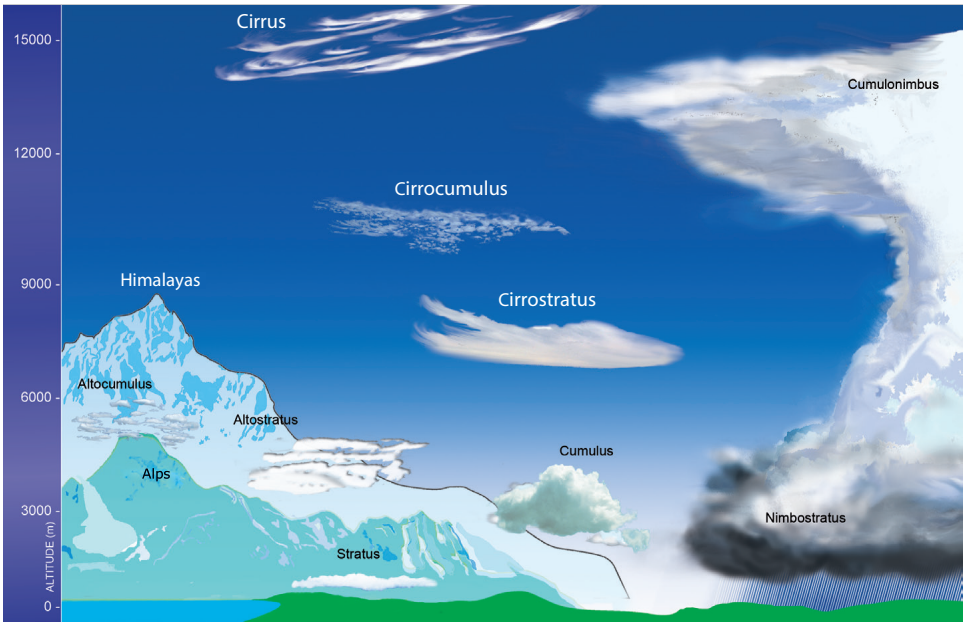


the winter a high-pressure system may bring with it extreme cold and clear conditions. A high-pressure system will show decreasing pressure outward when viewed on a large-scale pressure map. Decreasing pressure often signifies worsening weather conditions, whereas rising atmospheric pressure tends to indicate improving conditions. A rapid change in pressure often signifies a shorter but more intense shift in the weather, whereas a slow and steady change in the pressure typically indicates a change that will last for an extended period of time. Changes in atmospheric pressure are typically characterized by both ground and high-level winds.

The location where two air masses converge is referred to as a front. Fronts are often depicted on weather maps with modelling that illustrates the front's anticipated trajectory and speed. Cold fronts are typically shown in blue to delineate where a cold air mass is replacing a warm air mass, whereas warm fronts are typically shown in red to define warm air replacing cold air. Frontal lifting occurs when a warm front overtakes a colder air mass. The warm front rises over the colder air. As the warm, moist air rises, it cools. If the relative humidity reaches 100%, precipitation will commence. If a cold front overtakes a warm air mass, it will drive under the warm air at a steep angle and cause rapid lifting and precipitation.

INTERPRETING CLOUDS

The ability to identify and understand cloud formations will assist the hiking leader in identifying changes in the weather prior to their outing, as well as throughout the day. Clouds are commonly categorized as either cumulus, which indicate a vertical development, or stratus, which are clouds that form horizontally. Clouds between 2,000-6,000 metres are commonly given the prefix 'alto,' whereas clouds above 6,000 metres are coined 'cirrus.' Different cloud formations indicate the arrival of different weather systems. High cirrus clouds will be visible prior to the arrival of a low-pressure system or warm front. Cirrus clouds will commonly be visible before the weather changes are felt at a ground level. Initial cirrus cloud formation will precede the ground level weather changes because the warm air mass moving in is less dense and will overlay the cooler air mass. The initial high cirrus clouds are commonly followed by cirrostratus clouds, altostratus clouds, and eventually stratus, and nimbostratus clouds, which commonly bring rain or snow events. Conversely, the arrival of a high-pressure system or cold front



Cloud Layers

is often characterized by a decrease in visibility and the development of altostratus and cumulus clouds in a chain-like configuration. Weather changes at ground level are often felt quite quickly as the cold air mass pushes the warm air mass on top of it. This causes rapid cooling of the warm air as it gains elevation, and nearly immediate precipitation. One of the more significant weather-related risks to a summer hiking outing is a thunderstorm. Thunderstorms are easily visible forming in the sky. The formation of small cumulus clouds that gradually rise and develop into cumulonimbus clouds are a marked sign of the development of isolated thunderstorms. Large cumulonimbus clouds with dark bases indicate an imminent thunderstorm and a need for the leader to manage the group accordingly. In the field, it is important to differentiate between cumulonimbus and cumulus clouds, as the formation of cumulus clouds that lack vertical development is often insignificant and non-indicative of the formation of a thunderstorm.

Cumulonimbus



- Avoid being the highest point in the surrounding landscape
- Do not hide under tall trees
- Spread out the group
- Seek shelter in low-lying areas
- Insulate yourself from the ground by sitting on your pack or crouching on your sleeping pad
- Avoid hiding in small caves that may create a spark gap across the opening
- Stay out of gullies or ravines that are running with water

PRE-TRIP RISK ASSESSMENT

Prior to proceeding with a hiking outing, it is important to complete a pre-trip risk assessment to determine the viability of the outing. The pre-trip risk assessment involves the determination of a course of action through an examination of: the outing objectives, weather forecast, current weather conditions, current route conditions, the knowledge and experience of the hiking leader, and the abilities of the group members. Periods of predictable and desirable weather, matched with optimal route conditions, realistic objectives, and appropriate leader and group knowledge would demonstrate a likelihood to proceed with the trip as planned. Whereas periods of weather instability, poor route conditions, unrealistic objectives, or a lack of knowledge on the part of the hiking leader or group might necessitate a re-examination of the anticipated outing and an adjustment to the itinerary.

CONDITIONS MONITORING AND ITINERARY ADJUSTMENT

Regardless of the forecast, the weather will have an impact on a hiking outing. Some routes are better suited to days that are sunny and dry, while other routes can be managed when weather condition are poor. For the winter leader, significant afternoon warming (bringing the temperature to zero or above) will make for deeper foot penetration and more difficult snow travel. When this daytime warming is combined with an overnight freeze, foot penetration may be greatly reduced, and necessitate the use of cleats. Stable and dry conditions, while ideal for hiking, may lead to crowding of popular routes. Conversely, cool and damp conditions present cold-related risks, such as slippery rock and

access trails. Windy conditions present a risk in the form of windchill and communication challenges. A hiking leader needs to be acutely aware of the risks the weather presents and the impact they may have on the outing to ensure risks are appropriately mitigated. A hiking leader is responsible for ensuring that risks are well managed and appropriate for the participants throughout the trip. When completing the pre-trip risk assessment and calculating the risks, it is important for the hiking leader to determine their course of action based on their participants' abilities and risk tolerance. While the leader may personally be comfortable proceeding with a hiking outing during periods of weather instability, proceeding with the outing in less than optimal conditions may be beyond the comfort level of the participants.

Even during periods of weather stability, hiking leaders must monitor the weather for changing conditions throughout the day. Afternoon build-up and localized thunderstorms are common in the summer. Key elements to monitor throughout the day would include: notable changes in wind strength and direction, significant changes in temperature, significant cloud formation, presence of thunder and/or lightning, and rapid changes in the atmospheric pressure (> 0.2 kPa change per hour).

EQUIPMENT AND FOOD

Equipment and food preparation are relatively simple for day trips, but quickly become much more complex for overnight and multi-days trips. Although the hiking leader will have sent the participants equipment, clothing, and food lists prior to the trip, it is important to maintain open communication in the last few days leading up to a trip. Just because the leader has put it on the list, does not mean that every participant will show up on departure day with everything needed. Inexperienced hikers may substitute or eliminate items on the various lists. Communication will also help to fine-tune the final equipment and food selection based on the weather forecast.

ORGANIZE PERSONAL AND GROUP EQUIPMENT

Make sure that personal and group equipment is in good condition: no rips, tears or missing pieces. If the hiking leader is not providing

all of the group gear, check with each participant who is providing an item for the group, that the gear is appropriate for the trip and fully functional.

Winter day trips

The Winter Day-Trip Leader should ensure that the group has a thermos for every two or three people. They may also consider carrying a stove and pot.

Summer multi-day trips

Pre-departure checks

- Test the stoves. Make sure they are burning clean and hot
  - Calculate fuel consumption
- Set up the tents
  - Make sure all of the parts are included: poles, main body, fly, pegs
  - Check for rips, abraded areas, or holes in the tent fabric
  - Check the zipper functions

STOVE CONSIDERATIONS

Backpackable, single burner stoves are available in two general types, based on fuel type – liquid and canister. Most liquid fuel stoves burn Naphtha (white gas), however some stove versions made by MSR or Primus are multi-fuel capable. With a simple change of the jet, the stove is capable of burning Naphtha, kerosene, stove oil, or gasoline. Multi-fuel stoves are generally preferred for international trips where Naphtha may be unavailable. Liquid stoves have lighting and use procedures that will help to maintain efficient running and reduce the required maintenance. Proper pre-heating and stove shut down will reduce carbon build-up in the fuel jet. A yellow flame indicates poor combustion. It will accelerate carbon build-up and eventual stove failure. Liquid fuel stoves require regular maintenance. The fuel jet will become clogged over time and need cleaning.

Stove considerations





Choice of stove/fuel type and amounts required vary depending on the length of trip, group needs, anticipated conditions and local availability.

Some stoves have built-in cleaning jets, while others will need to be disassembled.

Burning old or dirty fuels such as kerosene will increase maintenance requirements. Naphtha fuel that has been exposed to low temperatures (-20 degrees Celsius or colder) may result in wax precipitates settling out. These wax precipitates may clog the fuel line and/or jet. With some stoves, it also may be necessary to clean the fuel line assembly. Pull the cable out, wipe it clean, blow air through the hose, and reinsert the cable.

Canister stoves are much easier to use and maintain. However, fuel canisters are more expensive than the equivalent liquid gas heat output. Additionally, performance declines with decreasing ambient temperature.

Fuel considerations

- Naphtha – readily available in North America, relatively cheap, relatively easy to pre-heat and light
- Kerosene – available worldwide, cheap, but requires more frequent stove maintenance, difficult to pre-heat in cold temperatures
- Canisters – available in mountain shops worldwide, easy to light, but relatively expensive, bulky, and susceptible to cold temperatures

Consumption rates

Consumption rates will vary based on ambient temperature, exposure to wind, stove model, and fuel type. A conservative estimate for liquid fuel stoves is 150ml/person/day. Consumption may go as high as 300ml/person/day if snow must be melted for drinking water in addition to cooking needs.

Ventilation

Stoves require oxygen for combustion. A limited flow of oxygen will result in incomplete combustion and the production of carbon monoxide, which is odourless/colourless and lethal. Inclement weather typically promotes the desire to cook in a sheltered area. The tent is an obvious solution; however careful consideration must be given. In addition to the threat of carbon monoxide poisoning, tent fabric is flammable.

Pot selection

Pot selection will depend on cooking group size. A team of two may get by with a single two-litre pot, whereas a group of four will be better served by having both a two-litre and a three-litre pot. Stainless steel pots are preferred as they are durable and cheap. Titanium pots are lighter; however, they are much more expensive and do not transfer heat as well as stainless steel.

PACKAGE AND ALLOCATE FOOD

Food for multi-days trips needs to be easy to prepare, taste good, provide sufficient calories and be light. The relative significance of each element will vary based on the trip scenario. If everything is to be carried by the participants, the emphasis will be placed on weight. A base camp scenario might have a focus that includes more elaborate preparation. Food should be one of the highlights of a trip. Poor quality, poorly prepared, or an insufficient quantity of food will provide an unforgettable experience that overwhelms majestic views and good companionship. Preparing and packaging meals prior to the trip has many benefits. Fresh vegetables, fruit and uncooked meat have finite limits before they become unfit for consumption. They are also heavy. Consider dehydrating food for longer trips. It will last longer and be much lighter. Water boils at a lower temperature as altitude increases, so cooking times must be adjusted accordingly. Some foods, such as long-grain rice with a cooking time of 40 minutes, are inappropriate for meals that are being prepared on a single burner stove. Quinoa is a much better choice, as the cooking time is substantially shorter. Canned food should be avoided as it is heavy, typically including water along with the weight of the food and the can. Quantities can be calculated and adjusted based on individuals' anticipated appetites.

Inexperienced hikers often experience food anxiety and a fear of running out of food. Although it is tempting to "pack a little extra – just in



Packaged trip food

case", food that is carried, cooked and then not eaten becomes a burden to carry for the rest of the trip. For example, 500g of dry, unused oatmeal becomes 1kg of cooked, and uneaten oatmeal.

Most food from the grocery store comes with excess packaging, which just becomes waste to be carried out. Measure out the quantities needed into plastic bags. Spices and condiments can be added to these bags. Put all items for a meal into a larger bag and label it "Dinner 1". Include cooking instructions such as "Mix 2:1 with water and cook for eight minutes." The group size will dictate whether smaller cooking groups will be needed. It is simpler and more efficient to prepare meals in smaller groups of up to four people. A good target for food weight on longer trips is 1kg per person per day.

FIT AND PACK A BACKPACK

Ensure that participants have packs that are the appropriate size and type for the trip and are fitted correctly. The pack should be large enough to fit all of the contents inside, typically 45-75 litres. Most packs of this size will have adjustments to accommodate a range of back sizes. Some packs come in different back lengths. Adjust the distance between the hip belt and the shoulder straps so that the weight is shared between the hips and shoulders. A pack with numerous items dangling on the outside is a hazard.

The various items that will be in the pack have different densities. Sleeping bags and tents take up a fair amount of space but have low density. Place them at the bottom of the pack. They will also not be needed during the day. Food and water have the highest density. Pack your lunch and water bottle near the top of the bag for easy access. The rest of your food should be close to your back and above your sleeping bag. Small items that will be needed during the day can be in the top pocket. Raincoat and pants should be near the top.

Weight distribution can be varied based on the terrain. For travel on relatively even terrain, weight can shift to be higher in the pack. Scrambling through a boulder field is easier when the pack has a lower centre of gravity.

DETERMINE APPROPRIATE PACK WEIGHTS

Equality is not the same as equity. Equality means that everyone will carry the same weight of group gear and food and then eat the same amount of food. This does not work. The group gets spread out on the trail as some people are slower than others. At dinner time, some people are "stuffed," while others are still hungry. Equity means that bigger, fitter people with bigger appetites carry more and eat more. Everybody is equally tired at the end of the day and happy with the amount of food that they have eaten.

A starting point to work with for appropriate pack weight is 25% to 33% of body weight. Less fit and/or overweight people should be at the lower end of the scale, while fitter, stronger, leaner people can be at the higher end of the scale. If someone brings personal equipment, such as a large camera with extra lenses, the group could discuss whether the camera gear takes on an element of group gear, as high quality photos can be shared as part of the community experience.



Fitted pack



Top pocket contents

REFERENCES AND FURTHER READING

UIAA (2013), *Alpine Skills Summer:* Basic knowledge – Alpine hiking – Climbing – Alpinism, The Petzl Foundation

NOTES:

NOTES:



Delivery of a Hiking Outing

A successful hiking outing requires thoughtful group management, diligent management of potential risks, and the administration of crucial documents such as waivers and acknowledgement of risk forms. In this chapter, we will explore the ACC waiver administration process, the basic principles of group management, and the cornerstones of risk management in a hiking context.

WAIVER ADMINISTRATION

In accordance with ACC policies, all participants must complete a waiver prior to participating in an outing. The importance of this document to The Alpine Club of Canada cannot be overemphasized. The hiking leader's conduct when administering the waiver to the participants is of paramount importance, as the administration of the waiver by the leader can affect its legal standing. The role of the waiver is to protect The Alpine Club of Canada and outing participants against lawsuits in the event that a participant is injured or killed. It also protects The Alpine Club of Canada if a participant's property or personal belongings become damaged or lost. The document further protects The Alpine Club of Canada from liability for natural hazards, as well as the possible negligence of any of the other Alpine Club of Canada member participants.

PREFERRED WAIVER DELIVERY PRACTICES FOR ONLINE WAIVER ADMINISTRATION INCLUDE:

Pre-Trip:

- A clear description of all potential hazards associated with the trip and a copy of the waiver on the trip info webpage.
- Online signing of the waiver during registration for the course (before payment is taken or registration is complete). This has to be a proper online waiver delivery software endorsed by the ACC. It cannot be done on by typing a name online or using a pdf editor tool.

Beginning of Trip:

- Ensure that participants are aware of the specific and general risks associated with the activity and ask if there are any questions.

PREFERRED WAIVER DELIVERY PRACTICES FOR IN PERSON WAIVER ADMINISTRATION INCLUDE:

Pre-Trip:

- A clear description of all potential hazards associated with the trip and a copy of the waiver on the trip info page.
- As part of the registration process the participant must answer yes to the following questions in order to proceed:
  - I have read and understood the ACC waiver and the hazards associated with this event found on the webpage/event registration page.

- I understand that there are risks associated with climbing/skiing/hiking/other (choose appropriate option) and am signing up for this event knowing the dangers that exist.
- I understand at this time that I may seek legal advice if I have any questions

Beginning of Trip:

- Ensure clear communication when delivering the waiver
- Allow participants adequate time to re-read the waiver
- Ensure that participants are aware of the specific and general risks associated with the activity prior to administering the waiver
- Have participants verbally acknowledge that they have read and understood the waiver
- Ensure waivers are completed in full and are unaltered
- Waivers should be administered and witnessed by the hiking leader
- Waivers should be presented in a standardized format. Completed, dated and signed in blue or black ink

OTHER WAIVER DELIVERY CONSIDERATIONS

- Waivers do not guarantee protection from lawsuits
- Waivers do not absolve leaders from acting appropriately
- Waivers are often be delivered annually to reiterate risks and ensure participants accept them
- Waivers are legal documents and cannot be altered in any way
- Waivers do not expire, but if the activity, dates, or risks change, a new waiver should be administered

COMPLETED WAIVERS

Signed waivers must be retained by the ACC Section for a period of seven years, after which time they can be destroyed. All signed waivers must be forwarded to the appropriate Section member who is responsible for storing the documents, as soon as possible following the hiking outing.

Copies of these waivers and any other forms in this book can be found at www.alpineclubofcanada.ca/forms

PRINCIPLES OF GROUP MANAGEMENT

A well-managed group will be more likely to achieve the trip objectives, will foster a more cohesive group dynamic capable of resolving interpersonal conflicts, and will be better equipped to address and mitigate any risks associated with the outing. Participants in an effectively managed group will be aware of their responsibilities, will operate under the leader's coordination and guidance, and will be educated and equipped for the day's activities.

Successful leaders diligently and deliberately set the tone for the outing early in the trip. This begins as part of the pre-trip communication, as discussed in Chapter 2. The face-to-face group briefing at the start of the trip is an opportunity to clarify goals and expectations. The leader introduces themselves, explains the goals for the outing, outlines their expectations of participants, and facilitates the opportunity for participants to introduce themselves to one another and to the group as a whole.

COMMUNICATION

The decision-making process is typically negotiated and communicated between the hiking leader and the group. A situational leadership approach is a dynamic process that needs clarity of communication. By including the group in the leader's thinking process, the potential for conflict can be reduced. For example, if weather and route conditions are deteriorating, the leader should give the group a heads up that the decision to pull the pin and head back is imminent.

EXPECTATIONS

Providing participants with clear expectations both before and during the hiking outing will enable them to better manage their personal safety and achieve the trip objectives. Common expectations may include:

- Group travel expectations
  - Pace and spacing
  - Scheduled breaks for water/clothing changes, etc.
  - Staying on trails
- Route expectations
  - Hazard zones (proximity to edges or other natural hazards)
  - Personal pack contents
  - Litter and human waste (pack out what you pack in)

- Activity expectations
  - Participant positioning
  - Hiker responsibilities
  - Equipment use expectations
  - Leader involvement expectations

LEADERSHIP

High quality leadership and timely motivation by the leader helps ensure that participants act according to the expectations that have been set. Further, supervision enables the leader to identify risks and address them before accidents occur, and to closely monitor the group's well-being throughout the outing. Depending on the outing objectives and participant experience, preferred supervision practices may include:

- Keeping the group's proximity close to allow for continued visual supervision and verbal communication
- Continual monitoring of participant nutritional/caloric intake and hydration
- Monitoring the group for signs of fatigue or distress
- Monitoring the group dynamics to ensure continued participant motivation and enjoyment

SELF-LEADERSHIP

The notion of self-leadership is not just an inventory of one's technical competence in a specific activity, but also includes communication skills, group management skills, judgment and decision-making skills, tolerance for uncertainty, emergency response skills, and self-awareness. These skills develop over time and typically progress from simple (low consequence) experiences to more technical (higher consequence) experiences. Self-leadership maintains a clear perspective of where one is at with respect to the inventory of leadership traits. When leading groups, the leader will select outings within their overall ability as a means of directing more of their energy towards the group versus themselves. As more experience is gained, the leader may select more challenging outings, as their overall leadership inventory now has more refined tools with which to manage the outing and the unknowns that may be encountered. This may be seen in a hiking leader progression from Day Leader to Winter Day Leader, or to Multi-day Leader.



DIVERSITY AND INCLUSION

The ACC is committed to building a diverse community that welcomes people of all backgrounds. A hiking leader is accountable for supporting that goal. This means facilitating an emotionally safe and inclusive environment for all participants. The hiking leader is responsible not only for their own behaviour, but also ensuring others are not discriminating against people based on their race, ethnicity, colour, gender identity or expression, sexual orientation, age, disability, or religion. It is important to keep in mind that this misconduct may be overt, or more subtle, such as using inappropriate or offensive humour.

EDUCATION

A significant component of group management involves ensuring that participants are educated and empowered to complete the day's activities under the guidance of the leader. For this to occur, leaders are often required to provide guidance and instructional inputs throughout the day. Typical instructional topics may include: navigation, self-care, ethics, ecology, risk management, technical systems, local history, personal experience and insight, etc.

GUIDANCE

In addition to educating participants, the success of a hiking outing requires diligent guidance on the part of the leader. Guidance differs from educating participants in the sense that it motivates and enables participants to develop independent competency with specific skills. Well-guided participants will feel empowered to make their own decisions and manage their personal safety, with the understanding that the hiking leader is available to provide support and assistance where required. Qualities of a strong leader capable of providing sound guidance include:

- Situationally aware of risks and safety concerns
- Enthusiastic, supportive, and motivational
- Knowledgeable and capable of articulately sharing their knowledge
- Technically proficient in their systems applications
- Physically fit and able to complete the day's activities
- Sympathetic to the group's needs
- Capable of resolving conflict and providing direct leadership if required

CONFLICT RESOLUTION

Inevitably, occasional conflicts will arise within a group or between participants and leaders. Therefore, hiking leaders need to be prepared and adept at resolving minor conflicts. Basic strategies for resolving conflicts include:

- Being open and recognizing the conflict
- Addressing the conflict privately if possible, rather than in front of the group
- Remaining calm and dedicated to resolving the conflict rather than winning an argument
- Acknowledging the feelings of all parties involved in the conflict and seeking further clarification specific to the issues at hand if required
- Determining potential resolutions to the conflict
- Selecting an appropriate resolution and seeking support from those involved in the conflict
- Proceeding with the resolution

Effective leaders recognize conflict building, and tactfully and firmly address it before it escalates.



PACING AND TRANSITIONS

Set a steady, measured, unrushed pace that can be maintained for a long period. The pace should be slow enough to allow adequate time to maintain a high level of situational awareness. In addition, much of the joy of hiking comes from observations of the natural landscape – flora, fauna, and vistas. Proper pacing is determined by several factors, which include the trip objective, the distance to be travelled, the difficulty of the terrain, participants' motivations and fitness levels, and the weather conditions (current and forecast). The proper pace has everyone moving within a comfortable range of exertion levels. A proper pace greatly reduces the risks of fatigue related injuries.

The hiking leader is typically at the front of the group, route finding, setting a track in a safe and efficient manner, and setting the pace for the group. The leader can think of pacing as their mechanism to manage the group's energy to ensure everyone is having a positive experience, as there may be participants with varying fitness levels. In general, the pace is set for the slowest member of the group. However, it is important not to stigmatize the slowest member. Position the slower members of the group near the front of the line. This makes it

easier for the leader to set a pace that is comfortable. If the faster, fitter group members are right behind the leader, a subtle (or not so subtle) pressure to hike faster can develop. This can lead to a split within the group. The faster group moves at a pace comfortable to them, but then needs to wait for the rest of the group to catch up. This might take five, 10, or even 15 minutes. If the faster members of the group resume hiking as soon as the last member arrives, it creates a Slinky effect. The slower members get no rest breaks, while the faster members enjoy a lot of breaks. The result is that slower members move even more slowly, and resentment builds. Managing energy expenditure, in addition to the group not spreading out too much, is part of the leader's risk management strategy.

If the temperature at the start of the trip is cool, the leader may suggest that everyone begin hiking with sufficient warm layers. Plan to take an early layer break (five to 15 minutes of hiking) to ensure members of the group are not overheating and possibly perspiring. The hiking leader should be ready to coach participants on efficient thermoregulation. Try to get everyone in the group to manage their layering at the same time so that the group can avoid overly frequent "layer breaks." Recognize that participants have a variety of thermoregulation needs and that this will mean some people may be a bit too cool or too warm for brief periods.

A good strategy for longer hikes is to travel for an hour and then take a 10-minute break. Plan breaks in appropriate places and use them as part of your rest or snack time strategy. Choose the location for a break. If navigation is difficult, choose a spot with a view. If the day is hot, choose a shady spot. If it is cold, stop in the sun. If it is windy, find shelter. Planning breaks will ensure a good flow to the day versus a day that feels choppy. When planning a break, avoid asking if participants need a water or layer break, as often they may say no due to not wanting to hold up the group. Instead, the leader would take off their pack and say that they are stopping for a water and snack break,



to remove a layer, or to attend to a foot problem and then proceed to do so. Model what you are looking for. The leader will plan breaks to reduce the number of cascading stops, which may otherwise occur. The exception to the planned break is if someone is developing a foot problem. A hot spot, that is, the early sign of a blister forming, must be dealt with immediately. Early, preventative treatment prevents a minor irritation from becoming a hobbling, painful experience.

Carry out basic equipment repair

Equipment that is well maintained is unlikely to fail during a day trip. However, on multi-day trips things can break or wear out. The hiking leader should carry a repair kit. The contents of the kit will be based on the equipment carried and the seriousness and commitment level of the trip. A trip leader can improvise so that a pack's broken shoulder strap can survive the remainder of a day trip, but it may be more challenging to create a more durable solution that lasts for the duration of a multi-day trip.

Items that could need fixing on a day trip include: boots, laces, packs, or clothing. Duct tape and parachute cord provide solutions



to multiple simple repairs. The number and complexity of repairs significantly increases on multi-day trips. Failure of a stove, tent, or sleeping pad has the most serious implications. A stove repair kit and the knowledge as to how to use it is essential. Liquid fuel stoves are the easiest to repair in the field, but require tools and spare parts specific to the stove model. Tent repairs range from stuck zippers, holes in the floor or fly, to bent or broken poles. A tent repair kit should include duct tape, adhesive nylon patches, zipper lubricant, and a pole sleeve section.

Other items for a repair kit include: a multi tool, needle and thread, a tube of Freesole (Goop), and a short section of bailing wire.

TRACK SETTING



Track setting for summer trail travel is fairly straightforward. Stay on the trail. But what if the trail is braided? Wet, muddy or boggy sections of a trail may have numerous options. Choose the most durable surface. Avoid cutting the corners on trails with steep switchbacks.

Winter travel is more complex. If the trail is untracked, it may be difficult to stay on the trail. Walking with snowshoes is different from walking with cleats or just boots. Snowshoes can be difficult to manage on sidehills. Snowshoe movement skills will be covered in Chapter 7, Movement skills.

Track setting off trail is the most complex challenge for the hiking leader. Track setting in thick bush can be considered an art form. A brutish style of track setting forces the line - up, over, under, or through obstacles. A more elegant solution is to look for natural openings in the forest. Follow them. Look for links to further openings. The line may wander more, but less energy is needed. When ascending steep, wooded hillsides, set long, rising traverses with switchbacks. This allows the leader to see more of the terrain and options may present themselves in terms of openings and easier travel. In open

terrain (treeline and above), an appropriate track will ensure a comfortable climb rate (not too steep), use as few corners as possible and place the corners on lower angle terrain versus steeper terrain. Work with the terrain to set a contoured track and avoid a track that has many ups and downs. This will add to the overall comfort of the group when travelling in the backcountry and increase the efficiency of the outing as a whole.

RISK MANAGEMENT

A hiking outing may present a variety of hazards to manage throughout the day. It is the responsibility of a hiking leader to recognize the risks associated with the hazards, quantify the risks, and appropriately mitigate the risk to decrease the likelihood of an accident or injury occurring. In this chapter, we will explore several crucial risk management components, including situational awareness, hazard recognition and mitigation, as well as the concept of participant demonstrated competency.

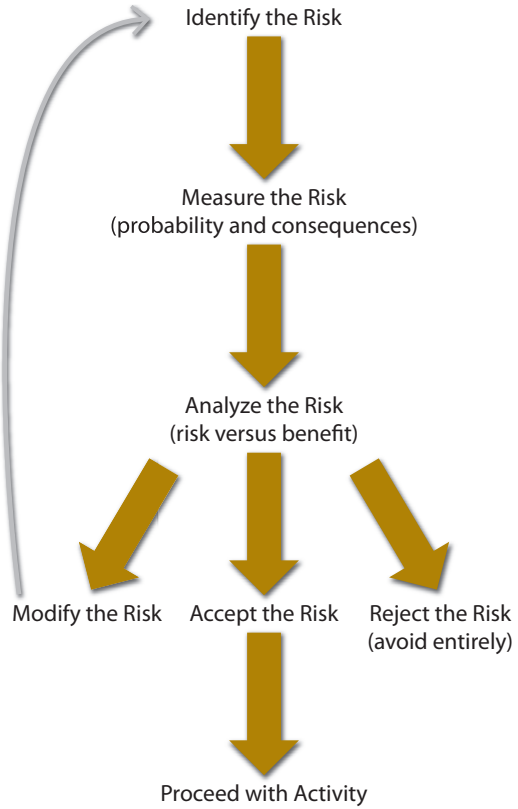
RISK ANALYSIS

Risk analysis is generated through an assessment of the likelihood or probability of an occurrence and the consequence of that occurrence. The consequence is influenced through exposure and vulnerability. How long are people exposed to the hazard? How vulnerable are they? What will happen if the people are impacted by the hazard? The starting point for a hiking risk management decision is based on the acceptance of some level of risk. This target level of acceptable risk is the level of risk chosen by a participant to attain optimal benefit from the activity. The acceptable level of risk is influenced by many factors, including: maturity (age) and prevailing conditions. A close call or an accident may trigger a reset in a person's acceptable level of risk. However, the absence of negative events, such as close calls and accidents, may lull the decision maker into a false sense of security. The absence of negative outcomes is not a good measure of decision competency. When nothing bad happens, it is easy to attribute the success to good decision making. This can lead to complacency. It is essential to recognize that the level of acceptable risk is personal. There will be an inevitable range of acceptable risk within a group. The wise hiking leader will be aware of and address these differences.

SITUATIONAL AWARENESS

Situational awareness refers to the hiking leader's ability to recognize and mitigate hazards before they present a risk to the group. It is the responsibility of the hiking leader to step back and evaluate all of the variables in a given situation, determine their interactions, and evaluate the potential for this to present a risk to the group.

- The leader must constantly evaluate the terrain.
  - Are there places that pose greater risks?
  - Are there any alternates?
  - Is it familiar terrain or new terrain?
  - How exposed is the group as it moves through the terrain?
  - Does the group have appropriate safety equipment for the terrain and conditions?
- The leader must constantly evaluate the weather.
  - What is the forecast?
  - Does the forecast seem to be right?
  - How rapidly is the weather changing?
  - Are conditions better or worse than expected?
- The leader must constantly evaluate the group.
  - Are the members performing as well as expected (physically, mentally and emotionally)?
  - How well is the group interacting?
  - Are any conflicting personal goals emerging?



Situational awareness is closely tied to expertise. Higher levels of expertise allow the leader to more quickly recognize the

events occurring around them and be better equipped to recognize potential risks. In the context of a hiking outing, situational awareness is the ability to recognize environmental, interpersonal, internal human factors, external human factors (other hikers), and the relationship between these factors, as well as any impacts this will have on the safety and success of the outing.

HAZARD RECOGNITION

Closely linked to situational awareness is the hiking leader's ability to recognize hazards, and determine their probability and severity. Hiking has an inherent level of hazard and therefore has some level of risk associated with it. The hiking leader's role is not to entirely eliminate the risks associated with the activity, but rather to recognize them and ensure they are well managed, mitigated, or avoided. Common hazards for a hiking leader to recognize include:

- Environmental
  - Very warm temperatures (heat exhaustion, heat stroke, sun burn, dehydration)
  - Very cool temperatures (hypothermia, loss of dexterity, lack of focus, frostbite)
  - Overnight freeze and daytime warming cycles (natural rockfall)
  - High wind (challenging communication, dehydration)
  - Precipitation (slippery conditions, hypothermia, whiteouts)
  - Lightning (electrocution)
  - Animal encounters (animal attacks, disease transmission, anaphylaxis)
- Interpersonal Risks:
  - Conflict (disagreements or altercations)
  - Group not following or listening to the leader
- Human Behaviours:
  - Intrinsic motivation (participants not following the directions of the leader or participants pushing the leader to take risks that are out of context with the trip objectives)
  - Food, hydration, sleep, symptoms of drugs or alcohol
  - Heuristic Biases - Familiarity, Acceptance, Commitment, Expert Halo, Tracks (scarcity), Social Proof – poorly applied simple rules or shortcuts (heuristics) that may affect decision-making

    - Group Think – A desire for harmony, conformity and minimal group conflict, resulting in a loss of critical analysis. This may result in the illusion that the group's decision is correct
    - Risky Shift – The risk accepted by the group may be higher than any individual group member would accept on their own
    - Fear - clouds objective decision making
    - Risk Tolerance - a level of risk one may take
    - Trust - trust (or lack of it) in the leader or other group members may influence decision-making with respect to risk management
- External Human Factors:
    - Other users and groups (crowding, interruptions to the day's program)

MITIGATION

Once hazards have been identified, their probability assessed, and their severity analyzed, the hiking leader must determine an appropriate mitigation strategy. In some instances, this may involve avoiding the hazard entirely or modifying the situation to decrease the probability or severity of the hazard, or it may involve acceptance of the hazard and continuing forward.

Examples of common hazard mitigation strategies in a hiking context include:

- Ensuring periodic breaks occur throughout the day to eat, drink, and adjust clothing
- Continually monitoring the weather to allow for adjustment of the program prior to weather changes
- Planning and managing transitions or equipment changes to minimize time in areas of higher objective hazard
- Recognizing group conflict and quickly addressing it
- Recognizing participant distress and addressing it

HIKING HAZARDS

Hiking trips can often be conducted in a relatively low hazard environment. Summer objective hazards include: terrain, weather, wildlife and other users. In winter, some hazards become more extreme, while



Class 1 and Class 2 terrain



Winter trail



Off trail

other become less of an issue. Winter weather, with colder temperatures, increases the complexity of hazard management of thermoregulation, snow-covered terrain, and frozen creeks and lakes. The likelihood of wildlife issues, such as bear encounters, is reduced during the winter.

Terrain

The terrain limitations of the hiking leader are confined to Class 1 and Class 2 terrain. For travel in Class 3 and above terrain, refer to the Summer Mountaineering Leader.

On-trail terrain – Trails can thread their way below, around and above obstacles and hazards.

The leader must be constantly aware of hazards from above that may impact the group. This includes:

- Rockfall – naturally occurring, generated by animals or people above, or generated within the group.
- Snow or icefall - naturally occurring

The leader must also manage fall hazards. What is the terrain below the party? Trail conditions that are loose, slippery, muddy, snowy or ice-covered increase the likelihood of a slip. If someone slips or falls off the trail, where will they stop? What is the consequence?

Winter on-trail travel has additional considerations. Snowshoes or cleats are a hazard mitigation strategy. Deep snow may be hard to travel through and require snowshoes. Hard snow may be slippery and require cleats. These movement skills will be covered in Chapter 7. Snow-covered trails that have no obvious tracks may be hard to follow, whereas tracks made by previous parties may not follow the trail. Navigation becomes more challenging.

Off-trail terrain – Hazard management becomes much more complex off-trail. Careful route selection is essential. Hazards include: rock slabs, talus fields, scree slopes, grassy slopes, lingering snow in early summer, dense vegetation, deadfalls, and creek crossings (see Chapter 8). Most terrain features become more challenging and hazardous when they are wet. A rock slab, or grassy slope may be relatively manageable when dry, but may need to be avoided when wet. Talus fields are often challenging when dry. The consequence of a fall can be significant. When wet, the likelihood of a fall increases dramatically. Dense vegetation and deadfalls require careful management when wet. Avoidance is preferable if possible.

Weather

Weather is perhaps the greatest hazard that hikers face. On a day trip in the summer, the weather forecast should be relatively accurate. But be aware that conditions can change rapidly in mountainous terrain. The hiking leader should be taking weather observations during the day. Thunderstorm activity can be hard to predict. Storm cells may cross some areas, but not others. On multi-day trips the leader begins with a similar accuracy of forecast as the day trip leader, but must recognize that the accuracy of the weather forecast deteriorates as the forecast model peers further into the future.





Winter and shoulder season conditions are a hazard that needs constant consideration. Cold injuries, such as frostnip, frostbite and hypothermia, can have rapid and insidious onset. Constant monitoring of participants is needed, particularly if they are unaccustomed to being active in a winter environment. Cold temperatures complicate dealing with an emergency or injury. See Chapter Nine for more information on responding to emergencies.

Wildlife

Wildlife encounters can occur at any time of the year. Bears, cougars, moose, elk, coyotes, wolves, wolverines, racoons, snakes, ticks, wasps, ravens, whiskey jacks, porcupines, mosquitoes, and black flies can pose a threat. The hiking leader needs to be well versed in the type and likelihood of wildlife encounters possible on the selected trip. A bear or cougar encounter can be a wonderful experience when managed well. But if managed poorly, it can lead to tragedy. Check with local authorities (park personnel, conservation officers, etc..) as to whether large predators have been seen in the area recently. Avoidance is the best solution. Choose a different trip. Mosquitoes and black flies may simply be annoying to those equipped with head nets and repellant, but could be a show stopper for the unprepared.

Other Users

Our wilderness areas are becoming more popular. In many places, the recreational carrying capacity of the land has been exceeded. Some areas have imposed restrictions or quotas. One has to question the value of the wilderness experience when it is shared with hundreds of other people. Sharing with other hikers is one issue, but a more complex issue is sharing with other types of users who may be less compatible. This includes mountain bikers and equestrian parties. Does everybody know the rules or etiquette of trail sharing? Downhill



mountain bikers moving at high speeds may have more difficulty giving way to other travellers, but that is not an excuse. Bikers yield to hikers and horses. Hikers yield to horses.

PARTICIPANT-DEMONSTRATED COMPETENCE

The ability to assess the demonstrated competency of a participant is a vital component of a hiking leader's hazard recognition and hazard mitigation strategy. Prior to giving participants risk-related responsibilities, such as creek crossings, it is important that participants demonstrate competency with the skills necessary to do so. Until participants have demonstrated adequate competence, it is imperative that the hiking leader manage risk on their behalf. Common techniques used to support participant competence with specific skills include:

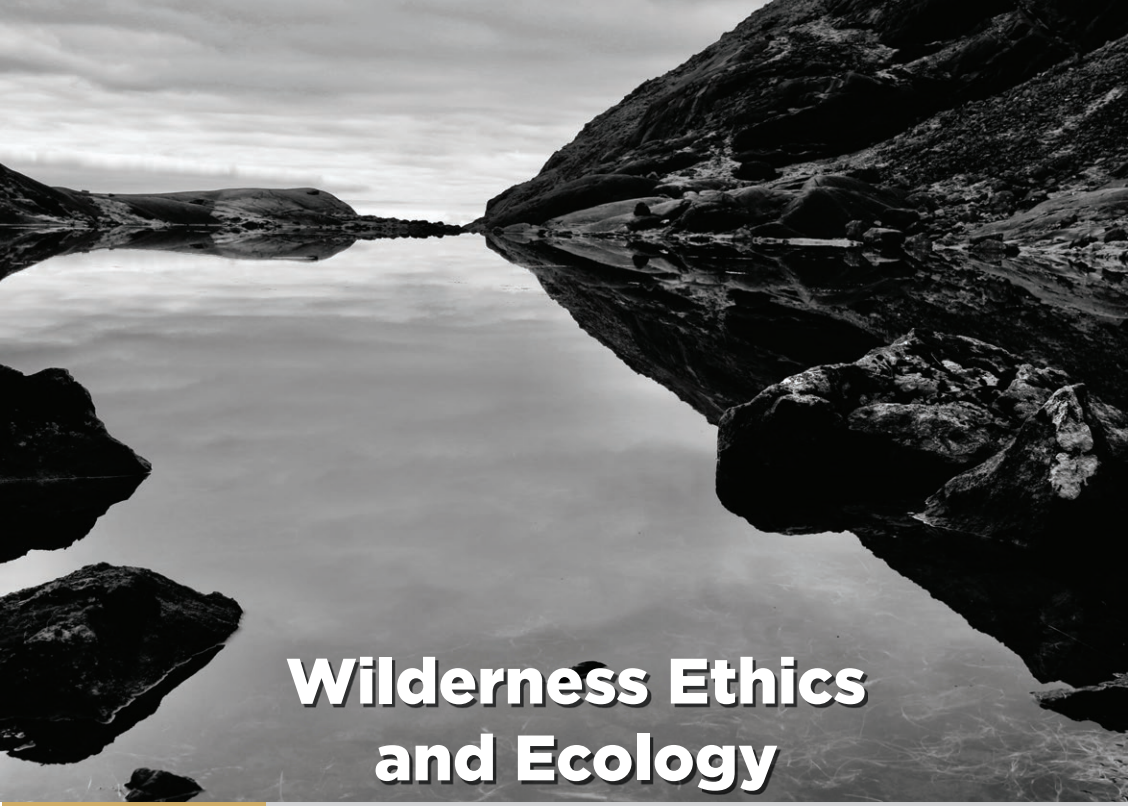
- Providing participants with the opportunity to practice skills in a risk-free context

- Visually monitoring participants to ensure skills are being practiced and applied correctly
- Verbally testing participants to gain an understanding of their comprehension of the skill
- Applying the skill progressively or incrementally
- Providing the participants with constructive feedback and coaching if they are struggling with a skill
- Physically supporting the participants' application of the skill in instances where it will increase comfort, safety, or success
- Monitoring the participants to ensure the application of the skill remains consistent over time, and complacency and regression do not occur

Ideally, participants would demonstrate competency all of the time, however, that is not a realistic expectation and often participants will need ongoing coaching, and/or instruction before they achieve independence with specific skills. For this reason, hiking leaders will need to exercise good judgement and limit the level of responsibility offered to those who are unable to demonstrate competency with a skill. This ensures the level of risk presented to the participants remains consistent with the nature of the outing and the trip objectives. As mentioned earlier, the hiking leader may choose terrain that has fewer consequences as a means for such skill development. While learning, errors will be made. A kind learning environment provides participants with high levels of quality feedback and minimal negative consequences. Ideally, the feedback comes from both people and the environment. The leader and more experienced members of the group provide a valuable resource from which to build competency. At the other end of the scale, a wicked environment provides minimal quality feedback and dire consequences. Providing an arena to make and learn from errors with little to no consequences reduces the overall vulnerability of the participants, and group, while providing valuable feedback and growth of specific skills. Once skills are acquired, it is possible to move to terrain that challenges these skills while maintaining an appropriate safety bandwidth.

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Wilderness Ethics and Ecology

Alpine meadows, such as those of lupine and paintbrush, exposed mountainous terrain such as buttresses, steep ridgelines, turquoise tarns and warmer temperatures create an idyllic summer mountain environment. Flora and fauna seize a short growing season and fauna feed and nurture their young. There is much to see and experience. With this opportunity, comes the responsibility to maintain low-impact travel techniques and set a positive example with respect for localized environments. In this chapter we will explore several principles of low-impact travel, basic wildlife precautions and interpretive knowledge, all related to a hiking environment.



PRINCIPLES OF LOW-IMPACT TRAVEL

Minimizing our impact when we travel in the backcountry is essential not only in terms of our ecological impact, but also our aesthetic impact. The first step is to plan ahead and prepare, as indicated in Chapters One through Three. Knowledge and skills help us to act in a way that will reduce both our impact on local environments as well as our visual impact for other user groups.

- Leave the land less impacted than when you arrived
- Preserve the past: examine, but do not touch, cultural or historic structures and artifacts
- Leave rocks, plants and other natural objects as you find them
- Avoid introducing or transporting non-native species
- Do not build structures, furniture, or dig trenches
- Pick up garbage and pack it out – both yours and others'

As a hiking leader, we are able to reinforce best practices in the backcountry with our groups

SUMMER TRAVEL



Rock, scree, snow and established trails are all deemed to be durable surfaces that when used, mean a group will exert less impact on local environments. Plants in the subalpine and alpine endure harsh year-round temperature fluctuations and environmental challenges, and are often slow to recover once damaged. Being intentional about where you place your feet creates better movement skills and can also help to maintain pristine environments.

There are many surfaces in the subalpine and alpine that are sensitive to human impact, such as alpine meadows, woody stemmed plants, and leafy lichens. Woody stemmed plants, such as mountain heather, can break under the weight of a hiker's footstep, and leafy lichen will often crumble with minimal pressure. Mountain travellers can choose to avoid such sensitive flora, or when not possible, spread out your group so each member takes their own path. The greatest site-specific impact we make is where we camp, and specifically where we eat; campsite selection is therefore the most critical time to think about durable surfaces, local flora and the consequences of our impact. Hikers can create further erosion and impact by shortcutting a switchback. This creates an inefficient pathway, and water can further erode the existing trail and impact the localized environment. This should be avoided. Another malpractice is the widening of trails or increasing the number of trails, often seen in alpine meadows when hikers wish to avoid walking through mud. If you and your group encounter a maze of trails, encourage group members to choose the most impacted trail, strap on their gaiters and embrace the muddy wilderness experience! Travelling in a smaller group and being aware of noise will allow your group to be more situationally aware of your surroundings. Make sure to encourage your group to look around and listen, cueing in to animals in the area. This can help prevent a surprise encounter with a feeding bear or a grazing mountain goat. Not only will this help your group experience a greater connection to their environment,

but it will also help mitigate the social impact for other user groups. Travelling in smaller groups also helps by potentially reducing crowding in high use areas.

Where we sleep, cook, and dispose of our human waste has the greatest potential environmental and aesthetic impact.

WINTER TRAVEL

Tracks on the snowy white canvas tell others where you have travelled and camped — that is, until it snows again. For that reason, visible signs of travel and impact in the winter environment can be short-lived (seasonal), however the winter hiking leader should think and visualize what impacts might extend beyond winter and into the summer season. Snow is a mouldable and low impact surface. Unlike the effects a group of travellers can have on an alpine meadow in the summertime, winter conditions provide a durable and protective surface. When travelling in areas with low snow, bear in mind what the surface may look like in other seasons. Stick to trails and more durable surfaces to avoid, for example, impacting alpine meadows. Travelling in a smaller group and being aware of the noise your group is making, especially in popular areas, helps to mitigate the social impact for other user groups. This also helps by potentially reducing crowding in high use areas.



HUMAN WASTE

Poor disposal of human waste has the potential to impact the cleanliness of our waterways and spread infection amongst backcountry travellers. Check for best practices in your area and requirements from land managers. Considerations include the number of user days you will spend in an area. For example, 10 people for two days in one place equals 20 user days. A good rule of thumb is that more than 20 user days in one area means a large impact in terms of human waste on a wilderness area. The greater the number of user days, the less an area can handle the human waste impact. It is best practice to dispose of urine and feces

approximately 100m from any water source or existing trails. The most widely accepted practice for feces is to dig a 'cat hole' 10-15 cm deep in organic soil and cover it back up. Pack out all toilet paper and feminine hygiene products. While toilet paper can be burned completely in a hot campfire, burning it with a lighter is not an option. It can easily result in an incomplete job, leaving remnants of toilet paper bits, and has the potential to allow hazardous roving embers to escape. A massive forest fire in Manitoba was caused by burning toilet paper. A hiking group was found to be at fault and deemed responsible for the damages. This included the value of the lost timber and the firefighting costs.

Depending on the land manager and best practices for the area, options may also include packing it out in a disposable bag for solid waste. Both individual and group systems are manufactured commercially with chemicals that work to solidify, decrease odour and minimize the waste as a biohazard. Packing out solid waste is becoming more common and is sometimes required in high use areas, especially those with minimal active soil, which facilitates the decomposition of organic matter. Examples include high alpine terrain and deserts. Some land managers offer free bags, available at trailheads. Hygiene is paramount; illness in the backcountry is often sourced to improper hand washing. Setting up a system to encourage yourself and your group members to use soap and water and/or hand sanitizer will limit transmission of fecal matter. If using soap, this should be used sparingly and over active soil, not directly into a natural water source.

GROUP SIZE

It is important for hiking leaders to recognize that the size of the group will impact both the environment and other users. The larger the group size, the more profound the impact will be on the environment and the more diligent the hiking leader will need to be to ensure the impacts are minimized. Although the technical nature of an outing may dictate group size, consideration should also be given to travel in popular areas (social impact) as well as overnight outings (environmental impact). If the leader has committed to a large group, find ways to lessen the impact. Use additional leaders to break the group into two or more smaller groups. Create a fast group and a slow group. Another option is to consider moving to a less popular venue. The hiking leader should consult with the local land manager for regulations on group size to help make an informed decision on the number of participants suitable for the outing.

WILDLIFE ISSUES

Educating participants on local wildlife can be for informative or social reasons, as well as for safety reasons. Encounters with humans can stress wild animals, as interactions with humans could impact their feeding or resting activities, or cause them to use up valuable energy reserves that could otherwise have been used to care for their young or escape from predators. Encouraging situational awareness and preparing your group in the unlikely event of a hazardous encounter with wildlife will build trust and educate on appropriate responses , should this be necessary. Encounters with large animals, such as bears, cougars or moose are possible and can be a positive wilderness experience, especially at a distance. Encounters with smaller animals, such as birds and rodents, are more common and can greatly affect camping and travel practices. Wild animals, big and small, are unpredictable and close encounters should be avoided. Best practices in the case of a hazardous encounter should be discussed. Travelling in groups of six or more statistically reduces your chance of a hazardous bear encounter, as does making your presence known when travelling in an area of reduced visibility (thick bush) or reduced sound (near a river). Should you encounter a larger animal such as a moose, cougar or a bear, give the animal space and back away. If the animal is aggressive, make your presence known, gather in a large group and back away slowly. Bear spray and bear bangers should be carried and easily accessible. Knowing when and how to use these tools is essential, as is a basic understanding of animal behaviour. Bear spray should be deployed downwind, to avoid negatively impacting the user. Bear bangers have a range. It is important that the explosive detonates between the user and the bear and not beyond the bear. Practice is essential. Further research is recommended.

Never feed animals, and ensure that human food is inaccessible. A fed animal often leads to habituated and hazardous animal behaviours. As a hiking leader, it is important to ensure that we do not further stress or impact animal behaviour. For example, the repeated flight of a grouse can create stress and compromise the bird's precious energy levels, often leaving a chick without a parent.

Sightings and encounters with potentially dangerous wildlife must be treated seriously. All planned activities should be stopped, and the group should leave the area.

INTERPRETIVE SKILLS

The hiking leader's ability to share specific area knowledge, seasonal understanding and human cultural history with their group is a significant value-added benefit for participants. Interpretation is about creating meaning through firsthand experience with natural and cultural history. Ideally it is informative, promotes understanding and curiosity, creates experiences and is potentially even inspirational. Interpretation takes practice: observing your surroundings, identifying flora and fauna, and learning specifics about the local geology, glaciology and ecology, for instance. Good interpretation matches the interests of your audience and should be an enjoyable experience. Common interpretation interests for the hiking traveller include understanding weather (covered in Chapter 2), recognizing hazards (covered in Chapter 3), understanding how mountains were formed, glaciology, observed flora and fauna, the night sky and human history in the area.

MOUNTAIN MORPHOLOGY

For the mountain traveller, there can be endless curiosity about mountain morphology, geology and history of the land, with people asking such questions as:

- Why do we have Pre-Cambrian (ocean creatures) fossils on our peaks?
- Why are there such distinct layers in these rocks?
- In the Rockies, why are all of the mountains' east sides steeper than the west sides?
- Why are these mountains around the same height?
- What kind of rock is this, how did it form and how old is it?

As a hiking leader, you do not need to have all of the answers, however, understanding some basics can be helpful for interpretation and encouraging a feeling of connection to the landscape. Simply put, mountains are formed due to the result of tectonic and volcanic forces. The particulars depend on the mountains in question. Essentially mountains are formed in either one, or a combination of three ways: block mountains that occur at the seam or rift between plates, plates folding under pressure, and volcanic action. The latter two are the most common in Canada. Another key factor in the shape of our mountains are glacier ages, with the last major one ending approximately 11,000 -13,000 years ago. The ice moves rocks and scrapes mountainsides. With the departure of the ice and the weight

lifted (up to 3km in some locales) off of the land, isostatic rebound occurs. Impressive features, such as icefields, glaciers, large and steep U-shaped valleys and moraines remain. More subtle post-glacier features can also be found, such as eskers, drumlins, kettles and tarns. Finally, constant weathering subjects mountains to erosion and change from wind, water, ice, temperature and gravity. These forces are actively shaping our mountains and valleys.

LOCAL FLORA AND FAUNA

To quote naturalist Ben Gadd, "seasonal ecology's reward [is] guaranteed to amaze and delight, or your money back," as "everything you see around you is the product of 3.6 billion years of seasonal ecology" (1995, p. 674). Summertime is a time for caring for young and feasting in anticipation of winter. Many animals can be seen and even experienced, as with prevalent summer mosquitoes. It is important to respect wildlife's space and habits, as even resting can be a survival need. At higher elevations, hikers may have the chance to see marmots, porcupine, wolves, coyotes, red foxes, black bears, bighorn sheep, or perhaps even the unlikely sighting of a cougar, North American badger or wolverine. Understanding a few key facts about commonly experienced fauna could be of great aid for interpretation!

There is much to know and understand about below treeline, subalpine and alpine ecologies, which can be an endless source of engagement. The alpine zone extends from where the density of the trees decreases, otherwise known as the treeline, up to the summits of the peaks. The subalpine zone occurs at and just below the treeline. It is believed that treeline is most significantly influenced by low soil temperatures, wind and drought over the winter. Tree species will depend on the mountain region, however two tree species that could be found in subalpine zones are Subalpine Fir and Englemann Spruce.



Marmot



Grey Wolf



Porcupine



Mountain Goat

Krummholz is the name given for trees stunted and clumped in groups at a high elevation. These trees are often a mixture of different species, are often not able to reproduce and represent the highest elevation of tree growth in the area. Subalpine and alpine organisms are well adapted to their environments, including: cold year-round temperatures, a short growing season, windy conditions, wet summers and dry winters. In the summer months, flora is exposed to large daily temperature fluctuations and increased solar radiation.

Adaptations include:

- Growing low to the ground to avoid wind and moisture loss
- Metabolizing at low temperatures to start early season growth
- Early season blooming (such as with the Avalanche Lily poking through the snow)

Incredible colour and form can be found in alpine plant adaptations. Favourites may include such plants as Lupine (Lupinus arcticus), Paintbrush (Castilleja miniata), Yellow Glacier Lily (Erythronium grandiflorum), Moss Campion (Silene acaulis), Kinnikinnik (Arctostaphylos uva-ursi) and various forms of Stonecrop (family Crassulaceae).



Englemann Spruce



Sub-Alpine Fir



Whiskey Jack

WINTER FLORA AND FAUNA

Adaptations allow for animal survival during colder temperatures, more challenging travel conditions and more limited food supplies. Animals may store food, pack on extra fat and reduce activity levels for the winter.

Other adaptations include:

- Migrations (birds, butterflies)
- Hibernation (marmots, bears)
- Torpor (snakes, frogs)
- Whiter and warmer fur or feathers (wolves, grouse, snowshoe hare)
- Snowshoe-shaped feet to better move over snow (alpine hare, grouse)

Some favourite Canadian winter creatures and their adaptations include the:

- Snowshoe Hare - Snowshoe hares moult twice in a year, changing from brown or grayish with white underbellies to white with black-tipped ears. Their large furry feet act as snowshoes. In winter they eat evergreen leaves, buds on shrubs and sometimes even lichen.
- Moose - Long legs can help moose move through powdery snow, but can be challenged with collapsing snow in late winter. Moose will often stay at mid-elevations during the winter, unlike other ungulates, which drop to valley bottoms.
- Grey Wolf - While wolves often struggle with travel on early season light snow, they excel as the snow develops a strong crust in the spring (the opposite to moose).
- Caribou (both woodland and mountain) - Caribou move below treeline in winter, and when the snow gets too deep, they adapt by eating lichen on trees instead of on the ground. Their hooves grow both hairier and larger for the winter. The ratio of a caribou's hoof size to that of their weight is more than twice that of a moose.
- Insects - Numerous insects have adapted to live in winter and snowy conditions, such as snow fleas, which hide under snow-laden vegetation and rocks in early season and reach adult maturity mid-winter.
- Watermelon Snow - Watermelon snow is pink to red and found on top of the snow in springtime. The red colour is caused by millions

of single celled photosynthetic blue-green algae containing a red pigmentation. This algae is a primary producer for insects and worms. The algae resist freezing in winter by living at the bottom of the snowpack. Using free water, they move up to the top of the snowpack in the spring in search of light.

Animal Tracks

Animal tracks in the winter can be a source of complete fascination for the naturalist. This leads to questions such as what is this animal, where is it going and why? It is even more exciting when you encounter one animal hunting another.



Grey Wolf (Canis lupus)



Caribou (Rangifer tarandus)





Snowshoe Hare
(Lepus americanus)

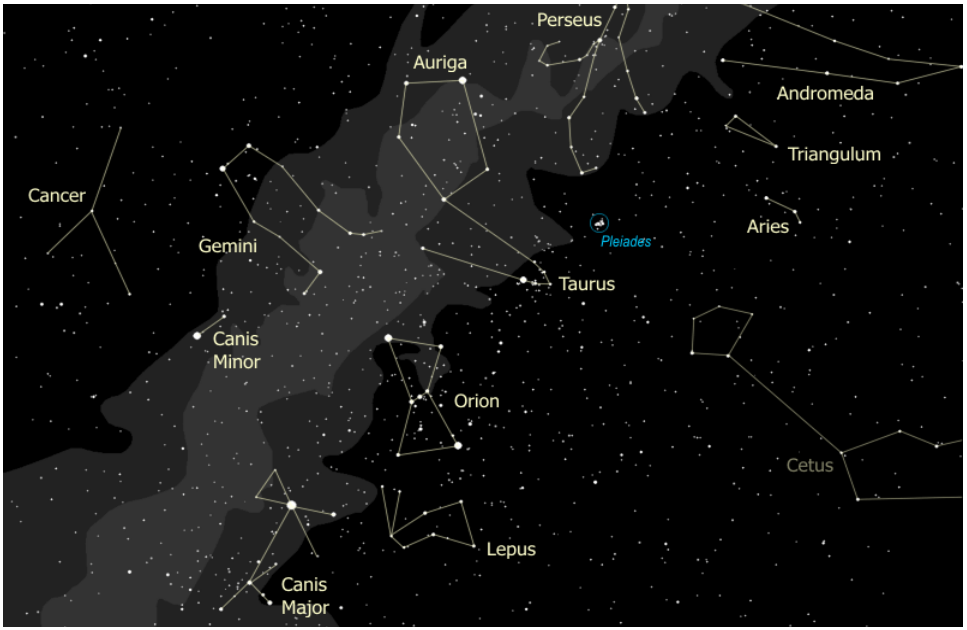


Cougar (Puma concolor)



Moose (Alces alces)

Deer Mouse (Peromyscus maniculatus)



THE NIGHT SKY

Understanding the basics of the night sky not only helps with identifying north and therefore aids in navigation, but at a distance from urban lights, discussions of the night sky are often entertaining. Start with finding the North Star (Polaris) and the Milky Way. Polaris sits at the handle end of the Little Dipper, also called Ursa Minor. Given that this constellation is not especially luminous, you can also look halfway between the Big Dipper of Ursa Major and the "W" of Cassiopeia. The Milky Way shows the axis of our galaxy, of which our sun is only one star of potentially 100 billion.

The following constellations can be seen in both the winter and the summer night sky constellations:

- Ursa Major – The Great Bear (the Big Dipper being a smaller component)
- Ursa Minor – The Little Bear (the Little Dipper being a smaller component)
- Cassiopeia – The Queen
- The Pleiades – Seven Sisters
- Draco – The Dragon
- Cepheus – The King
- Andromeda – Daughter of Cassiopeia

CULTURAL AND HUMAN HISTORY

Insight into local cultural and human history of the area in which you are travelling can help to build your team and create a greater understanding of the area. Invite others to contribute their knowledge, questions and interests.

Commonly shared cultural or human information may include:

- Indigenous history in the area pre- and post-European contact
- Current Indigenous territory and cultural information
- Early settlement of Europeans
- History of adventurers in the area, including first ascents or descents, mountaineering adventures and wilderness living
- Formation of parks, protected or conservation areas, current land managers and associated regulations and best practices
- Current local ethical debates or issues
- Other activities that occur in the area
- Stories of travel, camping, travel in a mountain environment, risk management scenarios: learning from others' successes, challenges and mistakes

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Basic Navigation Skills

Navigation is an essential part of travelling in the backcountry. The hiking leader will be practiced at a variety of navigation techniques using a variety of tools, including the map and compass together with GPS and altimeter. This chapter will explore map and navigation concepts, as well as some tools used to help the hiking leader with navigation on an outing.

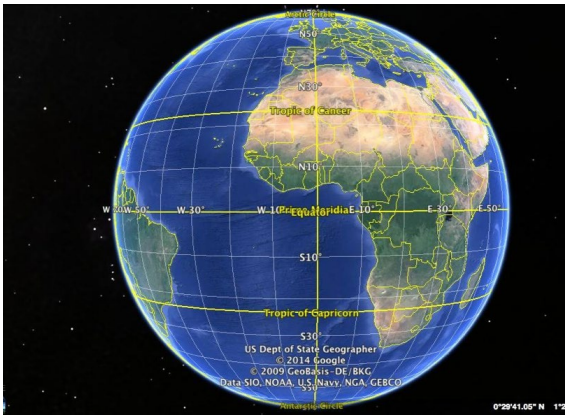
Navigation skills are essential for hiking leaders. These skills are needed to ensure the successful completion of trips. They become more significantly important as the weather deteriorates or the terrain becomes more complex. The key skills are: route planning, establishing a position (staying found), estimating distance, determining direction, identifying landmarks, identifying terrain barriers, estimating slope angles, determining land shapes, and picking out terrain features. The basis of quality navigation is the ability to integrate navigation tools, such as the map and compass, to the reality of travel in the terrain. Maps are the leader's primary navigational tool. Compasses, altimeters, and other instruments become useless without excellent map-reading abilities. Studies have shown that an over-reliance on GPS information hinders the development of neural pathways that are the basis for navigational expertise.

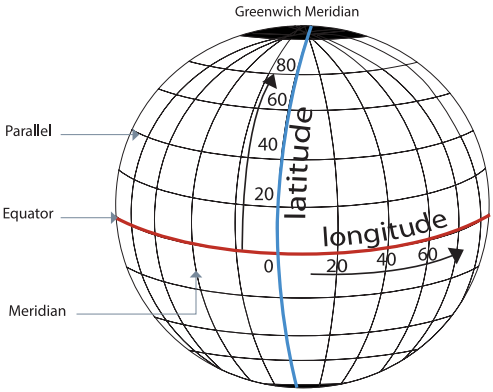
On the micro scale, successful navigation is based on careful terrain analysis. The map, compass and GPS work well to provide the general direction, but a terrain first approach will lead to more efficient and precise route-finding. A good navigator will apply the terrain first approach as broadly as possible before adding sequential layers of technological complexity. Under conditions of reasonably good visibility, a competent navigator should not need to constantly refer to the map and compass, and certainly not the GPS. On a macro scale, global navigation is based on latitude and longitude. This is useful for navigating over long distances, such as with aircraft and ocean-going ships. However, it is less useful for mountain travellers, as distances typically travelled in a day do not exceed 20 kilometres, so wilderness maps generally use a more precise method grid system. The challenge for hiking leaders is that although the latitude – longitude system is more difficult to use for foot travel, it is essential to comprehend the principles, as it is the system used by helicopter pilots and rescue personnel. The weather and terrain will dictate the levels of navigation required. In good visibility, with good landmarks, terrain interpretation and straightforward map reading will usually suffice. With worsening weather, intermittent visibility, and fewer landmarks, precision navigation will become dependent on the map, compass, altimeter, and GPS. In poor weather conditions (particularly whiteouts) or in thick forests, landmarks might rarely be seen. Intense map, compass, altimeter, and GPS use will be required.

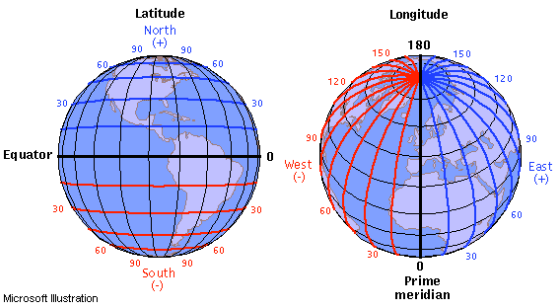
LATITUDE AND LONGITUDE

The latitude and longitude system has been in use for almost 2,000 years. Latitude and longitude lines are measured in degrees, minutes and seconds, with one degree equal to 60 minutes and one minute equal to 60 seconds. The equator is zero (0) degrees latitude and splits the globe into north and south hemispheres. The vertical longitude lines are also known as meridians. The Prime Meridian is zero (0) degrees longitude and passes through Greenwich, England. Degrees continue all the way to the Anti-Meridian at 1800 east and 1800 west. Read latitude lines from the bottom (equator) to top (North Pole) in the Northern Hemisphere. Example: 49 degrees 34 minutes 20 seconds. Read longitude lines from right to left. Example: 121 degrees 7 minutes 30 seconds.

One minute of latitude also equals one nautical mile. As one nautical mile equals 1.15 statute miles; one degree equals 60 nautical miles, which equals 69 miles or 111 kilometres. Longitude lines vary in distance from one another depending on how far north/south they are. At the equator, longitude lines are 111 km apart.

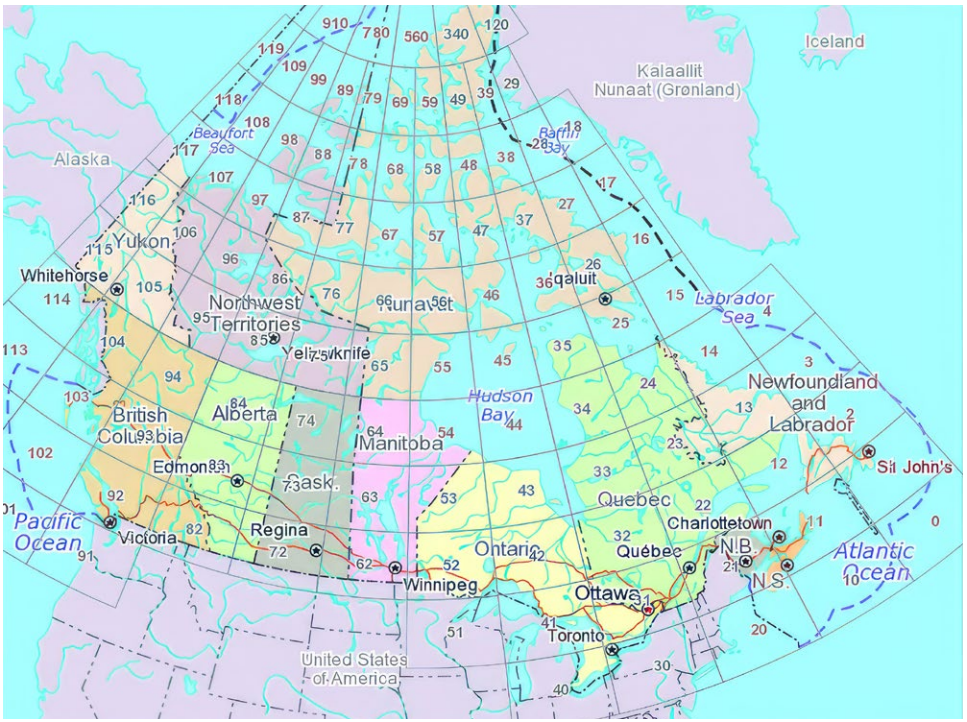




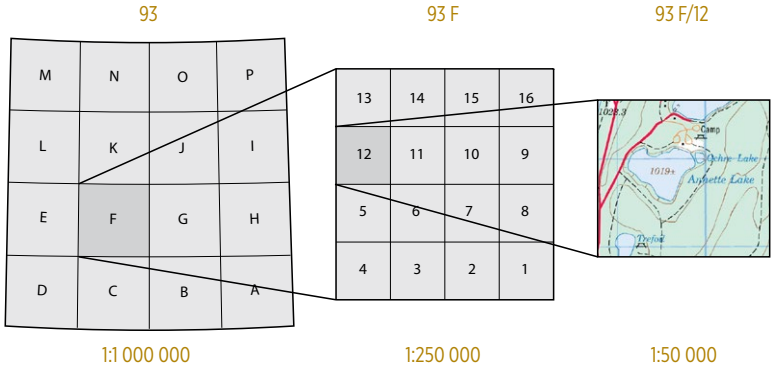


MAPS

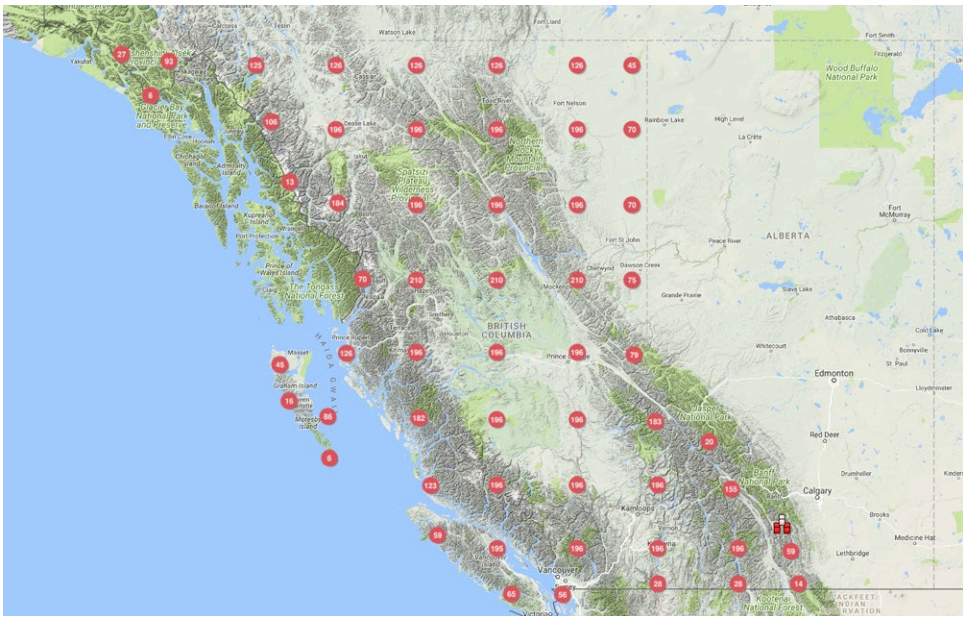
Maps are a two-dimensional representation of a three-dimensional world. It is important to choose a map that fits with the proposed activity. Road maps may help with finding the correct trailhead, but provide limited information about natural features and are of limited use in finding one's way across a glacier. Maps for wilderness navigation in North America use the Universal Transverse Mercator (UTM) Projection. (The term 'Transverse' refers to the fact the zone strips run north and south). The globe has a 360-degree circumference, or 60 zones that are six degrees wide. These zones are numbered 1-60. Canada is covered by Zones 7-22. The Zone number is followed by a letter that gives the north/ south location from the equator.



Map edges fall on parallels (latitude) & meridians (longitude)



- A Primary Quadrangle is a square with a scale of 1: 1,000,000 and given a number.
  - For example - 93
- Each primary quadrangle is made up of 16 sections (squares) at 1:250,000 and given a number and a letter.
  - For example - 93 F
- These squares in the primary quadrangle are then divided into 16 sections at 1:50,000 and given a number.
  - For example - 93 F/12



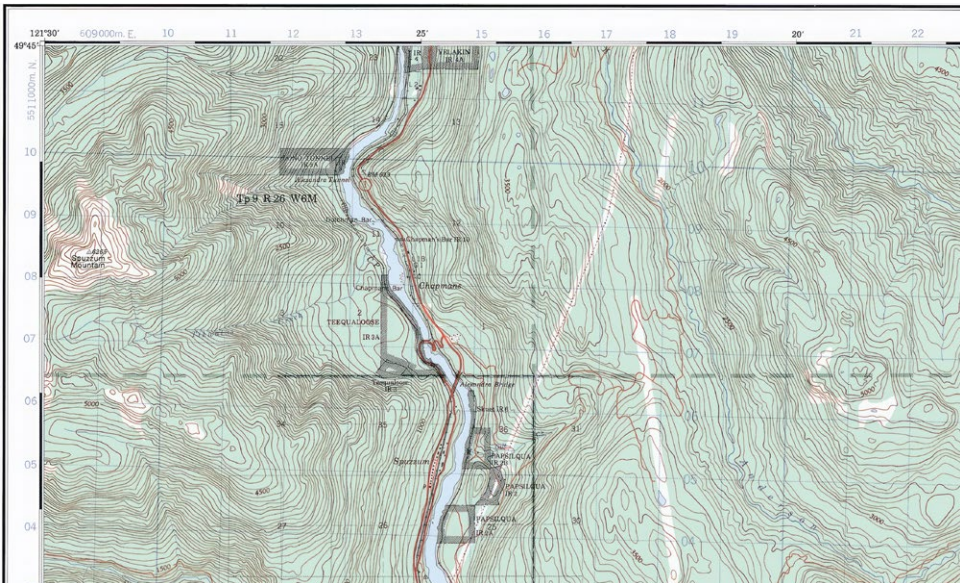
TOPOGRAPHIC MAPS

Topographic maps give more detailed information on natural features, such as relief, glaciation, vegetation and hydrography, as well as man-made features, such as roads and buildings. Each 1:50,000 topographic map covers 15 minutes of latitude (constant) and in Southern B.C./ Alberta approximately 30 minutes of longitude (variable). Each 1:50,000 topographic map covers approximately 28km x 35km = 980 square km.

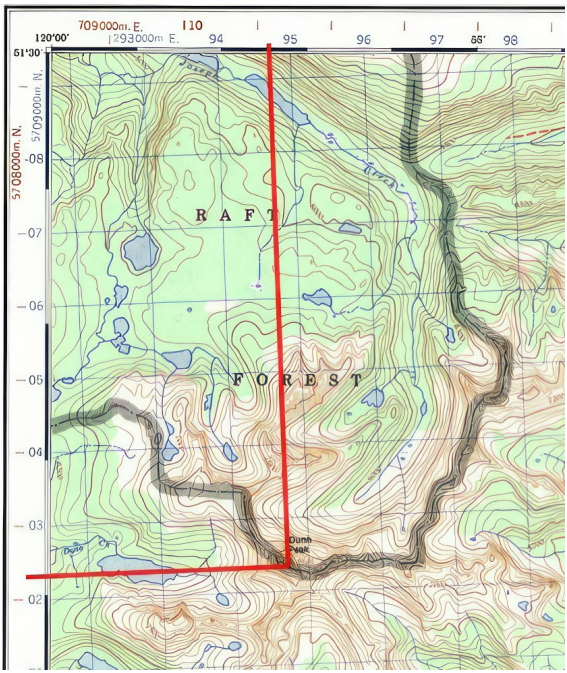
Map Accuracy

The age of the information used to create a map is an important consideration. Many wilderness areas have not been surveyed or photographed for a number of years, so the information will be dated. Of particular note, most glaciers in Western Canada have experienced accelerated melting in recent years and are smaller than indicated on dated maps. The age of the information given on maps can be ascertained by looking for dates of air photographs, surveys, and culture checks used to produce the map. Canadian maps are based on the interpretation of air photos taken during the summer. This information is generally printed on the map border. In popular areas, privately published maps can provide additional updated information.

Latitude and Longitude



Grid References



Dunn Peak

Each 1:50,000 topographic map is overlaid with a map grid system, the Universal Trans Mercator (UTM). The blue lines create two-cm-square grids, which equate to 1 km2 or (1,000m x 1,000m). These grids are numbered from 00 to 99 along both the vertical and horizontal axis. They are read left to right in the horizontal axis; also called the "easting." They are read bottom to top in the vertical axis, also called the "northing." It is essential that they are referred to in the correct order. The horizontal axis is referenced first, then the vertical axis. A handy reference to remember the order is "cross the meadow, then climb the mountain." A four-number grid denotes an area of one km2. The one-kilometre scale can be broken down further by dividing the two-centimetre side into 10 increments. This creates a six-number grid, which would equate to a 100m x 100m square. The six-figure grid reference is the standard used for mountain navigation.

For example, the grid reference for Dunn Peak is 947023. A complete grid reference includes the map name, map number, and the six or eight-digit grid reference number.

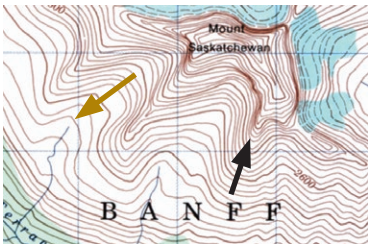
The 1:50,000 topographic map is also overlaid with latitude and longitude marks along the edges, indicated by black numbers and black and white bars. Each bar is one minute.

CONTOURS

It takes many years to develop expertise in the interpretation of contour lines. It is an essential skill that requires diligent effort. Contour lines help a wilderness traveller determine slope shape and angle. These two factors will aid in differentiating between ridges and valleys, and between summits and depressions. Direction, altitude is indicated on the main contour lines, normally with the top of the number pointing toward any summits. Contour lines indicate height above sea level. The closer the contour lines, the steeper the slope. The more widely spaced the contour lines, the gentler the slope. The vertical distance between contour lines is called the

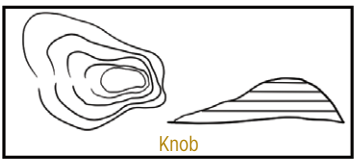


It is hard to tell what is a ridge and what is a valley

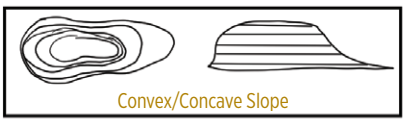


The larger picture shows an arrow pointing downhill toward a stream and an arrow pointing uphill toward the summit

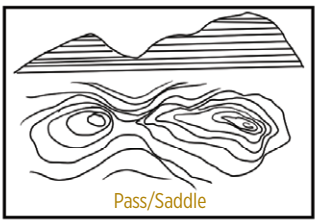
Contour lines and terrain shapes

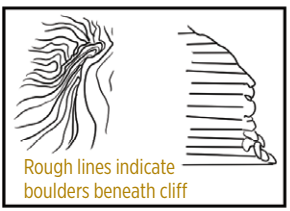


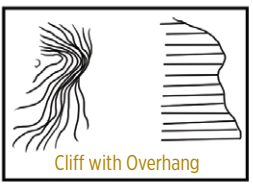












contour interval (CI) or the rise. Canadian topographic maps at 1:50,000 will have a metric interval of 20 or 40 metres. Older Imperial maps had a contour interval of 100 feet. The horizontal distance between contour lines is called the horizontal equivalent (HE) or the run.

Slope incline can be calculated by measuring the horizontal distance and counting the contour lines. The incline is expressed as a gradient or an angle. The gradient of a slope is expressed as a fraction or percentage. Incline can be expressed as Rise/Run.

For example – If the horizontal distance between two 40m contour lines is 80m,

Gradient = CI 40/HE 80 = 0.5

Slope Angle is the arc tangent of 0.5 = 270

Another example – descending from the summit of Snowdome toward the Athabasca glacier exit.

The CI = 610 & HE = 2500 the gradient is 610/2500 = 24.4

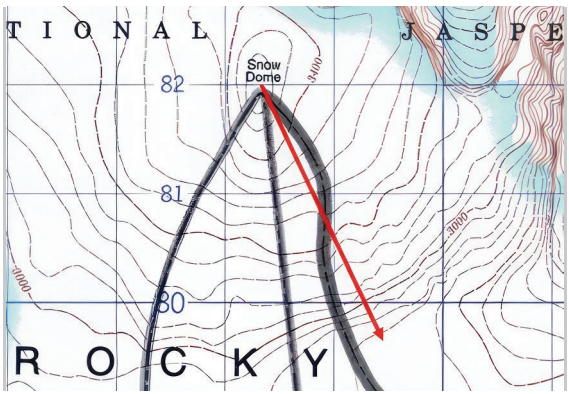
Slope Angle is the arc tangent of 24.4 = 140

Carry a slope gradient to angle conversion chart in your field book to simplify the calculation.

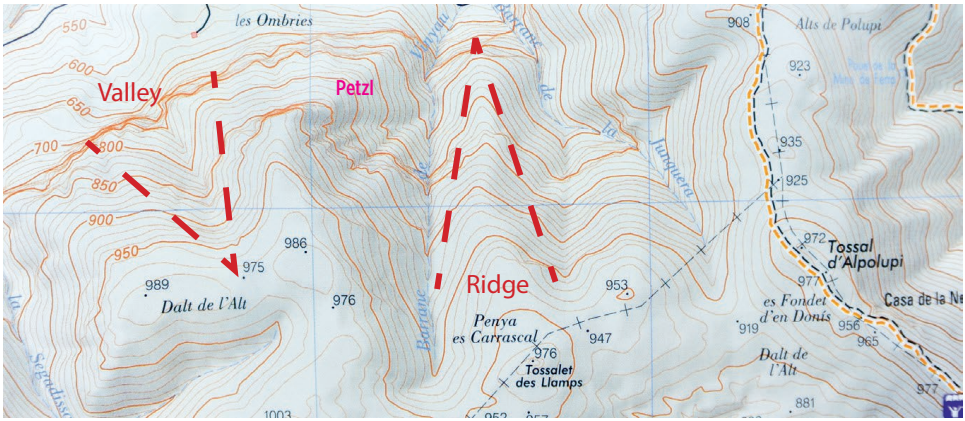
Valleys and ridges can be differentiated by looking both at the V-shape of the contour line, and also identifying the contour increment. V-shaped contours that point uphill are gullies and will often have streams indicated. V-shaped contours that point downhill indicate ridges.

Percent Grade	Slope Angle
20	12
25	14.5
30	17.5
35	19
40	22
45	25
50	27
55	29
60	31
65	33
70	35
75	37
80	39
85	41
90	42.5
95	44

Slope Gradient to Angle Conversion



Slope Gradient Example — Snow Dome

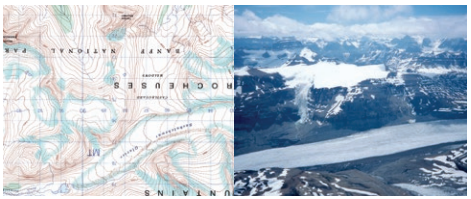


Relating Map Features to the Terrain

The hiking leader must be able to interpret map information and relate it to actual terrain. One of the challenges with this is that map information is a two-dimensional representation of terrain. Important to the success of relating map features to terrain is having the map oriented correctly. In other words, north on the map should be facing north on the terrain. This can be done using a compass or lining up terrain features that are very obvious (e.g. cliffs, well-defined peaks, etc.). When practicing this skill, begin with obvious map features and visualize what the actual terrain shape would look like. Progress to more detailed and nuanced terrain shapes as your skill and confidence improves. A hiking leader with good map interpretation skills can quickly and easily follow their position in terrain relative to the map.

Relating Terrain Features to the Map

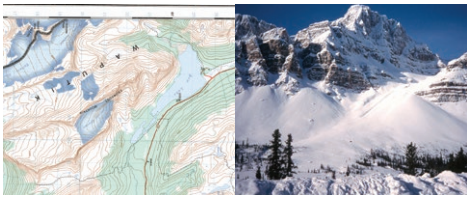
Just as it is important for the hiking leader to relate map features to the terrain, it is equally important to be able to relate identified terrain features to the map. This allows one to help identify and follow their position on a map. As with the previous section, start with obvious well-defined features and progress to more subtle and nuanced terrain.



Saskatchewan Glacier



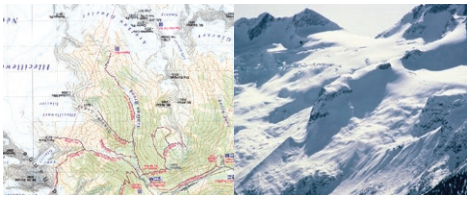
Richardson



Bow Summit



Robertson



Sapphire

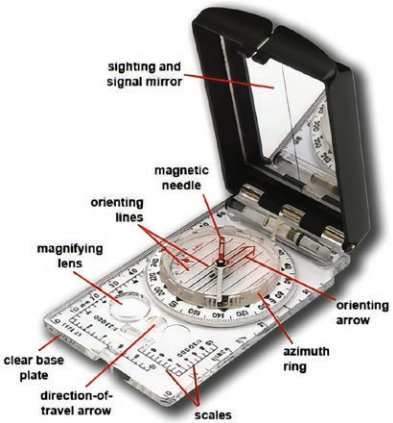


Gordon

In periods of challenging visibility, slow down and take the necessary time to correctly identify a terrain feature. It is all too easy to convince oneself and force a piece of terrain to fit on the map incorrectly.

COMPASS

There are a number of types of compasses, but for off-trail hiking needs a "sighting" compass is best. Look for a compass that is fluid filled, and has declination adjustment, good mechanics and stability, and an inclinometer.

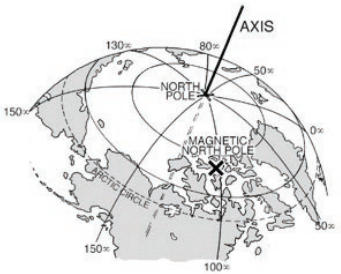


- The front of the compass is the end where the mirror is attached, and the bearing indicator is located
- The long edge of the base plate is used to measure bearings off the map
- The mirror is used to aid in accurate sighting
- The sighting notch is at the top centre of the mirror
- The housing rotates and is marked with numbers indicating degrees
- The orienting lines rotate with the azimuth ring housing and are used to align the compass to the map when transferring bearings from the field to the map
- The magnetic needle floats in the housing and points to magnetic north
- (Red end indicates north)

- The orienting arrow is used to align the magnetic needle to magnetic north when taking bearings in the field
- If the compass has a declination adjustment mechanism, the orienting arrow can be moved to adjust between magnetic and grid north

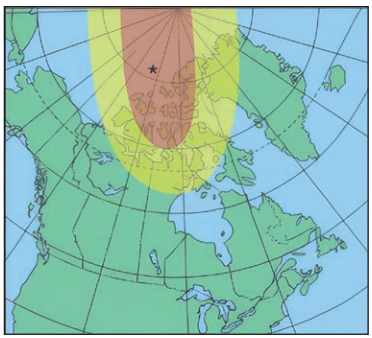
A good sighting compass should cost in the $90-$100 range. Don't put up with a hard-to-use, cheap compass. Your navigation accuracy will reflect this decision. Don't expect more than your calibration and information can deliver. A degree is about as good as it gets with most field compasses. Any further, and results go up in a linear fashion and money spent goes up in an exponential fashion. A simple solution to producing greater accuracy is to plan shorter legs, which should produce less potential error.

HOW MANY NORTHS ARE THERE?



How many norths?

There are three Norths: True North (the north pole), Grid North (north established by grid lines on the map), and Magnetic North (where the compass needle points to). The line where True North is the same as Magnetic North runs up the east coast of Florida, through Ontario (Lakes Superior and Nipigon) to the North Pole. Topographic maps are printed so that north is oriented to the top of the map. The north reference point used on maps is referred to as grid north. Grid north on a map varies slightly from true north in the field where the North Pole is the reference point. For the purposes of wilderness navigation, where techniques are rudimentary, grid north is used as the reference point on maps. Magnetic North refers to the direction given by a compass needle. This difference is discussed in the section on declination.


Compass Unreliability

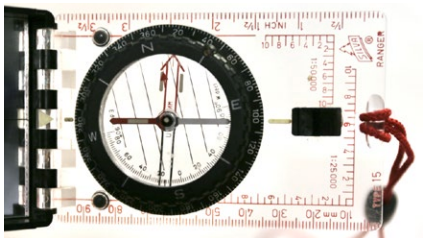
Compass Unreliability

The compass becomes increasingly erratic (yellow zone) and eventually unusable (red zone) as one approaches the North Magnetic Pole (marked with *) The compass needle points to Magnetic North. The angle between the direction the compass needle points and the true north line is called declination. This difference was first determined at around

720 AD. In 1700, Halley developed a declination chart of the Atlantic Ocean. The compass needle points to a location approximately 1,500 km south of the North Pole (Bathurst Island). This point is magnetic north. It is not a static location like Grid North or True North. From Western Canada, the compass needle points south and east of the North Pole (east declination). Declination can be indicated on a map similar to a contour line. Variation is the change in declination over time. The annual change is estimated and indicated on the map legend. It can also be found using a web resource.

http://geomag.nrcan.gc.ca/calc/mdcal-en.php

The diagram on the topographic map sheet gives the value of the angle between Magnetic North and Grid North, which is referenced to the grid lines shown on the map. This angle is properly called grid declination. So, because we are working with, and referencing, grid lines as we navigate, we use the value between Grid and Magnetic North as the declination.



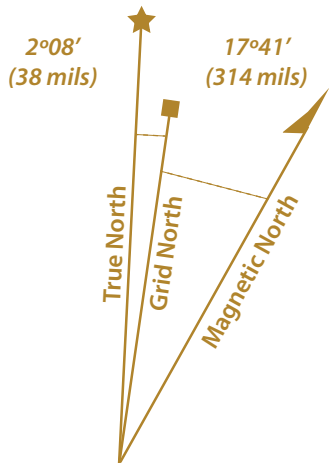
Setting the Adjustable Compass for Declination

- In Western Canada, the declination is east.
- In Eastern Canada, the declination is west.

Silva Ranger-Style Compass

Turn the adjustment screw so the orienting arrow in the base adds the declination amount. e.g. If the declination is 200 East, the orienting arrow should be adjusted to read 200 (not 3400)

Topo map declination adjustment



Accounting for Declination in a Non-adjustable Compass (Western Canada)

Transferring a map bearing to the field:

- Place the compass on the map to determine the bearing
- Subtract the declination amount from the bearing on the compass to get a lesser number
- Declination EAST – Compass LEAST
- Use the lesser compass bearing to follow in the field.

Transferring a field bearing to the map:

- Shoot the bearing in the field (Magnetic)
- Add the declination amount to the compass (True)
- Use the compass on the map

Note: In Eastern Canada, this is reversed.

BEARINGS AND ACCURACY

Compass work accuracy is based on the measurements taken in the field and transferred to the map, and vice versa. When choosing a feature in the field, it is best to pick prominent, easily identified landmarks. Peaks are often good selections, especially if your choice is a sharp summit over a broad, rounded one. However, the field features must also be easily identifiable on the map.

Errors in map reading, taking a bearing or walking on a bearing will be magnified over larger distances. For example, a 5-degree error will magnify at a rate of 87m per kilometre.

Error Angle (degrees)	Distance (kilometres)	Error (meters)
1	1	17
1	5	87
1	10	170
2	1	34
2	5	170
2	10	340
3	1	87
3	5	425
3	10	850

The Importance of Accuracy in Compass Bearings

Strategies to improve accuracy

- Use terrain handrails to reduce reliance on a compass bearing
- See below for handrail definition
- Plan shorter legs
- Use larger scale maps



A Hiking Leader shoots a bearing to determine the group's location in the field.

TAKING BEARINGS

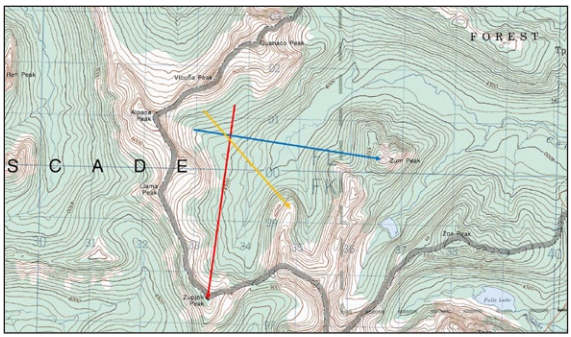
The compass can be used to identify a direction toward features in the field as well as relate field information to a map. The hiking leader will be familiar and practiced with taking bearings as a means of navigation or determining their position. When travelling in the backcountry with reasonable visibility, the leader would consider taking bearings of the feature they are travelling toward in the event the cloud cover increases and obscures the desired destination or reference point. To do this, the leader would simply hold the compass in front of themselves at eye level, and sight through the sighting notch, with the sighting line on the mirror in alignment with the front and back bearing indicators on the base plate. Doing this reduces potential error (parallax error) in bearing accuracy. Once the feature has been identified, the compass housing is rotated so the magnetic orienting arrow is in alignment with the magnetic needle. The number at the bearing indicator is the bearing one would follow if visibility were reduced and travelling by compass were necessary. In this case, the leader would hold the compass in front of themselves and rotate their body so the magnetic needle sits overtop the magnetic orienting arrow. When travelling, it is then important to keep the magnetic needle inside the orienting arrow in order to stay on the correct course, or direction.

TRANSFERRING A BEARING FROM THE MAP TO THE FIELD

On occasion, the leader knows their position on the map and wants to travel to another specific location or grid reference on the map. To do this, the leader would place their compass on the map 'from' the point they are 'toward' the point they are travelling toward. The next step is to rotate the compass housing so the grid lines on the housing are parallel with the grid lines on the map. It is important to turn north on the housing toward north on the map, otherwise the bearing will be 180 degrees off (backwards). Once the housing and grid lines are parallel, the number indicated at the bearing indicator is the bearing the leader would follow to the next desired location. In this instance, follow the travelling description as per the above example. The process described assumes the leader is using a compass with declination adjustment. If not, the leader would determine the bearing and subtract the magnetic declination (assuming east declination) before proceeding to ensure they end up at the correct location.

RESECTION

Resection is often mistakenly referred to as triangulation. It is used to determine one's position in the field by shooting bearings off identifiable land features and transferring them to the map. These features should be sharply defined points, identifiable both in the field and on the map, and 60 to 90 degrees apart for greatest accuracy.



In this resection example, the red and blue lines represent lines drawn along the edge of a compass baseplate after shooting bearings from the point where the interesct (the leader's location). The third (yellow) line represents an additional bearing for increased accuracy.

- Shoot the bearings and transfer to the map by drawing a line along the edge of the base plate
- Your location is at the intersection of the two bearings
- Shoot additional bearings to increase accuracy
  - A variety of clearly defined points or features can be used
  - Shoot a bearing to intersect a linear feature
    - Physical: creek, ridge
    - Cultural: trail, road

- Shoot a bearing to intersect an imaginary line or point
  - Altimeter reading (contour line)
- Shoot a bearing to the Intersection of a linear feature and an imaginary point
  - Ridge and altimeter

ALTIMETER

Altimeters measure barometric pressure. Barometric pressure varies with changes in elevation and may change due to weather systems that can render elevation readings inaccurate. The rate of change and degree of inaccuracy varies with the speed and intensity of the approaching weather system. To retain the highest degree of accuracy, altimeters should be reset whenever a location of known elevation is encountered, such as a lake or pass. This is particularly important during times of variable weather conditions. Resetting altimeters requires accurate interpretation of the map. Altimeters are most useful for navigation on steeper slopes where horizontal movement results in noticeable changes in altitude.

Because they are affected by weather systems, altimeters can also be used as barometers. If stationary at a point of known elevation for a length of time, changes in barometric pressure read as changes in elevation and provide important weather data, which can be used as a forecasting tool. For example, an increase in elevation reading indicates a decrease in barometric pressure and generally heralds deteriorating weather conditions. A decrease in elevation reading indicates an increase in barometric pressure. This is usually indicative of improving weather conditions. Although altimeters have some limitations, they provide valuable additional information when combined with information from the map and/or compass.



OFF-TRAIL NAVIGATION

WHITEOUT/GREENOUT NAVIGATION

Whiteout or greenout conditions are a reality of wilderness travel. Whiteouts occur when the terrain lacks discernable features and visibility is reduced due to weather (cloud, fog, blizzard). Greenout occurs in terrain (often low angle) where trees or vegetation obscure the view of discernable features. You cannot see the forest for the trees.

Above: Whiteout
Below: Greenout



Navigating through whiteout or greenout conditions is an advanced skill that must be practiced, and requires a complete route plan. In the case of a whiteout, if the weather is better than forecasted, the route plan will have a level of detail that may not be needed. However, if the weather deteriorates and the hiking leader has not made a detailed route plan, the navigation will be challenging. In some cases, the most prudent plan is to wait for an improvement in the weather.

THE GENERAL PRINCIPLES OF WHITEOUT/GREENOUT NAVIGATION ARE:

- Keep it simple
- Use the map to plot a general route
- Identify handrails and reference points along the route. These are well-defined features that can be recognized and followed, even in poor visibility
- Identify areas where navigation will be more difficult (e.g. No handrails)
- Determine lines of travel from one handrail or reference point to the next
- Keep these lines as short as possible
- Identify areas where deviations from straight line travel may be necessary due to hazards or terrain features (e.g. cliffs, canyons)
- The most difficult way to end/start a leg is by trying to calculate distance travelled

Accurate navigation in whiteout conditions begins with a known starting point. An accurate GPS receiver simplifies the problem of determining location and travelling in whiteout conditions, however, leaders are advised to have a complete whiteout plan ready, as a GPS may not provide an accurate enough location. GPS units are least accurate on steep north-facing terrain. It is essential to fix your party's position whenever practical if travelling in terrain where whiteout navigation may be required. This fixed location serves as a starting point if navigating in poor visibility becomes necessary. Once a party's location is established (e.g. by resection or GPS), upcoming travel is broken into sections. Each section is called a leg.

HANDRAILS

The identification and use of handrails is an essential navigational skill. Handrails are terrain features that can be followed in poor visibility. The most useful handrails run parallel to the desired direction of travel. Examples of handrails include: ridges, streams and cliff escarpments. Handrails need to be obvious enough to recognize in poor visibility. They can be as subtle as a significant change in slope angle, such as a bench on a steep hillside.

AIMING OFF

When a leg's destination is a small, specific point on a handrail, for example a col along a ridge or a hut beside a creek, use the aiming off technique. Aiming off is a deliberate error built into the leg's bearing. If trying to arrive exactly at a small point on a large feature and the point is missed, it can be difficult to tell which direction to go in to find the missed point. By deliberately aiming off slightly (usually three to five degrees are all that is required) to one side or the other, it is ensured that the miss will be in a known direction. Thus, having found the handrail, which way to travel to get to the destination is clear. It must be stressed that aiming off only works when a handrail accompanies the point to be located; it will not work for a small point surrounded by nondescript terrain.

ROUTE PLANS

(Detailed navigation plan)

A route plan differs from a trip plan in that the route plan describes the daily navigational details that are often broken down into shorter legs. During clear weather, navigation is typically straightforward. However, if visibility is poor, or travel is planned through thick bush, more precision navigation is required and the use of a route plan will help speed up the leader's travel, as the navigational details have been identified in advance and as such, the route plan becomes the cheat sheet. Depending on the complexity of the outing, the route plan may have several legs to help guide the hiking leader along the desired path envisioned on a map. As described earlier, shorter legs help reduce navigational errors. The hiking leader will identify significant features on a map to help break the overall daily outing into manageable and

Example of whiteout navigation plan

Leg	Grid # at Start	Grid # at End	Elev at Start	Elev at End	Elev +/–	Bearing	Distance	Est. Time	Est. Cum. Time	Actual Time	Comments
1	971 498	990 505	4300	5250	+950	67	2.0	90	90		
2	990 505	009 501	5250	5450	+200	102	2.0	45	135		
3	009 501	021 503	5450	5600	+150	75	1.3	35	170		
4	021	027	5600	5550	-50	104	0.6	15	185		

identifiable segments, called legs. Such features could include lakes, creeks, ridges, cols, valley junctions, meadows, etc. If travelling with an altimeter, these features can also be combined with elevation to further refine the desired leg start or end point. Each leg needs a definitive start point and an end point described by terrain, elevation, etc. In addition, data such as elevation gain/loss, bearing, back bearing, leg length, etc. is recorded for each leg. This information is carefully noted on a route card, in a field book, or on the map so it is accessible when in the field. Drawing a whiteout/greenout route on the map provides a quick reference when travelling. A preliminary route can be planned and recorded before leaving on a trip. If visibility is good upon arrival at an area where whiteout navigation may be required, it is wise to modify the route card based on the actual features (e.g. unmarked cliffs, etc.) not identifiable on the map.

TRAVEL TECHNIQUES

Before travelling in whiteout conditions consider whether travel is necessary and/or whether it can be carried out within reasonable margins of safety:

- What is the severity of the whiteout?
- How complex is the travel plan?
- What type of terrain will be encountered?
- What hazards will affect the party while travelling?
- How necessary is it to travel?

These factors will help determine if travel in a whiteout is appropriate. It may be more prudent to stay in place and wait for an improvement in visibility rather than travel in a severe whiteout when conditions are hazardous, or the terrain is complex.

Walking a Bearing (Whiteout)

- The hiking leader, carrying a compass, leads the group.
- Spread the group out
  - The leader should be able to see the last person in line
  - Lining up all participants helps ensure the direction of travel is maintained
- The second team member also carries a compass and helps the team leader stay on track
- Continual compass checks are required to ensure the party is staying on the bearing
- Looking back regularly ensures the line of travel is straight
- The last person also has a compass; they can aid straight line travel

Walking a Bearing (Greenout)

Similar to whiteout navigation, but simplified in that there are trees to use as reference points.

- The hiking leader, carrying a compass, leads the group
- Pick a tree as far away as possible that is on the bearing
  - The tree must be visible for the entire time it takes to walk to the tree
  - The track to the tree can deviate from the compass bearing to make for easier walking around thicker bush or to get over/under deadfall
- Once the tree is reached, sight the next tree that is as far away as possible
- Repeat…
- Looking back regularly ensures the line of travel is straight
- The last person also has a compass, they can aid straight line travel

Dead Reckoning

Current location can also be estimated using dead reckoning. Based on an accurate start position, an accurate bearing, and an accurate speed calculation, elapsed time will generate a position. However, accuracy degenerates over time and distance. The greatest challenge for the hiking leader is determining an accurate speed calculation. Variations in terrain and surface conditions can have drastic effects on the speed of travel. Dead reckoning is at best an educated guess.

Navigating Around Obstacles

Adjusting the line of travel when obstacles or hazards are encountered requires a carefully measured detour. Examples include: steep slopes, cliffs, ravines, lakes, rivers.

- Make a right-angle turn (90º) from the bearing being travelled
- Note the new bearing and calculate its back bearing
- Measure the distance travelled out on the new bearing
- Make a right-angle turn (90º) and travel until past the obstruction
- Once past the obstruction:
- Make a right-angle turn (90º) to the back bearing calculated in step 2. You should now be headed back toward the original line of travel
- Measure the distance back to the original line of travel
- The distance back should equal the distance out
- Having travelled the correct distance back, make a final right angle turn to regain the original line of travel



Navigating around an obstacle

Verifying the Route

Whenever a break in the weather or visibility occurs, location should be verified, and the route adjusted if required. Consider taking a new bearing or revising the route based on actual observations, rather than using a predetermined plan based on theoretical data.

TIME PLANNING GUIDELINES

- On Good Summer Trails
  - 5 km/hr
- On Packed Winter Trails
  - 4 km/hr
  - Using cleats – 3-4 km/hr
- On Winter Trails – breaking trail
  - Boots – 1-2 km/hr
  - Snowshoes – 1-3 km/hr
- Off-Trail
  - 3 km/hr in open terrain
  - 1-2 km/hr in rough terrain
  - < 1 km/hr in dense bush
- Additional Time Requirements
  - 10 min/hr for rest breaks
- Vertical Gain
  - Add 1 hr / 300m (1,000 ft)
- Descent
  - Add 10 min / 300m (1,000 ft)

OTHER CONSIDERATIONS

- If using a route plan – add 10 min for each leg transition
- Breaks – estimate approximately 10 min for breaks each hour
- Travelling with a multi-day pack will typically be slower than travelling with a day pack
- Travel slower with those new to the activity to preserve energy for the entire outing, as they will likely be less efficient in their movement skills
- Travel through relatively open forest is faster than through dense forest
- Poor visibility requires a slower rate of travel

GLOBAL POSITIONING SYSTEMS (GPS)

GPS technology has advanced over the years to the point where GPS units are smaller and provide more information to the user, including showing one's position on a map on the GPS screen, rate of travel, estimated time of arrival to a specific point etc. The global positioning system is based on the interaction of three components: a satellite array, a ground-based coordinating system and the user's handheld device. There are 30 satellites in orbit at 20,200 km. At any given time, at least 24 of them will be operational. The satellites produce a signal that tells the receiver the time, date and a timing code. This allows the GPS unit to calculate its distance from the satellite. Three satellites will allow two-dimensional location calculation and four satellites will generate a three-dimensional location. GPS signals are not affected by fog, clouds, altitude, darkness, weather, etc.

However, signals are line-of-sight and are degraded by trees, rocks, cliffs, buildings etc. Although GPS is a worldwide system, it functions with greater accuracy closer to the equator, due to an increased concentration of satellites over the lower latitudes.

INTEGRATION OF A GPS UNIT AND A MAP

Using both map and compass together with a GPS allows the leader to be much more versatile in their navigation techniques. In a whiteout, for example, the GPS can indicate the leader's position, thus confirming direction and rate of travel. This may allow the leader to travel at a faster rate and with more confidence than when strictly using map

and compass. It is essential to enter the correct map datum into the GPS. Tell the unit which map you are using. What year was the information gathered? The standard map datum for Canadian maps is the North American 1983 datum (NAD83). Older maps used NAD27. The coordinate systems are different, so if your GPS is set up on NAD27 map datum, a UTM grid reference will place you several hundred metres away from where the map places you. The GPS can also mark points along a route (waypoints), such as hazards or specific safety or travel features, which can be useful for future trips or if the outing is an out and back' trip. It is also possible to enter waypoints of a particular outing in advance (or via computer connection) so the hiking leader has their route all set to go in the event of poor visibility conditions.

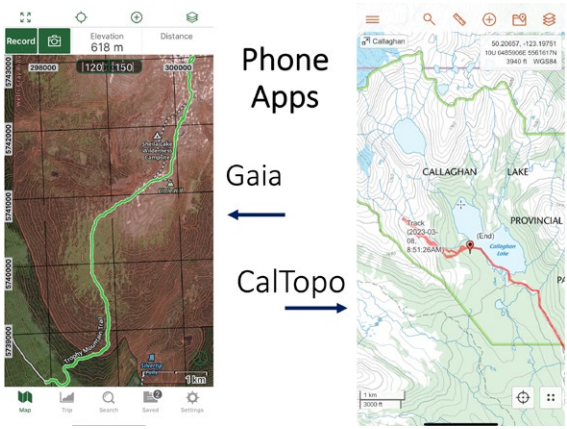
A GPS unit will:

- Tell you where you are
- Track where you have been
- "Go to" an entered waypoint
- Tell you direction of travel
- Tell you how far it is to a waypoint
- Tell your average speed
- Tell elapsed and estimated times

A GPS cannot `read' terrain – that's up to you! A GPS will take you on a straight line directly to your destination. It will not manage obstacles such as cliffs or crevasses.

SMART PHONES

There are numerous smart phone apps that provide additional information to assist the hiking leader with navigation. One of the challenges is that there are many apps available and one needs to filter out those apps that are less useful. This takes a bit of time, and a good way to spend a stormy evening where you have an internet connection. There are a few navigation apps the hiking leader may find useful and want to search for:



- Declination – apps that let the user drop a pin on your location for the current declination.
- Sunrise and Sunset – this may be useful for determining potential start times and daylight times for winter outings. Particularly useful for early season trips.
- Map apps – there are a variety of map apps, including some that are free, that allow one to download topographic maps. Different apps have different functionality and map resolutions.
  - CalTopo
  - Gaia GPS
  - Avensa Maps
  - FatMap

Navigation Apps for smartphones are constantly evolving. Mapping software that uses the phone's GPS can integrate satellite imagery with topographic maps. The apps need to be set up for offline use, as many wilderness areas do not have mobile coverage. Typically, this begins with downloading the maps, which are stored on the phone. The satellite imagery may need to be loaded each time, prior to leaving mobile coverage. Be aware, GPS apps are battery-hungry; particularly if you are on the edge of mobile coverage, do not switch to airplane mode. If you are depending on your phone for navigation and emergency communication, bring a back-up battery.

SUMMARY

Navigation can range from simple to complex. Although this is primarily based on the route selected, the complexity can vary tremendously based on the weather conditions. A skilled leader has the ability to visualize terrain and possible routes, read and interpret maps, and relate the information to terrain. When weather conditions make route travel more difficult, the leader must be able to use the map, compass, altimeter and GPS to problem solve and error correct. The use of navigational tools should fit with the complexity of the terrain and weather conditions. In simple terrain, in good weather, an occasional glance at the map should suffice, whereas travelling through complex terrain in a whiteout or greenout will require all of the tools in the box. When these tools are insufficient, the hiking leader must be willing and able to set up camp and wait for better weather.

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Camping in a Summer Backpacking Environment

Many hiking objectives are multi-day affairs that require competency in summer camping skills. A well situated and properly set-up camp sets the team up for a comfortable overnight stay. A well-defined hiking objective will dictate the type of camping equipment needed. For example, a light and fast high ridge traverse with a high bivouac will restrict the volume and weight of equipment carried, while a more leisurely approach to a treeline camp, with day trips planned beyond, may allow for greater luxuries to be carried. Consideration must be given to the climate. Going on a hike through a temperate rain forest means you will need more rain protection than on a hike in a semi-arid area.



CAMPING

As the old saying goes, great campsites are found, not made. Where possible, choose a campsite that has already been previously impacted. Should you be in a more remote location, choose a campsite on a durable surface at least 50m away from a freshwater source such as a lake or a stream. Avoid building structures or altering the environment to appear to be impacted by humans.

SHELTER TYPES

TENTS - THREE-SEASON VERSUS FOUR-SEASON

An above-treeline camping location may be subjected to extremes in wind and precipitation, so a sturdy three- or four-season tent is preferred. Tents should have multiple guylines. A four-season tent typically has windows that can be unzipped to allow air circulation, while a three-season tent has mesh panels that cannot be closed. Three-season



Three-season tent



Four-season tent

tents can be used in protected campsites and work well for below-treeline travel. Four-season tents will stand up to horizontally driven rain and snow. Four-season tents are as a result generally heavier, but provide a greater haven from inclement weather.

SINGLE WALL VERSUS DOUBLE WALL

Most tents utilize an inner nylon tent body suspended by an aluminum pole frame, with a waterproof exterior fly draped over it. Tents are also available with a single wall construction. Single-wall tents are typically much lighter, even though they are a four-season design. The material used is a waterproof, breathable fabric. However, there are limits to both the waterproofness and the breathability. Condensation is often a problem. Single-wall tents



Single wall tent



Double wall tent



Above: Guide's tarp rain shelter.
Below: A guide's tarp can be slept under.



are more appropriate for light and fast-paced, or longer distance trips when weight takes precedence over comfort.

SIZE

Consideration must be given to the size of the tent in relation to the number of people it is rated for. For example, four shorter, smaller people may be able to comfortably fit into a three-person tent, whereas taller, larger people may feel more comfortable if it is two people in a three-person tent. The trip length and objective will provide parameters as to the size and style of tent needed. It can be very useful to have a tent with two doors and a large vestibule at one end.

TARPS

Hiking groups should be carrying guides tarps to shelter the group if caught in an exposed place by inclement weather. The guide's tarp is a sheet of waterproof nylon with grommets at the corners and along the edges and two- to three-metre sections of 2mm or 3mm cord attached. The tarp is carried by the group when travelling away from the tents. It can also be used as a cooking shelter. However, it must be taken down and carried with the group during a day trip.

SLEEPING TARPS

As a lighter alternative to carrying a full tent, the guide's tarp can be slept under. Often this is paired with a bivi sac. This shelter setup does not work well in windy or exposed locations. Some companies produce tent-style tarps that provide greater protection.

EMERGENCY SHELTERS

Unplanned bivouac skills are an essential tool. Groups travelling in the alpine should at minimum carry a guide's tarp. Guide's tarps come in a variety of sizes and materials. A 2-metre by 3-metre tarp works well for most applications. Siltarp material is considerably lighter than nylon, but is also more expensive. Below treeline, natural shelters can be constructed from branches. Often shelter can be found below large conifer trees.



BUGS

Bug netting may be optional in arid settings, but mandatory for areas with significant biting insect populations. It is challenging to get a good night's sleep on a warm humid night with no bug netting.



SLEEPING SYSTEMS

Sleeping bags come in a variety of weights (warmth rating) and materials. Sleeping bags have a warmth rating. This might be 0 C, -20 C, -40 C, etc. The rating is based on an average person getting eight hours of sleep at a particular temperature. Down is an excellent insulator for its weight,

however loses virtually all of its insulating properties when wet. Synthetic insulation retains much of its insulating properties when wet but is heavier and bulkier than a down bag with an equivalent warmth rating. Down bags maintain their warmth ratings over time, while synthetic bags tend to pack out and lose insulating capacity. Over the long haul, the cost difference/longevity tends to balance out.

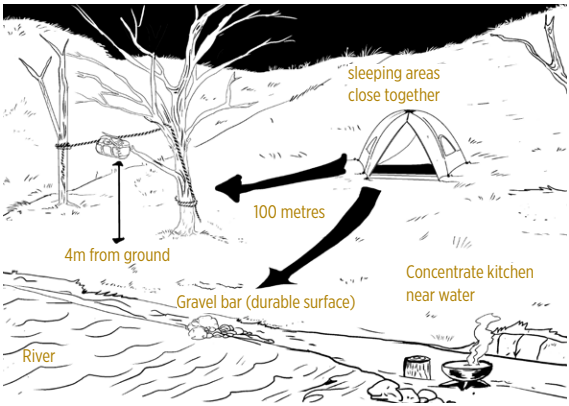
Sleeping pads are an integral part of a sleeping system, providing both insulation and comfort. A large amount of the heat lost during sleep is through conduction down to the ground or snow. Select a pad that provides sufficient insulation.

- Closed cell foam is the most basic. It is a durable and cost-effective material, but is not as comfortable as other options. It is light and bulky.
- Open cell foam is also cost-effective, but not as durable. Open cell foam absorbs water and is not a good option for hiking. It is light and bulky.
- Inflatable mattresses rely on a sealable system. Four types of construction are used.
    - Air mattresses rely on just air to provide high levels of comfort and low levels of insulation. They are light and compact.
    - Inflatable open cell foam mattresses provide high levels of comfort and varying levels of insulation based on the thickness of the foam. They are heavier and bulkier than air mattresses.
    - Inflatable synthetic-filled mattresses provide high levels of comfort and varying levels of insulation based on the amount of synthetic fill. They are heavier and bulkier than air mattresses, but lighter than inflatable open cell mattresses.
    - Inflatable down-filled mattresses provide high levels of comfort and varying levels of insulation based on the amount of down. They are heavier and bulkier than air mattresses but lighter than inflatable synthetic fill mattresses.

The method of inflation is an important consideration. Inflatable open cell foam mattresses will self-inflate to a point, but may need a few puffs of air to fully inflate. Air mattresses are fully dependent on air being blown into them. This can be achieved by mouth or mechanical device. Blowing into the pad by mouth may introduce moisture and bacteria. Over time, this may become a problem. The mechanical inflation devices employ a variety of strategies, from battery-operated fans to stuff sacks.

CAMPSITE SELECTION AND PREPARATION

TREELINE AND ALPINE CONSIDERATIONS



Site selection at treeline should be based on finding durable surfaces and away from riparian areas. The environment is fragile and easily damaged. Camping in a beautiful alpine meadow for a week will leave long-lasting impressions and signs of wear. Below treeline, the environment is more durable and can recover more quickly from camping impacts. (See Chapter 4 for additional environmental considerations)

KITCHENS



A well-organized kitchen area will simplify food preparation and facilitate FOODSAFE practices. The preparation of high-quality food does not require a complex kitchen set-up. However, poor food handling or storage can easily lead to food poisoning and an unforgettable trip. Hand washing capacity is an essential first step. For additional information, see Chapter 4. Note: Human food is an attractant for wild animals, from bears to pack rats, so careful storage of food is important. The kitchens should be located downwind from the sleeping area so that food odours do not attract wild animals to the sleeping area.

MEAL PREPARATION FOR A SUMMER ENVIRONMENT

Capacity for food preparation will vary based on the trip objectives. For example, a light and fast overnight high traverse will include limited meal preparation capacity compared to a week-long, heli- established camp. The group size will dictate whether smaller cooking groups will be needed. It is simpler and more efficient to prepare meals in smaller groups of up to four people.

Meal Preparation

Poorly stored and/or poorly prepared food can easily lead to gastrointestinal problems. A severe case of food poisoning will likely mean an early end to a trip. FOODSAFE principles must be used to ensure that people do not get sick. This includes proper hand washing and the use of clean utensils. Raw meats must be handled and stored separately from raw vegetables and fruits.

STORING FOOD

Storing food and disposing of food waste properly takes knowledge and skill. When in bear territory, it is best to cook 100m away from both where you sleep and where you store your food at night. This separates smells and perceived opportunity for wild animals, small and large. All food scraps should be eaten or packed out (not buried), even compost. Dishes should not be washed in waterways, but instead water carried to the dishes. Inevitably there will be grey water from dishes or straining pasta, and this can be disposed of, in the case of smaller groups, by dispersing it, and with larger groups (or greater user days) in a sump hole dug in active soil, approximately 10-15 cm deep. Pine martens and rodents such as deer mice may also investigate your kitchen. Sealing pots and dishes as well as securing them in your food hang or overnight food storage location may prevent contamination and environmental impact. Food storage lockers, or bear- and rodent-resistant canisters are preferred, as bear hangs can be tricky, especially where tree cover is limited. Bear hangs need a minimum height of 4m. Creating a proper bear hang requires 20-30m of rope, food bags or stuff sacks, and a pulley system. When a proper bear hang is not possible, separate your food from your sleeping and cooking areas

and hang it in the branches of a tree. While not ideal, this will at the very least separate smells, and possibly discourage scavengers, such as ravens or rodents. Fires in the subalpine and alpine can have significant environmental and aesthetic impacts and should be avoided. Should a campfire be built for emergency purposes or otherwise, build it on durable non-flammable ground, monitor it very carefully and put it out completely. Once cool, distribute the ashes and return the environment to its original aesthetics. Double check or sweep your campsite prior to departure to ensure you have left it clean of waste.

WATER SOURCES

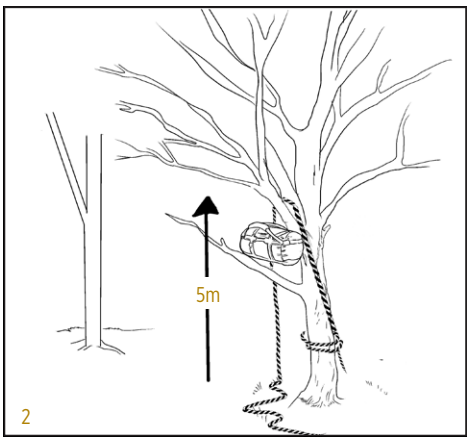
Water sources in many popular hiking areas may be contaminated by human or animal waste. It is difficult to determine whether water is contaminated, so water purification is highly recommended in areas that see regular human activity, and is suggested for all areas. Methods of purification include: chemicals, physical filters, exposure to ultraviolet (UV) light and boiling. Not all methods are equally effective.

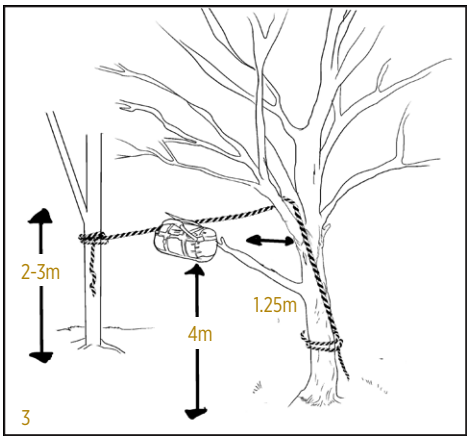
Chemicals are available in either tablet or liquid form. The chemical reaction takes longer to complete with colder water. Chemicals often leave an aftertaste.

Physical filters come in a variety of styles, from straws to pumps. A good pump will provide the greatest level of protection and is capable of a high level of throughput, however it is the most expensive option.

The SteriPen uses UV-C light to sterilize water. It is light, easy to use, quick and









Examples of different water purification devices: an MSR water filter, Steripen UV sterilizer, and chemical water treatment tablets.

effective. It is not as expensive as the best pumps. It does not work well in silty water.

Boiling water is a simple, yet effective sterilization method. Bring the water to a boil and turn off the stove. This works well during meal preparation times, but is less efficient if drinking water is needed during the day. Some forethought and planning are needed.

Siltladen, glacierfed streams may also produce uncomfortable gastrointestinal problems. Let the water stand in a pot or bottle. The silt will begin to settle to the bottom. Pour off and use the top. Only a physical filter will remove all of the silt. However, pushing significant volumes of silty water through a filter will shorten the lifespan of the membrane and the cartridge will need to be replaced sooner.

FIRES

Campfire use is discouraged due to the scarring left behind. If fires are considered necessary, build the fire on gravel or rock surfaces. Fires may be appropriate in established campsites with fire boxes. Do not burn plastic garbage or food waste. However, fire lighting is a skill that must be practiced. The emergency bivouac is a situation where a fire may make the difference between a moderately uncomfortable night out and a severely uncomfortable night. Fire starter material will greatly facilitate the process. Commercial products are available, but a few strips of bicycle inner tube are light and do not absorb water, so will work when wet.



PERSONAL HYGIENE

Although hikers may have a reputation for minimal personal hygiene, this does not need to be the case. However, some hygiene products can be harmful to the environment. Products such as biodegradable soap still contain a chemical that needs active soil to decompose. Use this sparingly or use an alcohol-based hand cleaner as an alternative. If washing, do so at least 30 metres from water sources. Toothpaste should be treated as food and disposed of as such. Used personal items (BandAids, etc.) are packed out.

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Movement Skills

Although hiking can be described as simply putting one foot in front of the other and repeating, it quickly becomes obvious that moving efficiently through wilderness terrain requires a skill set that is not practiced on city sidewalks, where the greatest hazard is tripping on cracks. Even on generally smooth trails, every step counts. As the terrain becomes rougher, more care is needed for foot placement and balance.

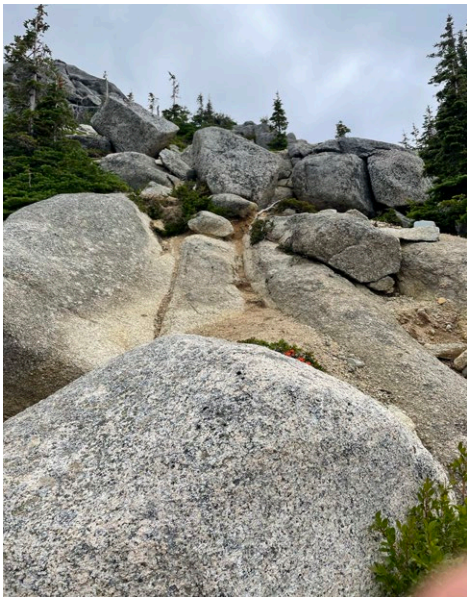
ON-TRAIL MOVEMENT SKILLS

The primary consideration for on-trail travel is the surface condition of the trail and incline. Trail surface characteristics are modified by weather. Recent, current and forecast weather conditions will change the nature of travel. A simple dirt trail will become dusty and loose during periods of prolonged drought. It will become muddy and boggy during periods of prolonged precipitation. Rocks and roots will become slippery when wet.



Muddy trail conditions

Movement techniques will be dictated by the surface characteristics: dirt, sand, rock, roots, etc. Anything other than a consistent, dry, hardpacked trail will demand constant monitoring and adjustments. This requires situational awareness of the surface condition for every footstep. Vegetation adds another complexity, with adaptations to accommodate for leaves, pine needles, branches, moss, and lichen.



Rocky trail conditions



Slippery roots

OFF-TRAIL MOVEMENT SKILLS

Off-trail movement skills are more varied and complex due to the changing nature of the terrain. Wetlands are easily damaged, so groups should minimize their impact by sticking to drier, more durable surfaces. Sturdy boots are recommended for off-trail travel.

DEADFALL



Deadfall

Forest deadfall can slow the pace of travel considerably and add an increased level of hazard. Although balancing along the top of a downed tree may be appealing, as this way the underbrush is avoided, the consequence of a fall is more severe. Before stepping on a log or tree, the surface condition must be assessed. Is it wet? Is the bark still firmly attached to the underlying wood? What is the likelihood of a slip? What are the consequences of a slip? Crawling under deadfall is likely a safer option, as it removes the potential for a fall. However, it may be necessary to remove packs and pass them through.

BOULDER FIELDS AND TALUS SLOPES



Boulder fields

Boulder fields pose a unique challenge in that the size, stability and surface condition of the boulders can vary with every step. Larger boulders tend to provide more stable platforms for travel. However, the consequences of a large boulder moving can be catastrophic, as there is the potential to be hit by the boulder in addition to the fall. Movement through a boulder field requires careful and purposeful travel. Place your foot central to the mass of each boulder. Balance is the most challenging component of travel through a boulder field. Ski poles make this much easier, as does lowering your centre of gravity. Place denser items lower in your pack and do not have any swinging items, such as water bottles, clipped to the outside.



Scree slope



Track setting

The surface condition of the boulders should be assessed. Moss- or lichen-covered boulders pose additional hazards, as they are exponentially more challenging when wet. Moss-covered boulders can be deceiving, as it is relatively easy to step into a hole between two boulders. A broken leg could easily result if this were to occur while travelling downhill carrying a large pack.

The consequences of a fall in a boulder field, as a result of a missed step, a trip or a slip can be severe. Travel should be approached with caution, particularly for beginner hikers with large packs.

SCREE

Scree slopes are tedious for uphill travel, and potentially fun and easy for downhill travel. The size and depth of the loose stones is the determining factor. Typically, scree's angle of repose is 35-38 degrees. A deep layer of small stones is difficult for walking uphill and better for going downhill. A shallow layer of larger stones is difficult for going downhill and better for walking uphill. Hand protection and ski poles are recommended.

TRACK SETTING

Efficient track setting will make travel much more comfortable. The goal of uphill travel is to find the optimum balance between vertical gain and effort extended. Straight up the fall line allows you to gain elevation the fastest, but requires more energy the steeper it gets. On low angle terrain, head straight up. Begin switchbacking as soon as your Achilles tendon begins to feel the strain. The optimal angle of a rising

traverse will depend on the slope angle and surface condition. Make the traverses as long as possible across a slope. Use natural terrain features for the corners. The same principle applies to downhill travel. Head straight downhill until it becomes more difficult to maintain traction, then switchback. It will be possible to descend straight down on steeper slope angles than would be comfortable to hike straight up.

PACING AND BREAKS

Set a steady, measured, unrushed pace that can be maintained for a long period. The proper pace has everyone moving at a comfortable level of exertion. Aim to walk for an hour and then take a 10-minute break. The pace should allow adequate time to maintain situational awareness. Proper pacing is determined by several factors, which include the objective for the day, distance, terrain, group fitness, and weather. A proper pace greatly reduces the risks of fatigue-related injuries. Choose breaks that optimize a balance of efficiency, hydration, rest, clothing adjustment, food, and enjoyment. Remember to enjoy the views.

HIKING POLES

Hiking poles are highly recommended. Typically, one pole is enough, but some people prefer two. Adjustable length poles allow for adaptations based on slope angle. Shorten the poles for uphill travel and lengthen them for downhill. On a sidehill traverse or switchback use a short pole on the uphill side and/or a long pole on the downhill side. Baskets can be removed to reduce the likelihood of the basket snagging on vegetation. There are pros and cons to using the metal spike on the end versus covering it with a rubber cap. A high-quality metal spike will last a long time and remain sharp. The metal will grab on stone surfaces to a point and then skate off. The degree of grip will depend on the surface roughness, and the hardness of the stone and metal. Cheaper poles with low quality metal tips will round out and become less secure over time. Rubber caps provide more consistent grip on stone surfaces, but wear out and can fall off. Wrist straps provide additional support, but can be awkward when switching the pole from hand to hand, or changing the grip point.



Hiking pole

WINTER MOVEMENT SKILLS

The Winter Hiking Leader needs to make decisions regarding the optimal mode of travel given the trail conditions. A popular trail with compacted snow can be travelled with a typical winter boot. However, cleats or spikes may be needed for steeper sections where the snow has hardened. Snowshoes will often be needed on less popular trails or on trails with significant new snow since the last party went through. During the planning and organizing phases of a winter hiking trip, participants should be prepared for the anticipated conditions, but recognize that conditions can change immediately prior to and even during a trip. Having snowshoes and spikes available may be necessary if there is a high level of uncertainty about the conditions. However, it is more efficient to carry rather than wear snowshoes or spikes when the trail surface is appropriate for regular walking.



Winter trail marker



Summer trail markers may be buried

ROUTEFINDING AND TRACK SETTING

The Winter Hiking Leader terrain limitation is for travel on designated trails in non-avalanche terrain. Routefinding may be more challenging due to snow cover. A poorly marked summer hiking trail may be hard to follow when covered by untracked snow. Good navigation skills are needed and at some point, travel may move beyond the skill set of the Winter Hiking Leader, as travel can now be considered "off-trail."

PACING AND BREAKS

Thermal efficiency becomes the most important consideration of winter travel pacing. The leader needs to pace the group so that people do not sweat. This becomes a balance of insulation and heat generation. The principles of summer travel pacing also apply. Ideally, choose break locations that are in the sun and out of the wind.

Avoid long breaks, as people may cool down too much. Add enough clothing layers to make the break comfortable.



SNOWSHOE TECHNIQUE

Snowshoe selection

Choose a type of snowshoe appropriate for the anticipated terrain. Steeper mountainous terrain will need a sturdier, more capable setup. Snowshoes need to be sized based on the anticipated load (both hiker and pack) and snow conditions. A longer and/or wider snowshoe will be needed for softer, deeper snow.

Ski Poles

Ski poles are essential for snowshoe travel. They are useful for maintaining balance, for extra push on steep slopes, and to help get up after a fall. When getting up from a fall, make an X with the poles on the surface of the snow. Push up on the centre of the X. Ski poles are strong when used in the vertical axis and weak when used as a lever.

Flat Ground

Depending on the snowshoe shape and width, a wider stance than regular walking may be needed. Lift the toe of the snowshoe so it clears the surface of the snow while allowing the tail to drag. In deeper snow, this motion can be hard on the hips and groin.

Uphill travel

Low-angle slopes with soft snow can be ascended with a rising traverse. As the slope steepens, it will be easier to ascend straight up the fall-line. Kick your toes into the slope to create a platform. The cleats under the ball of the foot will aid with traction. Some snowshoes include heel lifts for steeper travel.

Hard snow

Snowshoes with claws or cleats are essential for uphill travel on harder surfaces, however they have their limitations. It may be easier to remove the snowshoes and kick steps with just boots. If this does not work, pick an alternate route. If crampons and an ice ace are needed, then the trip is beyond the skill set of a Winter Hiking Leader.

Downhill travel

Keep your weight slightly back so that you do not hook a tip and fall headfirst down the slope. If you take a large step and the snowshoe clears the surface of the snow, the tail can flip forward and catch in the snow. Extend your poles so you can reach downhill for extra braking. Press your heels into the snow. The cleats will provide some braking. On steeper slopes, the snowshoe may begin to slide. Advanced walkers may be able to control the slide, but turning is difficult. If all else fails, sit on the back of the snowshoe and ride it out. It may be necessary to turn around and go downhill facing in.

Traverses

Skinnier snowshoes are better for sidehilling. A wide snowshoe with a soft boot can be difficult to manage on a steep sidehill/traverse, or on harder snow.



Spikes or cleats

SPIKES/CLEATS

Spikes or cleats provide greater traction on hard snow and ice, however they are not crampons. There is a variety of types. Some are designed for runners, while others are for urban walkers. The best design for winter hiking has spikes attached by small chains to a rubber gasket. The gasket should be tight enough to stay on the boot at the limits of its holding power to snow and ice.

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Water Crossings

Water crossings are often a necessary requirement of both summer and winter hiking travel. Popular trails often have some form of bridge, but not always. The hazards and techniques for open water crossings are very different than the hazards and techniques for frozen or snow-covered crossings. All water crossings should be considered dangerous and should be evaluated carefully. The ability to assess and manage water crossings is based on knowledge of the basic principles of water hazards. The ability to implement appropriate water crossing techniques is important.

PRINCIPLES OF WATER CROSSING

Water crossings are dangerous and must be evaluated carefully. Moving water is powerful and relentless, but also somewhat predictable. If a creek or river must be crossed, the ideal site has slow and shallow water. The three key factors to be evaluated are water temperature, flow rate and distance to cross. In Western Canada, creeks and rivers are generally influenced by snow melt, so they are cold. Cold water will quickly reduce sensation in feet and legs and decrease physical performance. Full immersion may cause hypothermia. Be wary of water temperatures below 20 C.

Water volume is measured in cubic metres per second (cms) and gives an indicator of the amount of water passing a given point. Water speed is driven by gravity. The river gradient influences the speed. Both the volume of water flowing, and the speed determine the force the river exerts. A slow-moving river may have the same force as a fast-moving creek with less water.

Flow may change over the course of a day due to the diurnal cycle. The streamflow is directly related to the weather. The rate of snowmelt will maximize in the afternoon due to daytime temperatures. Hot, sunny days will produce more snowmelt and consequently higher water volumes. Flow will be lowest early in the morning. This may make for an easy crossing in the morning on the way to a climb, but an impassable creek in the afternoon on the way home. Thunderstorms with intense rain events may produce flash floods. These thunderstorms may occur a long distance upstream from the location of the group.

HAZARD MANAGEMENT

DECISION MAKING AND COMMUNICATION

The hiking leader needs to take a firm stance and form a group action plan. Stream crossings can bring out an inappropriate, independent thinking process, as group members experiment with their vision of the best place and way to cross. It is easy to lose people as they investigate their options. River noise makes it hard to communicate from one side of a bank to the other. So, make sure everyone is clear on the plan before enacting it. Take the time to scout the riverbank both upstream and downstream before selecting a site.

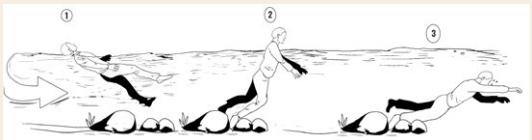


HAZARD ASSESSMENT

- Look downstream for hazards. This includes: obstructions, constrictions, bends, holes, waterfalls, logs, sweepers, strainers
  - Do not cross above the hazards
- Assess the bed surface condition. Is it large boulders, sharp rocks or smooth sand? Is there potential for a foot entrapment?
  - Avoid crossing when foot entrapments are possible
  - Look for smooth surfaces to walk on
- Assess the stream width. Is the river braided with many smaller channels? Does all the water flow through a tight gap?
  - Cross where the stream is braided
- Assess the direction of the flow. Is the river straight or does it follow a series of bends?
  - Avoid bends, as a swimmer will be flushed to the faster water on the outside of the bend
- Assess the bank height
  - Will it be easy to get out on the other side?
- Look for any debris floating down
  - Are there any large logs?

Foot entrapments

If you get swept away keep your feet up to avoid a foot entrapment. Only stand up if you are in shallow water (less than 60 cm) or out of the current. Use a defensive swimming position. Lie on your back with your head upstream and your feet up. Use a back-stroke to head for the shore.



Once the best crossing choice has been made, assess the residual risk compared to the alternatives.

- Can you change the route?
- Can you walk to a bridge?
- Should you just wait for the water level to drop?

If you get swept away, keep your feet up to avoid a foot entrapment. Only stand up if you are in shallow water (less than 60 cm) or out of the current. Use a defensive swimming position. Lie on your back with your head upstream and your feet up. Use a backstroke to head for shore.

WATER CROSSING TECHNIQUES

LOG CROSSING

There are two forms of log crossings: constructed and naturally occurring. Constructed crossings may have handrails, ropes or wires for additional balance. Naturally occurring crossings can have hand lines added.



Assess the Hazard

- How high is the log above the water?
  - A log that is in or near the water can be wet and slippery (or even frozen)
- What is the downstream consequence?

Strategies

- Tighten packs
- Add downstream safety
- Add a rope as a hand line
- Balance with a pole
- Put your cleats on
- Sit down on the log and shuffle
- Ferry the pack over for the weaker member(s)
- Ensure that everyone in the group is capable of making the crossing



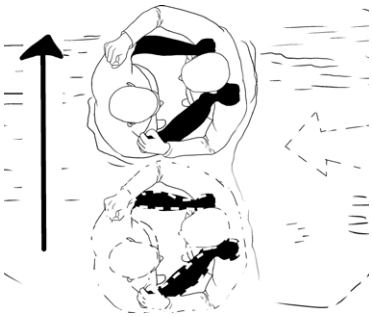
Boulder Hopping

Boulder hopping is often selected as a primary choice, as it offers the option of maintaining dry feet. However, it is not without hazard, as river rocks are often covered in slippery lichen and moss. Large steps and jumps require agility and balance. Ensure that everyone in the group is capable of making the crossing.

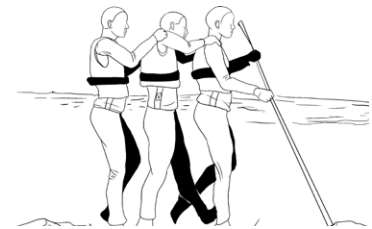




Solo crossing technique



Two person crossing technique



Group crossing techniques

- Place spotters on both sides of wider gaps
- Pass packs across
- Ski poles are of great benefit and should be fully extended
- Set up downstream safety. Place a person downstream of the crossing point. They should have their pack off and be prepared to jump in or extend a hand/stick
- Tighten pack straps for better balance

IN THE WATER

Once you have made the decision to enter the water use the following techniques.

- Packs
  - Loosen shoulder straps, hip belts undone
- Footwear
  - No bare feet
  - Plan ahead – bring running shoes
  - Use your boots
- Solo crossing
  - Use ski poles or a stick
  - Face upstream, bracing with poles upstream and move sideways
  - Face downstream, bracing with poles downstream and move sideways
  - Face the direction of travel, braced with a pole either upstream or downstream
- Group crossings provide mutual support but need coordinated movement



- Two people
  - Face each other, arms braced on each other's shoulders
  - One person is upstream of the other
  - Walk sideways
- Three people - Tripod
  - The largest person is upstream, facing downstream
- Many people - Line abreast
  - Face upstream
  - The largest person is upstream
  - The upstream person is supported and provides a buffer for the downstream people

DOWNSTREAM SAFETY

Have people downstream to help if someone gets flushed down the river. They should be equipped with a throw rope or reaching stick. Two five-metre prusiks will work. If in doubt, practice throwing the rope to ensure that it will reach.

WINTER WATER CROSSINGS

Winter water crossings present all of the challenges of summer crossings, with the additional complexities of assessing snow cover, ice thickness and verglas-covered rock. In addition to the hazard associated with drowning, cold water immersion and subsequent exposure to below freezing air temperatures with water logged clothing and footwear present a hazard management scenario with high complexity and consequences. As with summer crossings, clear communication from the leader is needed.

FLOWING CREEKS WITH OPEN WATER

Shoulder season travel – As temperatures drop below zero and creeks begin to freeze, water crossings may be simplified due to lower water levels, but may be more complicated due to verglas- or ice-covered rocks, logs and bridges. High volume or fast flowing creeks take longer to freeze.



Flowing Creeks with Ice Bridges and Open Pools

As creeks begin to freeze over, ice bridges will form. The Winter Hiking Leader must make decisions as to whether the ice is strong enough to support the weight of hikers and whether ice cleats will be needed. If possible, avoid crossing creeks by staying to one side or the other.

Mostly to Completely Frozen Creeks

Creeks that appear to be well frozen still need to be assessed. Thick solid ice no longer presents an immersion hazard, but increases the likelihood and severity of a fall hazard. Cleats are a hazard management tool, but have limitations. Cleats are not as secure as crampons. Running water under the ice can fluctuate due to temperatures and upstream conditions. Thin or eroded ice shelves can form, suspended with an air gap between the water and the ice. Breaking through ice and falling into the water can have high consequences, particularly if the water is moving quickly and the hiker is swept under the downstream ice sheet. If the ice sounds hollow, assess for ice thickness and strength.

Snow-covered Creeks

In climates with high snowfall amounts and relatively warm air temperatures, such as the Coast Range, creeks can be covered with snow before they begin to freeze. Snow bridges form over creeks much like they do over crevasses. Snow depth can be assessed with an avalanche



probe or a ski pole. Resistance will give an indicator of strength. Snowshoes will provide greater floatation and reduce the likelihood of breaking through the snow bridge.

Lakes

If possible, avoid lake crossings by following the shore and staying on the trail. A frozen lake with a packed trail across it provides a tempting shortcut, but ice quality and thickness must be assessed.

- Visual inspection
  - Unsafe conditions include cracks, holes, or soft, waterlogged ice
- Ice colour
  - Dull grey ice is newly formed
  - White, opaque ice has lots of snow mixed in with it
  - Blue ice is clear and strong
- Ice measurement
  - Use an axe or ice screw
  - 15 cm is considered a safe thickness for hikers

Be aware of potentially weaker areas where water flows into or out of the lake. Water levels in lakes can fluctuate through the winter as temperatures rise and fall. This can produce an unnerving surface condition with an ice – water - snow sandwich sitting on top of the lake water. Snow on the surface can appear to be sitting just on water, with

no ice to support travel. The rising water levels in the lake flood over the ice layer to produce this sandwich. Careful investigation is needed to ensure that it is indeed just a snow and water sandwich over a supportive layer of thick ice. Breaking through the snow into the water is a hazard that remains. Although the water layer might only be 10-30 cm deep, it is still enough to fill a boot with water. This surface condition is challenging to assess, as it might be a sandwich, or it might just be snow on top of an unfrozen lake. In either situation, the more prudent course of action is to stay on the shore.

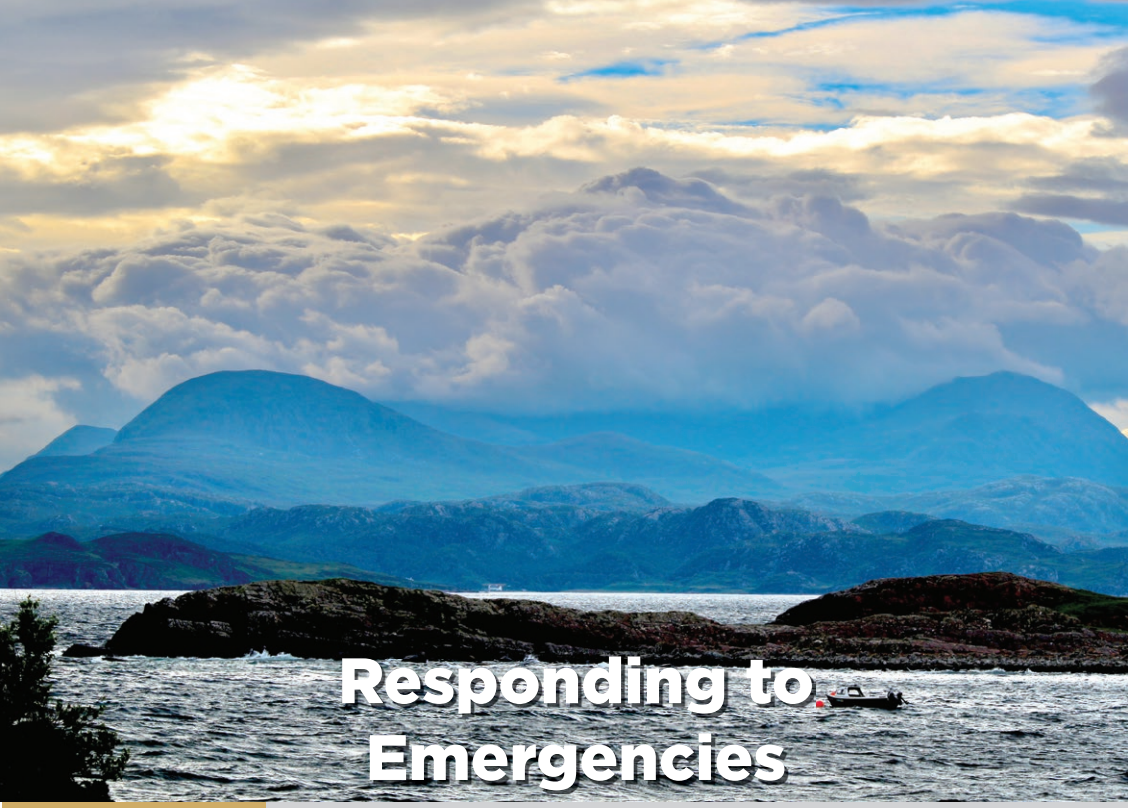
REFERENCES AND FURTHER READING

Long, S., (2004) *Hillwalking – The Official Handbook of the Mountain Leader and Walking Group Leader schemes*, The Mountain Training Trust, Sheffield, UK

Lavalley, J., Stegemann, M., & Segerstrom, J., (2010) *Rescue Canada Swiftwater/Flood Rescue Programs – Student Study Guide*, Rescue Canada

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Responding to Emergencies

Despite the best-laid plans, hiking leaders may at times be required to respond to accidents or emergencies within their group or other hiking groups in the area. It is therefore imperative that hiking leaders maintain first aid currency and be properly equipped to manage the initial stages of emergencies and if necessary, seek the assistance of organized rescue for the resolution of more major emergencies. There are many approaches to managing emergencies. In this chapter, we will explore the basics of first aid, emergency communication, and how to manage the group if an accident occurs. The basic principles outlined in this chapter are not a replacement for formal first aid training; all hiking leaders should possess current standard first aid and CPR certificates.

ACCIDENT



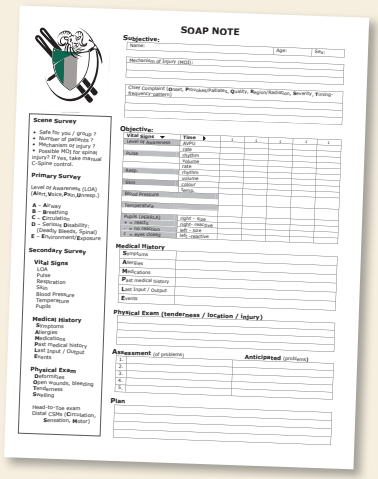
The underlying principles in any emergency situation include; protecting the patient, calling for help if required, and providing initial care and treatment.

PERFORMING FIRST AID

Once the scene has been assessed and deemed safe, or the patient has been moved to a safe location and a call for organized rescue (if required) has been made, the hiking leader can then provide initial first aid to the victim. Depending on the severity of the injury, general first aid procedures include:

- **A** (airway), ensuring the patient's airway is unobstructed;
- **B** (breathing), establishing that the victim is breathing and determining the quality of breath;
- **C** (circulation), checking for a pulse and the general heart rate over a period of one minute in addition to a quick check for severe bleeding;
- **D** (disability), determining the victim's level of consciousness and awareness, checking for sensation in all extremities; and
- **E** (environment), determining the effects the weather will have on the ability to treat the patient, effectuate a rescue, and manage the remaining group members.

Documenting patient information, in the event of an accident, can be beneficial in determining whether the patient's condition is improving or deteriorating. It can also be useful for organized rescue and emergency medical services, and can occupy a member of the group during an emergency. Copies of these and any other forms in this book can be found at www.alpineclubofcanada.ca/forms


SOAP NOTE

Subjective:

Objective:

Medical History

Physical Exam (tenderness / location / injury)

Assessment (of problems)

Plan

Scene Survey

Primary Survey

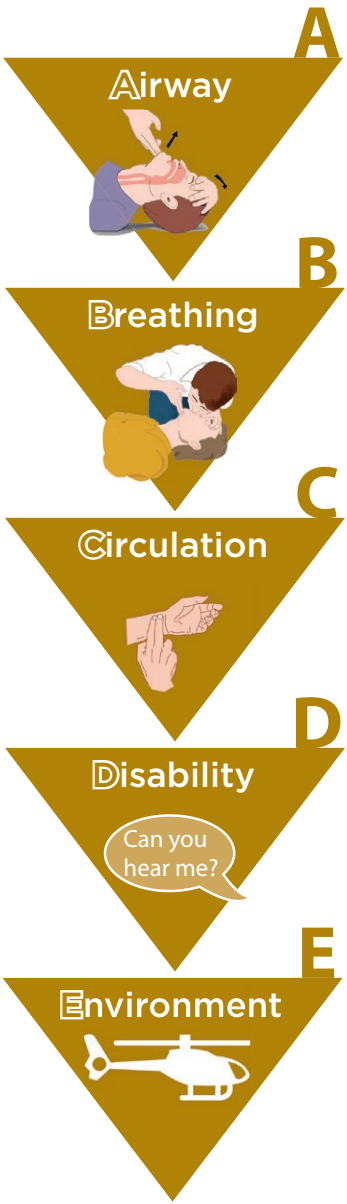
Secondary Survey

Vital Signs

Medical History

Physical Exam

ASSESSMENT



Due to the nature of hiking activities, many common accidents are trauma-related, and involve bleeding and/or fractures. In the case of bleeding, direct pressure should be applied to the wound site using sterile, non-stick dressings, and if practical the wound should be elevated above the heart. When dealing with bleeding injuries, the hiking leader should ensure they protect themselves and their victim from blood-borne pathogens by wearing gloves. In the case of fractures, small bones should be splinted, immobilized, and sensation below the break should be confirmed. Fractures of long bones, such as the femur, require immediate evacuation and may necessitate gentle traction to ensure continuous blood flow below the break to the extremity of the leg.



Common items to include in a first aid kit for a day of hiking include:

- Latex gloves
- Antiseptic wipes
- Pressure bandages or dressings
- A good selection of adhesive bandages
- Sterile non-stick pads
- Adhesive elastic bandage
- Non-adhesive elastic bandage
- Medical tape
- Steri-Strips
- Moleskin or second skin
- Small scissors
- Nail clippers
- Compact mouldable splint
- Triangular bandages

COMMON MEDICAL ISSUES

FEET

The ability to travel on a hiking trip is entirely dependent on proper foot care. Poorly fitting, overly stiff or simply unfamiliar boots can be enough to end a trip for a participant. Travelling uphill puts considerable pressure on the heels. This is exacerbated by a stiff boot. Blisters may be the result. Downhill travel puts pressure on the toes. A boot that is too small and/or untrimmed toenails may result in bruised and bloody toes.

This can be avoided by using a boot that fits well. Both the boot and the foot must be "broken in." Feet need to be toughened up in preparation for hiking endeavours. During the period that the boot and feet are being broken in, blisters are more likely. A participant with brand new boots (or borrowed boots that do not fit well) and who does not hike on a regular basis will probably get blisters unless preventative measures are taken.

The compounding factors that cause blistering are:

- Friction or pressure
  - This is generated by the quality of the fit between the foot and the boot. It can be adjusted by adding or removing socks. Ideally the boot should be fitted with two socks: a thin sock and a medium to heavy sock.
- Movement
  - Too much movement creates an environment for friction and chaffing.
  - Too little movement may cause bruising.
- Moisture
  - Uphill travel typically produces hot and sweaty feet. This moisture softens the skin and makes it more susceptible to blistering.

Treatment

- Prevention is key. Stop the blistering process before it becomes an issue and skin damage occurs.
  - Use good, well-fitting boots
  - Train your feet
  - Use two pairs of clean socks and change them regularly



- Tape and or pad areas likely to blister, before starting out on the trail.
  - Start with clean and dry skin
  - Prep the skin with an adhesive
  - Cut out a Moleskin pad to completely cover the area
  - Cover the Moleskin with white athletic tape
  - Commercial blister pads work well too

- If a hot spot develops, this is an early warning sign of a blister forming.
  - Stop and treat immediately
    - A 10-minute stop early in the day will translate into more efficient travel for the remainder of the day.
- If a hot spot has been ignored and a blister has formed:
  - Clean and dry the area
  - Drain the blister
  - Apply a skin adhesive
  - Cut a doughnut-shaped Moleskin pad large enough to protect the affected area
  - Cover the doughnut with another layer of Moleskin
  - Cover with athletic tape
  - In severe cases, use Second Skin as the first layer
  - Cover with a doughnut as above

Blisters can become debilitating, and even life threatening. As an open wound, infection is possible. On a longer hiking trip, ongoing wound care is essential. Do not leave the initial bandaging on for several days. Remove, clean and re-dress on a daily basis.

SUN

Solar radiation is both a short-term and long-term health hazard. Sun damage occurs to both exposed skin and to eyes. The intensity of the solar effect increases with altitude as the atmosphere becomes thinner. The intensity is also magnified by the Albedo Effect if the sun reflects off a bright surface, such as snow. This can lead to blistering of the roof of the mouth and inside the nostrils.

Prevention is key. Sun exposure is unavoidable, but harm as a result of that exposure is manageable.

Prevention

Sunscreen

- Use SPF 30+ sunscreen (60 SPF is recommended)
- Apply one hour before sun exposure
- Re-apply regularly (particularly if sweating heavily)
- Use a sun block, such as zinc, on lips and nose

Sun hat

- Use a wide brimmed hat
- Use a cap with neck protection under your helmet

Sunglasses

- Use mountain sunglasses with side protection and dark lenses
- Use a nose flap in severe conditions



Treatment

- Sunburn
  - Reduce, or better, eliminate sun exposure to the affected area
  - Apply Aloe Vera cream
- Snow blindness (Photokeratitis)
  - Sunburned cornea resulting in temporary loss of vision
  - Eyes will feel irritated, burning, watery and sensitive to light
  - Eliminate sun exposure
  - Apply cool wet compresses (tea bags work well)
  - Moisten with saline solution (contact lens solution)

BURNS

On outings where stoves and or fires may be used, the hiking leader should be prepared for first aid that involves burns. The most common backcountry cooking injury is scalding as a result of pots tipping over. The important consideration with any burn is the risk of infection.

Treatment

Burns should be immersed in cold, clean water or covered with a cold damp cloth for about 10 minutes followed by covering with dry sterile non-stick dressing. Depending on the severity and location of the burn, the trip leader may need to consider evacuation.

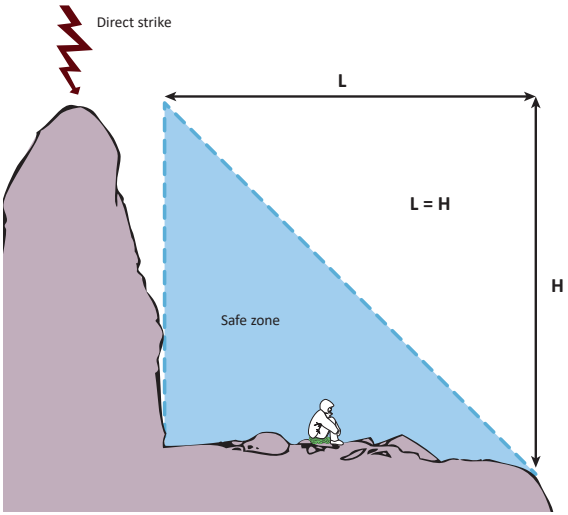
Names	Layers	Appearance	Healing Time	Complications
First Degree Burn Superficial	Skin	Redness	2 – 3 days	Increase risk of skin cancer
Second Degree Burn Superficial Partial Thickness	Extends superficial into dermis	Red with clear blister	1 – 2 weeks	Local infection
Second Degree Burn Deep Partial Thickness	Extends deep into dermis	Red with white bloody blisters	3 – 4 weeks	Scarring contractures and skin grafting
Third Degree Burn	Extends through the entire dermis	Stiff and white/ brown	Prolonged	Scarring, contractures and amputation
Fourth Degree Burn	Extends through the skin, tissue, muscle and bone	Black or charred	Requires excision	Amputation, functional impairment, gangrene and death

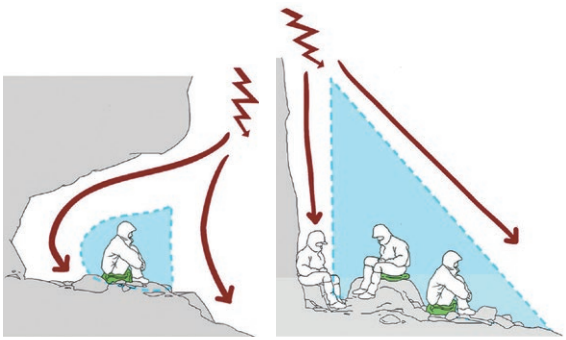
LIGHTNING

Thunderstorms are violent and intense events. If a group is caught high on an alpine ridge with minimal retreat options, they can become fatal. Get a good weather forecast and plan ahead for retreat options. Treatment includes initiating CPR if needed, and treating burns.

There are a number of mechanisms of injury.

- Direct strike – high likelihood of death, lethal cardiac injury
  - Will cause partial or full thickness burns
  - Some degree of protection can be found by hiding next to a high point that is at least 20 metres high. Insulate yourself from the ground
- Ground strike – fewer major problems
  - May cause asystole (cardiac arrest), or respiratory arrest
  - Spark gap
    - A ground current will arc across small gaps
    - If you are sheltering in a cave, ensure you are at least a metre back from the opening





HYPOTHERMIA

Hypothermia is the lowering of core body temperature. Although normally thought of as more of a winter hazard, the summer hiking leader must also be vigilant. Heat transfer occurs through convection, conduction, evaporation, radiation and respiration. Hypothermia can become a concern when two forms of heat loss occur at the same time. The combination of wet and wind is a potent force. An afternoon thunderstorm with heavy rain and wind will be enough to induce hypothermia in a poorly clad hiker.

Wind in particular can play a significant role in the effect of cold temperatures. Wind chill is the perceived lowering of temperature due to wind. The wind chill effect is amplified as the temperature drops.

Although the hiking leader may wish to move light and fast, good rain gear, insulation that remains warm when wet and a guide's tarp will go a long way to reducing the potential for hypothermia.

Different stages of hypothermia

- **Moderate hypothermia: 35 to 32° C.**
  - Intense shivering
  - Taciturnity, difficulty speaking
  - Stumbling, risk of falling
  - Cannot execute complex movements

This is the only stage of hypothermia during which it is possible to warm a victim back up in the field.

- **Severe hypothermia: 32 to 28° C.**
  - Shivering stops
  - Walking becomes impossible, muscles become rigid
  - Tendency to curl into the foetal position
  - Impaired consciousness, stupor
  - Cardiopulmonary slowdown
- **Deep hypothermia: 28 to 24° C.**
  - Hypertonic coma
  - Dilated pupils
- **Less than 24° C: lifeless appearance.**
  - Cardiac and respiratory arrest
  - Probable death, but death may occur at higher or lower temperatures
  - Heart and respiratory rates very low
  - Major risk of cardiac arrest

"There is no bad weather in the mountains, only poorly equipped hikers."

Wind Chill Factor / Index										
Wind speed (km/h)	What to look for when estimating wind speed	Temperature measured in ° C (first row) and perceived temperature (other rows)								
		0	-5	-10	-15	-20	-25	-30	-35	-40	-45
10	Wind perceptible on face; wind vane begins to move.	-3	-9	-15	-21	-27	-33	-39	-45	-51	-57
20	Small flags flap in the breeze.	-5	-12	-18	-24	-30	-37	-43	-49	-56	-62
30	Wind blows loose paper, large flags flap and small tree branches wave.	-6	-13	-20	-26	-33	-39	-45	-52	-59	-65
40	Small trees begin to sway, and large flags extend and flap strongly.	-7	-14	-21	-27	-34	-41	-48	-54	-61	-68
50	Large tree branches move, telephone lines whistle and it is hard to use an umbrella.	-8	-15	-22	-29	-35	-42	-49	-56	-63	-69
60	Trees bend, and walking against the wind is difficult.	-9	-16	-23	-30	-36	-43	-50	-57	-64	-71

Source: Environment Canada

Recommendations
Slight increase in discomfort. Dress warmly. Stay dry.
Uncomfortable. Risk of hypothermia if outside for long periods without adequate protection. Dress in layers of warm clothing, adding an outer wind-resistant layer. Wear a hat, mittens or insulated gloves, a scarf and insulated, waterproof footwear. Stay dry. Keep active.
Risk of frostnip or frostbite: check face and extremities for numbness or whiteness. Risk of hypothermia if outside for long periods without adequate clothing or shelter from wind and cold. Dress in layers of warm clothing, with a wind-resistant outer layer. Cover exposed skin. Wear a hat, mittens or insulated gloves, a scarf, neck warmer or face mask, and insulated, waterproof footwear. Stay dry. Keep active.
High risk of frostbite: check face and extremities for numbness or whiteness. Risk of hypothermia if outside for long periods without adequate clothing or shelter from wind and cold. Dress in layers of warm clothing, with a wind-resistant outer layer. Cover all exposed skin. Wear a hat, mittens or insulated gloves, a scarf, neck warmer or face mask, and insulated, waterproof footwear. Stay dry. Keep active.
Very high risk of frostbite: check face and extremities frequently for numbness or whiteness. Serious risk of hypothermia if outside for long periods without adequate clothing or shelter from wind and cold. Be careful. Dress very warmly in layers of clothing, with a wind-resistant outer layer. Cover all exposed skin. Wear a hat, mittens or insulated gloves, a scarf, neck warmer or face mask, and insulated, waterproof footwear. Be ready to curtail or cancel outdoor activities. Stay dry. Keep active.
DANGER! Outdoor conditions are hazardous. Stay indoors.

Note: see http://www.ec.gc.ca/meteo-weather/default.asp?lang=En&n=5FBF816A-1

EMERGENCY COMMUNICATIONS

If organized rescue is deemed necessary, communication should be initiated immediately and the following information provided to the local agency:

- The patient's exact location
- The caller's name and telephone number, if the communication is being initiated by phone
- The nature of the accident and the number of patients
- The severity of the patient's injuries, if known
- The patient's level of consciousness
- The time of the accident
- The local weather conditions
- Group size
- Any first aid actions that have been initiated

Table to keep in first aid kit:

Who?	Your first and last name, and where you can be reached.
Why?	Nature of the accident, number of victims, seriousness of the situation. Is the victim conscious?
Where?	Location, route, altitude, etc.
When?	Time of the accident.
Current weather conditions?	Winds, visibility, etc.

Ensuring that contact information for organized rescue is readily accessible is of crucial importance if an emergency necessitates this service. Phone numbers, radio frequencies and communication devices should be kept together and placed in an easily accessible location in the hiking leader's pack. Further, the leader should instruct participants in the use of all communication devices at the start of the outing, so they can initiate the call for help if required.

Communication devices

Whether on a day trip or a multiday outing, preparing for emergency communication is an important step should such an event occur.

Communication devices can include:

- Radios (FRS and VHF)
- Cell phones
- Satellite text communicators
  - In-Reach
  - Spot
  - Zoleo
- Satellite phones

Each device has its advantages and disadvantages, including cost, ability to connect, and one- or two-way communication capabilities. It is important for the hiking leader to recognize where the outing is to take place and the effectiveness of the chosen communication device being considered.

Device	Type of Comm.	Advantage	Disadvantage	Cost
Cell Phone	2-way	Conversation	Cell shadows	Low
Radio – VHF	2-way	Conversation	Radio shadows License to use Permission for frequencies	Low to Medium
Radio – FRS	2-way	Conversation – short range	Frequencies outside normal commercial agencies (wardens, lodges etc.)	Low
SPOT	1-way	OK or help signal	1-way communication Satellite coverage	Medium
inReach	2–way (text)	2-way text	May be unsure if or when msg is received	Medium +
Sat Phone	2-way	Conversation	Satellite coverage	High

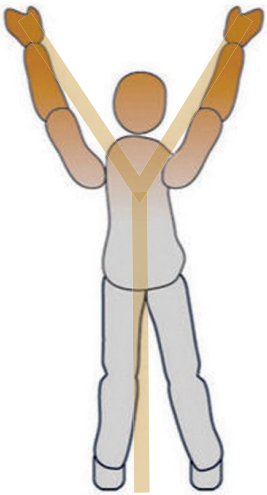




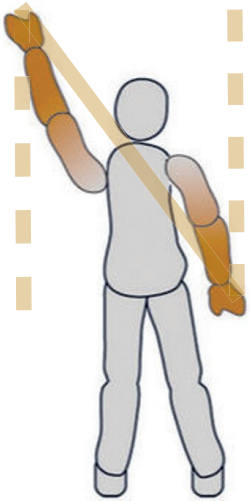




If organized rescue is coming by air, simple arm signals can assist the pilot in quickly locating the injured party.



Call for a rescue (Yes)



No need for a rescue (No)

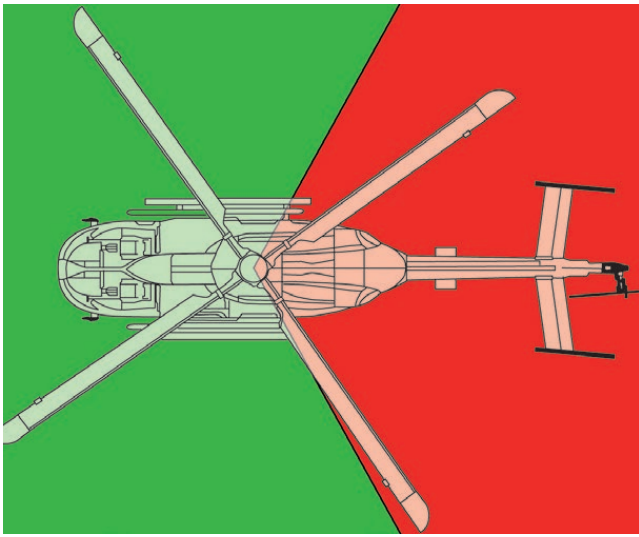
If organized rescue is coming by ground, designating one or two runners from the group to meet rescue personnel at the trailhead and direct them to the accident site is advisable when the site is difficult to locate or unfamiliar to rescue personnel.

HELICOPTERS

Helicopters are typically the first choice for emergency evacuation. A skilled pilot and rescue team can extricate an injured hiker from technical terrain, however there are limitations. The primary reasons that a helicopter cannot perform a rescue is poor weather and darkness. Most rescue helicopters in Canada are only equipped for VFR (Visual Flight Regulations). The hiking leader must consider the weather, the altitude of the landing area and the type of helicopter that might be available (as this will influence the payload and range). Helicopter pilots are capable of inserting their aircraft into some incredible places, however there are limitations. An awareness of both the capabilities and limitations of helicopters is essential when requesting assistance.

Safety around the helicopter

There are two components to safety around a helicopter: safety for people and safety for the helicopter. Both the main rotor and the tail rotor are close enough to the ground to strike a person. This is typically fatal. Only approach a running helicopter from the front, and only after the pilot has indicated that it is safe. Helicopters are by design an optimal balance of weight and power. This means that many parts on a helicopter can easily be damaged, and when damaged, often mean the machine cannot fly.



Helicopter danger zone - Approach from the front. Never from the back!

As the helicopter is making its final approach:

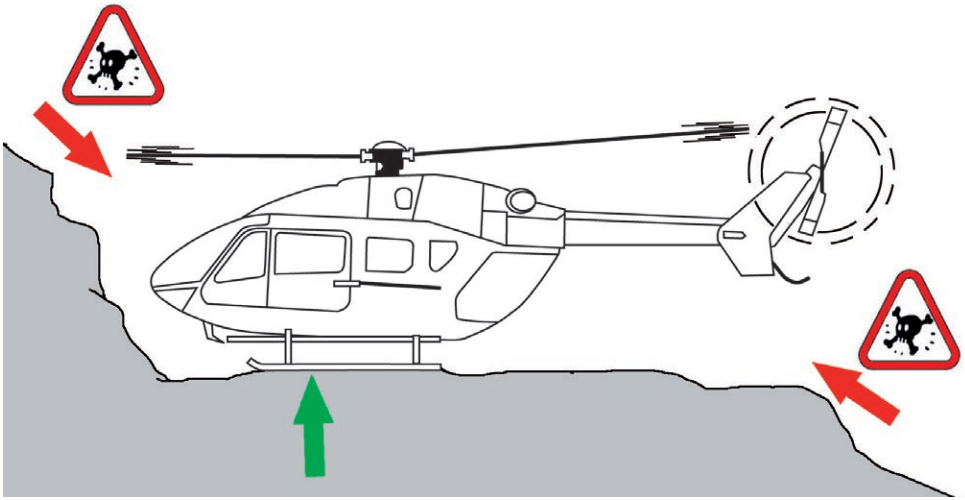
- Do a final check for loose objects
- Wear eye and ear protection
- Remain stationary
- Watch the helicopter land

Selecting a landing zone

Flight lines

- Both the approach and take off flight lines must be considered when selecting a landing area. The pilot will need a fixed visual reference at the landing spot. This can be a one-metre-high stake, ski pole or tree that will not blow away. The best visual reference is a person. Stand with your back to the wind and your arms pointing in the direction that the wind is blowing to.
- Wind intensity and direction
  - Helicopters should be facing into the wind for landing and take-off. Helicopters can land in fairly strong winds as long as the wind is consistent in both intensity and direction.
- Surface condition
  - The ideal landing pad is flat, solid and debris-free.

- Rotor clearance
  - Ensure there is adequate rotor clearance from trees, rock or snow. In alpine terrain, the pilot may be able to "toe-in" to a ledge if there is adequate rotor clearance to the rock. If the ledge is not big enough to fully land, the pilot will need to hold power. On a snow slope, dig out a ledge for the skid.
- Equipment
  - Ensure that all equipment is secured and will not blow away or up into the rotors.



Long lines and winches

Some helicopters (pilots and crew) are capable of performing long line or winch rescues. This requires a highly trained team. It allows a patient to be extracted from terrain where the helicopter cannot land.

EMERGENCY SURVIVAL SKILLS

In the event of an unplanned bivouac or an accident, the hiking leader must be able to provide shelter for the group. This is much easier to achieve below treeline, as both a shelter and fire can be constructed.

EMERGENCY SHELTERS

Emergency shelters must protect the group from precipitation and wind. Look for overhanging boulders, caves and natural feature that provide protection. If possible, select a site on rock. The go-to emergency shelter for hiking is the guide's tarp. This should be carried on all hikes. It must be large enough to shelter the whole group. Multiple tarps will be needed for larger groups. However, a guide's tarp alone is rarely sufficient. It must be used in conjunction with some form of wind block. This can be the lee side of a wind-exposed ridge, or a wall constructed from rocks or snow.

WINTER EMERGENCY SURVIVAL SKILLS

In the event of an accident or unplanned night out in winter, basic skills in fire lighting and improvised shelter construction can reduce the seriousness of the event.

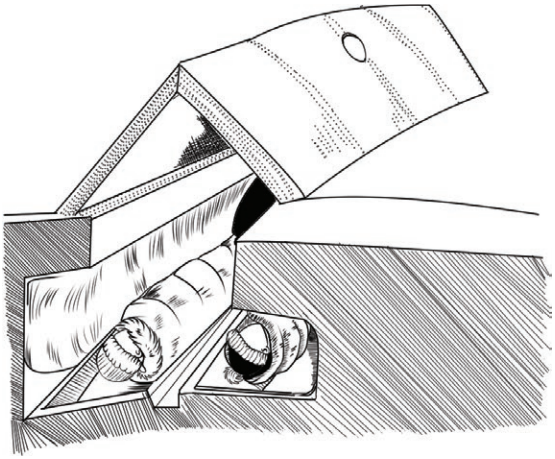
Emergency winter shelters

The type of emergency winter shelter one might consider will depend on the location (above or below treeline) and resources at hand (tarp, bivy sac, snow etc.). Start with simple solutions to determine if they will meet your needs before moving on to more complex and time-consuming options.

Snow shelters can be constructed. However, snow can be difficult and time consuming to work with. A shovel will dramatically accelerate the construction process. A huge amount of energy may be needed to construct an adequate shelter. Move the least amount of snow possible.

Should descending below treeline not be possible, here is an option for a hasty emergency style bivouac shelter (without the aid of a tarp): Hasty one- to two-person caves can offer some respite from the elements.

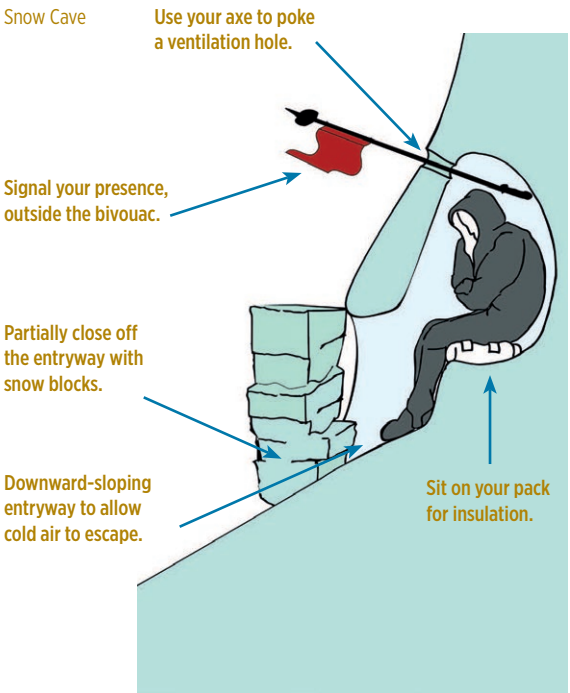
Below treeline emergency shelter designs are varied, but essentially utilize the environment as a backdrop for the shelter – sometimes in combination with a tarp or fly for protection and/or fire (as described below). A hasty shelter should be quick to build and will help maintain





L-R: A-frame trench

individuals' warmth. However, it may not necessarily be about getting a good night's sleep. One tried and true technique is to use a tree well, which is already a partial cave, to your advantage. Dig it out, further creating enough room for your group to sit and build a fire. Creative use of a tarp can aid in warmth and protection from the elements. The fire's heat will reflect off the walls of the snow and down from the boughs of the trees. Watch out for dropping snow bombs as the fire's heat melts them out.



FIRE LIGHTING

When at treeline or below, fires are an additional resource to provide warmth, cooking, melting snow for water, and/or psychological comfort in the event of an emergency. Practiced fire lighting skills are an essential component of the hiking leader's toolkit that will increase the group's comfort level in an emergency situation. If it appears that the group will

be spending the night out in an emergency situation, sufficient wood must be gathered to sustain the fire through the night. It will take more wood than anticipated to sustain a fire throughout a night and it is much more challenging to collect wood when it is dark, hence it is important to enlist the assistance of participants as soon as it is evident a night out is likely. Although starting fires with natural material is an essential skill, the hiking leader should also carry some form of fire-starting material. Small strips of bicycle inner tube are lightweight, waterproof and compact.

GROUP MANAGEMENT IN EMERGENCY SITUATIONS

Hiking leaders need to be cognizant of all group members in the event of an accident. While the patient may require immediate attention, uninjured party members often also require care and monitoring. If possible and practical, providing uninjured group members with tasks that assist in managing the emergency situation may help to occupy them. Common tasks that group members could complete in an emergency include:

- Assisting with first aid and documenting patient history and vitals
- Monitoring patients with non-life threatening injuries
- Creating a shelter and/or fire
- Meeting organized rescue at the trail head
- Inventorying the group's collective resources (gear, supplies and individual skills/training)
- Safety oversight (people can do unexpected and unpredictable things when adrenaline is flowing – safety of the responders remains the first priority)
- Constructing a flat landing pad for a helicopter

Normally, the leader would handle the content of external communications, but circumstances may suggest delegating this under supervision. The leader may consider delegating the technical aspects of establishing and maintaining external communications links with rescue agencies if communication cannot be established from the accident site. When doing so, the leader should write specific notes, so

important information remains consistent in the communication process.

If conditions allow, it is desirable that the leader remain in a supervisory, hands-off role. This will allow the leader to maintain oversight of the entire scene, plan ahead, allocate tasks and resources, and supervise. This will only work when there are group members with appropriate skills (training) in advanced first aid, shelter construction, technical skills etc. An effective leader is sensible, seeks advice, delegates wisely and, most importantly, takes charge and makes decisions.

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Haeren, Maarten van 15
Hoang, Peter 141, 153
Isaac, Sean 152
Moret, Olivier 160
Musto, Dominique 42, 69
Petzl 16, 100, 167, 170
Popov, Alex 142
Reynard, Blandine 39, 158, 159, 165
Shahshahani, Leila 113
Soissong, Alice 86, 93
Steadman, Shasta 40, 98, 127, 129, 147, 150, 174
Stewart-Patterson, Iain 1, 13, 14, 15, 20, 21, 23, 24, 26, 35, 45, 46, 48, 49, 53, 61, 62, 68, 70, 75, 76, 77, 78, 82, 83, 91, 105, 108, 121, 123, 124, 125, 127, 130, 131, 135, 136, 137, 138, 139, 140, 145, 148, 149, 150, 157, 162, 163, 174
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The purpose of this field handbook is to support The Alpine Club of Canada's Hiking Leader training program, as well as to act as an ongoing resource for the Hiking Leader. It is designed to highlight techniques and applications commonly used by Hiking Leaders to assist in the delivery of a successful hiking outing.

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