Integrating Activities for Advanced Communities

D3.10 - INTERACT Practical Field Guide

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CO	Confidential, only for members of the Consortium (including the Commission Services)	

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Publishable Executive Summary

This *Practical Field Guide* was jointly developed by INTERACT, APECS and research station managers with the aim of providing a resource that is designed to be taken into the field as a reminder of the main safety aspects and best practices. For the most common risks, specific safety tips and the recommended equipment are summarized. In addition, the field guide provides first aid basics, information on emergency preparedness, and space for emergency contact details.

INTERACT Practical Field Guide

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About INTERACT

INTERACT is a circum-arctic network with over 80 terrestrial field stations in the Arctic and adjacent boreal and alpine areas. The INTERACT network seeks to build capacity for research and monitoring in the Arctic and beyond and offers access to numerous research stations.

About APECS

The Association of Polar Early Career Scientists (APECS) is an international and interdisciplinary organisation for undergraduate and graduate students, postdoctoral researchers, early faculty members, educators and others with interests in the Polar and Alpine regions as well as the wider cryosphere.

Introduction to this guidebook

This *Practical Field Guide* was jointly developed by INTERACT, APECS and research station managers with the aim of providing a resource that is designed to be taken into the field as a reminder of the main safety aspects and best practices. For the most common risks, specific safety tips and the recommended equipment are summarized. In addition, the field guide provides first aid basics, information on emergency preparedness, and space for emergency contact details.

Disclaimer: This booklet is in no ways intended to replace proper safety training. Its purpose is solely to serve as a handy resource that can be taken with you into the field to remind you of main safety aspects. INTERACT and APECS take no responsibility neither for the content nor for your actions.

1 General advice concerning fieldwork

1.1 General guidelines

The safety of yourself and your team should be of highest priority during any fieldwork. Some general safety guidelines that apply to being out in the Arctic and Alpine regions include:

- Never head into the wilderness alone.
- Be properly trained for the tasks you set out to do.
- Ensure that all team members have completed first aid training.

Preparing your field outing:

- Always wear or bring warm and waterproof clothing with you.
- Always bring general and activity specific safety equipment with you.
- Always bring relevant means for navigation with you.
- Always bring at least two independent communication devices with you.
- Check that your equipment is in good working condition.
- Know how to use the equipment that you have with you.
- Always bring relevant emergency contact details with you and make sure that everyone knows where to find it.

- Be aware of potential risks and how to prevent these.
- Discuss your fieldwork plans with the station staff and team members.
- Be present and pay attention to where you are and what is happening around you.
- Pay attention to changes in weather, terrain, snow, and ice conditions.
- Obtain the latest weather/avalanche/sea or lake ice report/forecast, and arrange to have updates send to you.
- Sign out at the appropriate place when leaving the station/field camp.
- Sign in at the appropriate place when you return.
- Be aware of how to interact with the local community.

In the field:

- Groups should always stay together, with the most experienced person as the leader.
- Only move as fast as the slowest person in the group.
- Regularly check in with each other (e.g. check for frostbite).
- Eat, drink, and rest enough. Exhaustion can lead to unsound judgement, unnecessary risks, and accidents.
- Remember routine calls with the station and sub-groups.

- Communicate with others when you feel a situation is risky. Do not be afraid to point out any safety issues, however minor they might be.

1.2 Safety equipment

General safety equipment:

- First aid kit in waterproof packing
- Windproof and lightweight emergency bivouac bag (if relevant)
- Firearms and pyrotechnics (if relevant)

Communication equipment:

- Mobile phone
- GPS
- VHF radio
- Satellite phone
- InReach or SPOT
- Personal Locator Device
- Spare batteries and/or chargers

Navigation equipment:

- Map(s)/satellite images
- Compass
- GPS
- InReach
- SPOT
- Spare batteries and/or chargers

Essential personal equipment:

- Warm and waterproof clothing
- Backpack
- Whistle
- Headlamp
- Sunglasses
- Knife/multitool
- Water bottle
- Headlamp (if relevant)

2 Communication

2.1 Sign in/out boards

Stations have varying procedures, but normally you need to file a fieldwork/trip plan and use a board to sign in and out of the station.

Fieldwork plan

- Provide the station staff with your fieldwork/trip plan. Use this opportunity to obtain any relevant advice and check that you are adequately prepared to go into the field.
- If the station is unstaffed, leave your fieldwork plan at the station. This documentation may be useful to search and rescue teams if needed.

Sign out/in procedures
Each field team will be required to note their departure time, names of all team members, where they intend to go, as well as when they expect to return.

- Follow the station protocol and sign out on the relevant sign-out board.
- If you are changing your plan for some reason, make sure to communicate this back to the station (see section on non-routine calls).
- Upon returning to the station, remember to sign in.

FLOWCHART: Provide fieldwork/trip plan, ask for relevant advice --> Sign out --> Routine calls OR Inform the station of any deviations from your plan (non-routine call) --> Sign in upon return

2.2 Routine calls

When you are out in the field for longer periods (probably days) you will be requested to routinely call the station or a contact person to let them know that everything is well.

- Follow the agreed routine communication protocol.
- Use the back of this booklet to fill-in the routine communication protocol (telephone numbers, call frequency and time at which you need to report to the station).
- Use the routine calls to obtain updates on weather forecasts, sea-ice or snow conditions, polar bear sightings, etc.

2.3 Non-routine calls

You may need to make a non-scheduled call to the station or contact person to inform them about any changes while being out in the field.

It might be relevant to communicate with the station or contact person if:

- You are deviating from the planned route of travel for any reason.
- Weather is deteriorating and you need to stay out longer than expected.
- You are coming back to the station earlier than expected.
- You need assistance for safety or medical reasons.

2.4 Emergency calls

In case of emergency, the group leader should take charge and ensure emergency communication. Always have a list of emergency contact details (of the station and next of kin for all team members) with you and make sure that everyone knows where to find it.

In the event of emergency:

- Follow the agreed emergency communication protocol.
- Use the back of this booklet to fill-in agreed emergency contact details.
- Inform the contact person about:
  - Who is calling
  - Your location (if known)
  - A brief summary of the incident
  - Any injured people and their condition

Emergency calls

Who is calling?
Where are you?
What happened?
Are people **injured**?
What type of injuries?
Wait for questions.

Figure 2.1: Key information for emergency calls.

3 Safety during transport

3.1 Aircraft

You may need to fly in to the station or field camp that you are visiting. The flight company should provide detailed instructions, but here are a few important safety considerations to keep in mind.

Risks:

- Loading/unloading the aircraft.
- Embarking/disembarking the aircraft.
- Aircraft accidents.

Safety tips:

- Always await the pilot's instructions, they are ultimately responsible for your safety.
- During aircraft operations do not go on to the heli-pad or airstrip unless authorized to do so by the aircraft or airstrip staff.
- Never smoke in or near an aircraft.
- Remain seated with seat belts fastened during flights.
- Know the location and operation of emergency exits. Know the location of first aid kits and aircraft survival equipment.
- When loading, unloading, and reloading aircrafts ensure that you follow all safety procedures to avoid accidents.
- Always approach helicopters from the front and only when the pilot gives you the signal to do so. Never walk near the tail rotor.
- When carrying long loads towards a helicopter keep the load low and parallel to the ground.
- If you need to transport any cargo that is flammable, explosive, corrosive, under pressure, or poisonous, it is essential that it is properly packed and labelled, and that the aircraft crew are aware of the content.
- Multiple flights may be needed to bring all team members and equipment to a field site. It is essential that the first group carries enough food and gear to survive several days. This includes safety equipment and relevant means for communication and navigation, and where applicable tents, sleeping kits, cooking equipment, food, clothing, fuel.

3.2 Boats

INTERACT is a network of land-based field stations, but many of the stations are situated near coasts, rivers, or lakes with field sites that may be accessible only by boat.

Risks:

- Cold water temperatures.
- Icebergs and sea ice.
- Rapid weather changes.
- Landing boats in challenging areas.
- Wildlife.
- Cold injuries.
- Falling overboard.

Safety tips:

- Always wear a life jacket and/or immersion/survival suit.
- Make sure you are aware of all emergency procedures.
- Always carry the relevant communication and navigation equipment with you.
- Ensure waterproof packing of all equipment.
- When relevant, cover all body parts, including the face. This will help to protect you from cold injuries due to wind and splashing water.
- Wear insulated rubber boots or regular rubber boots with thick wool socks.

Safety Equipment:

- Life jacket and/or immersion/survival suit.
- Goggles, boots and gloves.
- Ensure waterproof packing of all equipment.
- Relevant navigation and communication equipment.
- Spare parts and basic tools for repair of engine and boat, extra fuel and oil, funnel.
- Emergency flares.
- You may also want to prepare a waterproof grab-bag with essentials such as emergency flares, communication and navigation tools, wind protection, torch, matches, etc.

3.3 Snowmobiles

Snowmobiles are often used to transport people and equipment. They should always be used with care as accidents may occur easily.

Risks:

- Unsafe driving (accidents occur most frequently from driving too fast).
- Inexperienced drivers.
- Dangerous terrain (e.g. sea-ice, steep mountain slopes, rocky terrain, areas with risk of snow avalanches, crevassed glaciers).

General safety tips:

- Spend time to learn how to drive a snowmobile.
- Make sure that the snowmobile is in good working condition and that there is enough fuel for your activity.
- Wear a suitable safety helmet.
- Ensure that you are dressed appropriately and do not leave skin uncovered. This also includes any possible passengers.
- Check weather forecast and trail/snow/glacier/sea ice conditions before heading out.
- Always have the relevant communication and navigation equipment with you.
- Always have spare parts, basic tools, and extra fuel with you.
- In remote and difficult terrain always travel with at least two snowmobiles.

Safety tips while driving:

- Agree on clear signals for slowing down and stopping.
- When starting, drive out one by one and drive behind one another.
- Always maintain visual contact, still keep a safe distance between each snowmobile.
- Drive on snow to avoid damage of the snowmobile and the environment.
- Pay attention to changes in the terrain and snow and ice conditions. Do not attempt to cross open water or slush.
- Adapt your driving speed and technique to the conditions, i.e. drive slower in unknown terrain and/or poor visibility.
- When travelling across sea-ice or glaciers, the second and the last snowmobiles are the ones to carry rescue equipment.
- If there is enough space, always park snowmobiles next to each other in a line.

Safety tips for transporting a sled:

- When packing a sled, place the heaviest items near the balance point of the sled.
- Pack smaller items in sled bags (if available) with any emergency equipment easily accessible.

- Use taut-line/ratched straps or trucker's hitches to tie gear down.
- Over uneven terrain, driving slowly will keep the sled stable.
- Periodically check your sled and cargo.
- When driving over sea-ice let a single snowmobile without sled drive first. If conditions appear safe, follow the same tracks but leave a good distance between the snowmobiles.

Safety equipment:

- Helmet, goggles, gloves, sturdy boots, and warm clothing.
- Extra clothing, spare goggles and gloves
- Sufficient provisions.
- Relevant navigation and communication equipment.
- Snowmobile repair kit: spare parts, basic tools, extra fuel and oil, cooling liquid, funnel, start cables, axe, rope.
- Ice spikes (when travelling across sea-ice or frozen lakes and rivers).
- Crevasse rescue equipment (when travelling across glaciers).
- Avalanche transceiver and rescue equipment (when travelling through avalanche terrain).
- When travelling long distances/multiple days: Snowmobile repair kit and camp equipment.

3.4 Vehicles (cars, trucks, ATVs, etc.)

Some INTERACT stations are accessible by road and at some stations vehicles can be used for transport into the field.

Risks:

- Road accidents.
- Snowy and icy roads.
- Accidents in rough terrain.
- Accidents in stormy weather with poor visibility.

Safety tips:

- Make sure you have a relevant driving licence for the type of vehicle you will use (and bring your driving license with you).
- Always adhere to the national traffic regulations.
- Use the seatbelts at all time.
- Drive safely and according to the conditions, especially in stormy weather with poor visibility and on snowy, icy or otherwise difficult roads.
- If vehicles are used to get around the station itself, follow all rules accordingly.
- When walking on roads in darkness or weather with poor visibility, stay on the sides, bring a torch and wear bright clothing or a reflective vest.

4 Safety in field camps

4.1 Setting up a field camp

All field camps need to be arranged properly.

Risks:

- Fire.
- Flooding, rock falls, rock and snow avalanches, glacial lake outburst floods, tsunamis created by calving glacier fronts.
- Strong winds and snow storms.
- Wildlife.

Keep the following in mind:

- Make sure you know how to set up your tent.
- Plan the camp layout and put up tents in daylight.
- Consider the topography when choosing your campsite. Avoid areas prone to flooding, rock falls, avalanches, etc.
- Do not camp in areas commonly visited by animals. Check the area for any signs of wildlife (tracks and droppings are good indicators).
- When possible, choose a site close to a source of running water and/or clean snow.
- Place tents some meters apart to minimise the risk of fire.
- Make the ground as flat as possible, for example, by compressing snow or removing rocks.
- A ground sheet is good for insulation and to keep things dry.
- Place your tent so that the entrance faces away from the predominant wind direction.
- Make sure your tent is securely anchored and check guy lines daily.
- Should you lack tent pegs, remember that you can always use stones, skis, hiking poles, or anything else appropriate to tie down your tent.
- You may want to build a snow or rock wall around your tent as wind/snow protection.
- Latrines should be placed at least 100 m away from the camp and downstream of any fresh water sources (streams, rivers, lakes, fresh snow, etc.).
- Pack out all waste upon return to the station and dispose of what you can at the station. This may include human waste.

Standard camping equipment list:

- Tent (including pegs and poles).
- Ground sheet.

- Mess tent (if relevant, including pegs and poles).
- Mattress(es).
- Sleeping bag(s).
- Cooking stove(s).
- Fuel bottle(s), filled with correct fuel blend.
- Pot(s) with lid.
- Plates/bowls, mugs and cutlery.
- Knife.
- Relevant provision.
- Matches/lighter in waterproof packing.
- Headlamp/torch.
- Shovel (for snow/latrine, where relevant).

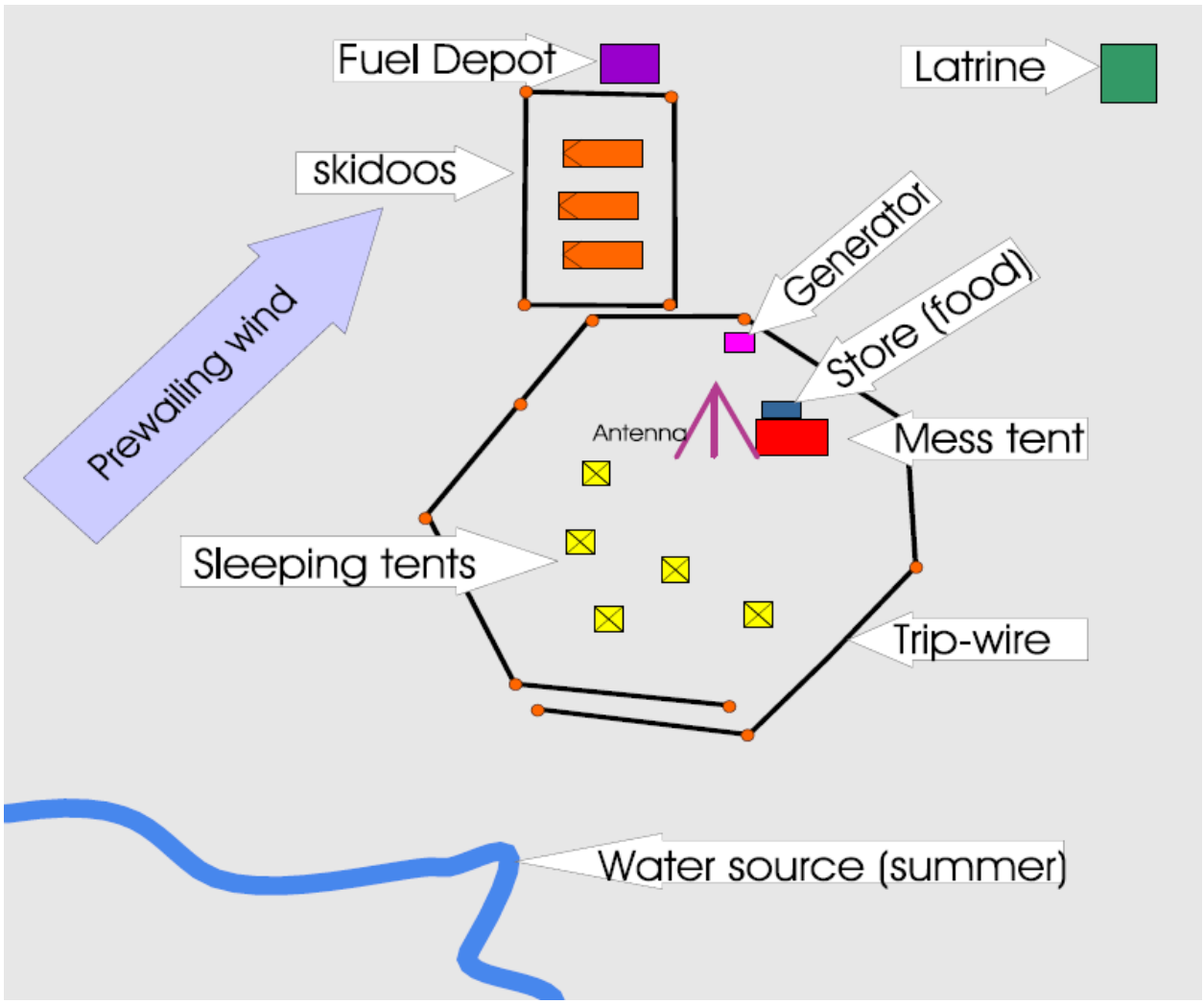


Figure 4.1: Possible camp layout including a tripwire system. Image from UNIS.

4.2 Cooking

You will likely be cooking your food on some form of gas or liquid fuel stove.

Risks:

- Fire (much outdoor fabric, e.g. waterproof clothing and tents can easily burn).
- Carbon monoxide (CO) poisoning: Dangerous amounts of CO can accumulate in a poorly-ventilated area.

Safety tips:

- Test the stove and know how to repair it before heading out.
- Make sure that you have the correct fuel blend (propane-butane mix in cold temperatures).
- If you need to refill a liquid-fuel canister do this carefully outside and with a designated pair of gloves.
- Pack stoves and fuel away from food.
- Check your stove and fuel canisters for damages or leaks before use.
- Always cook in ventilated places. Avoid cooking inside small tents, except in emergencies.

4.3 Drinking water

In the field you might get fresh water from a stream, river, lake, or by melting fresh snow. Depending on where you are you may need to treat your drinking water.

Risks:

- Contamination with waterborne bacteria and viruses.
- Contamination with toxins.

Safety tips:

- Snow and glacier water is depleted of minerals and salts. When using glacier water or melted snow as drinking water, make sure that you get these minerals and salts through your diet. You may also want to add a pinch of salt to the water.
- Treat any water you are uncertain about. Treatment options include:
    - Boiling water for at least three minutes.
    - Iodine/chlorine tablets (usually take 30-120 minutes to take effect).
    - Water filters (many different ones exist that filter various things).
- Remember that boiling water, adding iodine or chlorine, and filtering water may not necessarily remove any toxins. Therefore, be aware of any sources for possible chemical contamination of your drinking water.

5 Managing natural hazards

5.1 Weather

The weather in the Arctic and Alpine regions can change surprisingly rapidly. Therefore you need to be prepared for strong winds, cold, wet weather, and limited visibility at any time of year.

Risks:

- Getting lost due to limited visibility.
- Cold-related injuries.

Safety tips:

- Obtain the latest weather forecast whenever possible.
- Ask about local weather conditions, such as areas particularly vulnerable to strong winds, or tell-tale signs of weather change.
- Pack enough clothing, food, and water, even if good weather is predicted.
- Stop your fieldwork and return to the field camp or station if the weather starts to severely deteriorate, or head for shelter.
- Inform the station if you need to stay out longer than originally planned due to bad weather (see section on non-routine calls).
- Remember that wind chill and humidity have a strong effect on the temperature felt.

Wind			Temperature (°C)														
km/h	m/s	knots	25	20	15	10	5	0	-5	-15	-20	-25	-30	-35	-40	-45	-50
0	0	0	25	20	15	10	5	0	-5	-15	-20	-25	-30	-35	-40	-45	-50
7	2	4	25	20	15	9	5	-1	-6	-16	-21	-26	-31	-36	-41	-46	-51
14	4	8	23	17	12	5	0	-6	-12	-24	-30	-36	-42	-48	-54	-60	-66
22	6	12	23	16	10	3	-3	-10	-16	-29	-36	-42	-49	-55	-62	-69	-75
29	8	16	22	15	8	1	-6	-13	-19	-33	-40	-47	-54	-61	-68	-75	-82
36	10	19	21	14	7	0	-7	-15	-22	-36	-43	-50	-58	-65	-72	-79	-86
43	12	23		14	6	-1	-9	-16	-23	-38	-46	-53	-61	-68	-75	-83	-90
50	14	27		13	6	-2	-10	-17	-25	-40	-47	-55	-63	-70	-78	-85	
58	16	31			5	-3	-10	-18	-26	-41	-49	-57	-64	-72	-80	-87	
65	18	35					-11	-19	-26	-42	-50	-58	-65	-73	-81	-89	
72	20	39							-27	-43	-50	-59	-66	-74	-82	-90	

Cold Index	Effect from prolonged exposure, correctly equipped
0°C to -20°C	Minimal risk, but false sense of security at prolonged stay
-20°C to -40°C	Increased risk level, lighter frostbites of exposed skin
-40°C to -60°C	Danger, frostbite of exposed skin within a short time
under -60°C	Grave danger, immediate frostbite of exposed skin

The wind chill factor describes the real temperature felt as a result of temperature and wind speed. Increasing wind speed decreases the temperature experienced considerably.
Source: DMI

Figure 5.1: Wind chill chart. Image from Danish Meteorological Institute.

5.2 Glacier fieldwork

Travelling over glaciers is always a dangerous activity. Do not attempt to do so without training in glacier travel and crevasse rescue methods.

Risks:

- Crevasses.
- Snow bridges.
- Melt water channels and holes.
- Calving off tidewater glacier fronts and tsunamis in water bodies.
- Unstable moraine areas.
- Glacial lake outbursts.

Safety tips:

- Never approach a glacier without proper training.
- Never go on to a glacier alone.
- Never go on to a glacier in bad weather conditions, e.g. during poor visibility, storms, or heavy snowfall.
- Always rope up when travelling on glaciers.
- Even on warm days, keep your hands, arms and legs covered as ice and small rocks can be sharp.
- Follow known routes and GPS tracks (if available).
- Even if there are tracks from other teams, you should NOT assume that you are safe. Snow bridges may have thinned or ice conditions may have changed.
- If you are unsure about ice or snow bridge stability, stop and probe the area around you with an avalanche probe.
- Avoid areas where the glacier surface changes significantly (steepness, narrowness, etc. – this is where most crevasses occur). Do also avoid areas with visible crevasses and/or an irregular glacier surface.
- Be aware of meltwater channels.
- Keep a good distance from tidewater glacier fronts.
- Move carefully in adjacent moraine areas as these may be unstable.

Equipment list:

- Ice axe.
- Crampons.
- Harness.
- Rope.

- Helmet.
- Gloves.
- Avalanche probe.
- Crevasse rescue kit (this may vary, depending on the rescue technique you are familiar with).

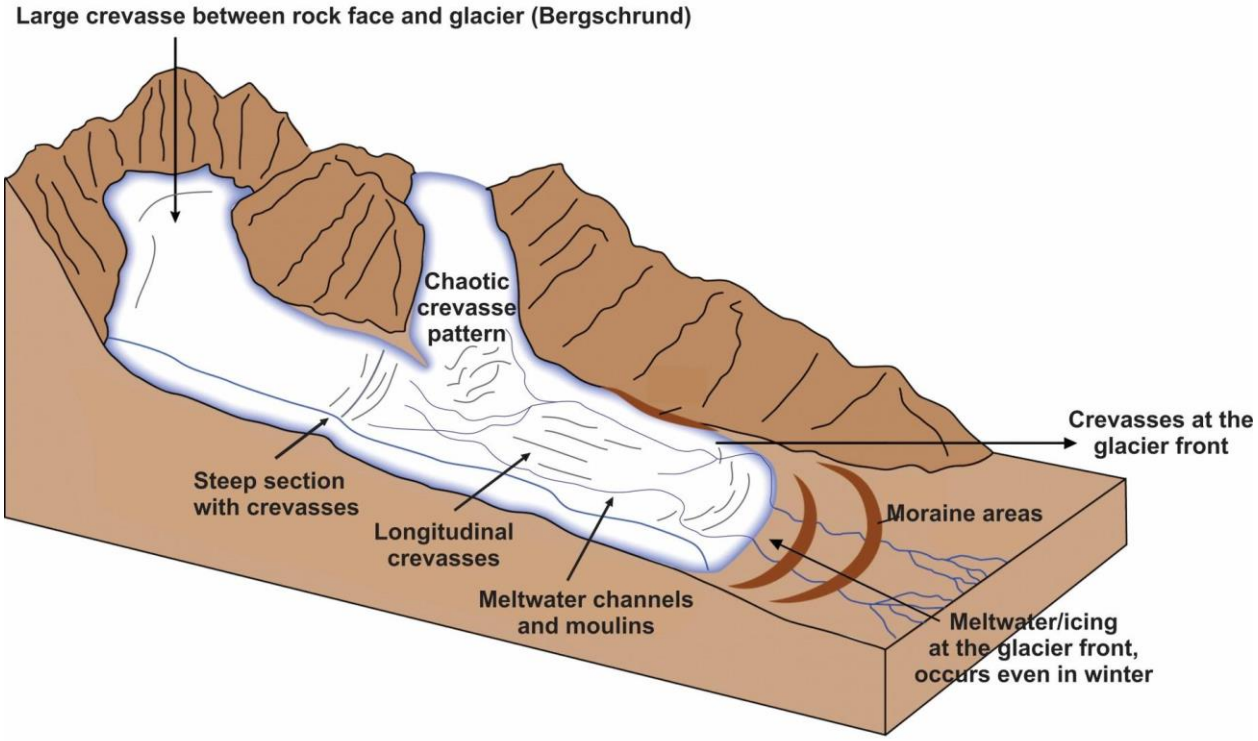


Figure 5.2: Schematic view of a glacier with areas that require special attention. Image modified from climatica.org.uk.

5.3 Snow avalanches and cornice falls

Risks:

- Steep snow covered terrain (>30°).
- Wind-loaded and convex slopes.
- Terrain traps (e.g. flat areas or topographic depressions below steep slopes/cliffs).
- Narrow ravines.
- Cornice build-up on lee sides of crests and ridges.

Signs to watch out for:

- Evidence of avalanches in the area (e.g. previous avalanches, torn trees).
- "Whoompfing" sounds.
- Cracks in the snow that propagate sideways from below your footwear or skies.

Safety tips:

- Never travel alone in avalanche-prone terrain.
- Ask station staff or local people about local conditions.
- Stop to estimate slope steepness if in doubt.
- Avoid slopes steeper than 30°, narrow ravines, and terrain traps.
- Avoid convex slopes and wind-loaded slopes.
- Keep good distance from snow loaded slopes or cornices above you.

Should someone get caught in a snow avalanche:

- You have very little time. It is vital to start searching for the victim(s) immediately. If you saw what happened, search in the area where you expect them to be (where you saw them the last time or where you spot part of their equipment in the snow).
- If you are a group of several people, one person makes an emergency call. All other group members search for the victim(s).
- Follow the search pattern described below.
- Once you have located the victim(s), dig them out as quickly as possible.
- Move the victim as little as possible. They may have suffered internal injuries that are invisible.
- If necessary, free airways, start CPR, and keep the person warm.

Safety equipment:

- Avalanche transceiver, worn on the body and switched on.
- Avalanche probe.
- Snow shovel (metal).

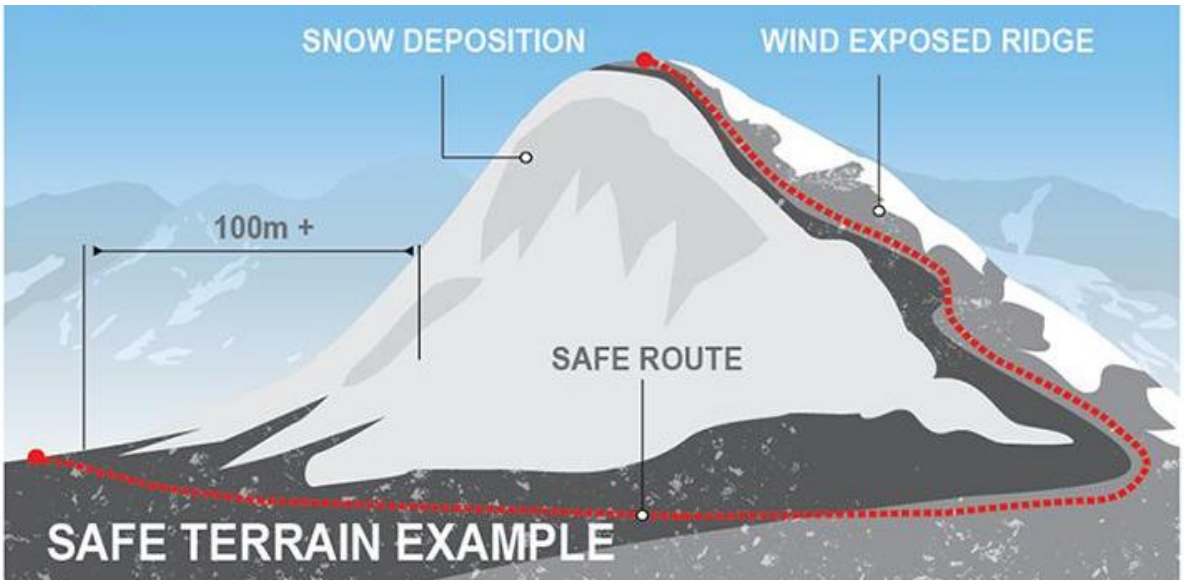
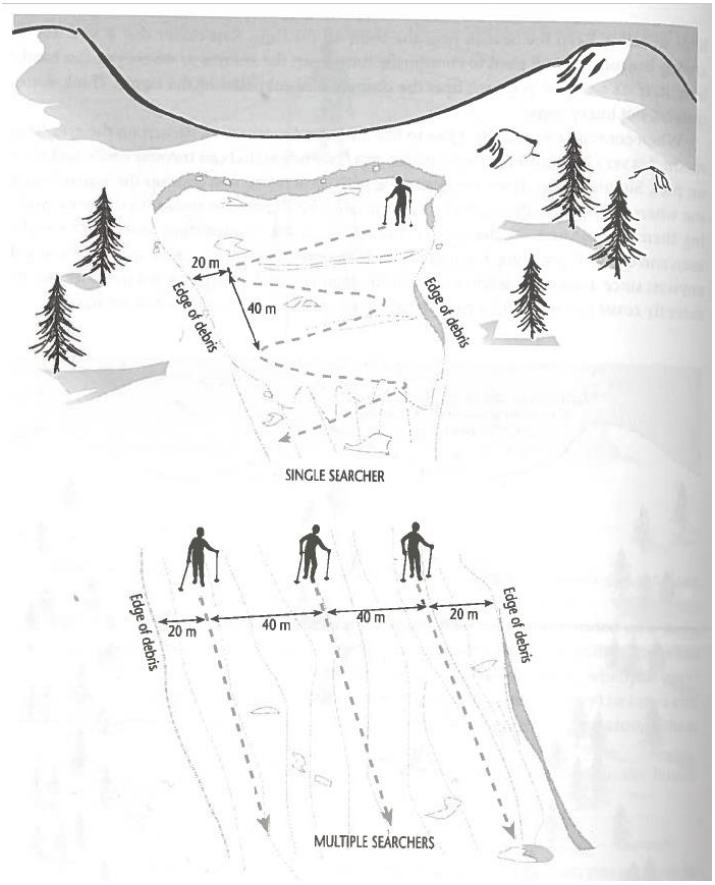


Figure 5.3: Example of a safe route choice in avalanche terrain. Image: Scottish Avalanche Information Service.



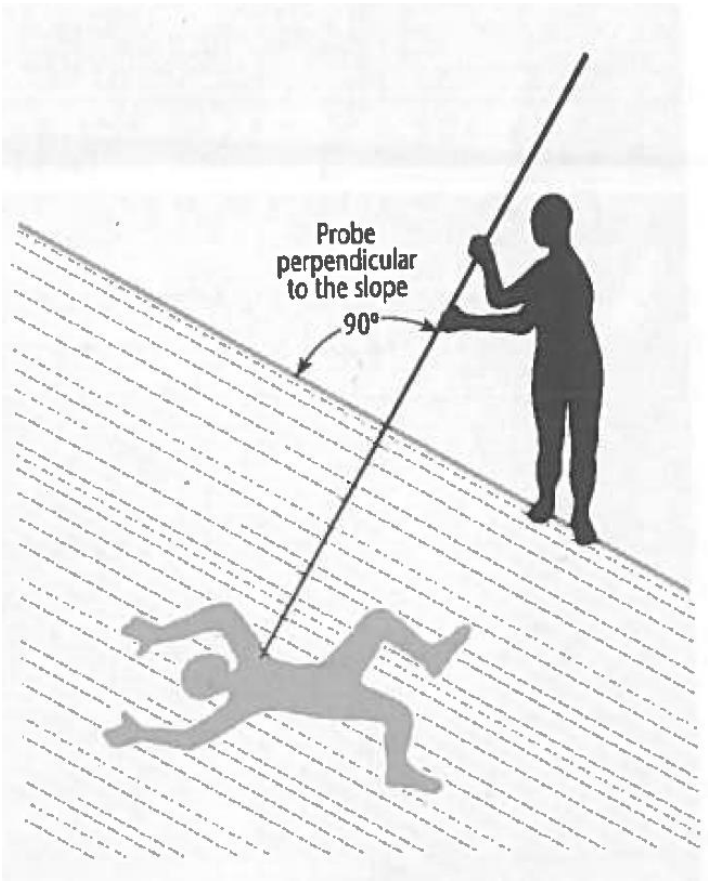


Figure 5.4: Avalanche search patterns for one and multiple persons searching. Images from B. Tremper, staying alive in avalanche terrain p 258 & 259.

5.4 Travelling in steep terrain

Risks:

- Rock falls and rock avalanches.
- Mud slides and mud flows.
- Snow avalanches.

Safety tips in steep terrain:

- Avoid areas under cliffs and steep slopes where there are signs of recent rock falls.
- When moving in areas with loose rocks, take extra care to not destabilise or make rocks fall – especially when there are other people in the area/below you.
- On steep terrain, never walk directly above or below another person.
- Consider to use hiking poles when working in steep rocky terrain.
- Wear helmets, use rope protection when applicable, and ensure that your gear does not fall.
- If you do cause a rock to fall, shout out a predetermined warning, e.g. "Rock"!

Safety tips in avalanche areas:

- See the section on snow avalanches.

5.5 Travelling on ice

Travelling over sea-ice or on frozen lakes and rivers is a dangerous activity. Do not attempt to do this without proper safety training.

Risks:

- Falling through the ice.
- Cold-related injuries.
- Drowning.

Safety tips:

- Consult ice reports, the station staff or other locals about the current ice conditions.
- Only travel across sea-ice if:
    - Ice thickness is more than 12 cm and you are travelling on foot or with skis ([1]).
    - Ice thickness is more than 30 cm and you are travelling on a snowmobile ([1]).
    - Ice thickness is more than 30 cm at -15°C or more than 50 cm at -2°C and you are travelling in a vehicle of 3 tonnes or more ([1]).
    - Lake ice should have a thickness of at least 10 cm before it is safe to enter on foot ([2]).
- Pay attention to the colour of the ice and snow. Changes in colour may indicate changes in ice thickness and/or the presence of slush.
- Avoid areas with slush and open water and areas around icebergs.
- Measure the ice thickness several times if you are unsure about it.
- Keep in mind that ice can be thinned by currents below and or weather changes above the ice.
- Do not travel across ice in bad weather conditions, e.g. during storms, poor visibility, or changes to warm weather.
- Be extra careful at the end of the winter season; this is when most accidents happen.

Safety equipment:

- Ice-spikes (these should always be around your neck).
- Probe or drill to test ice thickness (if applicable).
- Rope.

[1] University Centre in Svalbard
[2] Tarfala Research Station in Sweden

5.6 River crossings

- Consider using a rope.
- Cross one person at a time.
- Cross rivers where they are broad and shallow rather than where they are narrow and deep.
- Keep in mind that glacial rivers often flow more strongly in the late afternoon than in the morning. Plan your trip accordingly.
- Always wear shoes or sandals when crossing a river (rocks can be slippery or sharp).
- Use hiking poles to keep balance easier.
- Loosen your backpack straps for the crossing so that you can easily remove it should you slip and fall.

5.7 Dangerous wildlife

Some of the Arctic animals can be dangerous, no matter their size.

Risks:

- Infections from bites and scratches.
- Diseases, such as rabies.
- Parasites, such as *Echinococcus multilocularis.*
- Serious injury from various forms of unpredicted attack.

How to behave during close encounters:

- If an animal is acting aggressively, group together to look as large as possible.
- If the animal gets too close for comfort, make as much noise as you can.
- Do not run. You cannot outrun any of the larger mammals.
- Always back away slowly in a calm way with your eyes averted and not showing your teeth.

Avoiding parasite infections:

- Do not touch carcasses.
- Always wear gloves when handling wild animals, particularly birds.
- Boil your drinking water for at least three minutes.

Encounters with potentially rabies infected animals:

- If you are bitten by a fox or reindeer (on Svalbard) seek medical attention immediately. It is likely that you need to get a rabies vaccination within 48 hours.

Safety equipment:

- Canisters or containers for storing food and garbage.
- Deterrents, e.g. flare gun, pepper spray (where allowed, in regions with brown/black bears).
- Mosquito protection (e.g. deterrents, bug shirts, nets, gloves).

5.8 Safety measures in polar bear country

Polar bears are magnificent but potentially dangerous predators. Encounters can have serious consequences.

Risks:

- Serious injury from various forms of unpredicted attack.

Working in polar bear country:

- Consult the station manager and/or locals about recent polar bear sightings.
- Be alert and aware of your surroundings.
- Establish a bear watch during stationary fieldwork.
- Travel in daylight and avoid areas with restricted visibility.
- Trained dogs can help to detect polar bears.
- Carry deterrents and firearms. Know when and how to use them, and practice beforehand.
- Remember that firearms should be your last resort of self defense when other ways of deterring polar bears fail.
- Never approach a polar bear for any reason, in particular eating bears or mothers with cubs.
- Report all polar bear sightings to the station staff as soon as possible.

Precautions for field camps in polar bear country:

- Bring appropriate firearms and ammunition and know how to handle them.
- Establish a bear watch, especially during night time.
- Consider putting up a tripwire system around your camp.
- Night vision binoculars may be helpful to identify bears at night.
- Use sealed bags or bear-proof containers to store food and garbage. Store them at least 100 m away from your camp.
- Do not assume cabins are "bear proof" places.

Safety equipment:

- Binoculars.
- Polar bear deterrents: flare gun/signal pistol, pyrotechnics, noisemakers.
- Weapons for self defense: Rifle and ammunition.
- Tripwire systems.

When encountering a polar bear:

- Stay calm and watch the bear's behaviour.
- If the bear does not know you are there: Quietly back away, keep an eye on the bear.

- If the bear knows you are there: Help the bear to identify you as a human. Wave your arms slowly, talk in low tones, move slowly upwind so the bear can catch your scent.

Polar bear behaviour:

- Signs of curiosity: moving slowly with frequent stops, standing on hind legs and sniffing the air, moving its head from side to side.
- Signs of polar bears being agitated or feeling threatened: growling or jaw-snapping, stamping its feet, staring directly at you, lowering its head with the ears laid back.
- Signs of stalking or hunting: following or circling you, approaching directly and unafraid, returning after being scared away.

Aggressive encounters and self defense:

- Act non-threatening: Avoid direct eye contact. Back away slowly. Do not run.
- Be prepared to use deterrents.
- Make sure the bear has a clear and obvious escape route before using deterrents.
- Make sure deterrents explode in the air or touch the ground between you and the bear.
- If the bear is 30 m and approaching, prepare to shoot lethal rounds: Aim for large muscle groups such as the shoulder and the rump. Do not aim for its head, lower limbs, or belly.

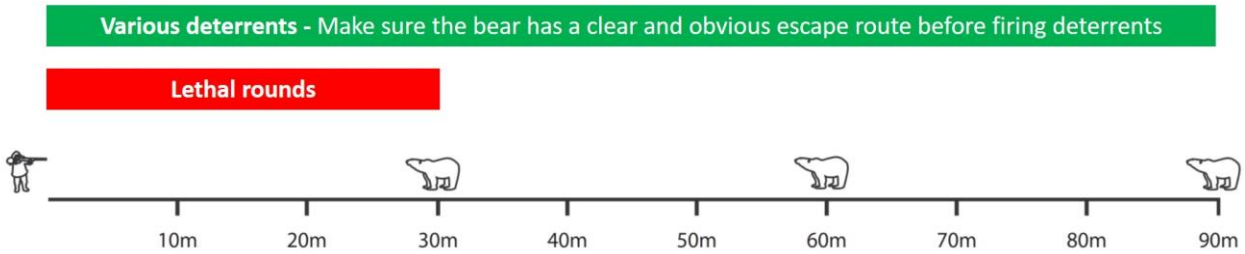


Figure 5.5: Distance ranges for deterrents and lethal rounds. Image modified from: Bear Safety. Reducing Bear-People Conflicts in Nunavut.

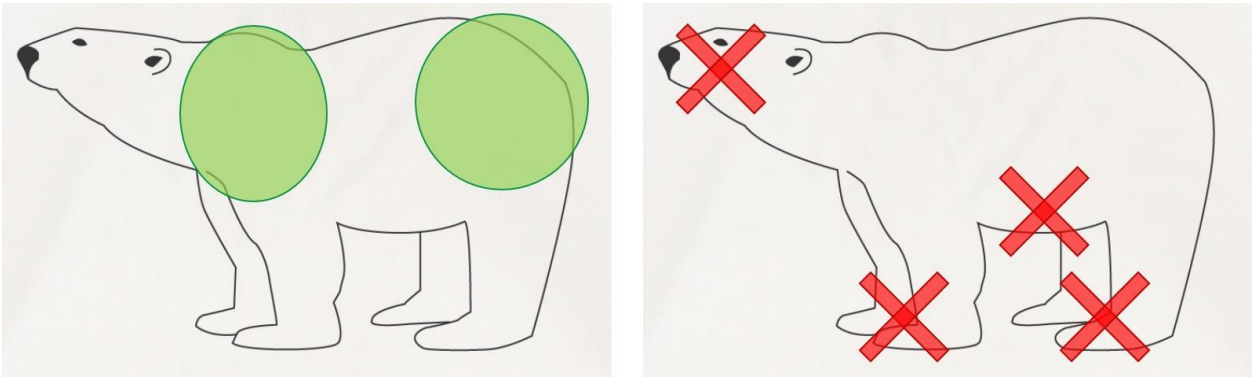


Figure 5.6: When shooting lethal rounds: Aim for large muscle groups such as the shoulder and the rump. Do not aim for its head, lower limbs, or belly. Image modified from: Bear Safety. Reducing Bear-People Conflicts in Nunavut.

6 Codes of conduct at stations and in the field

6.1 Fire

Many Arctic and northern Alpine environments have limited access to running water. When being at a remote and rather dry location, a fire may have severe consequences.

Risks:

- Fires in field camps and at stations.

Safety tips in field camps:

- Be extra careful if you are working in the kitchen and use flammable substances in laboratories.
- Place tents with a proper distance between them.
- Avoid cooking inside small tents.
- Exercise care when using campfires and make sure that fires cannot spread from there (e.g. pour enough water or sand on it after use).

Safety tips at stations:

- If differences in voltage occur, use adapters.
- Never leave charging devices unattended.
- Memorize the location of emergency exits and fire extinguishers in the station.
- Only smoke outdoors and never throw cigarette butts on the ground.
- Keep a good distance from buildings and tents when using campfires.

6.2 Firearms

In areas with polar bears, you need to carry a weapon and/or pyrotechnics (such as rifle, flare gun/signal pistol, firecrackers and/or handheld flares). You will very likely need to complete specific training before you are allowed to handle them.

Risks:

- Accidents with firearms.
- Jamming of firearms.

Proper handling of weapons:

- Understand what important terms mean:
  - Signal pistol/flare gun = handgun used for firing flares. Used as deterrent to scare off polar bears.
  - Firearm (in this context) = rifle suited for polar bear protection.
  - Half loaded = magazine is filled with ammunition while ensuring that the chamber is kept empty.
  - Loaded = ammunition is in the chamber.
  - Emptying the firearm = remove ammunition from the magazine and ensure the chamber is kept empty. Visually inspect and feel inside the chamber and magazine with your fingers to make sure they are empty.
- Never point a firearm at someone.
- Always check that the firearm is empty when you receive or give it to someone.
- Check the rifle for any damage and ensure that the sights are present and centred.
- As a main rule, firearms should be carried and transported empty. Ammunition should be stored easily accessible.
- Near buildings and communities carry the rifle so that everyone can see that the rifle is empty (bolt open or removed).

Safety tips:

- Be aware of any rules/laws/regulations regarding transport, storage, and use of firearms and ammunition.
- Train with the firearm that you will be using.
- Ensure dust- and waterproof packing of firearms during transport. When having a firearm in the field, you may want to cover the barrel opening with tape or similar to avoid dirt, snow, and ice from entering the barrel.
- Leave firearms outside when it is very cold as this avoids condensation and freezing of moving parts.

6.3 Getting lost

Getting lost happens regularly when working in remote areas, though most often it can and should be avoided. Remember that you put yourself, your team, and search and rescue personnel in unnecessary danger by getting lost.

How to avoid getting lost:

- Always have appropriate navigation and communication equipment with you: maps of different scales, satellite images, compass, GPS, mobile phone, satellite phone, VHF radio, InReach/SPOT, and/or other personal locator devices.
- Follow known GPS tracks if available.
- Have coordinates of the stations and/or camp, field sites, and potential shelters.
- Regularly check your map and/or GPS to know where you are. Use terrain features for orientation.
- If in doubt, stop and consult your map and/or GPS.

What to do if you get lost:

- Stay where you are, especially if the weather is deteriorating.
- Communicate with the station/contact person to inform them of your problem and last known position, and discuss with station manager how the situation can be resolved before initiating a search and rescue operation.
- Put up an emergency shelter if need be and adhere to the guidelines and orders given by the station manager and rescue personnel.
- Wait for rescue.

6.4 Shelters

If the weather deteriorates severely, or you get lost, it can be necessary to stay where you are and make or find shelter.

General guidelines:

- Move out of the wind. You can find shelter behind big rocks/vegetation, below ridges, etc.
- Take shelter in a windproof and lightweight emergency bivouac bag.
- Build an emergency shelter of whatever natural material is available, e.g. stones, snow, etc.
- Be aware of your surroundings. Avoid staying in terrain prone to avalanches and rock fall.

Figure 6.1: Building a snow (or stone) wall around your tent to protect it from the wind. Foto: K. Terwoelbeck

6.7 Respecting protected areas, cultural heritage, and environmental considerations

Protected areas may be subject to various restrictions and regulations.

General guidelines:

- Make sure you are aware of where protected areas are located and, if necessary, that you have the correct permit to enter them.
- Do not remove any plants, geological specimens, or artefacts from historical sites unless you have a permit to do so.
- Show respect to local communities and cultural heritage sites as they may still be in use.
- Do not build cairns or modify the environment in any way that is not a part of your field work.

6.8 Encounters with wildlife

There are many amazing animals in the Arctic and Alpine regions. Some of them can be dangerous. The best way to avoid incidents is to avoid encounters with wildlife in any way.

- Do not travel alone, especially not if there is a good chance of encountering large mammals.
- Be aware of your surroundings and keep your eyes open for animal tracks and droppings.
- Keep at least 100-200 m away from all animals, including marine mammals. Remember that animals are unpredictable and may act differently than expected. Large species can inflict significant damage even if just being curious.
- Always observe the behaviour and move away if animals show signs of distress. Familiarise yourself with aggressive behaviour of the potential dangerous species you may encounter.
- Never get between a mother and her young, no matter the species.
- Never approach eating wildlife, particularly bears.
- Never feed any wild animal, no matter the size.
- Do not leave food, cooking equipment, backpacks, boots, or anything else that may attract animals outside your tent/field hut.

6.9 Pollution and waste management

The Arctic and Alpine regions are fragile environments and it is therefore essential to prevent any pollution and to minimise the amount of waste produced.

General guidelines:

- Follow the "Leave no Trace" ethics.
- Remove as much packaging as possible before going into the field.
- Never leave any litter in the field or around the station, including cigarette butts, plastic wrappings, toilet paper, female hygiene items, etc.
- Never leave scientific instruments or camp equipment in the field unless they are (semi-) permanent installations.
- Store food and waste so that it will not attract wildlife.
- Use environmentally-friendly toiletries (i.e. without microplastics or harsh chemicals).
- Latrines should always be set up at least 100 m from your camp and downstream of any freshwater sources (rivers, lakes, fresh snow, etc.).
- Pack out all waste upon return to the station and dispose of what you can at the station. This may include human waste.
- Use appropriate spill kits or containers where necessary when working with hazardous substances. Report any pollutant spills, regardless of the volume spilled.
- Consult the station staff about how to deal with hazardous waste.

6.10 Reducing energy use and water consumption

Small and simple measures can help reduce energy use and the amount of waste water to be treated.

These measures include:

- Ensure that all equipment is as energy efficient as possible, and used only when necessary.
- Switch off lights, equipment, and computers when not in use.
- Unplug chargers when not in use.
- Regulate the temperatures in your bedroom and living space.
- Ensure that radiators and other heaters are not blocked by clothing or furniture.
- Ensure that refrigerators and freezers are set to the right temperature, not too cold. Remember to open them for as short a period as possible.
- Take only brief showers (if there are any possibilities).
- Do not leave taps running.
- Report any leaks in water systems immediately, no matter how small they may be.

6.11 Conflicts and harassment

It is an important aspect for any Arctic and high Alpine fieldwork that everyone is mentally prepared for high-pressure situations and that all team members are friendly and considerate. Ensure that you have discussed leadership roles, responsibilities, and expectations to minimise misunderstandings and confrontations.

Generally:

- Maintain a safe, secure and open environment to discuss any issues.
- Consider having a scheduled time at regular intervals to raise and overcome any issues (for example at dinner) in an open and friendly way before they develop further.
- Approach your team members and fieldwork with a positive attitude.

Steps to take if a conflict should arise:

- Agree on a neutral person to lead the process and ensure that the situation does not deteriorate.
- Gather information from all involved parties.
- Communicate any decisions to all involved.
- If necessary, inform the station manager. External experts may be asked for advice, particularly in the case of possible mental health problems.
- Following any conflict, it is vital that all involved parties undergo a debriefing.
- Restore a good living and working atmosphere.

Discrimination, harassment, and workplace violence:

- Remember that any kind of discrimination, harassment, and workplace violence are not tolerated in any project involving INTERACT or APECS. Team leaders and team members must work together to ensure the field is a safe and welcoming environment for all.

7 Emergency preparedness

7.1 Handling risks during fieldwork

Emergencies can occur, but being properly prepared can stop the situation from deteriorating and save lives. In case of an emergency situation it is important to follow the agreed safety protocol.

ALWAYS

- Be cautious and remember safety is your number one priority.
- Stop to work or travel if an incident occurs, observe, think about the best measures, and act accordingly.
- Have emergency contact details with you (use the back of this booklet).
- Have appropriate communication equipment with you and know how to use it.
- Ensure to have all safety equipment and an adequate first aid kit with you.
- Have an established leader and co-leader for all emergency situations.

Figure 7.1: Safety measures to prevent and mitigate risks during fieldwork. Image modified from UNIS.

In case of an emergency, here is an example of a safety protocol:

- Stop work or travel and gather nearby members of your group.
- Prevent the situation from getting worse: Assess casualties and stabilise injured/sick persons, keep them dry, warm, and protected from wind.
- Make sure that the rest of the group, yourself, and the injured person cannot be harmed any further by moving away from the danger zone.
- Gather all basic information about the accident/emergency situation.
- Assess all self-help options.
- Contact the station/rescue operator to get advice or plan a rescue mission.
- Keep a log of all incidents.
- Aid the rescue operation wherever possible.

After an emergency situation:

- Report the emergency to all relevant people/bodies (e.g. station manager, police, insurance company, home institution, next of kin), including information on date, location, summary of what happened, casualties, etc.
- Have one or more debriefing session: Discuss the event, all procedures carried out, and people's reactions.
- Post-emergency counselling may be necessary.

7.2 First aid basics

EMERGENCY PROCEDURES

Principal Procedures for Life Support – ACCIDENT

	Stop the Accident	• What happened? Quick survey • Is the site of injury safe for the medical examiner and the injured person? • Is the injured person conscious and alert? • Is emergency evacuation needed?
A	**Airways**	• In-line-stabilization: the position of the head is secured • Secure free airways
B	**Breathing**	• Assess breathing ability (observe – listen – feel)
C	**Circulation**	• Do you feel a pulse? Frequency and quality? • Examine the capillary response • Assess the skin colour and temperature • Check for haemorrhage • Re-assess ABC • Contact Project Leader/Field Leader
D	**Disability**	• Assess the level of consciousness • Examine pupil reaction to light (close and re-open eyelid) • Assess if treatment can continue on the site of injury
E	**Expose**	• Possibly a top-to-toe examination on the site of the injury • Fixation in a stretcher – if possible • Transfer to safe/protected place
	Protected place	• Re-assess ABC • Monitor the patient objectively • Contact Project Leader/Field Leader • Continue observations and standard First Aid • Follow prescription from Project Leader/Field Leader • Write a short report about the course of event of injury and your observations

NORMAL VALUES FOR ADULTS
Pulse: 60-80 /minute
Breathing: 12-16 /minute
Capillary response: less than 2 seconds

Figure 7.2: Principal procedures for life support.

7.3 Next of kin for team members

Team member name: .....

Next of kin name, address, and contact info: .....

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Next of kin name, address, and contact info: .....

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Next of kin name, address, and contact info: .....

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Next of kin name, address, and contact info: .....

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Next of kin name, address, and contact info: .....

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7.4 Routine communication protocol

Station telephone number: .....

Station communication frequency: .....

Call the station every: .....

Internal group telephone number: .....

Internal group communication frequency: .....

Call sub groups every: .....

7.5 Emergency contact details

Research station/contact person telephone number: .....

Station VHF emergency frequency: .....

Police/search and rescue telephone number: .....

Police/search and rescue VHF frequency: .....

Home institution: .....

Nearest of kin: .....

Colleagues, working at the research station: .....

Insurance company: .....

Insurance number: .....

Insurance contact details: .....