



Field Procedures and Safety Manual

UNBC Field Safety Committee

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INTRODUCTION

This handbook is designed for use by anyone who is about to embark on outdoor fieldwork or programs including those in community-based research, outdoor recreation, geography, natural resource management, and biology. The goal of this manual is to provide basic information to field assistants, graduate students, technicians, managers and instructors of outdoor programs at The University of Northern British Columbia. In general this manual is an introductory level guide whose purpose is to provide fieldworkers with a risk management resource that will help them conduct operations responsibly and prevent accidents and injuries during field work in wilderness and backcountry terrain. Certain sections deal with issues very briefly (e.g. avalanche awareness). We took this approach to encourage people to think about potential risk factors and to acquire specific skills through further training or using certified, more knowledgeable guides where necessary for the safe completion of field work.

Responsible operation of outdoor programs requires an integrated, systematic approach to minimizing risk. It is not enough to consider risk and risk management at the level of program delivery alone. Risk management is the responsibility of the whole institution. Risk management is the responsibility of UNBC's administration—including the Deans, Program Chairs, and Purchasing, Contract, and Risk Management—as well as of instructors and even students. It is, therefore, imperative that everyone monitor how successfully its organizational structure, policies, procedures, resources, and equipment are contributing to the effective management of risk.

Risk management is not a one-time event. It is a dynamic, evolving process of adaptation and change in response to shifting circumstances. This process ensures that outdoor programs will constantly improve—and constantly maintain a high standard and record of safety. The risk management information presented in this handbook draws from the practices used by private and public institutions around the world. This information, however, is tailored specifically for The University of Northern British Columbia and its outdoor programs. The result is a comprehensive set of **minimum operating** guidelines.

- UNBC Policies and Procedures regarding Field Work Safety (http://www.unbc.ca/assets/policy/pcrm/pcrm_field_work_safety.pdf)

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We would also like to acknowledge other manuals from which information in this manual was extracted: Field Workshop Manual (prepared by the External Communications committee of the Centre for Applied Conservation Biology, including several sections developed under Forest Renewal B.C. funding), Risk Management for Outdoor Programs developed by BC Provincial Adventure Tourism Articulation Committee, Soil Science field safety manual (prepared by T.M. Ballard – Safety and Security Committee), Safety in Research and Teaching 3rd ed., 1995 (prepared by the Safety Committee, Faculty of Forestry), Log Hauling & Lowbedding Safe Driving Practices And Operating Procedures For Canfor Roads October 2006; Forest Roads, Guide to Safe Travel, BC Forest Safety Council, Province of BC; Forest Service Roads, A Guide for Industrial Users, Ministry of Forests Resource Tenures & Engineering Branch, Safety Procedures in Research & Teaching (produced by the Safety Committee, Faculty of Forestry, 2003) and, Forestry Handbook for B.C. (edited by Sue Watts – 4th ed.).

1. SAFETY

1.1 *Who's Responsible?*

Everyone is. Safety is primarily common sense and common courtesy. The most important skill is to remain aware of yourself, others, and your relationship to the surrounding environment. Certain activities that might be safe under one set of circumstances might not be under a different set. Working alone should be avoided. If it is necessary to work alone, carry a radio and arrange a check-in procedure. See Section [4.4](#) for more information.

Keep your fellow workers in mind. In cases where special hazards are associated with your work, warnings should be posted in the vicinity of the project to alert co-workers and members of the public to the danger. These signs should be large and legible. Bright colors are preferred. Remove the signs when the work is completed.

There are certain responsibilities spelled out by WorkSafe BC, and compliance with the Workers' Compensation Act and Regulations is the minimum acceptable standard. All students, faculty, and staff are encouraged to strive to exceed these minimum legal standards. The University aims to provide a safe, healthy and secure environment in which to carry on the University's affairs. All reasonable preventive measures are taken to prevent accidental injuries, occupational diseases and risks to personal security.

The University

It is the responsibility of the University Administration to:

- Provide a safe, healthy and secure working environment;
- Ensure that regular inspections are made and take action as required to improve unsafe conditions;
- Ensure that health, safety, and personal security considerations form an integral part of the design, construction, purchase and maintenance of all buildings, equipment and work processes;
- Provide first aid facilities where appropriate;
- Support supervisors and safety committees in the implementation of an effective health, safety and security program;
- Ensure compliance with WorkSafe BC and other applicable legislation;
- Establish department or building safety committees;
- Communicate with the university community or affected groups about events or situations when potentially harmful conditions arise or are discovered;
- Ensure adequate resources are available to implement appropriate procedures.

The Supervisor

It is the responsibility of the supervisor to:

- Ensure that Critical Data forms are completed for all those working in the field;
- Ensure Volunteer Hazards waiver forms, and other applicable paperwork are completed when non-staff or students are in the field;
- Ensure hazard information and protocols for teaching are followed and completed when classes are involved;
- Formulate specific safety rules and safe work procedures for their area of supervision;
- Ensure that all employees under their supervision are aware of safety practices and follow safety procedures;
- Provide training in the safe operation of equipment;
- Inspect their areas regularly for hazardous conditions;
- Correct unsafe work practices or hazardous conditions promptly;
- Be responsive to concerns expressed about personal security and investigate any incidents or personal security concerns which have occurred in their area of responsibility;
- Report any accidents or incidents involving personal security to the appropriate University authority;
- Participate, if requested, on department or building safety committees.

Individual Students, Staff, and Faculty

It is the responsibility of individuals (students, faculty, and staff) to:

- Observe safety rules and procedures established by supervisory staff, administrative heads and the University;
- Be safety-conscious in all activities, be they work, study or recreation;
- Report as soon as possible any accident, injury, unsafe condition, insecure condition or threats to personal security to a supervisor or administrative head of unit;
- Use properly and care for personal protective equipment provided by the University;
- Participate, if elected or appointed, on departmental or building safety committees.

Program Safety Representatives monitor the safety programs within their areas and make recommendations to help meet the safety objectives of the University.

1.2 Risk Management

Risk is the likelihood of loss or damage occurring. In outdoor settings, this loss or damage is usually thought of in terms of personal physical injury. However, risk in outdoor programs also involves the potential to negatively impact mental, social, financial, market, business, and public relations aspects of an institution or its staff.

Outdoor programs contain varying levels of risk because the risk associated with them varies both by activity and by conditions at the time an activity is carried out. For example, canoeing along the shores of a lake is considered to pose a lower level of risk than does kayaking whitewater rapids. Crossing open water in a sea kayak on a calm day has a lower level of risk than crossing in poor weather. Snow conditions may make glacier travel more dangerous at one time of year than another. An individual's perception of risk in a given situation and general willingness to "take risks" are shaped by his or her previous experiences, knowledge, and even genetic predisposition (e.g., their personal comfort level with exposing themselves to risk), as well as by factors such as peer pressure and media coverage.

Risk factors are those elements that contribute to the likelihood of an incident occurring. These fall into three categories: people, equipment, and environment. The greater the number of issues related to these factors for any given outdoor activity, the greater the chance of an incident occurring. Most serious accidents are a result of a combination of risk factors at play, not just one.

A risk management strategy is an approach that is taken within a program to organize risk management practices into one integrated, overall plan or policy. Such a strategy requires all personnel involved in a program to be looking constantly for ways to manage program risks.

1.3 Planning Outdoor Activities to Manage Risk

Levels of risk are controlled by both the diligence of supervisors, who must attend to the administrative details required by good risk management, and the knowledge, skills, and abilities of supervisors or students who must conduct activities, sometimes in harsh environments and difficult circumstances. Risk management must be considered when preparing for field activities and community-based research.

Many programs, even those that appear to be similar to one another, contain different levels of real risk. A risk assessment for each activity must be performed before entering the field to ensure adequate hazard prevention and emergency procedures are in place.

2. ISSUES OF CONDUCT AND ETHICAL CONSIDERATIONS

Respecting yourself and your study area

2.1 Stewardship

In carrying out scientific research treat the natural world with care and consideration. Respect the rights of the public and property owners. For some studies it is advisable to obtain a list of threatened and endangered species to avoid destroying rare species inadvertently. A list for your study area may be obtained from the Conservation Data Centre in Victoria. They can be contacted via their web page <http://www.env.gov.bc.ca/cdc/access.html> or by calling 250-356-0928. You need to give the latitude/longitude of the area for them to check their database for possible species of concern in the area.

2.2 Communicating with Landbase Owners

In advance of going to the field, it is your responsibility to contact and obtain permission to enter and carry out your work from the owners or managers of the land base where you will be located. This may be a First Nations group, a provincial ministry (e.g. Ministry of Forests, etc.), a licensee, a private owner, or national or provincial parks service. Ask the proprietors to identify hazards they are aware of and establish a prime contact person.

2.3 Working Within National and Provincial Parks

Your research and methodology will have been reviewed carefully before you are given permission to work within a park. You may be making higher-use demands on the park than a typical visitor. Try to minimize your impact on the study area. Take alternative routes to your study sites to avoid creating permanent trails. Camp stoves are always preferable to campfires. When latrine facilities do not exist, bury human wastes and pack out toilet paper. Unless special permission is granted, it is illegal to pick plants or to remove rocks or soil in national and provincial parks. Wildlife (including insects) should not be harassed or killed. Vehicles should not be driven off-road within parks. Food waste can attract bears. All food wastes should be removed from parks and other work areas.

2.4 Personal Conduct

As an employee or student of UNBC (a publicly funded organization) you are representing your employer when you work in remote areas, even when you are on personal time. It is, therefore, important that you conduct yourself appropriately. Conflict resolution mechanisms should be in place as part of your field work plan. In small communities, people will know who you are and who you work for. This infringement on your privacy need not apply to everything you do; try to judge for yourself. If you drive a

marked vehicle (e.g. University of Northern BC, or Ministry of Forests (MoF) emblazoned), always be sure to drive responsibly. It is also a good idea to carry some form of identification (i.e. a simple business card) that describes who you are and what you are doing. If you require specific permits to conduct your research, make sure you are carrying them with you. Wet, dirty people rarely get a lift unless they show a legitimate piece of I.D. If you are driving an unmarked or personal vehicle for fieldwork, it may be a good idea to have a sign in the window describing who you are. While driving a UNBC vehicle on personal time, you are covered under UNBC insurance policy, provided you received prior approval from your departmental supervisor. Fill out the “Request to Use a University Motorized Vehicle” (available from the Risk and Safety office), prior to departure, as this lists you as a registered user of the vehicle. This coverage is also contingent upon you driving in a responsible manner and not being deemed negligent in any accidents. Drive defensively and follow all posted speed limits and traffic laws. It goes without saying that driving while intoxicated is considered negligent (and illegal).

2.5 Harassment and Equity

As an employee or student of the University of Northern British Columbia you must comply with policies concerning Harassment and Discrimination.

http://www.unbc.ca/assets/policy/diversity/harassment_and_discrimination_final.pdf

Working and living in close quarters during field work can lead to friction or unwanted attention. Each of you has a right to privacy and personal space. Be respectful of your coworkers. From the UNBC Policy Harassment and Discrimination: “The University of Northern British Columbia is committed to providing a working and learning environment in which all students, staff and faculty are treated with respect and dignity. The University of Northern British Columbia acknowledges the right of all individuals in the University Community to work or learn without discrimination or harassment because of race, colour, ancestry, place of origin, religion, family status, marital status, physical disability, mental disability, sex, age, sexual orientation, political beliefs or criminal or summary conviction offence unrelated to their employment.”

2.6 Resources

If you would like more information or assistance about the particulars of UNBC’s policies the following resources exist to help you:

UNBC Policies and Procedures: <http://www.unbc.ca/policy/>

Counselling Services: (250) 960-6369

Library 5-196

<http://www.unbc.ca/counsel/index.html>

Women's Centre Office: (250) 960-5632
Agora 7-213
<http://www.northernwomenscentre.ca/>

Wellness Centre: (250) 960-6369
Library 5-106
<http://www.unbc.ca/wellness/>

First Nations Centre: (250) 960-5772
Agora 7-109
<http://www.unbc.ca/firstnationscentre/>

UNBC Risk and Safety: (250) 960-5020
Admin 1085
<http://www.unbc.ca/safety/>

3. BEFORE FIELDWORK BEGINS

This is probably the most important part of field safety. Most problems can be avoided by taking proper precautions before going into the field. This means equipping yourself with the proper skills and equipment required for your type of work. This may include relevant vaccinations (see Section [5](#) – Wilderness Health Risks).

Most of this section of the Field Manual is lists of things to consider and/or ensure that you have brought with you into the field. It is intended to be concise. The detailed risks and procedures associated with most of these suggestions are covered in later sections of the manual, and we have made attempts to cross-reference these relevant sections throughout. Reading through this section will refresh your memory, but it should not be used to substitute going through the following sections regularly to update your understanding of risks and protocols.

3.1 Contact Procedures

Before going into the field, it is imperative that you leave a written description of how to reach the location where you will be working, your daily contact protocol, and when you expect to return with*:

- Your supervisor and one or more backup contact persons;
- The proprietor of the land base where you will be working.

See Appendix A for UNBC’s Field Crew Information Forms

Some organizations will require you to attend a safety training session before you begin work on their land base. They may also require you to carry specific safety or firefighting equipment.

- Be sure to familiarize yourself with industrial traffic patterns and locations of active industrial operations;
- Carry a two-way radio and call your mileage on industrial roads if required. You may need to obtain permission from the proprietor to use company radio frequencies;
- Cell phone coverage is generally poor away from towns and cities. Consider whether satellite phones and/or personal locating devices (e.g. avalanche beacons, or SPOT Satellite Personal Trackers) are additionally required, especially when traveling where cell phone range is poor.
- Remember that not all areas of BC follow the daylight saving time change (e.g. the Peace and Kootenay regions). It is important to be aware of this when planning daily security check-ins and planning of trip travel time. It is also important to note that the majority of BC highway driving is remote and there can be long stretches with no cell phone service.

* see Sections [4.1-4.4](#) on working alone and working near industrial sites

3.2 What to Bring

The following are a series of lists which indicate practices and items that should be considered before going into the field or included in equipment and supplies taken to the field.

3.2.1 Clothing and Personal Protective Equipment

Appropriate clothing will depend on the working conditions. Loose fitting clothing, dangly jewelry and long unconstrained hair may create a safety hazard. Caulked boots (also called cork boots – ones with steel spiked soles) improve safety in slippery conditions and are required in some locations. A CSA approved brightly-coloured hard hat is required equipment whenever there is the possibility of injury caused by falling, flying, or thrown objects. When working near machinery or during hunting season, a high-visibility vest is also required. When using a chainsaw you should wear boots equipped with steel toes, eye and ear protection, gloves, and Kevlar safety chaps or pants. Always be aware of your environment: it is easy to wander into hazardous areas (e.g. oil and gas industry sites are increasingly common in northern BC, and can be extremely dangerous), which require specialized safety equipment, without realizing that you are at risk. Consider whether you need protective equipment or clothing for handling chemicals or contaminants while conducting your field activities. If you would be required to wear these in the laboratory setting, then you also need them in the field. Also be sure that you have the necessary equipment and facilities for cleaning up spills and disposing of chemicals properly.

Dress needs for community-based research will depend on the research method and target audience. Professional dress code may be appropriate for conducting interviews or focus groups with local leaders, business or industry leaders, service providers, or residents in a community. However, if researchers are engaged in extensive community or door-to-door survey work, additional safety precautions should be considered. Each researcher should be equipped with an identification badge that may include information about community partners. Researchers should also be equipped with high-visibility safety vests if they are working outside of daylight hours. Researchers should also be dressed appropriately for local weather conditions. This may include the need for thermal layers, appropriate gloves, rain gear, head lamps, waterproof footwear, or even ice cleats.

3.2.2 First Aid Kit¹

Check expiry dates before leaving and check kit annually. Replace any items used as soon as possible. The minimum you should take is a Level One kit for the site and a personal kit to be kept in your pack at all times, but with a larger crew, or if you are working in extreme conditions or remote areas, you may need to take a larger kit and have a Certified First Aid Attendant on the study site. Contact WorkSafe BC to

¹ All vehicles used in the field must be equipped with an adequate First-aid kit, blanket and fire extinguisher.

determine what is appropriate to your situation. You should consider all of the following, especially when working away from immediate medical care:

Level 1 Kit

WorkSafe BC lists the following items as components of a Level 1 First Aid Kit (<http://www2.worksafebc.com/Publications/OHSRegulation/GuidelinePart3.asp#SectionNumber:FirstAidKits>). These items must be kept clean and dry and must be ready to take to the scene of an accident. A weatherproof container is recommended for all items except the blankets. Blankets should be readily available to the first aid attendant.

3	Blankets
24	14 cm x 19 cm wound cleaning towelettes, individually packaged
60	Hand cleansing towelettes, individually packaged
100	Sterile adhesive dressings, assorted sizes, individually packaged
12	10 cm x 10 cm sterile gauze dressings, individually packaged
4	10 cm x 16.5 cm sterile pressure dressings with crepe ties
2	7.5 cm x 4.5 m crepe roller bandages
1	2.5 cm x 4.5 m adhesive tape
4	20 cm x 25 cm sterile abdominal dressings, individually packaged
6	Cotton triangular bandages, minimum length of base 1.25 m
4	Safety pins
1	14 cm stainless steel bandage scissors or universal scissors
1	11.5 cm stainless steel sliver forceps
12	Cotton tip applicators
1	Pocket mask with a one-way valve and oxygen inlet
6	Pairs of medical gloves (preferably non-latex)
	First aid records and pen

In addition to the items listed for the Level 1 First Aid Kit, you should also consider including the following items:

1	Copy of a wilderness first aid guide (e.g. St. John Ambulance official wilderness first aid guide; Mountaineering First Aid: A Guide to Accident Response and First Aid Care, 5th Edition)
1 – 3	Non-adherent dressings, 25 x 40 cm
100	Strip bandages of varying sizes, assorted knuckle/fingertip elastic adhesive pads, butterfly suture bandages
1-3	Sealed sanitary napkins (for use as soaker pads)
1 – 2	Elastic bandages, 8 cm wide
	Rehydration packages or the salt, baking soda and sugar mixture outlined below ² - for treatment from dehydration (for treatment of heat cramps or heat exhaustion, metabolite replacement solutions like Gatorade packets can also be used)
3	Large plastic garbage bags, or a field safety blanket (for covering someone suffering from hypothermia)
1 pair	Tweezers/tick removers
1	Antiseptic solution, plastic bottle
3-4	Iodine swabs
1 pack	Benadryl or other antihistamines for insect bites and stings
1	Epi-pen (increasingly recommended, as members of the crew may not know if they have severe allergies to stings, etc. before going into the field)
	Any medicine as recommended by physicians and written instructions for use of all medicines carried

Personal Kit

WorkSafe BC lists the following items as components of a Personal First Aid Kit (<http://www2.worksafebc.com/Publications/OHSRegulation/GuidelinePart3.asp#SectionNumber:FirstAidKits>). These items must be kept clean and dry. A weatherproof container is recommended.

1	Pressure dressing
6	Sterile adhesive dressings, assorted sizes, individually packaged
1	Wallet-sized instruction card advising the worker to report any injury to the employer for entry in the first aid records, and instructions on how the worker is to call for assistance
6	14 cm x 19 cm wound cleansing towelettes, individually packaged

² Dehydration treatment (Mayo Clinic) - In an emergency situation where a pre-formulated solution is unavailable, you can make your own oral rehydration solution by mixing 1/2 teaspoon salt, 1/2 teaspoon baking soda, 3 tablespoons sugar and 1 liter (about 1 quart) of safe drinking water. Be sure to measure accurately because incorrect amounts can make the solution less effective or even harmful. If possible, have someone else check your measurements for accuracy. (<http://www.mayoclinic.com/health/dehydration/DS00561>)

In addition to the items listed for the Personal First Aid Kit, you should also consider including the following items:

1	Copy of a wilderness first aid guide (e.g. St. John Ambulance official wilderness first aid guide; Mountaineering First Aid: A Guide to Accident Response and First Aid Care, 5th Edition).
1	Pair scissors
2 – 6	Sterile gauze pads, 10 cm ²
1 – 3	Non-adherent dressings, 25 x 40 cm
12 – 24	Strip bandages of varying sizes, assorted knuckle/fingertip elastic adhesive pads, butterfly suture bandages
1 – 3	Sealed sanitary napkins (for use as soaker pads)
1 roll	Adhesive tape, 2.5 cm wide
3 – 7	Cloth triangular bandages
1 – 2	Elastic bandages, 8 cm wide
10 – 20	Cleansing wipes (antiseptic)
	Rehydration packages or the salt, baking soda and sugar mixture outlined below ³ - for treatment from dehydration. For treatment of heat cramps or heat exhaustion, metabolite replacement solutions like Gatorade packets can also be used.
2	Large plastic garbage bags, or a field safety blanket (for covering someone suffering from hypothermia)
1 pair	Tweezers/tick removers
1	Antiseptic solution, plastic bottle
3-4	Iodine swabs

³ Dehydration treatment (Mayo Clinic) - In an emergency situation where a pre-formulated solution is unavailable, you can make your own oral rehydration solution by mixing 1/2 teaspoon salt, 1/2 teaspoon baking soda, 3 tablespoons sugar and 1 liter (about 1 quart) of safe drinking water. Be sure to measure accurately because incorrect amounts can make the solution less effective or even harmful. If possible, have someone else check your measurements for accuracy. (<http://www.mayoclinic.com/health/dehydration/DS00561>)

3.2.3 Survival Kit

Any time you are driving or working in a remote area, you should have a survival kit with you in case you become lost or your vehicle breaks down and unexpectedly, you must survive for one or more days. The kit should include at least:

- Water bottle with water in it – **DO NOT** get dehydrated in the field
- Emergency food
- Blankets / sleeping bag, and warm clothing
- Pocket knife
- Watch
- Compass, map, GPS (make sure you know how to use these – just having them doesn't help you!)
- Flashlight/headlamp (if you get lost or just work a little too late you may have a hard time finding your way through dark woods) – check batteries and pack spare batteries
- Pencil and waterproof field notebook
- Flagging tape
- If working in bear country – bear spray and a bear banger (make sure you know how to use these – just having them doesn't help you!). See Sections [3.2.5](#) and [3.2.6](#) for more information.
- Matches in waterproof container or cigarette lighter
- Fire starter,
- Wire saw
- Candles-for warmth in vehicles
- Garbage bags – can be used for waterproofing, wood, clothes etc.
- In active logging areas, a hard hat and a high visibility vest must be worn. During hunting season, wear blazer orange headgear and a blaze orange vest or jacket
- Two-way radio/cell phone (check coverage)/satellite phone/SPOT Satellite Personal Tracker (check batteries – consider bringing spares)
- If there is even a remote chance of getting lost (i.e. working >200 m from the vehicle), bring a flare kit, rescue blanket (aluminized lightweight plastic), and clothing to spend the night. This can happen even where people feel familiar with their study sites.
- In winter, include sand, a shovel and chains in the vehicle kit. Know how to put chains on and remove them before leaving.
- Emergency first aid kit

3.2.4 Compass, Maps, GPS

Carry and know how to use a compass, maps, charts or aerial photographs. Know the scale of the maps and photos and where geographic north is located. Know the length of your stride so that you can pace distances if necessary. Keep track of your position as you travel. An inexpensive GPS can track your movement from a start position and give you return directions, however they may not work under heavy canopy or in deep valleys. A mapping quality GPS (Trimble GeoXT) with secondary CDGPS receiver works much better under canopy, but most GPS units would suffice to help get you un-lost, so long as you know how to use them.

3.2.5 Bear Spray

Bear spray (also see [5.3.2](#)) comes in pressurized cans of varying quantities. We recommend that you don't buy the smallest one, 325 g cans are the minimum recommended (you will regret it if you get repeated attacks during an encounter and have to spray the bear more than once). Make sure you have this in a holster for quick access – it is no good in your backpack.

Bear spray's active ingredient is *Capsicum* oleoresin (red pepper) and is harmful to humans. Respiratory responses to bear spray include burning of the throat, wheezing, dry cough, shortness of breath, gagging, gasping, inability to breathe or speak (due to laryngospasm or laryngeal paralysis) and rarely, cyanosis, apnea and respiratory arrest. There is a possibility of fatality for people with existing respiratory conditions. **Note: if you have a respiratory problem such as asthma or if you wear contact lenses, you might want to reconsider using bear spray.**

Keep away from children. Avoid accidental contact with eyes, skin, or mucous membranes. In case of external contact, flush thoroughly with water. Do not rub. Call a physician if symptoms persist.

When transporting bear spray in cars or enclosed spaces, it is best to pack this into air-tight containers. There is a huge danger associated with accidents if the bear spray went off in a car while you were driving. Dry ammo cases or marine boxes can be purchased at Canadian Tire or other stores – these containers are airtight and o-ring sealed, and work well for transporting bear spray. In a pinch, get a couple of ziplock freezer bags and double pack the bear spray canisters.

3.2.6 Bear Bangers

Although the committee acknowledges that bear bangers (also see section [5.3.2](#)) can be an effective way to deter bears, we do not recommend them as a primary deterrent. Rather, the committee advocates the use of bear spray (section 3.2.5 Bear Spray). We discuss them here for people who want to use them in addition to bear spray.

Bear bangers can be fired from pistols or signal launchers. These signal chargers can fire bear bangers or flares – be sure to read the labels and know which type of cartridge you are carrying and firing. Also remember that these are essentially exploding shells. Do not carry bear bangers with the shells loaded on the chambers, these should be set when needed (which means they are not effective in sudden and close encounters, only when the bear can be detected at a distance). Make sure you transport and store bear bangers in appropriate containers (e.g. ammo boxes).

The primary situations where bear bangers may be effectively used are:

1. When working in open country and bears can be detected at large distances (e.g. greater than 100m), and the bear has an easy escape route that takes it away from the field crew.
 - a. In this situation, bear bangers can be loaded and fired to encourage the bear to leave the area
 - b. Care must be taken to ensure that the banger explodes **BETWEEN** you and the bear. This will require firing the bear banger upwards at a 45 degree angle or higher – you do not want the cartridge to explode behind the bear and have the animal run towards you!
2. The second case of bear banger use would be having one stored in a central location within an established camp, where all personnel know its location. If the banger is stored within a sealed water-proof container (e.g. ammo case). This would allow the bear banger to be accessed and used if a bear approaches into the camp, but we still would advocate that the primary deterrent that should be accessible and used would be bear spray.

Other considerations:

- Store in cool and dry area;
- Do not expose to open fire or heat;
- Do not remove the safety cap from the cartridge before you want to use it;
- Shoot only with a launcher that is in good condition;
- Do not keep the cartridge loaded onto a launcher;
- Replace the cartridges after the expiry date has passed;
- Never try to take a cartridge apart.

For additional information on use and cautions, see section [5.3.2](#).

3.3 Courses to Take

Investigate what is required for your activities, and also carefully consider due diligence and take recommended courses beyond the minimum requirements. Minimum requirements for most field research at UNBC are Bear Safety (Staying Safe in Bear Country) and Level 1 First Aid. In some cases, higher-level first aid courses and Transport Endorsement may also be needed. Requirements are based on the hazards of the job and distance to the nearest hospital. Supervisors should undertake a risk assessment for each field activity. For certain types of field work, other courses may be required (e.g. chainsaw certification, ATV/snowmobile certification). Other courses or training could also be quite useful, such as Wilderness First Responder. If there are courses that you feel your personnel/students need that are not offered, contact the Risk and Safety office at UNBC. Courses are also available through companies and agencies external to UNBC.

Detailed knowledge, skill development and practice are always advised. UNBC Continuing Studies offers different courses on a regular basis under their “Workplace Health, Safety and First Aid” category. You should consult with their catalogue (<http://www.unbc.ca/continuing-studies>) for personnel that require first aid and other field training.

The most relevant offerings available through UNBC Continuing Studies are currently:

- Staying Safe in Bear Country
- ATV Safety Training
- Wilderness First Responder
- Chainsaw Safety Training
- Basic Fire Suppression and Safety Training

Continuing Studies contact info:

Telephone: (250) 960-5980

TOLL FREE: 1-866-843-8061

Fax: (250) 960-5984

Email: cstudies@unbc.ca

<http://www.unbc.ca/continuing-studies>

3.3.1 First Aid

Courses are typically taken through St. John Ambulance, 250-561-1696, and can be arranged either directly or through Continuing Studies. If you do arrange to do the course directly with St. John Ambulance, inform the Risk and Safety Office, as this makes you eligible for the University’s subsidy towards the course. It is advisable to purchase a good wilderness first aid book (available from local bookstores or Amazon.ca) to keep in camp. Potential options are:

- St. John Ambulance official wilderness first aid guide (1994) McClelland & Stewart; 1 edition (Mar 1 1994) ISBN-13: 978-0771082504

- Mountaineering First Aid: A Guide to Accident Response and First Aid Care; 5th Revised edition (2004) Mountaineers Books ISBN-13: 978-0898868784

Familiarize every member of your field crew with basic procedures for some commonly occurring emergency situations and insure that every member knows how to contact the closest source of help.

3.3.2 Proper Map and Compass Use

People have become disoriented and lost 200 m from the roadside. It is beyond the scope of this manual to teach proper map and compass use but be sure to familiarize yourself with these skills before heading into the field. Instruction can be provided on an as needed basis. Inquire at 250-960-6339 Aleza Lake. There are also some excellent books and web resources available.

3.3.3 Chainsaw Use

Before working on projects that involve chainsaw use, you will need to undertake a Chainsaw Safety course through Continuing Studies or some other recognized course. Some brief guidelines and a checklist for chainsaw use are provided in Appendix B:

3.3.4 Pulaski Fire Axe, Axes and Knives Use

Accidents caused by bladed tools such as Pulaski axes (axe/pick combination used by forest fire workers), knives and axes are usually the result of unsafe use. Each should be used for its correct purpose and safety guidelines followed. Cover cases can prevent accidental injury when carrying. Use these. Always be aware of others in your vicinity when using these tools and indicate to them that you are about to use them.

3.3.4.1 Axes

Long handled axes are safer than short handled hatchets. The proper grip for a right handed person is to have the right hand $\frac{3}{4}$ of the way up the handle and the left hand approximately 3 inches from the end of the handle. A left-handed person should reverse the position of the hands. Make sure you have a clear circle in which to swing the axe before chopping. Remove all vines (including overhead), brush and shrubbery within the swing range. Ensure you have good footing. It is advisable to wear caulk boots and protective eyewear when using an axe. Always inspect an axe before using it – check to ensure the head and haft are lined up. If the haft is split, chipped, damaged or broken, or the head is loose, do not use it. Sheath the axe when not in use.

When carrying axes, shovels or other hand tools in the field, do not carry them over your shoulder. If you slip, they may hit your head. Hold them at the balance point on the downhill side with the cutting edge away from the body. Maintain distance of at least 2m between individuals when carrying tools.

3.3.4.2 Knives

Knives are the source of more disabling injuries than any hand tool. The major hazard in the use of knives is in the hand slipping from the handle onto the blade. Ensure the cutting stroke is away from the body. If this is not possible, ensure the hands and body are kept clear. Folded lock-blade knives carried in a belt holder reduce the potential of injury during a fall.

3.3.5 Avalanche Awareness

Avalanches kill several people each year in western Canada and the number is increasing steadily with increased backcountry use. You must be avalanche-aware if you are doing any backcountry fieldwork. Even the most benign looking slopes can slide, or be at the base of sliding sections above. Weather and time of year also affect avalanche hazard. Always carry avalanche equipment for each person (transceiver, shovel, probe, etc.) when in avalanche terrain and know and practice how to use them. These tools won't save your life unless you are familiar with their use. Canada West Mountain School and the Federation of Mountain Clubs of British Columbia (FMCBC) 604-873-6096, <http://www.mountainclubs.bc.ca> offer introductory level avalanche courses. The Canadian Avalanche Association (CAA) avalanche has an information bulletin hotline: 250-837-2435 or 1-800-667-1105. <http://www.avalanche.ca/>.

3.3.6 Firearms Use

If you or anyone of your team will be handling firearms, you should have a Firearms Acquisition Certificate (FAC) or the new Federal Firearms License: Possession and Acquisition License (PAL) or Possession-Only License (POL). These two documents are required by law if you will be handling a firearm. Contact a local gun club for course information. For Canadian regulations for firearms contact the Canadian Firearms Centre: <http://www.rcmp-grc.gc.ca/cfp-pcaf/index-eng.htm>. It is not the intention of this manual to cover firearms safety in detail, but remember the “vital four”:

1. Regard every firearm as loaded;
2. Control the muzzle direction at all times;
3. Keep your finger off the trigger except when firing;
4. Open the action and check that there is no ammunition in the firearm.

3.4 Operating University Vehicles

Automobiles or other motorized vehicles used for fieldwork activities require special care to be taken to comply with local laws and regulations. These may depend on circumstances, so investigate the requirements for your particular work. For vehicles registered in British Columbia, it is mandatory for the vehicle to be insured by the Insurance Corporation of British Columbia.

Authorization is required in order to operate a University owned or leased vehicle. If an accident were to occur, it is possible that the individual's driving record could be affected.

It must be noted that the University cannot protect an individual's driving record. Theft of or damage to personal property is not covered under the UNBC insurance policy. Students, faculty and staff with a "L" designation will not be permitted to rent or use vehicles for University business. Individuals with an "N" designation will not be permitted to carry passengers. Under NO circumstance will the rental or use of 15 passenger vans be permitted.

Rental vehicles should be treated in the same manner with the addition of any specific requirements of the rental agency. BCAA or other road side assistance coverage is strongly recommended for all vehicles.

Request to operate a UNBC vehicle:

www.unbc.ca/assets/safety/vehicle/request_to_use_a_university_motorized_vehicle_for_m.pdf

ICBC Regulations:

www.icbc.com/licensing/lic_getlic_types.asp

3.5 Operating Personal Vehicles

In using personal vehicles the owner of the vehicle need to understand that they are taking on the liability for anything that should happen with regard to their vehicle in the field. It is their insurance that will be affected and they are responsible to ensure that they have the proper insurance requirements. Some items for consideration:

- Is the vehicle properly ensured for each person driving. (i.e. including others who have less than 10 years driving experience)
- Is the class of insurance appropriate for the activity (e.g. “to and from work within 15km” would not appropriate for field studies)
- It is advisable to discuss the intended use with your insurance provider

If a personal vehicle is used, the ownership and control of the vehicle can have implications for other members of the research team – particularly in communities that have limited or no public transportation. It is preferable that more than one researcher have keys to access the vehicle if needed. It is important that the owner of the vehicle understand that at all times they are responsible for the transportation needs of the research team. This may include being prepared to adequately share the use of the vehicle if needed. If this is questionable, then alternative transportation needs will have to be considered. The vehicle should always be parked within close proximity to where the research team is working (i.e. on a central location of a street, or within a few minutes distance to the research team). It is always preferable to park the vehicle in a space where it may not be blocked in and pointed in the direction of exit in order to facilitate a quick exit if needed.

It is critical that personal vehicles are held to the same maintenance standards as rental or university vehicles. Ensure that an adequate pre-trip inspection is conducted (see section 6.1)

3.6 Resources

The UNBC Lab and Field Safety website http://www.unbc.ca/safety/lab_safety.html is an excellent reference tool.

Other Useful websites:

UBC-Health Safety and Environment website www.hse.ubc.ca

U of A- Field Research Office http://www.ualberta.ca/FIELDOFFICE/about_us.html

Canadian Avalanche Centre <http://www.avalanche.ca/>

Recommended Readings:

Bear Attacks: Their Causes and Avoidance (2003) Stephen Herrero

Staying Safe in Bear Country (Bear Aware Video)-Gary Shelton

Emergency Survival: A Pocket Guide : Quick Information for Outdoor Safety by Christopher Van Tilburg (May 31, 2001) Outdoor Survival (Essential Guide) by Garth Hattingh

Mountain Weather: Backcountry Forecasting for Hikers, Campers, Climbers, Skiers, Snowboarders by Jeff Renner

Mountaineering First Aid: A Guide to Accident Response and First Aid Care; 5th Revised edition (2004) Mountaineers Books

St. John Ambulance official wilderness first aid guide (1994) McClelland & Stewart; 1 edition (Mar 1 1994)

Surviving Coastal and Open Water: Greg Davenport's Books for the Wilderness by Gregory J. Davenport (Paperback - July 2003)

Surviving Cold Weather: Simply Survival (Greg Davenport's Books for the Wilderness) by Gregory J. Davenport and Steven A. Davenport (Paperback - Jan. 2003)

The official wilderness first-aid guide. McClelland & Stewart Inc., Toronto. 390 pp. Merry, W. 1994.

Wilderness Medical Society Practice Guidelines for Wilderness Emergency Care, 5th by Wilderness Medical Society and William W. Forgey M.D. (Paperback - Aug. 1, 2006)

Wilderness Press First Aid, Safety, & Rescue by Wilderness Press

4. IN THE FIELD

4.1 Daily Routine

When you are working in the field you should leave a sign-out sheet and field work information with a responsible person who can monitor when you are to return from the field and initiate a search should you not report back. UNBC Security can do this. The following information should be included:

- Name;
- Date;
- Time of departure;
- Expected date/time of return;
- Anticipated route and location;
- Activities to be undertaken;
- Expected sign-in time. *

There is a standard form available on the UNBC Risk Management website or you can develop your own.

http://www.unbc.ca/assets/safety/lab_safety/daily_sign_out_form.pdf

A personal information form should also be submitted to UNBC Security at the start of the field season. See [Appendix A](#) for an example. This will ensure that in the case of a rescue, the search team will be able to correctly identify you and your crew members. If you are working from campus on a daily basis, UNBC security is available to monitor your sign-out/in times. Be sure that you are familiar with the UNBC sign-out/in procedures and that your contacts are willing and available to assist in an emergency.

*Always let someone know where you are going and when you are to return before going on any field trip. Always be prepared to spend a night in the woods, especially if you are working away from your vehicle (see Section [3.2.3](#)). Always park your vehicle with the front end facing an easy exit. The less you have to back up and maneuver in a stressful situation when every second counts, the better. Always be sure to sign in when you return from the field.

Remember that not all areas of BC follow the daylight saving time change (e.g. the Peace and Kootenay regions). It is important to be aware of this when planning daily security check-ins and planning of trip travel time. It is also important to note that the majority of BC highway driving is remote and there can be long stretches with no cell phone service. Care should be taken to drive during daylight hours. If travelling at dawn and dusk, drivers should take extra care as wildlife activity around the roadway can increase.

4.2 Working Out of Town

When a field crew is working off campus the sign-out/in procedures still apply, however local contacts will be needed to monitor your daily activities. Every crew member should use the system you adopt. Checking-in daily with whomever is responsible for the land base where you are working is a good option (e.g., a research forest or community forest manager, etc.).

4.3 Protocol for Radio/Phone Checks off campus

Establish the following protocol with your check-in person. If one radio/phone check is missed and you are alone, a search is initiated immediately. If there is more than one person in the party, two radio/phone checks are missed before a full search is initiated. When using a radio, assign a radio call sign to every crew member as it facilitates communication. If SPOT communications are used a similar protocol is required. All of these hand-held devices, including SPOT and GPS, now need to be hands-free unless there are two people in the vehicle.

4.4 Working Alone

Working alone should be avoided whenever possible. Some guidelines to follow are:

- Do not work alone if you will be climbing trees, operating a chainsaw or plan to engage in any other high risk activities;
- On day trips:
 - a. Carry a radio or other communication devices if possible and check periodically for loss of communication (cell phones can replace radios, but be sure that coverage is adequate, if unsure have both available). Most handheld radios are line of sight, good only for a few km depending on topography. If you are linked to a network of repeaters (e.g. company, 19 MoF or Parks Canada) your range can be increased to the size of the entire grid;
 - b. If radio communication is not possible, establish detailed check-in procedures and detailed route plans.
- SPOT communication devices are highly recommended for lone workers. These require a subscription service, some pre-field work set-up, and access to open sky (can be clear or cloudy, and they work within forests etc – basically same criteria as picking up signals with a GPS. Transmission can be blocked inside vehicles, so make sure it is on the dash and can ‘see’ the sky through the window). Visit SPOT’s website for more information -- <http://international.findmespot.com/> . For Canada -- <http://www.findmespot.ca/> ;
- A **radio repeater** is a combination of a radio receiver and a radio transmitter that receives a weak or low-level signal and re-transmits it at a higher level or higher

power, so that the signal can cover longer distances without degradation. The BC Ministry of Forests and Range has a repeater system that covers 80% of the province, is very reliable, and works well in most mountainous areas. However it is strictly regulated and mostly only available to Provincial field staff, particularly to fire crews. You may have access to this system if your research is closely linked to a provincial government agency that is partnering on your project and it may be worthwhile to inquire about it. Using the system requires having radios that are programmed for the repeater system and learning protocols that are set according to government standards. More information about the provincial radio repeater system can be found on the internet:

<http://www.for.gov.bc.ca/his/radio/Overview/overview.htm>.

- On overnight trips – twice a day radio check-in is mandatory (once in the morning, and once at the end of the day). Leave a detailed route plan. You don't necessarily have to carry a radio with you if there is one at the destination site (e.g. cabin, camp). If you are traveling alone into very remote areas it is advisable to set yourself up with a SPOT device, and also consider a radio-collar/beacon with a contact at camp who knows its frequency – if you are lost a plane can try to radiotrack you even if you aren't able to push the SPOT device to indicate you need help. Beacon transmitters that operate on AA lithium batteries can be purchased from Holohil Systems Inc. or other radio-telemetry providers for approximate \$200 Cdn, but these will require the operators having a receiver AND knowing your transmission frequency.
- SPOTs and beacons are good for locating users but convey very little info to rescuers should need arise. Use them in combination with other devices that allow 2-way communication (cell phones, radios or sat phones). If you are working in very remote locations, consider taking a sat phone so that you have better ability for outside contact should an emergency arise. In many areas, a satellite phone is the only viable option.

4.5 Working or Traveling Near Active Industrial Sites

Your travel or work may require you to drive, walk through, or work in active industrial sites. These include logging operations, log sorting or loading areas, oil and gas sites, road repair or construction zones. Hazards include falling trees, moving heavy equipment with limited visibility, helicopters, swinging or sliding logs, rock or debris falling on roadway, rough road surfaces and blasting, and even toxic emissions.

Contact the site/forest licensee before heading to the field to learn where active operations are located, and to let them know that you will be visiting the site. They can tell you if you can safely travel through the area, and what procedures to follow. If the plan is to be outside of your vehicle at the site, bring appropriate safety clothing including at minimum a hard hat, high visibility vest and ear protection. A good contractor will have extra safety equipment for you if needed.

When you are on an industrial site you must become familiar with, and respect the safety protocols of the company responsible for that site (the “prime contractor”). When you arrive at an industrial work area in the field watch for posted radio channels to see how to contact workers by radio. If you cannot see the activities/operators from the roadway, turn off your vehicle engine, wind down your windows and listen for chainsaws, yarding or log skidding equipment. Never enter an active work zone without making eye contact and receiving acknowledgement and permission from the supervisor or foreman, if present, or an equipment operator, or worker. Be patient if you need to wait for an operation to finish. Talk to the workers, explaining where you are heading and what you are doing, and ask where you can park safely and out of their way. You all have jobs to do and safety comes first. A safety conscious logging operator will provide a safety orientation for you on site and will let you know about the hazards to be aware of. Normally they will clear a path for you if you need access through their work area and stop the equipment when they have reached the end of a cycle. If you are planning to travel back by the same route, make sure the crew knows to leave a clear path for you if they finish work before you return.

4.6 Getting Lost

4.6.1 Prevent Getting Lost

Always plan your route before leaving a vehicle, and think about the length of time it should take to get to/from your study site. If you have a GPS, take a waypoint at the truck before you leave, but keep in mind that GPS units can fail due to batteries or poor satellite reception. Study your maps and make a mental note on the most direct route out of the woods in case you lose your map or equipment fails. What general direction will take you to the closest road or to a known landmark (north, south, east or west; uphill or downhill)? Make sure you have all orientation equipment with you and that it is working properly (maps, compass, GPS, aerial photos).

4.6.2 Action When Lost

1. Remain calm;
2. Take stock of what you have with you;
3. Sit down, relax, then try to figure out where you are;
4. Use your compass, maps and aerial photos;
5. Proceed to a high point to view the lay of the land and to be more readily spotted; or if that seems impractical, walk downhill until you encounter a creek and follow it;
6. If you have not discovered your position by at least one hour before sunset, admit you are lost;

Note: If you are lost due to a forced landing it is important to stay put. Search and rescue organizations have planes, highly trained personnel and every kind of equipment and medical supplies ready to find and rescue you.

7. Prepare to spend the night out:
 - Check instructions in flare kit (dusk and dawn are the best times for spotting flares. Pick an opening from a hilltop if possible and aim in front of the approaching aircraft).
 - Prepare smoke signal fire (be cautious during fire season). Lay out ground to air signals if necessary.
 - Make shelter and build a fire. If this is impossible, cover yourself with leaves and brush.
 - Keep busy but prevent exhaustion and exposure. In cold weather be especially careful not to sweat as this will lead to becoming chilled.
 - Conserve food.

4.7 Fire

4.7.1 Forest Fire

It is every person's legal obligation, under the BC Wildfire Act, to immediately report an open fire that is burning on or within 1 km of forest land or grass land and appears to be burning unattended or uncontrolled. If you see or suspect a forest fire while you're in the field, call BC MoF fire hotline at 1-800-663-5555, or *5555 from a cell phone.

Certain types of field activities (use of saws and ATVs) are restricted when fire hazard ratings are high. Be sure to monitor provincial government issued ratings at:
http://bcwildfire.ca/Weather/Maps/danger_rating.htm

Provincial forest fire risk categories are as follows:

- | | |
|-----------------|---|
| Low | Low fire danger. |
| Moderate | Carry out any forest activities with caution. |
| High | Fire hazard is serious. Extreme caution must be used in any forest activities. Burning permits and industrial activities may be restricted. |
| Extreme | Extremely high fire hazard. General forest activities may be restricted, including burning permits, industrial activities and campfires. |

For information on fire conditions and burning restrictions: 1-888-336-7378,
<http://bcwildfire.ca>

When reporting a fire, communicate the following information:

- Exact location and size of the fire;
- Colour, density and volume of smoke;
- Wind speed and direction;
- Type of trees and ground vegetation and how they are spaced;
- The terrain in the area (is the fire on a slope or an open area);

- Values at risk (communities, buildings, powerlines);
- Access to the area (road, boat, helicopter);
- Fire fighting resources currently in use suppressing the fire;

4.7.2 Caught in a Forest Fire

If fire hazard ratings are high when you are doing field work, take a moment at the beginning of the day to think about fire escape features in your area in case you are caught in the path of a wildfire. Features that might provide a refuge from a fire include:

- “Islands” : Wetlands, lakes, rivers, large creeks;
- Large cutblocks with a young plantation;
- Areas already burned.

4.7.3 Campfires

When building a campfire use common sense. Do not build it near a tree, a log or dry tinder. Scrape the area down to mineral soil. Keep your fire small and watch for flying sparks. Be sure your fire is dead out and cold before you leave it. Current regulations define a campfire as no larger than 0.5 m in height and 0.5 m in diameter. The person must be equipped with a hand tool, such as a shovel, or at least 8 litres of water. See http://bcwildfire.ca/Prevention/prevent_wildfires.htm for more information.

4.7.4 Required Fire Fighting Equipment When Working in the Field

Fire fighting (\$100) training is available through UNBC Continuing Education for those interested. For more information check the Ministry of Forests Protection Branch website: <http://bcwildfire.ca/>.

1. If the number of persons who normally work at a worksite is 3 or less, the person carrying out the industrial activity must ensure that the following fire fighting tools are kept at the worksite:
 - One round-nosed shovel;
 - One Pulaski tool or mattock;
 - One hand-tank pump containing at least 18 liters of water.
2. If the number of persons normally working at a worksite is more than 3, the person carrying out the industrial activity must ensure that the following fire fighting tools are kept at the worksite:
 - One round-nosed shovel, Pulaski tool or mattock for each person;
 - One hand-tank pump containing at least 18 liters of water for every 3 persons, to a maximum of 8 hand-tank pumps.
3. For the purpose of subsection (2), the number of round-nosed shovels must, as nearly as possible, equal the combined number of Pulaski tools and mattocks.

This equipment is especially important if you will be lighting any type of fire, or using any equipment, such as a chainsaw, with gasoline or diesel motor that could start a fire.

All work vehicles should contain a fire extinguisher rated ABC, and remember to check charge and the date of last inspection. If not included with rental vehicles purchase one separately.

4.8 Major Accidents/Injuries

If a person is found unconscious

Check area for ongoing safety hazards. Be aware that there may be serious unseen injuries, (*e.g.* fractured spine, other broken bones or internal bleeding). In case of injury or sudden severe illness when the patient is unconscious or semiconscious, it is advisable to refrain from moving the patient - except to open an airway (see below) – until professional help arrives. However, it may be necessary to move the patient if their life is endangered by the situation, (*e.g.* fire, fumes, explosion, moving machinery).

Call or radio someone to call 911

Specify whether you need **Police, Ambulance** or **Fire**

Have the following information ready:

- Location and distance from the nearest road;
- Nature of injury.

Assess the ABC's:

A – Open Airway by tilting head back and checking mouth for obstructions.

B – Check for **B**reathing and administer mouth-to-mouth assisted breathing if required.

C – Maintain circulation with **C**ardio **P**ulmonary **R**esuscitation if necessary.

Check for Bleeding (remember to check under clothing):

Hold a pad of clean cloth directly on the wound and apply hand pressure. If this fails to stop the bleeding, apply pressure to the relevant pressure point. Do not apply a tourniquet except in the extreme condition when the patient's life is threatened by loss of blood. Loosen tourniquet briefly every 20 minutes. Prevent infection by applying a clean, sterile dressing. Stitches or a tetanus booster may be necessary.

- If possible, remove any dangerous objects from the vicinity of the patient
- Keep the patient warm
- Inform area supervisor

Upon return have them fill out the appropriate UNBC Incident/Accident Report form and submit it to the UNBC office of Purchasing Contract and Risk Management.

4.9 Burns

Burns are classified and treated according to depth or degree of tissue damage:

Burn Type	Causes	Tissue Damage	Treatment
1st Degree	Hot object, scalding liquid	Produces redness or discoloration, mild swelling, pain;	Submerge burn in cold water or apply water to area. This will ease the pain of minor burns and may promote healing
2nd Degree	Severe contact with hot object, flash burns (flammable liquids)	Greater depth than 1st degree; red/mottled appearance, blisters; more pain than deeper burns because nerve endings are still intact	Submerge in cold water until pain subsides (or apply clean cloths soaked in cold water); gently blot dry; apply sterile gauze or clean bandage. For arms/legs - raise above the body. Never break blisters or remove tissue. DO NOT apply antiseptics or ointments (surgeons treating the burn may have to remove any greases or salves applied, causing further damage).
3rd Degree	More severe contact with hot object, flash burns (flammable liquids)	Deep tissue damage; white or charred-look; complete loss of skin	Do not remove particles of charred clothing; cover burns with clean clothes; keep hands/legs elevated above the heart. For face burns, keep patient propped up. DO NOT submerge a large burned area in water (may increase shock). DO NOT apply ointments or greases. Transport to hospital immediately.

4.10 Danger Tree Hazards

Danger trees are hazardous trees, or branches, that are at risk of falling and injuring a person. Visible indicators of potential danger trees are:

- Large amounts of fungi growing on the main stem or other evidence of decay;
- Leaning or “hung up” trees or branches that are over the work site;
- High winds that are strong enough to cause trees to snap or fall over.

Some trees may have no visible signs of decay and may still be a hazard. The degree of risk of injury from a known or unknown danger tree is proportional to the amount of time you spend at a particular location. For example, a walk-through transect survey will place you at low risk of getting hit by a tree, while spending all summer at only one or two sites will put you at high risk if there are hazard trees present. Diligent practice at sites that are visited more than once in a field season is to do a quick assessment of the

site every time you arrive to identify and avoid potentially hazardous areas. Protective headwear may be necessary if hazards are identified and the tree cannot be removed. In some cases it may be prudent to carry out a professional assessment (by a certified danger tree assessor) and to remove dangerous trees if appropriate. If there are known or suspected hazard trees at your site, it is best to avoid field work at that location during periods of high winds or heavy snow/ice loading.

See *Appendix B* for more information on tree hazards and research work procedures in the vicinity of dangerous trees.

4.11 Working Around Water

River, inland waterway, estuarine and oceanic work sites are always considered remote fieldwork sites according to UNBC's Field Work Safety Policy. Any time you are working in, on or near a water body, even a shallow one, you must be aware of the additional risks posed by water. For this reason, aquatic work should never be undertaken alone. Most water accidents result from people underestimating the power of water. Many people have drowned by slipping by a river bank and getting swept downstream. It is extremely easy to slip and fall in wet areas, and it is possible to drown in even a few inches of water.

4.11.1. Hazard Assessment:

Prior to working around any water site it is recommended that personnel identify all possible hazards associated with working in and around their water environment. Summer field work could involve working around lakes with sudden drop-offs, crossing shallow rivers and sampling from river banks where one could slip. Winter field work may involve working on frozen lakes or rivers where one could fall through the ice, slip on wet ice or become subject to cold weather and hypothermia. It is important that all personnel identify and prepare for such hazards. Water bodies can also be extremely productive, often with dense vegetation, and an important habitat type for many animals. Encounters with potentially hazardous wildlife, such as bear and moose, often occur near water. Running water can also make it more difficult to hear sounds caused by wildlife – and for them to hear your approach.

4.11.2. Personal protective equipment for water:

PFD – personnel flotation device, a life jacket that is approved by Transport Canada. The fit is the most important feature when selecting a PFD. A life jacket should provide the most flotation while also fitting properly. Most life jackets provide a minimum of 7 kilograms of flotation.

Footwear – street shoes are not appropriate for working in and around water. Wool or neoprene socks are useful combined with outdoor boots that have a good gripping sole. Whistle – a good whistle is necessary for communication. It should be specific to water conditions ie. It should be able to work when wet (a 'pea-less' whistle), and be very loud.

Loud enough to hear over flowing water. A whistle should be attached to the shoulder of a PFD

Hip waders – good hip waders will insulate from the cold, not leak and provide good footing. It is important to ensure hip waders fit properly. Keep your hip waders in good shape, and check them for leaks before each field season. It is also important to wash hip waders and boots thoroughly after each use as invasive plants and seeds can become stuck in wader boots and transferred between field sites.

4.11.3. Working directly in a water body:

On occasion, you may need to work directly in the water body itself if conducting cross sections or water sampling. If using hip waders be aware that it is easy to sink deeply into the sediments, particularly in wetlands, making it difficult to take your next step and often resulting in a fall into the water. Move deliberately, and test your footing before trusting your full weight to a step. Try to keep at least one foot on something solid, and pay attention while you're working: you will likely continue to sink into the sediments as you stand in place. If one foot does become stuck, avoid sudden movements or turns. Put your weight on the solid footing and slowly pull out the foot that is stuck. You will likely have to wiggle that foot or twist it gently from side to side to loosen it.

4.11.3.1. Never put your feet down if swept away and swimming.

Do not put your feet down in current. Basic river swimming is typically performed on the back with the feet downstream, knees bent and heels slightly lower than the buttocks. The feet should be ready to push the swimmer away from obstructions. Aggressive swimming where the swimmer rolls onto their stomach and swims hard using the crawl stroke may be considered if swimming into a safe calm area at the side of a river.

4.11.3.2. Running a line across a waterway

If running a line across a waterway for the purpose of a cross section, never stand downstream of the rope; always stand on the upstream side of the rope. In case the rope comes free and swings down river, the person will not be knocked over or injured.

4.11.3.3. Shallow water crossing

To decide if a crossing is possible, one must determine the water depth, water velocity and channel bottom. One must be able to determine that that water depth is shallow enough for a safe crossing. Water velocity is usually the most obvious danger and even fast moving shallow water has the ability to knock someone off their feet. Before crossing one must ensure the channel bottom is stable and not have any sudden drop offs. Often it is useful to use a stick for stabilization when crossing a stream. It is a good idea to always face upstream and not turn sideways, that way one can always see any upstream hazards that may be floating down.

4.11.4. Training

Rescue 3 International (<http://www.rescue3international.com/>) is the recognized world standard in water rescue education. In Canada, Raven Rescue, (<http://ravenrescue.com/>) provides water safety training in accordance and certified to Rescue 3 International standards.

The most common water safety courses taken throughout British Columbia by provincial government employees, Water Survey Canada technicians, private consulting and industry are:

Flatwater Safety and Rescue – 1 day course for natural resource personnel who work near or in non-moving water including lakes and ponds.

Swiftwater Operations – 2 day course for shore- based work beside moving water, but not in water itself.

Swiftwater Rescue Technician – 3 day course for field personnel working in moving water.

Ice safety and Rescue Technician – 2 day course for field personnel working on surface ice.

* If field personnel are operating a boat they must obtain a ‘Pleasure craft Operator Card’. This certification is mandatory for all operators of powered watercraft in Canada regardless of age, engine horsepower or length of boat. Certification can be obtained through the following website: <http://www.boatinglicense.ca/>

5. WILDERNESS HEALTH RISKS

5.1 Diseases

Field workers can come into contact with a variety of disease agents. Most are extremely rare and we include only the most dangerous or most common in BC. More information on these and other diseases is available from the British Columbia Centre for Disease Control (<http://www.bccdc.ca>), Health Canada (<http://www.hc-sc.gc.ca/index-eng.php>), and the Public Health Agency of Canada (<http://www.phac-aspc.gc.ca/index-eng.php>).

5.1.1 Hantavirus

Hantavirus is a very rare disease which has caused death in about one-third of the diagnosed cases in North America. The highest risk activity is working closely with rodents. Symptoms of hantavirus pulmonary syndrome are initially very similar to influenza. In early stages, a person may have fever, sore muscles and headache, feel nauseous, vomit, and have shortness of breath. Within about 12 hours, fluid builds up in the lungs causing death within about 48 hours. Early diagnosis is crucial: if a worker develops these symptoms, seek medical attention immediately and advise attending personnel of the occupational risk of hantavirus.

For people whose occupations involve frequent rodent contact (e.g. mouse trappers) a baseline serum sample should be drawn and stored at a local lab before work is begun. You must first get a doctor's referral for the test. Keep a note in your wallet which states what lab has your serum sample. If you become ill, speedy diagnosis is important; this is done by comparing a blood sample with your baseline sample, and the hospital will need to know where this baseline sample is being held. When handling rodents or handling and cleaning rodent traps, workers should wear appropriate personal protective equipment including a half-face air-purifying (or negative pressure) respirator equipped with HEPA filters (other types of masks, such as paper masks, and other filters **WILL NOT WORK** – make sure you have the right kind), rubber or latex gloves and coveralls. Coveralls and trapping gloves should be kept in a sealed bag between uses. If dirty traps are transported between sites in a vehicle, they should be placed in sealed bags. Disinfect traps and clothing with a commercial disinfectant or bleach solution. Traps should be soaked for several hours and scrubbed in the solution.

5.1.2 Giardia

Symptoms of infection by this intestinal parasite include diarrhea, abdominal cramps, nausea and vomiting, weight loss, and fatigue. The infection can last from one to three weeks or longer. The disease is not considered life-threatening, but can be very uncomfortable! The *Giardia* parasite is quite common in Canadian water bodies, even in very isolated areas. **NEVER** drink untreated surface water from any source. Water from lakes and streams should always be boiled for at least two minutes or filtered using an

absolute pore size of one micron or less. Most commonly available filters have pore sizes larger than one micron, which could allow cysts to pass through with the water. In an emergency situation, you can put two drops of **chlorinated** household bleach in 1 litre of water (four drops if the water is cloudy), stir and let sit for 30 minutes. Be careful to use the correct amount of bleach or your stomach lining will suffer.

5.1.3 Lyme Disease

There have been over 60 confirmed cases of Lyme disease in BC. Lyme disease is caused by an organism carried by ticks and can be transferred to humans through tick bites. The organism has been found in ticks from many areas of BC. Ticks also carry the organisms that cause relapsing fever, tularemia, and Rocky Mountain spotted fever. If you are working in areas where ticks are common in vegetation, take precautions to avoid being bitten (see Section [5.4.1](#) for more details). Symptoms of Lyme disease can appear days or weeks after being bitten, and include headache, muscle and joint pains, fatigue and weakness of the face muscles. A skin rash, especially one that looks like a “bull’s eye” may appear. If you have removed a tick and you experience these symptoms, your doctor will prescribe antibiotics that kill both Lyme disease and Rocky Mountain spotted fever. Be sure to tell the doctor that you have been bitten by a tick and, if possible, provide the tick for testing. Lyme disease is not a rapidly progressing disease, although it is serious, and its worst complications can be avoided if it is treated early.

5.1.4 Rabies

Rabies is a viral disease transmitted in the saliva of infected animals. It affects the nervous system, causing increased difficulty in swallowing, excessive drooling, muscle spasm or weakness, and strange behavior. If not treated in time, rabies kills almost all its victims. There has been only one recent rabies-caused death in British Columbia, but many people per year are treated for suspected exposure. It is crucial to begin treatment for suspected rabies as soon as possible. Rabies typically takes two weeks to a month to display symptoms. If treatment is not sought until the symptoms appear, it may be too late to begin effective medical procedures. If you are bitten, scratched or licked by an animal, examination of the animal’s brain will quickly show if it was rabid.

If you work with animals that are likely to carry rabies (the most likely carriers may vary depending on where you are working, but skunks, squirrels and wolves are potential carriers in BC) you may be able to request immunization: contact your family doctor, or Northern Health. Even if you are vaccinated, you will likely still undergo treatment if you are exposed to the virus. This is not a disease to take lightly!

5.1.5 West Nile Virus (WNV)

The first non-travel linked case of WNV was found in southern BC in 2009. The usual way for humans to get WNV is through the bite of an infected mosquito. To avoid contracting the virus, take steps to avoid mosquito bites (See Section [5.4](#) for more information). Species of mosquito capable of transmitting WNV do occur in BC. However, even in areas where mosquitoes do carry the virus, very few mosquitoes are infected and most people infected with WNV experience no symptoms at all. About 20% of those infected develop mild flulike symptoms lasting a week or less. Symptoms typically include fever, headache, and body aches; a rash on the trunk of the body and swollen lymph glands may also be present. Less than 1% of people who are infected become severely ill with meningitis or encephalitis. People over 50 years of age are most at risk for severe illness.

5.2 Some Common Ailments:

The following ailments may be common or worrisome to persons working in isolation:

5.2.1 Food Poisoning

Field camps often do not have refrigeration. Food poisoning is caused by bacteria (often *Salmonella*) and can result from allowing foods to go bad: especially eggs or meats (including fish). Most people develop diarrhea, fever, and abdominal cramps 12 to 72 hours after infection. Infections usually resolve in 5-7 days and often do not require treatment unless the patient becomes severely dehydrated or the infection spreads from the intestines. People with severe diarrhea may require hospitalization and rehydration, often with intravenous fluids.

5.2.2 Blood Poisoning

Blood poisoning and gangrene can result from allowing a bad blister or other wound to go untreated. Symptoms that the wound may have passed the trivial stage are redness, swelling and a hot feeling in a large area surrounding the wound, red lines traveling “up vein” from the wound, and pain and ache in the groin area. At this point medical treatment is essential. To help prevent a wound from becoming seriously infected, if you cannot get to a health clinic immediately, bathe it in very hot, heavily salted water several times throughout the day.

5.2.3 Tetanus

If you puncture your skin deeply in such a manner that the wound seals over on the surface, the anaerobic conditions necessary for tetanus to develop may occur. If you have

had a tetanus shot within the last ten years, you need not worry. Be sure to clean the wound thoroughly before it closes, and watch for symptoms of tetanus (muscle spasms, severely progressing tightness and swelling of neck muscles)⁴.

5.3 Wildlife

Before beginning work in an area, always gather information about potentially dangerous wildlife and find out how to prepare yourself. Obtain this information from field guides, your employer, local contacts or a Conservation Officer at the Ministry of Environment (<http://www.gov.bc.ca/env/index.html>). While in the field, be aware of your surroundings and pay attention to sights, sounds and smells that may alert you to the presence of potentially dangerous wildlife. For example, **do not** wear headphones while in the field! Learning track patterns of some of the more common species, particularly recognizing bear/cougar tracks, is useful.

Below we outline general information about a number of the more common species considered “potentially dangerous wildlife”. However, all wildlife should be treated with respect – even bites from seemingly-innocuous small animals, like chipmunks, can result in disease transmission such as Hantavirus (5.1.1) or Rabies (5.1.4). Deer can deliver strong kicks if provoked, so animal encounters may not be limited to carnivores.

General advice for avoiding negative animal encounters:

- Many wild animals will likely view you as a potential predator, and approaches or attempts to touch them may evoke anti-predator escape responses (biting, scratching, kicking etc).
 - If you need to handle animals as part of your research, make sure you are wearing protective gear appropriate to the species and risk (e.g. gloves, ventilation mask).
- Respect an animal’s personal space if you approach them. Watch for signs of distress (frequent glancing in your direction, ears back, jittery movement etc) as you approach. If the animal starts showing signs of these, stop and back off until those behaviours cease – this means you likely have maintained the distance at which the animal feels more comfortable.
- Don’t corner an animal – always make sure you leave an escape path for an animal if you are approaching them. If the encounter is sudden, move slowly and deliberately to allow the animal an escape route.

While this advice is fairly generic for animals you might encounter, some species have characteristic behaviours that have specific kinds of responses. These are outlined below. This list is not exhaustive, and if there are specific wildlife concerns within your area that are not covered, and you can not find resources on responses to these independently, please contact the field safety committee and we will endeavor to help find this and add it to this manual.

⁴ Sources: BC Ministry of Health, Vancouver/Richmond Health Board “From the Health Files” datasheet series.

5.3.1 Cougars⁵

Conflicts between cougars and humans are rare, but attacks have occurred in BC. Vancouver Island has particularly high cougar densities and proper care should be taken.

Working in groups offers more protection in cougar habitat, cougar attacks have tended to occur on individuals. Some indications suggest that children may be more likely to be viewed as potential prey than adults, possibly due to smaller size, higher pitched voices and more erratic movements. For field workers, this may indicate physical size is a factor in risk to consider.

Carrying a walking stick allows you to use it as a weapon if necessary. As you move through the wilderness, it is a good idea to be looking around you - look up above on bluffs, lower branches of trees, occasionally scan behind you, and keep an eye out for tracks and signs of animal presence (this applies to early detection of presence being a key factor in helping mitigate all large animal encounters). Also be aware of potential food caches – unusual abundance of scavengers/ravens in an area, and signs of dead or decaying animals. Avoid these food caches, as a cougar feeding on a kill is especially dangerous. Cougar kittens are usually well hidden, but if you chance upon some, do not approach them or attempt to pick them up. A female will defend her young, so leave the area immediately.

Even though cougars normally avoids confrontations, and you may never even detect the animals' presence, the species is unpredictable. Never approach a cougar.

If an encounter occurs^{5,6}

- Stay calm and talk in a confident voice.
- Pick up children immediately - children frighten easily, the noise and movements they make could provoke an attack. When picking up children, try to do so with minimal bending and do not take your eyes off the cougar.
- Leash dogs and keep them under control
- Keep the cougar in view and in front of you at all times. Never turn your back on a cougar
- Face the cougar, maintain eye contact, remain upright, and do all you can to enlarge your image: do not crouch down or try to hide.
- Do not run, but try to back away slowly; sudden movement or flight may trigger an attack.
- Ensure that the animal has a clear avenue of escape. Never corner large and potentially dangerous animals.
- Make yourself look as intimidating as possible. Pick up sticks or branches, and wave them about. Your goal is to persuade the cougar you are not easy prey.
- If a cougar shows interest or follows you, respond aggressively. Arm yourself with a large stick, throw rocks, and speak loudly and firmly. Crouch down as little as possible when bending down to pick up things off of the ground.

⁵ Information based on recommendations from:
http://www.env.gov.bc.ca/cos/info/wildlife_human_interaction/docs/cougars.html &
<http://www.env.gov.bc.ca/wld/documents/cougaf.htm>

⁶ Information based on recommendations from: Canadian Geographic, May/June 2004: Vol. 124

- If a cougar attacks, fight back. Convince the cougar you are a threat. Use anything you can as a weapon. Many people survive cougar attacks by fighting back with anything at hand, including rocks, sticks, bare fists, pocket knives and fishing poles. Focus your attack on the cougar's face and eyes.

5.3.2 Bears⁷

If you are planning on spending time in bear country you must take a Bear Aware course or take the provincial government's online bear encounter self-training course <http://www.for.gov.bc.ca/hfd/library/documents/bib22777.htm>.

You must also be carrying bearspray. Not only has this been proven to be one of the best means of deterrents for bear attacks, but it is both readily accessible and easy to apply by the greatest range of personnel. Buy the larger canisters (e.g. 325g) – it is false economy to get the cheaper, smaller canisters, as in an encounter you may want that extra spray. Make sure this is accessible and easy to draw – you should be able to access your spray in about 1-2 seconds. Check the expiry date on the canister when you buy it and each time you go into the field.

British Columbia has two bear species, the black bear (*Ursus americanus*) and the grizzly bear (*Ursus arctos*). Being able to identify the difference between the two species, both visually and by their tracks and sign, is extremely useful for being able to respond to encounters, as the behaviours exhibited by either animal, and recommended responses to encounters with each species differ. Information on identifying signs and physical appearance of either species is now available in a brochure by the provincial government at <http://www.env.gov.bc.ca/wld/documents/bearsmart/whoswhobears.pdf>.

Both bear species have been responsible for serious injuries and deaths to humans in BC, and both should be treated with extreme caution. The best way to avoid bear-human conflict is to alert bears to your presence *before* getting too close to them. Many encounters occur by suddenly surprising bears that were unaware of your presence – alerting them to your location will likely result in most bears avoiding you. This is best accomplished by making a lot of noise. Wherever possible, try to stick to open areas where you can be easily seen and heard, and also affords you greatest ability to detect bears at larger distances. While walking through thick bush, stay alert and make an extra effort to be noisy (e.g. calling out “YO⁸” about every 50 paces or at regular intervals if you are stationary works very well), especially near loud streams and waterfalls. Low

⁷ Information on bears is synopsed from the following sources:

- Herero, S. 2003. Bear attacks; there causes and avoidance. McClellan & Stuart Ltd. ISBN 0-7710-4059-8
- <http://www.env.gov.bc.ca/bcparks/explore/misc/bears/bearsaf.html>
- <http://www.env.gov.bc.ca/wld/documents/bearwld.htm>
- “Staying Safe in Bear Country” video - <http://www.bearsmart.com/video/206>

⁸ Some sources suggest calling “YO BEAR”, but the Alaskan Park Service recommends avoiding the use of the word “bear” reserving it until you actually encounter one. That way, it is a signal to companions that a bear is present – YouTube video – “Staying Safe in Bear Country. Part 1” - <http://www.youtube.com/watch?v=LM0OghpVaFY>

frequency sound transmits better than high frequency sounds in forests, so calling tends to work better than bells to alert bears of your presence. In very noisy areas, or areas with very dense vegetation, some workers have found small marine airhorns are effective noisemakers for alerting bears of your presence.

A particularly dangerous situation is when encountering a bear defending either a carcass, or a female with cubs. Stay vigilant for signs of carcasses - avoid areas where ravens or other scavengers appear to be congregating, and be aware of smells of decay. If you detect a carcass, leave the area. The responses of females with cubs can differ slightly between species, and will be dealt with below.

5.3.2.1 Black Bears

The black bear may not be black: colour can vary from brownish to cinnamon, and even white in Kermode bears on BCs northern coast. In physical appearance, these bears are typically smaller than grizzly bears, although large black bears can overlap in size with small grizzlies. Black bears have a more narrow-looking face and longer, rounder ears than grizzlies. When viewed from the side, black bears lack a hump on the back characteristic of grizzly bears, and the profile of the face has a straight slope from forehead through tip of nose.

Most encounters with black bears do not result in attacks. If unaccustomed to people, black bears will usually turn and run from an encounter. However, black bears are often curious, can easily become habituated to people if they begin associating people with sources of food, and have also been known to engage in predatory attacks. Reading the behaviour of the animal is a key to knowing how to respond in an encounter.

If an encounter occurs:

- **Get out your bear spray and have it ready for use – do this in ALL encounters**
- Stay calm and gauge the animal's behaviour
 - **If the bear appears nervous**, it may be looking for an opportunity to escape. This behaviour could include the bear standing on its hind limbs and sniffing the air, or moving its head back and forth to get a better view. *Standing is not necessarily an indication of aggressiveness* – look to see if the ears are forward and straight up. This may simply be a behaviour to determine what you are and what threat you impose.
 - Begin talking to the bear in a calm voice (doesn't really matter what you say, it is the tone of your voice that counts), and waving your hands slowly above your head
 - Make sure you give the bear an escape route
 - Back slowly away from the bear, never turning your back on the bear.
 - Do not run, this may invoke a predatory response to chase you, even if this hadn't been the bear's intention in the first place.
 - Leave the area, even if the bear does run away.
 - **If the bear appears aggressive** – this might take the form of the bear huffing or snapping its teeth, swiping at the ground, or even bluff charging in an

aggressive manner. The ears may be flat or back on the head. The bear is feeling threatened, or attempting to exert its dominance, so you need to respond by de-escalating the situation. Although frightening, the correct response in this type of encounter will reduce the prospects of escalating to physical contact.

- Stand your ground, do not run
- Begin talking calmly to the bear – you are now trying to show it you are not a threat. Wave your hands slowly above your head
- Avoid direct eye contact, as this can be perceived as a threat
- Back slowly away from the bear, never turning your back on the bear. If the bear charges, stop immediately and stand your ground and keep talking calmly. Look for the next opportunity to put more distance between you and the bear.
- When safe to do so, leave the area.
- If the bear gets very close or presses to a physical attack
 - first, deploy your bear spray. However, wait literally until the bear is close enough for you to be smelling breath and “seeing the whites of the eyes” – bear spray only works well in very close proximity (<2-3m distance between you and the bear).
 - If the attack persists, and physical contact is made, you should fight back with anything you have at your disposal – sticks, rocks, etc. You are now trying to show it you are dominant, as well as the preventing the encounter from changing to predatory.
- **If you encounter a female with cubs** – often the first sense you may have that a female with cubs is present is when one or more small bears scramble to safety in the trees ahead of you. If you see cubs climbing or in trees, assume that their mother is likely at the base of that tree to defend them.
 - The response to this scenario is similar to that of an **aggressive bear**. Your goal is to show the female you are not a threat to her cubs. Follow the same steps as above.
- **If the bear approaches you without appearing aggressive** – This may appear as though the bear is being curious. It may approach without looking directly at you, or avoiding eye contact. It may not appear aggressive (e.g. have ears in forward, alert position etc). **THIS IS AN EXTREMELY DANGEROUS SCENARIO.** The bear is potentially sizing you up as prey. **Your objective is to show it you are potentially dangerous and a bad prey item.**
 - Begin talking in a loud and assertive voice: yell at the bear, bang pots together, make as much noise as possible.
 - Make yourself look big. Stand on low stumps or rocks (as long as they are stable and aren't likely to cause you to fall over). Hold your hands above your head.
 - Make aggressive movements, like picking up large sticks and hitting them against tree trunks, the ground or waving them at the bear.
 - Try and distance yourself from the bear, acting aggressive as you back away. **DO NOT TURN YOUR BACK ON THE BEAR.**

- If the bear gets close enough, deploy your bear spray directing it at the face, targeting the eyes and nose area.
- If the bear presses the attack use whatever you have on hand and fight back. The rule of thumb is always to try and fight off an attacking black bear. Do not play dead. Use pepper spray, a branch, stones, or whatever is available to fight off an attack.

5.3.2.2 Grizzly Bears

Grizzlies are distinguished from black bears by their shoulder-hump and dish-shaped faces. They are also usually brownish or yellowish- brown, but vary in colour from blonde to black.

Grizzlies occasionally make unprovoked attacks, but most encounters result from them being surprised at close quarters. In this instance, it may act very aggressively. Fewer predatory attacks are reported for grizzly bears than for black bears, but these have been known to occur. As with black bears, reading the bears behaviour is important on determining your response. The responses in different scenarios, however, may differ from responses to a black bear, which is why it is important to be able to distinguish what kind of bear you are looking at!

If an encounter occurs:

- **Get out your bear spray and have it ready for use – do this in ALL encounters**
- Stay calm and gauge the animal’s behaviour
 - **If the bear detects you from a distance or appears nervous** – even in a surprise encounter, the bear may not behave aggressively. It could include the bear standing on its hind limbs and sniffing the air, or moving its head back and forth to get a better view. *Standing is not necessarily an indication of aggressiveness* – look to see if the ears are forward and straight up. This may simply be to determine what you are and what threat you impose. The response here is similar to the similar scenario for black bears.
 - Begin talking to the bear in a calm voice (doesn’t really matter what you say, it is the tone of your voice that counts), and waving your hands slowly above your head
 - Make sure you give the bear an escape route
 - Back slowly away from the bear, never turning your back on the bear.
 - Do not run, this may invoke a predatory response to chase you, even if this hadn’t been the bear’s intention in the first place.
 - Leave the area, even if the bear does run away.
 - **If the bear becomes aggressive (defensive attacks)** – particularly if you **surprise a bear at close range**, or it is **defending either cubs or a carcass**, the bear may begin acting in a very aggressive manner huffing or snapping its teeth, swiping at the ground, or even bluff charging in an aggressive manner. The ears may be flat or back on the head and the animal may be baring its teeth. The bear is attempting to exert its dominance and neutralize you as a threat. In grizzly encounters, this can escalate to the bear making physical

contact, knocking you to the ground and even biting. However, physical contact does not necessarily mean the bear is intent on killing or eating you, only ensuring that you no longer pose a threat. You need to respond by de-escalating the situation. Although frightening, the correct response in this type of encounter will reduce the prospects of escalating to physical contact.

- Stand your ground, do not run
- Begin talking calmly to the bear – you are now trying to show it you are not a threat. Wave your hands slowly above your head
- Avoid direct eye contact, as this can be perceived as a threat
- Back slowly away from the bear, never turning your back on the bear. If the bear charges, stop immediately and stand your ground and keep talking calmly. Look for the next opportunity to put more distance between you and the bear.
- When safe to do so, leave the area.
- If the bear gets very close or presses to a physical attack
 - First, deploy your bear spray. However, wait literally until the bear is close enough for you to be smelling breath and “seeing the whites of the eyes” – bear spray only works well in very close proximity (<2-3m distance between you and the bear).
 - **If the attack persists, and physical contact is made, DON'T FIGHT BACK** (at least not initially).
 - Drop to the ground, roll onto your stomach, spread your legs apart and clamp your hands, fingers interlocked behind your neck. This position best protects your vital organs and face.
 - If the bear bites or strikes you, make every effort possible not to make noise or move out of this position (your life may depend upon it).
 - If the bear tries to roll you onto your back, continue the momentum of the roll and continue until you are back on your stomach.
 - If you can maintain this submissive posture, a bear intent only on neutralizing you as a threat may cease an attack after less than a minute. **STAY IN THIS POSTURE AND DO NOT MOVE ONCE THE ATTACK HAS STOPPED UNTIL YOU ARE SURE THE BEAR HAS LEFT THE AREA.** If the bear is still nearby, moving or attempting to escape may result in it resuming its attack. Only when you are sure the bear has left the area should you attempt to escape. When it is safe to do so, leave the area as quickly and safely as possible.
 - *If the attack persists or the bear begins consuming you*, the attack may have shifted from neutralizing to an opportunistic predatory attack. This is far rarer scenario, but now you need to start fighting. Follow the response below for potentially predaceous attacks.
- **If the bear approaches you without appearing aggressive (predaceous attacks)** – This may appear as though the bear is being curious or nonchalantly

walking into your camp. It may approach without looking directly at you, or avoiding eye contact. It may not appear aggressive (e.g. have ears in forward, alert position etc). This kind of encounter is much less common type of grizzly encounter than is the defensive attacks noted above, but **THIS IS AN EXTREMELY DANGEROUS SCENARIO**. The bear does not see you as a threat, and is potentially sizing you up as prey. **Your objective is to show it you are potentially dangerous and a bad prey item.**

- Begin talking in a loud and assertive voice: yell at the bear, bang pots together, make as much noise as possible.
- Make yourself look big. Stand on low stumps or rocks (as long as they are stable and aren't likely to cause you to fall over). Hold your hands above your head.
- Make aggressive movements, like picking up large sticks and hitting them against tree trunks, the ground or waving them at the bear.
- Try and distance yourself from the bear, acting aggressive as you back away. **DO NOT TURN YOUR BACK ON THE BEAR.**
- If the bear gets close enough, deploy your bear spray directing it at the face, targetting the eyes and nose area.
- If the bear presses the attack use whatever you have on hand and fight back. Use pepper spray, a branch, stones, or whatever is available to fight off an attack. Target the eyes and nose.
- If what started as a defensive attack above turns into an opportunistic predatory attack, fight back as above.

5.3.2.3 Minimizing Risk

Learn to recognize bear sign – overturned logs, dug up mammal burrows, patches of earth overturned in searches for roots, broken tree branches, slashes on tree trunks, bear scat or tracks. Be sure to be on the lookout in berry patches – these are hotspots for bears. If you notice berries fallen from branches and mangled twigs, a bear may have been feeding recently. Riverbeds and valleys are also hotspots for bears as they feed on vegetation in these areas. Be particularly alert in areas where your vision is obscured, for instance by high, dense vegetation.

Some locally available bear deterrents include horns, bear spray (see Section [3.2.5](#)) and bear bangers (see Section [3.2.6](#)). As with any field equipment, be certain that such deterrents are well-maintained and accessible at all times. If you do encounter a bear, prepare to drop your pack to distract it if attacked but note that some people claim that a pack can afford protection during a mauling.

Avoid carrying odors that may attract bears (some are indicated below). If possible, when working in areas with high bear densities, leave your lunch in the truck and return to the truck to eat, rather than carrying food with you. Don't cook near your tent or sleeping area and never bring food into it to avoid permeating it with food odors. When camping, leave particularly smelly foods at home (e.g. bacon) and, if possible, burn empty wrappers or cans (retrieve from ashes and pack out). Store your food in a plastic

bag hung high in a tree at least 30m away. In a field camp, create a cache to keep all food, cosmetics, trapping supplies (bags of grain, *etc.*), and garbage: this should be suspended between two trees in bear country. All garbage should be promptly removed from the camp area for burial or for storage and subsequent packing out. Pitch tents well off the trail and well off what may be natural corridors for bear travel. Again, be aware of your surroundings and aware of bear sign. Note that, unless appropriately trained, dogs should not be taken into bear country. They are more likely to cause trouble than to render protection.

5.3.2.4 Polar Bears

In coastal arctic environments, polar bears may be a problem. These bears are extremely dangerous and may move out of sight to begin stalking human prey. Treat all approaches by polar bears as being potentially predaceous and respond to the “non-aggressive approaches” by a grizzly bear acting in similar manner. In polar bear habitat, a firearm may be needed for protection of field personnel (see Section [3.3.5](#)).

5.3.3. Wolves, Coyotes and Foxes⁹

Wolves and other canids (members of the dog family, such as coyotes and foxes) are generally not a threat to humans. Wolves are secretive; usually once a wolf has spotted or winded a human it will run away without the person even knowing it was there. An exception where canids, including wolves, may approach humans is when they have become acclimated to people, possibly through being fed by or associating people as a source of food. This may be especially true of coyotes and foxes, especially in urban settings.

5.3.3.1. Wolves

Indicators that wolves are present in an area will be sign (scat, tracks) as well as potential to hear howling from packs or individuals. Howling does not indicate aggressiveness; this is signaling method between individuals within a pack to locate each other, and between packs to identify territorial boundaries. Howls can be heard upwards of 5km away, so simply hearing a wolf does not indicate it is in immediate proximity. Wolf howls are typically long, low pitched and drawn out, whereas coyote howls tend to be short, higher pitched and often include yapping.

If an encounter occurs:

⁹ http://www.env.gov.bc.ca/cos/info/wildlife_human_interaction/docs/wolves.html

- Stay calm
- Do not allow a wolf to approach any closer than 100 metres.
- Back away slowly, do not turn your back on a wolf.
- If the wolf approaches, raise your arms and wave them in the air to make yourself look larger.
- If you have younger children with you, pick them up without bending down or taking your eyes off the wolf
- In the extremely unlikely event that you are attacked by a wolf, fight back. Try to remain standing and use sticks, rocks or any other implements you may have to fend off the attack. Keep the animal away from your neck and head.

5.3.3.2 Coyotes and Foxes

Encounters with these smaller canids are more likely to be considered a nuisance than dangerous. Coyotes, particularly in urban areas, can become acclimated to the presence of people, and have been known to prey on small residential pets. However attacks on people have occurred, including a recent case where a woman in the Maritimes was killed by a pair of coyotes¹⁰. Although extremely atypical of coyote behaviour, it does indicate that these animals should be given due respect.

Fox attacks are also rare, and would be unlikely to result in death. However, all canids, including foxes, are potential carriers of rabies, and bites from affected animals have occurred.

5.3.4 Moose

A moose encounter has the potential to be just as dangerous as a bear encounter. Further, encounters with moose are often more frequent than encounters with bears in given areas. Therefore, similar measures must be taken to avoid these large ungulates. Moose are especially aggressive in the spring (calving season) and the fall (rutting season). Moose are most active in the early hours of the morning. However, one can expect to meet a moose any time of the day, especially in marshy woodland and around lakes. The best method of avoiding unwanted encounters with wildlife is to make a lot of noise. Hence, while practicing good bear-avoidance measures, moose and other wildlife will also be alerted of your presence.

As harmless as a moose encounter may seem, it is important to have a high level of respect for the damage and injury these animals can incur if they feel threatened. Hence, if a moose is encountered, a minimum of 100 m should be put between yourself and the animal. If the moose remains stationary, you should cautiously move away from the animal, monitoring its behaviour in the process. Signals such as whether its ears are forward or back, or a lowering of the head are good indicators of aggressiveness (forward and erect is the animal being alert, back and down over the head is aggressive). React

¹⁰ <http://www.cbc.ca/news/canada/nova-scotia/coyotes-kill-toronto-singer-in-cape-breton-1.779304>

according to the signals being sent by the animal. Also, the direction you use in moving away should not interfere with any natural escape routes the moose may want to take. For instance, if near a marshy area, it is best to move away from both the moose and the marsh, as the moose will likely want to seek the marsh for safety. Similarly, it is very important not to position yourself between two moose (cow and calf or two rutting males).

If a moose feels threatened, it may charge at the person that has invaded its space. Moose are not predatory animals. As a result, if a crewmember notices a moose exhibiting aggressive behaviour, it is best to give the animal a lot of space, quickly. Some examples of aggressive behaviour that may be exhibited are flattening of the ears and approaching humans. An angry female may also try to put herself between crewmembers and her calf. **Unlike in a bear encounter, walking quickly, or if safe to do so, running away from an angry moose is unlikely to lead to a sustained attack; it will likely prevent it.**

Should the moose charge regardless, the best method of defense is to move behind a big tree. Continue to try to get away from the animal while always keeping large solid objects between yourself and the moose. It is imperative that no false sense of security is attained once a large solid object is between a person and an angry moose, as moose are very capable of kicking accurately with their forelegs around a tree trunk.

Although it is best to try to get away from the animal, this is sometimes difficult, particularly if the area is challenging to move through. In such a scenario, a final option may be to climb a tree. However, there are risks involved with this, such as the moose charging the tree, or simply not leaving the area at all and your being stuck in the tree.

Regardless of how minor an encounter with a moose is, good judgment must be used to determine whether it is safe to continue working in this area for the day. A good rule of thumb should be that if the moose does not leave the area upon the arrival of the fieldworker(s), the area should be vacated for the day. Other crewmembers must be alerted of the presence of moose using the radio.

5.3.4 Other Potentially Dangerous Animals

Researchers working in rattlesnake habitats might wish to carry a snake-bite kit among their first aid supplies and be familiar with its use. Informed opinions differ as to the merits of various snakebite kits. Obtain current advice on this before making a decision.

5.4 Invertebrates

5.4.1 Ticks

Avoid ticks by walking on cleared trails whenever possible. Apply insect repellent to clothing. Choose light-coloured clothing, and tuck your pants into your boots or socks and tuck your top into your pants. If the vegetation is high, wear a wide-brimmed hat. Check your body, scalp, and bedding for ticks every evening. The ticks are 2-3 mm long

and favour sheltered locations on the body, so check carefully. If you find an attached tick remove it carefully, as the tick burrows into the skin and can leave behind its mouthparts when pulled away suddenly. Using tweezers or a tick-remover¹¹, grasp the tick as close to the skin as possible. Without squeezing the tick, gently lift it straight out, and then clean the bite area with rubbing alcohol or soap and water. Keep the tick in an airtight container: if you develop symptoms of Lyme disease (see Section [5.1.3](#)) the tick can be tested easily.

5.4.2 Biting Flies

Biting flies include blackflies, mosquitoes, horseflies and deerflies, and biting midges or “no-see-ums”. Females of these flies break the host’s skin and inject saliva in order to obtain blood. The host’s body reacts to the physical damage but also to the injected saliva. There is also a psychological response, both to the bites themselves and to the sight and sound of the attacking flies. Different people react differently to different types of flies and to physical, biochemical and psychological irritation.

Blackflies complete their larval development in fast-running water, and the adults tend to be most common in areas where these habitats are available. They tend to be active during the day and do not bite indoors. They will crawl under loose-fitting clothing in order to feed. Mosquitoes, on the other hand, breed in stagnant water: however, even tiny amounts of water (e.g. a hoof print) can be enough. They tend to be most active at dusk and dawn, and will bite through thin clothing. Horseflies and deerflies are large flies that locate their prey by sight. They frequent edge habitats near forest openings and fields and are active during the day. They can be extremely persistent and aggressive biters. Biting midges or “no-see-ums” are tiny (1-3 mm) and are active especially at dawn and dusk in wooded areas or in dense vegetation. The bites can be extremely painful.

The best protection for most biting flies is avoiding times and habitats when the flies are most active, particularly when choosing a camp site. Because avoidance is not always possible for field workers, strategies such as dressing appropriately and using a repellent when necessary are recommended. Wear long sleeves, long pants and a hat. Tuck in cuffs, especially when blackflies are prevalent, and wear loose-fitting clothes to reduce mosquito bites. Choose light-coloured clothing, as some research suggests that biting flies prefer dark, matte colours. Many repellents are currently available. The most effective ones contain diethyltoluamide, or DEET. While effective, DEET is not risk-free for humans. When possible, avoid applying it directly to the skin. Instead, use it on clothing, and wash hands well after application. Be aware that DEET will destroy many plastics and synthetic fabrics! DEET is not particularly effective against biting midges or horseflies and deerflies. Deerfly patches (white sticky patches applied to the backs of hats) may provide some relief from horseflies and deerflies. For all biting flies, head nets and mesh “bug jackets” can also help prevent bites especially to the face and neck.

¹¹ Pro-Tick is available from SCS Ltd., P.O. Box 573, Stony Point, NY, 10980, Tel. 1-800-749-8425, Fax 1-800-749-8425, emailscs@mne.net, Web: <http://www.scs-mall.com/>. It is also available from other suppliers.

5.4.3 Stinging Insects

Bees and wasps will sting to defend themselves or their colony. They inject venom that contains histamine and several other proteins. The venom causes localized swelling and stinging. Some people react more than others to stings of various types, and a few people may exhibit a potentially lethal hypersensitive reaction (see Section [5.4.5](#) for more about anaphylaxis).

Bees rarely sting unless directly threatened. The honeybee stinger is barbed, and tears out when the bee pulls away, leaving the stinger and venom sack behind. The stinger is best removed by stroking a knife quickly and firmly along the surface of the skin, lifting the stinger out. **DO NOT** squeeze the stinger, as more venom will be injected into the wound. Wasps, on the other hand, do not have barbed stingers and are able to sting repeatedly. Most human-wasp encounters result from a person stepping on or brushing up against a nest of wasps. Large nests can be extremely aggressive and have many defending insects. To avoid being stung, pay attention to your surroundings and avoid these insects. If there are large numbers of wasps nearby, or if you can hear loud buzzing, choose a different route. Stings are usually not dangerous unless a person is allergic or is stung many times. In both those cases, remove the person from further harm and treat as if anaphylaxis is imminent. There are several products available for the relief of discomfort caused by stings.

5.4.4 Other Invertebrates

Spiders are also frequently blamed for bites. While all spiders have venom glands, which they use to subdue their prey, almost none of the species in BC are capable of breaking human skin. The black widow spider is, however, found in the southern half of the province. It is a shiny black spider with a red to orange hour-glass marking on the underside. It usually occurs away from occupied buildings, in fields, under logs or in disused buildings. It is sometimes found in outhouses. While the bite is painful, mortality is extremely rare. There have been various unconfirmed reports of other, potentially dangerous, spiders in BC. In general, any painful unidentified bite should probably be checked by a doctor, particularly if it becomes infected or does not heal quickly.

5.4.5 Anaphylaxis

Anaphylaxis is a life-threatening allergic reaction. Some common causes are insect bites/stings, and food and drug allergies. The reaction is sudden, severe, and causes constriction of the airways, resulting in wheezing and difficulty breathing. Hives on the lips, eyelids, throat, and/or tongue as well as abdominal pain, cramps, vomiting, and diarrhea may also occur. Symptoms develop rapidly, often within seconds or minutes. Risks include prior history of any type of allergic reaction. Any person who is stung by an insect should be monitored. People who have a history of allergy to insect bites/stings should be instructed to carry (and use) an emergency kit consisting of injectable

epinephrine and a chewable antihistamine such as Benadryl. They should also wear a Medic-Alert or similar bracelet/necklace stating their allergy. However, be aware that it is possible for a severe reaction to occur the first time a person is exposed or stung. Severe reactions may progress rapidly. Call for emergency assistance if signs of anaphylaxis appear. While waiting for or during transport, have the person lie down. If the person is unconscious and breathing, lie them on their side to allow drainage from the mouth. If there is no breathing, movement or response to touch, begin CPR. If the person is carrying an allergy kit containing epinephrine (Epipen), follow the instructions on the kit.

It is the best practice for every field crew to have immediate access to an Epipen.

5.5 Dehydration and Heatstroke

5.5.1 Dehydration

Dehydration can be a serious heat related disease. Under normal conditions, we all lose body water daily through sweat, tears, urine, and stool which is usually replaced by drinking fluids and eating foods that contain water. When a person becomes so sick with fever, diarrhea, or vomiting, or is overexposed to the sun, dehydration occurs as the body loses water and essential body salts such as sodium, potassium, calcium bicarbonate and phosphate. The most common symptoms include: thirst, less-frequent urination, dry skin, fatigue, dizziness, confusion, dry mouth and mucous membranes, and increased heart rate and breathing.

To prevent dehydration, drink plenty of fluids or sports drinks to maintain electrolyte balance, especially when working or playing in the sun. Schedule hard physical activity for the cooler parts of the day.

In cases of mild dehydration, simple rehydration is recommended by drinking fluids. Many sports drinks on the market effectively restore body fluids, electrolytes, and salt balance. For moderate dehydration, intravenous fluids may be required, although if caught early enough, simple rehydration may be effective. Cases of serious dehydration should be treated as a medical emergency, and hospitalization, along with intravenous fluids, is necessary. Immediate action should be taken.

5.5.2 Heat Stress and Heat Stroke

Heat stroke is the most severe form of heat illness and is a life-threatening emergency. Under certain circumstances, such as extreme heat, high humidity, or vigorous activity in the hot sun, if a person becomes dehydrated and cannot sweat enough to cool their body, their internal temperature may rise to dangerously high levels, causing heat stroke. It is a condition that can occur in anyone – even the young and fit. It develops rapidly and requires immediate medical treatment. The most common symptoms include: headache,

dizziness, disorientation, agitation or confusion, sluggishness or fatigue, seizure, hot, dry skin that is flushed but not sweaty, high body temperature, loss of consciousness, rapid heart rate, and hallucinations.

To prevent heat stroke, drink plenty of fluids during outdoor activities, especially on hot days. Water and sports drinks are the drinks of choice; avoid tea, coffee, soda and alcohol as these can lead to dehydration. Wear lightweight, tightly woven, loose-fitting clothing in light colors, and wear a hat. Schedule vigorous activity for cooler times of the day. Increase the time spent outdoors gradually to get your body used to the heat. During outdoor activities, take frequent drink breaks and splash water on your head. Be aware of humidity as high humidity inhibits a body's ability to perspire and cool even when the actual temperature is not that high.

It is important for a person with heat stroke to be treated immediately as it can cause permanent damage or death. There are some immediate first aid measures you can take while waiting for help to arrive. Get the person indoors or into the shade. Remove clothing and gently apply cool water to the skin followed by fanning to stimulate sweating. Apply ice packs to the groin and armpits. Have the person lie down in a cool area with their feet slightly elevated. Intravenous fluids are often necessary to compensate for fluid or electrolyte loss. In an emergency situation where a pre-formulated rehydration solution is unavailable, you can make your own oral rehydration solution by mixing 1/2 teaspoon salt, 1/2 teaspoon baking soda, 3 tablespoons sugar and 1 liter of safe drinking water. Be sure to measure accurately because incorrect amounts can make the solution less effective or even harmful. If possible, have someone else check your measurements for accuracy (see footnote on [3.2.2](#)). Bed rest is generally advised.

5.5.3 Heat Stress–Related Disorders¹²

A summary of heat stress–related disorders, causes, symptoms, treatment and prevention is presented in increasing severity in the table below.

	Cause	Symptoms	Treatment	Prevention
Heat Rash	Hot humid environment; plugged sweat glands.	Red bumpy rash with severe itching.	Change into dry clothes and avoid hot environments. Rinse skin with cool water.	Wash regularly to keep skin clean and dry.
Heat Cramps	Heavy sweating from strenuous physical activity drains a person's body of fluid and salt, which cannot be replaced just by drinking water. Cramps occur from salt imbalance resulting from failure to replace salt lost from heavy sweating.	Painful cramps commonly in the most worked muscles (arms, legs or stomach) which occur suddenly at work or later at home. Heat cramps are serious because they can be a warning of other more dangerous heat-induced illnesses.	Move to a cool area; loosen clothing, gently massage and stretch affected muscles and drink cool salted water (¼ to ½ tsp. salt in 1 litre of water) or balanced commercial fluid electrolyte replacement beverage. If the cramps are severe or don't go away after salt and fluid replacement, seek medical aid. Salt tablets are not recommended.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Fainting	Fluid loss and inadequate water intake.	Sudden fainting after at least two hours of work; cool moist skin; weak pulse.	GET MEDICAL ATTENTION. Assess need for CPR. Move to a cool area; loosen clothing; make person lie down; and if the person is conscious, offer sips of cool water. Fainting may also be due to other illnesses.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Heat Exhaustion	Fluid loss and inadequate salt and water intake causes a person's body's cooling system to start to break down.	Heavy sweating; cool moist skin; body temperature over 38°C; weak pulse; normal or low blood pressure; person is tired and weak, and has nausea and vomiting; is very thirsty; or is panting or breathing rapidly; vision may be blurred.	GET MEDICAL ATTENTION. This condition can lead to heat stroke, which can kill. Move the person to a cool shaded area; loosen or remove excess clothing; provide cool water to drink; fan and spray with cool water.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.
Heat Stroke	If a person's body has used up all its water and salt reserves, it will stop sweating. This can cause body temperature to rise. Heat stroke may develop suddenly or may follow from heat exhaustion.	High body temperature (over 41°C) and any one of the following: the person is weak, confused, upset or acting strangely; has hot, dry, red skin; a fast pulse; headache or dizziness. In later stages, a person may pass out and have convulsions.	CALL AMBULANCE. This condition can kill a person quickly. Remove excess clothing; fan and spray the person with cool water; offer sips of cool water if the person is conscious.	Reduce activity levels and/or heat exposure. Drink fluids regularly. Workers should check on each other to help spot the symptoms that often precede heat stroke.

¹² http://www.labour.gov.on.ca/english/hs/pubs/gl_heat.php

5.6 Hypothermia

Hypothermia, or loss of core body temperature, is a very serious threat in our environment and can occur in any season. Chapter 9 in St. John Ambulance's *Official Wilderness First Aid Guide* provides a good section on the prevention and treatment of hypothermia.

5.6.1 Prevention

Bring adequate clothing. Tell someone the instant you feel cold. Drink plenty of fluids throughout the day. Eat a lot before bed and first thing in the morning, try to snack throughout the day. This is especially important if you know you will be winter camping. You can wear all the clothes you want but your body needs energy to generate heat. Once hypothermia starts it may be too late for recently ingested food/fluid to be useful. Be aware of wet and windy conditions where you can lose heat faster than your body can generate it. Dress in layers and manage your clothing to avoid sweating. Change all wet clothing including socks, gloves, and hats. Keeping dry will minimize the risk of hypothermia which cools you through evaporation.

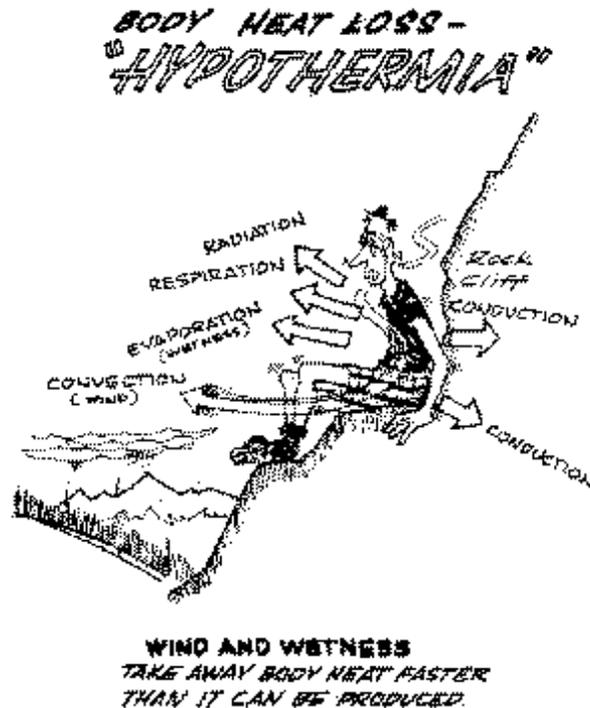


Figure 1: Hypothermia

5.6.2 Management of Mild Hypothermia

Patient is shivering, slurring words, but can answer questions intelligently:

1. Assess the ABC's
 - A** – Maintain adequate **A**irway
 - B** – Maintain adequate **B**reathing
 - C** – Support the **C**irculation as necessary

Patients with only mild hypothermia should not have abnormalities in the ABC's. If any signs of deterioration occur in the patient's status, i.e. decreased level of consciousness, respiratory distress, or decreased peripheral pulse, the attendant must consider the presence of other injuries.
2. Minimize further heat loss. Replace all wet clothes with dry ones. Wrap patient in a blanket or sleeping bag.
3. Handle the patient gently.
4. Do not suppress shivering, even if it appears violent. This is the most effective way that the body has to generate heat.
5. Only give warm fluids when the patient is fully alert, or else they have a high risk of vomiting. Do not give any stimulant (coffee, tea, alcohol).
6. Do not massage the extremities or trunk.
7. Do not give the patient a warm bath or shower.
8. The application of hot packs is controversial. Patients with moderate to severe hypothermia treated in this way have a higher mortality rate than those treated without hot packs. Furthermore, hot packs have the potential to burn the patient. Patients with mild hypothermia may benefit from the careful application of warm pads or hot-water bottles behind the patient's neck (unless a cervical spine injury is suspected), in the groin and the armpit (trunk areas only). Treatment of moderate to severe hypothermia is beyond the scope of this manual. Consult a reputable first aid guide such as St. John Ambulance's *Official Wilderness First Aid Guide* or *Mountaineering First Aid* for more information.¹³

¹³ <http://www.hypothermia.org/hypothermia.htm>

BODY SIGNS/SYMPTOMS TEMP. (rectal)		www.hypothermia.org
37.5°C NORMAL		
36 FEEL COLD	Seek dry shelter, replace wet clothing with dry including socks, gloves, hat, cover neck, insulate whole body including HEAD from cold. Exercise but avoid sweating. External warmth (bath, fire) ONLY if CORE TEMP. above 35°C. Warm sweet drinks and food (high calories).	
35 SHIVERING		
BODY CORE TEMPERATURE BELOW 35°C = HYPOTHERMIA = HOSPITAL		
	NO EXERCISE, HANDLE GENTLY, REST. NO EXTERNAL WARMTH (except to chest, trunk, eg. Hiebler Jacket). Warm sweet drinks and calories.	
34 IRRATIONAL CONFUSED (may appear drunk)	Internal warming via warm moist air (exhaled air, steam) or warm moist oxygen (40 - 42°C at mask).	
33 MUSCLE STIFFNESS	Monitor pulse, breathing. Restrict all activity, lie down with feet slightly raised.	
32 SHIVERING STOPS, COLLAPSE. TRANSFER TO HOSPITAL. URGENT.		
31 SEMI CONSCIOUS	Nothing by mouth. Check airway remains open.	
30 UNCONSCIOUS No response to painful stimuli	May tolerate plastic airway, put in recovery position, check airway, turn every 2 hours to protect skin, monitor pulse and breathing.	
29 SLOW PULSE AND BREATHING	Slow mouth-to-mouth breathing, at victim's own rate (may be very slow).	
28 CARDIAC ARREST No obvious pulse or breathing Pupils dilated	Check airway. CPR, with mouth-to-mouth breathing. Aim for normal CPR rates of 12-15 breaths/min. and 80-100 compressions/min. but slower rates of 6-12 breaths/min. and 40-60 compressions/min. may be adequate. Continue for as long as you can.	
BELOW 28°C. NO VITAL SIGNS, COLD. DO NOT GIVE UP TREATMENT.		
NOTE: NOT DEAD UNTIL WARM AND DEAD! Avoid rapid rewarming and HANDLE GENTLY AT ALL TIMES. Core temperature may lag behind skin temperature and continue to drop, so keep monitoring.		



Figure 2: Hypothermia Treatment Chart for a Field Situation

More information can be found at:

<http://www.hypothermia.org/onland.htm>

<http://www.hypothermia.org/>

5.6.2.1 First Aid Treatment¹⁴

It is essential to call for medical professionals as soon as possible. The most important phase of treatment is the prevention of post-rescue collapse during the first 30 minutes following rescue, and during transportation to a medical facility:

¹⁴ <http://www.abc-of-snowboarding.com/firstaid/hypothermia.asp>

5.6.2.2 After-drop

A further cooling of core temperature occurs after the victim is removed from the cold environment. This after-drop is often responsible for post-rescue collapse.

5.6.2.3 Pre-hospital Stabilization

Preventing respiratory heat loss and progressive cooling, of the heart through the tissues is essential. This cooling if not arrested, can lead to ventricular fibrillation of the heart. Patients who are unconscious, with a temperature below 30°C or 80°F, may not respond to defibrillation. Thermally stabilizing a patient with suitable equipment is necessary, both before transportation and enroute to the hospital to prevent additional cardiac complications.

5.6.2.4 Core Rewarming

This is the most effective treatment for all cases of moderate to severe hypothermia, whether treatment occurs in the hospital or in the field.

5.6.2.5 Inhalation Rewarming

As the only non-invasive hospital treatment suitable for active core rewarming in the field, inhalation rewarming donates heat directly to the head, neck, and thoracic core (the critical core) through inhalation of warm, water-saturated air at 43 - 45°C (107 - 122°F) i.e. steam. This method also warms the hypothalamus, the temperature regulation center, the respiratory center, and the cardiac center at the base of the brainstem. In many cases, this rewarming of the central nervous system at the brainstem reverses the cold-induced depression of the respiratory centers and improves the level of consciousness.

Beside this strategic donation of heat, inhalation rewarming also eliminates Respiratory heat loss. This accounts for 10% to 30% of the body's heat loss. This is particularly important in rescue situations where the ambient air is cold.

In summary, inhalation rewarming is highly effective in providing "basic life support" through thermally stabilizing the core and brainstem temperatures. It is safe for treatment for all levels of hypothermia, but is particularly important for severe cases, because insulating alone (blankets), does not prevent further cooling of the core.

The first half hour during rescue is the most critical phase of hypothermia management. Avoid having the victim assist with their own rescue. Muscular activity by the hypothermic victim pumps cold peripheral blood from the arms and legs into the central circulation causing the core temperature to drop even further. Gentle handling is critical!

A cold heart is particularly susceptible to ventricular fibrillation, and some victims may suffer fatal ventricular fibrillation when jolted about during initial handling or transportation.

5.7 Frostbite

Superficial frostbite is characterized by numbness and white or waxy skin. Warm the part with body heat by placing it against a bare stomach or in the armpit. Hold a warm hand over nose, ears or cheeks. Make sure that foot and hand circulation is not restricted by tight clothing. Add dry layers of clothing. Remember, “when your feet are cold put on a hat.”

Deep frostbite is more serious. The affected area has a hard and woody feeling. **Don't try to re-warm deep frostbite outdoors or by exercising the affected part.** Do not thaw if the tissue is at risk of being refrozen as this will create more severe damage. If you are unable to get indoors to a location where you can stay warm, leave the extremity frozen until definitive medical care can be instituted. The victim should be moved inside as soon as possible, preferably to a hospital. Thaw the frozen tissue in warm water (42-44°C, no hotter) for 20 – 30 minutes (very painful). Don't use cool or cold water. Don't walk on thawed feet or toes (serious damage may result). **Never rub frozen tissue with snow.** Don't massage before, during, or after re-warming.

6. VEHICLE MAINTENANCE, TROUBLESHOOTING, OFF-ROAD TRUCK USE, AND RADIO CALLING

Field vehicles are relied upon heavily during the field season. Getting to and from a study site may require substantial travel on gravel roads well away from paved highways and high travel areas. A number of issues will be covered here relating to off highway travel, including vehicle maintenance, troubleshooting, driving tips, safety, navigation, and radio calling. This discussion should be considered a “common sense” guide, and not viewed as complete coverage of best practices for vehicle use. Also refer to:

- Forest Roads: Guide for Safe Travel (BC government and BC Forest Safety Council brochure)
<http://www.for.gov.bc.ca/hth/engineering/documents/brochures/Guide-for-Safe-Travel.pdf>
- Road Safety Information for the Prince George Forest District
<http://www.for.gov.bc.ca/dpg/ForestRoads/FSRIndex.htm>
- Resource Road User Safety Guide (BC Forest Safety Council):
http://www.bcforestsafe.org/Resource_Road_User_Safety_Guide

6.1 Pre-trip Vehicle Inspection

Be sure to thoroughly check fluid levels (oil, coolant, brake, power steering, transmission), air pressure, tire tread, spare tire pressure, brakes, lights, horn, and vehicle contents before leaving town. Know where the spare tire, jack and tire change wrenches are located, and practice changing a tire. Vehicles should carry a first aid kit, blanket, flares, an ABC rated fire extinguisher, equipment for basic maintenance, and seasonally appropriate emergency equipment (see Section 6.4 for list). Vehicles that will be using active Forest Service or Resource Roads for University activities must be equipped with appropriate communications equipment i.e. VHF (Very High Frequency) radios. UNBC Information Technology Services (Telecommunications) rent both truck and handheld radios for research use. Note: it is not enough to have a radio installed in your vehicle. It is imperative that you have the correct radio channels for the resource roads that you will be operating on.

Before using a vehicle for the day a pre-trip inspection needs to be completed. This should be done for all vehicles: personal, university owned, or rentals

A thorough Pre-Trip Inspections should include a review of the following:

Engine Compartment (inspect with the engine off and keys in your pocket):

- Fluid levels:
 - Oil: Does it reach the full mark at the top of the dip-stick?
 - Transmission fluid: is it free of metal filings?
 - Coolant/ Radiator Fluid: is it full. If working in the winter have the fluid tested to ensure that is rated for winter temperature.
 - Brake Fluid: Is it full ? Has the level changed since last inspection?
 - Power Steering Fluid: Is it full ? Has the level changed since last inspection?

- Belts: are they present? Are they tight?
- Battery: are cables tight

Vehicle Walk Around:

- Are there objects that could be driven over – pick them up
- At each wheel
 - Tire pressure should be at the level recommended for the vehicle. All tires should be equal
 - Tire tread is adequate for your activity ? In winter, are winter/snow tires installed? Are the tires adequate for travelling resource roads?
Tire tread should always be in excess of ¼” deep
 - Tire sidewalls – is there any damage
 - Wheel lug nuts are they all present? Are they tight? *Especially important to check after tires have been changed or a spare tire has been installed*
 - Look behind the wheel: Is the shock intact (oil leaking from a shock is a sign of damage). Springs: are they intact? Are any cracks visible?
- Spare Tire(s): is it present? Does it have the correct air pressure?
- Lights:
 - Do they all function?
 - Are they all visible? Clear any dirt from lights so that other vehicles can see you.
 - Check brake lights – when pressing the brake do tail lights brighten
 - Check signal lights
 - Check headlights and high beams
- If hauling a trailer
 - Inspect lights as above
 - Inspect wheels as above
- Note any damage around or under the vehicle

In Vehicle cabin:

- Do all of the dash lights work?
- Jack and wheel wrench – are they present?
- Owner’s manual: Is it present?
- Equipment in the passenger area of the vehicle should be kept to a minimum and be secured. Any loose item will become a projectile in the event of an accident
- Seatbelts – ensure that they are all working.

In work/ research situations pre-trip inspections need to be documented.

Additional items for inspections – at an automotive shop

- Brakes: some service station outlets will check your brakes for free;

6.2 Before You Leave

Before driving on logging roads, check current activity and road conditions by contacting the BC Ministry of Forest District Office for the area you are in. A website is available which tracks active logging and some resource use (www.for.gov.bc.ca/mof/regdis.htm). Make sure you are able to interpret the posted road signage for radio frequencies being used. Contact the owner/manager to let them know you will be traveling, obtain maps, find out about industrial traffic patterns and active operations and clarify which radio channels are in use.



Figure 3: Typical signage indicating industrial activity in the field – could be found at the entrance to a hauling road and/or harvest block

6.3 Radio Calling

Often, field workers find themselves traveling through or working in areas where there is active logging. Forest companies and other officials communicate via two-way radio in actively logged areas in order to operate safely. This is important because on many roads one-way travel is required for loaded logging trucks due to their size and speed. By convention, all vehicles travelling ‘down’ or from the bush towards the highway have the right-of-way and will announce their locations by radio. Others traveling in on the same road should pull off until the vehicles travelling down passes. Most resource roads have signs at the beginning which describe the rules of the road including radio call procedure. Take the time to read and understand what is expected on the roads that you are using. The name of the road and frequency used on the road will be indicated. Make sure that your radio is on the correct frequency. Kms are always marked, generally on

signs nailed to trees on either side of the road. By convention, kms increase as one leaves the highway and approaches a work site. To learn the names of roads and which radio frequencies are in use in an active logging area, contact the MoFLNRO or licensee. Another possibility is to call the District Office¹⁰ for the area in which you are working. For most areas they will be able to tell you where the active logging areas are, what the frequencies are, and help you name the roads on the forest cover maps you are using to navigate to your site. If they can't help you directly, they will be able to point you to the appropriate licensee(s) who can.

It is best to have a two-way truck radio installed in your vehicle. Hand held radios will also work, but have a shorter range than a truck radio. Any radio you use will need to be programmed with the frequencies you need for the forest roads you will be driving. Some frequencies are owned by the licensees or logging companies, and require permission to be programmed into your radio so it is prudent to make these arrangements several weeks before field season starts. UNBC Information Technology Services (Telecommunications) rent both truck and handheld radios for research use. The radios are pre-programmed with the most common frequencies, so it is important to verify that they are the ones you actually will need. Several businesses that specialize in communications will rent or sell programmed radios as well.

Revised radio calling protocols were introduced in the province in 2009. The protocol for the Prince George District is provided here in Appendix D. It is essential to memorize and practice the procedure before starting the field season. If you are working in other Forest Districts in the Province, check the website or call the District office to ensure you are using the right protocol. The protocols must be strictly followed to prevent accidents on forestry roads. Up-to-date information on protocols can be found at <http://www.for.gov.bc.ca/dpg>. Driving on a busy forest road requires your undivided attention. It is important not only to call your position accurately and regularly, but also to listen for other traffic and monitor their location so that you can be prepared to pull over if necessary. If there is a passenger with you, they can help by calling the positions and monitoring the locations with the driver. It is absolutely unacceptable and unsafe to use the road radio frequency for any other use than calling your road position to others. Arrange to use another frequency (UNBC has its own channel, for example) to use in the field for general communication purposes.

6.4 Basic Truck Kit (necessary items will change seasonally)

The basic truck kit should include the following:

- Spare key in magnetic case on outside of vehicle or in a pocket that you will always have on (i.e. not in a jacket you might leave in a car);
- Jack;
- Aftermarket hydraulic jack and a 2' long piece of 4x4. Stock jacks (jacks that come with vehicles are not always reliable. When working on bush road a hydraulic jack placed on top of a piece 4x4 can lift your vehicle out of most situations.

- Swede saw, axe, or preferably both;
- Rope and/or “come-along” (hand winch);
- Shovel;
- Jumper cables;
- Ensure emergency spare tire is in the vehicle (recommend having a full size tire for the vehicle);
- A small compressor that plugs into the cigarette lighter is also useful for re-inflating tires;
- Reflective triangle or flares;
- Toolkit (more than just the jack accessories);
- Extra fuel.
- Flashlight and spare batteries;
- Fire extinguisher;
- First aid kit, personal safety equipment and survival kit (see section 3.2.2 and 3.2.3);
- Additional items for winter travel (candles with lighter or matches, sand, shovel, appropriate chains for the vehicle (and know how to use them), ice scraper/snow brush).

Most of these items should be considered mandatory for any extensive off-highway work

6.5 The Basics: Operation, Maintenance and Troubleshooting

Simple maintenance rules are provided in the **Pre-trip Inspection (section 6.1)**. Here we cover other considerations of operation.

6.5.1 Parking

Park facing home with enough access to the roadway to get you out but stay well clear of travel surface. Leave parked vehicles with manual transmissions in first gear and the emergency brake engaged. Never leave a vehicle in neutral. For vehicles with automatic transmissions, always shift into PARK and apply the emergency brake. Large trucks may roll when parked on a hill - check that the emergency brake works. Park with the wheels angled into the curb when facing down a hill and with wheels angled out from the curb when facing up a hill. Remember disengage the emergency brake when you drive away, otherwise it will quickly lose its effectiveness. Do not rely on the vehicle’s emergency brake to keep it from rolling on a steep hill; place rocks on the downward side of the tires to block them. In fire season, do not park in dry vegetation, especially grass. A hot exhaust system can start a fire!

6.5.2 Avoiding Flat Tires

Ensure tires are in good condition and are suitable for gravel roads before leaving town. Rental vehicles often have lightweight tires unsuitable for rough roads. When driving on gravel roads, avoid hitting potholes at high speed and be on the look-out for sharp rocks that could pierce the tread or slash the side walls. This is especially important on recently built or resurfaced roads. Slow down.

6.5.4 Flat Tires

If you are on remote roads, and get a flat tire pull off at a flat spot and change it. If you end up in a situation where your spare tire has also gone flat it is best to leave the vehicle parked, take the flat tires to town and return for the vehicle. If you are at a remote site and there is no one able to assist you it is to drive a fair distance on a partly or completely flat tire if it is necessary to reach civilization. If you choose to do so keep your speed low, no more than 30km/hr, to ensure that you can maintain control of the vehicle and stop as needed. If the tire is totally flat, driving on it will bend the wheel rim which is expensive to replace (e.g \$1000). Do not drive on the highway with a partly flat tire because if it breaks you could swerve into oncoming traffic at 100 km/hr.

NEVER DRIVE WITH A FLAT FRONT TIRE

6.5.5 Changing a Tire

Make sure the truck is in gear (not in neutral), place rocks or wood blocks in front and behind the tires so that the truck cannot roll once it is jacked up. Crack (loosen) the nuts of the flat tire while it is still on the ground. Do not take the nuts off entirely as the truck could fall over. Place a jack under the wheel axle in such a position that it looks least likely to fall over once the truck is jacked up. Jack the vehicle up until the tire is just off the ground. Remove the tire and replace it with a new one. When re-tightening the nuts, do so in a balanced fashion – first one, then the nut across from it, etc. When the nuts are tightened down, jack down the truck and do another tighten now that the wheel can't rotate. After driving for 15 minutes, check that the nuts are still tight. Repair the flat tire as soon as possible and ask the station to replace the spare with the repaired tire. Another flat can happen any time. If you are in an area where flats are common and repair stations are few and far between, consider carrying two spares – there is nothing more annoying than getting a second flat on the way to getting your spare fixed. It is good to practice changing a tire before the field season begins.

6.5.6 Avoiding Dead Batteries

Check that headlights and running lights are turned off before leaving the vehicle. Check that dome or door lights turn off when doors are closed. Make sure doors are closed.

6.5.7 Push-starting and Jumpstarting a Vehicle

Another common field problem is a dead battery. If you have a standard shift vehicle, you can push or roll-start it. If you have an automatic vehicle, you will need another vehicle and jumper cables to jump-start it.

6.5.7.1 Push or Roll-starting

This can be done with only one person, but with two it is much easier - especially on a level surface; one person pushes while the other steers. In theory, you can push the vehicle yourself and then jump in once it is rolling, but this is much more difficult. If on a hill, start the vehicle rolling with the transmission in neutral until you are moving about 10 km/hr. If rolling forward, shift into second gear and quickly “pop” the clutch out. As soon as the engine catches, push the clutch back in and rev the engine for a while. It will take some time to recharge the battery, so keep the engine running. You can also push-start going backwards down a hill. In this case, put the transmission in reverse before you start moving, and pop the clutch at a lower velocity.

6.5.7.2 Jump-starting

Park the working vehicle close to the one with the dead battery and put it in park (automatic) or neutral with hand brake on - wheels blocked if you don't trust the brake (standard) and leave the engine running. Attach the red end of the jumper cables to the positive terminal of the working vehicle's battery, and the black end to the negative terminal. The terminals are marked with a + for positive and a - for negative. Do not let the two clips of the other end of the cable touch each other. Clip the other red end onto the positive terminal of your dead vehicle and the black end to the negative terminal. It is extremely important not to connect the positive terminal of one battery to the negative terminal of the other. Start your vehicle. (If your battery is flat dead, it might require a few minutes for the other vehicle to charge it sufficiently to turn your engine over. Ask the other driver to rev his or her engine slightly). Once your engine starts, disconnect the cables by removing the negative clip first and then the positive one. Keep your vehicle running for at least 30 minutes to recharge the battery.

6.5.8 Getting Stuck

As soon as you are stuck, jam a bunch of branches and rocks under your tires, and put the vehicle in 4WD. This is worth the effort. Sure you might get out if you try for 5 minutes without doing this, but you might also get much more stuck. It is especially worth being careful if you are miles from anywhere. Be careful, though - there is a good likelihood that some of the stuff you jam under the tires for traction could be sent flying by a spinning truck wheel. Make sure that the trajectory path is clear of other personnel before you try and get yourself unstuck.

Another useful trick, if you have a small compressor with you, is to let a third to half the air out of your tires by pressing the escape valve pin. This increases the traction surface and will often allow you to drive out of mud and soft sand with little difficulty. Once back on solid ground, re-inflate the tires. This is especially useful if you do not have 4WD.

6.6 Driving Fundamentals

The known hazards of driving on forest roads include:

- Losing track of your location;
- Losing track of other vehicles' locations;
- Meeting oncoming vehicle without a radio;
- Not following calling procedures;
- Unnecessary radio chatter;
- Using the wrong frequency;
- "Talking over" other calls;
- Being distracted.

Since off-highway driving is less structured without traffic lights, signs, and centre lines, courtesy is even more important than usual. The fundamental rule of driving on dirt roads: *expect the unexpected*. You will experience a much broader range of conditions compared to paved roads. Drive with your headlights on. Be cautious and drive slower than what may seem necessary, especially if you are an inexperienced off-road driver.

Conditions can change rapidly and catch you off-guard. For example, a speed that is otherwise reasonable on a paved road can cause you to lose control when you hit a patch of washboard and/or loose gravel – right about the time you notice a cow on the road or a logging truck coming toward you. A pool of water on the road that looks superficially innocent may be much deeper than expected or sufficiently mud filled to ensure that you get stuck. Deep ruts should be approached with caution if you hope to get home with your muffler still attached or to avoid a broken axle. Roads in dry areas or summer conditions can be very dusty especially if there is little industrial traffic (during high use the road is sprayed to keep the dust down). In general, use an abundance of caution and common sense when making driving decisions and recognize that it takes time to become experienced at off-road driving.

Another issue relates to encountering other users of the road. Unlike yourself, assume that many others do not share your common sense and will make poor decisions. Thus it is almost inevitable that you will round a corner only to find that someone is approaching on your side of the road. If you are driving at a reasonable speed, on your own side of the road and paying attention, the likelihood of a problem is much reduced.

Special care needs to be taken in areas actively logged since logging trucks often need most or the entire road and travel at high speeds. Active logging roads may have restricted or no access. Obey all road signs. Knowing and being able to use appropriate VHF radio calling procedures is an important safety consideration as it makes you aware of surrounding conditions, and allow you to make others aware of you. Always yield to industrial traffic. Be very careful when following another vehicle in dusty road conditions and in general try not to follow others closely, even though this keeps you out of their dust stream. You may not see or may not be visible to on-coming traffic. Keep your headlights on at all times on gravel roads.

Check road reports before you leave if they are available. In BC, some Ministry of Forests and Range district offices provide these on their websites (see www.for.gov.bc.ca/mof/regdis.htm for a listing of Forest District web sites). It is also good to check weather reports and understand the implications for these for the area you are working in.

When hiring someone for field work, check that they have a valid driver's license (with a Class 4 designation if necessary for driving multi-passenger vans). You should make a copy of their license and check their driving record with ICBC (604 661-2800).

6.7 4WD Operation

With heavy rain, snow or other poor road conditions, the use of a four-wheel drive (4WD or 4x4) vehicle becomes mandatory. While all the previous comments apply to 4WD use, some points specific to 4WD driving require special considerations. The primary rule to remember is that 4WD does not make you invincible. On the contrary, common sense is especially important when making driving decisions in 4WD conditions. Generally you will be using 4WD because conditions are poor, and as such, opportunities to lose control or to become seriously stuck are probably much higher than when driving in 2WD. Most of us who have spent any time driving a 4x4 on back roads have probably made at least one poor decision that has, at the very least, left the vehicle seriously stuck. We know of one recent example of a decision to cross, what appeared (from the driver's seat) to be a fairly small stream, with a 4Runner. The Toyota came to a permanent halt midstream after the fuel injector inhaled some water. After a couple of days a tow truck was able to get to the site and remove the truck – final bill for towing and damages: more than \$5,000.00. That bill was not looked upon very favorably by the employer.

The moral of the story? Don't make quick assessments from the driver's seat. Get out and have a close look, and if you're still not sure, don't do it. 4 wheel drive can mean 4 times the trouble. You tend to go to places it is difficult to get out of - consider walking whenever possible. The best advice is: Always go IN to a location in 2WD, reserve 4WD for getting yourself OUT. Having said that, you can use 4WD:

- a. When you encounter a mud-slippery road and your vehicle starts sliding;
- b. As soon as you get stuck (do not wait until you've dug a hole);

- c. To navigate very rough or steep roads.

Most importantly, use it under speeds of 50 km/hr. If you have to go into 4WD it should be the first indicator that you should be slowing down your speed (remember, it wasn't safe enough to drive in 2WD – sticking it into 4WD and racing along is a poor decision). It is a false sense of security to simply put your vehicle into 4WD as soon as you leave pavement, and then driving as you otherwise would. If you skid on dry logging roads covered in gravel while in 4WD, and your front tire hits a soft shoulder and stops, there is a very good likelihood your back wheels will power you over and flip the vehicle. Use 4WD where it is appropriate and it is a powerful tool, but if you use it where it isn't appropriate you can end up getting stuck or damaging your vehicle, or yourself.

Learn the proper operation of the type of 4WD vehicle you are using. Vehicles may vary greatly in how they are put into and out of 4WD, according to their age. If you can't get an experienced operator to show you, at the very least read the operator's manual in the glove box. Some all wheel drive (AWD) vehicles will automatically shift power to the wheels that require them. Others need to be manually shifted into 4WD. Of those, some can be shifted while under power with a gear shift located in the cab, while older models must be stopped and put into neutral. This is very important – if you assume you can throw it into 4WD on the fly, and you are in vehicle that isn't designed for that, you are going to wreck your transmission. Some older trucks will have manual hubs which must be properly used to avoid some very expensive repairs. These trucks are put in 4WD by stopping the vehicle, climbing out, and twisting little hubs on the front wheel to a "locked" position. To disengage, you have to stop again, get out, and twist the hubs back. Some models also have to be driven backwards a few yards to engage or disengage 4WD. Extended operation on dry pavement will lead to extensive and expensive damage, so remember to switch back to 2WD before you turn onto the highway.

6.8 Accidents

If you are in a vehicle accident, stay calm, ensure everyone is safe and clear of hazards from damaged vehicles or traffic. Clear vehicles from the roadway or put out warning markers. Deal with first aid issues and call emergency services if necessary. Exchange names, addresses, license and insurance information including name and address of registered owner of vehicles and record the names and contact information of any witnesses. Report any incidents to the Risk and Safety Department. In BC you are required to report the accident to the police within 24 hours (or 48 hours if outside of a town) if anyone has been killed or injured or if damage to a vehicle is more than \$1000.

7. AIRCRAFT AND BOATS

When possible, speak to pilots in person before approaching their aircraft. Often they will have specific details relating to the safety of their aircraft and will give you a safety briefing. If you have not flown in a small plane or helicopter before. Ask for a safety briefing first. Individual pilots have their own protocols (e.g. identifying someone who is quarterbacking passenger unloading, providing info on toe ins). Go over all protocols with the pilot before taking off. Toe ins should be practiced before undertaking.

7.1 Helicopters

Even when the machine is shut down:

- Approach and leave a helicopter on the downslope side to avoid the main rotor. Crouch while approaching and leaving;
- Never walk behind a helicopter on the downslope side. Always approach and leave within the pilot's field of vision to avoid the tail rotor;
- Near the helicopter always carry tools horizontally, below waist level – never upright or on the shoulder;
- Loose items (e.g. parkas, empty cans) should be secured or removed from the helispot. Synthetic clothing has risks in fire conditions. No fires should be made in the helispot area;
- Have a crew and unloaded equipment moved to a safe area, in view of the pilot after unloading. Have them wait in a safe, visible (usually upwind) area from the helispot when the helicopter approaches for a pick-up;
- Do not slam helicopter doors. Double-check baggage compartment and passenger doors after loading and unloading. Keep seatbelts fastened continuously when in flight, and buckle seatbelts AFTER you exit the helicopter as well.

7.2 Fixed-wing Aircraft

- When on the ground, stay away from the propeller. When in flight, keep seatbelts fastened continuously;
- With a float plane, it is safest to wear a hard hat while loading and unloading, and beware of striking the head or neck on the flat trailing edge of the wing. This hazard may be serious when working on a float plane dock;
- Wheeled aircraft occasionally use roads, gravel bars, and other unprepared strips when transporting field workers. When waiting for a pickup, field crews should check the landing zone to ensure that it is long enough, that the ground is not too soft, and that boulders are removed. It may be helpful to mark both ends of the strip, and to mark the downwind (approach) end at both sides, where it can be checked by the pilot immediately before touchdown. A bright-colored shirt tied to a shovel handle may assist the pilot in judging wind during a fly-over before landing for a pickup;

- Radio the pilot before he/she begins landing, to exchange instructions. While landing, he/she will be too busy to transmit.

7.3 Boats

- Federal law requires boat operators to be licensed.
- Minimum safety equipment required by Transport Canada varies with pleasure-craft type and length (<http://www.tc.gc.ca/eng/marinesafety/debs-obs-equipment-size-menu-690.htm>). Ensure that all required safety equipment is on board, before operating any boat or pleasure craft.
- If you are unfamiliar with the use of the craft you will be piloting, obtain instruction from your employer or supervisor.
- Emergency supplies in a waterproof container and a spare oar or paddle should be attached to the boat.
- PFDs or life jackets should be worn at all times.
- When alone in a motorized boat the outboard should be equipped with a kill switch that is connected to your body by a cord. If you fall overboard, the boat will not continue without you.
- A patch kit which includes duct tape should always be carried with inflatables and canoes.
- It may be prudent to secure inflatables with a long line to shore upstream, while ferrying crew or equipment across fast water.

Appendices

Appendix A – Field Crew Information Form

Field Crew Information Form Procedures

1. Field Crew Information Form

This form will provide personal information for all the members of the field crew for each project.

Page 1 indicating the project and crew members will be filled out at the beginning of a project and amended as required.

Pages 2 and 3 will be filled out for each supervisor and crew member before field work begins. Please insert a current picture for each person if available.

These forms will be filed by the crew members last name and kept in the security office and are not required to be filled out for each project as they are kept on file. Project supervisors will be responsible for ensuring this is done. Copies will be kept on file in the Security Office Emergency Records binder and can be returned to the crew at any time for updating or removal. (Note: a designate for that research area may also hold a copy of these records.). Security officers are to record in the Radio Log Pass On anytime a record is added or removed.

Printable Version of the Field Crew Information Form can be found at:

http://www.unbc.ca/assets/safety/lab_safety/field_crew_information_form.doc

Project Name: _____ Crew Code
Name: _____

Field Season Duration: from _____ to _____

Project Supervisor(s) Name: _____
Phone# - Office: _____ Home: _____
Cell: _____
Email: _____

Name: _____
Phone# - Office: _____ Home: _____
Cell: _____
Email: _____

Field Crew Supervisor (s)	Name: _____	Name: _____
	Phone#	Phone#
	Office: _____	Office: _____
	Home: _____	Home: _____
	Cell: _____	Cell: _____
	Email: _____	Email: _____

FIELD CREW Supervisor

Current Picture

Name: _____
Position (e.g., supervisor, field assistant, etc.) _____
Phone# - Office: _____ Home: _____
Cell: _____
Email: _____
Male/Female: _____ Date of Birth: _____
Height: _____ Hair Colour: _____ Eye Colour: _____
Medical Conditions (e.g., diabetic, asthma
Etc.): _____
Medical Insurance: BC (MSP) _____ Other _____
Medical Insurance #: _____
First Aid Training: Yes ___ No ___ Level _____

FIELD CREW Member

Current Picture

Name: _____

Position (e.g., supervisor, field assistant, etc.) _____

Phone# - Office: _____ Home: _____

Cell: _____

Email: _____

Male/Female: _____ Date of Birth: _____

Height: _____ Hair Colour: _____ Eye Colour: _____

Medical Conditions (e.g., diabetic, asthma
Etc.): _____

Medical Insurance: BC (MSP) _____ Other _____

Medical Insurance #: _____

First Aid Training: Yes ___ No ___ Level _____

Appendix B – Chainsaw Checklist

Below are some brief guidelines for chainsaw use. This is not an exhaustive list: all chainsaw operators must have taken a chainsaw safety course.

- Always wear chainsaw pants that meet Worksafe BC standards and boots, as well as face and hearing protection and a high-visibility vest when operating a chainsaw.;
- Take steps to avoid kick-backs¹⁵ caused by poor working position, poor maintenance, binding, or inadvertently contacting branches or obstructions;
- Check that all parts are tight and that the chain is properly adjusted and filed;
- When idling, the chain should be stopped;
- When carrying the saw, shut the motor off and keep the chain bar to the rear;
- Don't stand directly behind the saw – work to one side;
- Allow the saw to cool before refueling, and follow the manufacturer's fuel and oil specifications;
- Refuel on bare ground and ensure the gas cap is replaced tightly;
- Check for leaks;
- Clean the saw of spilled fuel, sawdust and oil, and move away from the refueling spot before starting;
- Don't operate a saw if it is backfiring;
- Periodically check and clean the muffler.
- Always carry a whistle or other emergency signaling device

¹⁵ When handled improperly a chainsaw can kick upward toward the operator with great force causing very serious injury.

Appendix C – Procedures for Danger Tree Hazards

Adopted from UBC's Procedures for dangerous tree management at Research Forests and research installations (Feb., 2006)

Classification of group activities:

Group 1 - Activities such as surveying or sampling that produce very low disturbance levels with visits to plots at infrequent intervals (< 2 per year) and for short duration each time. Contact with live or dead trees includes taking routine tree measurements such as dbh, height and taking increment coring. These are equivalent to very low disturbance level activities (less than Level 1) as described in the workshop materials for the Forest Worker and Recreation Site modules of the Wildlife/Danger Tree Assessment Workshop.

Group 2 - Some studies produce very low level disturbance but require frequent visits (e.g. ≥ 3 per year) to plots and sustained work in plots. Contact with live or dead trees includes taking routine tree measurements such as dbh, height and taking increment coring. These are equivalent to very low disturbance level activities as described in the Forest Worker (less than Level 1) and low disturbance level (Level 1) in the Recreation Site modules.

Group 3 - Some studies require use of power equipment, permanent expensive or high-use infrastructure (e.g. weirs) etc. Contact with live or dead trees includes climbing or resting ladders, or use of pole-pruners. These studies are equivalent to disturbance Level 1 and greater and the specific disturbance Level will be assigned according to standard WCB criteria.

For Group 1-3 activities, workers must wear hardhats when working under forest canopies or in the vicinity of forest operations, and must inspect their jobsites for tree hazards before commencing work.

Group 2 activities – workers will travel to and from their plots in a manner that minimizes their exposure to tree hazards, will inspect their travel routes and plot locations for marked trees and unmarked hazards.

Danger tree classes:

Class A – dead trees with no evidence of significant decay, defect or lean.

Class B – dead trees with evidence of significant decay, defects or lean but that do not appear to be in imminent danger of falling.

Class C – dead trees with evidence of significant decay, defects or lean that are in imminent danger of falling.

Prior to the establishment of plots, the vicinity should be inspected for the presence of Class A-C trees. Researchers should plan their plot locations accordingly and be prepared to abandon plots if necessary for worker safety. It may be acceptable to have dangerous trees felled by qualified fallers or push down heavily leaning dangerous trees. In research forests, be aware that this decision may impact other research projects. Access routes for Group 2 activities should be located to minimize exposure to Class B trees and avoid

Class C trees. It may be necessary to periodically re-route access routes to avoid new Class C trees.

In areas where Group 3 activities occur, and along road rights-of-way, the standard WCB practices on dangerous tree management will be followed. If the standard management practices (no work zone or tree removal) jeopardize experimental objectives, case-specific practices should be developed through consultation by, researchers and the WCB. For example, in some cases, the object of study is the dangerous tree itself. In these cases, at least one member of the research team should be a certified Wildlife/Danger Tree Assessor. Each tree should be assessed for hazards before commencing measurements. Workers should work in pairs, with one acting as a spotter. Where it is necessary to inspect the tree above head height, self-supporting orchard-style (3-point) ladders should be used rather than resting ladders directly against the tree or climbing the tree. Workers should wear hard-hats or climbing helmets.

Regardless of the level of disturbance caused by the work activity, the likelihood of tree failure increases during severe weather – particularly high winds, heavy snowfall or ice loading. Weather conditions should be monitored during field activities and workers should leave the woods if conditions deteriorate. Tree hazards should be re-assessed following severe weather events.

Appendix D – Radio Calling Procedures

On the following two pages are the official calling procedures instructions for forest roads in the Prince George District, (<http://www.for.gov.bc.ca/dpg/ForestRoads/FSRIndex.htm>) as of March 2014. While these guidelines reflect provincial regulations, also consider checking for guidelines at other districts.

Add file Forest Road Procedures 1

Add file Forest Road Procedures 2