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10.0 Wildlife

Introduction

Wildlife may present a danger to field employees ranging from nuisance level to life-threatening. Depending on the location, the major risks may be large mammals, reptiles or insects and include potential attacks, bites or the diseases that result from bites. In addition to safety issues, many animals that may be encountered are endangered species and are protected by legislation. All field employees have a responsibility to avoid disturbing the environment, including animals, as much as possible.

Definitions

- Food conditioned – Animals that learn to associate human activity with a meal are referred to as food conditioned animals. They can become aggressive in their pursuit of human food and cause property damage or human injury (e.g., bears, monkeys).
- Human habituated – An animal that is repeatedly exposed to humans at close range without negative experience learns to tolerate them at these distances.

10.1 Risks and Hazards

Risks and hazards related to wildlife include the following:

- Death and/or injuries caused by animal attacks (bears, crocodiles, snakes, dogs, monkeys)
- Camp invasions by bears caused by poor choice of camp location, lack of preparation (no bear deterrents, firearms, electric fencing, bear guards), poor camp maintenance and inadequate food and waste handling (available attractants)
- Snakebite (tissue damage from venom) caused by not following safe traversing procedures, lack of training; increased risk of tissue damage due to improper treatment for snakebite, panic of the victim
- Anaphylactic shock caused by stings from insects (bees, wasps, ants) to people with allergies
- Diseases caused by insect bites: examples include malaria, dengue fever, Chagas disease, Lyme disease, yellow fever, various forms of encephalitis, plague
- Diseases caused by animal bites such as tetanus, rabies; diseases caused by contact with animal waste products such as Hantaviral disease, histoplasmosis, leptospirosis
- Insect and rodent infestations caused by poor kitchen cleanliness, poor housekeeping practices
- Damage to property (invasion of camp) caused by not following SOPs, inadequate food and waste handling resulting in available attractants
- Vehicle collisions with large animals caused by driving in hazardous areas, at high risk times, at too high a speed

10.2 Responsibilities (Due Diligence) Regarding Wildlife

As presented in section 1.2 Due Diligence, companies should be able to demonstrate due diligence with regard to safety at project sites. Compliance with regard to wildlife safety issues should include but not be limited to the following measures:

Exploration Companies

- Take all reasonable precautions to protect the health and safety of every employee.
- Comply with jurisdictional occupational health and safety (OHS) and wildlife legislation and regulations.
- Perform risk assessments to determine the threat from wildlife, including wildlife habitats at a project location and in traverse areas.
- Develop written safe operating procedures (SOPs) and site specific SOPs, as required, that address wildlife risks. SOPs should address the observations and conclusions of risk assessments.
- Make sure supervisors are trained, competent and provide supervision of employees who work where wildlife encounters may be a risk.
- Provide sufficient and appropriate equipment and support so employees can work and traverse safely, especially in bear country.
- Provide training to make sure employees are (1) knowledgeable about (SOPs) and emergency response plans (ERPs) that address wildlife risks and hazards, (2) knowledgeable about potential wildlife threats and how to react to encounters, and (3) competent in the use of their personal protective equipment (PPE) and deterrent equipment. Examples include:
 - In bear country, employees should know the correct response if they encounter a bear. They should be able to competently handle pepper spray and various deterrents. If handling firearms in Canada, employees must have all required licenses e.g., a Possession and Acquisition Licence (PAL).
 - Know how to prevent insect bites, especially where malaria is a risk. Know how to safely remove unpleasant creatures, such as ticks and leeches.
 - In venomous snake country, employees should know what types of clothing and footwear are appropriate to reduce potential snakebite; know the correct procedures to deal with snakebite.
 - Employees should know how to avoid encounters where crocodiles are a hazard.

Supervisors

- Project supervisors should develop written site specific SOPs, as necessary. Make sure employees comply with the SOPs.
- Make sure employees comply with applicable wildlife legislation and are prepared for potential wildlife related emergencies covered in the site ERPs.
- In bear country, develop site bear response plans and work with trained bear guards, as required.

Employees

- Comply with applicable wildlife legislation and follow SOPs regarding wildlife. Be familiar with the site ERPs, especially regarding bear and reptile related emergencies, which may be life-threatening.
- Take appropriate measures to prevent animal attacks and/or diseases.
- Prevent animals from becoming human habituated and food conditioned. Never feed wildlife and keep a clean camp so animals are not attracted by odours and garbage.

10.3 Bears

Bears encounters may be a threat to the safety of field employees and to company property. All employees working in bear country should receive bear safety training that is relevant to the project location. Employees need to know (1) how to maintain camps to prevent attracting bears, (2) how to avoid bear encounters and understand bear behaviour – especially workers who traverse, (3) details of the bear response plans, and (4) contact information for the local government wildlife agency. Wildlife officials should be able to provide local knowledge regarding bears and provide assistance with the removal of a troublesome bear to avoid destroying it.

Employees who traverse should learn about preferred bear habitats, bear behaviour, how to minimize contact with them, and how to react during an encounter. Anyone traversing or working at drill sites should always carry at least two types of bear deterrents – pepper spray and loud noise-making devices – and be trained to use them correctly. Where bear safety concerns are highest, employees should traverse in pairs or threes and in sight of each other. Where there is a perceived threat to life, companies should hire trained bear guards, or qualified field employees may be advised to carry firearms on traverse. In these circumstances discuss the situation with experienced personnel and comply with all regulations with respect to firearms purchase, use of company (or permitted personal) firearms, and required training.

General bear safety information has been compiled from numerous sources. The PDAC extends special thanks and recognition to Andy McMullen, BEAR WISE, 14 Tees Court, Yellowknife, NT X1A 3L5 Canada, bearwise@theedge.ca. As Chair of the Safety In Bear Country Society, he has granted permission for the PDAC to use material from the *Safety In Bear Country* series of instructional videos (in DVD format) produced by the Society. In addition, the following websites are especially informative:

http://www.enr.gov.nt.ca/live/pages/wpPages/Safety_in_Grizzly_and_Black_Bear_Country.aspx

<http://safety.eas.ualberta.ca/node/13>

<http://www.environmentyukon.gov.yk.ca/pdf/howyoucanstaysafe.pdf>

<http://www.amebc.ca/documents/resources-and-publications/publications/current/safety%20guidelines-web.pdf>

10.3.1 Precautions and Preventions

Where bears are a risk:

- Seek local knowledge from wildlife officials, elders and others with expertise regarding bears in the project area.
- Use the observations and conclusions of risk assessments when choosing project or camp site locations and traverse routes. See section 10.3.4 Tips for Camp Site Location.

- Develop site specific bear response plans appropriate for the local species of bears. Plans should address various scenarios including when a bear is sighted on traverse, near camp and if a bear enters camp. Training sessions should include drills both in daylight and at night to address potential bear emergencies (see section 10.3.7 Bear Response Plans).
- Adhere to SOPs, especially regarding camp cleanliness, food handling and waste management. Minimize bear attractants.
- Trained bear guards: In high risk areas it is advisable to hire trained bear guards to protect traversing employees and company property. Trained bear guards are usually local people who have completed a training program that covers firearms safety and the use of appropriate deterrents in response to recognized bear behaviours. If trained bear guards are not available in the project area, training programs can be arranged through BEAR WISE (bearwise@theedge.ca).
- Bear safety training is essential for every employee, including all contractors' employees.
 - Employees should receive a bear safety course from a wildlife official or competent person prior to beginning project work. Refresher training is advised for long time employees.
 - Train employees regarding the appropriate distances to use various bear deterrents.
 - If firearms are present in camp, it is advisable to hold firearms practice for employees authorized to use them. In Canada, a Possession and Acquisition Licence (PAL) is required to use a firearm.
 - Videos by the Safety In Bear Country Society are available for training sessions. They are available through the distributor's website: <https://www.distributionaccess.com>
 - *Staying Safe in Bear Country*, Safety in Bear Country Society, Revised Edition 2008. This program presents the accumulated knowledge of many bear specialists. It shows various bear behaviours that field workers should recognize and how to react during various bear encounters. Field employees, supervisors and managers who work on projects in bear country should be familiar with the content of this program. Available in English and French.
 - *Working in Bear Country*, Safety in Bear Country Society, 2001. This program is designed to be shown in conjunction with *Staying Safe in Bear Country* for a target audience of industry managers and supervisors. The program stresses the need for good planning regarding communication, camp location, site food preparation and waste management, along with bear deterrents, warning systems and bear response plans. Available in English.
 - *Polar Bears: A Guide to Safety*, Safety in Bear Country Society, 2006. This program presents information about typical polar bear habitats, how to avoid encounters, and appropriate responses to polar bear encounters should one occur. Available in English, French and Inuktitut.



Figure 10.1: Grizzly bear © Matt Turner

10.3.2 Types of Bears

All species of bears have an extremely keen sense of smell, good eyesight, and excellent hearing. They can run faster than any person and can swim very well.

1. Grizzly or brown bears (*Ursus arctos*) inhabit pockets of the western USA, all of Alaska, much of western and northern Canada, and parts of Siberia. There are a few fragmented populations in Europe, Central and Southern Asia, and Japan. Grizzlies vary greatly in size depending on the region and the local food supply. They prefer open and semi-open country; they defend themselves fiercely, as this habitat offers little cover or protection. They are omnivorous – eating whatever is available. Grizzlies can be recognized by their large shoulder hump, long upturned muzzle and long claws (about the size of your fingers), which are excellent for digging. Fur colour is not a dependable identifying feature in North America as both grizzly and black bears range in colour from blond to black. Normally, grizzly bears avoid contact with humans, but they may seek out garbage and become a nuisance at project sites. If grizzlies perceive a threat or are surprised, they normally react by charging or attacking. Usually only young grizzlies climb trees, but adult grizzlies may climb trees and can reach up at least 4 m from the ground. Therefore, if you must climb a tree to escape a grizzly, try to get your feet 10 m off the ground. Climb until you “run out of tree”.
2. Black bears (*Ursus americanus*) are found only in North America but are widely distributed in forested areas from northern Canada and Alaska to northern Mexico. They are smaller in build than grizzlies, lack a shoulder hump, have a straight muzzle and have short, curved claws. Black bears prefer forests with open clearings and rarely venture more than several hundred metres from cover. They climb trees with ease. Black bears are omnivorous and easily become accustomed to eating any available garbage. They pose a very real threat to field camps if their innate curiosity combines with easily accessible food. On occasion, black bears are predaceous.
3. Polar bears (*Ursus maritimus*) inhabit much of the land and ice bordering the Arctic Ocean and Hudson Bay. They are common in parts of the Arctic Islands and they occasionally range as far as 150 km inland. They are outstanding swimmers and may weigh up to 800 kg. Unlike other bears, polar bears are predominately carnivorous and their preferred diet is ringed and bearded seals. People in the Arctic may encounter polar

bears in any season and need to be careful all year round. Unlike other bears, there is no time when all polar bears are in winter dens. While many retreat temporarily to a den to conserve energy or escape stormy weather, it is only the pregnant females who disappear for most of the winter. Polar bears frequently hunt and travel in the evening and at night. Do not let your guard down in polar bear country as it is always possible to encounter them. When companies work in polar bear country they should hire trained bear guards; traversing employees should work in pairs or groups of three where one person continuously stands armed guard. Information regarding polar bears has been compiled from the Safety in Bear Country Society video *Polar Bears: A Guide to Safety* and following websites:

<http://dsp-psd.pwgsc.gc.ca/Collection/R62-342-2001E.pdf>

http://polar.nrcan.gc.ca/about/manual/ch2/16_e.php

<http://icwdm.org/handbook/carnivor/PolarBears.asp>

<http://www.nunavutparks.com/english/visitor-information/polar-bear-safety.html>

10.3.3 Bear Habitats and Signs

If you work in bear country, keep your eyes open and be prepared for bears encounter. Bears have preferred feeding areas and travel routes; they are always moving in search of food. Examples of preferred habitats include:

- Alluvial flood plains – when new growth appears in spring and when fish are plentiful
- Recently burned areas – succulent new growth and berries
- Wet meadows – skunk cabbage, sedges and horsetails
- Alpine meadows and ridges – are preferred grizzly feeding areas and travel routes
- Avalanche slopes – when new growth appears in spring
- Berry patches – preferred spring, summer and fall feeding area, especially for black bears. Bears may not be visible so watch for moving bushes.
- Rivers or streams – fish spawning grounds
- Eskers – frequented by barren land grizzlies
- Preferred travel routes – game trails, river banks, ridges, lake shorelines, and beaches

Preferred habitats for polar bears include:

- Ice suitable for catching seals: Where wind and ocean currents create pressure ridges, cracks or leads, seals can find breathing holes and polar bears can find seals.
- Coastline and beaches on the mainland and Arctic islands are favoured when the annual ice melts and disappears. Females with cubs move from the land toward the coast and onto remnant ice to hunt seals. Polar bears stay on the ice close to the seals as long as they can. Then they move from the ice as it melts onto land (or farther north on the permanent ice). Bears often drift into shore on ice. They hide among large beach boulders, vegetation, driftwood and remnant icebergs.
- On land the most common place to encounter bears is along their travel routes: beaches peninsulas and shore islands, or valley passes. Bears can approach from the sea. Drifting in on pieces of ice they can turn up unexpectedly anywhere on shore.

- In autumn, polar bears move to where the ocean freezes earliest, the calm water of fjords and large bays where rivers empty into the sea. As soon as the ice is thick enough to support them they move back onto it to hunt.

Bear Signs

Learn to recognize bear signs. They may indicate if a bear is in the immediate area or has recently passed through.

- **Bear tracks:** Be able to identify the species, especially where their ranges overlap. Learn to tell how recently the tracks were made. Look for evidence of cubs – smaller tracks – and note if there may be more than one cub.
- **Bear scat:** It will reflect the present diet, which changes somewhat throughout the year. Scat will be black and runny and may contain hair if derived from meat; it will be more fibrous if derived from vegetation and may contain lots of berries or seeds.
- **Dug up areas:** Grizzlies often dig up colonies of ground squirrels, insects and roots. Black bears and grizzlies pull apart logs and stumps to search for food.
- **Carcasses:** Do not approach carrion, gut piles or animal carcasses, especially if they are partially covered with dirt or leaves. They may be a food cache for a nearby bear.
- **Daybeds:** Do not approach a daybed or resting place. Bears often rest in the middle of the day in cool places by streams or near recent kills. A daybed may appear as flattened vegetation or a dug out area. They often rest on sandbars by salmon streams.
- **Marks on trees:** Look for claw marks, rubbed or scraped areas on tree trunks. Bears rub against trees and leave hair behind, which can be rather high up on the trunk if they stand on their hind legs to rub their back.
- **Den areas:** Seek local knowledge to avoid known den areas. Bears are a hazard if disturbed when in their den, especially a mother with cubs.
 - Grizzlies den in a wide variety of locations, but often on steep slopes in alpine and subalpine areas. They dig dens in sandy and rocky materials like eskers and in places where roots systems will support the roof of a den.
 - Black bears often prefer to den toward the bottom of valleys. They may excavate dens under tree roots and brush and they use natural cavities (e.g., under a fallen tree).
 - Polar bears are unlike other bears, as there is no time when they are all in winter dens. While many retreat temporarily to a den to conserve energy or escape stormy weather it's only the pregnant females who disappear for most of the winter. After the annual ice melts and bears are on land, they may briefly rest on or in remnant snow banks and dig earth dens.

10.3.4 Tips for Project or Camp Site Locations

Avoid bear problems when setting up a project site or temporary camp.

- Check with knowledgeable people (e.g., local wildlife officers) to avoid setting up camp where bears are known to cause problems.
- Do not locate a project in preferred seasonal bear habitat and on their travel routes.
- Try to choose a site with good visibility in order to see an approaching bear.

- Choose a site where noise (such as a rushing stream) does not block the sounds of your camp to an approaching bear.
- Look elsewhere for a camp site if you observe signs of bears (e.g., droppings, tracks or day beds).
- People in any camp site should (1) never sleep in the open without a tent, and (2) always use a flashlight at night when going to and from latrines or between buildings or tents. Bears often forage at night.
- In polar bear country, try to camp inland on a high point of land (always away from the shore) where you can easily observe the surrounding area. On land, the most common place to encounter polar bears is along their travel routes, beaches, peninsulas, near shore islands or valley passes. Avoid camping in the following places:
 - Peninsulas or points of land jutting into the ocean. Remnant ice often runs aground on peninsulas providing the bears with access both to ice and land. The peninsulas make easy travel routes and they may swim between points of land and near shore islands.
 - Coastal shorelines and beaches: In spring many bears move to areas along the coast where ice is more stable. As ice melts some bears seek out the last remaining ice in sheltered bays and inlets. If ice is drifting onshore, bears may be on it. They are forced onto land when the ice disappears.
 - Any place where rocks, vegetation, a hill or other land feature might provide a hiding place for a bear
- Additional information is available on the following websites:
 - <http://www.environmentyukon.gov.yk.ca/pdf/howyoucanstaysafe.pdf>
 - <http://www.absc.usgs.gov/research/brownbears/safety/safeconduct.htm>

The project or camp layout can help minimize bear problems. Depending on the jurisdiction, there may be a required setback distance from riparian habitat.

- Environment Yukon publication *Guidelines for Industrial Activity in Bear Country* provides many recommendations, including a camp layout and the optimum distance between sleeping quarters and cooking facilities, latrine and incineration facilities. Refer to the following website:
http://www.environmentyukon.gov.yk.ca/mapspublications/documents/Guidelines_for_Industrial_Activity_in_Bear_Country.pdf
- Set up tents in a line or a semi-circle, never in a circle, square or other closed configuration. If it becomes necessary to deter or shoot an invading bear, you do not want a tent in the line of fire.
- Use as few tents as possible. Fewer, larger tents offer more safety than many smaller ones. Leave sufficient space between tents so a bear can easily escape without getting tangled in support ropes.
- Surround established camps with trip wire fences with motion detectors or electric bear fences in polar bear country and anywhere there is a major risk from bears. See section 10.3.6 Bear Warning Systems for Camps.
- Where bears are a problem, tent frames, steps and other camp structures should have skirting to prevent creating a hiding place for bears (and other wildlife such as wolverines). All exits should have adjacent windows so you can check for bears before leaving. In high risk areas, buildings and tents should have a window on each side and large buildings should have two exits.

- Remove vegetation near camp that might hide a bear. Try to eliminate blind corners when arranging tents and buildings.
- For fly camps, set up a tripwire fence with an alarm if you see or suspect bears to be in the area. These noise-makers should wake you if a bear attempts to enter camp at night.
- Keep winter camps well lit, especially in the Arctic.
- Keep bear spray and a good flashlight in each tent.

10.3.5 Food Handling and Waste Management

Control the smells of food and waste products to minimize attracting bears. All bears have a very keen sense of smell; they will seek out and find carelessly stored food and incompletely burned garbage. Camps must be kept clean, whether they are established camps or fly camps. Projects should have a policy to never feed any wildlife, as this encourages animals to become human habituated and food conditioned.

10.3.5.1 Guidelines for Food Handling and Storage

Follow these guidelines for projects and camps.

- Restrict food to the kitchen and eating areas; no food should be allowed in sleeping or work areas. Food should be stored to prevent easy access by bears. In a very small camp, food should be stored in bear proof containers.
- Set up the cooking area separate from the sleeping area. The space between the locations should be open with clear visibility to prevent bear encounters when walking between them. When possible, 50 m is recommended.
- Prepare only enough food that can be consumed at one meal. Store any leftover food in sealed, metal or plastic containers and eat the leftovers as soon as possible. If you lack stronger containers in a fly camp, several layers of airtight very heavy plastic bags may work if they are carefully sealed.
- Use non-greasy foods whenever possible (bears seek out greasy foods). Use or incinerate all leftover grease as soon as possible. If stored, grease must be kept in an airtight container and used as soon as possible. Use common sense and always defrost meat in a refrigerator – not out in the open, on a work surface, or by the barbecue.
- Thoroughly wash all utensils and food preparation and eating surfaces after each meal.
- If a camp will be left unattended during the day, it is very important to prevent bears and other animals from accessing food. Place all food in metal storage drums whenever possible. In addition, strong smelling foods should be carefully sealed in layers of resealable plastic bags. Consider using a “Critter Gitter”, an infrared motion detection device that emits a very loud noise and flashing lights to scare off animals that enter the designated detection area. Mount it so the food is in the detection area (see section 10.3.6).
- For fly camps, suspend food stores (caches) between trees when possible. Food should hang at least 4 m off the ground and at least 100 m from the sleeping tent.
- Wrap lunch food carefully to prevent odours. Any leftover lunch food in daypacks should be removed and disposed of properly each day.

- Keep food, other than well sealed food in survival kits, out of vehicle, boats and helicopters.
- Do not sleep in clothes that have been worn while cooking. Store them in the cooking area if possible, not in your sleeping tent.
- Store all items with odours away from sleeping tents. This includes toothpaste, lip balm, shaving cream, soaps and shampoos, all cosmetics, petroleum products, sunscreen, insect repellent etc.
- If fishing from a boat, use a container to hold the fish. Clean fish far away from camp and dispose of fish guts where a lake is deep. Thoroughly scrub canoes or boats if fish have come in contact with them. Bears will demolish a canoe and pop every section of an inflatable boat in search of fish if they detect the smell of slime and fish remains.

10.3.5.2 Guidelines for Waste Management

Proper waste management is fundamental to camp safety, as garbage smells attract bears from great distances. All waste odours create hazards for people, for company property and for the bears.

- Follow all applicable regulations and secure required permits regarding garbage and waste disposal.
- Burn garbage daily, preferably after each meal, but do not burn it in the evening when lingering smells might attract bears while people sleep.
- If garbage is not completely burned to ash, store the residue in airtight containers and keep it in an appropriate area protected from bears. Remove it to a proper disposal site.
- Incinerators: If burning is permissible, most regions require the use of an incinerator rather than a burn barrel for the job. Use a commercial garbage incinerator that complies with local regulations. (An incinerator is different from a burn barrel, as the barrel cannot burn garbage sufficiently to remove odours that attract bears.) Keep spare parts for the incinerator on hand for repairs to prevent a build up of garbage.
- Where permitted, incinerate all garbage completely to ash and cool it; then remove it to an off site facility or bury it *at least* one metre deep and 200 metres away from camp. Incompletely burned garbage retains smells and attracts bears even when buried. In open areas it is advisable for the burning site to be visible from camp in order to monitor it.
- Burn barrels: A burn barrel, an oil drum punched full of holes to allow some extra airflow for a hot fire, may be acceptable for a very small, temporary camp, but this method requires a lot of attention and fuel to thoroughly burn garbage. Always cover the top of a burn barrel with a wire mesh lid to prevent sparks from starting a forest fire and stop animals and the wind from removing garbage. Check local regulations.
- Burn barrels require the use a slow burning fuel (such as diesel) with lots of air to create a hot incinerating fire. Quick burning fuels do not burn garbage thoroughly; they scorch the garbage and spread the smells. The smells from any fire that smoulders will attract bears.
- Grey water – the water left over from dishwashing, showers and washing machines – should be carefully treated to remove odours. Where regulations permit, use dolomite lime in the sumps in preference to a solution containing bleach solution. Do not allow grease or fine food particles to accumulate in sumps; use grease traps to recover the waste and then incinerate it. Cover sumps with plywood to minimize access and odours. It is recommended to fence in large sumps (required in some jurisdictions). Large

permanent camps should treat grey water with approved waste treatment systems. In small camps with no grey water disposal system, strain food bits out of dishwater. Place them with garbage and pour dishwater into a proper location and treat it with dolomite lime to remove odours.

- Proper maintenance of sewage and latrine systems is necessary to control odours. Use dolomite lime and earth regularly in latrines. Burn all tampons and sanitary napkins in a very hot fire.
- Wash all bottles to eliminate odours and dispose of them as permitted (i.e., fly out unburned garbage).
- Recycling cans: Storing pop cans for recycling is not advisable in bear country as their smell is a strong attractant. It is better to squash them ... burn them ...and then recycle or dispose of them according to local regulations.
- Drink boxes create a lot of garbage that attracts bears. Try to find an alternative.

10.3.6 Bear Warning Systems for Camps

To increase camp safety, professionally designed bear warning systems are recommended for use at all projects in polar bear habitat and at sites where bears may pose a significant risk. Electric fences are a bear deterrent, whereas trip wire fences, infrared motion detection devices and dogs are bear detection systems.

- To be effective, any alarm system must be properly installed and maintained *and* each alarm that sounds must be checked out. Even with a warning system fence for protection, a camp should not be located in an area with high bear traffic.
- Erect the warning system the first day to discourage curious bears, especially in polar bear country.
- A warning system will not necessarily deter a bear; it is designed to warn people of their presence and give people time to assess the situation and act accordingly.
- Do not develop a false sense of security just because the camp has a warning system. It is still extremely important to keep the camp free of attracting odours and operate in ways that minimize potential contact with bears.
- Use warning systems together with bear deterrents. When a bear is spotted approaching camp, use an appropriate deterrent as soon as possible to prevent it coming closer and possibly obtaining food (see section 10.3.9).

Electric fencing for camps

Portable or permanent electric fences can be designed to surround part of or an entire camp as a bear deterrent. Depending on the camp size and layout, it may be advisable to have two or more fenced areas. Fences can be powered by solar panels, batteries or from a generator. Construct them so they are properly grounded and check the perimeter frequently to maintain the fence. Post warning signs at critical places to remind employees of potential electric shock. The following website has information about electric fencing and bear safety:
<http://www.bearsmart.com/becoming-bear-smart/community/electric-fencing>

Trip wire fences

These fences work well as a detection system (not as a deterrent) for fly camps or small camps that are moved frequently. Set the fence up 10 m away from all sides of the camp or a bear can grab items near a tent. This distance allows time to respond to the warning. Trip wire detection

fences sound an alarm when it is set off – by *any* animal. Fences must be reset manually once they are tripped. Do not become complacent and ignore false alarms. Information about this item is available at the following website:

http://www.margosupplies.com/public/canadian1/bear_deterrents/bear_trip_wire/bear_trip_wire.htm

Infrared or motion detectors

Infrared or motion detectors systems can be used to set off alarms and lights. As animals other than bears can set them off, each alarm that sounds must be checked out to guarantee continued safety. The “Critter Gitter” is an infrared motion detection system that works for small camps.

Information about this item is available at the following website:

http://www.margosupplies.com/public/canadian1/bear_dets.htm

Dogs

If dogs are considered for use as bear detectors, they must be trained for that job and respond to their handler or master under all circumstances. They must be chained within the camp and not be allowed to roam or they may bring an angry bear into camp. Even trained bear dogs may not provide sufficient warning if they are asleep or unresponsive for some reason. While dogs may eat leftover food, do not allow dog food leftovers to remain on their plate or allow them to bury food as the odours will attract bears. Bear dogs are not pets. Pet dogs in camp will not provide the necessary warning protection if a bear approaches. Furthermore, people have been injured when rescuing their pet dog during a bear encounter.

10.3.7 Bear Response Plans

Projects and camps need bear response plans that address potential situations. It may be advisable to discuss bear response plans with wildlife officials. Everyone has the responsibility to prevent a bear becoming human habituated and food conditioned. Essential parts of bear response plans include but are not limited to the following measures:

- Train employee to respond correctly to bear encounters.
- Post contact information for the area wildlife officer in order to request assistance should it become necessary to have a bear removed (one persistently returns or enters camp).
- Maintain warning and detection systems and deterrent equipment.
- Monitor and report any bear activity near camp.
- Compile and report bear problems to wildlife officers.
- Deter and, if necessary, destroy a bear while remaining in compliance with wildlife regulations.
- Create different alarms for bears and for fire. People must respond differently.

Bear response plans should cover various emergency scenarios. Develop plans for:

1. When a bear is seen in the distance from camp: Use an appropriate deterrent as soon as possible. Adverse conditioning must be done every time a bear is sighted near camp to try to prevent it from becoming human habituated and/or food conditioned. The closer it gets to food the more difficult it will be to deter it. Any bear that has received a food reward in the past will be hard to deter and any fed bear is dangerous. Plan for the possibility that a bear in the distance may return.

2. When a bear attempts to enter camp: Bears that are scared away from camps frequently return.
 - Everyone must be familiar with the plans, which must cover both day and night situations. All employees should understand what is expected of them under various circumstances.
 - Decide at what distance from camp attempts will be made to direct or haze (harass) a bear to go away. Consider what tactics to use and in which order.
3. When a bear successfully enters camp during the day and during the night:
 - Know which deterrents to use for each situation when a bear is sighted (distance, or in camp) and which deterrents are appropriate for a specified distance.
 - Discuss plans of action in the event that a bear enters a camp building or tent, including the kitchen and dining structure.
 - Decide who will shoot the bear when there is a threat to life.
 - Discuss what tactics to use if someone is attacked.
4. Develop plans for bear encounters while traversing.
 - Know how to react in open areas when a bear is sighted in the distance.
 - Know how to react to close encounters that may occur in dense brush, forests, berry patches, shorelines etc.

10.3.8 Bear Behaviour

It is important to learn about bear behaviour so you can interpret a bear's behaviour when you encounter one. The better you understand and recognize bear behaviours and their motivations, the better your chance of lowering your risk during an encounter.

Interactive behaviours between bears are basically the same as when they encounter humans.

- Bears have a dominance hierarchy with large males ranking at the top and juveniles at the bottom. Juveniles engage in aggressive play and develop skills that will help them during bear interactions in later life.
- When faced with one of their own species, each bear will quickly assess the situation. Most encounters conclude with the bears increasing their distance from one another, but low stress interactions have the potential to escalate if one bear ignores another's warning or continues to crowd another's personal space. The extent of this space and level of defense can vary with each individual bear or its species.
- When a bear detects a human it will usually leave in order to avoid an encounter. Most of the time, you will never know a bear detected your presence.

10.3.8.1 Bear Behaviour – Recognizing Signs of Stress

The following information is adapted with permission from the video *Staying Safe in Bear Country*, produced by the Safety in Bear Country Society, and from *How You Can Stay Safe in Bear Country*, an Environment Yukon publication.

Signs of Stress

Bears use the same behaviours to indicate their level of stress, whether relating to another bear or to a human. The following signs reflect the degree the bear feels threatened:

Subtle signs of stress:

- Pause in activity – a bear stops eating and looks at you – the bear is checking you out
- Yawning – mouth open and tongue rolling
- Change in body posture or orientation, such as assuming a stiff-legged stance

Obvious signs of stress:

- Huffing
- Moaning
- Teeth-popping noises

Signs of high stress or aggression:

- Salivating
- Roaring and open-mouthed jawing
- Paw swatting
- Guttural sounds
- Charging – which usually stops before contact

Note: Bears that stand on their hind legs and sniff the air are curious and assessing the situation and they will not charge in this position.

10.3.8.2 Defensive and Non-Defensive Bear Behaviour

Usually, when a bear encounters a human it will leave the area. However, if a bear approaches a human, it is necessary to assess *why* the bear is approaching and whether the bear is displaying *defensive* or *non-defensive* behaviour.

Defensive Bears

In an encounter, a bear may react defensively, perceiving you as a threat – to itself, its cubs, or its food. Whatever the cause, a defensive bear will likely appear agitated or stressed. The closer you are when a bear becomes aware of you, the more likely it will react in a defensive manner – and the less time you will have to react. Though most defensive interactions with bears stop short of contact, they do sometimes result in attacks. With grizzlies, defensive attacks almost always stem from surprising a bear at close range when it is feeding on a carcass or protecting its young. On the rare occasions when a black bear attacks defensively, it usually involves a mother defending her young; black bears typically respond to a threat by fleeing.

Non-Defensive Bears

A bear may approach and take an interest in you for *non-defensive* reasons. The *non-defensive* approaches can appear similar to each other – and should not be confused with *defensive* behaviours.

- Curiosity: The bear displays a slow, hesitant approach with ears cocked forward and its head and nose raised to investigate what you are.

- Food conditioned: The bear might be after your food. Food conditioned bears may be bold and come right into camp looking for food.
- Dominance: The bear might approach to test its dominance.
- Predation: Rarely, the bear might see you as potential prey. Unlike a curious bear, one that is predatory will be intensely focused on you – as a potential meal – with its head up and ears erect. Its approach is confident and persistent. Predatory bears, especially ones that have been food conditioned, have been known to break into structures and attack people.

10.3.9 Bear Deterrents

Deterrents include noise makers, bear pepper spray and firearms that shoot both non-lethal and lethal ammunition. Do not become complacent because the camp has a warning system, or because you carry bear deterrents and have a firearm for backup protection when working. It is still mandatory to keep a clean camp and remain alert while traversing, drilling or carrying out project work.

- Know the capabilities and the limitations of the available deterrents. Keep a variety of deterrents in each camp so no one is dependent on one type. Carry several types while traversing.
- Deterrents must be used at the right time and in the right manner for maximum effect.
- Always carry at least two types of bear deterrents – including pepper spray – when traversing. When traversing in polar bear country, there should always be a person with a loaded firearm backing up anyone who might be forced to use a non-lethal deterrent on a polar bear.
- Transporting bear deterrents: Place orders well in advance to get bear spray and other deterrents to a remote destination. Always transport bear pepper spray, compressed air canister type horns and all explosive deterrents as “dangerous goods” products when using aircraft (refer to section 16.9 Transportation of “Dangerous Goods”). Do not ever consider hiding them in your luggage or pack.
- The following website has tables that compare and review deterrent methods:
http://www.extension.org/pages/Polar_Bear_Damage_Management

10.3.9.1 Noise Makers

Most, but not all, bears react to noisemakers and will leave. Any loud noise may alert a bear to your presence, and the human voice or metallic sounds are often very effective.

- Shouting and clapping hands is a standard method to make noise.
- Cans containing rocks: Shaking of a can partly full of rocks can produce a good racket. This combined with shouting and clapping may produce enough noise to alert a bear of your approach.
- Bang your hammer on a metal clipboard.
- Bear bells are commonly worn by hikers but most experts feel they do not make sufficient noise to warn a bear in advance. Don't count on them.
- Banging pots and pans together can be effective to scare off curious black bears that try to enter a camp.

- Air horns produce a very loud noise and are recommended when working in dense vegetation to warn of your impending presence when you are still a long way from a bear. Some air horns can be blown using your mouth to produce sound, some can be pressurized using a bicycle tire pump, and some air horns come with compressed air canisters, which must be transported as “dangerous goods” in aircraft. Some air horns may not be reliable in cold temperatures.
- Explosive deterrents are launched from a 12-gauge shotgun or specialized launchers (pencil or pistol launchers). These deterrents have ranges from 15-90 m (50-300 ft). Take the wind into account as it may cause deterrents to drift. Do not launch a deterrent so it lands behind the bear or the noise may scare it in your direction.
 - Bear bangers are designed to be shot up to 30 m away where the cartridge explodes. Bear bangers should have an expiry date stamped on the box or the shell. Inspect the shells for leakage and discolouration and replace them even before the expiry date if they do not look right. If they are shot with a pencil launcher they must match with the same firing mechanism (see launchers below). Store them in a cool dry place.
 - Shell crackers have a range of 60-80 m. Only use shell crackers when a bear is more than 65 m away to be sure it explodes in front of the bear. Use a 12-gauge shotgun. A PAL is required to use a shotgun in Canada.
 - Screamers and whistle crackers produce high pitched noises. Some give off a bright light, which is useful for spotting a bear at night. They can travel up to 60 m.
 - Launchers: Pistol launchers for bear bangers are more versatile than pencil launchers. They can fire multiple rounds and are much faster to reload. Pencil launchers: It is necessary to match the type of firing mechanism of a pencil launcher (rim fire or centre fire) with matching cartridges (bangers and flares). A centre fire launcher will not normally launch a rim fire cartridge and vice versa, so don't get caught with a mismatched launcher and bear banger at a bad time. If using pencil launchers, buy only one type of launcher and cartridges so no mix ups occur.
- Motor noises from snowmobiles, ATVs, or a helicopter engine may intimidate a bear to leave the area. Start the engines and rev them. If necessary, it may be permissible to gently “push” a bear away from camp at a fast walking pace using a helicopter, but not for long distances (no more than 10 minutes or 3 kilometres). A bear may easily become overheated or overstressed. Stop if a bear breaks into a run and monitor it from a distance. Inquire about this practice with local wildlife officials to determine if it is permitted.
- Warning shots: Firing a warning shot is the least effective method to deter a distant bear, as it may not hear much noise. Make sure the bear knows where you are before firing or you may scare it in your direction. Make sure no people are in the vicinity of the bear and shoot in the air to the side of it. Keep track of your shots; you may need your ammunition to shoot to kill the bear.

10.3.9.2 Bear Pepper Spray

Bear spray is a tested and proven bear deterrent and should be carried by employees when working where they may encounter bears. Pepper spray contains capsaicin, which is the active ingredient that produces a burning sensation to the eyes, nose and lungs. Bear spray must be immediately accessible during an unexpected bear encounter so carry it in a holster on your belt

or upper body. Bear spray is no use when it is buried in a pack! Check the expiry date; cans may leak propellant and lose pressure so an unused can that feels light is no good.

- The EPA (Environmental Protection Agency in the USA) rates pepper spray bear deterrents according to some minimum standards.
 - Choose a bear pepper spray product with an oil based formula; it will adhere to the bear's face better than water based products.
 - The canister should contain enough spray to do the job. The EPA suggests *at least* 6 seconds worth of spray as a minimum discharge time.
 - The pepper spray should spray a distance of *at least* 7.5 m.
- Be familiar with the specific manufacturer's directions for using bear spray. Some manufacturers advise firing a short blast of spray when a charging bear is about 15 m away. This creates a cloud of spray and a hissing noise that may deter the bear. If the bear continues charging, fire again for 3 seconds directly into the face of the bear at very close range (2-3 m).
- Practice. Many people have mistakenly sprayed themselves by holding the can backwards. Get to know the product you carry. Practice: remove bear spray from the holster, remove the safety clip and take aim, but do not test fire the pepper spray. It is advisable to save bear spray for a bear encounter. For practice, you can test fire cans that have passed their expiry date or purchase inert cans (without the capsaicin ingredient). If a regular can of bear spray is used for practice, make sure the can is emptied so no one faces a bear with a half empty can.
- Use bear spray only in the path and face of an attacking bear. It will **not** act as a deterrent if applied to objects such as tents, clothing or food containers. In fact, there is evidence that discharging pepper spray into the air or onto objects may actually attract grizzlies. The spray residue is long lasting.



Figure 10.2: Empty can of bear spray chewed by a grizzly bear.
© Michelle Pond

- A blast of bear spray does not project as far in wet and/or windy weather. Try to adjust the aim of the spray for any cross wind. Rain may wash it out of the air. Wind may blow it back onto you.
- Bear pepper spray does not fire as far in cold temperatures. Keep bear spray inside your jacket in cold temperatures. It has only been tested to low temperatures between -12°C and -21°C.

- Each person should have their own supply of bear pepper spray. For fly camps or traverses where bears are very common, the team should have more than one can per person. It may take several cans to deter a very aggressive bear or one that repeatedly attacks.
- Keep pepper spray immediately available at all times in the cooking tent or building.
- Purchase bear spray in the country where you will use it. Do not try to transport it between the USA and Canada – it is possible but difficult to do.
- Transporting bear pepper spray:
 - Aircraft: A pilot must know about *all types of deterrents* that are transported on the charter aircraft. Bear spray must never be transported in the passenger compartment of any aircraft; it would incapacitate the pilot if it were discharged. Bear spray and other explosive deterrents must be stowed in the cargo hold, cargo pods, or secured in a float compartment.
 - Boats: Transport bear spray outside the cabin of a boat.
 - Vehicles: Transport bear spray in a proper container made for that purpose. They can be purchased or made (e.g., an ammunition box with an airtight seal). Place it where it cannot be discharged by mistake, preferably in a separate compartment or container on a roof rack etc.
- First aid: If someone is inadvertently exposed to bear pepper spray, immediately remove any contact lenses (throw them away) and flush the eyes using lots of water for 15 minutes or until the burning sensation is gone. Contact lens saline solution is said to work well for flushing the eyes. Wash skin with mild soap and water. Be familiar with the first aid, storage and other recommendations on the bear pepper spray MSDS sheet.
- Refer to the following websites for additional information about bear pepper spray:
<http://www.bearsmart.com/becoming-bear-smart/home/bear-deterrents>
<http://www.absc.usgs.gov/research/brownbears/pepperspray/pepperspray.htm>

10.3.9.3 Firearms

Use of firearms

A mineral exploration company has the responsibility to exercise full control over the transportation and use of firearms by employees. It is necessary to have safe operating procedures (SOPs) regarding firearms when they are present at any project site or field camp. While the purpose of firearms in camps is for protection from wildlife, try to avoid putting an employee at risk if it becomes necessary to destroy a bear. Trained bear guards or the local government wildlife agency should deal with and/or dispatch a troublesome bear.

- Follow all company SOPs and jurisdictional legislation regarding firearms (refer to section 18.2.2 Firearms Regulations and Policies). Develop SOPs to address the use of personal firearms on site, as required.
- In Canada, only people who have a Possession and Acquisition Licence (PAL) *and* who are both competent *and* confident should have permission to use a firearm. Keep in mind that people may be overly confident unless they have had sufficient firearms training *plus* a lot of practice. Even then, faced with an attacking bear some people may panic.
- Employees responsible for using firearms for protection against bears should have extra firearms training. They should also mentally rehearse situations that might develop and practice for speed and accuracy.

- Make sure that people in camp understand what is expected of them when a bear is sighted, has entered camp, or must be shot – especially at night. See section 10.3.7 Bear Response Plans.
- Firearms must be fully functioning and kept in good condition. Any gun that is not absolutely dependable is a liability to the person using it and others whose safety depends upon the shooter. Keep firearms clean and stored to prevent condensation and ice forming in the barrel in cold climates.
- Everyone must know where the firearms are kept and who may use them.
- Store firearms unloaded and inoperable in a locked container. Store ammunition locked separately but available. In Canada, when there is an immediate wildlife threat, it may be permissible to store the firearm temporarily unlocked and out in the open, *as long as it is unloaded and ammunition is not readily accessible*. The firearm must be under the immediate control of a qualified person at all times. Immediate control means within an arm's length of the qualified person.
- It may be advisable when companies purchase guns for use in camps to purchase all the same type and use the same ammunition to prevent mix ups during a bear encounter.

Types of firearms appropriate to deter bears

- 12-gauge shotgun: Use a short-barrelled, pump action 12-gauge shotgun with a smooth bore slug barrel with no choke (no narrowing of the barrel at the muzzle). This type can be used to fire rubber slugs, bean bags, and whistle cracker shells to attempt to scare a bear away, as well as slugs to kill the bear. 12-gauge shotguns fire slugs that will kill a bear at a close range of less than 30 m.
- Rifles: Use high powered rifles .30-06 or higher calibre. A rifle has a greater effective killing range, which sometimes results in bears needlessly being killed.
- Handguns are not recommended.

Non-lethal projectiles

Several types of non-lethal projectiles can be used as part of adverse conditioning to cause a bear pain but not injure it; this gives the bear a chance to leave before it is necessary to shoot to kill. They require a 12-gauge shotgun.

- Rubber slugs: Use them when a bear is between 30 and 40 m away. Aim to hit the large muscles at the rear of the bear; do not aim at the front to prevent eye damage.
- Bean bags: Use them for ranges from 9 to 30 m. Use an open choked shotgun.
- When to use non-lethal projectiles:
 - Use the appropriate deterrent for the distance between the shooter and the bear. Accuracy is important.
 - Make sure the bear knows your location before firing and that it has a clear path to escape.
 - Make sure to have an experienced backup person with a loaded firearm.

10.3.9.4 When it is Necessary to Shoot a Bear

Know the wildlife regulations for the jurisdiction, as shooting a bear may only be allowed when life (not property) is immediately threatened. Some regions permit destroying a bear that is persistently destroying property. Shooting a bear is the least desirable solution to a bear problem. Whenever possible, contact the local government wildlife agency to remove or dispatch a problem bear.

If you must shoot a bear as a last resort, shoot to kill with the first shot. The closer the bear is to you (10 to 15 m away) the better your chances of killing it immediately.

- If the bear is facing you, aim behind the head at the back of the neck between the shoulders.
- If the bear is broadside, aim for the front shoulder, which may knock the bear down and disable it.
- Do not aim for the head, as the bullet may glance off the skull.
- Do not stop firing until the bear is dead.
- Report the kill to the appropriate authorities.

10.3.9.5 Deterrents Use – Effective Range

The PDAC acknowledges and thanks Andy McMullen, *BEARWISE*, for granting permission to use his *Deterrents Use - Effective Range* chart on the following page. Training and knowledge regarding the ranges of each deterrent will help the person make a sensible decision when choosing which deterrent to use during a bear encounter.

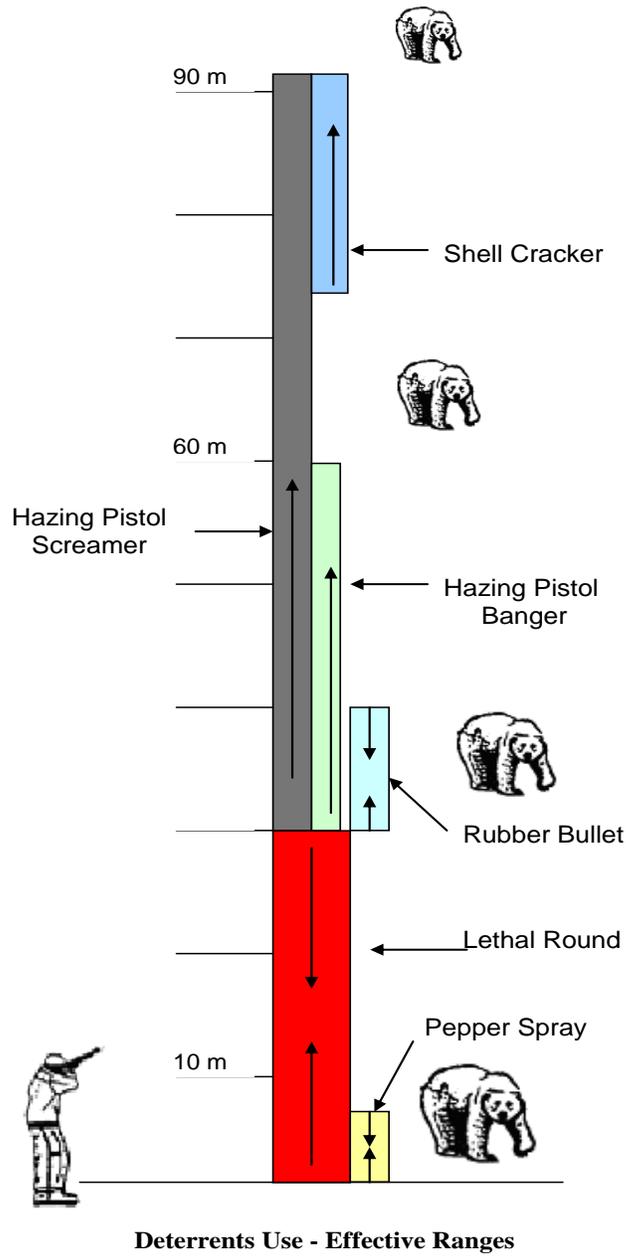


Figure 10.3: Choosing the correct deterrent during a bear encounter

10.3.10 Guidelines for Bear Encounters

Use your knowledge of bear behaviour and carefully observe the bear during an encounter to determine how you should react. The bear may just be curious, it may be annoyed and threatened by your presence, or it may regard you as prey.

10.3.10.1 Tips for Avoiding Bear Encounters on Traverses

To avoid encounters, stay alert, make noise and know when and where to expect bears. Use utmost caution if you must traverse through prime bear habitat. Do not become totally focused on the traverse route and outcrops.

- Keep track of wind direction. If the wind is at your back, your smell will be carried ahead of you and bears may sense your presence and leave. With the wind in your face, they will not smell you coming so be vigilant. Check behind frequently to make sure you are not being followed.
- If you are dropped off by helicopter, it is important to scan the area for bears before landing. If possible, check out the traverse route for bears as well. Note: Although you may not see bears when you fly over the landing and traverse route, that does not mean there are none in the area. Stay alert for signs of bears and be prepared for encounters throughout the day.
- Use binoculars in open areas to scan in all directions. They are useful in the barrens, on avalanche slopes, in alpine areas etc. Watch for bears realizing that you will probably see only part of a bear rather than all of it.
- Announce your presence; make lots of noise (see section 10.3.9.1 Noise makers).
- Watch for bear signs and listen for sounds in the surrounding bush that might indicate the presence of a bear.
- Use extra caution if you must traverse along rushing streams, through dense brush or near berry patches. Bears may not hear you coming so continue to make lots of loud noise.
- While traversing, make a mental note of available trees to climb, but do not depend on one for safety.
- Never come between any female bear and her cubs. Female grizzlies with cubs will charge or attack from a much greater distance than will a female black bear.
- Never approach any fresh kill, carrion or loosely piled dirt and branches (possible remains of a bear kill). Watch out, especially if scavenging birds like ravens are around. Bears act aggressively around their kills.
- Never approach a bear to photograph it.
- Do not imitate the vocalizations or postures made by a bear.
- Calmly prepare your deterrent as soon as an encounter occurs. The closer the encounter when a bear discovers you, the more likely it will charge or attack – especially grizzlies and polar bears. See section 10.3.9.
- Juvenile bears frequently test a situation during an encounter. Stand your ground with them, if possible.

- Increase your distance from a bear even if it seems unconcerned; it may be a human habituated or food conditioned bear. If you come closer it may provoke an aggressive response.
- A bear encounter is not classed as an attack unless the bear makes physical contact with the person.

10.3.10.2 Bear Encounters – How You Should React

When you encounter a bear the safest response is to keep calm and do not run from a bear; the act of running seems to encourage a bear to chase. Do not run for a tree (or a safe shelter) unless you know you can make it to the tree and climb high enough to escape the pursuing bear. When you run, you can no longer see what the bear is doing.

When you encounter a bear that is not aware of your presence:

- Try to move away without getting its attention. Make a wide detour and try to leave undetected.
- Watch for any change in its behaviour. Be careful not to startle it.
- If you see young bears on the ground or in a tree or hear bear vocalizations, be extremely cautious and go back the way you came as quietly as possible.

When you encounter a bear that knows you are there:

- Identify yourself as human by talking calmly in a low voice and waving your arms slowly. Do not shout or jump about, as this might provoke an aggressive response.
- Move away slowly and make no sudden movements. Do not run, as it might trigger a chase.
- A bear will usually leave.

If the bear starts to approach:

- Stand your ground.
- Stay calm.
- Prepare to use your deterrents.
- Determine what kind of approach the bear is making.

10.3.10.3 Encounters – When Bears React Defensively

If the bear is making a defensive approach toward you:

- Try to appear non-threatening; your goal is to avoid being seen as a threat.
- Talk in a calm voice and let the bear know you mean no harm. A defensive bear is stressed by your presence. When it no longer feels threatened, it may simply retreat.
- When the bear stops advancing toward you, start slowly moving away from it.
- If the bear continues to advance, your best strategy is to:

- Stand your ground! Most defensive charges stop short.
- Do not shout or throw anything. Once it knows there is nothing to fear the bear should calm down and stop its approach.
- When the bear is no longer advancing, start slowly moving away – still reassuring it in a calm voice.
- If the defensive bear advances again, STOP and stand your ground once more!
- If it keeps coming closer, stand your ground, keep talking, and use your deterrent. If the bear seems intent on attack, use your bear pepper spray when it is about 3 m away.
- If the bear attacks, wait as long as you can and then fall straight to the ground in the prone position.
- Prone position: Drop to the ground and lie face down on your stomach.
 - Keep your pack on for added protection. Clasp your hands together over the back of your neck to protect this vital area.
 - Stick your elbows out, spread your legs apart and dig your toes into the ground to help maintain this stable position to make it more difficult for a bear to roll your body over. Do not struggle or make noise.
 - Resist any attempt to roll you over with the strength of your legs. If the bear flips you over, roll back onto your stomach so you are face down again.
- Fetal or cannonball position: Crouch on the ground with your legs drawn up to your chest and your hands clasped around the back of your neck. Most bear authorities advise using the prone position, as your face is better protected and it is much harder for a bear to roll you over and expose your vital organs and face.
- When the attack stops, lie still and wait for the bear to leave. Moving too soon may provoke another assault.

10.3.10.4 Encounters – When Bears React Non-Defensively

If a bear makes a non-defensive approaches toward you, it will show little stress. Its head and ears will be up. Try to determine its motive (curious, food conditioned, testing its dominance, or predatory). Bears may quickly turn from curious to aggressive when surprised at close range. Your response needs to be assertive:

- Talk to the bear in a firm voice. Stay calm.
- Move out of the bear's path (in case it is testing its dominance); it may simply want to continue on its path. Watch it carefully if you move aside to give it room to pass.
- If the bear follows you:
 - Stop and stand your ground.
 - If the bear follows and stays focused on you, you are in a dangerous situation. It is time to become aggressive. Shout! Stare the bear in the eye. Move aggressively to intimidate the bear by making yourself as large and threatening as possible to let it know you will fight. Stand on a log or rock and use your deterrent. Fire a noise maker that lands in front of the bear.
 - Stamp your feet and take a step or two towards the bear. Stand on a rock or log. Threaten the bear with anything you can. Use your deterrent (bear spray) and any weapons within reach (rock hammer, mattock, rocks, sticks etc.).

- If the bear attacks, fight back for your life with all your might! At this point, you're dealing with a predatory bear intent on eating you. Be aggressive and make as much noise as possible. Concentrate on the bear's face, eyes and nose. Do not give up! Use and do anything that will help you dominate and drive the bear away; this action may save your life. You may be fighting for your life!

Black and Grizzly Bears

Play Dead if it is a defensive attack.

Fight if it is a non-defensive attack.

Polar Bears

Always fight if you are attacked.

- Information regarding bear encounters and attacks can be found on the following websites:
<http://www.bearsmart.com/becoming-bear-smart/play/bear-encounters>
<http://www.environmentyukon.gov.yk.ca/pdf/howyoucanstaysafe.pdf>

10.4. Other Large Mammals

Some large mammals may be attracted to a project site by the smells of food or garbage, the presence of dogs, or they may just be curious. Never feed wildlife or make food easily available to them through sloppy camp practices.

10.4.1 North and South America

Cougars (mountain lions or pumas) and Jaguars

Encounters with cougars are rare, but the number of encounters is increasing as cougar habitat is encroached on. Cougar populations are increasing in western Canada and the USA. The following websites have information about cougars:

<http://www.env.gov.bc.ca/wld/documents/cougfs.htm>
<http://gateway.cd.gov.ab.ca/pubsandmedia/Cougars%20WEB%20brochure.pdf>

Jaguars' preferred habitats includes forests, savannah and occasionally desert and scrub environments. They live in Central and South America, Mexico and occasionally in southernmost Arizona and New Mexico; jaguars are larger, heavier and stronger than cougars.

Prevention and Preparation

The following guidelines are based on information about cougars. The same principles should apply to jaguars.

- Inquire with locals to learn of habitat that cougars may favour. In warm regions they often rest in shady places like rock overhangs and ledges.
- It is not advisable to keep dogs, as they may lead a cougar into camp. Cougars prey on dogs much more frequently than on humans.
- Keep camps well lit at night when cougars are most active (dusk to dawn).
- Control possible sources of food to prevent food conditioning.

Traversing in Cougar Country

- Make lots of noise and carry a big walking stick to use as a weapon. Unusual or metallic sounds that sometimes work for scaring bears may work for cougars. Carry bear spray.
- Never approach a cougar. They are defensive, especially when with kittens and/or if they are feeding. Cougars cover their kill with dirt and debris; if you encounter a kill site, quickly and calmly leave the kill area and stay away.
- Never corner a cougar; always allow it a route to escape.

Cougar Encounters

- Never run away as this behaviour triggers a cougar's instinct to chase. **DO NOT** turn your back on it; they usually attack prey from the rear. **DO NOT** climb a tree as they are excellent climbers and will catch and pull you down.
- Stay calm. Try to appear as tall and imposing as possible by opening your jacket and raising your arms or holding a stick in a threatening position.
- Stop. Face the cougar and back away slowly if it is safe to do so. Speak calmly and firmly. Move to a safer location while backing up, preferably uphill so you look larger, but do not corner the cougar.
- Cougars rarely attack humans, but if an attack is imminent, try to convince it you are not prey. Be aggressive – make growling noises, shout at it, and threaten it with your walking stick.
- If a cougar attacks, try to inflict pain with a weapon as their pain threshold is rather low. Remain standing; try to get back up again if knocked down. Do not crouch down or turn your back on it. Protect our head as large cats try to attack the head and neck.
- Defensive weapons: Use a heavy stick, throw stones or branches, use pepper spray if you have it.

Wolves and Coyotes

Prevention and Preparation

Wolves are a more significant threat than coyotes but both species deserve respect. Wolves and coyotes are carnivores and will attack a camp dog to kill and eat it. They have an excellent sense of smell so food and garbage are attractants.

- Wolves fear people, but if they become human habituated they are hard to scare off. If they become food conditioned, they may approach a work site and expect to receive food. This is thought to have happened in northern Saskatchewan where a mineral exploration employee was allegedly killed by wolves in November of 2005.
 - Never feed wolves.
 - Keep a clean project or camp site. Do not provide access to garbage. Thoroughly burn it, if permitted. Do not bury garbage as they will dig it up.
 - Do not approach a wolf den or cubs. Leave immediately if you come upon a kill site.
 - An aggressive wolf will hold its tail high, raise its hackles and perhaps bark or howl.
- Coyotes generally fear people, especially where they are hunted or trapped, but if they become human habituated they will approach very near and be very difficult to scare off. If they become food conditioned, they may approach a work site or camp to search for

food and water. Their range is expanding and their habitat includes forests, deserts, grasslands, and many urban and suburban areas. Packs of coyotes can kill large prey including deer and elk. Although it is extremely rare, they have killed humans. Children have been attacked and killed and an adult was recently killed in Nova Scotia.

- Follow the same guidelines as for wolves by denying access to food and garbage and keeping a clean camp.
- Remove sources of water if possible, which attract coyotes – especially in dry areas.
- Coyotes are most active at dawn and dusk.

If approached by wolves or coyotes, follow the same reaction guidelines as for a cougar. Try not to allow wolves or coyotes to approach within 100 m.

- Use adverse conditioning techniques immediately when they approach a project or camp site. Try to make them afraid of humans. Make threatening moves: shout and wave sticks, throw rocks, and make noise – an air horn works well to scare them away.
- Appear as large as possible and try to intimidate them.
- Make eye contact and back away slowly if they stand their ground.
- DO NOT run, crouch down, or turn your back on the animals.
- If you are with a group, everyone should act in unison to create the impression of power.
- Bear spray will work as a deterrent, if available.

Caribou and Musk Oxen

Prevention and Preparation

If a project is located near a caribou migration path or herds of musk oxen:

- Develop written SOPs regarding the use of vehicles, aircraft, drills, and employee activities when caribou or musk oxen are sighted or are migrating through the project area.
- Musk oxen: Single bulls may charge. Musk oxen will form a protective circle around calves when threatened. Back away slowly if you see a musk ox rubbing its foreleg on a gland on its nose, as this is a sign that it is preparing to attack.

Moose and Elk

Prevention and Preparation

Do not approach these large animals. Males are dangerous during rutting season and in winter when food is in short supply. Females with calves are dangerous and may defend them by charging and stomping. Like bears, they may become human habituated and food conditioned. Once this happens, moose and elk are more likely to attack a human at close range.

- Signs of agitation: Moose will lower their head and lick their lips while raising the hackles on their back.
- Back away slowly from a close encounter. If a moose charges, climb a tree or use closely spaced trees or other large objects as a shield or decoy.

- Do not keep dogs at a site where there are moose; they will attack dogs, which they perceive as wolves (enemies).
- Vehicle collisions – if a collision is imminent and unavoidable, aim for the hind quarters as the animal is less likely to rise up over the hood and crash through the windshield. Be most alert at dusk and dawn.

10.4.2 Africa and Asia

Seek and follow local advice regarding the location and behaviour of these animals.

- **Leopards, Lions and Tigers:** Always maintain your distance. If you work where these animals live, use your vehicle and stay near it for safety. Never run from an encounter. Face them and back away slowly. Lions are poor climbers so you can try to get high in a tree. Except within game parks, you are more likely to encounter leopards than lions. Leopards are excellent climbers; they tend to live on escarpments and descend at night to hunt. Try not to camp near an escarpment and always sleep within a tent. Leopards are more likely to attack humans than are lions.
- **Elephants:** Always maintain your distance. Bull elephants are very dangerous. In rain forests, make lots of noise while traversing to announce your presence and usually they will leave the area. In savanna regions, watch out for tracks or other signs of their presence. If you encounter elephants while away from your vehicle, do not run. Face them and back away slowly. Beware of elephants that are flapping their ears and blowing – this is a sign of agitation so back away. During the dry season, do not take any fresh fruit on traverses as elephants are attracted to it and can smell it for great distances.
- **Hippopotamus:** Always maintain a safe distance from these animals both on land and water. Hippos graze on river banks at night and will attack and trample anything that comes between them and the safety of the river. Never camp near their grazing areas. If you are on the water in a boat or canoe, use extreme caution if you suspect there are hippos in the area. Do not talk. Remain quiet. Paddle or move with smooth, quiet motions until well clear as they may overturn a boat without provocation. A hippo with an open mouth is delivering a threat, *not* a yawn. Flapping ears and snorting are signs of agitation. Annually, hippos may kill more people in Africa than crocodiles kill.
- **Cape Buffalo and Anoa:** All Cape buffalo are very dangerous. Lone bulls are especially dangerous because they are extremely unpredictable without the security of a herd. Never approach Cape buffalo from behind as this may cause a herd to panic. They will trample, gore and toss a victim with their horns. It is safe to run from these animals, as they do not have a chasing instinct. Take cover behind a tree or anthill or try to reach a safe height in a tree. Noise-makers cannot be depended on as a deterrent. Brightly-coloured clothing may attract them.
- **Hyenas and Wild Dogs:** While these animals are not especially dangerous to adults, you should never corner one as they are capable of vicious attacks. Rarely, they have been reported to attack people at night sleeping outside of tents or houses.

10.5 Dogs, Cats and Monkeys

Stray dogs, cats and monkeys present potential health threats to field employees. All animal bites are high risk wounds due to bacteria present in the animal's mouth. In most developing countries, dogs and cats are rarely vaccinated and they are major carriers of rabies and tetanus. In these countries, it is advisable to consider all bites from dogs, cats and monkeys to be potentially lethal

unless you can prove without a doubt that the offending animal is free of rabies (refer to section 12.8.5.12).

- Do not feed, befriend, adopt or provoke stray or wild dogs, cats or monkeys.
- Do not keep pets or encourage wild animals to hang around a project site.
- Recognize signs when a dog is likely to bite, which may include:
 - Fierce barking, snarling, growling, the tail stiff and raised high, raised hackles on the neck
 - Fearful, cowering – shy dogs can be dangerous
 - Unusually still and unresponsive dogs may be bred to disguise their aggression.
 - Outdoor dogs, chained dogs or cornered dogs are more likely to bite.
- If packs of wild dogs inhabit the area, consider equipping employees with axe handles to fend off a possible attack. Packs of feral dogs are relatively common in Africa, Mexico and in remote parts of the southwestern USA.
- In some places, food conditioned monkeys may approach and bite a person to provoke them to provide food.
- Wash any animal bite vigorously and thoroughly with soap and water. Apply antiseptic and seek medical advice. Leave bites and puncture wounds open.

10.6 Reptiles

When projects are located where venomous snakes and crocodiles are a risk:

- Perform risk assessments that address reptile risks for project or camp locations and traverse areas. Develop SOPs that address the observations and conclusions of the risk assessments.
- Check on the location of the nearest medical treatment centre that treats venomous snakebite and post the contact information at the project/camp communication centre. This is essential information to include in the project ERP; it wastes valuable time to take a snakebite victim to the wrong medical centre.
- Develop and enforce safe operating procedures (SOPs), especially regarding the use of footwear and handling procedures for food and garbage.
- Make sure employees are trained to recognize and address traversing risks where there are venomous snakes and crocodiles and correctly respond to snakebite.

10.6.1 Snakes

Snakes are a source of anxiety for many people even though most snakes are not venomous. Although thousands of people die annually from venomous snakebites in developing countries, particularly in rural agricultural areas, this is due to the lack of medical facilities for treatment. Very few deaths occur where there are medical facilities equipped to treat snakebite.

Most snakebites occur when people fail to use good judgement.

- In North America, most snakebites occur when people try to corner, capture or play with snakes – 40% of bites in the USA are to males who have consumed alcohol.
- Snakebites occur more frequently to people who are wearing sandals or are barefoot.

- In the field, some people are bitten when they forget to look around carefully before sitting down, or they back up into a bush with a snake under it.
- Field employees are vulnerable if they are very focused when examining outcrops or when entering portals, declines, and/or abandoned buildings at old mine sites.
- If you encounter a venomous snake at close range, do not move suddenly as snakes strike at moving objects. It is usually best to remain motionless until you locate the snake and then back away slowly, but do not back into another snake. If you encounter a snake that is not within striking distance, back away slowly. Give the snake lots of space and be on the lookout for more snakes.
- In rattlesnake country, STOP if you hear a rattler and locate the snake before moving. Check around for other snakes and then back away slowly and carefully. You should stop rather than immediately run away as there is often a mate nearby – possibly behind you. Often, rattlesnakes hunt by hiding beneath a bush, by a rock or log where they wait for prey to pass.
- Stay clear of large constrictor-type snakes, (e.g., boas, anacondas and pythons). While their diets consist mainly of rodents and small animals or fish, some species grow large enough to potentially kill a human. They often bite first to grasp their prey and then coil around and suffocate the victim. Although not the longest species of snake (they can grow to five metres), green anacondas are the world's heaviest snake. They are unpredictable, noted for an aggressive temperament, and they are capable of giving a bite that can cause serious injury. Anacondas are excellent swimmers and hunt for prey in and near water. In tropical South America, be alert when working in their preferred habitat (e.g., rainforest, savannas, and grasslands with swampy areas of slow moving waters). They are most frequently found in the Amazon and Orinoco river basins. In the event that an anaconda (or other large constrictor) constricts around a person, do not attempt to pull at the coils because the snake's strength is adapted for tightening its coils. Remove the snake by unwinding it from the tail end as the snakes' muscles are not adapted to prevent unwinding.

10.6.1.1 Prevention and Preparation to Avoid Snakebite

Follow these guidelines for projects located where there are venomous snakes. Become educated regarding snake behaviour to avoid snakebite and excessive fear of snakes.

- Seek knowledgeable local advice regarding the habits and favoured habitats of local species of venomous snakes. Know where to expect to find them – they will be there some of the time. Snakes are cold-blooded. On a cool day, expect to find snakes in the sun resting on or near trails and rocky areas. On a hot day, they seek shade in and under bushes, logs, and rocky crevices or ledges etc.
- Complete a risk assessment to help choose the location of project living quarters. Avoid places where snakes are likely to live, such as in dry rocky locations, around swamps and watering holes, places with high rodent and frog populations, and areas with heavy vegetation or high grasses.
- Locate of the nearest medical centre that can treat snakebite and include the information in the project ERP so a victim is taken to the correct place for proper treatment. Know what field first aid procedures to administer for different types of snakebite, which vary by continent and the species of snake. (See section 10.6.1.2 Treatment of Snakebite.)
- Because snakes are well camouflaged, try to train your eye to see the shapes, colour patterns, and distinctive signs of local venomous snakes. For example, American coral snakes have a colour pattern of red bands adjacent to yellow or white bands. In Mexico,

Central and South America, the colour patterns are different. All sidewinder type snakes make an easily recognizable pattern of movement in sand that resembles Js or Ss.

- Snakes are more active at certain times of the year. Some snakes become very aggressive at mating times. Learn when this may occur and increase caution at these times.
- Be aware of the time of year when snakes shed their skin and be extra cautious. They cannot see well and often strike at anything nearby. Rattlesnakes may not be able to rattle again until the new skin and rattles are dry and firm.
- Do not kill snakes unnecessarily. Do not handle or disturb snakes in the wild, even if they appear dead or if they appear harmless. Many bites result from mistakenly identified venomous snakes and “dead” snakes – the South African cobra-like rinkhals snake will fake death to lure its prey. A severed snake head can administer a bite to someone who handles it; emphasize these points to both local and visiting employees.



Figure 10.4: Train your eyes to see the shapes, colours and patterns of snakes. © Dr. Kate Jackson

Tips to help prevent snakebite while working and traversing in snake country:

- Always wear loose, long trousers over boots and socks. Boots should cover your ankles – better still, your lower legs. Gaiters worn over boots are highly recommended. Proper clothing can greatly reduce the severity of snakebites by absorbing the venom or deflecting the fangs; this is especially true in Australia where the venom flows down and around the fangs to enter rather than being injected through the fangs into the victim. Never wear sandals where venomous snakes are a hazard.
- Make noise while traversing by treading heavily and you may encounter very few snakes. Snakes sense vibrations and most will retreat to avoid encounters. However, king browns and tiger snakes (Australia), cobras and some rattlesnakes will sometimes stand their ground and/or defend their nests.
- When traversing, walk at more than a metre away from rock overhangs and shady ledges, which may shelter snakes.
- Use extra caution if climbing rocks to take samples. Throw something onto a ledge before putting your face or hands up at that level.

- Never reach with your hand to pick up a rock sample or roll over a rock without looking first to check for a snake.
- In jungle or areas with heavy vegetation, watch for snakes in tree branches as well as on the ground.
- Experienced field employees say that they encounter snakes more frequently after blasting occurs in the immediate area.
- Keep tents tightly closed so no snakes can crawl inside. Check your bed before getting into it. Keep food out of all sleeping tents so it does not attract rodents. Snakes will follow rodents into a tent.
- Keep windows and doors to field vehicles closed so no snakes can crawl inside.
- Use a flashlight at night to walk around the site and between outbuildings. Unlit paths are especially dangerous after rainstorms as snakes will have emerged from holes and crevices.
- Use extra caution and wear gloves when collecting firewood, as snakes often live near wood or brush piles. Whack a wood pile with a stick before picking up wood and avoid collecting firewood at night.
- Do not hike at night. If it is necessary, always use a flashlight and a walking stick.

To avoid snakebites – avoid situations where snakes might strike you. Most snakes can only strike a distance equal to about half their body length.

- Step up onto logs and boulders rather than stepping over them and check that there are no snakes where you will step.
- Always roll over rocks or logs with a rock hammer or a long stick, *not* with your hand or foot. Roll them toward yourself to keep the object between you and a snake.
- Stamp on the ground and use a walking stick to sweep ahead of yourself in areas of tall grasses.
- Snakes can climb trees and fences so be very cautious if you must climb trees with dense foliage. Do not crawl under a fence in high grass.
- It is very dangerous to reach into a hole with a hand or a stick. Look carefully from a safe distance before reaching into any crack, crevice or hollow log.
- Use caution if you swim in lakes or rivers where there are venomous snakes. Snakes are often found near water and they swim well. They probably will not bite unless you try to capture them while in the water.

10.6.1.2 Treatment of Snakebite

It is very important that the victim of a venomous snakebite receives correct medical treatment as soon as possible. In North America, the emergency rooms of hospitals can treat snakebites, but not every hospital will keep antivenin on hand. All Poison Control centres in North America should be able to give guidance over the telephone regarding where to obtain treatment. In Australia, medical help is quickly available by radio communication with Flying Doctor services. In developing countries however, it is essential to learn the location of treatment centres in the project area that can treat snakebite. Mark them on a map. Program the numbers into the satellite or mobile/cell so they are with you on traverse and post the numbers in the project office. Call

ahead to notify the treatment centre of the pending arrival of a snakebite victim. Valuable time is wasted if a snakebite victim goes to the wrong treatment centre.

Only medical personnel should administer antivenin because serious side effects may develop. While some toxins may take hours to take effect, they may still cause death if left untreated and some bites are lethal in a short time. Therefore, all victims of suspected venomous snakebites must receive medical treatment as soon as possible.

General Treatment Guidelines

- Know the correct way to manage snakebite for the venomous snakes in the project area. There are two categories of snake venom. Most snakes have only one type of venom but a few have a combination of both types.
 - Hemotoxic venom affects the circulatory system and causes skin tissue damage and necrosis, destroys blood cells and causes internal hemorrhages. Snakes with this type of venom include the vipers and pit vipers (rattlesnakes, moccasins, and copperheads). Do not bandage these snakebites as this will increase tissue damage.
 - Neurotoxic venom affects the central nervous system and results in breathing difficulties and heart failure. Snakes with this type of venom include elapids – cobras, coral snakes, mambas, and kraits. Bandage these snakebites using the Australian pressure-immobilization techniques (see section 10.6.1.3).
- Treatment for viper or pit viper bites (hemotoxic venom): Gently wash the bitten area with lots of water and soap to remove venom and help prevent tetanus and tissue destruction. Immobilize the limb and keep it slightly below the heart. Transport the victim to a medical centre as soon as possible. These instructions apply to all snakes (except coral snakes) in North and South America and for any viper or adder bite in Africa, Asia and Europe.
- Treatment for elapids (neurotoxic venom) and for all snakes in Australia: Wrap the bitten area using the Australian pressure-immobilization technique. Do not apply a tourniquet. In Australia, do not wash any venom off the skin of the victim because it can be used to identify the snake. If venom is wiped away, *take that cloth* to the medical centre where it can be used to determine the required antivenin with a venom identification kit.
- If you encounter a spitting cobra and venom gets into your eyes, flush the eyes immediately with large quantities of water or any fluids available, as the venom causes blindness. Use sputum or urine if nothing else is available. After sufficient flushing, apply antibacterial eye drops. Seek medical attention as soon as possible.
- If a victim is severely envenomated and more than a day or two from a medical centre, it may be advisable to use the Australian pressure-immobilization technique on snakebites with hemotoxic venom, (such as a large Gaboon viper). It is better to chance losing the limb than to die.
- The following “do not” instructions are very important:
 - Do not cut or suck the bite. Cutting may cause tissue damage and will not result in removing more venom.
 - Do not apply ice. It will not inactivate the venom and may cause tissue damage.
 - Do not apply electric shock. It may cause burns and cardiac problems.
 - Do not apply alcohol, as it will enlarge the blood vessels and allow more venom to be absorbed. Do not drink alcohol as it will cause a change of mental status and obscure possible signs of venom absorption.

- Do not apply a tourniquet, as the resulting blood restriction may cause more tissue damage and may even cause a limb to be amputated.
- Only if it is safe to do so should you bring the dead snake (in a closed container) along for identification. It is never a good idea to kill snakes and risk getting bitten, especially if there are only one or two venomous species in the project area – doctors will know what antivenin to use. Do not handle a dead snake with bare hands, as reflex actions can cause the fangs to inject venom into a person for several hours after death.
- A study has show that the venom extraction pump by Sawyer, “The Extractor”, is not effective to remove venom from snakebite. It is more important to treat the bitten area appropriately and get to a medical treatment centre as soon as possible. Using “The Extractor” does not reduce the urgency for immediate medical attention to the snakebite and its use may give the victim a false sense of security. For information about the study, refer to the following website: <http://www.ncbi.nlm.nih.gov/pubmed/14747805>.
- NOTE: There are absolutely no “traditional” medicine cures for venomous snakebite from any culture on any continent, no matter how convincing locals may seem. Do not be fooled or complacent regarding “cures” for venomous snakebite. The only treatment is evaluation by medical staff and correctly administered antivenin in a medical treatment centre.

Procedures for Snake Bites

If someone is bitten, follow these procedures:

1. Back away from the snake carefully and make sure that no further bites occur to the victim or anyone else.
2. Reassure the victim to help keep him or her calm, which is an important part of treatment. Have the victim lie down and remain in this position. Remember, many snakebites do not result in venom being injected into the victim.
3. Remove rings and jewelry and any constricting clothing that might impede the flow of blood. Snakebitten areas may swell up alarmingly.
4. Do not cut, do not suck with your mouth, and do not apply a tourniquet to the bite area. Wash the bite area gently, if appropriate. Do not wash a snakebite in Australia. Apply a bandage, if appropriate.
5. Bring transportation to the victim or transport the victim to a vehicle by stretcher, whenever possible. If absolutely necessary, the victim may be carried. The victim should not walk and should never run in order to prevent rapid circulation of the venom. Take the victim to a medical treatment centre for treatment or observation for 24 hours.
6. Keep track of vital signs during transportation. If swelling develops, mark its progress on the skin every 10 minutes and note changes in the patient’s physical symptoms and mental state. These include quality of vision, respiration rate, emotional changes, and nausea. Maintain the victim in a horizontal position.
7. Leave all dressings and any splint in place. Only a doctor at a medical treatment centre should remove them once appropriate required medications are assembled. If venom was injected, it will quickly move into the blood stream once the dressings and splint are removed.

NOTE: If the victim is unconscious and near death, you may apply a tourniquet between the bite area and the heart. The victim may lose the bitten limb but that is preferable to death. If the victim stops breathing, begin CPR (cardiopulmonary resuscitation).

10.6.1.3 Australian Pressure-Immobilization Technique for Snakebite

Information regarding the Australian pressure-immobilization technique is reproduced with the permission from the:

Australian Venom Research Unit
Department of Pharmacology
University of Melbourne
VIC 3010 Australia

Website: <http://www.avru.org/compendium/biogs/A000066b.htm>

Try to obtain first aid instruction regarding the correct application of an elastic bandage for snakebite. An improperly applied elastic bandage may be too loose to do any good and one that is too tight may become a tourniquet and cause the loss of a limb. Do not apply a tourniquet.

Bites to the lower limb:

1. Apply a broad pressure bandage over the bite site as soon as possible. Crepe (Ace) bandages are ideal, but any flexible material may be used. Clothing, towels etc., may be torn into strips. Panty hose have been successfully use. Do not take off clothing, as any movement will assist the venom in entering the blood stream. Keep the bitten limb and the patient still.
2. The bandage should be as tight as you would apply to a sprained ankle.
3. Extend the bandage as high as possible up the limb.
4. Apply a splint to the leg. Any rigid object may be improvised as a splint, such as a spade, piece of wood or tree branch, or rolled up newspapers.
5. Bind it firmly to as much of the leg as possible. Use any rigid object for the splint (e.g., a piece of lumber, a spade).

Bites to the hand or forearm:

- Bandage as much of the arm as possible, starting at the fingers.
- Use a splint to the elbow.
- Use a sling to immobilize the arm.
- Keep the patient still. Lie the patient down to prevent walking or moving around.

Bites to the trunk:

- If possible, apply firm pressure over the bitten area. Do not restrict chest movement.
- Keep the patient still.

Bites to the head or neck:

- No first aid for bitten area.
- Keep the patient still.

10.6.2 Crocodiles and Alligators

More than 20 species of crocodiles, alligators, caimans and gharials live in tropical and sub-tropical regions. They range in size from dwarf varieties to over five metres in length – the larger they are, the more potentially dangerous they are. The narrow nosed fish-eating species are not usually dangerous to man but will give a nasty bite if provoked.

All crocodiles are well camouflaged; they will see you long before you see them. Male crocodiles are most aggressive during the breeding season and females aggressively defend their nesting sites and babies. The largest and most dangerous species are the African Nile crocodile and the Indo-Pacific saltwater crocodile – they will prey on humans. The Nile crocodile ranges throughout most of the river systems in Africa from Egypt to South Africa. The range of the Indo-Pacific species includes coastal and inland waters of India and Southeast Asia (particularly Indonesia and Papua New Guinea to northern Australia). The information in this section comes from Australian sources but safe practices regarding the Indo-Pacific crocodile are also applicable to the Nile crocodile.

In Australia, both freshwater and saltwater crocodiles present an increasing occupational hazard. Their ranges are expanding and it is illegal to shoot them. Although the preferred habitats of the Indo-Pacific saltwater crocodiles (salties) are tidal rivers and mangrove swamps, they are not confined to salt water. Salties may swim several hundred kilometres upstream in freshwater river systems so their range overlaps with freshwater crocodiles, which inhabit all types of non-tidal freshwater wetlands and the tidal areas of some rivers. Although dwarf crocodiles, Australian freshwater crocodiles, gharials, caimans and American alligators are comparatively less aggressive, you should treat all these species with respect and keep your distance. In Australia, you should treat freshwater crocodiles with the same respect as saltwater crocodiles.

Prevention and Preparation

Wherever there are crocodiles, heed these warnings.

- If traversing where there are crocodiles, be especially aware of potential dangers when working near water holes and sloping river banks. Crocodiles can lunge very quickly from the water onto shore, as well as sideways and upwards out of the water to catch prey (potentially you).
- Recognize crocodile slide marks and stay away. Move away quickly if a crocodile approaches you.
- If you encounter a crocodile (or alligator), stay at least ten metres away from them and leave the area. Never agitate or provoke them; they can travel very fast on land or in the water. If you are chased on land, run in a straight line as they have little stamina. You may be able to outrun it.
- If you must cross waterways while on traverse, do so where it is narrow, shallow and rocky. Avoid water crossings that are more than knee deep, especially if water is murky.
- Obtain local advice if it is necessary to use a boat in crocodile infested waters. Indo-Pacific crocodiles will occasionally attack boats with outboard motors. Do not canoe in streams, lakes, ponds or at the mouth of rivers in crocodile habitat, especially in northern Australia. Never trail your hands or feet in the water.
- Do not choose a camp site near water holes, river banks or any source of water where crocodiles are known or might be present. Project sites should be a minimum of 800 metres from the water's edge. Dispose of garbage and food refuse carefully as it attracts crocs.

- A temporary camp site should be located at least 50 m from the water's edge and at least 2 m above the high water mark.
- Stay away from water holes, rivers and streams between dusk and dawn when crocodiles are most active.
- Do not go to the same place each day for water. Use places with shallow flowing water. Use at least three or four places in random order, as crocodiles learn very quickly when and where to expect potential food. This can be in as few as two days.
- Prepare food and wash up at least 50 m away from the water's edge and sloping banks.
- Pay attention at all times to any posted warnings regarding crocodiles or swimming safety. Do not swim in waters known to have crocodiles and alligators. Do not swim at night when crocodiles are most active. Do not swim in inland water holes unless they are posted as safe for swimming.
- Never hike at night; crocodiles often move between ponds and channels at night.
- When you shine a flashlight on the eyes of crocodiles, they reflect light and glow in the dark. Despite this fact, do not assume they are absent if you cannot see their eyes at night.
- Fish only from a boat or stand several metres back from the water's edge – never stand in croc infested waters to fly fish. Do not stand on logs, branches or rocks over the water.
- Clean fish away from the water's edge (at least 50 m) and dispose of food remains safely – away from any campsite or boat ramp.
- Animal carcasses attract crocodiles. Do not approach or moor boats near carcasses.
- In Australia, saltwater crocodiles nest during the wet season and freshwater crocodiles nest during the dry season. Therefore, you must beware of crocodiles in all seasons.
- Do not disturb or provoke young crocodiles. Juvenile crocodiles make a barking or chirping distress call that will summon their mother from a good distance and she will defend her babies aggressively.
- If attacked, fight back as hard as possible and hit it repeatedly on the nose and try to gouge their eyes with your fingers. Scream for help.
- Refer to the following website for more information:
http://www.derm.qld.gov.au/wildlife-ecosystems/wildlife/living_with_wildlife/crocodiles/

10.7 Insects, Arthropods and Leeches

Depending on the project location and the time of year, insects may be a mere nuisance, sufficiently distracting that they impair good judgment, or they may carry life-threatening diseases. Be prepared to cope with insects and protect yourself from the diseases they may carry. People who have allergies to insect stings or bites should always carry appropriate medication or antidote such as antihistamine tablets or an EpiPen auto-injector, and they should instruct their co-workers how to administer it if necessary. For additional information refer to:

12.8.4. Protection from Insect Bites

12.8.5 Diseases (prevalent outside North America)

18.6.5 Diseases (prevalent in North America)

Website: <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/05vol31/asc-dcc-4/index-eng.php>

10.7.1 Mosquitoes and Flies

Mosquito and fly-borne diseases are a major concern in the tropics and some temperate regions (malaria, dengue fever, encephalitis). Black flies and mosquitoes are a notorious nuisance in northern latitudes and the Arctic, especially when conditions are cool and wet.

Risks: Serious and potentially fatal diseases, annoying bites

For more detailed information regarding specific diseases carried by mosquitoes, refer to the following sections:

12.8.5.9 Malaria

12.8.5.3 Dengue Fever

12.8.5.6 Japanese Encephalitis

12.8.5.16 Yellow Fever

18.6.5.13 West Nile Virus

Prevention and Preparation

The information below is summarized from section 12.8.4 Protection from Insect Bites. To successfully prevent insect bites, a multiple approach is necessary. When working in North America, steps 1 and 2 are sufficient.

1. Use insect repellent correctly on your skin and clothing. The most effective repellent contains from 15% to 35% DEET (N, N-diethyl meta-toluamide). Concentrations higher than this may cause reactions as it is absorbed through the skin.
2. Treat field clothing with DEET or permethrin products (insecticide) to repel or kill mosquitoes and flies (and ticks and leeches). Wear treated bug-jackets and head-nets to reduce distraction and insect bites, as necessary.

Follow steps 3 and 4 in addition to those above to help prevent malaria and other serious mosquito-borne diseases. It is important to prevent malaria, which can be spread by the bite of a single mosquito.

3. Use treated bed nets when protection from disease-bearing mosquitoes is advised (malaria, dengue fever). Refer to Appendix 1 in <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/05vol31/asc-dcc-4/index-eng.php>.
4. Use knock-down insecticide sprays in your quarters and inside the bed net before going to bed.

Further measures to help diminish the impact of mosquitoes and flies include:

- Carry out measures that eliminate potential breeding places for mosquitoes. Do not permit water to accumulate in equipment, tire tracks, ruts, or other potential breeding places – especially in project locations where diseases may be spread by mosquitoes.
- Avoid wearing products that contain fragrances as they attract insects.
- In the Arctic it may help to place mosquito coils in a metal container and burn them in a tent before bed.

10.7.2 Bees, Wasps and Ants

Risks: Reactions to stings range from minor irritations, to moderate reactions, through to severe reactions including anaphylactic shock causing death for people with allergies to the venom.

Prevention and Preparation

Bees and wasps

- Look out for bees and wasps nests while traversing and carrying out other exploration work. Bees and wasps can favour cliff faces or old mine entrances, as well as trees, underground crevices, buildings etc. Wasps live in large colonies and build paper-like nests.
- Check your work area and where you stop to eat lunch for nests of bees, wasps, and ants etc. Keep food and garbage covered as it attracts these insects.
- Honey bees only sting once and then die. They often leave their stinger embedded and it should be removed as soon as possible.
- Wasps can sting repeatedly. Yellowjackets, one of the most common wasps, sting more people than any other type of bee or wasp in North America.
- Do not swat or crush bees and wasps that fly around you as this excites them and attracts more of them.
- Avoid wearing products that contain fragrances as they attract insects.
- If you encounter a large numbers of bees or wasps, cover your face and eyes and leave the area immediately. Seek shelter in a building, a vehicle or an enclosed area. Heavy vegetation does not offer sufficient protection. If you jump into water, some bees will hover above and wait for you to emerge and continue stinging (e.g., Africanized bees).
- Africanized bees: Be especially vigilant to avoid swarms, nests or hives of Africanized honey bees. These bees are aggressive, very defensive of their territory, and may attack for little reason. Where these bees occur, stay at least 33 m from any hive or swarm of bees. While European honey bees may chase you for 50 m, Africanized honey bees may chase you for up to 800 m. If you encounter bees that “head butt”, retreat calmly and quickly, as this is a warning that you are approaching an Africanized bees nest. If stung multiple times, consult a physician as soon as possible. Remove stingers as soon as possible as the stinger sac continues to pump venom into the victim after the bee is gone. People may die from multiple bee stings even if they do not react with anaphylactic shock.

Range: southwestern USA, Mexico, Central and eastern South America.

Ants

- Army ants (South America) and driver ants (Africa): These ants are carnivorous and build temporary nests so they migrate in large numbers. They can be an invasive problem and are a hazard in the tropics.
- Fire ants: Fire ants are found from the southern USA to South America and sting repeatedly when they attach to you. Be aware of your surroundings; watch where you walk or sit down to avoid ant hills and disturbing them. Fire ants attack rather than flee when disturbed. They crawl onto the victim, bite or pinch the skin to anchor their body, and then repeatedly sting the victim. The sting has a very painful burning sensation and develops a blister. Some people develop an allergic reaction and a few develop anaphylactic shock from the stings.

- If you are bitten: Move away from the nest area as fast as possible. As soon as you feel the pinching bite, immediately brush off any non stinging ants on your clothing or skin. Kill any remaining ants that are attached to your skin. Wash the bitten and stung area with soap and water as soon as possible to remove any venom on your skin. Disinfect the area with alcohol and do not break the blisters, as they easily become infected. Apply cool compresses or ice to the bitten and stung area to reduce swelling and itching. Apply an antibiotic if the blisters become infected. If a systemic reaction develops very soon after being stung, take Benadryl immediately and seek immediate medical attention in case the reaction progresses to anaphylactic shock.

Additional information regarding bees, wasps and ants is available on the following websites:

http://www.ccohs.ca/oshanswers/biol_hazards/bees_wasps.html

<http://www.nasdonline.org/document/962/d000800/first-aid-for-bee-and-insect-stings.html>

<http://www.ars.usda.gov/research/docs.htm?docid=11059&page=2>

<http://www.cdc.gov/niosh/topics/insects/>

10.7.2.1 Allergic Reactions and Anaphylactic Shock

Some people are allergic to stings from bees, wasps and fire ants. Many people are unaware that they are allergic to bees or that they can develop an allergy as an adult. A severe allergic reaction can cause death from anaphylactic shock. People with a severe reaction to such stings should always carry medication to be administered immediately upon being stung (e.g., epinephrine such as an EpiPen auto-injector, plus Benadryl). Co-workers should be instructed how to recognize signs of an allergic reaction and how to administer the medication – before an emergency. A severely allergic person should carry several EpiPens, as one injection may not be sufficient. The Twinject contains two injections but one cannot be saved for another episode – the second injection must be used or discarded.

- Symptoms of a *local reaction* to a sting include redness, minor swelling and itching or pain at the site but no changes in breathing or blood pressure. Treat by applying a paste of baking soda or ice water after removing the stinger or any remaining venom on the skin.
- Symptoms of a *systemic reaction* to a sting includes itchy red skin, hives developing on other parts of the body, a runny nose and watering eyes. Treat with oral antihistamine (Benadryl) immediately and monitor for signs of a severe reaction.
- Symptoms of a *severe reaction* and *anaphylactic shock* may appear immediately or within 30 minutes. They include the following:
 - Skin turns red within minutes
 - Swelling in the face, lips, tongue, eyes and eyelids, and neck
 - Itchy hives develop
 - Wheezing, difficulty breathing and/or tightness in the chest, which gets worse
 - Increased heart rate and respiratory rate
 - Change in consciousness and drop in blood pressure and cardiac arrest
- Anaphylactic shock is a true medical emergency and requires immediate treatment. If the patient shows signs of developing anaphylactic shock, an auto-injection of epinephrine should be prepared. Four tablets of Benadryl should be given immediately if they have not been given earlier. Unfortunately, once a victim develops swelling and muscle spasm

in the airway and has difficulty breathing, the only treatment is epinephrine. The patient must be monitored because symptoms may reoccur and a second injection may be necessary. It may become necessary to administer CPR.

- Evacuate the patient to a medical facility for observation and evaluation.
- Other triggers of anaphylactic shock include: penicillin and other drugs, nuts, seafood, some food additives such as sulphites, and latex.

First Aid Tips

- Check that the stinger and venom sack do not remain embedded after a sting. Scrape them away with a knife blade, a credit card or fingernail rather than picking them out with your fingers or tweezers, which might rupture any remaining venom sack. Removing the stinger as soon as possible is more important than the method used.
- Benadryl does not take effect for 30 to 40 minutes. Consider including it in a personal first aid kit when working where stings are a risk.
- The EpiPen and Twinject are the only auto-injectors available in North America. The user should be aware of the storage requirements and expiry date. The Ana Kit has been discontinued.

10.7.3 Ticks

Ticks are blood sucking arthropods that may transmit serious diseases. They live in grassy and wooded areas and feed on blood of various animals, including humans. Once they hitch a ride on you, ticks prefer to hide in body crevices such as the armpits, the groin and head – especially the base of the neck, behind the ears and the scalp. They latch onto people with their barbed mouth parts so you must remove them carefully. If you find one tick, there are often more. Recheck thoroughly. Remember that some ticks are very small.

Risks: Diseases carried by ticks include Lyme disease, Rocky Mountain spotted fever, and several forms of encephalitis

Prevention and Preparation

Prevent tick bites by following these precautions:

- Know when ticks are most active in a project area and know which types may be present. This information may be valuable in order to watch out for potential diseases that might develop if someone is bitten.
- Ticks are more visible on light coloured clothing. Wear a long sleeved shirt and long, tucked-in pants with footwear that covers your feet.
- Apply insect repellents containing DEET to your skin. DEET can be sprayed on clothing as well, but it is not as effective as using permethrin (an insecticide) on clothing. Apply permethrin to clothing and let dry for at least two hours. The treatment remains active for weeks even if clothing is washed a few times. Follow directions carefully and wash off any insecticide immediately with soap and water should it get onto your skin.
- Use expandable athletic cuffs and head bands soaked (and dried) in permethrin or DEET to restrict or block the movement of ticks.
- Sit on bare rocks away from vegetation when you rest or eat lunch.

- Do not drape clothing on bushes or on the ground in tick infested areas.
- Perform daily checks of your body and each piece of clothing for ticks. A short hair cut makes it easier to locate them on your head. Check frequently – at least twice a day when doing field work during tick season.
- Check for ticks on clothing before entering your living quarters or you may bring them inside where they will find you later.
- If possible, put clothes in a hot clothes dryer for half an hour to kill lingering ticks. This adds extra protection.
- Habitat: Ticks are found in grass, brush, vegetation debris and weeds near the edges of forests or woods, and near water – wherever their animal hosts live.

Removal of Ticks

Transmission of disease bearing bacteria requires approximately 24 hours of attachment, so you need to find and remove ticks quickly. Do it correctly. Two methods to remove an attached tick:

1. Use sharp pointed tweezers to grasp the tick as close as possible to the mouth parts; pull gently for one or two minutes.
 2. Slide a straw over the tick so the body is inside the straw. Tie a thread in a loose knot around the straw and slide the thread down the straw to where the straw contacts the skin. Slide the knot off the straw and tighten it around the tick's jaws. This will persuade the tick to withdraw.
- Do not use your unprotected fingers to remove a tick. Wear latex gloves if using your fingers is required. Latex gloves should be part of the project first aid supplies.
 - Do not "twist" or jerk the tick as the mouth parts may break off in the wound and increase the likelihood of infection.
 - Do not apply the hot tip of a cigarette or match to the tick's body to cause the tick to back away. Do not apply gasoline, acetone or turpentine to the tick. These actions may cause the tick to spew out infected fluids into your bloodstream.
 - Cleanse the bite area thoroughly and apply a mild antiseptic.
 - If the tick has burrowed into your skin, it should be tested for diseases. Place the *live* tick in a small plastic vial with a damp piece of cotton ball and send it to the appropriate testing facility, if possible. Only live ticks can be tested for Lyme disease and the humidity is important or the tick will die en route. For additional information, refer to section 18.6.5.5 Lyme disease.

10.7.4 Fleas

Most of the time, fleas are a nuisance to be addressed regarding family dogs and cats. However, fleas can carry plague, which can be transmitted when they bite humans.

Risks: Annoying bites, plague

Prevention and Preparation

- In the field, use insect repellent (DEET) or insecticide (permethrin) on clothing to discourage fleas.

- If plague is present in a project area, obtain information from local medical authorities or a travel medicine clinic regarding precautions to take and signs and symptoms to watch for, especially if there are many rodents in the area. It is a good idea to monitor the health of any colonies of prairie dogs or ground squirrels, as sudden increase in the mortality rate may indicate plague. Do not handle dead animal carcasses, as fleas may transfer onto you. In some regions it may be wise to consider prophylactic inoculation if plague is known to be present. Refer to section 12.8.5.11 Plague.
- Symptoms: Flea bites appear as a small red spot within a larger spot. The spots swell and itch but usually disappear after a few days.
- Habitat: Humans, rodents, small and large animals. Adult fleas live on their host and feed on blood. Flea eggs are laid on hair and then drop off where the larvae hatch. The life cycle is easily repeated so it is necessary to eradicate the eggs and pupae as well as the adults to get rid of an infestation.
- Range: Worldwide

10.7.5 Bed Bugs

Bed bug infestations are an increasing problem worldwide and are often found in places with a high turnover occupancy rate, including hotels (even better ones), motels, dormitories etc., and on airplanes, trains or ships. While no diseases are proven to be associated with bed bugs, their bites are annoying and can become infected and a few people are allergic to the bites. Bed bugs hide in bedding, mattresses, bed frames and headboards, upholstered chairs and couches, and cracks and crevices in flooring, walls, and draperies etc. They come out to feed in the dark and hide again when it becomes light. They will migrate into your luggage and clothing. Your best protection is to avoid them if possible. Bed bugs are difficult to eradicate.

Risks: Annoying bites, transferring infestations

Preparation and Prevention

Check your hotel room for signs of infestation and request a different room if you find evidence of bed bugs.

- Inspect the bed by removing the sheets and mattress pad. Search for signs of insects in the seams and crevices of the mattress, between the layers of bedding, and for small specks of blood or black or brown spots (feces) on these items. Check the bed frame and headboard.
- Keep all items inside your luggage. Wrap your luggage in plastic (a large garbage bag works well) and place your luggage on a rack away from the wall.
- Move the bed away from the wall and tuck in blankets and sheet so they do not touch the floor.
- If the room is infested and you cannot leave, consider sleeping with the lights on in a desperate situation.
- Avoid transferring bed bugs to your home. If you suspect your luggage may be infested, isolate your luggage when you return home. Dry clean or wash all clothing and items in hot water and place them in a hot dryer for at least 20 minutes. Wash the luggage and apply an insecticide inside and out before bringing it into the house.
- Infestations of bedbugs are very difficult to eradicate. Professional help is usually required to exterminate bed bugs, as broad spectrum insecticides are required. Bait traps

do not work. More information regarding bed bugs is available on the following website:
http://www.pestcontrolcanada.com/INSECTS/get_rid_of_bed_bugs.htm

10.7.6 Triatoma Bugs

Certain species of the genus of Triatoma bugs, also called the kissing bug, assassin bug or vinchuca, may transmit a protozoan parasite (*Trypanosoma cruzi*), which causes Chagas disease. Insects drop onto the victim's bed and then bite, mainly at night. The bug bites soft tissue, especially around the mouth and eyes and defecates while feeding. The bitten person then rubs the feces into the bite site and transmits the parasites into their own body. Refer to section 12.8.5.1 Chagas Disease.

Risk: Chagas disease

Prevention and Preparation

If a project is located where Chagas disease is present, the following procedures are very important. Prevention is the key as treatment is generally not effective.

- Take active measures to prevent bites and to eradicate insects from your quarters. Use appropriate knockdown insecticides indoors. Use mosquito or insect repellent at bedtime.
- Search your bed and living area for insects; the beetles are large (2.5 cm) and easy to spot. They may hide under bedding and cushions on furniture.
- Fumigate all buildings whenever you occupy an uninhabited camp.
- Do not construct housing with local thatch materials in the roof or rafters.
- Habitat: Triatoma bugs inhabit palm trees, thatched roofs and the roofs and walls of mud, adobe or cane dwellings.
- Range: The species of Triatoma bugs carrying Chagas disease are found throughout some rural areas of Mexico, Central and South America.

10.7.7 Scorpions

Scorpions are common arthropods. In most field areas where scorpions are found, you are likely to encounter many more scorpions than snakes. Most scorpion stings are not serious even though they cause sharp pain and swelling at the site of the sting. Nevertheless, a few species of scorpions have stings that can be fatal. These include the small straw-coloured species *Centruroides exilicauda* found in the southwestern US and Mexico (see below), *Androctonus* (Middle East and Africa) and *Tityus* (Brazil), which are found in arid and tropical regions.

Risk: Stings – painful to severe, rarely fatal

Prevention and Preparation

Scorpions are not aggressive toward humans but will sting when they are trapped or threatened. To avoid stings:

- Do not handle or provoke scorpions. All scorpions have venomous stings and some species are very venomous.
- Use a flashlight at night. Scorpions hunt for food at night and hide from light in the day.
- Never reach into dark crevices. Wear gloves when gathering firewood.

- Do not sit in areas with loose, dry vegetation.
- Use a stick or rock hammer to roll stones and logs – use the same preventions as for snakes.
- Wear shoes, not sandals. Do not go barefoot.
- Keep tents tightly closed and shake out your sleeping bag at night. Try to sleep in the centre of the tent or your room. Pull your bed away from the walls, as scorpions travel up and down walls at night.
- Always shake out your boots and clothing before putting them on in the morning. Shake out boots and clothing left in field vehicles before putting them on. Shake out items that have been left outside or draped over rocks or shrubs to dry.
- Check eating utensils before use.
- Symptoms: A sting produces an immediate pain and burning sensation and perhaps some swelling. The site is very tender for a long time. Hot compresses may ease the continuing numbness.
- Treatment: Apply ice and immobilize the affected area. Seek medical attention.
- Habitat: Mountains to deserts – plus grasslands and savannahs, rain forests, and deciduous and mountain pine forests. Scorpions may be found up to an altitude of 3,600 metres. While they prefer hot, dry climates, they may also be found in moist warm climates.
- *Centruroides exilicauda* (Bark scorpion): This scorpion frequently lives under leaves, bark, and in wooded groves near water. It is often found clinging upside down to loose bark, sticks and leaves and beneath rocks. Scorpions can climb, so it is possible to find them on the upper floors of buildings.
 - The sting can be fatal to very old and young people or those with a compromised immune system.
 - Size: Slender shape 1-5 cm (¾ - 2 in) in length
 - Symptoms: If stung: The venom is neurotoxic and affects the nervous system and the whole body. Signs include fever, increased heart rate, restlessness and hyperactivity, numbness and tingling in the face or extremities, blurred vision and muscle spasms.
 - Treatment: Seek immediate medical attention at a medical centre.

10.7.8 Spiders

The bites of most spiders contain some toxin but very few species produce a bite with venom that is potentially harmful or life-threatening to humans. Seek immediate medical attention if bitten by a spider whose bite may be potentially harmful or life-threatening.

Risks: Serious illness or death may be caused by bites from a few species.

Prevention and Preparation

- Seek local knowledge regarding potentially harmful spiders. Learn to recognize the dangerous species, including their nests, and be observant in their preferred habitats.
- Always shake out clothing and check bedding if working where spiders are a hazard.

- Wear gloves and be careful when gathering wood.
- Avoid large fast-moving spiders. While many are not harmful, some can produce a nasty bite.
- Do not handle or provoke spiders.

Spiders with potentially harmful bites

Latrodectus sp. – black widow, red-back spider

- The black or brown female (15 mm) typically has a red stripe or hour-glass mark on her abdomen or back. Rarely, the mark may be white. Only the female produces enough venom to cause harm, as it includes potent toxins.
- This spider is shy and retiring. Bites usually occur when a spider becomes caught next to your skin. It will bite and run away.
- Symptoms: The toxin is neurotoxic and affects the nervous system. Initially, the bite may not hurt or show swelling. Within three hours the toxin produces muscle cramps and spasms, headache, anxiety, changes in blood pressure and intense pain throughout the body.
- Treatment: Ice packs may relieve the pain. Antivenin is available. Seek medical treatment if you suspect a bite.
- Habitat: Rural areas, barns, garages, woodpiles, rock crevices, under logs and stones
- Range: North and South America, Australia, Europe, Africa, Siberia.

Loxosceles sp. – brown recluse

- This pale brown spider (10 mm or larger) has a dark violin-shaped pattern on its upper body.
- Symptoms: The bite causes little pain. Within five hours a painful red blister develops that is surrounded by a ring of whitish-blue discoloration. As the toxin causes the tissue surrounding the bite site to die, that area may develop gangrene.
- Treatment: Medical treatment is necessary as soon as possible. Apply cold compresses or ice.
- Habitat: Dark sheltered areas such as woodpiles, porches and eaves; in houses – dark places such as closet, under furniture
- Range: Southern United States, Mexico, recently introduced to Australia, a larger species is found in the West Indies.

Atrax sp. or *Hadronyche* sp. – Australian funnel-web spiders

- These black or brown spiders (2-3 cm) are aggressive and will attack when disturbed. They bite and hold onto the victim with fangs that are capable of penetrating a fingernail.
- Their venom contains many neurotoxins and bites can produce severe effects that include sweating, muscle weakness, respiratory failure and death.
- Treatment: If bitten, immediately apply a pressure immobilization bandage to the bite area as if it were a snakebite and seek urgent medical treatment (see section 10.6.1.3).

Only medical personnel should remove the pressure bandage, as the venom may spread rapidly when it is loosened.

- Habitat: Rock crevices, burrows, beneath houses and shrubs
- Range: Australia – coastal New South Wales, southeast Queensland and an isolated pocket near Adelaide

Phoneutria sp. – wandering spider

- Avoid these large (10 cm and more), fast-moving spiders. Their bite is dangerous and may be fatal to young children.
- Range. Eastern South America, especially common in parts of Brazil

Other Spiders

Tarantulas found in the southern USA and northern Mexico produce bites that are not potentially harmful to humans. Some tarantulas including those of the genera *Hysteroocrates* (West Africa), *Poecilotheria* (India), *Pterinochilus* (Kenya) and *Theraphosa* (French Guyana) may produce a bite with severe consequences. Do not handle or provoke tarantulas.

10.7.9 Leeches

Leeches are blood sucking, aquatic, annelid worms; they inhabit flowing and stagnant waters and damp places in tropical and temperate zones. Some leeches can produce nasty lesions.

Risks: Potential infection from lesions

Prevention and Preparation

- Insect repellent will discourage leeches.
- Wear long pants that are tucked into socks. Wear shoes that cover your feet rather than sandals.
- If you work in an area where leeches are a problem, check for them frequently throughout the day and detach them. Do not pull them off if they are firmly attached.
- Remove leeches by applying salt, vinegar, a lighted match or cigarette, kerosene or turpentine to the leech's body. They will detach and fall off. Clean the bite area and apply antiseptic.

10.8 Resources

The Prospectors & Developers Association of Canada (PDAC) thanks the following for granting permission to include material from their publications.

Andy McMullen
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Australian Venom Research Unit
BEAR WISE
Dr. Kate Jackson

Environment Yukon
Safety In Bear Country Society

Their permission does not imply that they endorse the PDAC Health and Safety Guidelines. The PDAC is solely responsible for the content of these Health and Safety Guidelines.

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Suppliers:

BEAR WISE. Bear safety education services: These include, bear safety training, site monitoring, safety audits, and wildlife mitigation and contingency planning. 14 Tees Court, Yellowknife, NT X1A 3L5, Telephone (867) 766-4847, Email: bearwise@theedge.ca

Critter Gitter – an infrared noisemaker bear and small animal deterrent
http://www.margosupplies.com/public/canadian1/bear_dets.htm. Accessed December 10, 2009.

Safety in Bear Country Society. Bear safety videos in various formats and languages. The distributor can be reached at 1-866-999-5292 (Ontario & Quebec), 1-800-665-4121 (Western Canada and USA), 1-800-595-6734 (Atlantic Canada), and at:
<https://www.distributionaccess.com> . Accessed December 10, 2009.

Bear Trip Wire Fence System

http://www.margosupplies.com/public/canadian1/bear_deterrents/bear_trip_wire/bear_trip_wire.htm