



Animal Handling & Safety Manual

www.quicksilverair.com

2721 Cormorant Street, Fairbanks, AK 99709

Phone: (907)457-1941

Fax: (907)457-1075

akoffice@quicksilverair.com

14115 Seminole Lane, Peyton, CO 80831

Phone: (719)683-7194

Fax: (907)457-1075

cooffice@quicksilverair.com

Introduction

The goal for Quicksilver Air is to provide safe, reliable and quality helicopter wildlife management services to its clients. The Company specializes in capturing, collecting biological samples, placing radio collars, transporting, disease testing, and controlling wild animals using the most efficient and humane methods possible.

This Animal Handling and Safety Manual will help Quicksilver Air crews and clients better understand their respective expectations and responsibilities. The procedures and guidelines outlined in this manual will facilitate contracting processes between Quicksilver Air and its clients.

Organizations whose agenda is to protect the welfare of wild animals will have confidence in the knowledge that wild animals are being captured, handled, processed or removed by experienced, trained and professional personnel.

Clients and animal welfare organizations can have confidence that Quicksilver Air crews have an in-depth knowledge of this Animal Handling and Safety Manual and have received training in these specialized techniques.

Even though it is helpful to have standard procedures for most operations it is understood that the need for flexibility will arise and it is important that Company crews and clients can adapt accordingly.

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ANIMAL WELFARE CONSIDERATIONS

Wildlife capture by net-gun capture or chemical immobilization is a very specialized activity. During capture and handling, animal welfare is critical to obtain reliable, authentic information and to ensure animal health and prosperity is not compromised. Wild animals are generally captured to conduct research by gathering samples, taking measurements, disease testing, and placement of tracking and monitoring devices. Animals are also captured for relocation to establish new populations, disperse overpopulated populations, and protect sensitive and endangered species.

It is critical to have capture crews who understand wild animal behavior. This allows for captures without excessive chase times as well as fast and efficient processing. Animals that have been subjected to long and stressful chases before capture, or that have been subjected to harassment and lengthy restraint and processing experiences are more likely to suffer health complications. Biological data will often be unusable. Animals may disperse in search of safer habitat compromising the integrity of the study. At worst the animals may die of post-capture myopathy.

Most North American research institutions are required to follow guidelines on acceptable humane methods of field research and adhere to guidelines established by their institutional animal care and use committees when wild animals are captured and handled. For several decades, the United States federal government has required its grantees to comply with certain standards of humane animal care. The primary legislative authority for these requirements is the Animal Welfare Act of 1970, 1976, 1985, and 1991.

It is intended that capture procedures outlined in this manual will be followed and meet all requirements and guidelines for humane treatment of wild animals, ensure quality research data, maximize efficiency in completing a quality capture job in a safe manner, and facilitate approval for field research.

SAFETY OVERVIEW

Equal care and attention is required around aircraft whether personnel board an aircraft infrequently or are engaged in large-scale operational projects. Company employees have the responsibility of ensuring that aircraft are used effectively and efficiently to achieve the object of the operation. It is the responsibility of the pilot to ensure that the aircraft is operated within its capabilities.

Pilot / crew working relationships require a close bond; a small mistake on either part could lead to a serious accident. This teamwork is built upon mutual trust and communication. The level of experience and joint teamwork strengthens this trust over a period of time.

HAZARDS

Risks/ Hazards [Accident, Injury, Other forms of Loss Possible]

Vehicle / helicopter related accidents.

Walk into main rotors / tail rotor. Pilot / crew error. Shot rotor.

Burns from exhaust. Fire/burns/exposure to poisonous gasses.

Time lost in poor radio communications/radio equipment failure/ other equipment failure.

Shot by self or others. Ricochets. Cuts from knives.

Cuts and bruising due to falls. Twisted ankles, broken limbs, bones. Damaged feet, knees, and hips from rough terrain, blisters.

Being hit by falling debris. Rocks dislodged by animals, hit by animals, horns / antlers, dog bites.

Falls, puncture wounds, walking/travel in hours of darkness.

Being washed away in swollen/swift rivers, drowning.

Eye injuries, hearing loss.

Food / plant/insect related allergies. Undisclosed personal illness.

Sunburn, heat stress, wind chill, hypothermia

Risk Analysis

Helicopters

Power failure, aircraft malfunction.
Parts fly off. Rotor strike.
Shot to rotors / helicopter.
Contaminated fuel.

Pilots

Pilot error / fatigue
Not understanding emergency procedures for, fire, overdue aircraft, accident, and injuries.
Poor decision making, on weather and route in bad weather. River crossings and travel. Poor judgment to heights / distances
Poor communication.
Poor flying techniques / insecure loads
Poor group management.
Equipment left behind.
Cold limbs / hands.

Gunner/Crew

Gunner or crew error. Slip off skid / falls. Poor judgment to heights / distances
Accidental firearm discharge. Shot rotors. Wrong ammunition choice.
Inexperienced staff in aircraft / backcountry. No first aid experience. Lack of personal fitness.
Poor decision making on weather and route in bad weather. River crossings and travel. Poor judgment on terrain. Bluffed, bushed or lost. Slipping on ice. Not wearing harnesses or seat belt. Laces caught up/ not tied.
Poor communication.
Poor driving techniques. Insecure loads.
Excitement /inexperience around helicopters.
Poor group management.
Inappropriate use of net gun, rifle, knife, tools.
Inexperience with animals (when restrained, wounded)
No respect for the welfare or humane death of animals.
Equipment left behind.
Cold limbs / hands. Fatigue, nausea, vomiting
Not following instructions.

Risk Management Strategies

Pilots

Pilot concentrate on flying aircraft for the current conditions.
Pilot thoroughly briefed on work, locality and hazards. Fuel locations.
Good judgment to heights / distances. Shooter and crew in danger of slipping off skid.
Leave alone animals in dangerous areas.
Total understanding of emergency procedures for fire, overdue aircraft, accident, injuries.
Light fire. Stay with aircraft. Make radio communication
Good decision making on weather and route in bad weather. River crossings and travel.
Care on entry / exit in steep terrain, unstable slips and bluffs.
Good judgment on terrain. Identify likely areas one could get bluffed, slip, or fall.
Good communication.
Safe flying techniques. Secure loads
Good group management. Regular breaks and stops. Set capture plans and timetable.
Emergency and First Aid kit carried at all times.
Standard operating procedures followed.
Communicate on capture areas. Safe capture practices.
Some first aid experience. Good personal fitness.
Work from checklists so equipment is not left behind
Any non-trained personnel or observers must not carry out any task and must be made aware of the dangers.

Gunner / Crew

Concentrate on the set tasks.

Good judgment to heights / distances. Shooter and crew in danger of slipping off skid.

Safe use of firearms. Correct ammunition choice. Pointed down to avoid accidental discharge or shot into rotors.

Leave alone animals in dangerous areas.

Total understanding of emergency procedures for, fire, overdue aircraft, accident, injuries.

Light fire. Stay with aircraft. Make radio communication.

Good personal fitness

Good decision making on weather and route in bad weather and river crossings and travel.

Care on entry / exit in steep terrain, unstable slips, bluffs, dense bush, gorges, limestone country.

Good judgment on terrain. Identify likely areas one could get bluffed, bushed, slip, or fall.

Wearing harnesses and seat belt at all times.

Good communication skills. Communicate on capture areas

Safe driving techniques / secure loads.

Good group management skills. Regular breaks and stops. Set capture plans and timetable.

Respect for the death of animals. Care with wounded or live wild animals

Have emergency and First Aid kit carried at all times. Personal locator transmitter carried at all times.

Only switched off when not in field.

Standard operating procedures followed.

Safe hunting practices. Only trained persons or experienced staff to shoot.

Medical histories disclosed to supervisor - spare medication provided for leader to carry. Insect repellents and medication carried

Basic aircraft awareness. Safe working around aircraft.

Safe use of rifle, knife, tools. Work from checklists so equipment is not left behind.

Experienced in handling wild animals. Understand habitats and tendencies when under capture pressure.

Any non-trained personnel or observers must not carry out any task and must be made aware of the dangers by the pilot and Company personnel.

PERSONNEL

Qualifications

Only personnel who have demonstrated their knowledge and expertise will be permitted to act as pilots, gunners or animal handlers in Quicksilver Air crews.

PROJECT PLANNING

General

Helicopter wildlife capture and eradication projects are usually done for one of the following purposes:

1. Attaching radio collars or other marking devices and collecting biological samples before releasing at the capture location.
2. Capture for transfer to another area. This requires carriage of animals from point of capture to a central point where they are either processed and released, or prepared for subsequent transportation.

Adequate preplanning allows schedules to be planned to make efficient use of travel, helicopter time and use of crews.

In planning a project, the following issues will be addressed:

- Project location
- Numbers of animals to be captured
- Species, age & sex of animals to be captured
- Distribution of target animals
- Purpose of the capture
- Proposed date of capture
- Operational control of the project

Issues to be considered that will influence the project planning and its success include:

- The physiological condition and health status of the animals?
- Expected nutritional status of the animals? (Animals can react differently to capture depending on their strength, body condition and susceptibility to stress.)
- Will the capture compromise the breeding season?
- If the target animals are pregnant, what will be the stage of pregnancy?
- For males, will the antlers be in velvet, shed, or full head? How will antlers be dealt with during the capture? Removed or not?
- What procedures will be carried out with damaged antlers?
- What precautions will be taken to avoid disease transmission to other animals or crewmembers?
- Have the animals been pursued for previous operations? (Prior exposure to capture attempts can influence the response of animal groups to future efforts. Any information on prior operations may assist in planning future projects.)
- In some instances operational control may be vested in an agency or person with little experience. If the crew is uncomfortable with the operational control person, no captures will be made until all parties are satisfied with how the project will be performed.

Location

The G.P.S. coordinates (Latitude and longitude, not UTM's) of the proposed base of operations is important to assist the pilot when flying to the base.

Other issues to be clarified include:

- Crew accommodation. Supplied by the client or make own arrangements.
- Where is the nearest town.
- Availability of motels and restaurants.
- Where is the nearest source of helicopter fuel. Bulk or drums.
- What type of terrain, habitat, and altitude will the animals be in?
- Proposed altitude of the operation and the fuel base.
- What are the expected weather conditions and temperatures?
- Is there road access and what is its condition to the proposed base of operations?
- What is the size of the study area?
- What are the distances from the base area to proposed capture sights. (This will have an impact on flight time and fuel management.)

Pricing Projects

After considering all of the above issues, a price to capture and process the target animals will be agreed upon. Typically the Company will offer a price per animal successfully captured and processed. This method of pricing enables project managers to plan their projects knowing what the costs will be. In situations where a number of unknown circumstances prevail, a different pricing structure may be used.

EQUIPMENT

General maintenance

All equipment will be maintained in a clean and operating manner.

Animal blindfolds and nets used in capture operations are to be washed between projects to minimize the risk of spreading disease.

Clothing

Crews are encouraged to wear warm clothing preferably made from natural fibers or of a fireproof nature at all times. Multiple layers of clothing are recommended. Clothing should be of adequate quality to stop wind chill. A flight suit will double as a sleeping bag if the crew members are required to spend time waiting for the helicopter to return. Preferably clothing will be a bright color to stand out at a distance.

All crew members must at all times, wear boots that are capable of long and hard walks. You never know when you might have to walk out. Gloves, hats and scarves must be kept well secured when not in use.

Don't lose them

Boots

Adequate boots (For lace up boots, laces must be kept well tied). Strong good grip rubber sole boots are an advantage. Extreme care must be taken when extra grip is fitted to any boots as these form metal to metal when placed on the skid. (Care required on ice and carpet grass).

A helicopter is a wonderful machine, but can get you into more trouble than you can get out of. Remember, when you get out of the helicopter, can you get home? Don't rely on "the helicopter returning". Always be fully prepared and equipped to be left behind when the helicopter leaves the scene. ALWAYS BE PREPARED TO WALK OUT.

Helicopter Safety Kit

A safety Kit will be carried in the helicopter at all times.
The kit will be in a dust proof and moisture proof container.

Minimum contents

3" adhesive bandage strips
Antiseptic or alcohol wipes
Roller bandage, 4"x 5 yards(standard roll)
Adhesive tape, 1"x 5 yards(standard roll)
Knife
Signal mirror
Signal flares
Waterproof matches
Candles
Three space blankets
At least two days of emergency food rations
Chocolate bars
Metal cup
Magnesium fire starter
Collapsible water bag
In locations where water is not readily available, at least one gallon of water will be carried in the helicopter.

Personal Safety Kit

Crew members are encouraged to carry a small emergency kit in a fanny pack at all times

Recommended contents

Signal flare
Water proof matches or lighter
Compass
Power food bars
Small flashlight to show your position if you have to be picked up after dark.

Knives

Each crew member must carry a readily accessible sharp knife and steel. Knives must be kept free from blood and sweat to lessen the likelihood of hand-slip.

Helmets

Helmets are encouraged to be worn by the crew.
Hearing protection must be used.

Net Gun/ Dart Gun

All guns will be cleaned and maintained in a mechanically safe condition.
Net guns will never be cocked unless the shooter is ready to take a shot.
A net gun will only be cocked immediately prior to a shot being taken, and the shooter has the gun pointed away from the helicopter.
Never have a gun cocked with the safety catch on.

Net gun ammunition

Blank ammunition must be kept in a secure holding position. Avoid having blank ammunition being loose and rolling around.

Keep ammunition out of moisture as much as possible. When not operating, keep ammunition in a vehicle or shed where there is no chance of moisture contamination

Avoid loose empty shells being ejected inside helicopter to avoid shells jamming pedals or cyclic controls.

Nets

Nets will be continually checked for broken and weak strands. Repairs will be performed before broken and weak nets are reused.

Damaged o-rings will be replaced regularly.

Cords securing weights to the nets will be closely watched for fraying and broken strands. Damaged cords will be replaced before re-use of the net or the weight must be replaced.

A file will be kept on hand at all times to file off burrs.

Telemetry receivers and aerials

The use of telemetry equipment in any helicopter takes up space. Care must be maintained when using hand held aerials with a safety strap to the operator when in use.

Canisters

Ensure that Velcro straps on canisters are free from frays and Velcro is in good working order.

With the back door off make sure canisters and equipment are secured to avoid slipping out the door in flight.

Canisters will be continuously checked for cracks and damage. No damaged canisters will be used until they are repaired

Window protection

Prior to any operations the front seat area will be set up in accordance with Company policy. Lexan installation, equipment box between the front seats, support handles.

Back doors will be lined with lexan

The floor of the back compartment will have a Company approved floor installed.

Safety support handles

When any door (except the pilot's door) is removed it is recommended that the safety support handles are put on the helicopter.

Dual controls

Dual flight controls, including foot peddles, collective and cyclic will always be removed prior to capture operations.

Snow pads

Snow pads are recommended on the helicopters at all times. Snow pads are essential when landing in snow, swamps, tundra, rivers and loose gravel.

Radios/Communication

Pilot should make every effort to inform the base of his position. Particularly if the helicopter is moving to different areas and the base of operations can not see nor hear the helicopter.

If there is a chance the flight will be longer than planned, base must be informed to avoid rescue operations.

Keep a cell phone with a strong battery in the helicopter at all times. Spare batteries are worth taking.

Aircraft fitted with cell phones and pagers must ensure these are in working order. Identify areas of poor signal strength.

Helmets fitted with headsets and aviation type headsets provide clear communications both in the air and on the ground.

If radio communications are lost, pilot and crew must be made aware. An alternative method must be sought.

HELICOPTER OPERATIONS-GENERAL

General rules for helicopter capture operations

At no time should any member of the team take any unnecessary risks for the sake of any wild animal, adverse weather or financial restraints.

The pilot must be able to place the gunner or crew on steep ground, slip or nominated position and hover there while the gunner or crew make a safe entry or exit.

The shooter must have practiced in a controlled type situation any techniques that are to be used in aerial capture and be accustomed to flying.

The gunner and crew are to be in two-way communication with the pilot at all times or be fully briefed in the task expected to be carried out.

All gunning decisions are made by the gunner

Any crew being dropped off and the helicopter departs locality, must have sufficient equipment to leave the area on foot in case the helicopter can not return.

Any crewmember involved in aerial capture seated without a door is exposed to the risk of fall, through leaning out an open door. This person must wear a Company approved seat belt or harness at all times.

Seat belts

In addition to FAA approved seat belts and locking devices, both the front right hand seat and right hand back seats will have seat belts consisting of two male belts joined by a commercial grade caribina with a minimum weight grade of 2000 lb. Both male belts will be fixed to the helicopter with locking D bolts, regardless of any other method of fixation.

Note: During take off and landings the FAA approved seat belt configuration will be used.

Communications

Helicopters will be equipped with sufficient headsets and or helmets to enable all passengers to communicate with each other.

The company recommends flight helmets be worn by all passengers.

Prior to disembarking, passengers will communicate with the pilot to obtain disembarking instructions. Passengers must remember to unplug their helmets or remove their headsets prior to disembarking.

Flight following

The P.I. will discuss with the Company pilot plans for the command post (location, purpose, etc). It is important that the P.I. (or designee) be present at this post for the duration of the work. Any provisions that have been made for emergency services will be discussed and agreed upon at this time. Location of all first aid equipment and supplies will be identified.

The P.I. will be responsible for flight monitoring. The Company pilot will inform the P.I. before every flight of the expected duration of the flight.

The pilot will make every effort to contact the PI by radio whenever it is possible and give a position report. This policy is most important when the helicopter is moving to different locations during a single mission.

The P.I. will also be responsible for notifying appropriate authorities such as the State Patrol, sheriff, city police, and the RCMP that helicopter capture operations are occurring. It will be the responsibility of the P.I. to initiate search and rescue procedures should the helicopter not return in the designated time frame.

Gunner position

Net gunning and darting will be performed from the right hand front seat. If it is the pilot's preference then captures can be conducted from a rear seat (behind the pilot).

External loads

Strops (short ropes) must be attached to the helicopter in such a way the pilot can release it with one action. Do not connect rope to the helicopters hook as it can grab and not release, use metal to metal. Always have a karabiner attaching a strop to the belly hook.

Loading - it is obviously important that aircraft are not loaded beyond their carrying capacity. Some models have almost identical physical characteristics but have different lifting capabilities. The "controller" of the aircraft operations will need to check with the pilot to ensure loads are made up within the weight

limits of the particular aircraft being used. It is preferable to have a large safety factor between the actual load weight and maximum capacity load.

The pilot is responsible for the loading of the aircraft within its weight and balance limitations.

NEVER LOAD ANYTHING ON AN AIRCRAFT WITHOUT THE PILOTS KNOWLEDGE.

Know the weights of items to be airlifted and where possible clearly mark the weight. Arrange individual items into loads.

All items must be securely fastened. The pilot will either do this him/herself or at least check that it is properly secured.

External cargo must be balanced both laterally and fore and aft within certain limits.

Long objects moved around on the ground are to be carried horizontally by two persons, one at each end, whether or not the rotors are turning.

Helicopter loads should be slung on cargo hooks rather than carried on cargo racks if at all possible. Only very light loads should be carried on cargo racks, and these placed where the pilot can observe loading and off-loading.

FAA Part 133. No person shall be carried with the carriage of sling load operation unless he or she performs a function essential to the helicopter sling load operation. This covers a crewmember additional to the pilot, who may be required to assist the pilot to maneuver the load for accurate delivery or placement of animals to secure their position.

When loading equipment and personnel, a drill should be evolved and carried out in exactly the same manner each time, so that the pilot knows what is being done at any particular time.

The loading crew will stay clear until the aircraft lands or is in the required position, and on completion of loading will immediately move out of the area by moving in the direction that has been pre-arranged with the pilot.

When slinging loads on the cargo hook, the pilot cannot see how the load is behaving, therefore the pilot needs to be directed by the controller in front of the machine during take offs.

BEWARE OF CHAIN CATCHING IN THE SKIDS.

When the helicopter is landing, do not grab the loading hook or a load before it has touched the ground to "earth" as a considerable charge of static electricity may have built up while in flight.

Crews loading or working on the landing pad must wear goggles if conditions require.

A suitable fire extinguisher and large woolen gloves should be located at the central landing area while operations are in progress.

Those working underneath the helicopter should always monitor engine sounds and if any changes are detected, vacate the area immediately notifying the pilot.

Always do things for the pilot, don't make the pilot do things for you. The less the pilot has to think about, the safer and happier the pilot will be.

Never ride on a load or ride the chain.

Care with animals must be observed when being stropped up, where they are likely to become snagged on roots or clothing (horns and antlers).

Dogs must be tied to a fixed point in the rear compartment of the helicopter when loaded or not under supervision.

Selecting landing sites

The area should be checked for holes, tree stumps, rocks and loose objects which could be blown away and cause damage to the aircraft or crew. Avoid dusty locations.

The load lifting capability of a helicopter depends directly on the dimensions of the landing site and height of the surrounding obstacles, e.g. a helicopter will lift more from a flat unobstructed field than it would from a landing site of minimum dimensions.

In windy conditions it is desirable to have an obstruction free approach and exit path into the prevailing wind.

Landing in snow Check snow is compact, if not compact it, demonstrate to the pilot by jumping up and down on the site before the pilot commences landing.

Beware of powder snow. It may have to be blown away by hovering over the site. Indicate to the pilot by kicking up the powdered snow, as the helicopter could be enveloped in a snowball of powdered snow causing engine failure. (Watch for static shock).

Evening capture operations

Evening captures lead to the helicopter returning around dusk or dark. Landing may be required for fuel

or to pick up crewmembers, animals and equipment.

Crew left in the field must have survival kit / lighter, torch to assist pilot locating them in these conditions. The pilot must ensure the crew is left in a retrievable location during the hours of poor light.

Be aware of ground fog, low cloud, and evening winds.

Night landings

Try and mark the external boundaries by torches or lamps and illuminate the center of the landing site by the use of car headlights or similar bright lights inclined towards the direction of the helicopter approach. Any lights used must be securely fixed to prevent them being blown away. The landing site should be twice as big as for day landings and ground condition perfect. Do not shine lights directly on the aircraft. At night a pilot's eyes become accustomed to the dark, any bright lights could destroy the pilot's ability to see.

Door removal

Doors will be removed depending on the crew's preferences. The rear left hand door will not be removed unless extraordinary circumstances apply.

When doors are removed support handles for the back and rear doors will be in place.

Removed doors must be stored in a safe place where they will not blow away, or get scratched. Either, place the doors on the ground at least 50 yards from the landing area, or inside a vehicle or trailer, or inside a building.

Extra personnel in the helicopter

If non-company personnel are to fly in the helicopter and participate in capture and handling, the pilot and regular crew-members will discuss expectations with these personnel in detail before flights are initiated. Insurance responsibilities will be discussed at this time. In particular, such personnel will be instructed on general helicopter safety issues including how to exit and enter the helicopter on steep terrain, how to attach seat belts for maximum safety, and be cautioned to never walk behind the helicopter, out of the sight of the pilot. If there is question about experience or ability of the proposed crew-member to meet Company expectations, the person will not be included in the crew. All animal handlers will be briefed on how to approach, handle and carry animals.

While conducting external load operations no non-essential people will be in the helicopter.

Biologists, film crews and observers are permitted in the helicopters providing they not impair the helicopter or capture crews performance.

However, it is Company policy to only carry necessary and essential people in the helicopter during all capture operations.

Any person who is a passenger in a Company helicopter must be familiar with the Company's operating procedures, which may vary from what they have been accustomed to before.

First-aid and emergency supplies

First-aid and OAS survival kits are required to be in the helicopter at all times. Crews may wish to carry extra clothing and emergency food.

In remote country, a pistol with sufficient firepower to kill bears and lions and kill a large animal for its meat and hide is recommended.

ENVIRONMENTAL CONSIDERATIONS

Every effort must be made by company personal to protect the integrity of environment.

Cleanliness

All equipment, in particular nets and blindfolds will be disinfected after each project, and in some circumstances during a project, to avoid spreading disease.

Helicopters, trucks, trailers and clothing should have any seeds, soil and any other potential contaminants removed between jobs.

If an animal is suspected of being infected with a disease, the animal will not be released until the PI has been informed. Nets and face covers used on such animals will be properly cleaned and disinfected before further use.

Noise pollution and harassment

Pilots must attempt to keep the flight hours to a minimum to avoid excessive noise pollution to the area.

Excessive noise and disturbance causes unnecessary harassment to animals and recreationalists. When waiting for animals to be processed, helicopters must not continue to circle and stay flying, unless the pilot is looking for more animals or attempting to keep an eye on the target group of animals. The helicopter should be put on the ground and put onto idle whenever possible.

Herding animals

Crews must avoid herding animals into populated areas.

If people are seen in the proposed operating area, attempt to herd the animals some distance from the people to avoid any conflict.

Avoid chasing animals into fences. If it is not possible to avoid fences, back off the chase and allow animals to negotiate fences in their own time reducing chances of damage to the fences and the animals.

Trash

Spent shells, food rapping, and any other trash must be contained and disposed of. Trucks will be kept tidy and free from trash to avoid trash accidentally blowing our doors into rotor-wash.

Fuel management

Fuel spillage will be cleaned up immediately. Fuel delivery trailers and trucks will carry sufficient petroleum product absorbent pads or materials to absorb or at least contain fuel spillages.

EMERGENCY PLAN

Power or running gear failure

On Land

Do as the pilot tells you. The pilot will attempt an "auto rotation" (which is an emergency landing procedure), stay with the helicopter.

Over Water

Stay with the helicopter until the rotor blades have stopped turning and it is totally submerged. Then swim out or do as the pilot instructs you.

Accident

Check scene for dangers of fire, falls, and unstable aircraft position

Tie off to anchor point, fire extinguisher, remove fuel cans, and disable power supply.

Check aircraft emergency beacon ON,

Pilot and crew check each other for injuries / apply First Aid.

Activate personal beacon, radio working, cell phone, air band radio.

Make radio contact

No contact.

Stay with aircraft, use for shelter / carefully use fuel for fire / warmth, smoke signal.

If aircraft above bush line and snowline and dangers of wind chill and freezing, may be required to retreat to bush, hut, camp.

Leave note, route, destination, time, and injuries, carry radio

Mark route, leave sign in snow or dirt.

PRE-FLIGHT BRIEFING

At the commencement of operations the pilot and/or the lead gunner, and the client (PI) will brief the crew, and all support personal.

At this briefing the client will identify the P.I. (decision-maker) so crews will know who to refer to once the operation begins. The PI will explain purpose, extent, concerns, and expectations of the job.

Pilots will emphasize that decisions to fly with regard to weather, equipment and other factors are theirs to make and will not be deferred to the client or over-ruled by others.

If there are no-fly zones in the study area, the P.I. will identify these on a map to the pilot. Specific areas to consider are boundaries of cities or towns, National Parks, and Monuments.

The P.I. will specify any restrictions on sex, age, and condition of animals, location of capture, measurements, or data recording (see Company Data Form in Appendix). Types of marking devices and

special instructions for their attachment will be identified by the P.I. The P.I. must identify any special requirements for collar attachment such as tightness of fit, front and back of collar, etc.

Potential hazards

Hazards and their locations, heights above ground, identify telephone lines, power lines, towers, tall trees, hut sites and aeriels, wires over valleys / rivers, swing bridges, cableways.

Aeronautical activity, gliding, parachute jump, military low level exercises.

Road access.

Local weather, wind turbulence sites.

The crew must know where the emergency and safety devices are located on the aircraft and their operating procedures.

Responsibilities

Pilots are responsible for their aircraft and the safety of crew.

All aircraft will be under supervision of the pilot unless the company designates an alternative

Remember, a happy pilot is a safe one.

Final decision is always the pilot's.

One takes it for granted that the pilot will get you from A to B safely. If you crash or have to land and cannot take off, who looks after the pilot?

General safety precautions with helicopters

Be careful that you don't get left in the field without your equipment.

If working with a team of people, if it is possible, a team should be shifted as a team or two at a time, not as individuals.

In alpine country ensure you have suitable equipment to stay there or walk out. The aircraft might never get to you in adverse conditions on the arranged time. The weather conditions in these mountainous regions can deteriorate very quickly.

Make sure everybody required to travel is conversant with safety rules regarding entry and exit from the aircraft.

Static electricity. Beware during a hover or when using a chain more likely on wet days (snow, drizzle).

Goggles should be available and worn by personnel required to work near aircraft in dusty or powder snow conditions.

If anything goes wrong, e.g. blinded by dust, snow, scared, or not sure what to do, kneel down, don't move. Never go into the prohibited area of any aircraft unless you have consulted with the pilot. e.g. (you may be required to remove plants / bush close to the tail rotor when aircraft is on the ground in remote areas. Pilot to identify problem then depart to allow safe removal.

Never walk around the back of the helicopter unless you are at a far distance or the pilot has instructed such a move.

Keep your head down and never raise your arms above shoulder height. Don't proceed to put on coats and jackets under the rotor disk or carry anything vertical or over your shoulder, e.g. firearms, packs, bags, or throw any article as they may make contact with rotors. Never wear loose clothing or have loose gear on packs or in the aircraft. Be aware of these articles when in flight and if the doors are off. Ensure they are well secured.

Never stand under or near a helicopter that is hovering, e.g. lifting, landing, unless you have an essential job to do.

When hooking on the chain or strop, keep eye contact on load until clear. Others stand back in safe location, keeping gear secure from rotor wash.

Never approach or leave a helicopter when starting up or closing down. The rotors are at a lower position. Be aware of blade sail in wind

Danger

Remember that there are many dangers around a helicopter

Be aware of: Main Rotor

Tail Rotor

Weight transformation, (boarding and leaving)

Exhaust

Firing Zone (Ricochets, main rotors, skids and accidental discharge)

Fire is the biggest danger, remember WOOL is slow burning so wear it and beware of nylon flight suits as they can burn very quickly and melt onto the skin. Wool or fire-proof clothing worn between this type of

suit will lessen the degree of burns.

Boarding and exiting a helicopter.

Always approach a helicopter from the front where the pilot can see you. Stand outside the rotor area and wait for the signal from the pilot before moving forward. Keep eye contact with the pilot at all times if it is possible

Never move backwards toward or around a helicopter. Face the direction you are moving.

When exiting the helicopter, ensure you have removed your helmet/ headset. Seat belt is clipped back together or in the center of the seat (not hanging out the door). Close the door to its locked position (if applicable).

Exiting during toe-in, single-skid, and hovering landings

Make sure the pilot understands what your intentions are. Wait for directions from the pilot and then move out to the front if it is possible. Do so as smoothly as possible. Transfer your weight off the skid carefully if possible.

When out of the helicopter squat down immediately and remain in that position until the helicopter has departed.

Never stand up or attempt to walk up hill when the helicopter is still landed or hovering.

Attempt to put yourself in a position where the pilot can see where you are.

Any equipment to be removed from the helicopter must be firmly held onto or secured in a manner to avoid being sucked up into the rotor wash.

Boarding during toe-in, single-skid, and hovering positions

On sloping ground approach up the slope towards the aircraft (as close to the front as possible) or if you have chosen a suitable site crouch down and the pilot will position the aircraft so you are able to make contact with it.

Find a place for the helicopter to approach you that is the least steep, to give the pilot maximum rotor clearance from objects.

Squat down while the helicopter approaches.

Once the pilot has committed to pick you up at a certain spot, don't move until indicated to by the pilot.

Only stand up once you are holding onto the helicopter.

If you slip don't lunge at the aircraft.

On entering aircraft put equipment in first. Then take a hold of a safety support handle and proceed to transfer your weight onto the skid as smoothly as possible. Ensure the pilot is aware you are about to transfer your weight so the movement can be allowed for. Ensure you have solid footing before you make contact with the aircraft and be prepared for the rotor wash. Once in the seat, immediately put on the seat belt or connect the harness. Acknowledge to the pilot you are connected. Ensure you have your seat belt on before the aircraft banks away from the hill. Connect your headset or safety helmet intercom.

Management of capture equipment

Management of the nets, canisters, straps, strops and animal bags after use. Packing and readiness for further use.

How will this equipment be returned to the helicopter for further use?

Aircraft performance

The pilot and lead gunner will advise all potential passengers of the weight limitations for the helicopter. This will vary depending on elevation, and the amount of fuel on board and the temperature.

Public Relations

Capture projects sometimes attract the attention of local TV news and newspaper reporters along with other interested people. Company crews will make themselves known to all media personal. They will cooperate in every way possible to inform both the media and interested people about the techniques employed by the company for capturing animals, what to expect in terms of animal capture rates and what the crews expect from them in order to be able to go about their work in an efficient, safe and humane manner. If any mentioned representatives wish to ride in the helicopter, this will be at the sole discretion of the pilot, and will only be allowed in situations where such activities will not compromise safety or humane treatment of the animals.

CAPTURE OPERATIONS

PREPERATION

Search time

The Company pilot will discuss with the P.I. the extent of effort to search for study animals on the identified study area. Study areas must be clearly delineated on standard USGS maps or aerial photographs and discussed with the pilots. Normally search time will be limited to two hours if study animals cannot be located.

The P.I. will also inform the Company crew of specific treatment or disposal requirements for any animal injuries or mortalities that might occur. If no specific requirements are in place, crews will discuss Company protocols for euthanasia and disposal of animals (see euthanasia section).

Placing Radio Collars

In preparation for each project, Company crews will prepare a kit for each animal to be captured. All necessary blood tubes, needles, ear tags, specialized sample collection equipment, and data recording forms will be placed in a zip-lock bag. This bag and a radio collar will be placed in a backpack. Crews will make sure they have appropriate marking devices and tools prior to each flight.

Each animal handler will carry the following items:

1. Nut drivers for attaching radio collars
2. Spare nuts, plates, and bolts for collars
3. Cutters for cutting excess collar material
4. Ear tags, applicator, and spare tags
5. Two feet of 1/4' surgical rubber tubing for attaching collars on young or small animals
6. Three blindfolds
7. Six leg straps/hobbles
8. Two sling strops
9. Personal survival kit in a fanny pack

Relocating Animals

Each Company crew-member will carry the following equipment:

1. A minimum of four leg straps
2. A minimum of two blindfolds designed for the target species
3. A minimum of two sling strops

Also carried in the helicopter will be spare straps, blindfolds, strops, and a 50-foot cargo rope.

Injured animals

308 'live' rounds will be carried at all times in the helicopter to euthanize seriously injured animals.

THE CAPTURE

The most critical issue with helicopter net-gun capture of animals is the time taken to pursue, catch, untangle from the net, secure, process and finally release the animal. The majority of post capture related deaths are a result of this process taking too long, and being performed by inexperienced crews.

Chase

Chase can be broken down into three separate categories:

1. Herding
2. Positioning
3. Pursuit

Herding occurs when an animal or group of animals is identified. The animal/animals may be herded at a slow speed to an area where the capture can be better performed. Herding will be done in a manner to cause the least disturbance to animals and while retaining as many animals as possible in the group.

There is no time limit on this activity. Herding may occur with a single animal, or a large group of animals. During this phase, individual animals are usually unaware of the intent to capture.

Positioning occurs when an individual or a small group of animals is split away from a large group and increased pressure is applied to direct them to an area where capture can occur. At this stage an animal may become aware that it has become a target. There is little restriction on the time this may take, as long as the animal/animals is/are not running hard and becoming overheated.

Pursuit begins when an individual or small group of animals is/are pursued in a positive capture mode. Animals are running and aware of the intent to capture. This is the most critical phase of the capture operation. Time limit for this phase varies between species, location, and condition of animals. In general the pursuit phase should last longer than 30 seconds. However, under certain circumstances it may be longer depending on the topography, condition of the animal and the animal's reaction. If the net misses or the animal gets free of the net, and immediate re-capture is not possible (within thirty seconds), any further pursuit of the animal will cease.

Multiple captures

If more than one animal is to be taken from a single group, pursuit time of non-target animals will be kept to a minimum. If multiple captures are made, netted animals should not be left to struggle in the net unattended. If it is not possible to make a second capture immediately, a crewmember must be left with the first animal to restrain it. Care will be taken to avoid chasing animals into fences, roads, and over cliffs. Animals that are obviously crippled, old, or in poor nutritional condition will, not be pursued.

ANIMAL HANDLING

Net Gun Capture

Removal from net and securing the animal

Immediately upon capture, a crewmember will exit the helicopter and proceed to untangle the animal from the net. At all times the animal must be restricted from kicking or thrashing about. A blindfold will be placed on the animal as soon as possible and secured behind the ears to prevent premature removal. Care must be taken to avoid any restrictions to normal respiratory airflow. Noise, including talking, must be kept to a minimum. The netted animal should be off its feet before beginning the net removal. (*The following does not apply to carnivores - see species section*). The handler should attempt to hold the animal on the ground by positioning himself behind the topside rear leg. The handler must not attempt to hold an animal on the ground by sitting on the head or shoulder sections of the animal. Once a secure position is obtained, the handler will systematically remove the front and rear legs on the top side from the net and then strap these legs together using the straps buckled around the handler's waste.

With the animal secure and unable to escape, the bottom legs can be tied together. With small animals, the handler will roll the animal over, while at the same time peeling the net off the animal. When working with large animals, the handler should let the animal try to stand up. This enables the handler to reposition the animal onto the other side bringing the untied legs to the topside. The net can then be removed and these legs are tied together in a similar manner as stated above. The handler must at all times remain positioned behind the topside rear leg with a balanced, secure posture. This position eliminates the possibility of the animal standing up or kicking out with its rear legs, possibly causing injury to the handler. The handler must avoid at all times walking or standing in front of an animal lying on the ground with legs not tied. All movements and positions must be from the backside of the animal. Once the animal is out of the net it will either be processed on site or prepared for transfer to the command post/ handling area.

If an animal is to be processed or has to wait for any length of time to be slung, it will be positioned in a natural resting posture with legs underneath and head uphill. Animals demonstrating physiological evidence (increases in temperature, heart rate, or respiratory rate) or behavioral evidence of extreme stress (excessive struggle) will be released immediately.

Chemical Immobilization

When the client wishes to use immobilizing, tranquilizing, or dissociative drugs for animal capture and restraint they are responsible for providing the agents, antidotes to the agents, and the appropriate equipment (syringes, needles, etc.) for administering the agents.

In most cases where these drugs are to be used, an experienced wildlife veterinarian will be overseeing the capture operations and Company personnel will follow his or her instructions. If no wildlife veterinarian is present, the P.I. is responsible for prescribing the use and administration of drugs and antidotes under any specific agency policies. Company personnel have received training in the use of currently accepted immobilizing, tranquilizing, and dissociative agents. Company personnel will not follow procedures for the use of agents that pose unacceptable risks to human or animal safety.

Antibiotics, Anthelmintics, and Supplements

Company personnel will administer medications (antibiotics, anthelmintics, vitamin mineral supplements, sedatives, analgesics, etc.) as prescribed by the P.I. All medications should be obtained from a licensed veterinary medical supplier and should be used according to label directions or according to directions of a licensed veterinarian. The client must provide the medications in adequate form and quantities, and provide all equipment (hypodermic syringes, dose syringes, needles, etc.) for proper administration of medication to the entire group of animals to be treated. The P.I. will be notified by Company personnel of the successful administration of the medications to individual animals, and any failure to administer medications. The client accepts responsibility for threats to human or animal health resulting from the use of drugs in wild animals potentially entering the food chain.

Release

Processing will be completed as soon as possible. At completion of processing, the animal will be quickly examined for any injuries or wounds. The animal will be released taking care to steer it away from people, helicopters, and hazardous conditions (fences, highways, cliffs etc.). Any abnormal behavior or injuries will be noted, recorded, and reported to the P.I.

ANIMAL WELFARE

Animal Injuries

Any capture operation poses a risk to animals and their handlers. If at any time in a capture operation the rate of injury and/or mortality exceeds (2.5%), the capture operation will be halted and all aspects of the technique and capture environment will be reviewed. If corrective actions can be identified and prove to be successful upon commencing captures then further captures may be carried out. If corrective actions cannot be identified, the capture operation will be halted until further analysis verifies it is appropriate to continue.

Any animal injury will be assessed by the P.I. when feasible, or by the Company crew and a decision will be made to release or euthanize the animal depending on its severity. Any injury that would cause the animal to suffer severe or chronic distress and/or would result in the animal not being able to function in a normal manner in the wild will result in the animal being euthanized. Decisions on euthanasia should be made by the P.I. whenever possible. However, Company crews have been trained to recognize debilitating injuries and use of humane euthanasia techniques and, when necessary, will make the decision.

In animal translocation projects, any animal demonstrating stress or injury at the time of capture will be identified by the capture crew with predetermined special marking, such as paint or colored ribbons, so that processing crews at the command center may immediately treat the animal. Medical treatment of injured animals at the command center will be under the supervision of the P.I.

Shock

Shock is defined as circulatory collapse. It is characterized by progressively diminishing circulating blood volume relative to the capacity of the vascular system, leading to acute failure of blood supply to vital organs. The onset of shock can be very rapid or take hours to develop depending on the cause.

Causative Factors: Severe blood loss, trauma, infection, hyperthermia, low blood sugar, heart failure, malnutrition, or major abdominal organ failure.

Physiological Effects: Inadequate circulating blood volume develops secondary to the redistribution of available blood or blood loss. During the early, reversible phase of the syndrome the body compensates by contraction of the spleen and veins to force blood into the central circulatory system, constriction of the small arteries to increase blood pressure and tissue perfusion, and increased heart rate to increase cardiac output. All of these adaptations maintain blood perfusion of the brain and heart at the expense of other organs and muscle masses. As the condition progresses, compensatory mechanisms are no longer able to maintain blood flow to vital organs and cardiac output is progressively reduced. Finally an irreversible stage is reached, characterized by myocardial depression and pooling of blood in the peripheral circulatory beds. The progression of shock from the early, reversible stage to the irreversible stage with subsequent coma and death may take minutes or hours.

Physical Signs of Shock: The clinical signs of shock can be variable, depending on the underlying cause for development of the syndrome and the stage of the condition. Generally an animal shows depression or disorientation, decreased body temperature, cold extremities, rapid weak pulse, rapid shallow respiration, pale and dry mucus membranes, and slow capillary refill time.

Prevention: Many cases of shock in wild animals can be avoided by adequate evaluation of the population of animals to be captured, selection of healthy individuals, minimum chase, capture and processing times, using experienced crews and the proper equipment. Animals from populations suffering from nutritional deficiencies, psychological stress or disease are more prone to succumb to shock. During the chase, animals in poor body condition or showing signs of disease should be avoided unless this is contrary to the goal of the capture project. The chase sequence, and especially the final pursuit, should be efficient and short to avoid physiological and psychological disturbance to the animal that may predispose to development of shock.

After capture has been accomplished, animals that struggle continuously and fiercely should be released from restraint immediately and allowed to return to the wild.

The use of professionally trained capture personnel ensures recognition of the early signs of shock. Members of the capture crew should monitor animals in their care, closely for these signs. Since shock can progress rapidly to the irreversible stages with subsequent coma and death, capture personnel must be prepared to make a rapid diagnosis of developing shock and be prepared to release the animal immediately or provide treatment.

Treatment: Treatment of shock is a complex challenge in the best of situations. A quick and accurate diagnosis of the underlying causes of the condition and appropriate therapy must be made. These treatments may involve the administration of blood, plasma, or electrolyte solutions; corticosteroids; antibiotics; oxygen, and pain or stress relieving drugs. Therefore treatment of shock should usually be left to trained medical professionals. Even under their supervision the successful treatment of shock under field capture conditions is unlikely to be successful.

If treatment of shock is unsuccessful then euthanasia of the animal should be conducted. In the event that initial treatment is successful, adequate facilities and personnel must be available for continued treatment and support to return the animal to a condition suitable for later release. This may take days to weeks. **Prevention of shock is the only sure treatment.**

Capture Myopathy

Capture myopathy is a term applied to the damage of skeletal muscles associated with the stress of capture, restraint, and transportation of wild animals. This syndrome has been reported in many North American ungulates and some wild birds. It may occur within minutes of animal capture or may not become evident for days or weeks following capture and restraint.

Causative Factors: Common causes of capture myopathy in wild animals are severe stress and physical exertion, or the restraint of animals in abnormal positions that restrict normal blood flow to major muscle masses. Wild animals do not normally exert themselves for long periods of time without rest,

but when pursued or struggling against restraint, they will make a maximal effort to escape, creating potentially fatal physiological changes.

Predisposing factors include nutritional deprivation or imbalances, psychological or physical stress, prolonged pursuit or restraint, repeated capture and handling, and lengthy periods of transport in inadequate vehicles without periodic stops to allow animals to rest.

Physiological Effects: Normal muscle function requires oxygen, and energy in the form of glucose and other chemicals supplied by adequate blood flow. Any condition restricting oxygen supply to muscle tissues may begin a sequence of events leading to myopathy or muscle damage. For example, extreme muscle exertion can result in the death of muscle cells as a result of rupture of the cells, or as a result of the accumulation of lactic acid in muscle tissues and the circulatory system. Once initial muscle cell death or necrosis has begun, the process may be progressive due to continuing damage to remaining muscle from struggling, restriction of blood flow to muscle in recumbent animals, and continuing local and systemic lactic acid buildup.

Physical Signs of Capture Myopathy: Capture myopathy may present as a peracute, acute, subacute, or chronic syndrome. If the muscle tissue of the heart is involved, sudden death can result from cardiac failure. If muscle exertion results in severe circulatory acidosis, death can also be peracute or acute. If major skeletal muscle tissues are involved, painful, stiff movement of the extremities, especially the hind legs may be the initial clinical sign. Depending on the individual animal this may progress to complete paralysis of the legs with inability to rise, or the animal may fight to maintain mobility and eventually recover from the disease. Bending of the neck in an uncontrolled manner (Rye neck), is another common clinical sign. If the animal is able to walk, it will result in the animal moving in a circle in the direction of the bend in the neck. Many animals that survive capture myopathy may suffer from debilitating secondary skeletal muscle and tendon damage, heart, and kidney damage. Animals that have survived episodes of capture myopathy are more susceptible to myopathy during subsequent capture procedures.

Prevention: Wild ungulate populations or individual animals that are under nutritional or psychological stress or nutritional imbalances (especially vitamin E and selenium deficiency) are more prone to suffer from capture myopathy. Assessment of herd health and nutrition before capture operations proceed may alert capture personnel to potential problems with capture myopathy. The exclusion of individual animals with obvious health problems during the chase may prevent cases of capture myopathy. Since mature males with large muscle mass appear to be more susceptible to the disease, these animals should only be caught if the goals of the capture project require their capture. Some species also appear to be more prone to muscle damage (wild sheep and goats).

Once capture operations have begun, the primary means of preventing capture myopathy are: -

- efficient and rapid capture
- fast and effective animal restraint
- fast and effective processing
- intensive animal monitoring by professionally trained and experienced animal capture personnel

In animal populations with low levels of vitamin E and selenium, supplementation with injectable vitamin E and selenium may be useful in preventing sub-acute or chronic capture myopathy. However, this cannot be depended upon and prevention is the key.

If evidence of capture myopathy is observed in an animal, the P.I. or person in charge at the site must make a decision regarding treatment or release of the animal. Due to the difficulty of treating capture myopathy in a field situation, animals showing early signs of the condition and adequate mobility should be treated if possible and released immediately.

Treatment: Since treatment of animals recumbent as a result of capture myopathy requires long term, intensive treatment and nursing care, and success in treatment is rare, animals progressing to this state should be euthanized.

If it is decided that treatment will be attempted, then a veterinarian or other person experienced in animal medical treatment should be consulted. Common medications that are used in the treatment of capture myopathy and exertional myopathy include injectable sodium bicarbonate, corticosteroids, mild sedatives or tranquilizers, and vitamin E/selenium supplements. Nursing care including hot or cold therapy of affected muscles and physical therapy over lengthy periods is required.

Hyperthermia: Hyperthermia is elevation of body temperature due to excess heat production, heat absorption, or insufficient heat loss. In wildlife capture operations, hyperthermia is a common problem and capture personnel should be aware of physical signs of hyperthermia and appropriate treatments. When not identified and treated in the correct manner Hyperthermia can lead to the death of animals.

Causative Factors: The most significant factors causing hyperthermia are time taken in the pursuit of an animal during the capture and the time taken to extract an animal from the net and process it. Inexperienced crews and the wrong equipment are the single most causative factors creating hyperthermia.

Other factors in the development of hyperthermia include high environmental temperatures, high humidity, and prolonged periods of muscular exertion. Contributing factors include dense hair coats, thick subcutaneous fat deposits, dehydration, intense sunlight, pre-existing disease conditions, and inadequate ventilation. Ruminants are especially susceptible to excessive body heat production since they cannot rapidly lose heat through sweating. Wildlife capture personnel should be aware that tranquilizers and anesthetic drugs impair normal body temperature regulation.

Physiological Effects: When hyperthermia occurs there are a number of physiological events that can arise. High core temperatures depress temperature regulation centers in the brain. Dehydration resulting from hyperthermia prevents heat loss through sweating.

As the body temperature rises, depression of the respiratory control centers may impair respiration, reducing heat loss through panting. Circulatory failure may develop from disturbance of electrolyte levels in the blood. This produces weakness of the heart muscle and causes shock as a result of dilation of the peripheral blood vessels. At extremely high body temperatures, cellular degeneration and death occurs.

Physical Signs of Hyperthermia: Wildlife capture personnel should be constantly alert for physical signs of hyperthermia in animals they are handling. Experience and observation of the animal's vital signs may enable a faster and more accurate indication of the animal's physical status than reliance on mechanical or electronic monitoring devices.

Normal responses to high body temperature are increased heart rate, increased respiratory rate, and increased blood perfusion of the skin and mucus membranes. Normal ranges of pulse rates, respiratory rates, and body temperature for common species of wildlife are shown in Table 1. If regulatory mechanisms are able to respond adequately to the increased body temperature, heart rate and respiratory rate should stabilize or begin to drop. At the same time, depth of respiration and strength of the pulse should remain strong. Mucus membranes will be bright pink and may be slightly dry.

When hyperthermia begins to reach dangerous levels (106° to 108° F; 41° to 42° C) heart rate will become very high and pulse will begin to weaken. The animal will be continuously panting and exhaled air will feel hot. The mucus membranes may begin to turn pale or muddy, and they will be dry and warm to the touch. The animal may become agitated, but soon becomes depressed and weak. Muscle tremors may occur. These are definite signs of hyperthermia and shock development.

At this point, the individual responsible for the animal must first recognize this state then decide whether intervention is required, as without intervention the animal may progress into an irreversible state of hyperthermia and shock. Panting will continue, but breaths will become shallower. Eventually breathing may change to shallow and intermittent. Pulse will be rapid and weak, then weak and irregular. Mucus membranes will be pale and dry. The animal will have a vacant look and

be oblivious to external stimuli. Eventually it will slip into convulsions, coma, and then death.

Prevention: Professional wildlife capture specialists should strive to avoid situations that predispose to hyperthermia. The risk of hyperthermia can be greatly reduced by only using experienced pilots, gunners, and animal handlers. In translocation projects it is critical to have experienced personnel at the base to ensure animals are processed and placed in transportation trailers as fast and efficiently as possible. The single most important point at this stage of the operation is to get animals standing on their feet as soon as possible. Animals can then compensate and return to a more normal state. This may mean it is not possible to collect biological samples or place radio collars at this stage.

Animal capture operations should be avoided if possible in conditions including strong winds (where animals are typically considerably more flighty), high environmental temperatures, intense sunlight and high humidity. If captures must be done under these conditions, extreme care must be taken. Physical factors that effect length of pursuit before capture such as topography and amount of escape cover should be considered in planning the capture effort.

Every effort should be made to obtain information on the source population from which animals will be captured. Accurate assessment of the total number of animals in the population is important so that the numerical goal for total animals captured is not unrealistically high. If too many animals are captured from one herd, some animals may be pursued repetitively without an opportunity to rest and regain normal body temperature. If possible, health and condition of the herd from which captures will be made should be assessed. This would include information on nutritional status, reproductive status, and prevalent disease conditions in the herd that might affect animal stamina.

Health of individual animals should be assessed at initiation of, and during, pursuit. Pursuit should be abandoned immediately for animals judged to be unfit for capture due to poor condition, injury, or disease.

When transporting or restraining animals after capture, restraint devices such as transport bags made of solid fabric that enclose all or most of the body should not be used if environmental conditions favor development of hyperthermia. Blindfolds should be constructed and used in a manner that does not obstruct breathing.

Treatment: Once animals have been captured, each member of the capture team in direct contact with the animals should accept responsibility for monitoring animal welfare. If it is observed by physical or behavioral signs that an animal is experiencing undue distress, the situation must be assessed as to whether to continue to handle the animal or release it. **At the time of capture, if there is any doubt that the state of health of a captured animal is being unduly compromised, it must be immediately released into the wild.**

In translocation projects, large containers of water should be kept available at the command center and animals suffering from hyperthermia should be placed in shade and doused with water. Water should be applied to ventral, less haired surfaces.

Although certain drugs have been used experimentally to treat hyperthermia in animals, none have yet proved to be effective in wildlife. The time that might be consumed in administering drugs would probably be more productively spent in releasing the animal.

Table 1. Normal Pulse Rates, Respiration Rates and Rectal Temperatures for Wild Animals.

FAMILY/SPECIES	PULSE (beats/mm)	RESPIRATION (breaths/mm)	RECTAL TEMPERATURE	
			°F	°C
Deer	80	18	101.0	38.4
Elk	65	10	101.0	38.4
Bighorn Sheep	130	28	98.0-99.0	36.8-
Horse	32-44	8-16	100.0	37.8
Burro	40-56	14	101.0	38.4
Wolf	70-120	10-30	102.0	39.0
Moose	60-70	18-28	101.5	38.7

Adapted from: California Dept of Fish and Game Wildlife Restraint Handbook, 1989.

Bloat

Bloat is over-distension of the rumen and reticulum with the gases of fermentation. There are two types of bloat. **Frothy** bloat occurs when gas in the form of foam becomes mixed with rumen contents as a result of a sudden change of diet to consumption of highly digestible plants high in protein or carbohydrates. This type of bloat commonly occurs when animals move to new pastures or with spring green-up. **Free gas** bloat is produced by failure of normal expulsion of gas from the rumen through the esophagus (eructation) due to physical interference. Physical factors responsible for free gas bloat may include obstruction of the esophagus, damage to sensory and motor nerves of the rumen and reticulum, and unusual postures including lateral recumbency.

Wildlife capture personnel must be constantly aware of environmental and physical conditions that may lead to bloat. Caution should always be exercised with populations of animals during spring green-up, or when changes to new food sources have recently occurred. Every effort should be made to capture the animal in a manner that avoids excessive trauma to the neck, thorax, and abdomen. The animals should be maintained in sternal recumbency whenever possible and the neck should not be held in abnormal postures that might occlude the esophagus. If the animal cannot be kept in sternal recumbency then it should be placed in lateral recumbency with its left side down. This will place pressure on the rumen and help expel excess gas. The esophagus and head should be kept elevated above the rumen to avoid regurgitation of rumen contents into the mouth and aspiration into the lungs. The animal should not be left in lateral recumbency for longer than absolutely necessary. Animals should not be rolled onto their backs while on the ground.

Clinical signs of bloat reflect the enlargement of the rumen due to excess gas. Initially there is distention of the left paralumbar fossa (the depression high on the left abdominal wall just ahead of the pelvis). As bloat progresses the entire abdomen becomes enlarged. The animal may show signs of difficult breathing including open mouth breathing, grunting, extension of the neck, and protrusion of the tongue. The animal usually is in pain and may struggle excessively. In some cases the animal may vomit rumen contents. If the conditions producing the bloat are not corrected immediately the animal may die in a short period of time.

In domestic livestock there are a number of medical and surgical interventions for the treatment of bloat. In free-ranging wild animals undergoing capture and restraint, there is only one practical treatment: immediate release.

Euthanasia

Euthanasia is the act of inducing a painless death using humane techniques. To ensure insensitivity to pain it is necessary to depress the central nervous system, specifically the cerebral cortex. To be considered humane, a euthanasia method must induce rapidly occurring unconsciousness followed by

cardiac or respiratory arrest..

The Canadian Council on Animal Care (1993) listed the following criteria for a humane death:

1. Death without signs of panic, pain, or distress
2. Minimum time to loss of consciousness
3. Reliability and reproducibility
4. Safety for personnel involved
5. Minimal undesirable physiological and psychological effects on the animal
6. Compatibility with the requirement and the purpose of the scientific study
7. Minimal or no emotional effects on the observer and the operator
8. Minimal environmental or ecological impact
9. Simple, inexpensive mechanical equipment that is relatively maintenance free
10. A location remote and separate from other animals.

Euthanizing agents are commonly categorized into three main categories; inhalant agents, non-inhalant pharmacological agents, and physical methods. Inhalant agents would include the anesthetic gases such as ether, nitrous oxide, hydrogen cyanide gas and halothane. Inhalants are administered to the animal by container or facemask or in a closed chamber. Non-inhalant agents include injectable pharmacological agents and are mostly administered by intravenous injection. Physical methods include use of the captive bolt pistol, gunshot, cervical dislocation, decapitation, electrocution, microwave irradiation, and rapid freezing (Kreger et. al. 1993).

Method of choice must also evaluate appropriateness for the species of concern considering such things as the necessary dose or concentration required, expected struggling or vocalizations, skill of the administrator, rapidity of the agent, and economics (Kreger et al 1993). There may be no right and wrong method and the decision on the method chosen must consider the larger context of the action. Method of choice should be clarified before each capture project is initiated.

Any necessary euthanasia of animals captured by Company crews will be performed using appropriate techniques for the species or group of animal as prescribed by the appropriate national veterinary medical authority (American Veterinary Medical Association in the US, Canadian Council on Animal Care and Canadian Veterinary Medical Association in Canada). In situations where a veterinarian is available, the veterinarian, in consultation with the P.I. should determine the method of euthanasia.

If an animal is injured at the capture site and it is determined that it cannot function in a normal manner without undue pain and stress, then the animal will be quickly and humanely euthanized by shooting with 308 bullet to the brain. Placement of the bullet will vary by species of animal depending upon skull structure. The euthanized animal will be transported to the processing area and turned over to the P.I. for examination and final disposal of the carcass. Care will be taken to minimize display of a dead animal.

ANIMAL MARKING

Attaching Radio Collars

In many cases radio collars applied to wild animals will remain on the animal for several years and sometimes for the animal's entire life. They must therefore be placed in such a manner as to not inhibit the animal's normal functions or threaten its safety and well being.

Proper fitting of radio collars on the adult female cohort is fairly straightforward. However, fitting of sub-adults and adult males can be much more challenging. Unless the objectives of the research project mandate otherwise, radio collars should be attached to adult females. If other cohorts must be radio collared then commercial expanding collars or special techniques such as shortening collars with 1/4 inch surgical tubing that will fall off in several months must be used.

The goal in all cases is to fit the collars tight enough to prevent excess movement without inhibiting normal functions. Collars placed too loose may result in legs, branches or other objects being caught under the collar. Loose collars may also slide up and down the neck serving as a nuisance to the animal, and wearing away the hair coat that is unsightly and causes a loss of thermal integrity. Loose collars can cause

problems to the lower jaw by resting on the jaw while the animal is eating. Collars applied too tight can inhibit airflow through the trachea, blood flow through blood vessels, and can produce pressure necrosis of the skin.

Company crews have received training in the placement of radio collars. They have applied radio collars thousands of animals and the company has conducted follow up surveys to determine if the placement of collars has been successful. Generally Company crews will adjust collar length so that one or two fingers will fit snugly between the collar and the skin of the animal's neck when it has reached full growth. If the agency has a different philosophy on the placement of radio collars it is the responsibility of the P.I. to express this philosophy at the pre-capture briefing.

Some species (pronghorn and mule deer) react more aggressively to radio collars immediately after attachment. Certain individuals will overreact and attempt to remove the collar by kicking with the rear legs. It is important to observe these animals until the panic reaction ceases and the animal moves off in a normal manner.

Attaching Ear Tags

Generally two forms of ear tags may be applied to wildlife during capture operations for animal identification. ***Metal ear tags*** are attached for identification at close range. Official metal ear tags supplied by government regulatory agencies may be applied if animals have received certain vaccinations. ***Numbered plastic ear tags*** are applied when visual identification at long range is desired.

Metal ear tags and tag attachment tools are available from a number of commercial manufacturers. Tags should be purchased with sequential numbering and the addition of letters identifying the management agency is preferable. Tags of appropriate size for the animal species should be used. The agency should possess at least three applicator tools and multiple tools should be available during all capture operations. These tools should be cleaned and disinfected between capture operations in different herds, and preferably between animals within a herd.

With large plastic tags, placement of the tag in the ear will depend on the proposed method of observation. If observers will monitor the animals on the ground the tag should be facing forward and inserted in the front of the ear so the number can be read from the front of the animal. If the animals are to be observed from aircraft, the tag should be placed in the back of the ear so that the number will be facing backward. The tags and numbers should be of maximum size appropriate for the animal. Additional value can be realized from plastic ear tags if a system of color-coding is used to identify herd of origin, year of capture, etc. The agency should provide at least three tag applicators specific for the plastic tags to be applied at all capture operations. These applicators should be cleaned and disinfected as specified above for metal tag applicators.

Proper placement of metal or plastic ear tags is critical for long term maintenance of the tags, to reduce infection, and prevent traumatic effects to the animal. In ruminants the external ear where tags will be applied consists of a thin cartilage plate supported by three cartilaginous ridges. Muscles and connective tissue attach to the medial third of the cartilage plate. Blood vessel and nerve branches run along the cartilaginous ridges. Plastic or metal ear tags must be applied at a location in the ear to avoid muscle, connective tissue, and cartilage ridges. The preferred site for application of metal tags is approximately the halfway point from base to tip on the top or bottom of the ear. Tags placed too far out on the ear will tear out of the thin cartilage. Tags placed through muscle, connective tissue, or cartilage ridges will cause undue pain, bleeding and possibly infection resulting in the tag falling out.

Misplaced tags or tags placed too tightly will often result in inflammation, infection, and eventual sloughing of the tag and portions of the ear. Care must be taken to not apply the tag with too much pressure resulting in crushing the tag and the ear tissue. Plastic ear tags are inserted approximately midway along the ear between cartilage ridges. Proper insertion of the barbed tab into the body of the tag should be checked after application of the tag.

COLLECTING BIOLOGICAL SAMPLES

Procedures

Protocols provided by the P.I. will be used for the collection of biological samples. When no specific instructions are provided, Company crews will secure samples following standard procedures as described in later sections of this manual. Company crews have been trained and have extensive experience in these procedures. In addition, the Company has on hand equipment and supplies for collecting most biological samples. The company has developed procedures and uses equipment which enables samples to be collected with the minimum amount of stress to the animal, security of the sample, integrity of the data and less helicopter time. Biologists are encouraged to consult with Company crews prior to making up animal “tagging” kits.

If invasive biological sampling or surgical procedures are required the client will provide protocols for these procedures established by the appropriate animal care and use committee. The client will provide all necessary veterinary expertise, equipment, and drugs necessary to perform these procedures in a medically acceptable and humane manner. The client will provide all biological sampling supplies required to perform the procedures.

Blood Collection Systems

Blood samples are commonly collected from wild animals at the time of capture to determine physiological and disease exposure status of the animal. Company crews are trained in various techniques of sterile blood sample collection and familiar with the location of major superficial veins. Training and experience is necessary for the efficient collection of quality blood samples.

Blood collections can be very time consuming and increase stress on captured animals. Blood should only be considered routine and collected when important uses of the samples are identified and planned for. Blood collection tubes will be labeled with the appropriate animal number immediately after the completion of the capture effort.

All needles and blood collection apparatus used must be sterile, disposable, and proper techniques used to maintain sterility while blood is collected and subsequently stored. All used needles and syringes will be disposed of as required by state and federal regulatory agencies. There are currently two common blood collection systems.

1. Syringe and Hypodermic Needle:

The use of plastic syringes with large bore hypodermic needles for collection of blood is familiar to most biologists. Large gauge hypodermic needles (18 gauge is preferable) should be used to speed flow of blood into the syringe, reduce chances of blood freezing in the needle, and to decrease chance of lysis of red blood cells during collection of blood. One-inch long needles are adequate for most carnivores and small ungulates, however longer needles may be required for larger animals, in particular bison, moose and horses.

If more than one tube of blood is required to be collected, it is easier to aspirate the total volume of blood necessary to fill blood collection tubes into a syringe. Use a syringe large enough to collect the desired amount of blood in a single draw. The plunger should be checked for free movement and any air present in the syringe should be expelled before the needle is inserted into a vein. The needle cover should not be removed until immediately before the needle is inserted into the vein. The hypodermic needle is always inserted through the skin and wall of the vein with the bevel up. Using slow and steady suction, adequate blood should be drawn into the syringe to fill all blood collection tubes. Pressure should be held on the vein puncture site after withdrawal to prevent excessive bleeding.

Blood should be transferred to tubes immediately after collection. If the needle has not been contaminated during bleeding, then blood can be transferred into tubes by inserting the needle through the rubber stopper on each blood tube. A vacuum in the tube will draw blood from the syringe into the tube. Tubes should be held upright during this procedure. Blood cell lysis is less likely if the tip of the needle is held close to the inside wall of the tube.

2. Vacutainer Collection System:

One version of the vacutainer needle is available with single sampling tubes, while another version is available that allows sequential filling of multiple blood collection tubes without blood dripping from the needle or clotting. Maintenance of needle sterility is achieved by the same methods as outlined for the needle and syringe technique. Contamination of the blood sample is less likely than with the needle and syringe technique because blood flows directly from the vein into the collection tube. However, in rare instances where the vacuum in the tube has been lost, blood cannot be collected with this method, unless a spare tube is available.

For each animal to be bled, a new sterile needle is screwed into the vacutainer holder. The needle is inserted into a vein. A blood collection tube is then pressed into the vacutainer holder piercing the rubber stopper. Blood is drawn into the tube by the vacuum inside. If more than one tube must be filled, the first tube is withdrawn from the holder when it is full, and another empty tube inserted into the holder. Care must be taken to avoid withdrawing the needle from the vein while manipulating new tubes into the holder. When the last tube has been filled, the needle can be withdrawn from the vein along with the holder. The used needle must be replaced in the holder with a new, sterile needle before the next animal is bled.

Blood Collection Sites

1. External Jugular vein (neck): The external jugular veins carry most blood returning from the head to the heart. It is a large vessel located in a depression between small muscles superficial and lateral to the trachea and large muscle masses lateral to the neck vertebrae. This depression is called the jugular groove.

In mature male ungulates, especially during breeding season, muscle masses surrounding the jugular groove are very large and there is substantial connective tissue in the groove surrounding the jugular vein. The vein may actually be displaced slightly lateral to the jugular groove in these animals.

To locate the jugular vein in an animal in sternal or lateral position, the neck should be extended to tighten the vein and the overlying skin. The vein can sometimes be more prominently exposed if the animal's head is rotated slightly away from the side where the vein is to be punctured. (The animal's head must always be elevated above the level of the stomach). Care must be taken to ensure the animal's head is not put in a position that obstructs the trachea or nose inhibiting respiration. Pressure is then applied with one thumb, or fingers in a very large animal, in the jugular groove. Caution must be exercised so pressure applied does not compress the trachea and inhibit airflow. The jugular vein will slowly fill with blood above the level where pressure has been applied. Location of the distended jugular vein can often be seen, otherwise the vein must be located by lightly palpating the jugular groove above the pressure point. If the vein cannot be palpated in the jugular groove, palpation is continued lateral to the groove. The jugular vein is identified when a soft, tubular structure running parallel with length of the jugular groove is palpated. The wall of the structure should flex when additional pressure is applied.

Once the jugular vein has been located, blood collection can proceed. The hypodermic needle is inserted at an angle between 20 to 30 degrees from parallel to the skin and pointing towards the animal's head. Care should be taken not to penetrate through the jugular vein since major nerves and arteries lie under the vein. Movement of the needle from within the lumen of the vein should also be avoided to minimize damage to the wall of the vein. Before removing the needle from the vein, pressure applied to the jugular vein below the bleeding site should be released to lower the blood pressure in the vein, and avoid hemorrhaging into the surrounding tissue. Pressure should be applied to the puncture site as the needle is withdrawn to reduce bleeding.

If the animal does not cooperate by maintaining its head in an extended position, it is necessary for capture personnel to hold the head in the proper position. If two people are present, one holds the head in the proper position, while the other performs the blood collection. If only one person is available, that individual must hold the head extended with one hand while keeping pressure on the jugular vein below the venipuncture (entrance) point with the outer fingers of the bleeding hand. Once the jugular vein is located, venipuncture is accomplished by manipulating the blood collection apparatus with the

thumb, index finger and middle finger of the hand occluding (putting pressure on) the vein.

An alternative approach in a large animal is to kneel next to the animal's head facing in the same direction as the animal. Bending forward, the animal's mandible is rested in the angle formed by the person's shoulder blade and back of the upper arm. Both hands are then free. One hand can be used to occlude the jugular vein and manipulate blood tubes. The other is used to operate the blood collection apparatus in the normal manner or backhand, as the person finds most convenient.

Care must always be taken to assure human safety when bleeding animals. When bleeding from the jugular vein, capture personnel must constantly be alert for the animal throwing the head. This is especially dangerous in antlered animals and when a single person must restrain the head and collect blood. When dealing with horses or donkeys personnel must also avoid being bitten. Carnivores should always be muzzled to prevent biting.

2. Lateral Caudal Malleolar vein (outer rear leg): The lateral caudal malleolar vein is usually visible just under the skin on the lateral side of the hind leg just above the hock joint. If the animal has been hobbled in a manner that binds the front leg to the hind leg, and the animal is not struggling, the vein is accessible for blood collection.

The vein is not large and is fairly mobile under the skin. Therefore it is necessary to firmly grasp the posterior aspect of the leg above the hock with one hand in a manner that stabilizes the vein and occludes the blood flow to distend the vein with blood. Using the other hand to control the blood collection apparatus the hypodermic needle is inserted into the vein pointing down the leg. Care should be taken to avoid human injury resulting from kicking of the legs when bleeding animals from this vein.

Blood is collected according to instructions for the specific blood collection apparatus as described in the section on blood collection systems.

3. Saphenous vein (rear leg): The saphenous vein is found just under the skin beginning at the middle of the inner thigh. Because of its location it is difficult to gain access to this vein in a large animal that is hobbled and not chemically immobilized. A nerve and artery run parallel with the vein. It may be found partially buried between large muscle masses. On the lower thigh the vein is fairly large and can usually be seen under the skin. It can be distended by pressure at the point where it emerges from between muscle masses. The bleeding apparatus is manipulated to insert the needle into the vein facing up or down the leg.

4. Cephalic vein (front leg): The cephalic vein runs under the skin along the front of the front leg starting below the elbow and running to the knee or wrist. It runs parallel to a nerve and artery. The vein is fairly large and can be distended with blood by holding a thumb over the front and inner surface of the elbow joint or by using a tourniquet. Using the other hand to control the blood collection apparatus the hypodermic needle is inserted into the vein pointing up the leg. As the blood commences to be drawn, pressure must be taken off the vein to avoid the vein from collapsing and to allow blood to flow into the vein to be collected.

Handling Blood Samples

General rules: Blood samples are collected for many different laboratory tests. Different laboratory tests require many special blood collection tubes for blood collection. Proper collection, handling, and shipping of blood samples are critical to assure that quality samples reach the lab. Improper handling of blood samples will result in inability to perform lab tests or inaccurate test results.

Cellular and chemical constituents of blood are susceptible to destruction by chemical and physical factors. Blood samples must also be protected from contaminants such as bacteria or fungus that will degrade samples.

Commercially available blood tubes, syringes, and needles are sterile. These devices should be handled

with proper techniques as previously described to maintain sterility and to prevent breaking syringes or tubes.

Blood samples must also be protected from extreme heat or cold that may cause degradation of chemical constituents or blood cells. Samples should be cooled to a temperature range from 40° to 50° F (5° to 10° C) as soon after collection as possible. Blood samples must not be allowed to freeze or be exposed to high temperatures through exposure to direct sunlight or other heat sources. Samples should be protected from vibration during storage and transport to prevent destruction of blood cells or breakage of blood collection tubes.

Whole blood collection tubes: Whole blood collection tubes have different colored stoppers that code for various anticoagulant chemicals that prevent blood clotting. Stopper colors for these tubes may be lavender, gray, light or dark blue, light or dark green, yellow, yellow/gray, brown, or black. Different chemicals are required to allow various laboratory tests to be conducted. To mix anticoagulant chemicals in the collection tube with blood to prevent clotting, the tube must be gently tilted from top to bottom at least five times.

Serum collection tubes: Serum tubes allow blood to coagulate so that serum can be collected for laboratory tests. These tubes may have stoppers of red, red/gray, gold, or pink. Some varieties of serum tubes contain a translucent silicone gel within the tube that separates the serum fraction of blood from blood cells after the tube is centrifuged. No tilting of these tubes is necessary.

Fecal Samples

Fecal samples are collected for a number of research purposes, including examination for internal parasites, identification of food items, determination of metabolic parameters, and quantification of hormones. Since different research goals will require different quantities of fecal material, and different methods of sample preservation, the client must notify Company crews of the protocol for fecal sample collection and preservation during the pre-capture briefing. The client must supply appropriate supplies for collection and preservation of the samples consistent with their protocols.

Fecal samples should be collected in a manner that does not cause undue pain or trauma to the animal. Vinyl or latex exam or surgical gloves should be included in the sample kit if fecal samples are to be collected. Insertion of fingers of the gloved hand should be done slowly, starting with one or two fingers depending on the size of the anus. If the animal resists the insertion of the fingers or struggles, the insertion should be halted and retried after a short pause. The least number of fingers should be inserted necessary for extracting the sample. Lubricants such as water, vaseline, or mineral oil may be used if they will not interfere with laboratory testing protocols. The rectum of many ruminant species is a thin-walled structure that can be perforated with relative ease. Perforation of the rectum will usually result in severe internal infection and eventual death. Therefore, overly aggressive probing for fecal samples must be avoided. Any evidence of bleeding from the anus during fecal collection should result in immediate cessation of attempted fecal collection. If fecal material is not found on initial palpation of the rectum, fecal collection should be abandoned.

When fecal collection is completed, the fecal sample can be contained by simply inverting the glove and tying off the opening, or by transferring the fecal material to a zip lock bag if one is available.

Throat Swabs

Tonsillar or pharyngeal swabs are collected for culture and identification of bacterial, viral, protozoa, or fungal agents present. The agents may be normal flora or they may be potential disease agents. It is the responsibility of the client to provide appropriate swabs in adequate numbers to obtain the samples of the tonsillar or pharynx that they desire. The client must specify the protocol for collection and preservation of the swabs to Company crews during the pre-capture briefing.

Company crews are trained to collect tonsillar or pharyngeal swabs under the following protocol.

After the animal has been restrained and blindfolded, tonsillar swabbing can begin. The blindfold should be made of a stretch material and of a size to allow the jaws to be spread wide enough to allow a mouth speculum to be inserted between the upper and lower cheek teeth. Once the speculum has been placed

securely, a swab is inserted over the tongue to the back of the pharynx. The swab is extended to contact the mucus membranes, rotated back and forth then retracted. The apparatus is removed from the animal's mouth and preservation of organisms is achieved by transfer of the swab into a culture tube containing appropriate media. Culture tubes containing swabs are stored on wet ice for transfer to base camp and shipment to a laboratory.

Company personnel will wear latex or vinyl exam gloves.

Nasal Swabs

Nasal swabs are collected for the isolation of viruses and certain bacteria or mycoplasmas. The client is responsible for providing appropriate commercial swabs and media in adequate quantities for the collection of nasal swab specimens. The client should also discuss the protocol for the collection of nasal swab specimens with Company crews during the pre-capture meeting.

The normal protocol followed for the collection of nasal swabs by Company personnel is to use commercially available, sterile, viral or bacterial culturettes. One swab is introduced into either the right or left nostril, rotated, withdrawn and inserted into the media in the culturette case. The culturette is then placed on wet ice for transport to the base camp and lab. If more than one swab must be employed to culture for multiple agents the second swab is introduced into the nostril that was not cultured previously. When culturing for multiple agents the side cultured for each agent should be consistent between animals.

External Parasites

External parasites are collected from animals for species identification, isolation of disease agents potentially harbored by the parasite, and other scientific research. The client should discuss with Company crews what parasites, and what number of parasites they wish to have collected during the capture effort. The agency must provide a protocol for collection and preservation of the parasites and all supplies necessary for conducting the protocol.

Company personnel have been trained to collect external parasites in the following manner.

For parasites of the external ear canal such as mites, a non-sterile cotton or dacron swab is inserted into the ear canal and rotated. Care is taken to avoid inserting the swab too deep and causing pain to the animal. The swab is removed from the ear and transferred to a vial containing mineral oil or moistened tissue if the parasite is to be preserved alive, and alcohol or formalin if the parasite is to be fixed.

For parasites of the skin surface such as lice or ticks, Company personnel use latex or vinyl exam gloves and remove the parasites by hand or using forceps. These parasites are preserved as described above for ear mites, depending on the objective of the research.

All instruments used for the collection of external parasites should be cleaned and disinfected between each animal. All personnel handling external parasites should thoroughly wash and disinfect their hands periodically during the capture operation.

Tooth Collection from Live Ungulates

Determination of age of individual wild animals by decalcifying, sectioning, mounting, and staining teeth to count annular cementum rings is a common wildlife research technique. Traditionally, teeth were removed from dead animals, however some researchers are taking teeth from live animals when accurate age determination is critical.

Removal of teeth from live animals, even with use of local or general anesthetics, subjects animals to post-operative pain, potential infection of the gums and jaw, and some loss of normal ability to obtain food. Therefore, removal of teeth from a live animal will only proceed after a review by the appropriate animal care and use committee has documented scientific justification for the procedure, and approved of the protocol for pre and post-operative care of the animals. Responsibility for these approvals rests with the P.I.

In situations where the Company will be involved in tooth extractions from live animals the following procedures will be used:

Anesthesia: Removal of permanent teeth in animals should be restricted to projects, which have established valid justification, and in those animals under general anesthesia. If general anesthetics cannot be used, then local anesthesia to deaden sensory nerves to the affected teeth must be used. Common local anesthetics used for local nerve blocks include 2% lidocaine hydrochloride (Xylocaine) or 1%, 1.5% or 2% mepivacaine hydrochloride (Carbocaine) should be used in performing the nerve block.

The recommended tooth for cementum analysis in live ungulates is the lower canine (incisor to most biologists). To remove this tooth it is necessary to anesthetize the lower lip and gums and the teeth and bone of the anterior mandible. This is accomplished by anesthetizing the mandibular alveolar nerve and its branches at the mental foramen. Sufficient anesthetic agent must be injected into the foramen to block both the exterior branches of the nerve, which enervate the gum and lip, and the interior branches of the nerve that branch forward within the mandible to enter the roots of the incisor and canine teeth.

Injection of anesthetic into the mental foramen requires use of a small gauge needle of 1½ to 2 inches in length attached to a syringe containing at least one to two milliliters of anesthetic agent. The mental foramen can be palpated through the skin on the lateral side of the mandible behind the canine tooth. The needle is inserted through the skin parallel to the mandible, approximately ½ to ¾ of an inch in front of the foramen. The needle is directed up the jaw and into the narrow canal as far as it will go, injecting anesthetic as it proceeds. Due to the small size of the foramen, only small amounts of anesthetic agent can be injected into this location. Therefore additional anesthetic should be injected into the gums surrounding the lower canine to be removed. Tooth removal should not be attempted for at least one minute after the anesthetic has been administered.

Tooth extraction: Extraction of permanent canine teeth from ungulates requires use of appropriate size dental elevators to loosen the ligaments attaching the tooth to the bony socket. Dental forceps or pliers can be used to grasp the crown of the tooth for final extraction. Care must be taken not to scrape away the cementum layer on the root of the tooth. After the tooth is extracted, the tooth socket should be packed with a degradable gauze or foam to control hemorrhage. The animal should receive an intramuscular injection of antibiotic before release.

Physical Measurements

Physical measurements will be taken following protocols furnished by the P.I. For validity of data it is important that all measurements be taken as consistently as possible from study to study. To accomplish this, Company crews will discuss the protocol for the measurement requested to be sure the P.I. understands how the measurements will be taken. Whenever possible, standard zoological procedures will be followed for physical measurements.

Aging

Numerous aging techniques have been used in an attempt to age animals. Company crews are directed to use the techniques detailed in Appendix A of Hoofed mammals of Alberta by J. Brad Stelfox. Age Determination Techniques. Pages 187-191.

ANIMAL TRANSPORT

Small Animals

Most commonly animals will be transported upright in the appropriate sized animal transport bag. Occasionally animals that are small enough to fit into the helicopter will be transported to the central processing point inside the helicopter. This is often done when an animal needs to be transported a long distance. If wolves need to be transported they will always be transported in the rear cabin of the helicopter. When animals are inside the helicopter they must be positioned in the sternum position, sitting on their legs and chest with the head up.

Large Animals

Larger animals will always be transported under the helicopter in a transport bag. Special care must be taken as animals are lowered to the ground to avoid improper placement of the head and neck. Ground crew must be aware of the need to ensure proper placement of the head to safeguard against any breathing

restrictions and to avoid prolonged bending of the neck, which predisposes to *rye neck* (see section on *capture myopathy*).

Any animal that has been subjected to a hard fall and may have injuries or has potential to develop stress related symptoms will be identified by Company personnel to the P.I. by a previously agreed upon method. These animals will receive priority treatment at the central processing base.

Company crews will verify that the animal to be transported is in good health and not injured. If heat is a concern, necessary steps to cool the animal may be taken before the animal is transported (i.e., water applications, etc.). This will require prior planning so that water is available at pre-determined sites prior to capture.

Euthanized Animals

Euthanized animals will be transported in a manner similar to live animals so that it is not obvious to the public that the animal is dead.

DISEASE

Personnel Considerations

All persons working with wild animals must be aware of potential disease or infectious agent transmission from animals to people or from animal to animal via handling equipment, etc.

Transmission of infections from animals to humans can usually be avoided through proper veterinary care and adherence to standard operating procedures for control of transmission. However, when animals are obtained from areas in which zoonotic diseases are known to exist, special care must be taken.

The most important zoonotic disease threats to personnel working in the capture of wild animals in North America are the following.

- Rabies
- Hantavirus
- Contagious Ecthyma
- Bovine Tuberculosis (TB)
- Brucellosis (Bangs)
- Thlaremia
- Plague
- Colorado Tick Fever
- Lyme Disease
- Rocky Mountain Spotted Fever
- Ringworm
- Cystic Hydatid Disease

INDIVIDUAL SPECIES CAPTURE PROTOCOL

BIGHORN SHEEP

Capture Timing and Conditions

Captures of females should be avoided in late pregnancy. Many captures are done in summer in desert environments when ambient temperatures are extreme. Care must be taken to work in early mornings to minimize problems related to heat and hyperthermia.

Many sheep populations throughout North America have now been involved with helicopter net-gunning. As a result, certain populations of sheep become instantly nervous and run at the first sign of the approach of a helicopter. Interestingly, other populations of sheep do not seem to develop this reaction to helicopters

and remain calm until the helicopter pursues them directly.

To reduce problems with captures in populations showing adverse response to helicopters, it is important that pilots seek information from previous pilots and from on-site biologists for each population prior to capture. This information may alter the method used to capture the sheep.

In populations where sheep are prone to run, extra caution must be taken with captures. It can be expected that the stress level will be higher with these sheep and it will be important to keep processing and/or transportation times to a minimum.

Transport

In many studies with bighorn sheep, animal transfer is involved. In all translocation projects and in some studies where extensive biological information is required, animals are transported from the capture location to a central processing point. Bighorn sheep are almost always transported beneath the helicopter in a transport bag.

Hyperthermia

Each capture must be monitored for changing weather conditions negatively influencing safety of the bighorn sheep to be captured. Bighorn sheep are especially vulnerable to stress and it is critical that animals are processed and transported as quickly as possible once they are netted.

Wind typically causes sheep to be more flighty. This results in more difficult captures and increased stress on the animals. When wind becomes a factor, captures should be terminated. At any time a capture crew feels that safety of the animals or people is in jeopardy, they should terminate the operation.

Tips to reduce the possibility of hyperthermia:

- 1) If snow is available, pack it around sheep for transport
- 2) If water is close by, wet ventral surface of sheep
- 3) Carry bottles of water in helicopter
- 4) Place blindfolds on sheep as soon as possible
- 5) Never leave sheep tied up unattended - Always have a “baby-sitter”
- 6) When sheep are tied up, make sure they are sitting upright with head uphill
- 7) Restraint times should be kept as short as possible

At any time during the handling, or processing of sheep, if the handler considers the sheep is showing signs of hyperthermia, no further processing will take place. If water or snow is available, the animal should be quickly treated and then released back into the wild.

Diseases and Clinical Signs

Bacterial or lungworm Pneumonia	Open mouth breathing coughing, nasal discharge, rough hair coat maciation.
Contagious Ecthyma (soremouth)	Licking lips and nostrils, rubbing head on inanimate objects, vesicular or pustular lesions on nose, lips, face, ears, udder, or feet.
Psoroptic Mange	Drooping ears filled with scaly debris, scabs on ears and on flanks in generalized cases, bad odor if secondary bacterial infections.
Ticks	Adult and sub-adult ticks in and on ears, on belly and inguinal region, and around anus.

BISON

Bison have been successfully captured in a wide variety of habitats for both placing radio collars and translocation.

Capture Timing and Conditions

Bison have been captured in both summer and winter. Captures of pregnant females should be avoided in late pregnancy.

Handling

Handling a large male bison in a net can be difficult. It will usually be necessary for two people to remove a bison from the net and to secure its legs. One person must be on the top side back leg, while the other is on the head/shoulder/back area. Extra care must be taken to avoid injury to the handlers from the horns and hooves.

Release

The temperament of a bison after release can be a problem. Either the helicopter must be hovering near by so the handlers can immediately get into the helicopter and lift out of harms way, or a substantial tree or rough terrain must be available for hiding.

Transport

In all situations, bison will be transported under the helicopter in transport bags.

Diseases and Clinical Signs

Brucellosis (Yellowstone NP, WY; Wood Buffalo NP, and National Bison Range.) Abortion with partially expelled placenta and dead fetus, scrotal enlargement and inflammation, Arthritis and joint inflammation.

Tuberculosis (Wood Buffalo National Park, Alberta) Emaciation, respiratory disease with coughing, breathing difficulty, oral or nasal discharge. Enlarged lymph nodes with or without draining pus.

Ticks Adult and sub-adult ticks on ears, body and around anus.

CARIBOU

Capture Timing and Conditions

Captures of females should be avoided in late pregnancy.

Transport

If animals are to be transported to trailers for translocation, antlers will be removed with a hand saw. Antlers will be removed leaving a base of 1 to 3/4 inches above the coronet.

Broken Antlers

Caribou antlers can break during capture. The crew must have a hand saw readily available in the helicopter to be able to remove any broken antlers. Special notice must be taken to identify any possible skull damage. In such cases both antlers must be removed before releasing the animal.

Sexing Caribou

Female caribou have a black patch on the vulva. Males have no such black patch.

Diseases and Clinical Signs

Brucellosis Abortion and retained placenta, scrotal enlargement and inflammation in males, arthritis and bursitis of joints and tendons.

Besnoitiosis Hair loss; thick, wrinkled skin; emaciation secondary bacterial infections; white of eye.

Ticks Adults and sub-adults around ears, on body and around anus; excessive grooming and possible hair loss.

Bot Flies Erratic behavior with running and head shaking, and sneezing during the summer.

ELK

Elk have been successfully captured using net-guns throughout the western USA and Canada in a wide variety of habitats. The majority of captures have been in winter months (post hunting), but an increasing number of radio collars are now being placed on elk in the summer months while they are on summer range.

Capture Timing and Conditions

Elk have been successfully captured in both summer and winter. Capturing pregnant cows from mid March into early April should only be done if it is absolutely necessary. No capture of pregnant cows should occur after mid April. If capture is to occur in the mid March to mid April period it is important that netting for cows does not occur on slopes where the animal may roll. It is also important to avoid netting cows that are running fast. If it is possible, the elk should be worked uphill then netted to slow them down and reduce the risk of injury.

Elk Bulls

If large antlered elk are to be net gun captured, special consideration should be given to the potential for neck and spinal cord injuries. Never attempt to net adult elk bulls in full antler when they are running fast. Bulls must be slowed down by turning up hill, running through thick scrub, or what ever it takes before a net is launched.

Human conflict

Many capture projects for elk are on areas resulting in potential for conflict with high human developments during winter seasons (ski areas, residential, lodging, commercial, tourists). These conflicts will necessitate designation of no-fly zones or areas where animals will not be captured. It is critical that the P.I. clearly identify these conflict zones prior to initiating the capture work. Local police and any other organization with authority (Press/media) should be informed about the project to limit the possibility of misinformation.

Transport

In most studies with elk, animals are captured, processed, and released on site. However, in translocation projects and in some studies where considerable information is required, animals are transported from capture location to a central processing point in large transport bags.

Capture of Elk calves

When attempting to capture elk calves of specific gender, the most efficient method is to position the helicopter beside the calf as closely as possible and look for urine stains on the belly (male). Attempting to sex elk calves by other methods such as size, hair color, etc have not proven successful. This technique is increasingly more successful the later in the winter the project is done.

Diseases and Clinical Signs

Brucellosis - (Yellowstone NP, NW Wyoming). Abortion and retained placenta, weak calves scrotal inflammation in males.

Tuberculosis - (Maybe Montana, Colorado, and Ontario in game farms). Enlarged lymph nodes and sub-cutaneous abscesses, emaciation.

Psoroptic Mange - (National Elk Refuge). Dry scabs and hair loss from neck, shoulders, and chest of adult males during fall and winter.

Brain Worm - (Eastern and Midwestern U.S. and eastern Canada). Incoordination, wandering, emaciation, circling lameness, blindness, abnormal posture of head and neck, recumbency.

Chronic Wasting Disease - (Wyoming and Colorado in the wild. Possibly several states and provinces throughout the US and Canada). Emaciation, depression.

Arterial Worm - Blindness, sloughing of ears and nose, and antler deformities.

Minegial Worm

HORSE & BURROS

Horses and burros have been successfully captured throughout the western USA. The majority of captures are done with the purpose of removing the animals. This results in the animals being slung back to trailers and pens.

Capture Timing and Conditions

Horses and burros have been successfully captured during most months of the year. However, as most captures are for removal, females in late pregnancy and during lactation should not be captured. The optimum time for capture and removal of horses and burros is from September through April/May.

Horses and donkeys main defense mechanism is to bite or kick. It is important to only be on the front end of a horse or donkey if the head is secured and controlled or the handler is confident he won't be bitten. Do not attempt to stop, control or take a burro down by using the head.

Transport

Horse and donkey projects are frequently translocation efforts and animals are transported from the capture location to a central processing point. Animals will be transported under the helicopter in large transport bags.

MOOSE

Cows, bulls, and calf moose have been successfully captured in both the USA and Canada in a wide variety of habitats and seasons.

Capture Timing and Conditions

Deep snow conditions can result in moose living deep in forests, making it difficult to get moose out of tree cover. At times the moose will have to be pushed for long periods of time to get them out of the trees. As many moose are captured on frozen lakes, care must be taken not to make a capture where the ice is thin and there is the possibility of the animal falling through the ice. Making a capture on the edge of the lake is to be avoided.

If large antlered moose are to be captured, special consideration should be given to the potential for neck and spinal cord injuries. Moose, both male and female, should not be netted while running at full speed in open terrain. Efforts must be made to slow them down using the terrain and helicopter positioning.

Handling

During net gun capture of moose it is necessary to use two handlers to restrain and secure the animal, one person will be behind and on top of the topside rear leg. The second person will secure the head and shoulder area. At no time should a handler move around the front or leg side of the animal.

Transport

In most studies with moose, animals are captured, processed, and released on site. However, in translocation projects, animals are transported from the capture location to a central processing point. Moose will be transported in large transport bags.

Sexing Moose

In the absence of antlers to differentiate between different sexes, female moose have a white patch directly under the vulva.

Release

Special care must be taken when releasing moose, particularly if the females have calves present. Cows are prone to attacking both humans and helicopter. Escape methods for personnel handling the moose are to hide behind trees or get back into the helicopter. If more than one person is handling the animal, take

cover in different locations upon release so that one person in a secure position may distract the animal while the other boards the helicopter. If the helicopter is parked within the vicinity of the captured moose about to be released, it should be running and ready to take off in case of a charging animal.

Moose Calves

When capturing newly born moose calves, it is important to keep the cow from injuring the personnel processing the calf. Special care must be taken to minimize the disturbance to the cow to avoid her abandoning the area and the calf post processing.

Diseases and Clinical Signs

Brain Worm - Uncoordination, lameness, blindness, circling, emaciation, abnormal posture of head and neck, and paralysis.

Winter Ticks - Loss of winter hair coat beginning on neck, shoulders and anal region. Also emaciation, weakness.

MOUNTAIN GOATS

Mountain Goats have been successfully captured throughout the western USA and Canada.

Capture Timing and Conditions

Late summer captures are a good time for mountain goat captures. The goats are high above tree line and the kids are of sufficient size to run with their mothers.

Multiple Capture:

In some situations where many goats are to be captured from a group it may be necessary to work mountain goats into steep bluffs and overhangs where they feel secure. Otherwise goats may disperse or go into trees where they cannot be captured. Once goats are comfortable in their escape terrain, they can then be singled out and pursued to areas suitable for capture. It is best to use large nets and attempt to have the net catch on small trees or large rocks to avoid animals rolling down the slope in the nets.

Handlers must exit the helicopter in the fastest and safest manner possible. If an animal is in an insecure location (steep etc) a crew member will stay with the animal at all times until stabilized or released.

Handlers must carry at least two strops with them. The strops can be used either to sling the goat to a better position for processing or to secure the goat to trees or rocks to avoid falls and injury.

Special Notes for Mountain Goat Captures

Due to extreme topography involved in most mountain goat captures it is imperative that each capture be monitored for changing weather conditions negatively influencing safety of either the mountain goats to be captured or the personnel involved in the capture.

Diseases and Clinical Signs

Contagious Ecthyma (soremouth) - Nervousness, licking of nose and lips, ulcerative lesions with crusting and scabs on nose, lips, hard palate and hard udder.

Ticks. Indications: Adult and sub-adult ticks in and on the ears, body, and around the anus.

Special Notes

Capture personnel must carry rubber piping to place on goat horns to prevent injury to the animals while restrained and prevent injury to the handler as well as protecting the interior of the helicopter if the animals are to be transported inside the helicopter; however goats are usually transported in small transport bags beneath the helicopter.

MULE DEER

Capture Timing and Conditions

Mule deer have successfully been captured in both summer and winter. However, the majority of captures

occur during months of November to February when mule deer are usually on wintering areas. Captures of females should be avoided in late pregnancy.

If large antlered mule deer are to be captured, special consideration should be given to the potential for neck and spinal cord injuries if the antlered animal is netted while running at full speed.

Collaring Fawns

If expandable collars are being placed on fawns, precaution must be taken when releasing the animals as some tend to kick repeatedly while getting to their feet, sometimes pulling off the expandable collar. To avoid collar removal, animals should be held and placed on their feet before releasing.

Transport

In most studies with mule deer, animals are captured, processed, and released on site. However, in relocation projects and in some studies where more information is required, animals are transported from the capture location to a central processing point. Fawns and yearling Mule Deer will be primarily transported in the back compartment of the helicopter to the processing point. Adult deer are transported slung under the helicopter.

Diseases and Clinical Signs

Hemorrhagic Disease	Weakness, disorientation, respiratory difficulty, oral ulcers, subcutaneous edema, and sudden death in the acute form; healed oral ulcers and sloughing or deformed hooves in recovering animals.
Pinkeye	Watery or pus discharge from the eye with staining of the hair below the eye. Swollen and closed eyelids, cloudy cornea, rupture of the cornea.
Ringworm	Small circular patches of hair loss and crusting on face, ears, or legs. Some individuals suffer from generalized infections with hair loss and crusting over large areas of the body.
Ticks	Adult or sub-adult ticks with associated hair loss and scabs on ears, neck, body and around anus.
Bot Flies	Erratic behavior with running and head shaking during the summer and fall. Watch for sneezing.
Fibromas	Small or large protruding, hairless tumors on the skin. If numerous, the tumors may interfere with vision or feeding. Tumors may become infected by bacteria with ulceration and pus.

PRONGHORN ANTELOPE

Capture Timing and Conditions

Pronghorn are best captured between November to early March when on wintering areas. Early winter is the prime capturing time on most winter ranges. This avoids deep and or crusted snow that can cause excessive skin abrasions and injury to the legs of pronghorn.

In most cases pronghorn are netted with short chase times. Researchers from Colorado have shown that captures should not be attempted without running the animals for at least one minute to warm animals in order to prevent capture myopathy. Pronghorn tend to gather in large groups and run at high speeds so care must be taken to avoid netting more than two or three pronghorn in any one net.

Transport

In most studies with pronghorn, animals are captured, processed, and released on site. However, in translocation projects, animals are transported from the capture location to a central processing point. Pronghorn are transported beneath the helicopter in small transport bags.

Special Notes for Pronghorn Captures

After capture and fitting with a radio collar some pronghorn have been observed to actively resist the collar by jumping, falling, and generally thrashing about. Usually the pronghorn will accept the collar and run away normally. Difficult animals that repeatedly throw themselves to the ground, should be lifted onto their feet and held for a short period before releasing.

Diseases and Clinical Signs

Hemorrhagic Disease	Weakness, incoordination, labored breathing, lateral recumbency and paddling with legs, and sudden death.
Skin Abscesses	Traumatic injuries and abscesses of the skin, especially of the legs and feet in both sexes; and the head in adult males.
Necrotic Somatitis and Foot-rot	Foul smelling necrosis of the tongue and palate, or of the sole of the foot.

Sexing Pronghorn

From the air, animals can be sexed by noting that only males have distinct black elongated markings down either side of their faces near the back of the jaw.

WHITETAIL DEER

Capture Techniques and Locations

If large antlered whitetail deer are to be captured, special consideration should be given to potential neck and spinal-cord injuries when animals being netted are running at full speed.

Much of the work with whitetail deer is located on private land and it is important that pilots are well aware of property boundaries.

In most studies with whitetail deer, animals are captured, processed, and released on site. However, in translocation projects, animals are transported from the capture location to a central processing point. Whitetail deer are transported in small transport bags.

Diseases and Clinical Signs

Hemorrhagic Disease	Weakness, disorientation, respiratory difficulty, oral ulcers, subcutaneous edema, and sudden death in the acute form; healed oral ulcers and sloughing or deformed hooves in recovering animals.
Necrotic Stomatitis & Foot-rot	Foul smelling necrotic infections of the foot or sole of the tongue, lameness, or inability to eat.
Bot Fly Ticks	Running and shaking the head during the fly season, sneezing adult and sub-adult ticks on the ears, body or around the anus, hair loss and rubbing of affected areas.
Fibroma	Small to large hairless tumors of the skin, numerous or large tumors may inhibit normal vision or feeding.

Special Notes for Whitetail Deer Captures

Whitetail deer can be a carrier of the tick involved in Lyme disease transmission, therefore handlers of these deer must be aware of this potential.

WOLVES

Company crews successfully capture wolves with both net-guns and chemical immobilization.

Capture Timing

Primarily locating the wolves for capture is the key issue. Without the presence of an existing radio collar in a pack, the most suitable conditions are in winter. A clear day after fresh snow is optimal as wolves can be tracked more easily.

Equipment for net-gunning wolves

Suitable sized nets.

Lengths of cord approximately 3 feet long with a noose for securing the muzzle.

Leather straps for securing legs.

Two wolf sticks - forked bottom with a T handle & wire noose (sticks must be padded to protect the wolf's teeth if they bite the stick)
- muzzle/face covers.

Techniques

Once netted, it is critical to exit the helicopter quickly and secure the netted wolf. Given enough time, wolves find their way out of nets.

Prepare for each individual capture by securing a wolf stick in a position on the helicopter easily and immediately accessible to the net-gunner as he exits the helicopter.

Immediately after successfully netting the wolf, either the net-gunner or the animal handler must exit the helicopter and immobilize the animal by pinning the wolf to the ground using the forked stick placed on the wolf's neck and sitting astride the animal. Care must be taken not to exert too much pressure on the neck, possibly causing injury. Care must also be taken not to become tangled in the net. If the wolf is excessively aggressive, biting the net, and attempting to attack the handler; use the stick to divert the wolf's attention, protecting the net and giving the second handler an opportunity to use the second stick to pin the wolf's neck and immobilize the animal using body weight while sitting astride it.

Once 'pinned' to the ground with the forked stick the second handler will secure the wolf's head with the noose on the end of the stick. Once the head is secure in the noose the handler has very good control of the wolf. The mouth is then secured and must be strapped to avoid being bitten. Make a noose with the cord (pigging string) and suspend it over the wolf's mouth. It is important to only catch one jaw with this loop. Once the loop is secure on one jaw proceed to put several half-hitch loops around both jaws pulling the mouth shut in the process. Catching only one jaw first minimizes the risk of the rope slipping off the nose as the rope is held in place by the wolf's teeth. When the cord is tied off with the jaws securely shut, place a muzzle/blindfold over the jaws and eyes.

A front and a back leg on the same side of the animal can then be strapped together while the wolf is still in the net. The opposite legs are then also firmly strapped.

Release

With the wolf on it's side, the handlers upper leg should be firmly placed on the wolf's neck and the lower leg over the rump of the wolf. Untie the bottom set of legs, remove the muzzle/blindfold and untie the noose cord from the jaws before loosening and flicking it off its nose. While keeping pressure on the neck and keeping bodyweight on the wolf's body to avoid it wriggling free, untie the topside legs. While coming to a standing position the wolf should be firmly pushed away from the handler.

If wolves are sedated, ensure that they are not left with their heads lower than their bodies. Point the wolves in a direction to reduce exposure of their eyes to the sun. It may be necessary to place a branch or some cover over their heads.

Transport

Wolves are always transported inside helicopters.

Diseases and Clinical Signs

Rabies

Abnormal behavior including lack of fear of humans, increased vocalizations, drooling, and hypersensitivity to sound.

Canine Distemper	Lack of fear of humans, weakness, mucus discharge from nose and eyes, and diarrhea.
Sarcoptic Mange	Hair loss usually beginning at the tail; crusty, sloughing skin with oily, foul smelling discharge, excessive scratching and rubbing.
Echinococcosis	Few clinical signs in most wolves, but shedding of large numbers of larva in feces that can infect humans.

Special Notes

When first approaching a wolf caught in a net some wolves will act aggressively towards the person attempting to secure them. It is critical to have absolute confidence and know exactly what to expect before attempting to capture and handle wolves with net-gun capture. Lack of knowledge and hesitation can lead to either the wolf escaping or a handler being severely bitten.

BEARS

Capture Timing

Primarily locating bears for capture is the key issue. Without the presence of an existing radio collar, the most suitable conditions are in early spring on fresh “green up” when bears come out into the open onto sunny faces to feed, or in the fall when the bears are attracted to berry fields. Brown bears on the tundra can be captured at any time throughout the spring, summer and fall.

Identifying bears in heavily treed areas

In spring, bears can be identified by early morning or late evening flights over clearings that have new growth. Fast pass-overs are necessary to find bears before they get back into the trees. In the fall months bears will be attracted to berry fields. The key is to have previously identified the berry fields and fly around the perimeter of the field to cut off the escape route of the bears back into treed areas.

Release

If bears are sedated, ensure that they are not left with their heads lower than their bodies. Point the bears in a direction to reduce exposure of their eyes to the sun. It may be necessary to place a branch or some cover over their heads.

Transport

Bears are generally transported in animal bags under the helicopter. Smaller bears may be transported inside the helicopter providing they are adequately secured.

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