| | |
|---|---|
| BRITISH COLUMBIA | **MINISTRY OF WATER, LAND AND RESOURCE STEWARDSHIP**<br>**&**<br>**MINISTRY OF FORESTS** |
| **STANDARD OPERATING PROCEDURES** | **Subject:**<br>**Aerial-Based Live Capture and Lethal Removal of Wolves** |

# AERIAL-BASED LIVE CAPTURE AND LETHAL REMOVAL OF WOLVES

## INTRODUCTION

Certain work activities associated with the delivery of wildlife management initiatives (e.g., woodland caribou population recovery) may benefit from, or require, government employees (hereafter referred to as 'Staff') or external contractors (hereafter referred to as "Contractors") to conduct the lethal removal of wolves (*Canis lupus*) using an aerial-based (i.e., helicopter) approach. Such activities may include the live capture of wolves for the purpose of radio-collaring, and/or shooting of wolves for lethal removal.

Aerial-based wolf reduction is deemed by the Province to be the most effective and humane method of removing wolves from remote, expansive landscapes for the purpose of eliciting positive population responses for at-risk ungulate species, such as woodland caribou. Aerial-based wolf reduction facilitates the removal of entire wolf packs with no risk of bycatch (i.e., incidental death of non-target species). A high level of removal intensity is required over large geographical areas to reduce wolf densities below the necessary thresholds to support population recovery for caribou – this can be achieved through aerial-based shooting. At this time, ground-based methods (i.e., trapping or shooting) of removing wolves have not been effective at eliciting positive population responses in at-risk species like caribou, and there is uncertainty surrounding the humaneness and inherent risks of bycatch that can occur through ground-based methods.

Standard Operating Procedures (SOPs) are necessary to ensure that the activities are conducted by standardized and acceptable methods, and that all measures are taken to achieve high standards for animal handling and humane killing. The focus of this document is towards the use of appropriate equipment, animal care and handling techniques, and shooting techniques to maximize humane killing.


| PREPARED BY | | AUTHORIZATION | |
|---|---|---|---|
| NAME<br>Michael Bridger | Name<br>Dr. Caeley Thacker | NAME<br>Michael Burwash | SIGNATURE |
| POSITION<br>Wildlife Specialist | Position<br>Provincial Wildlife Veterinarian | POSITION<br>Associate Director – Wildlife | |


| DATE EFFECTIVE |
|---|
| December 16, 2022 |

For examples of practices and procedures specific to human safety considerations, please refer to the Northeast Region Safe Work Practices (SWPs) and SOPs for aerial net-gunning capture of wildlife and aerial firearm use for wildlife management (https://intranet.gov.bc.ca/flnrord/tools/safety/branch-local-office-safety/north-east).

## DEFINITIONS

- **Contractor** – Non-government personnel or a company hired by the Province of British Columbia (BC) to carry out wolf reduction activities under contract and permit
- **Crew** – All personnel onboard a helicopter (including pilot) partaking in the work outlined in the Standard Operating Procedures
- **Dart gun –** Uses gas or a gunpowder charge to propel a dart containing a chemical immobilizer for the purpose of live wildlife capture
- **Firearm** –Rifles or shotguns of appropriate make, model, and calibre identified for the work outlined in the Standard Operating Procedures
- **Humane Killing**: Killing performed in a manner that minimizes animal distress but may not meet the requirements of euthanasia due to situational constraints (AVMA 2020)
- **Net gun** – A projector used to fire a net over top of wildlife from a helicopter for the purpose of physical restraint for live capture
- **Observer or Handler** – Those Staff or Contractors that have been approved by a Regional Manager to participate as passengers during live capture and shooting of wolves, but not actively engaged in the shooting of net guns, dart guns, or firearms
- **Project Lead** – A BC government employee who oversees a wolf reduction project
- **Shooter** – Those Staff or Contractors that have been approved by a Regional Manager, situated in the rear of the helicopter behind the pilot who are responsible for the operation of the firearm(s), net gun(s), and/or dart gun(s)
- **Staff** – BC government employees
- **Wolf Reduction** – The lethal removal (via aerial shooting) of wolves in pre-determined treatment areas to reduce overall wolf densities as deemed necessary for certain wildlife management activities (e.g., caribou population recovery)

## SCOPE AND PURPOSE

The SOPs apply to the Staff or Contractors involved in helicopter flights where the live capture and/or humane killing of wolves occurs to support certain wildlife management activities. The procedures within this SOP apply to all parties involved in aerial wolf reduction activities. Contractors are expected to follow the procedures outlined in this document; however, the Contractors are expected to follow their company SOPs or SWPs regarding crew safety considerations. Crew safety is out of scope of this SOP – Staff should refer to provincial or regional SOPs and SWPs specific to the human-safety aspects of aerial-based wildlife capture and aerial-based shooting for the purpose of lethal wildlife removal.

The purpose of this SOP is to provide specific step-by-step direction regarding equipment selection, live animal handling techniques, and lethal shooting techniques and considerations. The SOP aims to maximize animal care during live capture and handling and minimize distress for animals that are humanely killed.

| STANDARD OPERATING PROCEDURES | **Subject:**<br>**Aerial-Based Live Capture and Lethal Removal of Wolves** |
|---|---|

These standard operating procedures have been reviewed and endorsed by the BC Provincial Wildlife Veterinarian and will continue to be adapted and amended, as necessary.

## PROCEDURES

### A. EQUIPMENT: FIREARMS, NET-GUNNING, CHEMICAL IMMOBILIZATION, AND SAMPLING

- Firearms – for the lethal removal of wolves
    - Properly functioning firearm(s) of adequate make, model, and calibre must be on board each helicopter
    - Centrefire Rifles:
        - Minimum caliber of .223 or greater
        - Factory-loaded ammunition, high-velocity, with rapid expansion lead-core bullets, or rapid expansion solid copper bullets
            - Expanding copper bullets are currently limited in availability for many rifle calibers, but should be sought out as a preferred option if available
        - Rifles must be equipped semi-automatic actions and detachable magazines for quick follow-up shots and rapid reloading
        - A scope with low magnification or no magnification must be used – scopes with crosshairs or scopes with illuminated red dots are acceptable
    - Shotguns:
        - Should be considered a secondary option relative to a rifle, primarily due to their lower range of effectiveness
        - 10 or 12 gauge
        - Ammunition must be double-aught (00) or triple-aught (000) buckshot
        - Used only at close range (<30 m)
        - Preference for shotguns with semi-automatic actions and detachable magazines for quick follow-up shots and rapid reloading
        - A scope with low magnification or no magnification must be used – scopes with crosshairs or scopes with illuminated red dots are preferable

- Net-Gunning Capture Equipment (for live capture of wolves to facilitate radio-collaring)
    - Two netguns per helicopter (to enable quick follow-up shots)
    - Recommend at least four nets and canisters per helicopter
        - 12’ x 12’ nets are the recommended size for wolves
    - Blank ammunition of appropriate caliber for netgun
    - Hobbles, blindfold, Y-pole (or equivalent), and catchpole (aka. snare pole) for restraining wolves

- Chemical Immobilization (for live capture of wolves to facilitate radio-collaring)
    - Dart gun – $CO_2$ or gunpowder propelled
    - Appropriate darts (e.g., Pneudart, Daninject) suitable for delivering 2–3 mL of solution
    - Appropriate sedative/anesthetic – typically Tiletamine-zolazepam (Telazol/Zoletil) approx. 6–10 mg/kg dosage

        - Consideration for other drugs or new drugs must be discussed with the Provincial Wildlife Veterinarian prior to use
    - Reversal drugs, if available for the anesthetic that was used
    - Syringes and needles
    - Pole syringe (if combining net-gunning and chemical immobilization)
    - Blindfold
    - Eye lubricant
    - Body blanket or mat
    - Scalpel blade for dart excision
    - Sterile saline solution
    - Antibiotic ointment for wound management
    - Thermometer
    - Ear tag pliers
    - Portable pulse oximeter
    - Oxygen and oxygen delivery equipment

- Biological Sampling and Radio-Collaring of Live Wolves
    - 6 mm biopsy punch
    - Envelope for biopsy sample collection
    - Envelope for hair sample collection
    - Ear tag and ear tag applicator (optional for net-gun captures; required for chemical immobilization)
    - Blood collection tubes, needles, and syringe
    - Flexible measuring tape
    - Radio collar – <4% of animal's body weight
        - Associated radio collar hardware (i.e., extra nuts and plates, nut driver, knife, etc.)

## B. REQUIREMENTS AND APPROVALS FOR PERSONNEL (SHOOTERS/HANDLERS, ETC.)

- Candidate Staff identified to participate in animal handling, net-gunning, darting, and/or shooting must meet the minimum requirements outlined in applicable regional or provincial Safe Work Practices, or similar documents
- All Contractors involved in animal handling, net-gunning, darting, and/or shooting must meet the minimum requirements outlined in Government contract procurement processes, and must meet their company's minimum requirements, as applicable
- All personnel involved in wolf reduction activities must be identified on Animal Care Applications and be approved by the Provincial Wildlife Veterinarian prior to being added to a Wildlife Act permit for decision by a Regional Manager
- All personnel identified on the Wildlife Act permits to conduct wolf reduction activities must be deemed to have sufficient skillset, training, and experience by a Regional Manager responsible for issuing Wildlife Act permits
    - 4-7-04.13.07 Evaluating Sufficient Skill Under the Permit Regulation (2021)

## C. PILOT REQUIREMENTS AND HELICOPTER CONSIDERATIONS

- Helicopter pilots must meet or exceed the following requirements:
    - Minimum company requirements for wildlife capture and culling flights
    - Minimum requirements outlined in Government contract procurement processes and/or minimum requirements outlined in regional or provincial Safe Work Practices, or similar documents
    - Identified on the Animal Care Application and approved by the Provincial Wildlife Veterinarian
    - Deemed to have sufficient skill, training, and experience by a Regional Manager responsible for issuing Wildlife Act permits
- Suitable Light/Intermediate helicopter models appropriate for low-level flight, where the Project Lead must consider the terrain, weather conditions, elevation, etc.
    - Appropriate models may include variations of Bell 206 (i.e., Jet Ranger, or Long Ranger), Eurocopter AS350, and Hughes-MD 500 (or variations thereof)
- Helicopter must be equipped with either a sliding or removable rear door for the Shooter's seat (which must be in the rear of the helicopter and on the same side as the pilot's seat)
- Helicopter must be equipped with voice-activated communication
- Helicopter must be equipped with standard safety equipment, including real-time flight tracking, radios, radio-telemetry equipment, emergency locator transmitter, satellite phone, first aid kit, winter survival kit, axe, fire extinguisher, and remote fueling gear (as needed)

## D. LIVE CAPTURE OF WOLVES FOR THE PURPOSE OF RADIO-COLLARING

The deployment of radio-collars can be critical to the success of aerial wolf reduction programs by enabling the Crew to quickly relocate wolf packs and ensure entire pack removal occurs (if that is an objective of the program). Radio-collared wolves may be removed by the Crew prior to the end of the winter field season, at the discretion of the Project Lead. Live capture of wolves follows the general guidance outlined in the "Live Animal Capture and Handling Guidelines for Wild Mammals, Birds, Amphibians & Reptiles" (RIC 1998). The procedures outlined here also align with protocols outlined in Animal Care Applications for live capture of wolves.

### Net-Gunning

The method of aerial net-gunning wolves to facilitate live capture is a commonly used technique in BC. This method poses the lowest risk of injury or mortality to wolves, however, can pose greater challenges to the Crew during the handling process. Net-gunning generally allows for quick handling and processing times and few complications for the captured wolves (relative to chemical immobilization).

The following procedures should be followed upon locating and identifying wolves for the purpose of live net-gunning capture and radio-collaring:

- Captures will take place during the winter (December–March) when cold temperatures reduce the risk of heat stress and deep snow slows wolf movement and reduces the risk of injury
- Once wolves are located, the selection of a particular individual wolf for capture is usually indiscriminate, but that may vary depending on the objectives of the study

- When a candidate wolf has been selected near a suitable capture location, the helicopter will approach the animal and haze it into a suitable nearby opening – maintaining an appropriate flight altitude to encourage the animal to move at a relatively slow pace (e.g., walk, trot, slow run)
- A net projected from a net gun should only be used to capture a single wolf at a time
- Haze times may be extensive (15–20 minutes) as wolves tend to be difficult to push into large openings suitable for capture – wolves are generally in a standstill, walking, trotting, or on a slow run during the hazing period
- The chase time (when wolves are running at a high rate, immediately preceding an opportunity to deploy a net) should be minimized to reduce stress, overheating, and exhaustion (<2 minutes)
- Capture location will be selected to minimize risks to the crew and animal (i.e., avoiding open water, avalanche terrain, thin ice, wooded areas, steep terrain, etc.)
    - Suitable locations may include frozen lakes and rivers, meadows, clearcuts, linear features, preferably with deep snow to slow wolf mobility and cushion any impacts from net entanglement
- Once the wolf is hazed/chased into a suitable opening for capture, upon close approach (within 5–10 m) with the helicopter, the Shooter will fire a net (preferably 12’ x 12’) over top of the wolf
    - A second, follow-up net may be deployed to further entangle the wolf, or if the wolf escapes the first net
    - Two net-guns with four or five loaded detachable net canisters will be available to the Shooter for each capture – this provides a backup netgun and nets that can be used to reduce chase duration if the first net fails to adequately restrain the animal, or to further entangle the animal if a single net is inadequate
- Once the net is deployed the animal usually quickly trips and is wrapped up in the net, becoming entangled
- The pilot should immediately land the helicopter nearby the wolf to drop off the Shooter first (or whomever has access to the Y-pole), followed by the Handler
- The Shooter is generally the first to engage the wolf, and will use a Y-pole (or variation of a pitchfork-like tool) to pin the entangled wolf to the ground by placing the Y-pole around the neck immediately behind the head
    - Care should be taken to avoid allowing the wolf to bite the Y-pole to reduce risk of damage to the mouth/teeth of the wolf
    - The Shooter must apply substantial pressure to the Y-pole to keep the wolf pinned, but should be aware of potential airway and breathing issues and allow the wolf to breath freely
    - Capture in deeper snow can provide cushioning during this process, while also limiting the mobility of the wolf
- Once the wolf is restrained with the Y-pole, the Handler will apply a catchpole snare around the mouth of the wolf and tighten it until it is securely closed
    - Again, care should be taken to avoid allowing the wolf to bite the catchpole excessively to reduce risk of damage to the mouth/teeth of the wolf
    - Care must also be taken when applying the snare pole to ensure the airway of the wolf is not restricted – the snare should be secured as far up the snout towards the forehead as possible to avoid sinching the snare near the nose and hence restricting airflow
- Once the catchpole snare is secured, the Crew will then apply a commercial muzzle or multiple wraps of strong tape (i.e., duct tape) to the mouth to eliminate the risk of a wolf biting any crew members
    - Care must also be taken to ensure the muzzle or duct tape does not restrict the wolf’s airway
    - Airways should be maintained by outstretching the neck and keeping the nose dependent, and monitoring for proper breathing throughout the restraint, radio-collaring, and sampling process
- A blindfold will then be applied to reduce visual stress to the animal

  - Auditory stimuli should be minimized at this time as well, including turning off the helicopter engine, and talking quietly
- Hobbles will then be applied by securing the right front leg to the right rear leg, and the left front leg to the left rear leg
- At this point, the wolf is considered fully immobilized and safe, and can then be untangled and separated from the net(s)
- The wolf will then be positioned to minimize discomfort and complications (i.e., lateral recumbency, head slightly uphill, head and airways free from deep snow)
- The restraining process should generally take less than 2–3 minutes, at which point the radio-collaring and sampling procedures will occur (see Biological Sampling and Tagging of Live Wolves section)
- Upon completion of biological sampling and radio-collaring, the wolf can be released by following these steps:
  - Point the wolf in a safe direction away from the Crew, helicopter, or any hazards
  - The blindfold is removed, and the catchpole snare is reapplied securely high on the wolf's snout
  - The muzzle can be undone, or the tape can be gently unwrapped or carefully cut away while ensuring the catchpole snare remains securely in place
  - The Y-pole is reapplied securely behind the head of the wolf, at which point the hobbles can be removed
  - Finally, the catchpole snare is released, the Y-pole is removed, and the wolf is free to flee
- In the event of any injuries to a wolf, the crew will assess the extent of the injury and likelihood of survival without unnecessary suffering
  - The crew may consider contacting the Project Lead or the Provincial Wildlife Veterinarian for advice prior to taking action
  - If an injury is deemed to cause significant suffering or results in a significantly reduced likelihood of survival, the wolf will be euthanized by high caliber gunshot to the brain
- While mortalities of wolves during net-gunning capture are extremely rare, any mortality will be investigated and if the mortality rate exceeds 2% of captured wolves, the operation will cease, and the Provincial Wildlife Veterinarian and Project Lead will be contacted immediately

**Chemical Immobilization**

An alternative method to net-gunning capture is the use of chemical immobilization techniques. Chemical immobilization must be conducted by experienced personnel to reduce the risk of harm to captured wolves. This method poses additional risks to captured wolves (i.e., dart velocity and placement, drug complications, body temperature regulation, etc.), but is generally a safer method for the crew during the handling process. The same principles regarding the selection of capture locations, haze times, and chase times described in the aerial net-gunning procedures apply.

The following procedures should be followed upon locating and identifying wolves for the purpose of live capture via chemical immobilization (i.e., aerial darting):

- Upon locating a target wolf for capture and radio-collaring, considerations for capture locations, haze time, and chase time (as described above) will be followed
- The helicopter will be positioned approximately 5–10 m from the wolf, setting up the Shooter for a shot opportunity with the dart gun
  - The helicopter positioning should allow for a shot perpendicular to a large muscle mass of the wolf (i.e., hind quarter)

- Multiple darts will be prepared ahead of time to allow for quick follow-up shots if necessary (i.e., first shot misses, or is in an ineffective location to administer the drugs)
    - Each dart will contain the appropriate drug, as advised by the Provincial Wildlife Veterinarian – Most commonly used in BC is a mixture of Tiletamine-zolazepam (Telazol or Zoletil) reconstituted with sterile water
    - For example, 1.8 mL of sterile water per vial of Telazol to yield a 227 mg/mL concentration and a dosage of 6–10 mg/kg
    - The Crew may consider pre-mixing different dosages in different sized darts for small (< 40 kg) and large wolves (> 45 kg)
- Once a shot is taken, the crew will confirm the dart location, and the helicopter will climb in elevation and distance to observe the wolf without unnecessarily hazing or stressing the animal
    - If the initial shot misses, the helicopter will be repositioned for a follow-up shot
    - If the initial shot is in a poor location to effectively administer the drug, the Crew will retreat and discuss options while observing the wolf's response, and consider repositioning for a follow-up shot if the wolf does not show signs of succumbing to the drugs
- Induction time is generally under ten minutes
    - During that time, the crew will attempt to passively haze the wolf into a good location for the wolf to safely succumb to sedation/anesthesia (i.e., away from hazards, like open water) and where the helicopter can safely land nearby
- Once the wolf has become immobilized, the helicopter will land nearby, and the Crew will assess the depth of anesthesia before approaching the wolf (i.e., observing response to sound)
    - An additional, lesser dose may be administered by hand injection or pole syringe if the initial anesthesia is deemed to be too light
- Upon confirming satisfactory sedation/anesthesia, the Crew will commence with radio-collaring and biological sampling
- A blindfold will be applied to reduce visual stress to the animal
    - Auditory stimuli should be minimized at this time as well, including turning off the helicopter engine, and talking quietly
- The wolf will be positioned to minimize discomfort and complications (i.e., lateral recumbency, head slightly uphill, nose dependent, head and airways free from deep snow, the use of a mat or blanket to control heat loss could be considered)
- Vital rates will be monitored during the radio-collaring and sampling process
    - Having oxygen and oxygen delivery equipment available in case of emergency is recommended
    - There is no reversal available for Telazol/Zoletil
- Once radio-collaring and sampling is complete, the Crew will monitor the recovery of the wolf (from a distance) by observing movements of head and legs, and will remain present until the wolf is fully mobile
    - Typical recovery time is approximately 30–120 minutes following administration
- Considerations for injuries or mortalities will be addressed, as described in the net-gunning and sampling procedures

**Combination of Net-Gunning and Chemical Immobilization**

Another option for the live capture of wolves is to use a combination of net-gunning and chemical immobilization. This approach combines the use of a net to entangle a wolf, and a chemical immobilizer to sedate/anesthetize the wolf for

the purpose of radio-collaring and sampling. This method may reduce the risk of harm to the crew during the handling process.

The following procedures should be followed upon locating and identifying wolves for the purpose of live capture via net-gunning combined with chemical immobilization:

- The aerial net-gunning procedures, as outlined above, are followed
- Once the wolf is entangled in the net, the Shooter may administer a dart to the muscle mass of the wolf via dart gun (following the procedures outlined above for chemical immobilization)
- Alternatively, once the wolf is entangled in the net, the helicopter may land, and the Crew will engage the wolf as described in the procedures for net-gunning
- Once the wolf has been pinned with the Y-pole, a Crew member may hand inject drugs (as outlined in the chemical immobilization procedures) directly into a large muscle mass (i.e., hind quarter) of the wolf
- The Crew will continue to physically restrain the wolf via the Y-pole while entangled in the net until the wolf is anesthetized
    - The wolf will be assessed for depth of anesthesia, as described above, and the Crew can commence with radio-collaring and sampling when sufficient anesthesia is confirmed
- Considerations for body positioning, airways, and auditory and visual stimuli will be addressed, as described above
- Upon completion of radio-collaring and sampling, the Crew will follow the same procedures described above for assessing the recovery of the wolf from anesthesia
- Considerations for injuries or mortalities will be addressed, as described in the net-gunning and sampling procedures

**Biological Sampling and Radio-Collaring of Live Wolves**

The live capture and radio-collaring of wolves to facilitate lethal removal presents an opportunity to collect biological samples that can contribute to the broader understanding of wolf health, genetics, diet, and a variety of other research considerations. For sample processing details, refer to BC Wolf Health Sampling Data Form instructions.

The following procedures for sampling and radio-collaring live wolves should be followed:

- Once physically restrained, or chemically immobilized, the crew will assess the wolf for any injuries that may have occurred during capture
    - In case of injury during a capture event, the Crew will assess the severity
    - If an injury is deemed to significantly affect the likelihood of survival, the wolf will be euthanized via a high velocity gunshot directly to the brain
    - In the event of a capture-related mortality or euthanasia, the Crew must notify the Project Lead and/or the Provincial Wildlife Veterinarian before proceeding with additional captures
- Small crews of two personnel will be used for radio-collaring and sampling, and sudden movements or auditory stimuli will be kept to a minimum to reduce stress
- Wolves will be fitted with a satellite GPS radio-collar, weighing approximately 700 g (equal to about 1.5% of the body mass of an average-sized wolf)
    - Any model or variation of radio-collar to be used must be less than 4% of the animal's body weight
    - Radio-collars will contain an internal tip switch to detect animal movement, and should be programmed to send a mortality alert if no movement is detected for a sustained period (i.e., 12-hours)
- The radio-collar will be applied by the most experienced crew member

  - Radio-collars will be fitted in a manner to maximize comfort for each wolf, while ensuring that they are not fitted too loosely as to slip off the individual or cause neck irritation
  - Radio-collars should be fitted snuggly, with one or two fingers width between the skin and the collar belt
  - If young wolves (< 1 year-old) are captured, radio-collars should be slightly looser to allow for growth over the course of the winter
- Radio-collars should include labelled plates instructing hunters or trappers to contact Staff if they harvest a collared wolf
- Radio-collars should be programmed with relatively high fix rates (8–12 fixes per day) to provide the Crew with up-to-date location data to facilitate effective lethal removal
- A sample of over > 100 hairs will be pulled from between the shoulders (roots included) and placed into a paper envelope
  - Pliers may be required to pull hairs, as wolf hair is often difficult to pluck
- A 6 mm punch biopsy may be taken from the ear of the wolf near the base (close to the head), making sure to avoid blood vessels or cartilaginous ridges in the ear
  - The biopsied tissue will be placed into a paper envelope
  - The hole left by the punch may be used for applying an ear tag
- Ear tags are a requirement only if chemical immobilization was used or other drugs administered, and may be useful as a visual queue when attempting to differentiate the radio-collared wolf from uncollared individuals in the pack while conducting lethal removals
- Blood should be drawn (10–15 mL) from either a jugular, cephalic, or saphenous vein for serological screening (i.e., parvovirus, neospora, distemper, etc.), pressure will be applied to the venipuncture site until bleeding has stopped before releasing the wolf
  - Blood should be prevented from freezing in the field prior to processing
- Biological samples should be processed and prepared, as necessary, soon after collection, and sent to the BC Wildlife Health Program once ready (see BC Wolf Health Sample Data Form for instructions)
- Other information to be collected includes:
  - General body condition and previous injuries
  - Morphometric measurements
  - Age estimate using tooth eruption/wear/staining as an index
  - Sex
  - Breeding status for females (i.e., lactating, swollen labia with discharge, etc.)
  - Colour
  - External parasite presence and severity
  - Pack size estimate
  - Location
  - Photos
- The total handling time associated with radio-collar attachment and sample collection should be less than 15 minutes

## E. AERIAL SHOOTING FOR THE PURPOSE OF LETHAL REMOVAL (I.E., CULLING)

The procedures outlined below align with the AVMA Guidelines for the Euthanasia of Animals: 2020 Edition (Subsection 7.6: Free-Ranging Wildlife) and the AVMA Guidelines for the Depopulation of Animals: 2019 Edition

(Section 9: Free-Ranging Wildlife, Subsection 9.4: Carnivores). Gunshot is an acceptable and effective method for humanely killing carnivores, and is the preferred method for removing large, free-ranging carnivores from the landscape. Furthermore, aerial shooting is commonly used to remove carnivores, such as wolves, from vast landscapes. Nontarget bycatch is avoided entirely through this method. Appropriate shot placement results in minimal animal suffering, where bullet placement is to the head, heart/lungs (chest), or neck (vertebrae, with intent of severing the spinal cord). Wolves should only be shot when a humane kill is judged as highly probable – this requires skilled shooters, appropriate firearms, ammunition, shooting distances, and ultimately a high likelihood of hitting a target area that results in instantaneous or near-instantaneous incapacitation.

Prior to entering the field, the accuracy and precision of the firearms should be tested at a firearms range, and Shooters should sight the firearm for the typical distances anticipated while shooting in the field. Shooting should be carried out by skilled and experienced Shooters who have been deemed suitable for the task and hold the necessary licenses and training (see 4-7-04.13.07 Evaluating Sufficient Skill Under the Permit Regulation - 2021).

The following sequence of events should be adhered to upon locating and identifying wolves for the purpose of lethal removal via aerial shooting:

- Upon locating wolves, the pilot and Shooter should discuss the external conditions, such as wind direction and terrain, and determine the safest direction of approach to haze the wolves into a suitable location for shooting
- A suitable location for shooting should be open enough to allow the pilot to position the helicopter within an ethical shot distance that would result in a high likelihood of the Shooter hitting the target zone
    - An ethical distance is considered the longest shot that can be taken that will result in a humane kill (instantaneous or near-instantaneous incapacitation) with a low chance of missing the target area
    - For a rifle, under most circumstances, shot distances should be less than 50 m
    - For a shotgun, under most circumstances, shot distances should be less than 30 m
- A clear line of sight is required to ensure projectiles do not deflect on route to the target
- Wolves should be slowed down, when possible, to maximize shot accuracy
    - This can be achieved by hazing wolves uphill or into deep snow
- Shooters should be aiming for the 1) head – brain, 2) neck – upper cervical spine, 3) chest – heart/lungs to achieve the most humane kill possible
    - Desired target location may depend on shot distance, speed, terrain, etc.
    - A shot to the brain or upper cervical spine is optimal for instantaneous loss of consciousness and rapid death, but is also a smaller, challenging target area
    - A shot to the chest (heart/lungs) may be preferable, as it is the largest vital area and has a higher likelihood of an accurate shot under field conditions
- Shots must only be taken when a wolf's kill zone can clearly be seen and is within the effective range of the firearm being used
- If shot opportunities do not meet the aforementioned conditions, no shots should be taken
- Once a shot occurs, the Shooter and pilot will communicate about the shot location and effectiveness
- If the wolf becomes incapacitated after the initial shot and impact, the crew will hover over the wolf and confirm death by observing the following:
    - No head or tail movement or shaking
    - The carcass is limp and muscles are relaxed

        - Stiff, tense, or kicking limbs may occur post-mortem, but should return to a relaxed state shortly thereafter
    - No rhythmic breathing (if able to observe closely from helicopter)
    - No eye blinking – eyes are fixed and glazed (if able to observe closely from helicopter)
- If there is any doubt about death, another lethal follow-up shot should be taken
- If a wolf is not immediately incapacitated, a lethal follow-up shot(s) should occur until the wolf is immobile/incapacitated and death is confirmed
    - Additional ammunition, or detachable magazines, must be immediately available for rapid reloading and follow-up shots, as necessary
    - Semi-automatic rifle and shotgun actions are preferred for lethal wolf removal when attempting to remove multiple wolves from a pack during a lethal removal event
- Once death is confirmed, the shooting can be terminated, a GPS location of the carcass or carcasses should be recorded, and the Crew can move on to locate and remove other wolves
    - Coat colour and age estimates of dispatched should be recorded

By following the procedures outlined in this document, the standards for live capture and humane killing can be achieved. Professional oversight from Ministry Staff frequently onboard wolf reduction flights helps support the assessment of humaneness. Ministry Staff, in their role as Wildlife Biologists and designated as Officers under the B.C. Wildlife Act can provide real-time assessment of crew proficiency and ultimately make determinations as to whether the standards for live capture and humane killing are being met. Processes are in place for contract procurement and issuance of Wildlife Act permits ensure that the experience and skillset of those Contractors are sufficient and that they can achieve humane standards when not under the direct oversight of Ministry Staff. Regular check-ins between Staff, Contractors, and the Provincial Wildlife Veterinarian prior to, during, and following wolf reduction efforts are an important part of the ongoing assessments.

If any aspects of the program implementation consistently fail to meet the expectations for live capture and/or humane killing, measures will be taken to address those.

- Such aspects may include the performance of individual personnel (e.g., net-gunner/shooter, handler, or pilot) or Crews as a whole, firearm models, calibers, ammunition, or other equipment
- Corrective measures may include changes to equipment, or removal of individuals or Crews from aerial wolf reduction programs
- Such measures should be at the discretion of the Staff and Project Leads overseeing the operational aspects of the programs, the Provincial Wildlife Veterinarian, and/or the Regional Manager responsible for the issuance of permits

## POLICIES, PROCEDURES, AND OTHER CROSS-REFERENCES

**B.C. Legislation and Regulations:**

- *Wildlife Act* (RSBC 1996 c.448)
- Permit Regulation (BC Reg 19/2021)
- Hunting Regulation (BC Reg 220/2020)

- Wildlife Act General Regulation (BC Reg 340/82)

**B.C. Policy, Procedures, Management Plans, and other guidance:**

- 4-7-04.01.3 Control of Species Policy (2006)
- 4-7-04.01.3 Protecting Species at Risk from Other Species (2006)
- 4-7-04.13.07 Evaluating Sufficient Skill Under the Permit Regulation (2021)
- 4-7-04.06 Caribou Recovery Program Interim Aerial Wolf Reduction Procedure (2021)
- Resources Information Standards Committee
    - Live Animal Capture and Handling Guidelines for Wild Mammals, Birds, Amphibians, and Reptiles (1998)
- B.C. Parks Policy
    - Native Wildlife Species Control Policy: Control of Native Wildlife Species for the Recovery of Species or Ecological Communities at Risk (2020)
- Management Plan for the Grey Wolf (*Canis lupus*) in British Columbia, 2014
- BC Animal Care Applications
- NE Standard Operating Procedures and Safe Work Practices for net-gunning live capture of wildlife
- NE/LWRS Standard Operating Procedures and Safe Work Practices for using firearms from a helicopter

**Federal Legislation and Regulations:**

- Firearms Act (SC 1995, c.39)
- Aeronautics Act (RSC 1985, c.A-2)
    - Canadian Aviation Security Regulations (SOR/2011-318)
- Transportation of Dangerous Goods Act, 1992
    - Transportation of Dangerous Goods Regulations (SOR/2001-286)

## Other Guidelines:

- American Veterinary Medical Association Guidelines for the Depopulation of Animals (2019)
- American Veterinary Medical Association Guidelines for the Euthanasia of Animals (2020)