

Charles Darwin University Animal Ethics Committee

Standard Operating Procedure:

Humane Killing of animals under field conditions (DBCA, 02/2022)

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NOTE:

- For cane toad euthanasia, please refer to Cane Toad Euthanasia (GSOP, 08/2022)
- The CDU AEC would like to reiterate that Table 1 provides general guidance only and is not prescriptive. The CDU AEC recommends that investigators consider the use of chemical agents for the euthanasia of amphibians and fish. The use of any such chemical agents should be detailed in the project application.

Standard Operating Procedure

HUMANE KILLING OF ANIMALS UNDER FIELD CONDITIONS

Prepared by: Species and Communities Branch, Science and Conservation, Department of Biodiversity, Conservation and Attractions

Prepared for: Animal Ethics Committee

Version 1.2

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This document has been reviewed and endorsed by the Department's Animal Ethics Committee

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1 Purpose

This standard operating procedure (SOP) provides advice on the humane killing of animals under field conditions for personnel conducting biological surveys, fauna monitoring programs, captive breeding programs, translocations and introduced predator control, and handling sick, injured, orphaned and confiscated fauna. This document is intended as an operational guide to facilitate appropriate humane killing practices, and ensure that animals do not suffer unnecessarily. The humane killing of animals may be required for a number of reasons including;

- Emergency euthanasia of animals with untreatable injuries or illness/disease where an animal may be suffering.
- As a requirement of a research procedure or vouchering purposes.
- Destruction of live-captured declared pest animals where release is prohibited.
- Diagnostics and disease screening for emerging diseases/zoonoses

This standard operating procedure provides advice on the humane killing of animals in fauna research and management under field conditions only.

2 Scope

This SOP has been written specifically for scientific and education purposes, and endorsed by the Department's Animal Ethics Committee. However, this SOP may also be appropriate for other situations.

This SOP applies to all activities involving fauna that are undertaken across the State by Department of Biodiversity, Conservation and Attractions (hereafter Department) personnel. It may also be used to guide fauna-related activities undertaken by Natural Resource Management groups, consultants, researchers and any other individuals or organisations. All Department personnel involved in fauna monitoring and management should be familiar with the content of this document.

Projects involving wildlife may require a licence under the provisions of the *Wildlife Conservation Act 1950* and/or the *Biodiversity Conservation Act 2016*. Personnel should consult the Department's Wildlife Licensing Section and Animal Ethics Committee Executive Officer for further guidance. In Western Australia any person using animals for scientific purposes must also be covered by a licence issued under the provisions of the *Animal Welfare Act 2002*, which is administered by the Department of Primary Industries and Regional Development. This SOP complements the *Australian code of practice for the care and use of animals for scientific purposes* (The Code). The Code contains an introduction to the ethical use of animals in wildlife studies and should be referred to for broader issues. A copy of the code may be viewed by visiting the National Health and Medical Research Council website (<http://www.nhmrc.gov.au>).

3 Definitions

Animal handler: A person listed on an application to the Department's Animal Ethics Committee who will be responsible for handling animals during the project.

Anoxia: A lack or absence of oxygen.

Caudally: Of or towards the posterior part of the body.

Cervical: Relating to the neck.

Euthanasia: the humane killing of an animal, in the interests of its own welfare, to alleviate pain and distress.

Humane killing: the act of inducing death using a method appropriate to the species that results in a rapid loss of consciousness without recovery and minimum pain and/or distress to the animal.

Intraperitoneal: Referring to injection into a specific site in the abdominal body cavity.

Intravenous: Within a vein.

Neonate: A newborn, up to four weeks old.

Point Blank: 0.1-2m brain shot via firearm.

Temporal: Pertaining to or situated near the temple or temporal bone of the skull.

Ventral: Pertaining to the venter or belly; abdominal.

Zoonoses: Any infectious disease transmitted to humans from contact with animals.

4 Deciding When Humane Killing Is Necessary

In most situations the decision to humanely kill an animal must be based on the perceived degree of suffering and the chances of recovery. If an animal is severely injured and is suffering, it must be relieved of its suffering as soon as possible. Although there may be many different circumstances under which a decision process is carried out, generalised guidance criteria are provided in Figure 1.

Note the following when using the decision-making flow chart:

- There may be other reasons for humane killing to be necessary other than the animal being sick, injured and/or orphaned.
- For a list of Threatened species in Western Australia, refer to the Department's Threatened Species and Communities webpage <https://www.dpaw.wa.gov.au/plants-and-animals/threatened-species-and-communities>
- If it is decided to humanely kill the animal, contact the Department's Species and Communities Branch via fauna@dbca.wa.gov.au to find out whether a research or educational institution is interested in receiving specimens.

Humane killing should only be carried out after giving due consideration to the following factors (in order of priority):

1. Human safety
2. Animal welfare
3. Practicality
4. Skill
5. Aesthetics

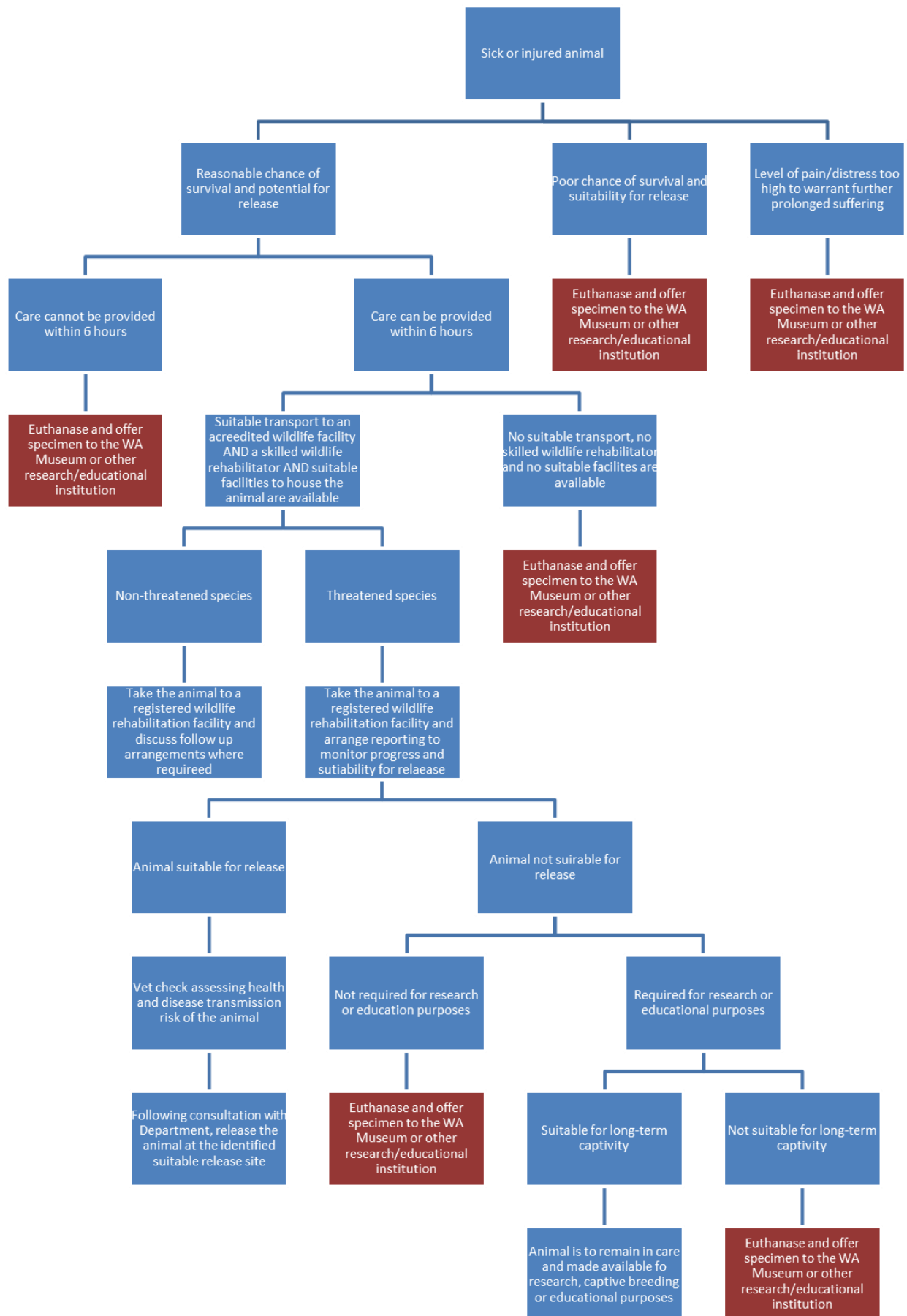


Figure 1 Decision making flow chart for sick, injured and/or orphaned fauna.

Department fauna research projects must have an *Emergency Euthanasia Action Plan* developed for the project, and have it identified and endorsed in the AEC application. This action plan should identify and address all potential situations where emergency euthanasia may be required as part of the tasks and duties to be undertaken by personnel and the protocol assigned to manage individual situations. All staff must be aware of the agreed action plan prior to undertaking field work. Where unforeseen situations occur that are not designated under an action plan, general guidance for decision making is described below.

5 Humane Killing Process

The goal of using humane killing techniques is to produce a painless, rapid death and to avoid stressing or alarming the animal. Animals should be humanely killed in a quiet area, away from other animals, as distress signals from a sick or injured animal may cause fear and distress for others within audible reach. The technique used should be as reliable, simple, safe and effective as possible, should only be performed by competent personnel, and should not cause undue stress to human observers. Wherever possible, it should be conducted away from members of the public, but in doing so, should not add additional stress to the animal.

Remember that your safety and the safety of co-workers and volunteers is the first priority.

Upon deciding it is necessary to humanely kill an animal, the preferred methods are dependent upon a number of factors:

- The animal species and age grouping.
- If the animal is injured, the severity of the injury (i.e. is immediate euthanasia required).
- Overall stress level of the animal (i.e. can the animal be safely handled and transported).
- Available transportation and time (i.e. distance to a veterinary clinic or wildlife rehabilitation facility, is appropriate transportation equipment on hand).
- Location (e.g. proximity to people and infrastructure in relation to firearm safety).
- Practicality of the method in regards to the nature of the animal and the situation, and presence of appropriately experienced personnel (i.e. can the animal be safely handled and chosen methods safely administered).

Expert judgement will be required to determine the most appropriate means to proceed. The suitability of the methods in individual circumstances will be at the discretion of the Chief Investigator of the project.

The following list, in order of priority, can be contacted to assist in decision making:

- Principal Zoologist, Species and Communities Branch, Department of Biodiversity, Conservation and Attractions ((08) 9219 9511)
- Perth Zoo Veterinary Department
- A local veterinarian, preferably with experience with the specific species. It is preferable to have a local veterinarian pre-selected prior to undertaking fauna-related activities.
- Registered fauna rehabilitation facility with experience with the specific species. It is preferable to have a regular wildlife rehabilitator pre-selected prior to undertaking

fauna-related activities. However, the Wildcare Helpline can be reached on: (08) 9474 9055 (24 hrs) and may be able to connect you to the nearest registered rehabilitation facility.

Procedures are preferably performed by a person competent in, or qualified for, the method to be used, or under the supervision of a competent person. The methods recommended for humanely killing animals in various field situations described in this standard operating procedure include:

- Injectable chemical agents (lethal injection)
- Shooting via firearm
- Blunt force trauma
- Cervical dislocation

Further details regarding the appropriateness and circumstances under which each is carried out are described in detail in the following sections. There are numerous methods not described in this SOP which are generally considered as either unsuitable for field conditions in the context of this document or not acceptable. However, there are situations in which alternate methods not described may be valid upon approval by the Department's Animal Ethics Committee. For example, there are continual advances in specialised equipment such as captive bolt mechanisms that may be suitable for use in field conditions.

The use of either injectable chemical agents or firearms (where considered appropriate to the situation) are the preferred methods for humanely killing animals, where the required accreditation, equipment and personnel skills are available, it can be applied in a timely manner, and does not cause additional stress to the animal. This may be difficult when in remote locations. Blunt force trauma and cervical dislocation are acceptable methods in these situations. Refer to Table 1 for the limitations of each method that must be considered when deciding how to proceed.

Note: This general guidance will not conform to all situations and all incidents must be assessed on an individual basis.

If an animal that is to be humanely killed has dependent offspring, then the dependant offspring must also be humanely killed unless care can be provided for them (see Figure 1). This would require planning for the care and subsequent release of the animal in regards to time and resources required to ensure its suitability for release; and an appropriate designated release site. For further information refer to the Department SOP for *Care of Evicted Pouch Young*.

6 Humane Killing Techniques Under Field Conditions

Ideally either injectable chemical agents or firearms should be used to humanely kill animals wherever possible. However, if the equipment required is not on hand, trained personnel are not available to carry out these techniques or the condition/characteristics of the animal and/or field environment do not favour the accurate and successful application, then alternate methods must be used. The methods outlined below and in the following tables are based on laboratory testing and Department experience. Table 1 is designed as a quick overall reference summary of the most humane and ethical methods of euthanasia under field

conditions. Table 2 outlines the factors associated with each method that should be considered and mitigated where possible.

Note: Table 1 must never be used in isolation and must be used in conjunction with the explanatory information that follows. The information contained in this SOP is general guidance only.

Table 1 Recommended techniques for humanely killing animals. The symbols denote ✓ recommended, □ not recommended and X not acceptable (adapted from Reilly, 2001).

Species/Animal Class	Lethal Injection	Shooting	Blunt Trauma	Cervical Dislocation
Small mammals (e.g. bats, mice, rats)	✓	□	✓	✓ (under 150g only)
Medium sized mammals (e.g. quolls, bandicoots, rabbits)	✓	✓	✓	✓ (juveniles under 150g only)
Dingoes, dogs, foxes and cats	✓	✓	□	✓ (juveniles under 150g only)
Kangaroos and wallabies	✓	✓ (brain shot preferable; heart shot acceptable)	✓	✓ (pouch young under 150g only)
Birds	✓	✓ (medium and large birds only)	✓	✓ (small and medium birds only)
Lizards and snakes	✓	□	✓	X
Freshwater turtles	✓	□	✓	X
Marine turtles	✓	✓ (brain shot only)	✓	X
Crocodiles	□	✓ (brain shot only)	✓ (juveniles only)	X
Amphibians	□	□	✓	X
Fish	□	□	✓	✓ (small fish only)
Cetaceans, sirenians and pinnipeds	X	✓	X	X

Table 2 Qualitative comparison of recommended euthanasia methods.

Factors	Lethal Injection	Shooting	Blunt Trauma	Cervical Dislocation
Level of certification and training	High	High	Low	Medium
Specialised equipment and costs	High	Medium	Low	Low
Relative time to death from commencement of procedure	Potentially prolonged as handling and sedation is required first	Instant if accurate placement of shot	Instant if animal can be approached and struck quickly	Potentially prolonged as handling is required first
Stress to animal	Potentially high during handling	Low if accurate placement of shot	Low if stress is reduced by approaching from behind	Potentially high during handling
Level of risk/hazard to personnel health and safety	High	High	Low	Low
Level of amenity and distress to personnel and the public	Low	Medium	High	Low

6.1 Injectable chemical agents (lethal injection)

This technique involves administration of a barbiturate overdose either by the intravenous, intracardiac or intraperitoneal injection. Barbiturates are able to depress the central nervous system leading to death following cessation of breathing and heart function. Refer to Table 1 for general guidance on the suitability of lethal injection for a selection of common species. Administration of injectable chemical agents is a specialised method of euthanasia that requires significant training, particularly for use in field situations. Injectable solutions of Sodium Pentobarbitone can be used for humane euthanasia of most vertebrates however its use as a sole agent is often restricted in its applicability to certain groups of species in field situations due to safety and practicality factors.

The most efficient route for the solution to enter the blood stream and take effect is via intracardiac and intravenous injection. Accurate administration via intracardiac and intravenous is highly technical and requires significant training and experience. Injection by the intraperitoneal route is generally used in the field environment and while not as technically difficult as the other injection methods still requires training and a detailed understanding of dose rates. Expertise is required to inform under what conditions and for what species a given method will be suitable. When used at high concentrations pentobarbital causes pain on injection and therefore a sedative such as Zoletil may often be administered first. Sedation aims to reduce stress to the animal and eliminate potential pain while allowing the operator to accurately administer the injection.

It is critical to ensure confirmation of death post administration of pentobarbital, particularly when using a sedative. It must be confirmed that the technique has been performed correctly and that the animal has not simply been sedated without being euthanased.

Department personnel seeking to use this method must be trained in the correct dose rates and injection techniques by an experienced veterinarian, be supervised by qualified staff in administration until deemed competent, and understand storage and safety procedures. Euthanasia solutions can only be administered by Department personnel who have satisfied the applicable permit requirements of the Western Australian Department of Health (DoH). A permit from the DoH is required for use and storage of S4 drugs (scheduled prescription only medicine or prescription animal remedy). Storage facilities must be registered and double lock secured. Such drugs must also be securely locked in a container during transport.

6.2 Firearms (shooting)

Shooting is a quick and effective means of humanely killing animals and commonly the most practical method in field situations, particularly where animals cannot be safely handled and restrained. Shooters can euthanase an animal from a distance, and assuming the placement of an accurate shot, it produces an instant or rapid death.

Shots must be aimed so that the projectile enters the brain or heart, causing instant loss of consciousness. The shooter must always aim for a brain shot, a heart shot is only justifiable where the accuracy required for a brain shot cannot be achieved or where there are diagnostic considerations (e.g. taxonomic studies). Diagrams illustrating points of aim for the brain shot (and heart shot if required) are described for common species in Appendix II.

Note: shooting is generally only suitable for larger animals.

Shooting requires specialised equipment and must only be carried out by personnel who have completed nationally recognised training, who have been issued a nominated persons authorisation by Western Australian Police and who are listed on the Department's Corporate Firearms Licence. A guide to the recommended firearms, calibre and shot specifications for the ethical and humane shooting of common animals are shown in Appendix I.

Firearm users must strictly observe all relevant safety guidelines relating to firearm ownership, possession and use. All people should stand well behind the shooter when an animal is being shot and the line of fire chosen should prevent accidents or injury from stray bullets or ricochets.

Animals must not be shot from a moving vehicle or platform. The animal must be clearly visible, stationary, within the appropriate range and shot using the appropriate calibre and cartridge specifications (see Appendix I).

The firearm specification and techniques described in Appendices I and II are a guide only and do not cover all species:

- The final choice of minimum calibre and shot size/type may depend on the known behavioural characteristics of the species (e.g. wary vs. approachable, ground forager vs. canopy forager for birds).
- Further specialist training in addition to the Department's Firearms Training Course is required for the destruction of marine species.

- Species specific research should be undertaken and expert advice sought as part of an *Emergency Euthanasia Action Plan* to determine the most appropriate shooting method prior to undertaking field work.

6.3 Blunt force trauma

This technique involved a hard, sharp blow to the base of the back of the skull with a blunt metal or heavy wooden bar. Blunt force trauma is usually recommended to humanely kill reptiles, amphibians and small to medium sized mammals. This method should only be utilised where the person has some experience in the practice of blunt force trauma, feels comfortable in carrying out the technique and can be followed by a secondary method of euthanasia where appropriate (e.g. cervical dislocation, decapitation) if there is uncertainty as to final death.

The anatomy of the skull varies greatly between species and some will require more force than others to be an effective and humane method. The operator must be confident of performing the technique quickly and effectively. This method should not be used where the behaviour of a stressed animal will impede the operator carrying out the method quickly and effectively.

Note: this method can lead to undesirable damage to key body parts that are important for taxonomic studies. If the head must be preserved intact, for scientific purposes, an alternative technique should be used. Refer to the Department SOP for Vouchering Vertebrate Fauna Specimens for further guidance.

6.4 Cervical dislocation

Cervical dislocation leads to separation of the skull and the brain from the spinal cord by pressure applied posterior to the base of the skull, damaging the brain stem which controls respiration and heart activity. This is an acceptable method of humane killing for small animals that are easily handled (e.g. small to medium sized birds or mammals up to 150g). Some consideration should be given to the cervical anatomy and degree of musculature when assessing if it is appropriate for the animal in question. This requires training gained under the supervision of more experienced personnel.

This technique involves holding the animal prostrate on a solid surface with the thumb and forefinger of the operator firmly squeezing the neck behind the head of the animal. The hindquarters are grasped firmly with the free hand and pulled caudally away from the head. An instrument such as scissors or a steel rod can be used in place of the thumb and forefinger. For birds, the legs are taken in the left hand and the head held between the first two fingers of the right hand with the thumb under the beak. A sharp jerk with each hand, pulling in directly opposite directions will break the spinal cord and carotid arteries.

The operator must be confident of performing the technique quickly and effectively. Cervical dislocation should only be performed by a person experienced in the technique for that species. This method should not be used where the behaviour of a stressed animal will impede the operator carrying out the method quickly and effectively.

6.5 Confirmation of death

After administering any of the humane killing methods, it is essential to establish that the animal is dead before disposing of the carcass. This can be difficult for some animals such as

reptiles and amphibians. A combination of criteria is most reliable in confirming death, and at least three signs must be used to establish that death has occurred, including:

- absence of a heart beat;
- lack of pulse;
- no corneal reflex or response by the eyelid (where applicable) when stimulated and glazing of the eyes;
- absence of breathing;
- loss of reflex (eg. no response to firm toe pinch in mammals)
- loss of colour (changing from pink to white or grey/blue) in the mucous membranes.
- rigor mortis

Absence of breathing should not be used as the sole criteria to confirm death.

Methods should be appropriate to the species being euthanased. If there is any doubt about confirmation of death, a secondary euthanasia method must be used to ensure the animal is dead.

Additional care must be taken to ensure death following euthanasia in ectothermic vertebrates such as fish, reptiles and amphibians. Such animals may normally exhibit very low heart rates, and can hold their breath for an hour or more. Absence of heart beat and/or breathing will not necessarily provide confirmation of death in these animals and they must be monitored closely; a secondary method of euthanasia may be required to confirm death.

6.6 Preservation and/or disposal of dead animals

Guidance for the preservation of animals for post-mortem, pathology testing and DNA analysis is provided below. If not required for scientific purposes, dead or euthanased animals should be offered to the Western Australian Museum which holds the research collection forming the basis of our understanding of the State's biodiversity. Contact the Species and Communities Branch via fauna@dbca.wa.gov.au or (08) 9219 9511 for contact details of research and education institutions that are interested in receiving specimens. Detailed information regarding the vouchering of specimens can be found in the Department SOP for *Vouchering Vertebrate Fauna Specimens*.

Pathology and post mortem

- Refrigeration is often the most practical preservation method and is sufficient where the specimen can reach a veterinarian for examination within 48 hours. Refrigeration may be particularly useful where the entire body of a larger animal requires examination and preserving fluid is impractical. The body of the animal can be wrapped in newspaper and placed in a well labelled plastic bag prior to chilling.
- Formalin is the ideal preserving fluid, particularly where examination of a specimen is likely to be delayed beyond 48 hours. *Note: formalin is hazardous.* It requires careful handling and containers used to hold samples must be well labelled. Tissue samples can be placed in a volume of 10% buffered formalin solution equal to at least ten times the tissue volume to ensure adequate preservation. Due to the hazards involved in handling this substance it is more practical for the entire body of small specimens or for samples taken from larger specimens.

DNA analysis

- 100% ethanol is most efficient where DNA analysis is required. The body cavity must be opened along the ventral mid-line to allow the preservative to penetrate the internal organs and the animal must be immersed in about five times the volume of the specimen. 70% ethyl alcohol (a mix of seven parts methylated spirits to three parts water) will suffice in most cases for small specimens if ethanol is not available.

If the specimen is NOT required for the Western Australian Museum collection or other scientific or educational purposes, the body should be buried at an appropriate site, disposed of at an approved refuse disposal site or disposed of by a veterinary clinic. Dead animals carry and shed infective agents, so appropriate care and hygiene must be maintained during handling, storage and transport of specimens and carcasses (refer to the Department SOP for *Managing Disease Risk in Wildlife Management*).

If burying a carcass, ensure it is buried sufficiently to prevent scavenging. The recommended minimum depth of burial is 1m. Where secondary poisoning may be a potential risk to other fauna (i.e. where injectable chemical agents have been used) or other disease risks apply, it may be necessary to incinerate the carcass or cover it with lime before burial. Contact the Local Government Authority to arrange for disposal of animals that have been euthanased on Shire land.

7 Level of Impact

The impact of the above humane killing procedures on fauna should be low if experienced personnel are available to carry out techniques correctly. Incorrect or inappropriate use of the above techniques can potentially result in a high level of impact and care should be taken to minimise the level of impact where possible.

Potential impacts include:

- Distress to animals during handling (refer to the Department SOP for *Hand Restraint of Wildlife*).
- Pain (where a technique is administered incorrectly or ineffectively).
- Physical injury to the animal (in trying to restrain an animal or an animal causes itself further harm as a result of distress).
- Transmission of infectious agents to animals as result of poor hygiene practices (refer to the Department SOP for *Managing Disease Risk in Wildlife Management*).

Note: Ineffective attempts to humanely kill an animal can potentially promote high levels of stress and suffering.

Where personnel are not equipped to perform the appropriate euthanasia method correctly, or do not feel comfortable in carrying out the action, it is best to leave the animal to avoid increased stress and suffering. Pre planning and application of an *Emergency Euthanasia Action Plan* is essential as an effective mechanism for avoiding such situations.

8 Ethical Considerations

There are a number of ethical considerations that should be addressed to reduce the level of impact of humane killing on the welfare of animals. Department projects involving fauna will require approval from the Department's Animal Ethics Committee.

An *Emergency Euthanasia Action Plan* must be incorporated in the pre-planning of any field based projects and personnel with adequate training and experience must be present when carrying out field based duties.

8.1 Reporting

For projects approved by the Department's Animal Ethics Committee, adverse events such as injury, unexpected deaths or humane killing must be reported in writing to the Department's Animal Ethics Committee immediately following the incident (or at the soonest opportunity) (as per 2.2.28 of The Code) by completing an *Adverse Events Form* available on the Department's AEC Intranet webpage.

All animal deaths (including humane killing) and injuries should be recorded and communicated to the Chief Investigator of the project.

Chief Investigators must provide statistics of all animal deaths (including humane killing) and injuries in annual reports submitted at the end of the year or at the completion of a project.

8.2 People

The public can be a major hazard to the safety of the animal, personnel and themselves. Where possible, and without increasing the stress of the animal, euthanasia of an animal should be conducted away from members of the public. Only personnel who need to be directly involved should remain in the immediate vicinity.

8.3 Animal Handling

To ensure minimal stress to animals, they should only be handled for as long as required to assess the animal (where disease is suspected) and determine a decision outcome. Improper restraint, especially when dealing with a stressed and frightened animal, can lead to major physiological disturbances (hyperthermia, stress, shock capture myopathy). Refer to the Department SOPs for *Animal Handling and Restraint using Soft Containment* and *Hand Restraint of Wildlife* for further guidance.

8.4 Hygiene

Good hygiene practices must be maintained to reduce the risk of spreading pathogens between animals and between sites. Refer to the Department SOP for *Managing Disease Risk in Wildlife Management* for further information.

9 Competencies and Approvals

Department personnel, and other external parties covered by the Department's Animal Ethics Committee, undertaking fauna-related activities require approval from the committee and will need to satisfy the competency requirements detailed in Table 3. This is to ensure that

personnel involved have the necessary knowledge and experience to minimise the potential impacts of humane killing on the welfare of the animals. Other groups, organisations or individuals using this SOP to guide their fauna monitoring activities are encouraged to also meet these competency requirements as well as their basic animal welfare legislative obligations.

Humane killing of animals is required in a variety of situations, often by unexpected encounters, and may be administered by a variety of methods as described previously. Table 3 details the competency requirements for use of specific methods as well as recommended competencies for personnel that are involved in fauna management and will likely be exposed to humane killing practices in performing their duties.

Table 3 Competency requirements for the humane killing of animals under field conditions

Competency category	Competency requirement	Competency assessment
Formal experience, qualifications and course certificates for lethal injection and shooting	For use of drugs/injectable chemical agents: applicable permits where required by the DoH and VSB	Training and written endorsement of competency in specified procedures by a veterinarian & completion of a euthanasia course approved by the Department's AEC
	For use of firearms: suitable training, authorisation and documentation.	Written verification of completion of nationally recognised training, copy of a nominated persons authorisation from WA Police, and listed on Department's Corporate Firearms Licence.
General skills/experience for manual techniques	At minimum, shown how to perform one of the described methods by an experienced person. Experience under supervision an experienced supervisor/Chief Investigator for each described technique.	At least 2 instances under the supervision of a person experienced in euthanasia techniques, successfully demonstrating the specified technique for each specified species. In emergency cases – At least some form of training & assessment in the specific technique by a person trained in the technique for at least 5 years Department staff may require a letter of competency specifying the range of techniques and species to which their experience extends

10 Occupational Health and Safety

Always carry a first aid kit in your vehicle and be aware of your own safety and the safety of others as well as the animals when handling. Wear practical clothing and footwear, and beware of zips, buttons and jewellery that are likely to become caught in equipment.

A job safety analysis is recommended prior to undertaking any fauna-related activities. This safety analysis should include the following considerations.

10.1 Manual handling

Manual handling is generally often an integral part of humanely killing animals and the risk of injury to the animal and personnel is increased where an animal is stressed and/or in pain. Personnel must have experience when carrying out techniques such as cervical dislocation and blunt force trauma to humanely kill an animal. Personnel must also be trained in the appropriate manual handling techniques for the hand restraint of animals especially where personnel are directly involved with fauna as part of their duties.

10.2 Animal bites, stings and scratches

Care should be taken when handling animals to avoid bites, stings or scratches. All inflicted injuries (even superficial ones) should be appropriately treated as soon as possible to ameliorate possible allergic reaction, prevent infection and promote healing.

Personal Protective Equipment (PPE) should be worn where required, and consideration should be given to PPE that may be relevant for the types of animals likely to be handled. Provisions should be made to ensure that this equipment is accessible.

To improve safety, field personnel should be aware of the treatment for snakebite and carry appropriate pressure bandages. Personnel should also have up-to-date tetanus vaccinations. Department personnel must not capture bats unless fully vaccinated against Australian Bat Lyssavirus.

If Department personnel or volunteers are injured, please refer to the Department's Health and Safety Section's 'Report a Hazard, near-miss or incident' intranet page, which can be found at http://intranet/csd/People_Services/rm/Pages/ReportingHazards,Near-MissesandIncidents.aspx?Zoonoses.

10.3 Zoonoses

There are a number of diseases carried by animals that can be transmitted to humans (i.e. zoonoses such as Toxoplasmosis, Leptospirosis, Salmonella). All personnel must take precautions to minimise the risk of disease transmission to protect themselves, their families and wildlife populations.

Advice on minimising disease risk is contained in the Department SOP for *Managing Disease Risk in Wildlife Management*

10.4 Allergies

Some personnel may develop allergies when they come in contact with animal materials such as hair and dander. Personnel known to develop allergies should wear gloves when handling animals and long sleeved pants/shirt.

People with severe allergies associated with animals, with immune deficiency diseases or on immunosuppressant therapy should not engage in the handling of wildlife.

10.5 Firearms

All personnel using firearms have completed nationally recognised training, have been issued

a nominated persons authorisation by WA Police and should be registered on the Department's Corporate Firearms Licence. Contact the Corporate Firearms Officer for additional information and guidance.

You must be aware of your own safety and the safety of others as well as the animals during handling and/or operating firearms.

If handled appropriately, there is minimal risk to the operator, the public, or co-workers from firearms injury. Ensure that basic safety standards are observed at all times. Always check the calibre of the rifle and the projectile before loading ammunition, and only load firearms once all members of the public are removed to a safe distance

Due to the danger to humans, as well as animals, associated with the wrongful possession and use of firearms, all equipment must be secured within a locked facility to prevent unauthorised access to the equipment when not in use.

10.6 Chemicals

Personnel should be aware of the dangers of the chemicals they use in the field. Refer to *Material Safety Data Sheets* (MSDS) relevant to the chemical(s) being used.

Injectable agents: Personnel must be extremely careful of their own safety when administering lethal injection. Accidental self-injection requires immediate medical attention. Only personnel trained and accredited in this technique should be present in the immediate vicinity of the animal.

Formalin: Personnel must be aware of the safety precautions for handling and storage relevant to this chemical as advised on the *MSDS* before use. Ensure contact with the skin and inhalation is prevented.

Ethanol: Samples stored in more than 70% ethanol or more than 50mL of total volume of alcohol must be transported via courier and labelled as Dangerous Goods (O'Meally & Livingston, 2002). Samples stored in less than 70% ethanol or less than 50mL of total volume of alcohol can be transported via Parcel Post providing they are adequately sealed with parafilm wrapped around the cap.

11 Further Reading

The following SOPs have been mentioned in this advice regarding humane killing, and it is recommended that they are consulted when proposing fauna-related activities:

- Department SOP *Vouchering Vertebrate Fauna Specimens*
- Department SOP *Tissue Sample Collection and Storage for Mammals*
- Department SOP *Hand Restraint of Fauna*
- Department SOP *Animal Handling and Restraint using Soft Containment*
- Department SOP *Transport and Temporary Holding of Fauna*
- Department SOP *Care of Evicted Pouch Young*
- Department SOP *First Aid for Animals*
- Department SOP *Managing Disease Risk in Wildlife Management*

For following institutions and links may be of further assistance:

- Australian and New Zealand Council for the Care of Animals in Research and Teaching (<http://www.arc.gov.au/ncgp/sri/ansccart.htm>)
- Department *Firearms Safety Course Training Manual*: (http://intranet/csd/People_Services/rm/Documents/Firearms%20Safety%20Course%20Manual.pdf)
- National Health and Medical Research Council <http://www.nhmrc.gov.au>
- NSW Office of Environment and Heritage (2011). *Code of Practice for Injured, Sick and Orphaned Protected Fauna*. NSW Government.
- WA Health -Public Health: Licences and permits for medicines and poisons (http://www.public.health.wa.gov.au/2/1301/2/licences_and_permits_for_medicines_and_poisons.pm)
- Veterinary Surgeons Board WA (<http://www.vsbwa.org.au>)

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13 Appendix 1: Firearm Specifications

Table 4 Recommended minimum caliber and shot specifications for the use of firearms to shoot common species. (modified from the Department's Firearms Training Course Manual and APB, 1991). The symbol X denotes not acceptable/applicable.

Species/Fauna Class	0-5m (head shot only)	5-30m	30-100m	<100m
Camel	.357 magnum	.357 Magnum	.308	.308
Donkey	.357 Magnum	.357 Magnum	.308	.308
Pig	.22 Magnum	.357 Magnum 12 Gauge SG	≥.243	≥.243
Kangaroo	.22LR	.22 Magnum 12 Gauge SSG	≥.222	≥.222
Goat	.22 Magnum	.22 magnum 12 Gauge SSG	≥.222	≥.243
Dingo/dog	.22LR	.22 Magnum 12 Gauge AAA	≥.222	≥.243
Cat	.22LR	.22LR Magnum 12 Gauge BB	.22 Magnum	≥.222
Fox	.22LR	.22 Magnum 12 Gauge BB	≥.222	≥.222
Rabbit	.22LR	.22LR 12 Gauge #4 shot	.22 Magnum	.222
Small birds (e.g. silvereyes, sparrows)	X (cervical dislocation or blunt trauma)	.177 air rifle 410 Gauge #9 shot	X	X
Medium birds (e.g. parrots, starlings)	X (cervical dislocation or blunt trauma)	.177 air rifle 12 Gauge #9 shot	≥.22LR	X
Large birds (e.g. cockatoos, ducks)	X (cervical dislocation or blunt trauma)	.22LR 12 Gauge #4 Shot	≥.22LR	X
Extra-large birds (e.g. emus)	.22LR	.22 Magnum 12 Gauge AAA	≥.222	≥.243
Crocodile	.22 Magnum (1.5m-3m long) .357 Magnum (>3m long)	X	X	X
Sea turtle	.22 Magnum	X	X	X
Dugong	.357 Magnum	.308	X	X
Sea lion	.357 Magnum	.243	243	X

14 Appendix II: Shooting Techniques

14.1 Kangaroos

The following information is taken from DEH (1998) and NRMMC (2008).

There are large differences in the terrain and prevailing weather conditions that may exist at the time of shooting and common sense is required to assess these circumstances. Where the conditions are such as to raise doubt about achieving a sudden and humane death, shooting must not be attempted. Where an individual kangaroo or wallaby is injured, no further animals should be shot until all reasonable efforts have been made to locate and kill the injured animal.

Brain shot

Front view: Aim horizontally at the point of intersection of lines taken from the base of each ear to the opposite eye. This method is acceptable for younger animals, but not older animals (especially those that engage in head butting confrontations) because the frontal bones are very dense in older animals and the shot may not penetrate the skull.

Side View: Aim horizontally from the side of the head at a point midway between the eye and the base of the ear. This approach is preferred for mature or old animals that have developed dense frontal bone structures.

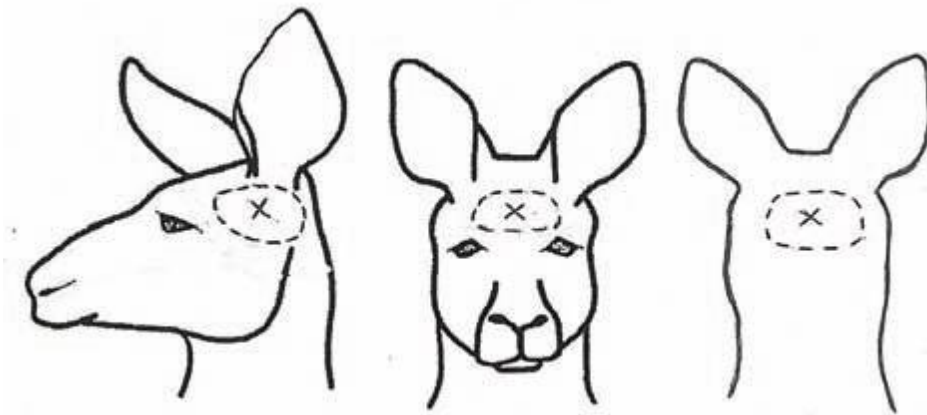


Figure 2 Target locations for brain shots on kangaroos

Note: A shot to the side of the head is preferred because it offers a larger target area.

Heart shot

Front View: Aim horizontally at the mid-point of the chest midway between the forelegs and immediately below the base of the throat. Frontal chest shots should only be used for animals in the 'head high' position.

Side View: Aim horizontally at the centre of a line encircling the minimum girth of the animal, immediately behind the forelegs. The ideal side-on heart shot is taken from an angle slightly to the rear of the target animal's shoulder. This angle of aim is taken because the shoulder blade (scapula) provides partial protection of the heart from a direct side on shot.



Figure 3 Target locations for heart shots on kangaroos

14.2 Birds

Never attempt to shoot moving birds. Wait until birds settle and are not obstructed by vegetation before a shot is attempted. A shot should only be taken where the operator is confident that a kill shot outcome is highly likely. A bird should be shot from front on wherever possible. A shot that misses the brain case or heart, and penetrates the gut or wing, may render a bird injured and capable of escape.

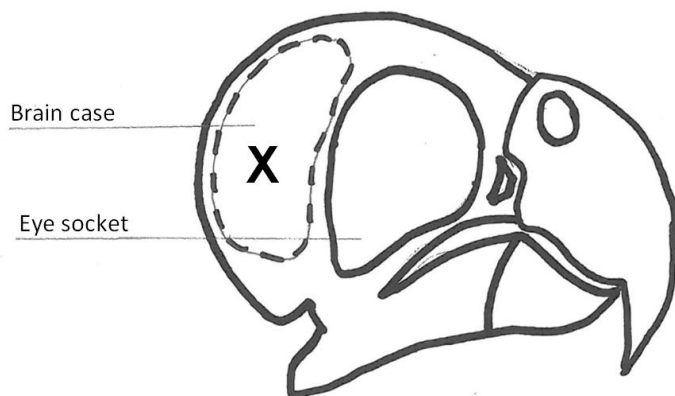


Figure 4 Target location for head shots on birds. Image: Mark Blythman/DBCA

Brain shot

In most birds, the majority of the skull is comprised of empty space where the eyes sit. Aim for the area just behind the eyes, remembering that ruffled and/or some display feathers may make the skull appear bigger than it actually is.

Heart shot

A shot to the heart should be front on wherever possible. If taking a heart shot from side on, the projectile will need to travel through the wing before it gets to the heart. Projectiles may lodge in the wing or ricochet off a wing bone and miss the heart.

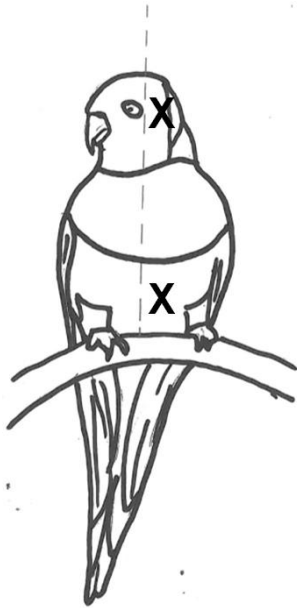


Figure 5 Target locations for brain and heart shots on birds. Image: Mark Blythman/DBCA

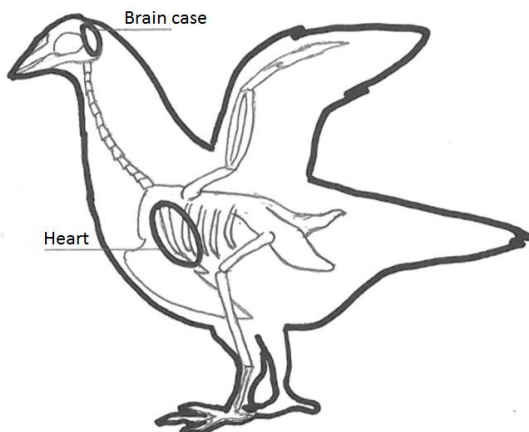


Figure 6 Locations of brain and heart in birds. Image: Mark Blythman/DBCA

14.3 Crocodiles

For information regarding best practice shooting techniques for crocodiles see NRMCC (2009).

14.4 Marine fauna

For information regarding best practice shooting techniques for marine fauna including turtles, dugong, seals, sea lions, dolphins and whales <6m long see DERM (2007). See Coughran *et al.* (2012) for information regarding euthanasia of large cetaceans.

Refer to Section 11 for further publications advising recommended techniques and specifications for shooting various animals.