Recommended Guidelines
for the
Captive Management of Raptors
Accipitriformes, Falconiformes & Strigiformes
in South Australia

Notes:

- The *Animal Welfare Act 1985* creates offences for persons who fail to provide appropriate and adequate, food, water, living conditions (whether temporary or permanent), or exercise, or fails to take reasonable steps to mitigate harm suffered by an animal in their care.
- These guidelines are to be read in conjunction with the *"General Guidelines for the Management of Protected Wildlife in Captivity in South Australia".*

Table of Contents

Background Information

Raptors (also known as “birds of prey”) are a specialised group of birds that hunt for food and rely on their acute senses, agility, stealth, speed and strength to locate and capture their prey. The term “raptor” is derived from the Latin word “raptare”, which means "to seize and carry away".
Raptors fall into two broad groups, the nocturnal (night) species and the diurnal (day) species. Hawks, Kites, Eagles, Osprey and Falcons generally fall into the diurnal raptor group, while the Barn Owls and “True Owls” are all nocturnal raptors. However there are some exceptions to the norm, with the Letter-winged Kite being the only member of its family that hunts at night, and a number of other species being observed hunting during the twilight periods around dawn and dusk.
There are over 490 species of raptors worldwide and they occur on all continents (except Antarctica) and on many oceanic islands. Of these, approximately 60% are diurnal raptor species, with nocturnal raptors making up the remaining 40%.

Raptors can be found across most of Australia and occur in a range of habitat types. While many raptor species in Australian occur nowhere else, some species, such as the Peregrine Falcon and Barn Owl, have a world-wide distribution. While less than 7% of the world’s raptor species are found in Australia (not including vagrants and species restricted to island territories), almost 85% of these have been recorded in South Australia according to the “*Checklist of South Australian Birds*” (available at; http://birdssa.asn.au/CHECKLIST.pdf). A list of the raptor species found in Australia and those that have been recorded in South Australia can be found in Table 1.

Table 1: Australian Raptor Species

Family	**Common Name**	**Species Name**	**Notes**
Accipitridae	Eastern Osprey	*Pandion cristatus*	
	Black-shouldered Kite	*Elanus axillaris*	
	Letter-winged Kite	*Elanus scriptus*	Listed as “Near Threatened” by the IUCN
	Square-tailed Kite	*Lophoictinia isura*	
	Black-breasted Buzzard	*Hamirostra melanosternon*	
	White-bellied Sea Eagle	*Haliaeetus leucogaster*	
	Whistling Kite	*Haliastur sphenurus*	
	Black Kite	*Milvus migrans*	
	Brown Goshawk	*Accipiter fasciatus*	
	Collared Sparrowhawk	*Accipiter cirrhocephalus*	
	Grey Goshawk	*Accipiter novaehollandiae*	
	Swamp Harrier	*Circus approximans*	
	Spotted Harrier	*Circus assimilis*	

	Wedge-tailed Eagle	*Aquila audax*	Federally listed as "Endangered" under the *Environment Protection and Biodiversity Conservation Act 1999* (Tasmanian sub-species only: *Aquila audax fleayi*)
	Little Eagle	*Hieraaetus morphnoides*	
	Pacific Baza	*Aviceda subcristata*	Not recorded in South Australia
	Brahminy Kite	*Haliastur indus*	Not recorded in South Australia
	Red Goshawk	*Erythrotriorchis radiatus*	Not recorded in South Australia. Federally listed as "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999*
Falconidae	Nankeen Kestrel	*Falco cenchroides*	
	Brown Falcon	*Falco berigora*	
	Australian Hobby	*Falco longipennis*	
	Grey Falcon	*Falco hypoleucos*	Listed as "Near Threatened" by the IUCN
	Black Falcon	*Falco subniger*	
	Peregrine Falcon	*Falco peregrinus*	
Strigidae	Powerful Owl	*Ninox strenua*	
	Barking Owl	*Ninox connivens*	
	Southern Boobook	*Ninox novaeseelandiae*	
	Rufous Owl	*Ninox rufa*	Not recorded in South Australia
Tytonidae	Masked Owl	*Tyto novaehollandiae*	Federally listed as "Vulnerable" under the *Environment Protection and Biodiversity Conservation Act 1999 (*Northern sub-species only: *Tyto novaehollandiae kimberli*)
	Eastern Barn Owl	*Tyto javanica*	
	Eastern Grass Owl	*Tyto longimembris*	
	Sooty Owl	*Tyto tenebricosa*	Not recorded in South Australia

Most species of raptors are monogamous, however an alternative mate may be selected if one dies. Most species are also sexually dimorphic, with the females being considerably larger than the males. While diurnal raptors tend to build open nests, nocturnal raptors are predominantly hollow nesting species.

Raptors are "obligate carnivores" and obtain their energy requirements from a diet consisting exclusively of vertebrate and/or invertebrate animal tissue. Their talons and beaks tend to be relatively large, powerful and adapted for tearing and/or piercing flesh. Raptors feed on a range of prey items, with the larger raptors generally feeding on larger prey species. While raptors in Australia will generally hunt for live prey, including insects, fish, mammals, birds, reptiles and amphibians, a number of species will also feed on carrion. Raptors are at the top of their food chain and as a result they are vulnerable to habitat and other environmental changes and can provide an indication of environmental degradation. A classic example is the decline in Peregrine Falcon breeding success caused by the use of organochlorine pesticides in agriculture.

Owls are also known to become victims of secondary poisoning by eating mice or rats that have previously been poisoned with rodenticides.

Scope

These guidelines apply to members of the public that apply for and/or obtain a DEW "rescue permit" for raptors or have a Wildlife Carer or Wildlife Rehabilitation Facility Permit endorsed for raptors. These procedures do not apply to raptors held in;

- Zoological Institutions
- Veterinary Clinics
- Approved Research Programs
- Approved Population Management Programs

Objectives

The objectives of these guidelines are to:

- Provide recommendations which protect raptors' welfare, identify when it is not appropriate to return a raptors to the wild and to establish controls which assist in meeting conservation objectives;
- Provide recommended guidelines for the maintenance of raptors kept in captivity;
- Ensure a consistent State wide process for the rescue, rehabilitation, release, captive holding and euthanasia of raptors;
- Provide a clear and consistent framework for DEW in developing and maintaining a partnership with wildlife rehabilitation groups and individuals in their approach to holding raptors for any reason;
- Ensure that holders of raptors are appropriately endorsed and accountable for their activities, and that rehabilitation activities are undertaken in the most effective and efficient manner; and
- Contribute to the maintenance of biodiversity through the successful return of temporarily compromised raptors to their natural environments where possible.

Raptor Rehabilitation

The DEW Standard Operating Procedure for the Rescue and Release of Native Species states;
"*There is no conservation value in releasing a common animal back to the wild, particularly if it is behaviourally, physically or otherwise impaired*."
However, this comment is qualified by the statement that;
"*The welfare of an individual animal and the preservation of an individual animal's life are intrinsically important*."
DEW recognises that the work of wildlife rehabilitators contributes to conservation through research, community education and promotion of a respect for native wildlife.

Raptors are more difficult to manage than other species and they require specialist knowledge and facilities to care and rehabilitate them successfully. Raptors must be under the supervision of a person capable of:

- Safely handling and/or restraining raptorial birds;
- Minimising the risk of attacks on carers by raptors;
- Minimising the stress experienced by raptors;
- Providing appropriate captive husbandry and diets; and
- Recognising aberrant behaviour and ill health in species under care.

In addition, a person attempting to rehabilitate a raptor must:

- Have a good knowledge of raptor biology;
- Be able to accurately identify different species;
- Be able to differentiate between males and females;
- Have access to a veterinarian with raptor knowledge;
- Have access to suitable release sites;
- Have access to a reliable food source;
- Have suitable enclosures and treatment boxes; and
- Be able to provide some form of post release monitoring.

A large number of raptors (and other native animals) are injured or killed each year through human causes. In addition, raptors can be inflicted with a number of debilitating diseases and young raptors (in particular) may be unable to secure sufficient food to sustain them and become weak. The major reasons for raptors coming in to care include:

- Car strike
- Power line collision
- Barbed-wire fence injury
- Gunshot
- Poisoning
- Trichomoniasis
- Starvation and dehydration
- Mismanagement in captivity

Raptors which come into care are almost always sick or injured as members of the public will ordinarily not come across or be able to pick up a raptor unless there is something wrong with it.

Research has shown that healthy wild raptors successfully catch prey on average only once in seven attempts. A raptor needs to be in almost perfect physical condition to survive in the wild and compromised birds that are released will slowly starve to death. Relatively minor injuries such as bruising or damage to flight or tail feathers would not seriously impede or jeopardise the survival of most bird species in the wild, however they can be life threatening to a raptor. If a rehabilitated bird is not 100% fit, do not release it!
To be a viable release candidate, a raptor must:

- Be fully coordinated in both general and hunting flight;
- Be able to see perfectly;
- Be able to negotiate a holding/flight aviary without showing any flight or fitness deficiencies;
- Have a complete set of tail, primary and secondary feathers;
- Have no permanent foot impairments;
- Be of maximum weight when released;
- Not have any behavioural problems (i.e. not imprinted);
- Have perfect balance and control; and
- Be able to recognise wild food and have the appropriate skills to hunt them effectively.

Physically crippled raptors should not be kept in captivity as they are very easily stressed and do not settle well into captivity. Unless physically crippled raptors are suitable to be included in a captive breeding program, there is often little animal welfare justification for keeping them captive and in some cases it is extremely inhumane to do so.

The following injuries will severely restrict a raptors ability to hunt wild prey and they should be euthanized:

- A compound fracture - the bone will become infected making healing virtually impossible.
- Fractures near or involving a joint and dislocations - the joint will fuse or be damaged, leading to arthritis and an inability to use the joint sufficiently.
- One or both eyes missing or severely damaged.
- Loss of use of a leg – raptors cannot effectively hunt with the loss of a leg and are prone to developing foot infections due to the uneven weight distribution.
- Digit 2 and the rear digit missing on one or both feet, or the rear digit missing on both feet - these digits are vital for the bird to be able to kill its prey.

Some of the more commonly encountered injuries which may be treatable include;

- Fresh soft tissue injuries which can be adequately cleaned and sutured if necessary.
- Wing fractures in the middle of the bone - these can be repaired surgically.
- Leg fractures - it is not as crucial to have perfectly functional legs as it is for the wings.
- Concussion.

Raptors may also come into care with feather damage that inhibits their ability to survive in the wild. A raptor should not be released if it has more than four broken (mid shaft) feathers on either wing or tail unless they have been repaired (imped). Imping must only be attempted by skilled raptor specialists.

The decision to treat an injured raptor needs to be made after careful consideration and with the expectation of a prolonged convalescence period. It is unusual to be able to release a bird with a fractured bone less than 2 months after its initial presentation. X-rays are a vital part of a good diagnosis. Raptors should be released close to where they were found, providing they were not found in an inappropriate location.

The release of a raptor should be undertaken;

- After the raptor has been fed;
- When the weather forecast is favourable;
- Outside of the established territory of other raptors, magpies and ravens, particularly during the breeding season;
- Early in the morning for diurnal (day) raptors; or
- Early in the evening for nocturnal (night) raptors; and
- Only after a post release monitoring program has been approved.

Further information in relation to the rescue, holding and release of Protected Wildlife can be found in the "*General Guidelines for the Management of Protected Wildlife in Captivity in South Australia*".

Manner of Housing

Each animal must be housed in a manner which does not pose a risk to the wellbeing of the animal being held or to wild animals, and does not pose a risk to the safety of carers or other persons.

2) Raptors must not be housed with, or adjacent to, any other species that would cause harm to the welfare of the raptor or the other species. Raptors should not be housed in an area where they can see potential prey that is being held in other aviaries or enclosures.

The size and shape of the enclosure must provide for:

- Freedom of movement for the raptor, both vertically and horizontally;
- Sufficient space to enable it to be protected from undue dominance and conflict with the same or other species;
- Appropriate exercise opportunities;
- Its husbandry needs; and
- The minimisation of stress.

Regular inspection and evaluation of animal housing must take place when feeding and cleaning to monitor hygiene levels and to detect potential housing problems.

Raptor species of similar size and hunting capacity may be held together in the same enclosure if they are not noted for inter-specific aggression.

If a raptor is being stressed by the aggression/presence of other raptor(s) of its own or other species, then arrangements shall be made for it to be housed separately from the other raptor(s) causing the stress.

Spatial Requirements

Three distinct holding facility types are required for the successful rehabilitation of raptors and the illnesses and injuries that they may sustain. While it is not necessary that each raptor carer to personally possess all three types of facility, they need to have access to all three types.
Tethering is an effective raptor management technique when used in conjunction with other housing facilities. Tethered birds must be monitored throughout the day to ensure their health and safety and must be protected from the elements, intruders, predators, and other tethered birds in the vicinity.

The three types of holding facility required are:

- Intensive care cage;
- Second stage hospital aviary; and
- Holding/flight aviary.

Intensive Care Cage

Intensive care hospital facilities should be equipped to carry out the following:

- Examination
- Treatment
- Follow-up veterinary procedure
- Hospitalisation and intensive care

An intensive care cage is used for the initial holding of raptors suffering from severe injury, shock or requiring force feeding and must be constructed in such a way as to;

- Provide a warm, dark and quiet environment and there should be minimal external interference;
- Be of a sufficient size to allow the housed bird to stand fully erect or lie fully extended across the cage; and
- Allow the bird to be readily captured and removed for examination or treatment.

A solid-walled cage that has enough space to turn around and stretch a wing is suitable to hold a raptor with a fractured wing for the first two weeks. It prevents further damage and makes it easier

to catch the bird for treatment. Walls, roof and floor should be constructed of solid material (e.g.; timber, fibreglass or plastic sheet) and provided with adequate ventilation and heating.

Second Stage Hospital Aviary

A Second Stage Hospital Aviary is used to house birds outdoors which:

- Have a strapped wing following fracture or surgery
- Require confinement during recovery from conditions such as beak and soft tissue injuries

A second stage hospital aviary can be used for raptors with a fractured wing after the first two weeks. It should be large enough for the bird to extend its wings fully, but not to fly. The dimensions for a suitable secondary stage hospital aviary are 3 x 3 x 3 metres.

A second stage hospital aviary must be constructed in such a way as to;

- Allow easy access to the bird by the carer
- Allow the bird to feel secure and comfortable
- Visual and auditory disturbances are limited
- Climatic extremes are minimised
- Provide adequate ventilation to avoid the formation of mould or mildew

Orientation of the enclosure should be such that the bird does not receive intense summer sun or be exposed to cold prevailing winds in winter. All walls should be solid however in situations where the birds housed will not be exposed to outside disturbance, part of some walls may be of more open construction such as slats, however dense (70-80%) shade cloth must be fixed to the internal surface of the wall.

The roof of the aviary should be constructed to provide shelter from rain and any section constructed of slats must have dense (70-80%) shade cloth fixed to the internal surface.
For raptors that are being exercised using free flight techniques on a regular basis, the dimensions for the second stage hospital aviary are sufficient to maintain a single animal.

Holding/Flight Enclosure

Holding/flight enclosures are used to:

- Provide exercise;
- Enable forced flight to increase fitness;
- Assess behaviour, flight, vision and balance; and
- House raptors held permanently by licensed permit holders

Holding/flight enclosures are suitable for rescued raptors that have passed the intensive care stage and do not have serious injuries. They should be large enough to allow birds to exercise and strengthen muscles prior to release, and are also appropriate for the long term housing of raptors held permanently by permit holders.

A holding/flight enclosure can be used for raptors with a fractured wing after 30 days, as by this time the bone should have healed completely and the bird can start to regain fitness by flying in a larger aviary. If the bird cannot fly it should be re-evaluated by a veterinarian.

The size of holding/flight enclosures vary according to the species held. In accordance with current industry best practice, the guidelines for minimum holding/flight enclosure sizes for maintaining Raptors in South Australia (see Table 2) shall apply. Minimum enclosure sizes are for two birds that are compatible with each other only.

Table 2: South Australian Raptor Holding/Flight Enclosure Sizes for Two Compatible Individuals

.Species	Minimum Length (m)	Minimum Width (m)	Minimum Height (m)	Increased Floor Area for each Additional Raptor (m2)
Osprey (*Pandion haliaetus*)	10	4	4	8
Black-shouldered Kite (*Elanus notatus*)	6	3	3	5
Letter-winged Kite (*Elanus scriptus*)	6	3	3	5
Black Kite (*Milvus migrans*)	10	4	4	8
Square-tailed Kite (*Lophoictinia isura*)	10	4	4	8
Black-breasted Buzzard (*Hamirostra melanosternon*)	10	4	4	8
Brahminy Kite (*Haliastur indus*)	10	4	4	8
Whistling Kite (*Haliastur sphenurus*)	10	4	4	8
Collared Sparrowhawk (*Accipiter cirrhocephalus*)	8	3	4	8
Brown Goshawk (*Accipiter fasciatus*)	10	4	4	8
Grey Goshawk *Accipiter novaehollandiae*)	10	4	4	8
Red Goshawk (*Erythrotriorchis radiatus*)	10	4	4	8
Little Eagle (*Hieraaetus morphnoides*)	10	4	4	8
Wedge-tailed Eagle (*Aquila audax*)	10	5	4.5	17
White-breasted Sea Eagle (*Haliaeetus leucogaster*)	10	5	4.5	17
Spotted Harrier (*Circus assimilis*)	10	3	4	8
Swamp Harrier (*Circus aeruginosus*)	10	4	4	8
Crested Hawk/Pacific Baza (*Aviceda subcristata*)	6	3	4	5
Australian Hobby (*Falco longipennis*)	10	4	4	8
Peregrine Falcon (*Falco peregrinus*)	10	4	4	8
Black Falcon (*Falco subniger*)	10	4	4	8
Grey Falcon (*Falco hypoleucos*)	10	4	4	8
Brown Falcon (*Falco berigora*)	10	4	4	8
Australian/Nankeen Kestrel (*Falco cenchroides*)	6	3	3	5

Rufous Owl (*Ninox rufa*)	7	3	3	7
Powerful Owl (*Ninox strenua*)	8	3	3	8
Boobook Owl (*Ninox novaeseelandiae*)	6	3	3	5
Barking Owl (*Ninox connivens*)	7	3	3	7
Barn Owl (*Tyto alba*)	6	3	3	5
Masked Owl (*Tyto novaehollandiae*)	7	3	3	7
Grass Owl (*Tyto longimembris*)	6	3	3	5

Enclosure Construction

There are a number of general principles that should be followed in order to satisfy minimum conditions for the keeping raptors in captivity.

An enclosure must be constructed to ensure that:

- A raptor cannot escape in circumstances that can reasonably be foreseen and guarded against;
- The risk of injury to the raptor is minimised;
- Animal carers are safe if they comply with directions and/or warning signage; and
- Raptors are not exposed to excessive noise or vibration.

Each cage or enclosure is to provide protection to raptors against interference from wild animals, domestic pets or people.

Raptors must not be housed in enclosures constructed of exposed mesh, horizontal slats or lattice on the walls or roof.

Wooden slats placed vertically 20-50mm apart (dependant upon the size of the raptor) are acceptable as a wall structure (shade cloth covering is not required). Other suitable materials include nylon or polyethylene mesh and shade cloth.

Enclosures must be designed to give the raptor some exposure to the elements and access to direct sunlight.

Enclosures for raptors shall include a water mist spray or allow the birds access to rain and bathing facilities.

Substrate and Drainage

The substrate must not be abrasive or irritating to the animals. Suitable substrates include sand, crusher dust, concrete or pebbles. The substrate must be readily cleanable or be of a material which can be replaced to avoid the accumulation of faeces, urates, fungi and moulds.

An enclosure must be provided with a drainage system that quickly carries excess water away from the enclosure. Unless it carries only surface water, an open drain should be inaccessible to the raptors.

Weather Protection

One quarter of the enclosure must be fully enclosed on three sides and the roof to provide protection from wind, rain and extremes in temperature and sunlight and a place where the bird can retreat from observation.

Access to adequate shade during warm weather (i.e. >25oC) must always be provided. Water misting or other cooling techniques should be supplied if ambient temperatures are over 30oC.

Access to adequate sunning areas should be provided to allow the raptors the opportunity to sun themselves.

Gates, Doors and Slides

Access to raptor enclosures should be through a double door safety entrance.

Access doors are to be self-closing and locked upon exiting to prevent unauthorised entry.

The design of a perimeter gate or door should facilitate the delivery and removal of feed, and the removal and replacement of perching material.

Enclosure Furniture

The total number of perches and/or ledges must outnumber the number of birds in an aviary.) In addition a number of stumps may also be provided.

Perch(es)/ledge(s) in the covered shelter must be placed so that a raptor resting on one of these may avoid visual contact with raptors in adjoining enclosures.

All perches should be placed so that birds in adjoining enclosures cannot perch within reach of each other through cage walls.

5) Perches/ledges should be placed so as to encourage the raptors to make maximum use of the flight possibilities within the enclosure. At least one perch should be no less than two (2) metres from the ground.

All perches/ledges/tree stumps must be placed so that birds can perch comfortably without their plumage coming into contact with walls or fixtures.

Competition for the highest vantage point should be avoided by providing a number of perches at that height.

Perches must be no closer to the roof of the enclosure than that distance which is needed for the bird's wing to go through its natural arc during take-off and landing.

Enclosures containing raptors which are incapable of normal flight should include rough-barked branches which permit the birds to climb to perches from the substrate.

Perches should be constructed from uncontaminated natural branches and vary in diameter and cross-section so that at least some have a circumference not less than the talon span of the species to be housed.

Perches should have a covering of non-slip bark or be wrapped in astro turf, coconut fibre, hemp rope or similar.

Perches must not be positioned directly over each other or over food or water containers.

Care should be taken to ensure that there are no projections that are likely to injure housed birds.

Each nocturnal hole-nesting owl shall be provided with at least a darkened corner to hide from the light and provide roost security. Provision of a suitable hollow log or nest box is recommended.

An aviary for the housing of raptors must contain a bathing pond/container with a diameter sufficient to allow normal bathing behaviour. The pond/container must have a non-slip, cleanable surface and no sharp edges and be kept filled with clean fresh water.

Electrical and Other Equipment

Electrical apparatus and other plant and fixed equipment must be installed so that:

- It does not endanger the raptors or carers;
- The raptors cannot disrupt its operation; and
- It is does not pose a fire risk.

Indoor Housing of Animals

Lighting in indoor housing for animals should be adequate to facilitate proper cleaning of the housing and the carrying out of routine health, hygiene and maintenance checks.

Indoor lighting must provide the correct UV spectrum to facilitate normal feather care and calcium absorption.

Indoor lighting should only be switched on for around 11 to 13 hours a day to simulate natural day-length.

- Indoor housing for an animal must be provided with ventilation that:
- Is sufficient to maintain the health of the animal; and
- Is so designed as to minimise undue dust, draughts, odours and moisture condensation.

Hygiene

Good hygiene is extremely important in the care of captive raptors to ensure that disease hazards and husbandry issues are minimised.

The daily hygiene routine should include the removal of leftover food, introduced rubbish and foreign objects to minimise vermin infestation and disease hazards and prevent the ingestion of potentially harmful objects.

Regular hygiene routine (but not daily) should include:

- The substrate, perches, shelves, nestboxes, food and water containers and other components of the enclosure shall be maintained in a clean and hygienic condition, free from the accumulation of faeces and urates.
- Contaminated substrate material must be removed and replaced as necessary.
- Perches, shelves, nestboxes and other items of enclosure furniture made from wood should be replaced as necessary and be maintained in a clean and hygienic condition, free from the accumulation of faeces and urates.

Toxins should be used with care, including:

- When disinfecting solid surfaces within the enclosure these surfaces should be rinsed before animals come in contact with them again. The disinfectants are to be of a kind approved by, and used in compliance with, veterinary advice or label instructions.
- The use of insecticides containing chlorinated hydrocarbons and animal poisons (e.g. rodent baits) shall be under veterinary instruction and in regard to the known toxicity of these substances to raptors.

Entry of potential pests, such as wild rodents, birds and insects shall be controlled.

Behavioural Enrichment

Although there are no known reports published of raptors exhibiting stereotypic behaviour, enrichment should be included in captive maintenance. Most of the enrichment techniques currently used for raptors focus on providing a suitable environment and feeding regime to allow natural behaviours to be exhibited.

Some of the techniques include providing;

- Areas to promote free flight
- A variety of perching sizes and sunbathing perches
- Live plants
- Deep or shallow pools, running water, moats, sprinklers, etc.
- A variety of substrates
- Dust baths
- Nest boxes, logs, platforms etc (birds can "excavate" their own nest log if shavings or mulch are placed inside)
- A variety of feed stations
- Live invertebrate feeds
- Whole carcass feeds
- Ice blocks with food frozen inside (summertime only)
- Several feedings throughout day at unpredictable times
- Scatter feeds
- Commercially made food puzzles
- Boxes
- Lures to simulate hunting

Diet and Feeding

Captive raptors obtain stimulation from plucking their prey, which fulfils not only nutritional but also behavioural needs. Meat, dog biscuits and other commercial diets contain very little fibre and inhibit the regurgitation of a cast (pellet) by the raptor, which is a normal process to maintain gut health. Food being thawed should not be thawed in a microwave or placed into water to defrost as this will leach nutrients out of the meat. Food should be fed to the bird at ambient room temperature.

A person applying for a permit to care for raptors must show that they have access to a suitable supply of fresh and/or frozen whole animals, and that they have access to appropriate fridge and/or freezer storage facilities.

Whole animals suitable for use as feed will depend upon the raptor species and their natural diet in the wild. In addition to any natural prey species which can be legally obtained, other suitable foods include;

Raptor type	Suitable foods	Notes
Mammal eating species	domestic mice, rats, guinea pigs, rabbits etc	Suitable whole animals should provide at least 50% of the nutritional and energy requirements of raptors.
Bird eating species	quail, domestic chickens, pigeons etc	Suitable bird species should provide at least 60% of the dietary requirements of birds of the Accipiter and Erythrotriorchis genera and bird-hunting species of the Falco genera.
Piscivorous species	Fish	Suitable fish species should provide at least 25% of the dietary requirements of piscivorous raptor species. If frozen fish are used, the addition of sea bird tablets should be used to replace vitamins lost during the freezing process.
Insectivorous species	invertebrates	

Additional considerations

- Mammal and bird specimens less than ten weeks of age should not form more than 25% by weight of the diet fed to raptors in any one week.Food supplied to raptors shall be clean and fresh, obtained from a reliable source and, preferably, bred under laboratory conditions.
- Before carcasses are offered as food, they should be cut open and observed for gross lesions suggestive of disease.
- Except on starve days a sufficient quantity of food should be provided to maintain the bird at a healthy weight. (Starve days are optional and should only be used on larger raptor species).
- Raptors must be given no more than one starve day per week and there should be at least three days between any two starve days.
- Food items should be placed on a non-contaminated surface.

The following should not be fed to raptors:

- Any animal that has died, or is suspected of dying from a toxic material including insecticides, rodenticides, and euthanasing chemicals;
- Animals showing clinical signs of being infected by disease (especially trichomoniasis protozoa in pigeons and doves);
- Birds which have not undergone treatment to remove the risk of trichomoniasis infection. (Preferred treatment: freeze for at least 24 hours at a temperature equal to or below -18 degrees Celsius or remove upper gastro-intestinal tract directly after euthanasia,

- Laboratory rodents that have been used in research programs which result in the food animals retaining chemicals used during research;
- Fatty meat or meat which has not been supplemented with an appropriate calcium additive;
- Animals which have been killed by lead shot; or
- Home bred or wild caught prey items unless they have been frozen for at least six weeks; or
- Live vertebrate prey. It is an offence under the *Animal Welfare Act 1985* to use live vertebrates (other than fish) as a food source

Hand Rearing Orphaned Chicks

Young raptors may come into care in poor condition and must be hacked before being released back to the wild. This is a very specialised process and must only be undertaken by an experienced raptor specialist. Young raptors that come into care can easily become imprinted and will be unable to survive once released. Imprinting in raptors, when raised naturally by their parents, basically occurs in the following manner;

Age	Cognitive Development
Day 1 – 20	Parental imprinting occurs
Day 10 – 25	Sibling recognition or imprinting
Day 10 – 25	Development of fear responses
Day 20 – 45	Future sexual partner recognition
Day 35	Independence: Nest site recognition

Young hand-reared raptors often die through overfeeding. Do not force feed the chick if is not interested as it is either not hungry or ill and veterinary advice should be sought. A mixed diet of finely minced or chopped meat is suitable for most species. Rabbits, rats, mice, day old chicks etc. are all suitable foods for young raptors.

When rearing orphaned raptors, the following points should be noted;

- All food used should be of good quality.
- Too high a protein diet can cause problems in some of the larger, fast growing raptor species.
- Rapid muscle growth puts strain on the tendons and leg deformities can result.
- Growing chicks have a high calcium requirement so it might be necessary to supplement the diet with calcium and ensure the correct calcium to phosphorous ratio is provided.
- Bones should be removed when feeding chicks for the first few days (this is when it is advisable to use some form of calcium supplementation) but after this they should be included in the diet as they help to provide a balanced mineral intake.
- Damping the food with warm water makes feeding a little easier and keeps young birds from getting dehydrated.
- Four feeds per day is generally sufficient to give good weight gain and growth rate.
- To keep a check on the health and growth of young birds they should be weighed regularly and weighing before and after every feed provides a good indication of food intake.
- Encourage any young that are being hand reared to learn to feed on their own as quickly as possible, and spend as little time as possible exposing them to human contact to reduce imprinting.

Identification

Unless distinguishing marks or features are documented in the animal records, it may not be easy to identify an individual animal housed with others of the same species. A permanent method of identification may be required for individual animals. The preferred method of identification is a

microchip implanted subcutaneously in the left pectoral muscle or thigh. This can be undertaken by an experienced carer or veterinarian. Alternatively a suitable sized band can be applied to the leg.

Regular Health Checks

Arrangements must be made for the health of each animal to be checked every day. Signs of ill health or stress can be observed in a variety of ways, however careful observation may be needed as sick raptors may suppress some indications.

In particular, the following symptoms of ill health should be noted:

- Changes in weight or condition;
- Discharges from the nostrils, eyes, beak or cloaca;
- Excess loss of feathers;
- Changes in appearance of droppings;
- Heat stress or dehydration;
- Broken bones or other physical injury;
- Changes in food or water consumption;
- Changes in attitude or behaviour e.g. inability to fly or see;
- Changes in appearance or posture;
- Enlargements or swellings;
- Vomiting, injury or bleeding;
- Lameness or sores on feet; or
- Overgrown beak or nails.

If poor physical health of an animal is detected, all reasonable steps must be taken to restore the animal to good physical health, or it should be euthanased. This will ordinarily require consultation with a veterinarian.

Sick or injured birds should be isolated for observation and treatment. This will prevent further injury and restrict the spread of infections. Suitable warm, low light isolation facilities shall be available for treatment of sick animals Veterinary advice should be sought if rapid recovery is not evident.

All housing and equipment in which sick birds have been kept must be thoroughly cleaned and disinfected before the introduction of another bird.

Common Raptor Health Conditions

Some of the more common health conditions that occur in raptors include;

- Bumblefoot
- Trichomoniasis/Frounce
- Nematode/Throat worms
- Avian pox
- Aspergillosis
- Chlamydiosis
- Salmonellosis
- Giardia
- Coccidiosis
- Other parasites

Bumblefoot:

Swelling on the pads of the toes. This bacterial infection is commonly seen in raptors that sit on wrong size or dirty perches. Microscopic cracks in the skin become infected and can be very hard to cure.

Trichomoniasis/Frounce

This is a devastating protozoan infection of birds that is common in raptors. It is characterised by large cheesy masses in the upper and lower oesophagus. A raptor often becomes infected after feeding on an infected prey bird. Wild birds are often near death before found making this disease difficult to treat. It has not been reported to infect humans.

Nematode/Throat worms

These can occur in the mouth and crop of raptors and can often be identified by the stringy slimy appearance of the inside of the mouth. The small lumps on the membrane inside the mouth will have a tiny white wriggling thread-like worm protruding. There are no reports of these nematodes infecting humans.

Avian pox

Pox virus is related to the herpes virus but it is not zoonotic. Pox virus is transmitted via blood sucking insects, such as mosquitoes, mites, and biting flies. The lesions begin as small white or yellow lumps that resemble pimples which rapidly grow. It is commonly seen as a raised, warty-looking nodular crusty lesion on non-feathered areas of the skin, particularly the feet, legs and head and around the eyes and sometimes in the mouth. Bacteria can attack lesions where the skin is broken, causing secondary infection, which can complicate treatment.

Aspergillosis

A fungal infection affecting the respiratory tract that is often associated with stress. Poor ventilation and large numbers of fungal spores released into the environment from moist rotting/decomposing vegetation (compost heaps, wood chips, hay, and straw) contribute to disease outbreak. Siting the aviary appropriately can lower exposure to the spores. (Note: see Zoonotic diseases)

Chlamydiosis

Transmission of the organism between individuals is primarily through inhalation of contaminated faecal or feather dust. The risk of infection is increased by close contact with infected birds, and birds that are stressed have a greater tendency to shed the organism. Infected birds may shed the organism even if no clinical signs of disease are observed. (Note: see Zoonotic diseases)

Salmonellosis

Salmonella infection can be picked up through contaminated food (usually avian) and symptoms are difficult to spot in time. It is difficult to avoid, but providing a non-avian diet for captive raptors can minimise the risk. It is a significant but not great problem, largely controlled by acquisition of quality food, correct storage and good hygiene. (Note: see Zoonotic diseases)

Giardia

Giardia is a protozoan parasite that lives inside the intestines of a range of species. Individuals become infected through ingesting the parasite or coming into contact with contaminated food, soil, water or other surface that have been tainted by the faeces of an infected animal. (Note: see Zoonotic diseases)

Coccidiosis

Coccidiosis is caused by Coccidia, a microscopic protozoan parasite which infects the intestinal tract of a range of animal species. The disease spreads from one animal to another by contact with infected faeces or ingestion of infected tissue. Diarrhoea, which may become bloody in severe cases, is the primary symptom. Most animals infected with coccidia may show no clinical signs of the disease, however young or stressed animals may suffer severe symptoms, including death. (Note: see Zoonotic diseases)

Other parasites

Raptors can be affected by a number of other internal and external parasites. Internal parasite control can be administered via food or water but dosing individual birds is more efficient. Individual dosing should be performed by experienced carers. External parasites
can be eradicated by applying an appropriate insecticide to birds, cages and nest boxes.

Carer and General Public Safety

Enclosures shall be constructed of such materials and be maintained in sufficiently good repair to ensure that they will contain the animals at all times and are to be safe for the animals and carers.

Raptors can inflict significant injuries if handled inappropriately. While the beak may look formidable, the talons are the most dangerous part of the animal and you should ensure that you have control over them at all times when handling.

Zoonotic diseases

Zoonotic diseases are diseases which can be transferred from animals to humans. Many bird species can harbour diseases that don't show or cause any harm to the bird normally, however when it becomes subject to stress it may develop the disease and can create dangerously contagious situations. On the basis that people don't rescue healthy birds, every bird that comes in is potentially a health risk to the carer and raptor rehabilitators should be aware of a number of diseases. Zoonotic diseases that may be of concern in relation to the captive management of raptors in Australia include, but are not limited to;

Organism type	Disease	Causative agent
Bacterial	Salmonellosis	*Salmonella sp.*
	Avian tuberculosis	*Mycobacterium avium*
	Chlamydiosis (Psittacosis)	*Chlamydia psittaci*
	E. coli	*Escherichia coli*
	Erysipelas	*Erysipelothrix rhusiopathiae*
	Staphylococcosis	
	Campylobacteriosis	
	Yersiniosis (pseudoTB)	*Yersinia enterocolitica*
	Avian cholera	*Pasteurella multocida*
Fungal	Thrush	*Candida albicans*
	Ringworm	*Trichophyton sp.*
	Cryptococcis	
	Aspergillus	*Aspergillus fumigatus*
Viral	Newcastle disease	*Paramyxovirus*
	Avian Influenza	
Other	Giardia	
	Coccidia	
	Other parasites	internal & external

Further Information

Captive Husbandry:

Raptor Husbandry Manuals and Guidelines; http://www.australasianzookeeping.org/Husbandry%20Manuals%20-%20Birds.htm	Behavioural Enrichment Guidelines; http://www.australasianzookeeping.org/Husbandry%20Manuals%20-%20Rearing,%20Training%20&%20Enrichment.htm#Enrichment_

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http://www.environment.sa.gov.au/biodiversity/faunapermits/

Other:

Australasian Raptor Association http://www.ausraptor.org.au/frmain.htm	Naisbitt, R. & Holz, P. (2004) Captive Raptor Management & Rehabilitation Hancock House Publishers Ltd., Surrey	Olsen, P. (1995) Australian Birds of Prey University of New South Wales Press., Sydney

Definitions

Carer	An individual who has responsibility for the care and rehabilitation of a native animal under a rescue permit, or that has responsibility for the care of a native animal under a permit to keep
Zoonoses	Any disease or infection that is naturally transmissible from vertebrate animals to humans and vice-versa. They are caused by all types of agents: bacteria, parasites, fungi, viruses and unconventional agents.
Hacking	A specialised training method that helps young raptors to be rehabilitated to reach their hunting potential by giving them exercise and experience. Hacking sites are usually large areas of land which are similar to the species natural habitat.
Flight Aviary	A very large enclosure that allows the birds adequate room to exercise.
Free Flight	A technique used to exercise the bird outside the constraints of its aviary through specific training programs
Imping	A specialised technique used to graft replacement feathers onto the wing or tail of a raptor to repair damaged feathers
Tethering	A management practice which involves the application of jesses and soft leather anklets around the legs of the bird. The leash is then attached to a stationary object such as a heavy perch in a manner that allows the bird freedom of movement between perching, bath pans, and the ground, but limits the distance it can go from the stationary object