

Draft Terms of Reference for Puma (*Puma concolor*)



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Proposal Summary

Puma concolor (Linnaeus, 1771) is a large slender American cat species known by a myriad of names including, cougar, mountain lion, catamount and panther. It occupies the most extensive range of any New World terrestrial mammal (Nielsen et al., 2015).

This species was formerly captive in Australia in a sizeable population, kept and bred at several zoos and parks. Puma are covered by the zoo carnivore felidae policy. The last major zoo in the country to hold them was Melbourne Zoo (their last animal dying in 2011) and until recently there were also two females at Dreamworld, which died in 2016 and March 2018.

Puma concolor have been safely exhibited in Australia since the seventies (Bullen's Animal World, Australia), without any record being found of incidence. Currently the only captive puma (female 17 years) remaining in Australia is under the care of Zambi Wildlife Retreat (ZWR) and will soon be transferred to their exhibitors' license on completion and NSW Department of Primary Industries (DPI) approval of their new puma exhibit.

Zambi Wildlife Retreat would like to provide co-habitation for the last puma in Australian captivity, along with the opportunity to exhibit both sexes of the species for education. ZWR was approved by the NSW DPI in September 2017 to construct a new exhibited puma enclosure. The exhibit is a 4.2m high fully enclosed 324sqm naturalistic habitat with a 50sqm off exhibit holding yard and a further 30sqm of den space. The exhibit is capable of housing 3 individuals comfortably.

Interest has been shown to exhibit pumas from other Australian institutions, including Australia Zoo, Mogo Zoo, Shoalhaven Zoo, Wild Animal Encounters and Darling Downs Zoo.

The exhibited animals will play an important role in ZWR's public exhibition and educational programs. ZWR has become a real world training ground for students undertaking animal studies in TAFES and Universities throughout Australia.

The imported animals after undergoing an Official Veterinarian inspection and being issued with a health certification regarding freedom from disease and fitness for travel, would then travel in IATA approved crates via International air services. On arrival the imports would then

be transported by road to a secure, approved NSW quarantine facility where it/they will stay for a quarantined period of 30 days, as per Biosecurity regulation.

1. Taxonomy of the species (IUCN Red List of Threatened Species, 2018).

Kingdom

Animalia

Phylum

Chordata

Class

Mammalia

Order

Carnivora

Family name

Felidae

Genus

Puma

Species

Puma concolor

Scientific name

Puma concolor (Linnaeus, 1771)

Common names

Puma, Cougar, Mountain Lion

2. Status of species under CITES

Puma concolor is classified in CITES as Appendix II, which includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilisation incompatible with their survival (Shivaraju, 2003).

This assessment uses the CITES standard taxonomic reference for *Puma concolor*, which names the subspecies *coryi* and *cougar* as separate subspecies of *Puma concolor* (Wilson and Reeder, 1993).

According to the IUCN Status the Puma is classified as Least Concern (LC), however, numbers are decreasing in the wild (Nielsen et al., 2015).

This species is listed as Least Concern because it is one of the most widely-distributed mammals in the Western Hemisphere. Although it has been extirpated from its former range in mid-western and eastern North America (Nowell and Jackson, 1996), it is attempting to recolonize this region (Thompson and Jenks, 2010, LaRue et al., 2012) and populations are healthy enough for regulated harvest in western North America. However, it is considered to be declining elsewhere in its range, and as a large carnivore intricately linked to other wildlife and habitat associations, from a social and political perspective its conservation and management presents numerous challenges.

3. Species Ecology

Lifespan of the species

Puma concolor can live up to 18 years in the wild and averages 23.8 years in captivity (Weigl, 2005).

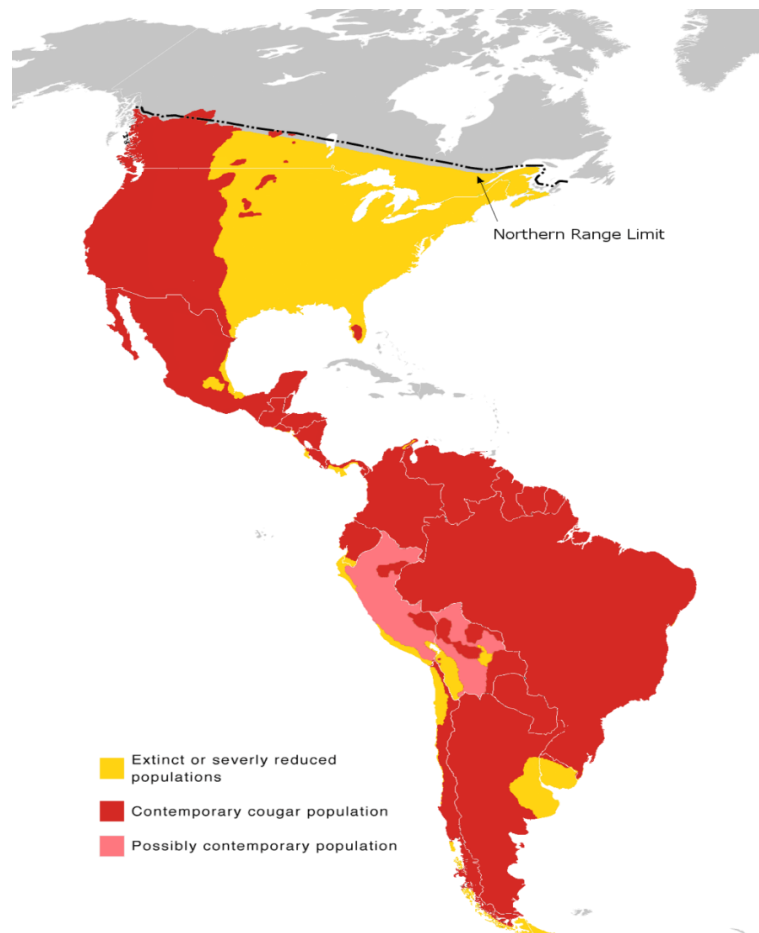
Size and weight range

As with many felid species, males are often larger in size than females (Logan and Sweanor, 2001). This is also applicable to Pumas. They stand between 60 -76 cm tall at the shoulder.

Adult male pumas are around 2.4 m long nose to tail, and typically weigh 53 to 100 kilograms, averaging 62 kg.

Females average 2.05 m from nose to tail and typically weigh between 29 and 64 kg, averaging 42 kg.

Natural geographic range



The geographic range of the Puma is the largest of any terrestrial mammal in the Western Hemisphere (Sunquist and Sunquist, 2002), from Canada through the US, Central and South America to the southern tip of Chile. While the Puma is an adaptable cat, being found in every major habitat type of the Americas, including the high Andes (5,800 m asl in southern Peru;

Sunquist and Sunquist, 2002), it was eliminated from the entire eastern half of North America within 200 years following European colonization (Nowell and Jackson 1996). The male can occupy a territory of 250 km², while the female makes do with about half this area. A remnant endangered sub-population persists in Florida. Recent confirmations and suitable habitat in the Midwestern U.S. indicate attempts at recolonization (LaRue and Nielsen 2011, LaRue et al., 2012).

Habitat

This species is found in a broad range of habitats, in all forest types, as well as lowland and montane desert. Several studies have shown that habitat with dense understory vegetation is preferred, however, Pumas can live in very open habitats with only a minimum of vegetative cover (Nowell and Jackson, 1996). Pumas co-occur with Jaguars in much of their Latin American range, and may favour more open habitats than their larger competitor, although both can be found in dense forest (Sunquist and Sunquist, 2002; Busch, 1996). Mountain lions use a wide variety of habitats including montane coniferous forests, lowland tropical forests, grassland, dry brush country, swamps, and any areas with adequate cover and prey. Dense vegetation, caves, and rocky crevices provide shelter.

¥ Habitat Regions temperate tropical terrestrial

¥ Terrestrial Biomes desert or dune savannah or grassland chaparral forest rainforest scrub forest mountains

¥ Other Habitat Features suburban agricultural riparian

Diet, including potential to feed on agricultural plants

Diet in the Wild

Pumas are highly successful obligate carnivores, meaning they must eat meat to survive. In the wild, pumas will eat elk, deer, moose and caribou in North America. They will also eat smaller animals such as squirrels, bobcats, coyote, other pumas, rabbits, possums, birds, rats and fish. In North America over 60% of a puma's diet is deer. If there is a scarcity of prey, pumas will also eat domestic animals like calves, sheep, poultry, goats and pigs. Puma do not eat agricultural plants. Mountain Lions are able to hunt a diversity of prey sizes from rabbits to moose. In Texas Mountain Lions are relatively smaller than those found in the northern and southern ranges (Canada and Argentina for example) and their main prey species are deer and smaller mammals.

Captive Diet

As pumas are an obligate carnivore, their protein source must be derived from raw animal flesh. Pumas in captivity are fed beef, horse, kangaroo, rabbits, deer and chicken with an added supplement of predamax vitamin and mineral powder (Shoemaker et al., 1997).

Social behaviour and groupings

Pumas are typically solitary, spending most of their lives in well-defined home ranges that vary in size according to a cat's gender, the season, habitat quality, and prey availability (Vynne et al., 2007). Generally, male territories are larger, (often up to 140kms) than those of females, with females often sharing overlapping ranges, (mostly 50kms each animal). For breeding access, male territories may overlap several female ranges, but never those of other resident

males. Pumas mark the boundaries of their territories with olfactory signposts, or scrapes, specifically by building and urinating on piles of dirt, pine needles, and leaves. In search of home ranges, young and transient pumas are allowed to travel through the established ranges of resident cats, but not for long periods. When young males, (sub-adults) leave their mother at 12-24 months of age, they must disperse out of their natal area or be killed by the dominant male (their father). Females usually disperse shorter distances and often times set up home ranges adjacent to their mother (López and González, 1998).

Territorial and aggressive behaviours

Most felids are solitary, with some notable exceptions (e.g. the lion, and to a lesser extent the cheetah, and wildcat). Mostly for cats, conspecific encounters occur most frequently not between individuals but between signals, sent through territorial marking behaviour. Pumas are sympatric with jaguars in much of their Latin American range, and may favour more open habitats than their larger competitor (Vynne et al., 2007), although both can be found in dense forest.

Felids compete for access to resources, ranges, mates, and/or reproductive opportunities, and deadly conspecific encounters have been recorded for some big cats. Among pumas, mature males may kill (but generally do not eat) other males (Anderson et al., 1992) or juveniles of both sexes (Harveson et al. 2000). Some of these wanderers are undoubtedly overflow from wild areas filled to their cougar capacity. Adult males can have home ranges of 100 square miles or more, and aggressively defend those territories from other lions.

Research has also shown that the Puma plays a critical role in providing resources to other species in the ecosystem in which they live. This concept is known as “ecosystem engineering which increases ecosystem health and biodiversity” (Barry et al. 2018).

Behavioural traits:

Growling/Snarling/ Spitting: all signs of aggressive or territorial behaviour. When a puma is threatened it will start growling at a low volume, gradually getting louder if the threat/discomfort persists. Snarling and spitting signal an increase in aggression and potential for confrontation.

Hissing: Cubs are able to hiss from 9-10 days old. Pumas will hiss when protecting territory/food.

Meow/Chirp: Short meows are a greeting to cubs and also a greeting to familiar people within captive settings for hand reared pumas.

Purring - sound of contentment, heard during intimate interactions (with a male before copulation, and also heard in hand reared pumas with their handlers). Heard when cubs suckle. Scream/Yowl: Heard when the female puma is in oestrous (to attract a male). Aggression occurs when a puma, encountering a person or animal, responds in such a way as to increase the odds of physical contact, either as an act of predation or in defence of self, dependent young, or killed prey.

Olfactory Communication

Solitary felids such as *puma concolor* will use scent-marking behaviours by means of communication for territorial defence and location of mates (Allen et al., 2014). These scent marking behaviours are inclusive of “scraping, urine spraying, body rubbing, caterwauling, cheek rubbing, and the flehmen response” (Allen et al., 2014; Harmsen et al., 2010).

Urine spraying - Male pumas will perform territorial patrols and mark objects at significant intervals by urine spraying on vertical objects. Although females may spray on vertical objects on the occasion, it's mainly the male that sprays and marks territory. Pumas are also found to use urine as a way of conveying and interpreting communication within their communities in the wild (Allen et al., 2014).

Clawing - similar to domestic cats clawing at carpet, pumas will claw at the ground and use scratching posts to sharpen claws and mark territory.

Scent marking - pumas have scent glands in their cheeks and paws. They leave scent markings by scratching or rubbing their heads on objects and trees. They can follow scent markings left by other pumas.

Natural predators

For the most part, the puma has no natural enemies and sits atop the food chain. However, they occasionally compete with other predators such as bears and wolves for food.

It has been known however, for pumas that are vulnerable due to sickness or injury to be preyed upon by other large predators including Bears and Wolves, and even other Pumas.

Characteristics that may cause harm to humans and other species.

Pumas are ambush predators that require cover to stalk their prey. They are opportunist hunters and will take advantage of circumstances.

With increasing human populations and spread of residential areas into puma habitat, the probability of humans encountering puma has increased. At the same time, puma seemingly have become less wary of humans near residential or recreation areas in puma habitat. As a result, the number of humans encountering puma has increased along with attacks on domestic stock and backyard pets. (Beier et al., 1991; Fitzhugh et al., 2003)

Presently, the puma is the most widespread apex predator in the Americas. Livestock predation is one of the major causes of conflicts between humans and pumas and one of the major causes of this conflict and consequently, a major driver of the depletion of large carnivore populations worldwide (Guerisoli et al., 2017).

Human fatality by puma in their native lands is very rare as they almost never attack a human. They prefer to avoid confrontation, but in saying this if the animal is cornered and feeling threatened or a fleeing human/child stimulates their prey instincts there would be a potential for an attack (Mattson et al., 2004).

Humans and felids come into conflict in ecosystems, where a high proportion of ungulate biomass is made up of domesticated species. Pumas are intermediate sized felids so they prey on smaller livestock and juveniles of the larger species. There have been accounts of predation on livestock such as cattle, sheep, goats and pigs (see Table 6.1; pg. 169, Macdonald and Loveridge 2010). Also, there have been records of accidental or depredation by Puma on humans with only record found from the USA between 1890-90s. It was noted that people were attacked or killed mainly because of human encroachment into habitat (see table 6.2, pg 174; Macdonald and Loveridge (2010).

4. Reproductive biology

Male pumas remain reproductively active until they are at least 20 years old, and females remain fertile until at least the age of 12. Mountain lion cubs weigh about 400–500 g at birth (Robinette et al., 1961). Males typically outweigh females throughout their lives (Logan et al., 2001).

Pumas have no specific breeding season and are induced ovulators. Female pumas generally reproduce when they are about 2-1/2 years old. A female mountain lion can come into oestrus any time of the year. Oestrus lasts about nine days. Females usually give birth every other year (average generation time is 92.3 days). After six cycles without mating, the female has a lull for two months before coming into oestrous again.

Female pumas in oestrous rub against objects in their territories and vocalise frequently to gain the attention of a potential mate. Courtship begins when a roaming female in heat makes frequent sounds (screams/yowls) and leaves a scent that attracts males. Males often respond with similar yowls. After locating the female, the male accompanies her for just a few days when mating occurs.

Breeding can take place throughout the year but most females give birth between April and July (in the northern hemisphere) following 3-month gestation period. The male puma has no role in raising cubs.

Litters vary in size from 1 to 6 cubs with an average of 3 or 4. The cubs open their eyes 10 days after birth. At the same time their ear pinnae unfolds, their first teeth erupt, and they begin play. The cubs are fully weaned at about 40 days of age. Cubs have about a 70 percent survival rate during the first year. Mother and cubs remain together for as long as 26 months, though the average is 15 months. Male young disperse from 23 to 274 km, while females disperse from 9 to 140 km. Males reach sexual maturity at about 3 years of age and females at 2 1/2 years.

5. Feral populations

Presently, there are no confirmed evidence of wild big cats present in Australian forests. Researchers have mentioned that the the most parsimonious explanation for many of the reported sightings is that they involve large, feral individuals of the domestic cat *Felis catus*. Obtaining unequivocal evidence for the presence of ‘big cats’ would require an organised and structured program aimed at collecting DNA samples from faecal material or prey carcasses, or the opportunistic collection of a number of ‘big cat’ carcasses of proven provenance. More than one specimen would be required because the presence of a single individual is not evidence of a self-sustaining population (Menkhorst and Morrison, 2012).

According to a study by O’Neil et al. (2014), recent findings indicate that cougars (*Puma concolor*) are expanding their range into the Midwestern United States. Confirmed reports of cougar in Michigan, Minnesota, and Wisconsin have increased dramatically in frequency during the last five years, leading to speculation that cougars may re-establish in the Upper Great Lakes (UGL) region, USA. Recent work showed favourable cougar habitat in north-eastern Minnesota, suggesting that the northern forested regions of Michigan and Wisconsin may have similar potential. Recolonization of cougars in the UGL states would have important ecological, social, and political impacts that will require effective management.

A distribution list of countries and territories is available as follows (Source: Species + https://speciesplus.net/#/taxon_concepts/6330/distribution);

COUNTRIES AND TERRITORIES

Argentina
Belize
Bolivia (Plurinational State of)
Brazil
Canada
Chile
Colombia
Costa Rica
Ecuador
El Salvador
French Guiana [FR]
Guatemala
Guyana
Honduras
Mexico
Nicaragua
Panama
Paraguay
Peru
Suriname
United States of America
Uruguay
Venezuela (Bolivarian Republic of)

6. Environmental risk assessments of the species

Risk assessments have been completed on *puma concolor* in its natural territories in North and South America. These assessments were needed due to livestock predation and human conflicts. In reference to the environmental risk assessment the disease agent, Puma lentivirus is genetically distinct from Feline immunodeficiency virus (FIV) found in domestic cats and does not cause disease in domestic cats (Australia B, 2002).

Puma lentivirus

Puma lentivirus (PLV) is related to, but phylogenetically distinct from feline immunodeficiency virus (FIV). It has been detected in North American non-domestic feline species. A lentivirus that cross reacts with FIV has also been found in East African lions, and one that reacts to puma lentivirus was found in lions, leopards and cheetahs in Botswana. A survey report in 1993 by Roelke et al. indicated that the pathogenic effects, if any, for *Felis concolor coryi*, were mild. Pathogenicity for domestic cats appears negligible, although viraemia and seroconversion were demonstrated. Transmission could be vertical (both

placental and mammary transmission suggested), and horizontal via wounds, copulation and ingestion.

Likelihood of disease agent entry, establishment and spread

Puma lentivirus seropositivity of the order 40% has been detected in some wild populations of *Felis concolor* in the USA. Importation of these species would present a moderate likelihood of agent entry. For other species, data are not available. Because of the intimate contact required for transmission of this agent, establishment of the disease in other species within zoo Felidae, or other genera within or outside the zoo would not be expected to occur.

Biological, environmental and economic consequences

The consequence of introduction of this agent, if not already present in zoo Felidae would be expected to be negligible to mild.

Conclusion on risk

The status of this agent in Australia is not known. Current knowledge of the mode of transmission indicates the rate of spread would be low, and then only within the affected species. The consequences of establishment if not already present, would be negligible to mild. Quarantine measures for this agent are not considered warranted.

Transmissible spongiform encephalopathy agents

Transmissible spongiform encephalopathy (TSE) is caused by prions, infectious protein agents that affect the central nervous system, resulting in a slowly progressive degenerative disease. Several cases of TSE have occurred in non-domestic Felidae. The first of these was identified in the UK in 1990. Since then it has also been diagnosed in Norway. Circumstantial evidence indicates that infection may have resulted from ingestion of tissues from cattle affected with bovine spongiform encephalopathy (BSE). Onset of the disease in a puma (*Felis concolor*) began with ataxia, loss of balance and fine muscle tremors. She was euthanized, and histopathology and immunostaining with TSE prion antiserum confirmed a diagnosis of a scrapie-like spongiform encephalopathy. Cases of TSE in cats and non-domestic Felidae have occurred predominantly in the UK. One case in an imported cheetah occurred in Australia and one in France, both cheetahs having been bred and spent a period of their lives in the UK, where it is assumed they contracted the infection. The incubation period is long and, in cats, infection appears to occur through consumption of infected carcass parts.

Likelihood of disease agent entry, establishment and spread

The likelihood of TSE entering Australia in an infected animal is extremely low. Changes to slaughter procedures as a result of BSE in cattle in the UK would likely preclude current TSE transmission to carnivores. Older animals may still be affected because of the long incubation period. Theoretically, these animals could be imported, but in practice zoos prefer to import younger animals, therefore the risk of introduction of an infected animal is extremely low. Dead zoo animals are not destined to end up in the animal food chain in Australia, and the likelihood of a zoo Felid importation resulting in the establishment of a TSE in Australia is negligible.

Conclusion on risk

The conclusion is that negligible quarantine risk is associated with transmissible spongiform encephalopathy in zoo Felidae. No risk management measures are warranted.

Below is an abstract from a risk assessment carried out in Patagonia (Kissling et al., 2009), "Livestock predation and associated human-carnivore conflicts are increasing worldwide and require the development of methods and concepts for risk assessment and conflict management.

Here we use knowledge on habitat preference and distribution of pumas and provide a first assessment of the spatial risk of livestock to puma depredation in Patagonian ranches, Argentina. In an initial step, we developed a rule-based habitat model in a Geographic Information System (GIS) to predict the distribution of puma habitat at a regional scale in Patagonia. We then used empirically derived puma occurrence records from Patagonian ranches 1) to test our regional habitat predictions, and 2) to evaluate if paddock characteristics (vegetation cover, topography, and distance to roads) contribute to explain puma occurrences within ranches. Finally, we simulated three livestock management scenarios differing in their spatial and seasonal allocation of livestock to paddocks, and compared the likelihood of livestock exposure to pumas among scenarios. At a regional scale, 22% of the study region was predicted to be suitable for puma home ranges. The greatest uncertainty in these predictions resulted from assumptions on woody vegetation cover requirements at the home range scale. Within ranches, puma occurrences were positively associated with paddock topography, woody vegetation cover on paddocks, and proximity to predicted regional puma habitat. Comparing the risk of predation by puma among simulated livestock management scenarios implied that rotating livestock during seasons may help to reduce the likelihood of livestock exposure to pumas. Our results show the usefulness of rule-based habitat models for describing broad-scale carnivore distributions and for aiding risk assessments to mitigate conflicts between predators and human activities.”

7. Likelihood of species establishing a breeding population in Australia.

In Australia, given that there is suitable habitat and food available for this species, the likelihood of puma establishing a breeding population would be highly unlikely. A founding population would have to be of considerable size. According to MVP (minimal breeding population) there would need to be a minimum of 50 wild animals to establish a viable breeding population going on the 50/500 rule, which suggested that a minimum population size of 50 was necessary to combat inbreeding and a minimum of 500 individuals was needed to reduce genetic drift. Management agencies tended to use the 50/500 rule under the assumption that it was applicable to species generally (Vath and Robinson, 2015; Shaffer, 1981). The high security standards for keeping of this species would ensure a very low likelihood of this species being able to enter the Australian environment.

Based upon literature review, it is unlikely that accidental release of puma pair from captivity will eventually result in establishment of a viable population. This is evident from a recent study by (LaRue and Nielsen, 2016), which used population viability analysis (PVA), a process which has been used to predict population changes in wide-ranging carnivores. Specifically, this study built a stage based population model using >40years of published literature, and implemented the stage matrix into a spatially explicit population model (RAMAS/GIS) to understand the possibility for establishment and viability of cougar populations in the Midwest.

To some extent the Midwest is similar Australian rangeland in that it contains variably sized patches separated by poor habitat (in this case, row-crop fields, prairies, and pastures). The study found that that regardless of harvest scenario, female cougars are likely to recolonize large patches of habitat in Midwestern North America within 25 years, with seven of eight large patches occupied in the harvest scenario. Recolonization was dependent on dispersal rates and distances, and not on variation in demographic rates; this suggests that despite harvests in western populations, female cougars are likely to disperse far enough to encounter large habitat patches in the Midwest such that these patches are likely to be recolonized.

Even patches as far-east as Minnesota and Wisconsin were predicted to contain at least one female cougar during this time, though such a population could suffer from the Allee effect and therefore could remain effectively extinct (Allee et al., 1949; Lande, 1987).

8. Potential impact of a feral population if established.

Cougars, particularly young males, will travel hundreds of kilometres in search of new territory (Sweaner et al., 2000; Thompson and Jenks, 2005; Logan and Sweaner, 2010; Wiedenhoef et al., 2012). In 2011, one individual travelled more than 1,700 km from Minnesota to Connecticut, and may have travelled a straight-line distance of 2,500 km from the Black Hills to the East Coast (Wiedenhoef et al., 2012).

If puma did establish a feral population their solitary and elusive habits would make them difficult to detect and therefore difficult to eradicate by hunting. Puma would therefore become the apex predator in their chosen territory (males up to 140kms and females 50kms) and would compete with the dingo for food. Diet would consist of large and small mammals, feral deer, pigs and domestic livestock.

The overall impact of an established feral population would impact on Australia's native wildlife but would not affect agricultural crops. Puma would be a nuisance to livestock farmers alongside dingoes, foxes and feral dogs. It is reported that livestock losses to predation both in North and South America to puma runs at between 1 - 10% (Guerisoli et al., 2017; Elbroch and Wittmer, 2013; Smith et al, 2017).

9. Conditions/restrictions that could be applied to importation of species to reduce negative impacts on environments

Given that this species is to be imported to approved high security facilities only, where there are existing management protocols, the likelihood of accidental introduction to the natural environment would be extremely remote. If it was seen necessary to take further precautions, the import of animals could possibly be restricted to single sex or neutered animals only.

10. Summary of the types of activities that species would be involved in.

Currently, Zambi Wildlife Retreat cares for a single female puma aged 17 years. Given that she is the last of her kind in Australia and quite capable of living another 6 years, ZWR would like to offer her co-habitation. Pumas, long known as solitary carnivores, are more social than previously thought, according to a study led by conservation organisation Panthera and co-authored by UC Davis and the American Museum of Natural History (Panthera, 2017; Elbroch et al., 2017). The study, is the first to quantify complex, enduring, and friendly interactions of these secretive animals, revealing a rich puma society far more tolerant and social than previously understood. Puma's are quite social, even with other species of felid and canid of similar size. Puma's tend to display more natural behaviours when living in co-habitation. ZWR's new naturalistic puma habitat is designed to encourage these behaviours. As the largest cat species of the North American continent the puma makes a handsome exhibited animal as well as being a valuable educational ambassador for its species.

11. Species management (Husbandry)

ZWR was granted approval to construct an animal display establishment in September

2017. The application for the puma enclosure was approved by the Department of Primary Industries (DPI).

In New South Wales the display of animals is regulated by the Exhibited Animals Protection Act 1986 (EAPA), The Standards for Exhibiting Carnivores in NSW. The Exhibited Animals Protection Act 1986 pertains to the conditions for exhibiting carnivores (pursuant to Clause 8(2) of the Exhibited Animals Protection Regulation 1995). This publication outlines the standards developed to maximise the welfare of animals in captivity and cover a range of areas including:

- ¥ psychological and physical animal welfare
- ¥ educational value of exhibits
- ¥ public safety
- ¥ guidelines for new and existing displays
- ¥ legal effect

The General Standards for Exhibiting Animals in NSW apply to all exhibited animals and include requirements such as:

- ¥ Staff experience
- ¥ Educational value.
- ¥ Visitor facilities.
- ¥ Animal enclosures.
- ¥ Public safety.
- ¥ Husbandry and management.
- ¥ Nutrition and hygiene.
- ¥ Capture, handling and transport.
- ¥ Health
- ¥ Behaviour.
- ¥ Breeding control.

Measures can be taken to control breeding and eliminate surplus animals in captive populations of pumas by the use of the following techniques.

Separation of males and females is the most direct and easy way to prevent breeding from occurring. However, if this is not possible because a pair is compatible, or there are space/housing constraints, then other options are:

De-sexing – (removing ovaries and the uterus of a female). A permanent, safe way of eliminating pregnancy in the female puma. Castration (removal of testicles) of male. A permanent, safe way of preventing pregnancy due to the elimination of sperm production.

Contraceptive implants:

Deslorelin, a GnRH agonist available as an implant for long-term use, successfully suppressed reproductive functions in male and female dogs by down regulating GnRH receptors at the gonadotropes in the pituitary gland without adverse reactions and is a potentially useful contraceptive for cats (L. Munson et al, 2001).

GnRH analogues are used to down regulate LH and FSH receptors in the pituitary gland. Treatment with the GnRH analogue deslorelin in long-acting implants resulted in a reversible cessation of male and female reproduction functions in dogs and cats. Captive housing of wild carnivores in zoos or holding in wildlife conservancies or sanctuaries often requires temporary contraception or suppression of aggression (H.J. Bertschinger et al, 2001).

Deslorelin has proven to be a very effective contraceptive where female felids are concerned. And though they are not as effective as a contraceptive in males it does reduce aggression, and so males are often treated with it as well, especially when housed in a group environment.

Previously one of the most frequently used reversible contraceptive methods was the melengestrol acetate (MGA) implant. This subcutaneous implant is a reversible control of reproduction, which has been successfully and easily accomplished. It is a medical grade silastic compound impregnated with melengestrol acetate. Each implant is usually effective for a two-year period after which the implant can be replaced if further contraception is desired (Ed. R.L. Tilson and U.S.Seal, 1987).

Exhibitors must meet these standards of husbandry as well as any other relevant standards for the exhibition of specific taxonomic groups. Puma comes under the Standards for Exhibiting Carnivores in New South Wales.

**The General Standards for Exhibiting Animals in New South Wales is a code of practise that is followed nationally by other states such as WA, TAS and QLD.*

Security

The exhibited animal facility is enclosed by a perimeter security fence. All compound gates are secured and locked. All access points, enclosures, cages and fencing are checked first thing in the AM and last thing in PM as part of the ZWR Standard Operating Procedures (SOP'S). In extreme weather conditions, precautions are taken to secure animals inside den areas. The Operations Manager and a senior staff member live onsite. A video camera surveillance system will be included in the new exhibited area.

Housing

The DPI approved puma exhibit, currently under construction at ZWR exceeds the EAPA standards. It is designed with species specific requirements to ensure animal welfare along with providing components to stimulate natural behaviours. This naturalistic habitat will showcase this beautiful cat species.

The ZWR puma enclosure is designed to ensure security and safety to both human and animal. Enclosure entry points are double gated and den areas are entered via a locked service walkway. The 324 sqm, 4.2 metre high enclosure is fully enclosed with 5mm 75 x 50 galvanised weldmesh panels, as per the EAPA requirements for housing *Puma concolor*.

12. Provide information on all other commonwealth, state and territory legislative controls on the species.

Puma concolor is a high security non-indigenous animal that requires specialised care and housing. Therefore, it is required nationally, that an exhibitor hold an authority to house this species.

National issues are dealt with by the Commonwealth Government, e.g. Australian Government Department of Agriculture and Water Resources, Department of Environment and Energy, Biosecurity Australia, national security, quarantine, customs, international treaties, such as CITES. At the Commonwealth level, zoos principally have to comply with

the *Biosecurity Act 2015* and the *Environment Protection and Biodiversity Conservation Act 1999*.

The Puma is listed in the Vertebrate Pests Committee List of Exotic Vertebrate Animals in Australia under VPC threat category of extreme and earlier VPC category of 2 (2 - Limited to statutory zoos or endorsed special collections) (VPC, 2007).

The Puma is also currently listed under the CITES listing appendix II (Source: <http://www.environment.gov.au/biodiversity/wildlife-trade/do-i-need-permit>).

Appendix II of CITES contains the species that, although not threatened with extinction now, might become so unless trade in them is strictly regulated. You can read more about Appendix II listings on the CITES page.

To assist in the effective regulation of sustainable trade, Australia has chosen to adopt a stronger position by applying stricter domestic measures than required by CITES for these species.

Import of live animals listed on Appendix II of CITES into Australia for non-commercial purposes are limited to research, exhibition (and zoos), education and as household pets.

Export of live animals listed on Appendix II of CITES from Australia for non-commercial purposes are limited to research and exhibition (and zoos).

You must meet strict Australian standards and animal welfare requirements to be granted a permit for these purposes.

If you are importing into Australia, you will need to apply for a CITES import permit and provide with your application a CITES export permit issued by the CITES Management Authority of the country of export.

This species is intended for holding by approved carnivore exhibitors only. Each state and territory has its own legislature and responsibilities governing the control and standards for keeping exhibited animals both native and non-indigenous.

Department of Primary Industries NSW (*Exhibited Animals Act 2015, Exhibited Animals Protection Regulation 2010*).

Department of Primary Industries SA (*National Resources Management Act 2004*) (*Bio Security SA*)

Department of Economic Development, Jobs, Transport, and Resources, Agriculture Victoria (*The Catchment and Land Protection Act 1994*)

Department of Agriculture and Fisheries, Biosecurity QLD (*Exhibited Animals Act 2015*),

Department of Primary Industries and Regional Development WA (*Biosecurity and Agriculture Management Act 2007*) (*The Animal Welfare Act 2002*)

Department Primary Industries, Parks, Water and Environment TAS (*Nature Conservation Act, Wildlife Regulations 2010*),

Department of Primary Industries, Parks, Water and Environment NT
(Territory Parks and Wildlife Conservation Act 2006)

Department of Agriculture and Water Resources ACT
(Commonwealth Government)

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