RISK ASSESSMENT FOR AUSTRALIA – Eurasian Lynx (*Lynx lynx*) (Linnaeus, 1758)

Class - Mammalia, Order – Carnivora, Family - Felidae (Fischer, 1817), Genus - *Lynx* (Kerr, 1792); (Wilson and Reeder 1993, Nowak 1999)

GOVERNMENT OF WESTERN AUSTRALIA

Department of Agriculture and Food

Score Sheet

SPECIES: Eurasian Lynx (*Lynx lynx*) Other common names include: Siberian Lynx Synonyms: *Felis lynx* (Nowak 1999)		**Species Description** – Medium-sized cat, the largest of the bob-tailed cats (Sunquist and Sunquist 2002). Head and body length 800-1300 mm; tail length 11-245 mm; shoulder height 600-750 mm; weight 8-38 kg, males average 21.6 kg, females 18.1 kg (Nowell and Jackson 1996b, Nowak 1999, Sunquist and Sunquist 2002, Long 2003). The fur is long and dense however, in summer it is shorter, coarser, lighter in colour and spots are more prominent. Colouration is variable, ranging from reddish, brown, yellowish, grey, ashy-blue to almost white. Pattern of spots on the coat varies in colour, number, size, sharpness, tone and vividness (lynx pelts are valuable). The body is often marked with narrow dark stripes along the back that may also occur on the forehead, between the ears, and on top of the head. Underparts, chest, neck and throat, eyelids, insides of the ears and legs are usually white. (Finn 1929, Tumlison 1987, Nowell and Jackson 1996b, Nowak 1999, Sunquist and Sunquist 2002, Long 2003). Broad and relatively short skull; the head is round with a short neck; the face has a flat appearance (Breitenmoser et al 2000, Sunquist and Sunquist 2002). It has a prominent facial ruff, as well as prominent black tufts on the tips of the angular, pointed ears (Finn 1929, Tumlison 1987, Gurung and Singh 1996, Nowell and Jackson 1996b, Nowak 1999, Breitenmoser et al 2000, Sunquist and Sunquist 2002, Long 2003). The legs are long and feet large, hind legs are longer than the fore legs (Gurung and Singh 1996, Nowell and Jackson 1996b, Mitchell-Jones et al 1999, Nowak 1999, Breitenmoser et al 2000, Sunquist and Sunquist 2002). The feet are thickly haired in winter (Nowak 1999, Sunquist and Sunquist 2002, Long 2003). The claws are sharp, strong and retractable (Tumlison 1987, Breitenmoser et al 2000). The tail is short and stubby, thickly furred, with a black tip (Finn 1929, Tumlison 1987, Gurung and Singh 1996, Nowell and Jackson 1996b, Nowak 1999, Breitenmoser et al 2000, Sunquist and Sunquist 2002, Long 2003). **General information** – Ecological studies have been carried out on the Lynx in central and northern Europe where the species inhabits forest and its major prey are ungulate species. However, the distribution of the Lynx includes very large areas of central Asia, from Turkey to Mongolia, with open habitat – mainly grasslands. Few studies have been done on the species from these areas and little is known about the species behaviour in this type of habitat; a type common to Australia (Linnell 2008). **Longevity –** Wild animals may live up to 17 years (Nowell and Jackson 1996b) and a captive specimen recorded as reaching 23.7 years of age (HAGR Human Ageing Genomic Resources 2006). Normally few live past 10 years (pers comm. (Linnell 2008)). **Status –** (Cat Specialist Group 2002) 1. Red List Category (Europe) - Least Concern (LC) Rationale: European: The species has a wide range in Europe, and remains abundant in the eastern part of the range. Although population trends in European Russia have not been quantified, they are not believed to approach the threshold for the population decline criterion of the IUCN Red List (30% over 10 years or 3 generations). Consequently the species is classed as Least Concern at the European level.

		2. Red List Category (EU 25) - Near Threatened (NT) Rationale: Listed as 'Near Threatened' on the IUCN Red List of Threatened Species – Assessed 2002, based on estimates of density and geographic range (Nowell and Jackson 1996a, Breitenmoser et al 2000) the Lynx's total effective population size is estimated at below 50,000 mature breeding individuals, with a declining trend due to degradation of its habitat and prey base, and may possibly qualify as Vulnerable if these trends persist, or if better information on its status and range were available. **CITES listed** Protection Status: CITES Appendix II. Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. It also includes so-called "look-alike species", i.e. species of which the specimens in trade look like those of species listed for conservation reasons. International trade in specimens of Appendix-II species may be authorized by the granting of an export permit or re-export certificate. No import permit is necessary for these species under CITES (although a permit is needed in some countries that have taken stricter measures than CITES requires). Permits or certificates should only be granted if the relevant authorities are satisfied that certain conditions are met, above all that trade will not be detrimental to the survival of the species in the wild (CITES 2007).
DATE OF ASSESSMENT: 10/01/2008 **Bird and Mammal Model used (Bomford 2008) using PC CLIMATE (Brown et al 2006, Bureau of Rural Sciences 2006)**		**The Risk Assessment Model** Models for assessing the risk that exotic vertebrates could establish in Australia have been developed for mammals, birds (Bomford 2003, 2006, 2008), reptiles and amphibians (Bomford et al 2005, Bomford 2008). Developed by Dr Mary Bomford of the Bureau of Rural Sciences (BRS), the model uses criteria that have been demonstrated to have significant correlation between a risk factor and the establishment of populations of exotic species and the pest potential of those species that do establish. For example, a risk factor for establishment is similarity in climate (temperature and rainfall) within the species' distribution overseas and Australia. For pest potential, the species' overseas pest status is a risk factor. The model was originally published in 'Risk Assessment for the Import and Keeping of Exotic Vertebrates in Australia' (Bomford 2003) available online http://www.daff.gov.au/brs/land/feral-animals/management/risk . This model used the Apple Mac application CLIMATE (Pheloung 1996) for climate matching. The risk assessment model was revised and recalibrated 'Risk Assessment for the Establishment of Exotic Vertebrates in Australia: Recalibrated and Refinement of Models' (Bomford 2006) and the climate application changed to PC CLIMATE software (Bureau of Rural Sciences 2006), available online at http://affashop.gov.au/product.asp?prodid=13506. The most recent publication (Bomford 2008) includes updated instructions for using the exotic vertebrate risk assessment models and an additional model for freshwater fish. A bird and mammal model for New Zealand has also been included. **Which models are being used for the assessments:** Birds and mammals have been assessed using the Australian Bird and Mammal Model (Bomford 2008), pp 16-28, including both versions of stage B, models 1 (4 factors) and 2 (7 factors). All reptiles and amphibians were assessed using three models; the Australian Bird and Mammal Model (Bomford 2008), including Model A, using 3 factors from stage B (pp 54-55), and Model B, using 7 factors from stage B (pp 20), and the Australian Reptile and Amphibian Model (Bomford 2008), p 51-53. The rational for using additional models for reptiles and amphibians is to compare establishment risk ranks of the three models for a precautionary approach. If the models produce different outcomes for the establishment potential of any reptile or amphibian, the highest ranked outcome should be used

		(Bomford 2008). **Climate Matching Using PC CLIMATE** Sixteen climate parameters (variables) of temperature and rainfall are used to estimate the extent of similarity between data from meteorological stations located in the species' world distribution and in Australia. Worldwide, data (source; worlddata_all.txt CLIMATE database) from approximately 8000 locations are available for analysis. The number of locations used in an analysis will vary according to the size of the species' distribution. Data from approximately 762 Australian locations is used for analysis. To represent the climate match visually, the map of Australia has been divided into 2875 grid squares, each measured in 0.5 degrees in both longitude and latitude. CLIMATE calculates a match for each Australian grid by comparing it with all of the meteorological stations within the species' distribution (excluding any populations in Australia) and allocating a score ranging from ten for the highest level match to zero for the poorest match. These levels of climate match are used in the risk assessment for questions B1 (scores are summed to give a cumulative score), C6, and C8. For a grid square on the Australian map to score highly, it must match closely all 16 climatic variables of at least one meteorological station in the species' distribution for each level of climate match. [The score for each grid is based on the minimum Euclidian distance in the 16-dimensional variable space between it and all stations in the species' distribution. Each variable is normalized by dividing it by its worldwide standard deviation.]
LITERATURE SEARCH TYPE AND DATE: NCBI, CAB Direct, MEDLINE, Science Direct, Web of Knowledge (Zoological Records, Biological Abstracts), SCIRUS, Google Search and Google Scholar 20/11/2007		
FACTOR	**SCORE**	
STAGE A: RISKS POSED BY CAPTIVE OR RELEASED INDIVIDUALS		
A1. Risk to people from individual escapees (0–2) *Assess the risk that individuals of the species could harm people. (NB, this question only relates to aggressive behaviour shown by escaped or released individual animals. Question C11 addresses the risk of harm from aggressive behaviour if the species establishes a wild population).* *Aggressive behaviour, size, plus the possession of organs capable of inflicting harm, such as sharp teeth, claws, spines, a sharp bill, or toxin-delivering apparatus may enable individual animals to harm people. Any known history of the species attacking, injuring or killing people should also be taken into account. Assume the individual is not protecting nest or young. Choose one:*	1	*Animal that is unlikely to make an unprovoked attack but which can cause serious injury (requiring hospitalisation) or fatality if cornered or handled* One report of an attack on a six year old girl in America – the girl was pounced on by an escaped Lynx; the animal released the child's head after being struck by a brick and the girl did not sustain serious injury (Captive Wild Animal Protection Coalition 2006). No information regarding whether or not this attack was provoked. Several sources claim that the Lynx is not a threat to human safety (Breitenmoser et al 2000, Hetherington 2006, Ministry of Agriculture and Forestry 2007). Although the Lynx is a powerful carnivore, capable of killing animals three to four times its own size and it possess sharp claws (Tumlison 1987, Breitenmoser et al 2000), no reports of harm to humans from captive-kept Lynx were found for this assessment therefore, ranked as Moderately dangerous. In captivity lynx have occasionally attacked keepers such as when the person turned their back on the animal however, in general lynx are easy to handle in captivity (pers comm.(Linnell 2008)).
A2. Risk to public safety from individual captive animals (0–2)	0	*Nil or low risk (highly unlikely or not possible)*.

Assess the risk that irresponsible use of products obtained from captive individuals of the species (such as toxins) pose a public safety risk (excluding the safety of anyone entering the animals' cage/enclosure or otherwise coming within reach of the captive animals)		
STAGE A. PUBLIC SAFETY RISK SCORE **SUM A1 TO A2 (0–4)**	**1**	
STAGE B: PROBABILITY ESCAPED OR RELEASED INDIVIDUALS WILL ESTABLISH FREE-LIVING POPULATION		
Model 1: Four-factor model for birds and mammals (BOMFORD 2008)		
B1. Degree of climate match between species overseas range and Australia (1–6)	3	*Climate Match Score = 682 Moderate climate match with Australia* [See above information on climate matching.] Climate data from *851* locations (see species worldwide distribution map) were used to calculate the CMS; distribution extends from Europe to central Asia (see B3 for details).
B2. Exotic population established overseas (0–4)	0	*No exotic population established anywhere on a continent* Many re-introductions and some expansions back into areas that were previously part of the species' natural range have occurred. However, as none of these areas are geographically separate from the natural range they are not considered exotic populations as defined by the risk assessment model (Bomford 2006). . Efforts have been made to reintroduce the Lynx to parts of its former range. Re-introductions (from the 1970s) have occurred in parts of Germany, Austria, Switzerland, Slovenia, Italy, and Yugoslavia (Nowak 1999, Breitenmoser et al 2000, Sunquist and Sunquist 2002, Long 2003, IUCN 2007), and to the Vosges Mountains, Jura Mountains, and the Alps (Lever 1985, Wilson and Reeder 1993, Mitchell-Jones et al 1999, Ministry of Agriculture and Forestry 2007). In Germany isolated attempts have been made to re-establish the Lynx, and occasionally it enters the country from its range further east (Long 2003). Three lynx escaped from an animal park at Hellbabrun near Munich, Germany (*year unknown*) and evidently became established for a period, and were still known in the environs of the city in 1950 (Niethammer 1963). The species is said to be a relatively poor coloniser and further reintroductions will be required to restore the species to potentially suitable areas (Hetherington and Gorman 2007). (See B3 for species distribution). In Fennoscandia (Scandinavian Peninsula, the Kola Peninsula, Karelia and Finland) the Lynx has re-expanded its range dramatically during the 20th Centaury and given suitable continuous habitat the species is considered a moderate coloniser (pers comm.(Linnell 2008)).
B3. Overseas range size (0–2) < 1 = 0; 1 – 70 = 1; >70 = 2	1	*Overseas range size between 1-70 million km^2, estimated at 54 million km^2. Includes current and past 1000 years, natural and introduced range.* The Lynx has one of the widest distributions of all the cat species however, over the past several hundred years it has been extirpated from much of its range, and although it has since been reintroduced to several areas much of its former range remains unoccupied. Populations in some countries have rebounded from near extinction and relict populations persisted in other countries; expansion occurred during 1960s and 70s northward in Scandinavia, Finland and Russia (Breitenmoser

		et al 2000, Cat Specialist Group 2002, Hetherington and Gorman 2007, IUCN 2007). Details follow: **Historical distribution** The Lynx had a widespread distribution that previously extended from Europe, throughout Russia, to central Asia (Nowak 1999, IUCN 2007, Ministry of Agriculture and Forestry 2007): ▪ **Europe** – it was found throughout forested montane areas in Europe, including Norway, Sweden, Finland, Estonia, Latvia, Lithuania, Belarus, Moldova, Czech Republic, south-west Germany (Black Forest Region) the Carpathian Mountains (Slovakia, Poland, the Ukraine, Romania), Hungary, Romania, Yugoslavia, Former Yugoslav Republic of Macedonia, the Balkans (Albania, Croatia and Slovenia), Greece, Turkey (Asia Minor). Small populations in the French Pyrenees, the Vosges mountains (France), the Jura Mountains (France, Switzerland), and the Alps (Austria, France, Italy, Switzerland) (Wilson and Reeder 1993, Nowell and Jackson 1996b, Mitchell-Jones et al 1999, Nowak 1999, Breitenmoser et al 2000, Sunquist and Sunquist 2002, Long 2003, Kaphegyi et al 2006, IUCN 2007) Absent from the Iberian Peninsula where the smaller Iberian lynx *Lynx pardinus* occurs (Mitchell-Jones et al 1999, Breitenmoser et al 2000, IUCN 2007, Ministry of Agriculture and Forestry 2007). Also absent from countries without forest, and unforested coastal areas, the north-west of northern Europe, and the larger islands such as Ireland and Sicily (Breitenmoser et al 2000, IUCN 2007). It is thought to have become extinct in Britain during the late medieval period (Hetherington 2006) ▪ **Russian Federation** – across Russia, throughout eastern Siberia, including Sakhalin Island (Wilson and Reeder 1993, Nowell and Jackson 1996b, Mitchell-Jones et al 1999, Nowak 1999, Breitenmoser et al 2000, Sunquist and Sunquist 2002, Long 2003, IUCN 2007) ▪ **Asia** – throughout much of the montane regions of northern and central China (Gansu, Qinghai, Shaanxi, and Sichuan provinces), Manchuria, the Tien Shan to the Kopet Dag, locally over the entire Tibetan plateau, and throughout the northern slopes of the Himalayas (Wilson and Reeder 1993, Nowell and Jackson 1996b, Mitchell-Jones et al 1999, Nowak 1999, Breitenmoser et al 2000, Sunquist and Sunquist 2002, Long 2003, Ministry of Agriculture and Forestry 2007) **Current distribution** ▪ The Lynx disappeared from most of western Europe during the nineteenth century, populations were either eradicated or seriously reduced (Nowak 1999, Breitenmoser et al 2000, Sunquist and Sunquist 2002) reaching their lowest point around 1950 (Ministry of Agriculture and Forestry 2007); larger populations persisted in European Russia (IUCN 2007) ▪ Lynx populations in Norway, Sweden, Finland, the Czech Republic, Slovakia, Romania and Poland have recovered from near extinction (Wilson and Reeder 1993, Mitchell-Jones et al 1999, Nowak 1999, Sunquist and Sunquist 2002, Ministry of Agriculture and Forestry 2007). Relict populations persist in Turkey, Albania, Macedonia and Kosovo in the southwest Balkans (pers comm. (Linnell 2008)). ▪ Successful reintroductions have been carried out in areas from which the species was eradicated, including the French Vosges and Jura mountains, in the Alps, and the Balkans (Wilson and Reeder 1993, Mitchell-Jones et al 1999, Nowak 1999, Breitenmoser et al 2000, Sunquist and Sunquist 2002, Hetherington 2006, IUCN 2007, Ministry of Agriculture and Forestry 2007).
B4. Taxonomic Class (0–1)	1	*Mammal* (Wilson and Reeder 1993, Nowak 1999).

B. ESTABLISHMENT RISK SCORE **SUM OF B1-4 (1–13)**	**5**	
Model 2: Seven-factor model for birds and mammals (BOMFORD 2008)		
B5. Diet (0–1)	1	*Generalist with a broad diet of many food types* The Lynx is carnivorous, consuming a variety of prey, and are capable of killing animals three to four times larger than itself. Hunting is carried out on the ground by stalking and ambush; the Lynx locates its prey by hearing and sight. Two out of three kills are made after a chase of 20-30 m; Lynx don't usually pursue or chase down prey if the initial surprise attack fails. Lynx kill small prey by biting into the neck or back, larger animals are killed with a throat bite (Gurung and Singh 1996, Nowak 1999, Hetherington 2006, Ministry of Agriculture and Forestry 2007). Data on the Lynx in Sweden showed that 70% of successful hunts involved chases of 20 m or less and in longer chases of reindeer and hares success at 200 m was 67% and 100% at 300 m; speculated as possibly due to the Lynx assessing the prey and chasing only weak prey over the long distances when there was a high probability of success. Ungulates ranging in size from Musk Deer to the larger Red Deer are killed but preference is for the smallest ungulate available (Sunquist and Sunquist 2002) Moose over 100 kg killed but this extremely rare (pers comm. (Linnell 2008)). The diet varies according to location and season and includes hares, small ungulates such as Roe Deer, Chamois and Musk Deer, and in some areas semi-domestic Reindeer, and young domestic stock (Tumlison 1987, Gurung and Singh 1996, Jedrzejewski et al 1999, Nowak 1999, Breitenmoser et al 2000, Jobin et al 2000, Long 2003, Odden et al 2006) . In some areas the Lynx will feed on larger ungulates (mainly females and young), including Red Deer, Moose, wild boar and Argali (mountain sheep, *Ovis ammon*) (Tumlison 1987, Gurung and Singh 1996, Jedrzejewski et al 1999, Nowak 1999, Breitenmoser et al 2000, Odden et al 2006). Reported to take pikas, hedgehogs, and small rodents including beavers, marmots, and squirrels (Gurung and Singh 1996, Nowak 1999, Breitenmoser et al 2000, Jobin et al 2000, Long 2003). Lynx will also eat other carnivores, including Red Fox, martens, badgers, domestic and wild cat, and dogs (Gurung and Singh 1996, Jobin et al 2000, Odden et al 2006). Ungulates dominate western and northern Europe and are the Lynx's main prey type however in central and northern Eurasia smaller prey is taken, especially lagomorphs and tetranoid birds (e.g. grouse) (pers comm.(Linnell 2008)). Ground dwelling birds are sometimes taken, including grouse and capercaillie, partridges, pheasants and passerine (Tumlison 1987, Gurung and Singh 1996, Nowak 1999, Breitenmoser et al 2000, Jobin et al 2000, Long 2003, Odden et al 2006). Lynx will sometimes feed on reptiles (of the order Squamata), and carrion (Tumlison 1987, Gurung and Singh 1996, Long 2003).
B6. Lives in disturbed habitat (0–1)	1	*Can live in disturbed habitats* In central Europe the Lynx is associated with forested habitat (Schadt 2002). A study in Poland indicated that the occurrence of Lynx was negatively associated with human settlements and transportation infrastructure – the majority of Lynx (75%) were found at study sites where there were no more than four villages and towns; Lynx did not occur at study sites with more than 10 villages and towns (Niedziałkowskaa et al 2006). It is uncommon for the Lynx to be found in cultivated areas (Long 2003). The species is typically associated with forest, dense undergrowth, open forest, rocky areas,

		tundra, wooded areas, scrub woodland, barren rocky areas above the tree line, or rocky hills in desert regions (Nowak 1999, Long 2003). In Poland, the Lynx occurred in areas where forest cover was greater than 40% (Niedziałkowskaa et al 2006). Clear-felling of forests had a negative effect on Lynx populations when deforestation occurred at levels of 40 – 50% and at 80%, at 25% level Lynx populations remained stable and resident (Zheltuchin 1992 as cited in (Nowell and Jackson 1996b). As a large, wide-ranging carnivore that requires a large home range, viable populations of Lynx can only be maintained in densely urbanised and populated countries such as Germany in mixed-use landscapes: For Lynx populations to disperse, fragmented landscapes that have suitable habitat for the species need to have pathways connecting areas as well as some means for the Lynx to avoid high mortality on roads (Schadt 2002). In western Europe the Lynx requires forest but can tolerate, to a certain degree if prey is available, both heavily exploited forest and forest fragmented by farmland; in Scandinavia Lynx occur in fairly open tundra; in central Asia, Lynx occur in treeless areas however little is known about the species in this area (pers comm. (Linnell 2008)).
B7. Non-migratory behaviour (0–1)	1	*Non-migratory or facultative migrant in its native range* Lynx can move considerable distances while hunting prey (up to 20 km but on average 10 km), searching for prey (up to 100 km if prey is scarce) or when following prey undertaking migration or seasonal movement. Home ranges are large, up to 300 km^2 and males' are larger than females', as well as larger in autumn-winter than in spring-summer (Jedrzejewski et al 1999, Nowak 1999, Sunquist and Sunquist 2002, Long 2003).
B. ESTABLISHMENT RISK SCORE **SUM OF B1-7 (1-16)**	**8**	
STAGE C: PROBABILITY AN ESTABLISHED SPECIES WILL BECOME A PEST		
C1. Taxonomic group (0–4)	2	*Mammal in one of the orders that have been demonstrated to have detrimental effects on prey abundance* Order Carnivora (Wilson and Reeder 1993, Nowak 1999).
C2. Overseas range size including current and past 1000 years, natural and introduced range (0–2)	2	*Overseas range greater than 30 million km^2. Estimated at 54 million km^2.* Overseas distribution extends from Europe to central Asia (see B3 for details).
C3. Diet and feeding (0–3)	3	*Mammal that is a strict carnivore and arboreal* The Lynx is proficient at climbing trees and will use trees to escape if suddenly frightened or pursued (Finn 1929, Gurung and Singh 1996, Sunquist and Sunquist 2002). Lynx observed caching prey in trees (Cerveny and Okarma 2002) but this is not considered normal activity for the species (pers comm. (Linnell 2008)). No reports found of it hunting up trees, however the main prey species are not arboreal, such as hares and small ungulates (see B5 for information on diet).
C4. Competition with native fauna for tree hollows (0–2)	2	*Can nest or shelter in tree hollows* Only a few wild den sites have been described but they can be sited in a cave or hole in rock piles, in crevices under bushes, beneath low overhanging branches of conifers, among the roots at the base of a tree, or in a hollow tree or hollow log (Gurung and Singh 1996, Hernandez 2002, Sunquist and Sunquist 2002, Long 2003).

C5. Overseas environmental pest status (0–3) Has the species been reported to cause declines in abundance of any native species of plant or animal or cause degradation to any natural communities in any country or region of the world?	0	*Never reported as an environmental pest in any country or region* The effect of predation by the Lynx on prey populations is largely unknown, with few long-term studies done to generalise about predation (Breitenmoser et al 2000, Sunquist and Sunquist 2002) and suggestions that the species can nearly eradicate prey have not been confirmed (Breitenmoser et al 2000). Studies have shown that annually, the Lynx is able to kill 21-36 % of the roe deer population in Poland, and that it is the most important cause of Roe Deer mortality (Okarma et al 1997, Breitenmoser et al 2000). In Poland 6-13 % of the Red Deer population is killed by the Lynx annually however although deer numbers are reduced Red Deer population trends were not regulated by the Lynx (Okarma et al 1997). It has been suggested that the Lynx could bring about a reduction in deer populations and restore balance in areas where browsing and grazing deer cause problems that could include costly damage to forestry, agricultural and natural heritage interests (Hetherington 2006).
C6. Climate match to areas with susceptible native species or communities (0–5) Identify any native Australian animal or plant species or communities that could be susceptible to harm by the exotic species if it were to establish a wild population here.	5	*The species has one or more susceptible native species or ecological communities that are listed as vulnerable or endangered under the Australian Government Environment Protection and Biodiversity Conservation Act 1999 has a restricted geographical range that lies within the mapped area of the highest six climate match classes for the exotic species being assessed.* These susceptible native species include: Western Quoll (*Dasyurus. geoffroii)* **(vulnerable),** Southern Dibbler (*Parantechinus apicalis*) **(endangered)** Tasmanian Devil (*Sarcophilus harrisii*) **(vulnerable)**, Red-tailed Phascogale (*Phascogale calura*) **(endangered)**, including Sandhill Dunnart (*Sminthopsis psammophila*) **(endangered)**, Numbat (*Myrmecobius fasciatus*) **(vulnerable)** Eastern Barred Bandicoot (*Perameles gunnii*) **(endangered)**, Long-footed Potoroo (*Potorous longipes*) **(endangered)** Quokka (*Setonix brachyurus*) **(vulnerable)** Heath Rat (*Pseudomys shortridgei*) **(vulnerable)**, Hastings River Mouse (*P. oralis)* **(endangered)** Reference for all vulnerable or endangered species (status noted in bold) (Dept of the Environment Water Heritage and the Arts 2007, 2008). **AND** *The species has more than 100 grid squares within the highest four climate match classes that overlap the distribution of susceptible species or communities* Susceptible Australian native species or natural communities that could be threatened include **Mammals:** Platypus (*Ornithorhynchus anatinus*), Short-beaked Echidna (*Tachyglossus aculeatus*), **(vulnerable)**, Spotted-tailed Quoll (*Dasyurus maculatus*) **(endangered)**, Woolley's Pseudantechinus (*Pseudantechinus woolleyae*), Brush-tailed Phascogale (*P. tapoatafa*), Yellow-footed Antechinus (*Antechinus flavipes*), Brown Antechinus (*A. stuartii*), Dusky Antechinus (*A. swainsonnii*), Wongai Ningaui (*Ningaui ridei*), Southern Ningaui (*N. yvonneae*), dunnarts (*Sminthopsis* spp.), Southern Brown Bandicoot (*Isoodon obesulus*) **(endangered)**, Long-nosed Bandicoot (*P. nasuta*) Southern Hairy-nosed Wombat (*Lasiorhinus latifrons*), Common Wombat (*Vombatus ursinus*), **(endangered)**, Long-nosed Potoroo (*P. tridactylus*) **(vulnerable)**, Black-footed Rock-wallaby (*Petrogale lateralis*) Eastern Grey Kangaroo (*Macropus* giganteus), Western Grey Kangaroo (*M. fuliginosus*), Common Wallaroo (*M. robustus*) Red Kangaroo (*M. rufus*), Mitchell's Hopping-mouse (*Notomys mitchelli*), Spinifex Hopping-mouse (*N. alexis*) (Strahan 1995). **Birds:** Malleefowl (*Leipoa ocellate*) **(vulnerable)**, Stubble Quail (*Coturnix pectoralis*), Brown Quail (*C. ypsilophora*), King Quail (*C. chinensis*), Buff-banded Rail (*Gallirallus philippensis*), Lewin's Rail (*Rallus pectoralis*), Bush-hen (*Amaurornis olivaceus*), button-quails (*Turnix* spp.), Plains-wanderer (*Pedionomus torquatus*) **(vulnerable)**, Bush Stone-curlew (*Burhinus grallarius*), bronzewings (*Phaps*

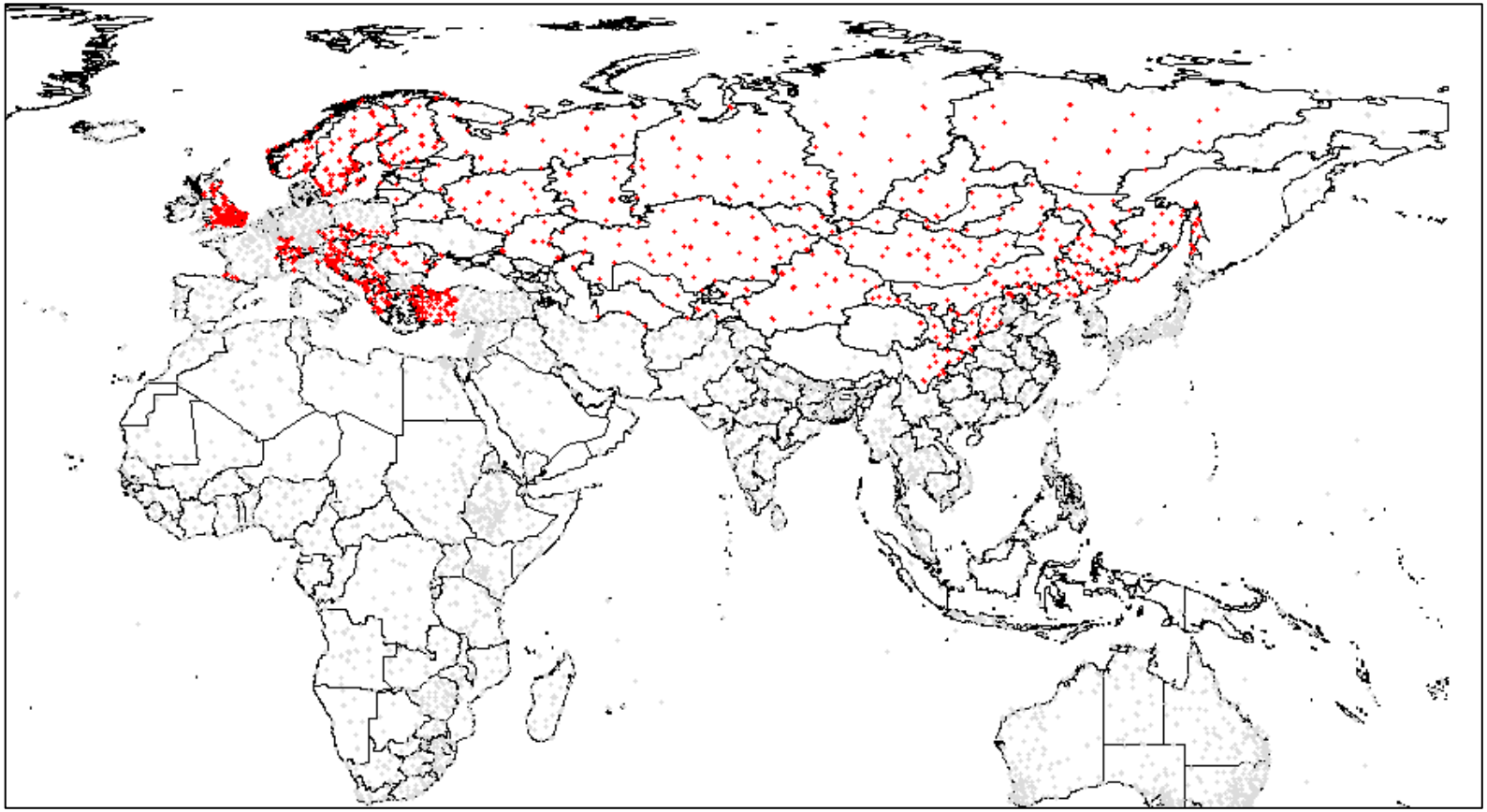
		spp.), doves (*Geopelia* spp.), Squatter Pigeon (*Geophaps scripta*) **(vulnerable)**, Ground Parrot (*Pezoporus wallicus*) **(endangered)**, quail-thrush (*Cinclosoma* spp.) including Spotted Quail-thrush (*C. punctatum)* **(critically endangered)**, Tawny Grassbird (*Megalurus timoriensis*) and Little Grassbird (*M. gramineus*). (Pizzey and Knight 1997, Barrett et al 2003) **Reptiles:** Lizards – Pernatty Knob-tail (*Nephrurus deleani*) **(vulnerable)**, Border Thick-tailed Gecko (*Underwoodisaurus sphyrurus*) **(vulnerable)**, Brigalow Scaly-foot (*Paradelma orientalis*) **(vulnerable)**, Grassland Earless Dragon (*T. pinguicolla*) **(endangered)**, Collared Delma (*Delma torquata)* **(vulnerable)**, Long-legged Worm-skink (*Anomalopus mackayi)* **(vulnerable)** Hamelin Ctenotus (*Ctenotus zastictus)* **(vulnerable**), Three-toed Snake-tooth Skink (*Coeranoscincus reticulatus*) **(vulnerable)**, Yakka Skink (*Egernia rugosa)* **(vulnerable)**, Western Spiny-tailed Skink (*E. stokesii)* **(endangered**), Corangamite Water Skink (*Eulamprus tympanum*) (**endangered**), Adelaide Blue-tongue Lizard (*Tiliqua adelaidensis*) **(endangered)** (Cogger 2000). Note: other native mammals such as small kangaroos, wallabies, rats and mice would be susceptible as potential prey for lynx but have distributions at less than 100 grid squares within the highest four climate match classes, e.g. Tammar Wallaby (*Marcopus eugenii*) (Strahan 1995). **Communities:** No listed vulnerable or endangered ecological communities likely to be at risk.
C7. Overseas primary production pest status (0–3) *Has the species been reported to damage crops or other primary production in any country or region of the world?*	2	*Moderate pest of primary production in any country or region* The Lynx has been intensively hunted because it is considered a threat to game and livestock, including deer, sheep, goats and poultry (Finn 1929, Nowak 1999, Breitenmoser et al 2000). All reviews of depredation by the Lynx concluded that livestock losses are relatively low compared with losses caused by other large predators and the Lynx is not regarded as a major problem to livestock production in most European countries (Breitenmoser et al 2000, Long 2003); except for depredation on sheep in Norway and domestic reindeer in Norway, Sweden and Finland (pers comm. (Linnell 2008)). Problems of depredation on livestock is most severe in western Europe where the Lynx has been reintroduced. After native wild ungulates readapted to the presence of predators, livestock killing increased, but later declined as the Lynx dispersed. Overall stock losses were relatively low and compensation was paid by governments or environmental groups. In Switzerland, from a total of US$35 million paid in subsidy to sheep farming only US$7000 was paid in compensation for loss from lynx-kills; the problem therefore not necessarily economic, but more psychological and political (Nowell and Jackson 1996b). In Sweden, a study found that of the large carnivores, the Lynx caused the second highest total cost of livestock losses (wolverines caused the highest loss) (Bostedt and Grahn 2007). Compensation is paid to farmers in some countries for Lynx-caused stock loss; Sweden $31,000 (for sheep and cattle) and in Norway $2,155,971 (for sheep and cattle) (Woodroffe et al 2005). It is thought that Lynx depredation on sheep is due more to chance encounters between Lynx and sheep, rather than the result of sheep being sought out as prey (Odden et al 2006). Male Lynx were found to be responsible for more livestock deaths than female Lynx (Odden et al 2002). Depredation on sheep in Norway higher compared to any other European country; this is because sheep are generally unattended or unguarded and allowed to graze freely (Breitenmoser et al 2000, Asheim and Mysterud 2004, Woodroffe et al 2005, Odden et al 2006, Ministry of Agriculture and Forestry 2007). In Norway, the number of sheep killed by the Lynx steadily increased and reached around 8000 in 1995, with a mean annual loss of about 5000 sheep. The second most important loss was reported from France, where 208 sheep were killed in the Jura Mountains in 1990. All other

		countries had annual losses of 10-100 sheep maximum. (Breitenmoser et al 2000) Additionally, conflict between lynx and people arises from competition for prey species that are also trophy targets for hunters, such as deer (Breitenmoser et al 2000). The Lynx accounted for only 2% of the total sheep and goat livestock loss from predation by large carnivores in the Indian Trans-Himalayan region attacked (Namgail et al 2007).
C8. Climate match to susceptible primary production (0–5) *Assess Potential Commodity Impact Scores for each primary production commodity listed in Table 9, based on species' attributes (diet, behaviour, ecology), excluding risk of spreading disease which is addressed in Question C9.*	5	Score = 175 (Bomford 2003, Bomford 2006); Goat production (McGregor 1997) See Commodity Scores Table - species has attributes making it capable of damaging sheep, cattle, pig, poultry, aquaculture, and other livestock commodities.
C9. Spread disease (1–2)	2	*All birds and mammals (likely or unknown effect on native species and on livestock and other domestic animals).*
C10. Harm to property (0–3)	0	*$0* No reports found.
C11. Harm to people (0–5) *Assess the risk that, if a wild population established, the species could cause harm to or annoy people. Aggressive behaviour, plus the possession of organs capable of inflicting harm, such as sharp teeth, tusks, claws, spines, a sharp bill, horns, antlers or toxin-delivering organs may enable animals to harm people. Any known history of the species attacking, injuring or killing people should also be taken into account (see Stage A, Score A1).*	3	*Moderate risk - Injuries or harm moderate but unlikely to be fatal and few people at risk* Powerful carnivore, capable of killing animals three to four times its own size; it can also drag prey several hundred meters before consuming (Nowak 1999), and possess sharp claws (Tumlison 1987, Breitenmoser et al 2000). Lynx are described as cautious or timid animals, but not cowardly (Sunquist and Sunquist 2002, Hetherington 2006). Several sources claim that the Lynx is not a threat to human safety, as there were no recorded attacks on people in Europe (Breitenmoser et al 2000, Hetherington 2006, Ministry of Agriculture and Forestry 2007). There are said to be a few cases where the Lynx has injured humans, all accidents involved wounded or captured Lynx and one incident involving a rapid Lynx in Slovenia (Breitenmoser et al 2000). Female Lynx pushed away from their litters do not defend cubs but will attack dogs accompanied by humans in defence of cubs (Breitenmoser et al 2000). Lynx can be affected by the rabies virus and rabid lynxes from France, Slovenia, Slovakia, Croatia and Russia have been occasionally reported (Breitenmoser et al 2000, Zienius et al 2003).
C. PEST RISK SCORE **SUM C 1 TO 11 (1–37)**	**26**	
STAGE A. PUBLIC SAFETY RISK RANK – RISK TO PUBLIC SAFETY POSED BY CAPTIVE OR RELEASED INDIVIDUALS 0 = Not dangerous; 1 = Moderately dangerous; ≥ 2 = Highly dangerous	**1**	**MODERATELY DANGEROUS**
STAGE B. ESTABLISHMENT RISK RANK – RISK OF ESTABLISHING A WILD POPULATION **MODEL 1: FOUR-FACTOR MODEL FOR BIRDS AND MAMMALS (BOMFORD 2008)**	**5**	**LOW ESTABLISHMENT RISK**

≤ 5 = low establishment risk; 6-8 = moderate establishment risk; 9-10 = serious establishment risk; ≥11-13 = extreme establishment risk		
STAGE B. ESTABLISHMENT RISK RANK – RISK OF ESTABLISHING A WILD POPULATION **MODEL 2: SEVEN-FACTOR MODEL FOR BIRDS AND MAMMALS (BOMFORD 2008)** ≤ 6 = low establishment risk; 7-11 = moderate establishment risk; 12-13 = serious establishment risk; ≥14 = extreme establishment risk	**8**	**MODERATE ESTABLISHMENT RISK**
STAGE C. PEST RISK RANK - RISK OF BECOMING A PEST FOLLOWING ESTABLISHMENT < 9 = low pest risk; 9-14 = moderate pest risk; 15-19 = serious pest risk; > 19 = extreme pest risk	**26**	**EXTREME PEST RISK**
VERTEBRATE PESTS COMMITTEE THREAT CATEGORY		**EXTREME – ENDORSED BY VPC**
Median number of references per mammal, for all mammals assessed by (Massam et al 2010) (n=17) Total number of references for this species *(median number for references for Public Safety Risk, Establishment Risk and Overseas Environmental and Agricultural Adverse Impacts)*		37 37 – the median number of mammal references were used for this assessment.

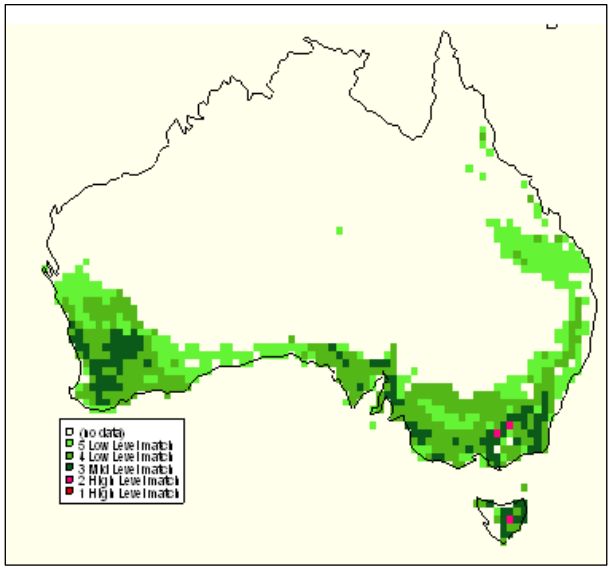
WORLDWIDE DISTRIBUTION – Eurasian Lynx (*Lynx lynx*), includes current and past 1000 years.

Each red dot is a location where meteorological data was sourced for the climate analysis (see B1); faint grey dots are locations available for CLIMATE analysis but are not within the species distribution therefore not used. There is no introduced range for this species.



Map 1. Climate match between the world distribution of Eurasian Lynx (*Lynx lynx*) and Australia for five match classes.

Colour on Map	Level of Match from Highest (10) to Lowest (6)	No. Grid Squares on Map
Red	10 HIGH MATCH	0
Pink	9 HIGH MATCH	3
Dark Green	8 MODERATE MATCH	109
Mid Green	7 MODERATE MATCH	297
Lime Green	6 LOW MATCH	273
		CMS = 682



Eurasian Lynx *(Lynx lynx)* Susceptible Australian Primary Production – Calculating Total Commodity Damage Score

The commodity value index scores in this table are derived from Australian Bureau of Statistics 2005 – 2006 data. The values will require updating if significant change has occurred in the value of the commodity (Bomford 2008).Table 9

Industry	Commodity Value Index 1 (CVI based on 2005- 06 data)	Potential Commodity Impact Score (PCIS 0-3)	Climate Match to Commodity Score (CMCS 0–5)	Commodity Damage Score (CDS columns 2 X 3 X 4)
Cattle (includes dairy and beef) consumption of stock fodder consumption of stock fodder only therefore commodity value adjusted down by 1/3	11	**2**	**4**	**88**
Timber (includes native and plantation forests)	10	0	0	0
Cereal grain (includes wheat, barley sorghum etc) no reports of damage to this commodity	8	0	0	0
Sheep (includes wool and sheep meat) consumption of stock fodder only therefore commodity value adjusted down by 1/3	5	**3**	**5**	**75**
Fruit (includes wine grapes)	4	0	0	0
Vegetables	3	0	0	0
Poultry and eggs	**2**	**1**	**2**	**4**
Aquaculture(includes coastal mariculture)	2	0	0	0
Oilseeds (includes canola, sunflower etc) no reports of damage to this commodity	1	0	0	0
Grain legumes (includes soybeans) no reports of damage to this commodity	1	0	0	0
Sugarcane	1	0	0	0
Cotton	1	0	0	0
Other crops and horticulture (includes nuts tobacco and flowers etc)	0	0	0	0
Pigs	1	**1**	**2**	**2**
Other livestock (includes goats, deer, camels, rabbits)	**0.5**	**3**	**4**	**6**
Bees (included honey, beeswax and pollination)	0.5	0	0	0
Total Commodity Damage Score (TCDS)				**175**

[Table 9 Rational

Potential Commodity Impact Score (0-3)

Assess Potential Commodity Impact Scores for each primary production commodity listed in Table 9, based on species' attributes (diet, behaviour, ecology), excluding risk of spreading disease which is addressed in Question C9, and pest status worldwide as:

0. Nil (species does not have attributes to make it capable of damaging this commodity)

1. Low (species has attributes making it capable of damaging this or similar commodities and has had the opportunity but no reports or other evidence that it has caused damage in any country or region

2. Moderate–serious (reports of damage to this or similar commodities exist but damage levels have never been high in any country or region and no major control programs against the species have ever been conducted OR the species has attributes making it capable of damaging this or similar commodities but has not had the opportunity)

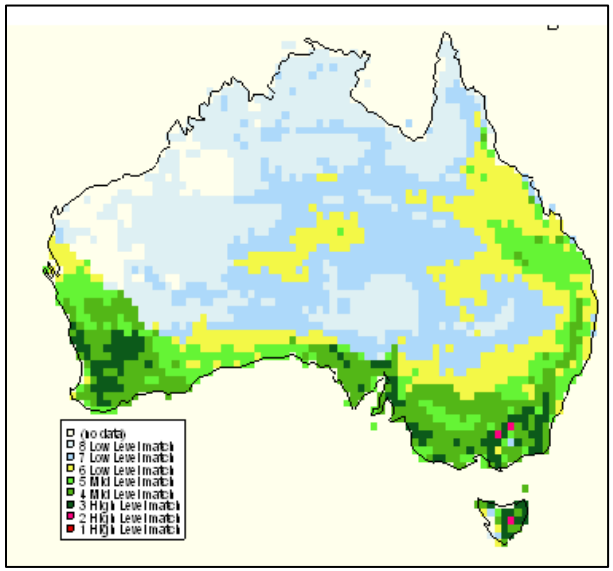
3. Extreme (damage occurs at high levels to this or similar commodities and/or major control programs have been conducted against the species in any country or region and the listed commodity would be vulnerable to the type of harm this species can cause).

Climate Match to Commodity Score (0–5)

- *None of the commodity is produced in areas where the species has a climate match within the highest eight climate match classes (ie classes 10, 9, 8, 7, 6, 5, 4 and 3) = 0*
- *Less than 10% of the commodity is produced in areas where the species has a climate match within the highest eight climate match classes = 1*
- *Less than 10% of the commodity is produced in areas where the species has a climate match within the highest six climate match classes (ie classes 10, 9, 8, 7, 6 and 5) = 2*
- *Less than 50% of the commodity is produced in areas where the species has a climate match within the highest six climate match classes AND less than 10% of the commodity is produced in areas where the species has a climate match within the highest three climate match classes (ie classes 10, 9 and 8) = 3*
- *Less than 50% of the commodity is produced in areas where the species has a climate match within the highest six climate match classes BUT more than 10% of the commodity is produced in areas where the species has a climate match within the highest three climate match classes = 4*
- *OR More than 50% of the commodity is produced in areas where the species has a climate match within the highest six climate match classes BUT less than 20% of the commodity is produced in areas where the species has a climate match within the highest three climate match classes = 4*
- *More than 20% of the commodity is produced in areas where the species has a climate match within the highest three climate match classes OR overseas range unknown and climate match to Australia unknown = 5.]*

Map 2. Climate match between the world distribution of Eurasian Lynx *(Lynx lynx)* and Australia for eight match classes.

Colour on Map	Level of Match from Highest (10) to Lowest (3)	No. Grid Squares on Map
Red	10 HIGH MATCH	0
Pink	9 HIGH MATCH	3
Dark Green	8 HIGH MATCH	109
Mid Green	7 MODERATE MATCH	297
Lime Green	6 MODERATE MATCH	273
Yellow	5 MODERATE MATCH	436
Blue	4 LOW MATCH	716
Light blue	3 LOW MATCH	793



References

Asheim LJ and Mysterud I (2004). Economic impact of protected large carnivores on sheep farming in Norway. *Sheep & Goat Research Journal,* 19:89-96.

Barrett G, Silcocks A, Barry S, Cunningham R and Poulter R (2003). *The New Atlas of Australian Birds*. Royal Australasian Ornithologists Union/Birds Australia.

Bomford M (2003). Risk Assessment for the Import and Keeping of Exotic Vertebrates in Australia. Bureau of Rural Sciences, Canberra.

(2006). *Risk assessment for the establishment of exotic vertebrates in Australia: recalibration and refinement of models - A report produced for the Department of Environment and Heritage*. Bureau of Rural Sciences.

(2008). Risk assessment models for establishment of exotic vertebrates in Australia and New Zealand - A report produced for the Invasive Animals Cooperative Research Centre. Bureau of Rural Sciences, Canberra.

Bomford M, Kraus F, Braysher M, Walter L and Brown L (2005). Risk Assessment Model for the Import and Keeping of Exotic Reptiles and Amphibians. A report produced for the Department of Environment and Heritage. Bureau of Rural Sciences, Canberra.

Bostedt G and Grahn P (2007). Estimating cost functions for the four large carnivores in Sweden. *Arbetsrapport - Institutionen för Skogsekonomi, Sveriges Lantbruksuniversitet,* (No.361):25 pp.

Breitenmoser U, Breitenmoser-Würsten C, Okarma H, Kaphegyi T, Kaphygyi-Wallmann U and Muller UM (2000). *Action Plan for the conservation of the Eurasian Lynx (Lynx lynx) in Europe*. Convention on the Conservation of European Wildlife and Natural Habitats, Council and Europe Publishing, Switzerland.

Brown L, Barry S, Cunningham D and Bomford M (2006). Current practice in applying CLIMATE for weed risk assessment in Australia. In: Proceedings of the 15th Australian Weeds Conference, Adelaide, South Australia, pp.703-706.

Bureau of Rural Sciences (2006). CLIMATE software. Bureau of Rural Sciences, Department of Agriculture, Fisheries and Forestry, Canberra. http://adl.brs.gov.au/anrdl/metadata_files/pe_brs90000003434.xml [Access date:09/04/2010].

Captive Wild Animal Protection Coalition (2006). Big Cat Incidents, United States, Jan 2004 – June 2006. In: *Captive Wild Animal Report*, San Carlos, California. http://www.cwapc.org/ [Access date:24/01/2008].

Cat Specialist Group (2002). *Lynx lynx*. IUCN Red List of Threatened Species. www.iucnredlist.org [Access date:20/11/2007].

Cerveny J and Okarma H (2002). Caching prey in trees by Eurasian lynx *Acta Theriologica,* 47(4):505-508.

CITES (2007). Appendices I, II and III. CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora). http://www.cites.org [Access date:01/02/2008].

Cogger HG (2000). *Reptiles & Amphibians of Australia*. Reed New Holland, Sydney.

Dept of the Environment Water Heritage and the Arts (2007). Threatened species and threatened ecological communities. http://www.environment.gov.au/biodiversity/threatened/species.html [Access date:09/04/2010].

(2008). EPBC Act List of Threatened Ecological Communities. Australian Government. http://www.environment.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl [Date accessed:15/01/2008].

Finn F (1929). *Sterndale's Mammalia of India*. Thacker, Spink and Co., Bombay.

Gurung KK and Singh R (1996). *Field Guide to the Mammals of the Indian Subcontinent*. Academic Press Limited, London.

HAGR Human Ageing Genomic Resources (2006). AnAge Database. Human Ageing Genomic Resources http://genomics.senescence.info/ [Access date:09/04/2010].

Hernandez S (2002). *Lynx lynx*, Eurasian lynx. Animal Diversity Web, Museum of Zoology, University of Michigan. http://animaldiversity.ummz.umich.edu/site/accounts/information/Lynx_lynx.html [Access date:20/11/2007].

Hetherington D (2006). The lynx in Britain's past, present and future. *ECOS,* 27(1):66-74.

Hetherington DA and Gorman ML (2007). Using prey densities to estimate the potential size of reintroduced populations of Eurasian lynx. *Biological Conservation,* 137:37-44.

IUCN (2007). European Mammal Assessment. IUCN. http://ec.europa.eu/environment/nature/conservation/species/ema/ [Access date:20/11/2007].

Jedrzejewski W, Jedrzejewska B, Schmidt K, Okarma H and Kowalczyk R (1999). Ecology of the lynx (Lynx lynx) in Bialowieza Primeval Forest. *Wiadomosci Ekologiczne,* 45(1):17-41.

Jobin A, Molinari P and Breitenmoser U (2000). Prey spectrum, prey preference and consumption rates of Eurasian lynx in the Swiss Jura Mountains *Acta Theriologica,* 45(2):243-252

Kaphegyi TAM, Kaphegyi U and Muller U (2006). Status of the Eurasian lynx (*Lynx lynx*) in the Black Forest region, South Western Germany. *Mammalian Biology,* 71(3):172-177.

Lever C (1985). *Naturalised Mammals of the World*. Longman, London.

Linnell JDC (2008). *Lynx lynx.* Personal communication - Dr. John D.C. Linnell Norwegian Institute for Nature Research Tungasletta conducted the expert review of the Lynx lynx risk assessment, April 2008, Tungasletta, Norway.
Long JL (2003). *Introduced Mammals of the World: Their History, Distribution and Influence*. CSIRO Publishing, Collingwood, Australia.
Massam M, Kirkpatrick W and Page A (2010). Assessment and prioritisation of risk for 40 exotic animal species Department of Agriculture and Food, Western Australia. Invasive Animals Cooperative Research Centre, Canberra.
McGregor B (1997). Mohair. Rural Industries Research & Development Corporation, Barton, ACT http://www.rirdc.gov.au/pub/handbook/mohair.html [Access date:07/01/2008].
Ministry of Agriculture and Forestry (2007). *Management plan for the lynx population in Finland*. Ministry of Agriculture and Forestry, Finland. http://www.mmm.fi.
Mitchell-Jones AJ, Amori G, Bogdanowicz W, Krystufek B, Reijnders PJH, Spitzenberger F, Stubbe M, Thissen JBM, Vohralik V and Zima J (1999). *The Atlas of European Mammals*. Academic Press, London.
Namgail T, Fox JL and Bhatnagar YV (2007). Carnivore-Caused Livestock Mortality in Trans-Himalaya. *Environmental Management,* 39(4):490-496.
Natural Resource Management Standing Committee (2004). Guidelines for the Import, Movement and Keeping of Exotic Vertebrates in Australia. Developed by the Vertebrate Pests Committee http://www.feral.org.au/feral_documents/VPCGuidelinesApril05.pdf [Access date:09/04/2010].
Niedziałkowskaa M, Jedrzejewskia W, Mysłajekb RW, Nowakb S, Jedrzejewskaa B and Schmidta K (2006). Environmental correlates of Eurasian lynx occurrence in Poland – Large scale census and GIS mapping. *Biological Conservation,* 133(1):63-69.
Niethammer G (1963). *Die Einburgerung von Saugetiere und Vogeln in Europa*. Hamburg & Berlin.
Nowak RM (1999). *Walker's Mammals of the World Vol I*. The Johns Hopkins University Press, Baltimore.
Nowell K and Jackson P (1996a). Wild Cats. Status Survey and Conservation Action Plan. IUCN/SSC Cat Specialist Group. IUCN, Gland, Switzerland. (online version) [Access.
(1996b). *Wild cats: status survey and conservation action plan*. IUCN/SSC, Gland, Switzerland.
Odden J, Linnell JDC and Andersen R (2006). Diet of Eurasian lynx, Lynx lynx, in the boreal forest of southeastern Norway: the relative importance of livestock and hares at low roe deer density. *European Journal of Wildlife Research,* 52:237-244.
Odden J, Linnell JDC, Moa PF, Herfindal I, Kvam T and Andersen R (2002). Lynx Depredation on Domestic Sheep in Norway *Journal of Wildlife Management,* 66(1):98-105.
Okarma H, Jedrzejewski W, Schmidt K, Kowalczyk R and Jedrzejewska B (1997). Predation of Eurasian lynx on roe deer and red deer in Bialowieza Primeval Forest, Poland *Acta Theriologica,* 42(2):203-224.
Pheloung PC (1996). *CLIMATE: a system to predict the distribution of an organism based on climate preferences*. Agriculture Western Australia, Perth.
Pizzey G and Knight F (1997). *The Graham Pizzey and Frank Knight Field Guide to the Birds of Australia*. Angus and Robertson.
Schadt SA (2002). *Scenarios assessing the viability of a lynx population in Germany*. In: Lehrstuhl für Landschaftsökologie. der Technischen Universität Munchen, pp.116.
Strahan R (1995). *The Mammals of Australia*. Reed New Holland, Sydney, Auckland, London, Cape Town.
Sunquist M and Sunquist F (2002). *Wild Cats of the World*. Univ. Chicago Press, Chicago.
Tumlison R (1987). *Felis lynx*. *Mammalian Species,* 269:1-8.
Wilson DE and Reeder DM (1993). *Mammal Species of the World. A Taxonomic and Geographic Reference*. Smithsonian Institution Press, Washington.
Woodroffe R, Thirgood S and Rabinowitz A (2005). *People and Wildlife, Conflict or Co-existence?* Cambridge University Press, Cambridge.
Zienius D, Bagdonas J and Dranseika A (2003). Epidemiological situation of rabies in Lithuania from 1990 to 2000. *Veterinary Microbiology,* 93:91-100.

Vertebrate Pests Committee Threat Categories (Natural Resource Management Standing Committee 2004)

VPC Threat Category

A species' VPC Threat Category is determined from the various combinations of its three risk ranks; (A) Public safety risk rank, (B) Establishment risk rank, (C) Pest risk rank.

B. Establishment Risk Rank[1]	C. Pest Risk Rank[1]	A. Public Safety Risk Rank	Threat Category
Extreme	Extreme	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Extreme**
Extreme	High	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Extreme**
Extreme	Moderate	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Extreme**
Extreme	Low	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Extreme**
High	Extreme	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Extreme**
High	High	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Extreme**
High	Moderate	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Serious**
High	Low	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Serious**
Moderate	Extreme	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Extreme**
Moderate	High	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Serious**
Moderate	Moderate	Highly Dangerous	**Serious**
Moderate	Moderate	Moderately Dangerous or Not Dangerous	**Moderate**
Moderate	Low	Highly Dangerous	**Serious**
Moderate	Low	Moderately Dangerous or Not Dangerous	**Moderate**
Low	Extreme	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Serious**
Low	High	Highly Dangerous, Moderately Dangerous or Not Dangerous	**Serious**
Low	Moderate	Highly Dangerous	**Serious**
Low	Moderate	Moderately Dangerous or Not Dangerous	**Moderate**
Low	Low	Highly Dangerous	**Serious**
Low	Low	Moderately Dangerous	**Moderate**
Low	Low	Not Dangerous	**Low**

[1] 'Establishment Risk' is referred to as the 'Establishment Likelihood' and 'Pest Risk' is referred to as the 'Establishment Consequences' by the Natural Resource Management Standing Committee (2004).